



Smarter Monitoring.
Reliable Power.

SCYC-HLJC2304
Power Cable Sheath Circulation And Partial Discharge
Integrated
Online monitoring device



Sichuan Yachen Electric Co., Ltd.
Qingdao Britop International Trading Co., Ltd.

High-Voltage Cable Circulating Current and Partial Discharge Integrated Online Monitoring Device

Sichuan Yachen Electric



Sichuan Yachen Electric Co., Ltd. is a technology-driven manufacturing enterprise headquartered in Mianyang, Sichuan Province—known as China's "City of Science and Technology." Since its establishment in 2004, the company has specialized in the R&D and production of electromagnetic pulse (EMP) protection products, power transmission network monitoring equipment, lightning protection systems, instrumentation, high/low voltage electrical switches, and medical isolated power (IT) systems.

Our solutions are widely deployed across diverse sectors, including construction, electric power, telecommunications, railways, healthcare, and defense. Leveraging a robust R&D team, significant capital investment, and state-of-the-art infrastructure, Yachen Electric maintains long-term strategic partnerships with leading universities and research institutions. This commitment to collaboration ensures continuous technological optimization and innovation. To date, the company holds numerous invention and utility model patents, and all products have been rigorously tested and certified by authoritative Chinese industry bodies.

Our unwavering focus on advanced R&D, stringent quality control, and exceptional product reliability has earned Yachen Electric extensive recognition and acclaim from clients worldwide.

Mission: To enhance global power reliability through cutting-edge intelligent monitoring technology and innovative protection solutions. (使命：通过尖端的智能监测技术和创新的防护方案，提升全球电力的可靠性。)

Core Values:

Precision: In every sensor and every data point. (精准：对待每一个传感器和数据点。)

Integrity: Building trust through reliable infrastructure. (正直：通过可靠的基础设施建立信任。)

Innovation: Solving tomorrow's grid challenges today. (创新：今日即解决明天的电网挑战。)

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- ▶ **ISO 9001:2015** (Quality Management System)
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- ▶ **AAA-rated Credit Enterprise** (since 2011) and **AAA-rated Quality & Integrity Excellence Unit** (since 2012)

Furthermore, the company serves as the Vice Chairman Unit of the Electromagnetic Pulse and Lightning Protection Technology Professional Committee of the Sichuan Institute of Electronics, and a Director Unit of the Southwest Construction Electrical Information Network. We are also a selected supplier for military-grade products.

To ensure superior customer experience, Yachen Electric maintains a strong presence across major regions in China, providing rapid and high-quality technical support and after-sales service. Our global reach is further extended through an extensive network of authorized distributors.

We sincerely welcome domestic and international partners to explore collaborative opportunities and achieve mutual growth.

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职务 Title: 总经理 CEO

日期 Date : 2026.7.30

被授权方/Authorized Party(盖章/Seal)

Qingdao Britop International Trading Co., Ltd.

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职务 Title: 总经理 General Manager

日期 Date : 2026.7.30

For and on behalf of
QINGDAO BRITOP INTERNATIONAL TRADING CO., LTD
青岛博越达国际贸易有限公司
Authorized Signature(s)

Circulating current, partial discharge, main cable current, return line current, vibration, temperature, induced voltage

1

Measurement System Introduction

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Equipment appearance

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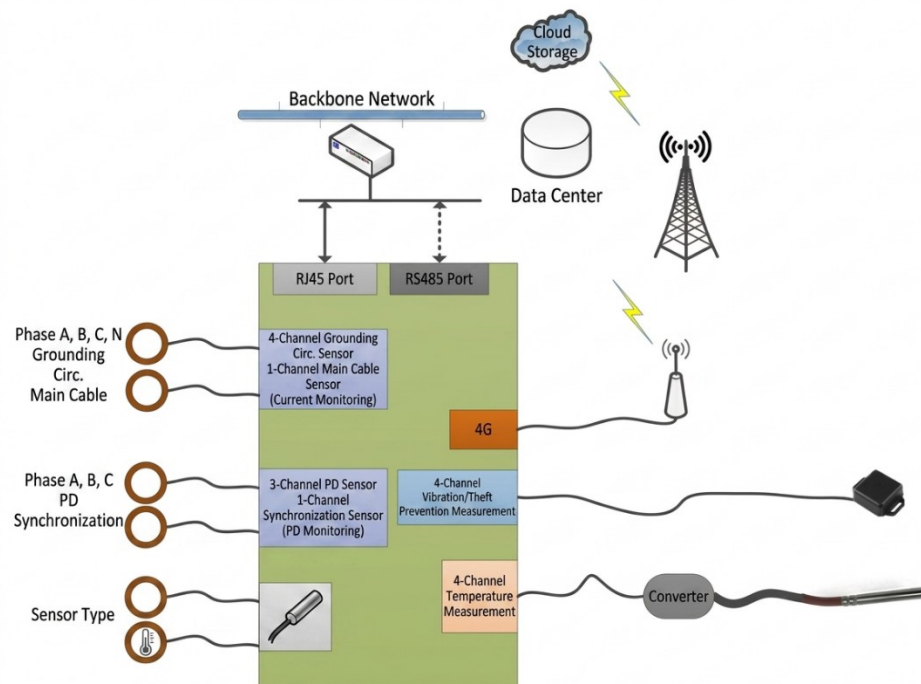
Measurement System Introduction

4

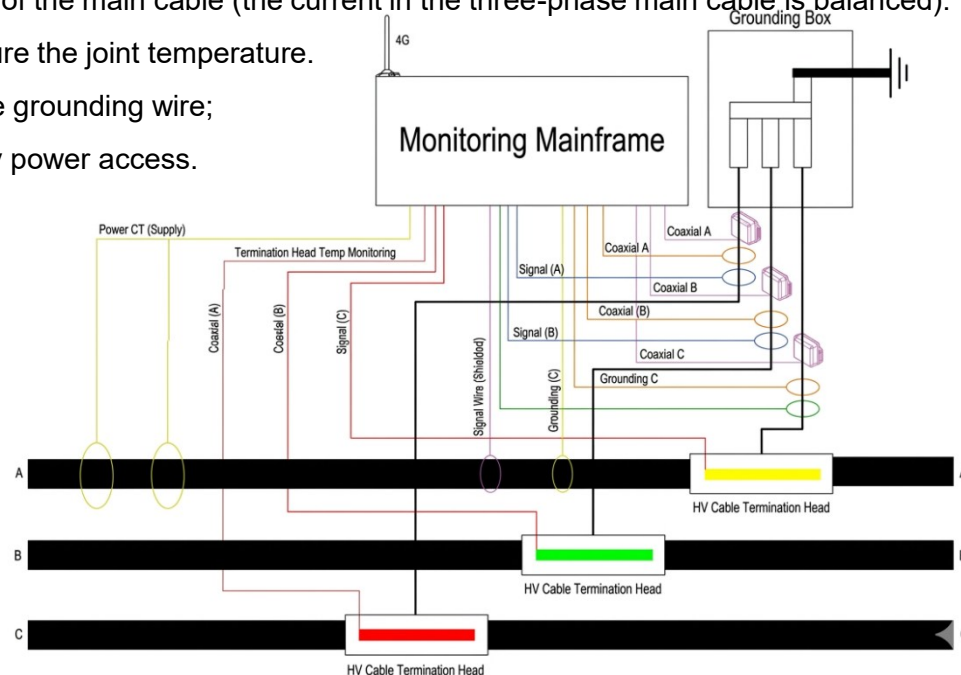
On-site installation photos

The Power Cable Sheath Circulation
And Partial Discharge Integrated Online monitoring device
consists of a monitoring host, current transformers, partial
discharge sensors, temperature sensors, and anti-theft
sensors. Open-type current transformers are installed on
the cable sheath grounding wire and the main cable,
converting the signal into a secondary signal before
introducing it into the monitoring device. Temperature
sensors are used to monitor cable temperature, and anti-
theft sensors monitor the circulating grounding wire for anti-
theft operations.

All of the above monitoring interfaces can be added or
removed according to customer needs.



- The grounding current detection transformer and the partial discharge monitoring transformer are installed on the grounding wire;
- The operating current transformer is installed on any phase of the main cable (the current in the three-phase main cable is balanced).
- A temperature sensor is installed at the cable joint to measure the joint temperature.
- The anti-theft and cutting detection device is installed on the grounding wire;
- The CT power supply is installed on the main cable for easy power access.



- (1) Real-time monitoring of the sheath grounding current, total grounding current and operating current of any phase main cable of the three-phase cable;
- (2) Real-time monitoring of the temperature of the three-phase cable joints;
- (3) Real-time monitoring of the anti-theft and anti-cutting of cable sheath grounding wire;
- (4) Real-time monitoring of partial discharge in three-phase cables;
- (5) The monitoring time interval can be set;
- (6) Alarm parameters and whether to allow corresponding monitoring parameters to generate alarms can be set;
- (7) Calculate the maximum, minimum, and average values within the set time period;
- (8) Monitor the ratio of the maximum and minimum values of single-phase grounding current within the statistical period in real time and perform alarm processing;
- (9) Monitor the ratio of grounding current to load in real time within the statistical period and perform alarm processing;
- (10) Monitor the rate of change of single-phase grounding current within the statistical period in real time and perform alarm processing;

- (11) All monitoring data have time tags to ensure the uniqueness of the data;
- (12) All monitoring sensors can be added or removed according to user requirements;
- (13) Multiple data transmission interfaces: RS485 interface, GPRS , GSM SMS,
One or more data transmission modes can be used simultaneously;
- (14) Supports remote maintenance and upgrades;
- (15) It adopts a low-power design and supports multiple power supply methods: CT induction power supply,
AC-DC power supply, DC power supply and battery power supply;

- (16) All components are industrial grade, with good reliability and stability;
- (17) The modular, fully enclosed structure design is easy to install, and all components are secured with locking mechanisms.
It has good vibration resistance and is easy to replace and disassemble;
- (18) Fully enclosed structure: epoxy resin enclosed, no exposed components, no water ingress, perfectly supports IP68 protection level.
- (19) High reliability and maintenance-free.



High-Voltage Cable Circulating Current and Partial Discharge Integrated Online Monitoring Device



Stainless steel enclosure:

All components were encapsulated with epoxy resin.
Uses highly reliable waterproof aviation connectors.





高频脉冲电流传感器



高频脉冲电流传感器



Category	Parameter	Specification
Current Measurement	Operating Current	1 channel, 0.1A~3000A (Customizable)
	Sheath Grounding Current	4 channels, 0.1A~300A (Customizable)
	Return Line Current	1 channel, 0.1A~300A (Customizable)
	Accuracy	Measurement error not exceeding $\pm(1\%$ of reading + 0.5A)
	Measurement Cycle	1s~260s (Configurable)
Partial Discharge	PD Interface Qty	4 channels sync detection (Phase A, B, C + 1 Power Frequency)
	Bandwidth	0.1 ~ 50MHz
	Min. Discharge	5pC
	AD Resolution	14-bit
Temperature	Range	4 channels, -40°C~+130°C
	Accuracy	$\pm 1^{\circ}\text{C}$; Response time (PT100) is 1 min 10 s
	Measurement Cycle	10s~260s (Configurable)
	Others	Sensor disconnection detection; RS-485 transmission
Vibration	Range	4 channels, freq. 1 ~500 times/sec
	Alarm Range	10~250 times/sec (Configurable)
	Alarm Duration	1~600s (Configurable)
	Others	Sensor disconnection detection
Voltage Monitoring	Induced Sheath Voltage	3 channels, 0~500V (Customizable)

Test Item	Level & Standard
Electrostatic Discharge	Level 4 : IEC 61000-4-2 (Equivalent to GB/T 17626.2)
Radiated RF Immunity	Level 3 : IEC 61000-4-3 (Equivalent to GB/T 17626.3)
EFT/Burst Immunity	Level 4 : IEC 61000-4-4 (Equivalent to GB/T 17626.4)
Surge Immunity	Level 4 : IEC 61000-4-5 (Equivalent to GB/T 17626.5)
Conducted RF Immunity	Level 3 : IEC 61000-4-6 (Equivalent to GB/T 17626.6)
Power Frequency Magnetic Field	Level 5 : IEC 61000-4-8 (Equivalent to GB/T 17626.8)
Pulse Magnetic Field	Level 5 : IEC 61000-4-9 (Equivalent to GB/T 17626.9)
Damped Oscillatory Magnetic Field	Level 5 : IEC 61000-4-10 (Equivalent to GB/T 17626.10)
Voltage Variations Immunity	Level 3 : IEC 61000-4-11 (Equivalent to GB/T 17626.11)

RS485 interface:

Baud rate: 2400bps , 9600bps , 19200bps (configurable)

Data length: 8 bits;

Start bit: 1 bit;

Stop bit: 1 bit;

Verification: No verification.

RS485 interface currently supports the following protocols:

1. Our company's proprietary protocol (open to the public, providing PC testing programs, open source);
2. Supports the standard Modbus RTU protocol;

Currently, the GPRS data interface supports the following protocols:

1. Our company's proprietary protocol (open to the public, providing PC testing programs, open source);
2. Chinese SMS protocol (for situations where setting up a network is inconvenient);
3. Alibaba Cloud IoT Cloud Platform;
4. Guangdong Power Grid Transmission Line Condition Monitoring System Protocol V1.3

GSM/ GPRS interface

Operating frequency bands: 4 bands, 850 MHz/900 MHz/1800 MHz/1900 MHz ;

GSM SMS messages in both Chinese and English;

GPRS class 10 , maximum downlink speed of 85.6 kbit /s , maximum uplink speed of 42.8 kbit /s , supports TCP/IP , UDP , FTP , and HTTP protocols.

Fiber optic interface

Two 100Base - FX optical ports;

Supports ring network redundancy technology and various ring network structures;

Network fault self-healing time < 20ms ;

Ethernet interface

Speed: 10/100 Mbps , automatic switching between MDI/MDIX cross-connect direct connection;

Protection: 1.5KV electromagnetic isolation;

Network protocols: TCP , UDP , ARP , ICMP , DHCP , DNS , HTTPD Client ;

The following protocols are supported by fiber optic and Ethernet interfaces:

1. Supports protocols similar to GPRS links;
2. Modbus TCP protocol;

AC power supply method

Voltage: 85~305VAC ;

Frequency: 47~63Hz ;

Power: $\leq 8\text{W}$

It has the following characteristics:

1. Overvoltage and overcurrent protection;
2. Surge protection performance meets Level 4 standard;
3. Operating temperature range: -40°C to $+85^{\circ}\text{C}$;

CT power supply method

Starting current: $> 25A$;

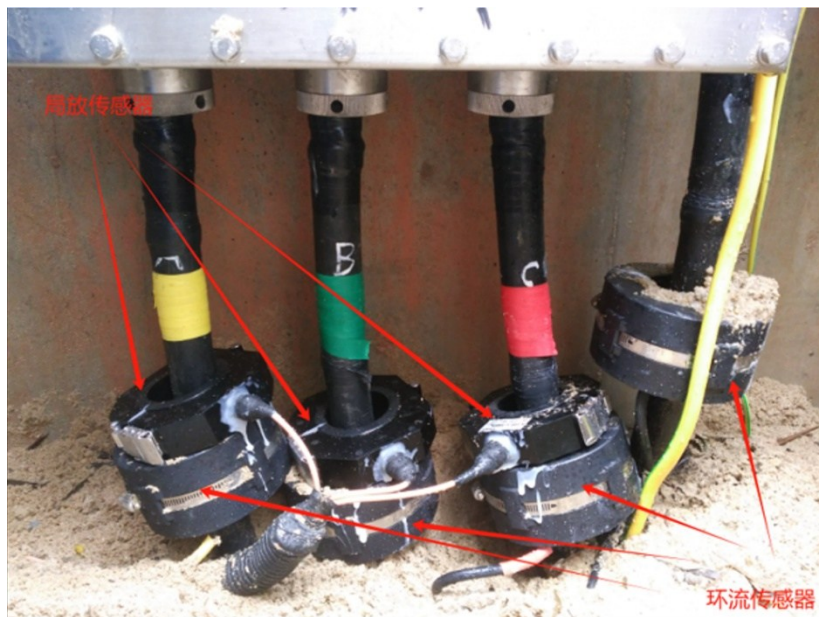
It has the following characteristics:

1. Low starting current; the equipment can operate normally when the main cable current reaches
2. Maximum continuous load current 1200A ;
2. It can withstand a large inrush current, 30kA for 4 seconds;
3. Set up overheat and overload protection;
4. Multiple CTs can be used to draw power, increasing output power;

This CT power supply device has been widely used in traveling wave ranging products for power transmission lines.













More to come

THANK YOU

Smarter Monitoring, Reliable Power.

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Technical Specifications

Of SCYC-HLJC2304 Power Cable Sheath Circulation Online monitoring device

—Circulating current, main cable current, return line current, vibration, temperature, flexible sensors



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1 Overview

This device is specifically designed for real-time online monitoring of circulating current (hereinafter referred to as "circulating current") in the sheath of high-voltage single-core cables.

1.1 Background and Necessity

High-voltage cables of 10kV and above mostly adopt a single-core structure with a metal sheath. Due to the influence of AC electromagnetic induction in the core wire, an induced voltage will be generated at both ends of the metal sheath. To control the induced voltage within a safe range (typically $\leq 50V$, $\leq 100V$ with protective measures), short-distance cables typically use a "one end directly grounded, the other end grounded via a protector" mode; long-distance cables use a "three-phase segmented cross-interconnection, two-end grounding" mode.

Regardless of the grounding method, maintaining the insulation performance of the sheath is crucial. Once insulation damage leads to multiple grounding points, a significant circulating current will be generated within the metal sheath, resulting in increased sheath loss, decreased current carrying capacity, and in severe cases, cable overheating or even fire. Furthermore, if the direct grounding point suffers from corrosion or loose contact, the sheath potential will surge to several thousand volts or even tens of thousands of volts, easily puncturing the outer sheath and inducing a continuous discharge fire.

1.2, Working Principle

The SCYC-HLJC2304 device is based on the "circulating current method" monitoring principle. Under normal single-point grounding conditions, the circulating current in the metallic sheath is extremely small (mainly capacitive current); when multiple grounding occurs and a physical loop is formed, the circulating current will increase significantly, reaching over 90% of the main current in extreme cases. Through real-time dynamic monitoring of the circulating current and its changes, the system can accurately identify multi-point grounding faults, ensuring timely warnings before accidents occur and improving the safety and reliability of cable operation.

1.3, Communication and Application

The device supports GSM wireless communication and RS485 wired bus mode, and is widely applicable to multi-point grounding fault monitoring of 10kV and above single-core cable lines.

1.4, Features

Flexible Communication: Supports GSM wireless transmission and RS485 industrial bus.

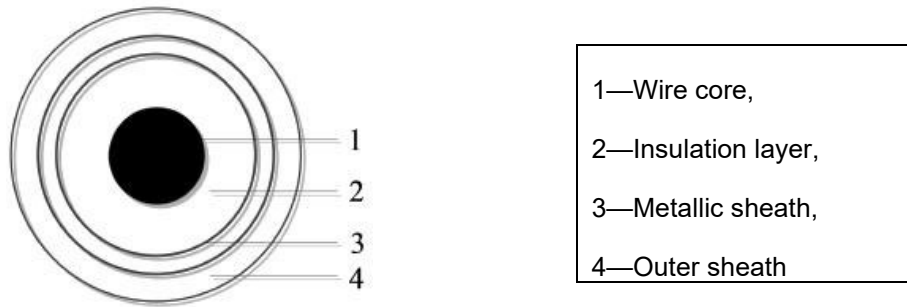
Wide Applicability: Compatible with various grounding systems, including single-end grounding and cross-connection.

Core Value: Transforms passive maintenance into proactive early warning, effectively preventing power accidents caused by sheathing faults and ensuring power grid stability.

2 The principle of circulation generation

As we know from the cable structure, its outer layer is a metal sheath. When conducting electrical energy, the current in the core will induce an electromagnetic induction with the outer metal sheath, causing a cutting effect. This electromagnetic induction generates an

electromotive force on the metal sheath, called an induced voltage. Its strength is related to the current; as the current increases, the voltage also increases, exhibiting an increasing relationship. Excessive voltage can affect the sheath and even cause cable breakdown. Therefore, a grounding wire is connected to the cable at regular intervals to release the induced voltage accumulated on the sheath. This creates a path between the metal sheath and the ground, forming a loop current under the influence of the induced voltage; this current is called the cable sheath circulating current.



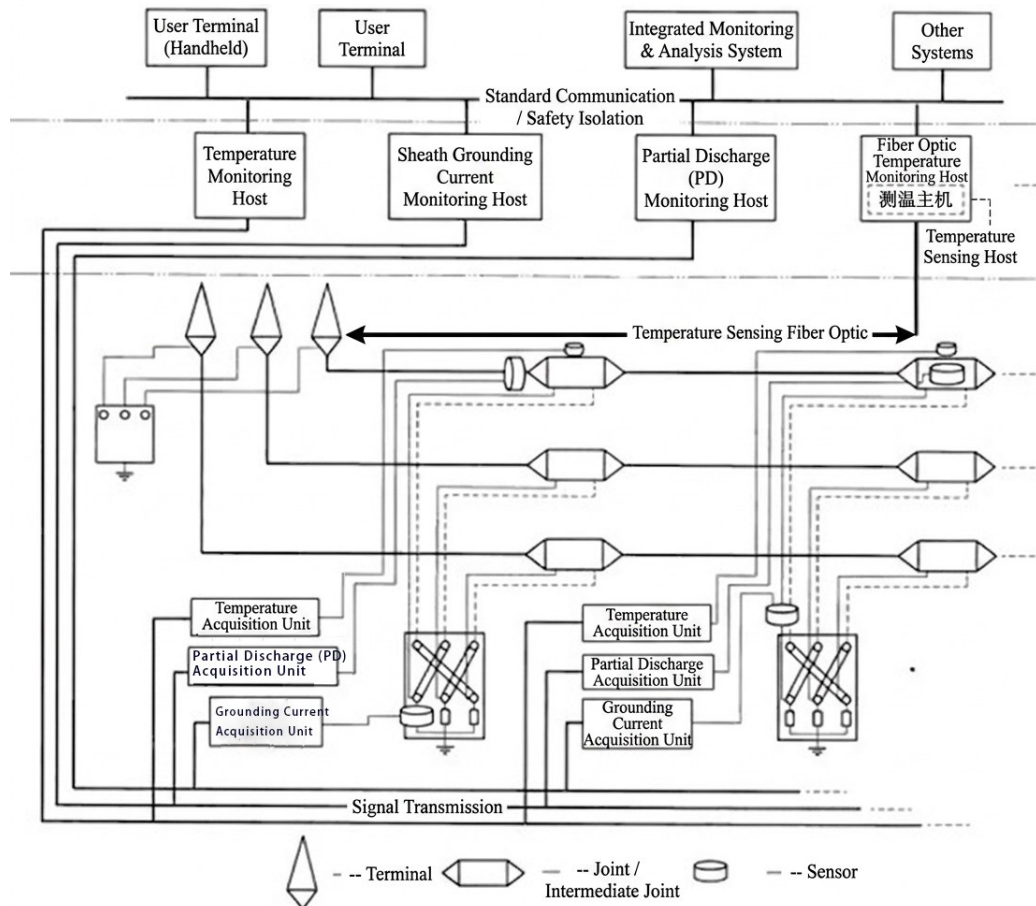
picture 1. Cable Structure

3 The dangers of excessive circulation

- (1) Increased circulating current in the metal sheath system of high-voltage cables leads to a sharp increase in metal sheath loss and temperature rise, which in severe cases may cause overheating or even fire.
- (2) The circulating current in the metal sheath of high-voltage cables significantly increases energy loss during power transmission, reduces transmission efficiency, and results in serious resource waste.
- (3) current in the metal sheath of a high-voltage cable accelerates the aging of the cable insulation and shortens the cable's normal service life.
- (4) Overheating at cross-connection points can occur if the circulating current in the cable sheath is high during long-term operation, and the contact at the cross-connection point is poor. From a design perspective and operational experience, ensuring good cross-connection contact during operation will prevent overheating issues.

4 Typical Solution for Online Monitoring System of High Voltage AC Cables

The circulation is mainly monitored at the location of the cross-connection box.



picture 2

Typical Schemes for Online Monitoring of High-Voltage Cables

5 State Grid Standards and Notices on Online Monitoring of Cable Circulating Current

ICS 29.240

Q/GDW

国 家 电 网 公 司 企 业 标 准

Q/GDW 11223—2014

高压电缆状态检测技术规范

Technical specification for state detection
for high voltage cable lines

2014 - 12 - 01 发布

2014 - 12 - 01 实施

国家电网公司

发 布

4.1 Cable condition detection can be categorized into **Online Detection** and **Offline Detection** based on the detection mode.

- **Online Detection** primarily includes: Infrared Thermography, Metallic Sheath Grounding Current Detection, and Partial Discharge (PD) Detection, etc.
- **Offline Detection** primarily includes: PD Detection under Variable Frequency Resonance Test, and OWTS (Oscillating Wave Test System) Cable PD Detection, etc.

4.2 Cable condition detection implements a workflow consisting of "large-scale general testing, re-testing of suspicious signals, and key monitoring of problematic equipment" to ensure the safe and stable operation of cable assets.

4.3 Condition detection personnel shall participate in technical training for cable condition detection and obtain corresponding technical qualifications.

4.4 Basic requirements for infrared thermal imagers and grounding current detection instruments are provided in Appendix A. Basic requirements for High-Frequency PD (HFPD), Ultra-High Frequency PD (UHF PD), and Ultrasonic PD detection instruments shall comply with Q/GDW 1124-2014.

4.5 The application scope of cable condition detection methods is shown in **Table 1** (as translated below).

Table 1: Application Scope of Various Condition Detection Methods

Method	Applicable Cable	Key Detection Parts	Targeted Defects	Detection Mode	Remarks
Infrared Thermography	Cables equal or above 35kV	Terminal, Connector	Loose Connection, Moisture Intrusion, Insulation Defect	Online	Mandatory
Metallic Sheath Grounding Current	Cables equal or above 110kV	Grounding System	Cable Grounding System Defect	Online	Mandatory
HFPD	Cables equal or above 110kV	Terminal, Connector	Insulation Defect	Online	Mandatory
UHF PD	Cables equal or above 110kV	Terminal, Connector	Insulation Defect	Online	Optional
Ultrasonic	Cables equal or above 110kV	Terminal, Connector	Insulation Defect	Online	Optional
PD under Variable Frequency Resonance Test	Cables equal or above 110kV	Terminal, Connector	Insulation Defect	Offline	Mandatory
OWTS Oscillating Wave PD	Cables 35kV	Terminal, Connector	Insulation Defect	Offline	Mandatory

5.2.3 Diagnostic Criteria

The analysis of measurement data for cable metallic sheath grounding current should be integrated with the load conditions of the cable lines. A comprehensive analysis must be conducted on the development and evolution trends of any anomalies in the metallic sheath grounding current.

The diagnostic basis for cable metallic sheath grounding current detection is shown in Table 5.

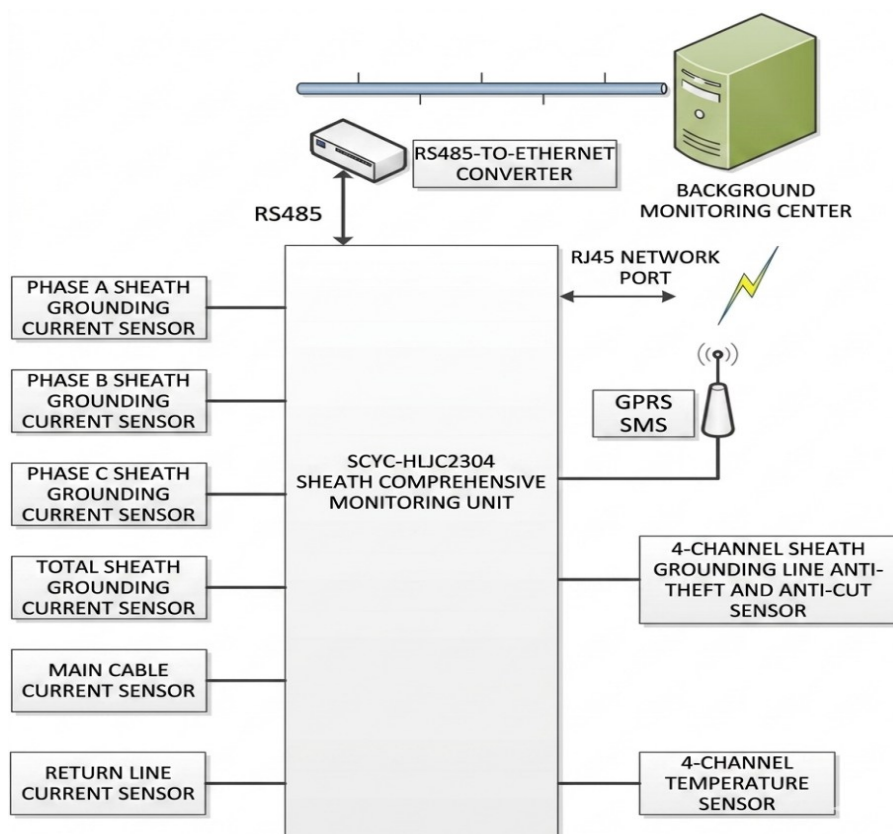
Table 5: Diagnostic Basis for Ground Current Detection of High-Voltage Cable Lines

Test Results	Judgment	Recommended Strategy
--------------	----------	----------------------

Meets ALL of the following: 1) Grounding Current Absolute Value < 50A 2) Grounding Current to Load Ratio < 20% 3) Single-Phase Grounding Current Maximum/Minimum Value < 3	Normal	Follow regular inspection cycle
Meets ANY of the following: 1) $50A \leq \text{Grounding Current Absolute Value} \leq 100A$ 2) $20\% \leq \text{Grounding Current to Load Ratio} \leq 50\%$ 3) $3 \leq \text{Single-Phase Grounding Current Maximum/Minimum Value} \leq 5$	Attention	Enhance monitoring, shorten inspection cycle
Meets ANY of the following: 1) Grounding Current Absolute Value > 100A 2) Grounding Current to Load Ratio > 50% 3) Single-Phase Grounding Current Maximum/Minimum Value > 5	Defect	Shutdown for inspection

6 System Composition

The monitoring device consists of a monitoring host, current transformers, temperature sensors, and anti-theft sensors. Open-type current transformers are installed on the cable sheath grounding wire and the main cable, converting the signal into a secondary signal before it is introduced into the monitoring device. Temperature sensors are used to monitor cable temperature, and anti-theft sensors monitor the circulating grounding wire for anti-theft operations.





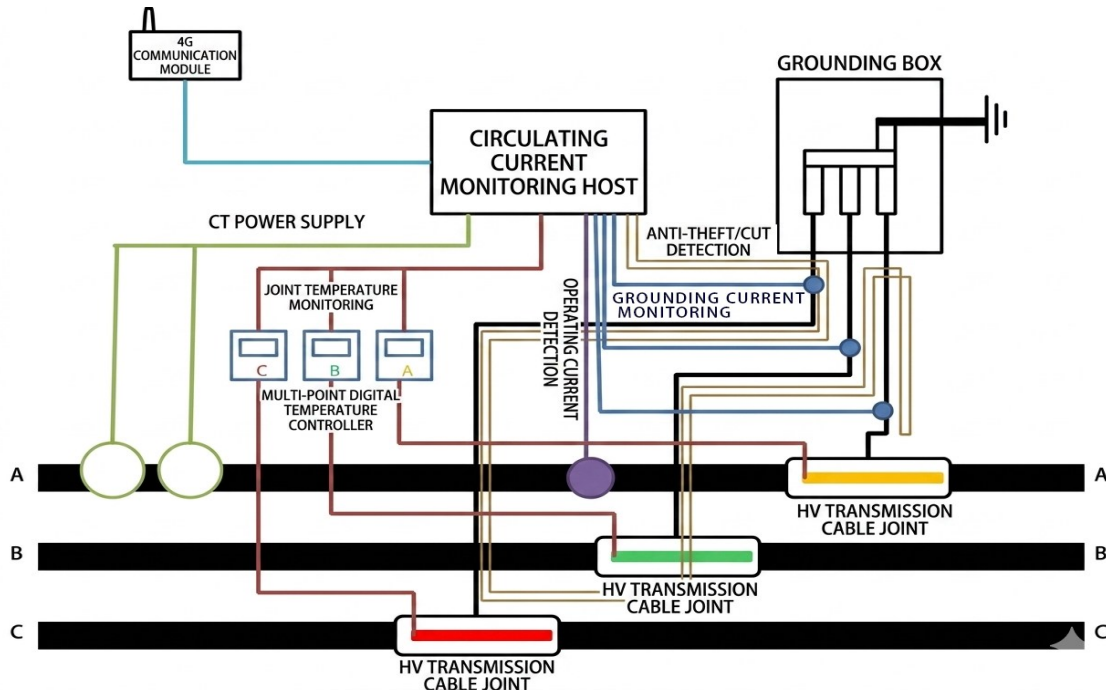
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All the above monitoring interfaces can be added or removed according to customer needs. The composition of the cable sheath integrated online monitoring system is shown in the figure below:

7 Schematic diagram of sensor installation location



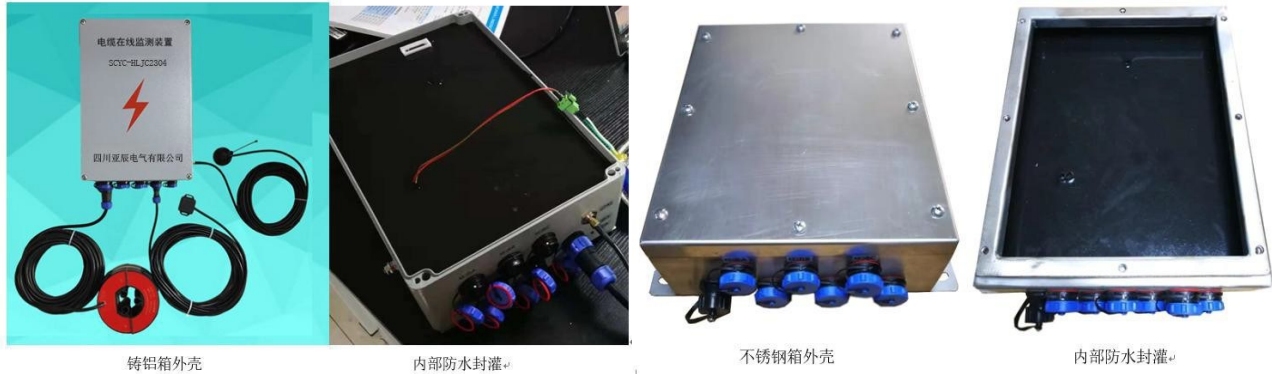
8 Features

- 1) Real-time monitoring of sheath grounding current, total grounding current and operating current of any phase main cable of three-phase cables;
- 2) Real-time monitoring of three-phase cable joint temperature;
- 3) Real-time monitoring of cable sheath grounding wires to prevent theft and cutting;
- 4) The monitoring time interval can be set;
- 5) Alarm parameters and whether to allow alarms to be generated for the corresponding monitoring parameters can be set;
- 6) Calculate the maximum, minimum, and average values within a specified time period;
- 7) Real-time monitoring of the ratio of the maximum to minimum single-phase grounding current within a statistical period, and alarm processing accordingly;
- 8) Real-time monitoring of the ratio of grounding current to load within a statistical period, and alarm processing accordingly;
- 9) Real-time monitoring of the rate of change of single-phase grounding current within a statistical period, and alarm processing accordingly;
- 10) All monitoring data are time-stamped to ensure data uniqueness;
- 11) All monitoring sensors can be added or removed according to user requirements;
- 12) Multiple data transmission interfaces: RS485 Interface, GPRS , GSM SMS messages can use one or more data transmission modes simultaneously.
- 13) Supports remote maintenance and upgrades;
- 14) Employing a low-power design, it supports multiple power supply methods: CT Inductive power supply, AC-DC power supply, DC power supply and battery power supply;
- 15) All components are industrial-grade, ensuring excellent reliability and stability;
- 16) The modular, fully enclosed structure design is easy to install. All components are securely locked, providing excellent vibration resistance and easy replacement and disassembly.

- 17) Fully enclosed structure: epoxy resin encapsulation, no exposed components, water-proof, perfectly supports IP68. Protection level.
18) High reliability and maintenance-free.

9 Equipment appearance and internal packaging status

The enclosure is made of cast aluminum or stainless steel; all components are encapsulated with epoxy resin. Uses highly reliable waterproof aviation connectors.



10 Sensor appearance



The cable circulating current online monitoring device, which uses flexible sensors (Rogowski coils and built-in integrators) , is suitable for high-voltage transmission line terminals, grounding boxes with limited space, cable trays, and other similar applications.

11 Technical indicators

11.1 Monitoring parameters

	Parameter	Index
Current measurement	Operating current measurement	Route 1 , 0.1A~3000A (other options require customization)
	Sheath grounding current measurement	4-channel , 0.1A~300A (other options require customization)
	Return line current measurement	Route 1, 0.1A~300A (other options require customization)
	Measurement accuracy	The measurement error shall not exceed $\pm(\text{standard reading} \times 1\% + 0.5\text{A})$.
	Measurement cycle	The time can be set from 1 second to 260 seconds.
Temperature measurement	scope	4 routes , -40°C to +130°C
	accuracy	$\pm 1^\circ\text{C}$, temperature sensor (sensing device PT100) The reaction time is 1 minute and 10 seconds.
	Measurement cycle	The duration can be set from 10 seconds to 260 seconds.
	other	Sensor disconnection detection, RS-485 transmission.
Vibration measurement	scope	4 channels , vibration monitoring frequency 1-500 times/second
	Alarm range	10-250 times/second adjustable
	Alarm duration	The time can be set from 1 to 600 seconds.
	other	Sensor wire breakage detection

11.2 Electromagnetic compatibility characteristics

Electrostatic discharge immunity	Level 4: GB/T 17626.2
Radio frequency electromagnetic field radiation immunity	Level 3: GB/T 17626.3
Electrical Fast Transient/Bulk Immunity	Level 4: GB/T 17626.4
Surge immunity	Level 4: GB/T 17626.5
RF field induced conducted immunity	Level 3: GB/T 17626.6
Power frequency magnetic field immunity	Level 5: GB/T 17626.8
Pulse magnetic field immunity	Level 5: GB/T 17626.9
Damped oscillating magnetic field immunity	Level 5: GB/T 17626.10
Resistance to voltage changes	Level 3: GB/T 17626.11

12 Communication Interface and Supported Protocols

12.1 RS485 interface

- Baud rate: 2400bps, 9600bps, 19200bps (configurable)
- Data length: 8 bits;
- Start bit: 1 bit;
- Stop bits: 1 bit;
- Verification: No verification.

The RS485 interface currently supports the following protocols:

- 1) Our company's proprietary protocol (open to the public, providing PC testing programs, open source) ;
- 2) Supports the standard Modbus RTU protocol.

12.2 GSM/GPRS interface

- Operating frequency bands: 4 bands , 850 MHz/900 MHz/1800 MHz/1900 MHz ;
- GSM SMS messages in both Chinese and English;
- GPRS class 10, maximum downlink speed 85.6 kbit/s , maximum uplink speed of 42.8 kbit/s , supports TCP/IP , UDP, FTP and HTTP protocols.
- 4G transmission, data frame interval: 2 minutes.

Currently, the GPRS data interface supports the following protocols:

- 1) Our company's proprietary protocol (open to the public, providing PC testing programs, open source) ;
- 2) Chinese SMS protocol (for situations where setting up a network is inconvenient) ;
- 3) Alibaba Cloud IoT Cloud Platform;
- 4) Guangdong Power Grid Transmission Line Condition Monitoring System Specification V1.3.

12.3 Fiber optic interface

2 x 100Base-FX optical ports;

Supports ring network redundancy technology and various ring network structures; network fault self-healing time <20ms.

12.4 Ethernet interface

Speed: 10/100 Mbps, automatic switching between MDI/MDIX cross-connection; Protection: 1.5KV electromagnetic isolation;

Network protocols: TCP, UDP, ARP, ICMP, DHCP, DNS, HTTPD Client. Fiber optic and Ethernet interfaces support the following protocols:

- 1) Supports GPRS links with the same protocol;
- 2) Modbus TCP protocol.

13 Power supply method

13.1 AC power supply method

Voltage: 85~305VAC; Frequency: 47~63Hz;

Power: ≤8W. It has the following characteristics:

- 1) Overvoltage and overcurrent protection;
- 2) Surge protection performance meets Level 4 standard;
- 3) Operating temperature range: -40°C to +85°C.

13.2 Battery powered

In areas where an AC power source is unavailable for the monitoring equipment, users can choose battery power, allowing the equipment to operate in a low-power mode. The battery can last for 3 to 4 years.

13.3 CT Power supply method



It has the following characteristics:

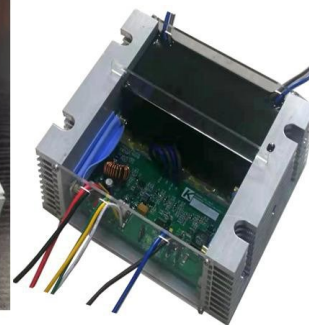
- 1) the equipment can operate normally when the main cable current reaches 25A.
- 2) Maximum continuous load current 1200A;
- 3) It can withstand a large inrush current, 30kA for 4 seconds;
- 4) Set up overheat and overload protection;
- 5) Multiple CTs can be used to draw power, thereby increasing the output power.



单CT取电模块



双CT取电模块外观



双CT取电模块内部结构

13.4 Power consumption

RS485 communication: DC power supply voltage 12V , operating current 30mA.

For RJ45 communication: DC power supply voltage 12V , operating current 130mA.

For GPRS/4G communication: DC power supply voltage 12V.

Average operating current: 100mA

Maximum operating current: 160mA (instantaneous).

If an RTU is required , the power consumption of the RTU is:

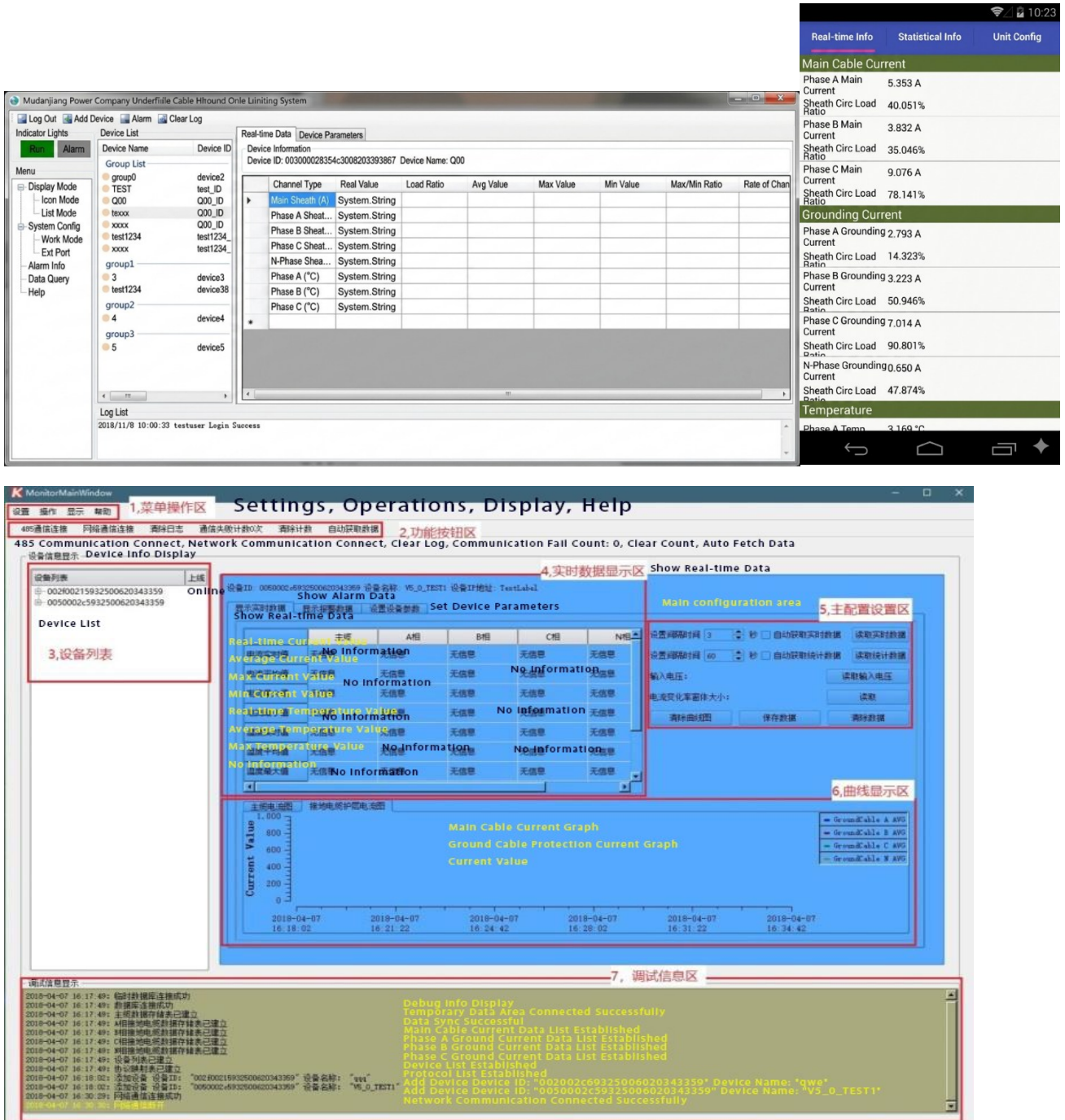
DC power supply voltage 12V

Average operating current: 120mA

Maximum operating current: 180mA (instantaneous)

At low power consumption, the standby current is 25-30uA . When sending GPRS/4G data, if the signal is poor, a peak current of 2A will occur. Assuming 4.2V , the power consumption at this time is 8.4W . Not counting GPRS/4G , the power consumption of fiber optic cables is less than 0.5W.

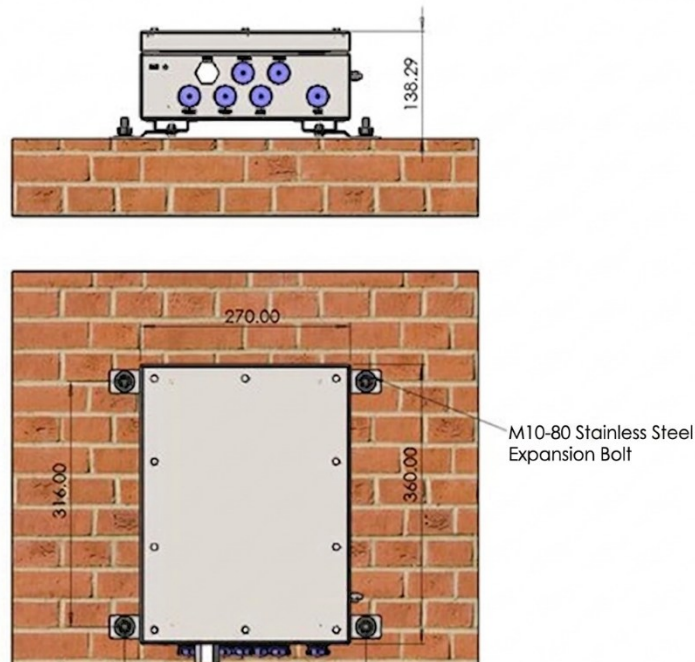
14 Software Interface



15 Install

This product must be installed and set up correctly to achieve the expected design requirements. This section mainly explains the installation steps of the product.

15.1 Host installation



15.2 GSM Antenna installation

The product's antenna interface uses a 50Ω... For SMA female connector bases, external antennas must be compatible with the GPRS operating band. Using other incompatible antennas will affect the use of the equipment and may even cause product damage.

15.3 SIM Card installation

Before installing the SIM card, open the outer stainless steel (or cast aluminum) case cover. Then you can install the SIM card by following these steps.

1. Open the outer cover of the monitoring host to see the SIM card installation box.



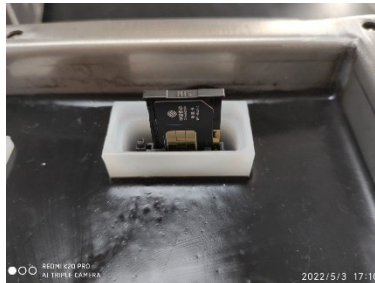
2. After opening the sealed cover of the SIM card installation box, you can see:

- (1) SIM card installation box sealing cover;

- (2) SIM card eject button: Press this button with a pointed or needle-like object to eject the SIM card drawer;
- (3) SIM card drawer;
- (4) Desiccant.



3. Place the SIM card into the SIM card drawer.



4. Insert the drawer for installing the SIM card into the mounting bracket.
5. After debugging, apply silicone rubber evenly to the edge of the SIM card installation box and cover it with the SIM card sealing cover.



6. Apply silicone rubber (available in black or white) to the sealing cover of the SIM card installation box .

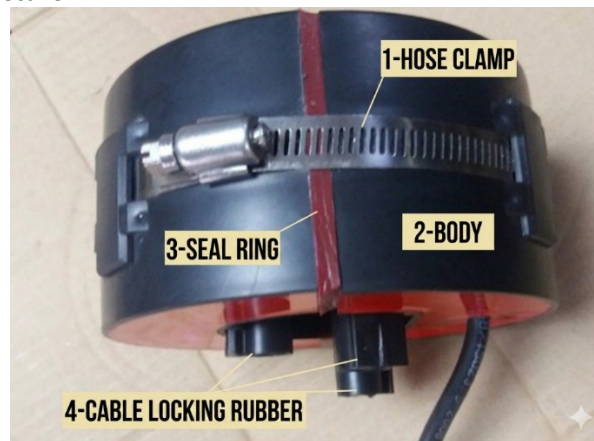


Caution:

Do not insert or remove the SIM card while the device is powered on. Doing so will erase all information on the SIM card during device initialization. Users should back up any important information on their SIM card before use. Our company is not responsible for any data

15.4 Installation of measuring current transformer

To ensure the measurement accuracy and protection performance of the current transformer, please install the current transformer according to the following requirements. Since silicone rubber is used in the installation of the transformer, please keep the transformer away from water until the silicone rubber has hardened.

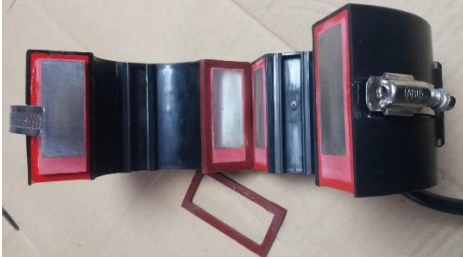
I. Current Transformer Structure

To facilitate on-site installation, this current transformer uses an open structure. The components are described as follows:

- 1) Clamp, used to lock the two halves of the current transformer together;
- 2) The transformer body consists of two halves, left and right.
- 3) The current transformer is connected to a sealing rubber ring;
- 4) Cable locking rubber is used to secure the current transformer to the cable, preventing vibration of the current transformer.

II. Current Transformer Installation Method

- 1) Loosen the clamps on the current transformer and pull out the cable locking rubber;



- 2) Remove the rubber sealing ring;



- 3) Apply silicone evenly to the two connection ends of the current transformer core as shown in the diagram. All four connection ends should be coated with silicone (only two ends are shown in the diagram) .



- 4) Reinstall the rubber sealant on the stepped end;



- 5) Merge the current transformers and lock them with clamps. Insert cable locking rubber into the current transformers to secure the cables to the current transformers and prevent the current transformers from vibrating.

15.5 Installation method of fixing current transformers on vertical cables



Make a bracket under the current transformer.

16 On-site installation pictures

The site conditions are divided into: urban underground utility tunnels, underground cable trenches, and underground cable to overhead lines.

16.1 Urban underground utility tunnels

In this case, the cable sheath is grounded in the urban underground utility tunnel, and the equipment is installed in the underground utility tunnel. The three-phase grounding current signal is directly taken from the grounding wire and the data is transmitted to the backend via RS485 or RJ45 signal.



16.2 underground cable trench



In this case, the cable sheath is grounded inside the grounding well, the equipment is installed inside the grounding well, and the three-phase grounding wire current signal is directly taken from the grounding well and transmitted to the backend via RS485 and GSM/GPRS signals.

16.3 Overhead line to underground cable



In this scenario, the cable is grounded on the tower, the equipment is installed on the tower, and three single-phase grounding wire current signals are taken and transmitted to the backend via three GSM/GPRS modules or wired communication methods.

16.4 Cable and wiring diameter

220kV Cable diameter: $\phi 155$ 110kV Cable diameter: $\phi 105$; Grounding wire diameter: $\phi 50$