BSRK & BSCK Temperature Transmitter

I. Product Definition

The BSRK (resistance-type) and BSCK (thermocouple-type) temperature transmitters are industrial-grade isolated temperature signal processing devices that integrate signal isolation, transmission, noise suppression, and power distribution into a single unit.

Core Functions

--- Electrical Isolation: Breaks the electrical connection between inputs, outputs, and the power supply, preventing ground loop interference and high-voltage crosstalk.

---Signal Conversion: Converts the weak, non-linear signals (mV/Ω) from PT100/Cu50 resistance thermometers and K/E/S/T-type thermocouples into industrial standard signals such as 4–20 mA, 0–5 V, or 0–10 V, compatible with PLCs, DCS systems, and display instruments.

---Interference Suppression: Features built-in filtering and isolated amplification to resist electromagnetic interference (EMI) from inverters, motors, and high-voltage circuits.

---Power Distribution: Provides isolated power supply for passive field sensors (such as certain resistance thermometers), simplifying field wiring.

II. Working Principle

Core Process: Input → Isolation → Processing → Output

---Signal Input: On-site RTDs/thermocouples convert temperature into weak electrical signals (mV or Ω level) and feed them into the transmitter.

---Three-Point Isolation (Core Advantage): Implements electrical isolation at the input, output, and power supply points (typically 2500 VAC isolation withstand voltage), physically severing the electrical pathways between them.

This completely eliminates ground potential differences, common-mode interference, and crosstalk, preventing issues such as “signal drift” and “temperature crosstalk.”

Signal Processing:

---Amplification: Amplifies the weak signal to a level suitable for processing.

---Linearization / Compensation: Performs cold-junction compensation for thermocouples and nonlinearity correction for RTDs/thermocouples, producing a signal that is strictly linear with temperature.

---Filtering: Filters out high-frequency electromagnetic noise from the field.

---Standard Output: Converts to a 4–20 mA current signal (most commonly used for long-distance transmission and interference resistance) or a 0–5 V/0–10 V voltage signal for transmission to the control system.

Advantages of Three-Terminal Isolation

The input, output, and power supply are completely electrically isolated from one another, providing interference protection, equipment safeguarding, and safety assurance—serving as a “safety firewall” for stable temperature measurement in industrial environments.

III. Core Value

1. Stable Transmission: Say Goodbye to “Data Fluctuations”

Non-isolated pain points: Signals are easily affected by ground loops, inverters, and motors, leading to fluctuations, drift, and cross-temperature interference, which result in inaccurate temperature measurements and process fluctuations.

Qidian’s Value: Three-terminal isolation + robust anti-interference design. Tested to withstand 3,500V pulse interference, ensuring stable data without fluctuations and maintaining accuracy over long distances (hundreds of meters).

2. Equipment Protection: Eliminate “Board Burnouts / System Failures”

Challenges Without Isolation: Shared ground between input, output, and power supply; high-voltage crosstalk and surges can easily damage PLC/DCS modules, causing equipment failure and downtime.

Qidian Value: Three-terminal isolation cuts off high-voltage pathways, protecting downstream control systems and reducing equipment maintenance costs and downtime risks.

3. Extended Lifespan: Enhanced System Reliability

Challenges Without Isolation: Prolonged exposure to interference and ground loop currents significantly shortens the lifespan of sensors, instruments, and modules, leading to high failure rates.

Value of Qidian: Isolation design reduces electrical stress, significantly increasing the Mean Time Between Failures (MTBF) of equipment, resulting in a more stable system and reduced maintenance.

4. Explosion-Proof Compliance: Suitable for High-Risk Environments

Challenges Without Isolation: Non-isolated designs fail to meet safety requirements in explosion-proof zones such as chemical, oil, and gas facilities, posing safety hazards.

Benefits of Qidian: Supports Intrinsically Safe (Ex ia) and Flameproof (Ex d) certifications, making it suitable for flammable and explosive environments and compliant with industrial safety standards.

5. Simplified Engineering: Reduced Wiring and Commissioning Costs

Non-Isolated Pain Points: Requires additional shielding, grounding, and signal conditioning, resulting in complex wiring, cumbersome commissioning, and a high risk of errors.

Qidian Value: Integrates isolation, signal conditioning, and power distribution; features standard DIN rail mounting; supports two-wire and three-wire systems; offers simple wiring and convenient commissioning; suitable for various industrial applications.

IV. Key Specifications

4.1 Basic Electrical Specifications

Input Signal Type:

BSRK: PT100 / PT1000/CU-50

BSCK: K/E/J/T/B/R/S/N

Input Impedance: ≥100 MΩ;

Output Signals: 4-20mA/0-10mA/0-20mA/0-10V/0-5V/1-5V/RS485

Load Capacity:

Current Output: ≤500 Ω (24 VDC power supply)

Voltage Output: ≥1 MΩ (0–5 V/0–10 V)

Accuracy and Stability:

Accuracy Class: ±0.1% F.S. / ±0.2% F.S. (25°C ±2°C standard conditions)

Temperature Drift: ≤0.005% F.S./°C (-20°C to +55°C)

Response Time: ≤0.5 s (0–90%)

4.2 Isolation Performance Parameters (Three-Terminal Isolation Core)

Isolation Strength:

Dielectric Strength: 1500 VAC / 1 min (between input, output, and power supply; leakage current ≤1 mA)

Insulation Resistance: ≥100 MΩ (between input, output, and power supply; tested at 500 VDC)

Electromagnetic Compatibility (EMC):

Compliance Standards: IEC 61326-3 / GB/T 18268

Immunity: Withstands 3500 V burst interference; suitable for harsh industrial environments with strong electromagnetic fields

4.3 Power Supply & Power Consumption Parameters

Supply Voltage:

DC: 24 VDC ±10% (typical, with reverse polarity protection)

AC: 85–265 VAC (wide-range option available)

Minimum operating voltage: 12 VDC (two-wire 4–20 mA loop)

Power Consumption and Power Distribution:

Full-load power consumption: ≤0.5 VA (single channel, 24 VDC)

Power Distribution Output: 24VDC isolated power supply (optional, for powering passive sensors, max. 20mA)

Current Consumption: Single channel ≤70mA (24VDC, 20mA output)

4.4 Environmental Parameters

Temperature and Humidity:Operating Temperature: -20°C to +55°C

Storage Temperature: -40°C to +85°C

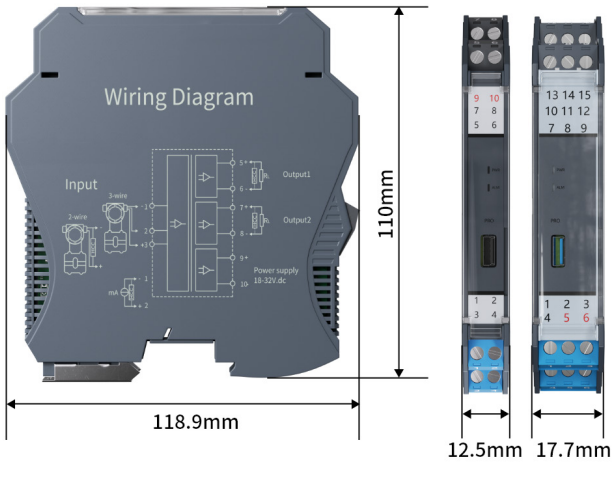
Relative Humidity: 5%–95% RH (non-condensing)

Protection and Explosion-Proof Rating:

Protection Rating: IP20 (DIN rail mounting, indoor / inside control cabinet)

Explosion-Proof Rating: Ex ia II C T6 Ga (Intrinsically Safe), compatible with Qidian QD-6914/QD-6917 safety barriers

Mounting Method: Standard 35mm DIN rail mounting



Mounting Method: 35mm DIN Rail
Dimensions: 118.9mm × 110mm × 12.5mm / 118.9mm × 110mm × 17.7mm
Indicator Light Definitions: PWR—Power / ALM—Alarm

V. Selection Guide

5.1 Key Selection Criteria

Select a model based on signal type:

If the field signal is a resistance temperature detector (PT100/Cu50) → Select the BSRK series

If the field signal is a thermocouple (K/E/J/T/S/B, etc.) → Select the BSCK series

Select specifications based on channel requirements:

Single-channel temperature measurement, single-channel output → 1-in-1-out (Standard model, most cost-effective)

Requires redundancy backup / dual-system data acquisition → 1-in-2-out (one input, two independent isolated outputs)

Multi-point centralized temperature measurement → Multi-channel integrated solution (customizable 4/8/16 channels)

Select based on power supply and distribution:

Standard industrial control cabinets, 24V DC power supply → Universal 24VDC model

No DC power supply on-site → Optional wide-voltage AC220V model

On-site sensors are passive and require power → Select a model with isolated power distribution output

Select based on safety and environment:

General workshops, no flammable or explosive media → Standard industrial type

Chemical, Oil & Gas, Pharmaceutical Explosion-Proof Zones → Must select Ex ia Intrinsically Safe Type

High-Interference Environments (Dense Arrays of Inverters and Motors) → Prioritize Three-Terminal Fully Isolated Enhanced Type

5.2 Common Selection Pitfalls

---Focusing Only on Price, Ignoring Isolation Level

Pitfall: Selecting Non-Isolated / Low-End Isolation Modules

Consequences: Signal drift, interference-induced fluctuations, PLC module breakdown

Recommendation: Always select three-terminal fully isolated modules for industrial sites; use reinforced isolation in high-interference environments

--- Incorrect signal range selection or lack of calibration

Mistake: Default range does not match actual temperature range

Consequences: Inaccurate measurements, out-of-range alarms, loss of control

Recommendation: Confirm minimum/maximum temperatures before ordering; complete range calibration before shipment

---Neglecting Output Load Capacity

Misconception: Excessively long cables, too many instruments, or a load exceeding 500Ω

Consequences: 4-20mA signal attenuation, inaccurate data acquisition

Recommendation: Current output load ≤500Ω; prioritize current output for long-distance applications

---Selecting General-Purpose Models for Explosion-Proof Applications

Misconception: Using non-explosion-proof temperature transmitters in hazardous areas

Consequences: Non-compliance, failure to pass acceptance testing, and safety hazards

Recommendation: Ex ia II C T6 explosion-proof models must be used with corresponding safety barriers

--- Blindly Selecting Too Many Channels

Misconception: Choosing 1-in-2-out configurations even for single-point temperature measurement, increasing costs

Recommendation: Use 1-in-1-out for single-system data acquisition; use 1-in-2-out only for dual-system or redundant configurations

5.3 Customization Recommendations

For non-standard requirements, Qidian offers customized solutions for the BSRK/BSCK series:

---Customized Signal Processing

Non-standard RTD/thermocouple signals

Special measurement ranges, special outputs (e.g., 0–20 mA, 1–5 V, 0–10 V, etc.)

---Customization for Non-Standard Operating Conditions

Higher/lower operating temperature environments

Requirements for higher protection ratings and corrosion-resistant enclosures

Requirements for higher isolation voltage and stronger EMC interference resistance

---Multi-Channel Integration Customization

2/4/8/16-channel centralized temperature transmitters

Single-input/multi-output, multi-input/multi-output, and mixed-signal input configurations

---System Integration Customization

Complete system integration with safety barriers, isolators, and PLC/DCS systems

Provision of calibration certificates, explosion-proof certifications, and factory test reports

VI. Installation and Commissioning

6.1 Pre-installation Preparation

1. Verification of Accessories

Verify model: Check whether BSRK (resistance temperature detector) or BSCK (thermocouple) matches the on-site sensor.

Check accessories: Transmitter body, DIN rail clips, certificate of conformity, instruction manual, explosion-proof certificate (for explosion-proof models)

Verify cables: Shielded cable, terminal blocks, safety barrier (Required for explosion-proof environments)

2. Environmental Inspection

Installation Location: Inside a control cabinet that is dry, well-ventilated, and free from severe vibration

Environmental Conditions: Temperature -20°C to +55°C, no condensation, no corrosive gases

High-Interference Areas: Keep a minimum distance of 30 cm from variable frequency drives, contactors, and power cables

3. Tool List

Phillips / flathead screwdrivers, wire strippers, crimping pliers

Multimeter (current / voltage / resistance ranges)

Signal generator / standard resistance box (for debugging and calibration)

4. Safety Precautions

Never connect or disconnect wires while the system is energized

In explosion-proof areas, work must be performed with the power disconnected; sparking is strictly prohibited

Verify that the supply voltage is DC 24V; connecting to AC 220V is strictly prohibited

6.2 Standard Installation Steps

1. Mounting the Rail

Install using a standard 35mm DIN rail

Snap the clips downward into the rail to ensure a secure, rattle-free fit

When installing multiple units side-by-side, leave a gap of ≥10mm to facilitate heat dissipation

2. Wiring Specifications

Strictly separate terminals: Power, input, and output must be independent

Recommended wire gauge: 0.5–1.5 mm² multi-strand copper wire

Apply moderate torque when tightening connections to prevent loose or faulty connections

3. Grounding Requirements

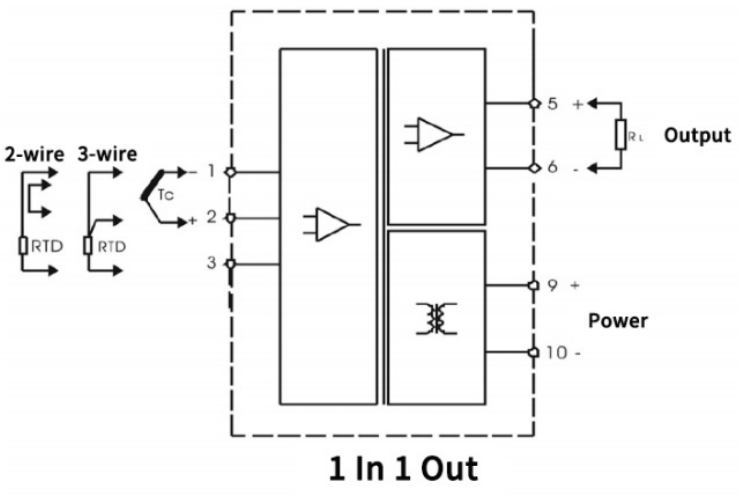
Ground the shield at a single point (typically at the instrument end in the control room)

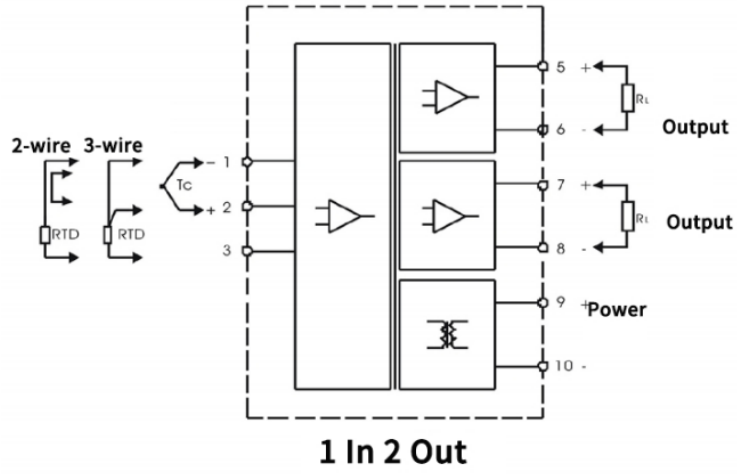
Do not ground the transmitter housing to avoid ground loops

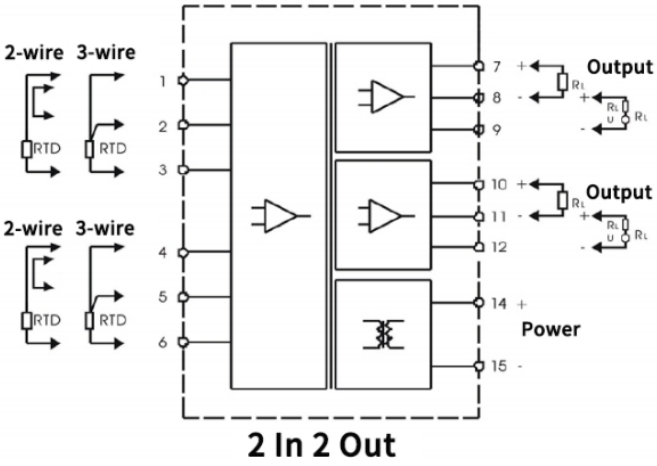
Grounding for explosion-proof systems must comply with intrinsically safe grounding specifications

6.3 Wiring Diagram

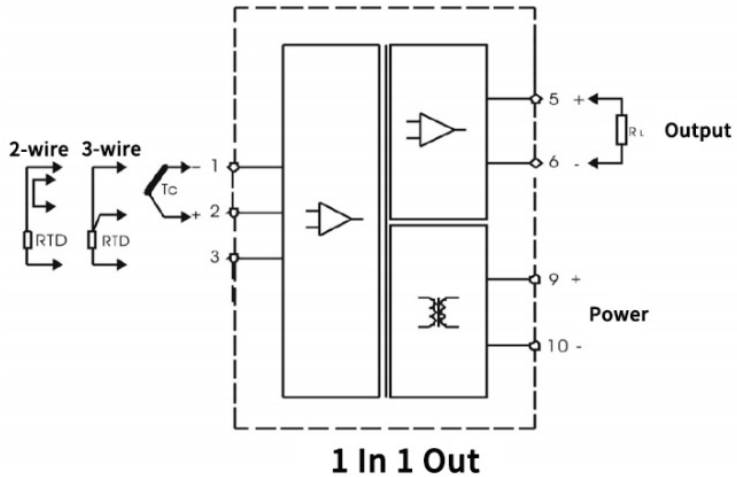
BSCK

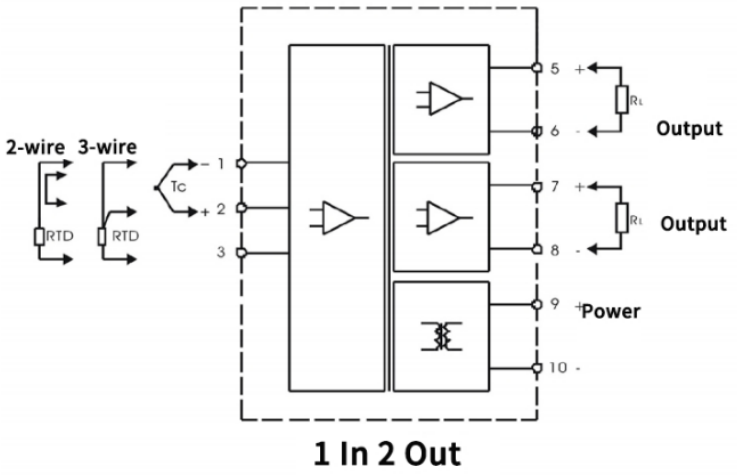


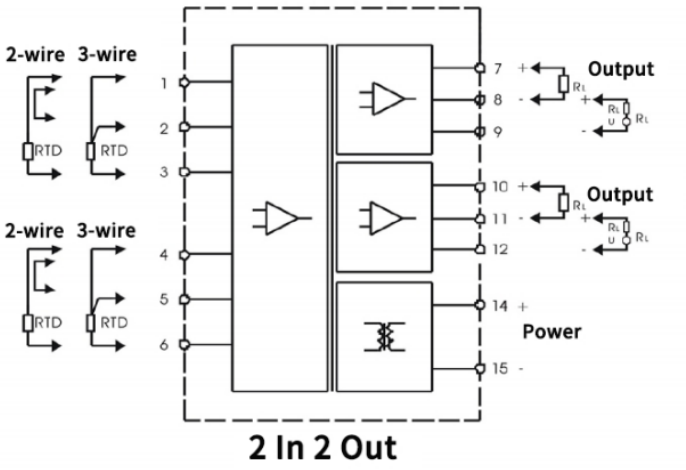




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6.4 Power-On Commissioning Procedure
1. No-Load Test:
Do not connect a sensor; apply power only
Observe whether the output is normal (approximately 4 mA with no input)
Confirm there is no overheating, no unusual odors, and no alarms
2. Connect the Sensor
Connect a PT100 or thermocouple
Observe whether the temperature display and output current vary normally with temperature
3. Signal Verification
Input a standard signal using a standard resistance box or signal source
Verify that the 4–20 mA output corresponds to the measurement range
Standard temperature points: 0%, 25%, 50%, 75%, 100%
4. Accuracy Calibration
Perform zero and span adjustments according to the product manual
Generally pre-calibrated at the factory; on-site verification is sufficient
For explosion-proof models, do not open the cover for calibration under any circumstances
5. Indicator Light Status Assessment
Normal: Power indicator is constantly on; output changes steadily with temperature
Abnormal: Output is saturated, out of range, or shows no change → Check wiring / sensor / range settings

6.5 Installation Precautions (Must Read)
1. Do not operate under overpressure or beyond the measurement range
Rated at 24V DC; connecting to 220V AC or higher voltages is strictly prohibited
Temperature signals must not exceed the upper limit of the measurement range
2. Strictly prohibit wiring that causes high-voltage interference
Signal wires must not be routed in the same conduit or cable tray as 220V/380V AC power lines
Avoid running signal wires parallel to inverter output lines over long distances
3. Strictly prohibit exposed installation in damp, condensing, or corrosive environments
Must be installed inside a control cabinet
Dehumidification equipment must be installed in high-humidity environments
4. Improper operation is strictly prohibited in explosion-proof environments
Do not open the cover with non-explosion-proof tools
Must be used in conjunction with the corresponding safety barrier
Do not arbitrarily modify wiring or short-circuit terminals
5. Loose connections, missing connections, and reverse connections are strictly prohibited
Reverse power connection may damage the module
Reversing input and output connections may result in no signal or measurement errors

VII. Recommendations for Daily Use & Maintenance
7.1 Key Points for Daily Inspections (Mandatory for Every Shift / Every Day)
1. Inspection of Indicator Lights
Power indicator: Should remain lit under normal conditions; if off or flashing → power supply issue / module failure
Signal output indicator: Should flash normally in response to signal changes / remain steady

Alarm Indicators: Lit indicates out-of-range, sensor disconnection, or input anomaly
2. Signal Stability Monitoring
Observe PLC / Host Computer Temperature Curves: No sudden spikes or sustained drift
4–20mA output current should correspond smoothly to actual temperature, with no unexplained fluctuations
Compare multi-point temperature values to identify interference phenomena such as “temperature drift, false readings, or sudden changes”
3. Operating Environment Inspection
Cabinet temperature: ≤55°C; no noticeable overheating or unusual odors
Cabinet humidity: no condensation, no standing water, no corrosive gases
No sudden signal changes caused by abnormal activation of nearby high-power electromagnetic equipment
4. Wiring and Safety Inspection
Terminals show no signs of burning, overheating, or loosening
Seals in explosion-proof zones are intact; no open covers or damage

7.2 Regular Maintenance Plan (Performed on a Scheduled Basis)
1. Monthly Maintenance (Basic Inspection)
Inspect terminal connections: Retighten to eliminate loose or faulty connections
Clean surface dust to ensure proper heat dissipation
Verify that signal displays match actual on-site operating conditions
2. Quarterly Maintenance (In-Depth Inspection)
Use a multimeter to re-test whether the 4mA/20mA upper and lower limit outputs are normal
Check if shielded cable grounding is intact and if there are any new sources of interference
For explosion-proof models, inspect sealing gaskets and the sealing condition of cable entry points
3. Annual Maintenance (Calibration-Level Maintenance)
Use a standard temperature source or resistance box to retest full-range accuracy
Perform necessary calibration of zero and full-scale points (professional equipment required for non-dip-switch models)
Issue calibration records and incorporate them into the equipment ledger
Modules with severe aging or temperature drift exceeding tolerance limits should be replaced immediately

7.3 Long-Term Maintenance Tips (Extending Service Life)
1. Dust and Moisture Protection
Keep control cabinets closed; install dust filters and sealing strips
In high-humidity environments, use dehumidifiers or desiccants to strictly prevent condensation
Outdoor cabinets must be protected against rain, sunlight, and condensation
2. Long-Term Interference Mitigation
Use shielded cables for the entire signal path; ensure reliable grounding at one end
Route power and signal cables in separate channels; do not run them parallel or in the same conduit
Install filters on inverters and servo drives to reduce electromagnetic interference
3. Protection in Extreme Environments
Low-temperature environments: Ensure the cabinet interior remains above -20°C; install heaters if necessary
High-temperature environments: Increase cabinet ventilation or install cooling fans
Vibration-prone environments: Install vibration-damping pads on modules and periodically retighten connections
4. Load and Power Supply Protection
Output load strictly ≤500Ω; avoid long-term full-load operation
Install surge protectors and reverse-connection protection modules on the power supply
Eliminate frequent power cycling to reduce damage from power surges

7.4 Parameter Backup & Adjustment (Applicable to Programmable Models)
1. Parameter Settings
Input Type: Select PT100/Cu50, K/E/T/J thermocouples, etc.
Temperature Range: Set lower limit to upper limit
Output Signal: Switch between 4–20mA / 0–10V, etc.
Filter Strength, Response Speed, Alarm Thresholds
2. Parameter Adjustment Methods
Button-Configurable Type: Enter setup mode via panel buttons or programming keys
Software-Configurable Type: Download via dedicated configuration software + USB/485
DIP Switch Type: Set range and input type via DIP switches (non-programmable)
3. Parameter Backup Methods
Paper Records: Fill out the “Transmitter Parameter Configuration Form” and file it
Electronic Backup: Export parameter files via software, name and archive them
Batch Equipment: Create a unified ledger by model - range - wiring - parameters
4. Precautions
Disconnect power or enter programming mode before changing parameters to avoid accidental operation
For explosion-proof equipment, it is strictly prohibited to open the cover and modify parameters while powered on
Retain records after calibration for subsequent traceability and comparison

7.5 Simple Troubleshooting for Common Issues (Quick Diagnosis for Operations and Maintenance)
--- No signal output: Check power supply → Check wiring → Check if sensor is disconnected
--- Value fluctuations: Check shield grounding → Check for interference → Check for loose connections
--- Temperature too high / too low: Check sensor polarity → Check measurement range settings → Check cold junction compensation
--- Module overheating: Check supply voltage → Check for load overload → Check for short circuits

VIII. Troubleshooting & Emergency Procedures
8.1 List of Common Faults + Symptom Descriptions
1. No Output / Fixed Output
No 4–20 mA signal, no voltage signal; host computer displays 0, open circuit, or a fixed value
2. Signal Drift / Slow Drift
Temperature remains constant but the value slowly increases or decreases; irregular drift
3. Signal Jitter / Distortion
Values fluctuate frequently, fluctuating between high and low; severe spikes in the curve
4. Abnormal Indicator Lights
Power indicator does not light up, flickers, or alarm light remains on
5. Out-of-Range / Alarm Triggered
Displays HH/LL; output is saturated (≥20.5mA or ≤3.8mA)
6. Significant Measurement Deviation
Significantly inconsistent with actual on-site temperature; consistently too high or too low
8.2 Analysis of Fault Causes
1. Wiring Issues (Most Common)
Reversed polarity, incorrect input/output connections
Loose connections, missing connections, broken wires, poor contact
Shielding wire grounded incorrectly / not grounded
2. Power Supply Issues
Insufficient voltage, reverse polarity, incorrect connection to AC 220V
High power supply ripple, switching power supply interference
3. Signal and Sensor Issues
Sensor damage, thermocouple polarity reversal, excessive resistance in RTD leads
Mismatched measurement range, input overload
4. Environmental and Interference Issues
Interference from inverters, servo drives, or high-voltage cables
Excessive temperature or humidity, condensation, corrosion, vibration
5. Device-Specific Issues
Internal module damage, aging, temperature drift exceeding tolerance
Mismatched or faulty explosion-proof safety barrier
8.3 Step-by-Step Troubleshooting
1. Fault: No output / Fixed output
Troubleshooting steps:
First, check the power supply: Use a multimeter to measure whether the terminal voltage is DC24V ±10%
Check the power indicator light: Not lit → Check power supply / fuse / module damage

Check wiring: Verify if input / output / power connections are misaligned, or if positive and negative terminals are reversed
Disconnect the load: Directly measure the output current to determine if there is a short circuit in the load
Replace the sensor: Use a simulator or standard resistor as a substitute to determine if the sensor is open-circuited
Emergency Measures:
Temporarily replace with a spare transmitter to quickly resume production
In urgent situations, a short-circuit test may be performed (limited to non-explosion-proof and non-safety-critical environments)
2. Fault: Signal Drift (Slow Drift)
Troubleshooting Steps:
Check cabinet temperature and humidity: Check for condensation or high temperatures
Check sensor wiring: Check for moisture or oxidation
Check if zero point / full-scale have drifted; perform on-site calibration
Check if power supply is stable; test by replacing with a clean switching power supply
Emergency Measures:
Temporarily enhance cooling / dehumidification and observe if conditions recover
Record the drift value and implement software compensation in the PLC. (temporary solution)
3. Fault: Signal Jitter, Interference, or Distortion
Troubleshooting Steps:
Check shielded cables: Check for single-ended grounding or routing in the same conduit as power lines
Keep away from inverters, contactors, and high-current cables
Check grounding: Check for multiple ground loops
Replace shielded cables and shorten cable runs
Emergency Measures:
Temporarily add ferrite rings or filter beads
Adjust the module's filter setting (if available)
In high-interference environments, switch to a transmitter with enhanced isolation
4. Fault: Abnormal Indicator Lights
Light does not illuminate: Power supply issue, reversed wiring, module burnout
Light flickers: Voltage instability, output short circuit, module protection
Alarm light stays on: Sensor disconnection, out-of-range, input anomaly
Resolution:
Disconnect power and recheck supply → Rewire according to specifications → Replace sensor → Replace transmitter
5. Fault: Out-of-Range / Alarm (HH/LL)
Troubleshooting Steps:
Verify if the actual temperature is truly out of range
Check if the sensor is open-circuited or short-circuited
Check if the range setting matches the field conditions
Check polarity for thermocouples; check wiring configuration (2/3/4-wire) for RTDs
Emergency Measures:
Reset to the correct range
Temporarily short-circuit the input terminals to determine if the module is functioning normally
6. Fault: Large Measurement Deviation, Inaccurate Calibration
Troubleshooting Steps:
Compare with a standard temperature source to verify transmitter accuracy
Thermocouple: Check if cold-junction compensation is functioning properly
Resistance Thermometer: Check wire resistance compensation and wiring configuration
Check if zero point and full-scale calibration are out of alignment
Resolution:
Perform zero-point and full-scale calibration according to procedures; if the error persists, replace the module
8.4 Emergency Workaround
Directly replace with a spare transmitter of the same model for the fastest restoration
Temporarily use a signal isolator + external temperature transmitter as a workaround
Explosion-proof environments: First switch to bypass mode; resume operation after replacement
Critical circuits: Activate the 1-in-2-out redundant channel for temporary
8.5 After-Sales Repair Guidelines
1. Failure Determination Criteria (Scope of Warranty Coverage)
Functional failure not caused by wiring, power supply, or interference
Accuracy out of tolerance, temperature drift exceeding limits, inability to calibrate
Internal damage occurring during normal use
Within the warranty period, with no signs of human-caused damage
2. Exclusions from Warranty Coverage
Wiring while powered on, accidental connection to AC 220V, or burnout due to reverse polarity
Intrusion of high-voltage current, lightning strikes, water damage, or physical damage
Unauthorized opening of the casing, modification, or disassembly (especially strict for explosion-proof models)
Beyond the warranty period, or lacking factory identification marks
3. Repair Process
Provide: Model, serial number, purchase date, and description of the fault
Provide photos of: indicator light status, wiring connections, and measurement data
Technical support will make an initial assessment and guide you through on-site troubleshooting
If confirmed as a quality issue: Return to factory for inspection / Replacement
4. Warranty Information
Standard Warranty: 12–18 months from the date of manufacture
For explosion-proof products and custom-made products, terms are subject to the contract
Free repair or replacement for non-human-caused faults within the warranty period