# BSR & BSC Temperature Transmitter

## I. Product Definition

The Qidian BSR/BSC is a 35DIN-rail mounted isolated temperature transmitter** designed primarily to process signals from resistance temperature detectors (RTDs, such as PT100 and PT1000) and thermocouples (such as Type K and Type J). Its core function is to convert “temperature signals into standard electrical signals” and ensure isolated transmission, serving as both a “signal converter” and a “safety barrier” for industrial temperature acquisition systems.

Four Core Functions

-- Electrical Isolation: Cuts off direct electrical connections between inputs, outputs, and power supplies, blocking ground potential differences, surges, and high-voltage crosstalk to protect downstream precision equipment such as PLCs and DCS systems at the source.

-- Signal Conversion: Precisely converts the weak resistance signals (e.g., PT100) and millivolt signals (e.g., thermocouples) output by RTDs/thermocouples into standard electrical signals of 4-20mA, 0-10V, or 0-5V, ensuring compatibility with all industrial control systems and achieving unified signal compatibility.

--Interference Resistance: Equipped with built-in professional filtering circuits and electromagnetic isolation structures, it effectively withstands strong electromagnetic interference from inverters, motors, relays, and other sources, preventing signal distortion and fluctuations.

--Power Distribution: Some models support isolated power supply for two-wire RTD/thermocouple sensors, eliminating the need for separate power lines to the sensors. This significantly simplifies on-site wiring and reduces installation costs.

## II. Working Principle

Temperature Acquisition → Signal Conditioning → Three-Terminal Isolation → Linear Conversion → Standard Output

1. Acquisition: On-site RTDs/thermocouples sense the ambient temperature and convert temperature changes into a weak resistance signal (RTD) or a millivolt signal (thermocouple);
2. Conditioning: The transmitter features built-in cold-junction compensation (for thermocouples), nonlinearity correction, signal amplification, and filtering functions to correct errors in the raw signal and improve signal stability and accuracy;
3. Isolation: Utilizing electromagnetic or optoelectronic isolation technology, the device achieves complete electrical separation between the input, output, and power supply, forming independent signal loops;
4. Output: The conditioned and isolated signal is linearly converted into industrial standard electrical signals such as 4–20 mA, which are then transmitted stably to PLCs, DCS systems, or display instruments in the control room, enabling real-time temperature monitoring and control.

Core Advantages of 3-Terminal Isolation

--- The input, output, and power supply are mutually insulated with no direct electrical path, completely severing interference transmission routes;

--- Effectively eliminates common industrial field issues such as “ground potential differences” and “ground loops,” preventing temperature data drift and fluctuations to ensure measurement accuracy;

--- Blocks abnormal voltages such as lightning strikes, surges, and high-voltage crosstalk, preventing damage to downstream PLC and DCS analog modules;

--- Suitable for explosion-proof environments; compatible with intrinsically safe barriers to meet intrinsic safety requirements in hazardous areas such as chemical and oil & gas facilities, ensuring on-site safety.

## III. Core Value

(1) Results in scenarios where temperature transmitters are not used and sensors are connected directly

-- Signal Transmission Challenges: The raw signals output by resistance temperature detectors (RTDs) and thermocouples are weak. At transmission distances exceeding 50 meters, attenuation and distortion occur, resulting in significant data deviations during long-distance data acquisition and preventing accurate monitoring;

--Interference Challenges: Without isolation protection, strong electromagnetic interference from on-site inverters, motors, relays, and other sources can directly enter the signal loop, causing frequent fluctuations and variations in temperature data, or even generating false readings, which affects production control;

--System Safety Challenges: On-site ground potential differences and ground loops generate stray currents that directly enter downstream PLCs and DCS modules. Prolonged exposure can burn out modules, increasing equipment maintenance costs and the risk of downtime;

-- Measurement Accuracy Challenges: Without cold-junction compensation (for thermocouples) or nonlinear correction functions, the raw signal contains inherent errors, resulting in low measurement accuracy that fails to meet the requirements of high-precision production environments (such as pharmaceuticals and electronics);

-- Wiring and Compatibility Challenges: Output signals from different sensor types are inconsistent (resistance, millivolt signals), making them incompatible with control systems such as PLCs and DCSs. Additional conversion devices are required, leading to complex wiring and poor compatibility;

-- Compliance Challenges: Lack of isolated explosion-proof design fails to meet safety standards for hazardous areas such as chemical, oil and gas, and dusty environments, resulting in failure to pass on-site inspections and posing safety hazards.

(2) Application Scenarios and Results for Qidian BSR & BSC Temperature Transmitters

-- Signal Transmission Benefits: Converts weak raw signals into standard 4–20 mA current signals, with a transmission distance of up to 1,000 meters. Signals remain free of attenuation and distortion, ensuring accurate and stable temperature data acquisition over long distances;

--Interference Resistance: Three-terminal isolation combined with built-in filtering circuits completely blocks strong electromagnetic interference and ground potential differences, ensuring stable temperature data without fluctuations and guaranteeing the reliability of production control;

--System Safety: The isolation layer provides physical protection, blocking surges and high-voltage crosstalk, effectively safeguarding downstream precision equipment such as PLCs and DCS systems. This prevents module burnout, extends equipment lifespan, and reduces maintenance and downtime costs;

-- Measurement Accuracy: Built-in cold-junction compensation (for thermocouples in the BSC series) and nonlinearity correction ensure measurement accuracy of ≤±0.1% FS, delivering reliable and accurate data suitable for high-precision production environments;

-- Wiring and Compatibility: Standardized 4–20 mA/0–10 V output signals allow direct integration with all industrial control systems without additional adapters; Some models support isolated power supply, simplifying on-site wiring and reducing installation complexity and costs;

--Compliance Value: Supports isolated explosion-proof design and can be used with intrinsically safe barriers to meet intrinsic safety requirements in hazardous areas such as chemical and oil & gas industries, complying with on-site safety regulations and ensuring smooth acceptance testing.

## IV. Key Considerations for Beginners to Avoid Pitfalls

---BSR Series: Primarily designed for resistance temperature detector (RTD) inputs (PT100, PT1000, etc.), offering high precision and versatility, suitable for standard low-to-medium temperature data acquisition scenarios;

---BSC Series: Primarily designed for thermocouple inputs (Type K, Type J, etc.), featuring built-in cold-junction compensation, suitable for high-temperature and ultra-high-temperature data acquisition scenarios;

---Prioritize three-terminal isolated models during selection; avoid two-wire non-isolated models, as they cannot handle interference and ground potential differences in complex industrial environments;

---In hazardous environments such as chemical and oil & gas facilities, prioritize models with explosion-proof certification and use them in conjunction with intrinsically safe barriers to ensure compliance and safety.

## IV. Key Specifications

4.1 Basic Electrical Specifications

Input Signal Types: PT100, PT1000, Cu50, etc.
Type K, Type J, Type S, Type T, Type E, etc.

Output Signal Types: 4–20 mA, 0–20 mA, 0–10 mA, 10–5 V, 0–10 V, RS485

Load Capacity: Current Output: RL ≤ 500 Ω; Voltage Output: RL ≥ 10 kΩ

Input Impedance: ≥ 10 MΩ (voltage input); ≤ 100 Ω (current input)

Accuracy Class: ±0.1% FS, ±0.2% FS

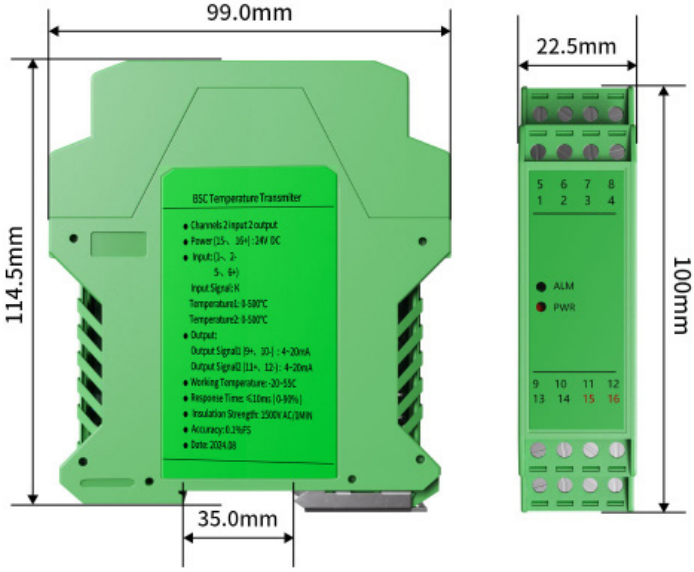
4.2 Isolation Performance Parameters

Dielectric Strength: ≥ 1500 V AC, 1 min (between input, output, and power supply terminals)

Insulation Resistance: ≥100 MΩ @ 500 V DC (between input, output, and power supply terminals)

Electromagnetic Compatibility Standards: Complies with IEC 61326-3, GB/T 18268 (IEC 61326-1)

Response Time: ≤1 s (0–90%, typical)
Temperature drift: ≤0.005% FS/°C (-20°C to +55°C)
4.3 Power Supply & Power Consumption Parameters
Supply Voltage: DC 18–32 V (typically 24 V DC), wide-range compatible
Full-Load Power Consumption: ≤1.5 W (single channel); ≤3.0 W (dual channel)
Distribution Output Parameters: Distribution Voltage: 18–24 V DC; Distribution Current: ≤20 mA
4.4 Environmental Parameters
Operating Temperature: -20°C to +55°C (Standard Model); -40°C to +85°C (Wide-Temperature Model, Optional)
Operating Humidity: 10%RH to 90%RH, non-condensing
Storage Temperature: -40°C to +85°C
Storage Humidity: 5%RH–95%RH, non-condensing
Protection Rating: IP20 (DIN-rail mounting)
Explosion-proof Rating & Compatible Safety Barriers: Explosion-proof Rating: Ex ia II CT6 (Intrinsically Safe, optional); Compatible Safety Barriers: QD-6041, QD-6045, and other Qidian-specific intrinsically safe barriers




Mounting Method: 35mm DIN Rail
Dimensions: 114.5mm x 99mm x 22.5mm
Indicator Lights: PWR - Power / ALM - Alarm

**V. Selection Guide**

This module addresses the core pain points of "not knowing how to select" and "choosing the wrong model." Centered on the approach of "dimension breakdown + scenario matching + avoiding common pitfalls," it provides actionable selection recommendations that balance ease of use for beginners with professional suitability, ensuring error-free selection and compatibility with on-site operating conditions.

5.1 Core Selection Dimensions

---Signal Type (Core Prerequisite): First, confirm the type of front-end sensor—for resistance thermometers (PT100, PT1000, Cu50, etc.), select the BSR series; Thermocouples (Type K, J, S, T, E, etc.) should use the BSC series. The BSC series features built-in cold-junction compensation, eliminating the need for an additional compensation module. This meets the core requirements for thermocouple temperature measurement. Additionally, the transmitter model can be selected based on the sensor's signal range to ensure accurate signal acquisition without deviation.

---Number of Channels (to meet system requirements): Select based on signal transmission needs. For standard scenarios, prioritize 1-in-1-out (single-channel) to meet the isolated transmission requirements of a single sensor signal; if you need to transmit one input signal to two backend devices simultaneously (e.g., PLC + display instrument), select 1-in-2-out; For multi-sensor centralized data acquisition scenarios (such as multi-point temperature monitoring), multi-channel models such as 2-in-2-out or 4-in-4-out are available. The integrated design saves control cabinet space, simplifies wiring, and reduces equipment procurement and installation costs.

---Power Supply (Adapting to On-Site Power): By default, a wide-voltage DC 18–32 V power supply (typically 24 V DC) is selected, compatible with standard industrial DC power supply scenarios to prevent voltage fluctuations from affecting device operation; When there is no independent power supply on-site or wiring is inconvenient, prioritize models with power distribution and feed-through capabilities (distribution voltage 18–24 V DC, distribution current ≤20 mA). These can power two-wire resistance temperature detectors (RTDs) or thermocouple sensors without the need for additional power lines, significantly simplifying on-site wiring.

--- Explosion-Proof Requirements (Compliance Prerequisites): For standard industrial environments (without flammable or explosive media), select the general-purpose model; for hazardous environments such as chemical, oil and gas, or dusty settings, select the Ex ia II CT6 intrinsically safe explosion-proof model, which must be used in conjunction with Qidian's dedicated intrinsically safe barriers (QD-6041, QD-6045, etc.) to ensure compliance with on-site explosion-proof regulations, pass safety inspections, and eliminate potential safety hazards.

--- Installation Environment (Application Scenarios): For standard environments (-20°C to +55°C, no condensation, low dust), select the standard model; it features DIN rail mounting (standard 35mm DIN rail clip-on installation) and is suitable for installation inside control cabinets; For extreme environments such as high temperatures (>55°C) or low temperatures (<-20°C), select the wide-temperature model (-40°C to +85°C); in humid or dusty environments, use a dust-proof and moisture-proof cover, and ensure sufficient heat dissipation space is reserved inside the control cabinet to prevent equipment damage caused by environmental factors.

5.2 Common Selection Misconceptions

- Misconception 1: Ignoring isolation levels and selecting non-three-terminal isolated models

Risk: Industrial sites are subject to ground potential differences and strong electromagnetic interference (from inverters, motors, etc.). Non-three-terminal isolated models cannot block interference, leading to temperature data fluctuations, distortion, or even the burnout of downstream PLC/DCS modules. Additionally, they fail to meet signal isolation requirements in complex scenarios.

Correct Approach: Regardless of the application, prioritize three-terminal isolated models (input/output/power supply) to ensure a dielectric strength of ≥1500 V AC and an insulation resistance of ≥100 MΩ. This completely cuts off interference transmission paths, safeguards equipment, and meets industrial field anti-interference requirements.

- Misconception 2: Selecting the wrong signal range, resulting in incompatibility with the sensor

Consequences: Using the BSC series (designed for thermocouples) with resistance temperature detectors (RTDs), or the BSR series (designed for RTDs) with thermocouples, prevents normal signal acquisition and conversion, leading to significant measurement errors or even no output; failing to match the sensor's range causes data deviations beyond the permissible limits.

Correct Approach: Use the BSR series for resistance temperature detectors (such as PT100) and the BSC series for thermocouples (such as Type K). Verify the sensor's signal range and ensure it matches the transmitter's corresponding range to guarantee accurate signal acquisition and conversion. The built-in nonlinearity correction function further optimizes measurement accuracy.

- Misconception 3: Neglecting load matching, leading to signal abnormalities

Consequences: Failure to verify the load of the downstream PLC/DCS module and selecting a transmitter with an incompatible load capacity can cause signal attenuation, distortion, or even failure to output signals, thereby affecting temperature monitoring and control. This issue is particularly pronounced during long-distance transmission, where load mismatch exacerbates signal attenuation.

Correct Approach: For current-output transmitters, ensure the downstream load RL ≤ 500 Ω; for voltage-output transmitters, ensure RL ≥ 10 kΩ. Additionally, consider transmission distance when selecting the appropriate output signal type (prioritize 4–20 mA current signals for long-distance applications due to their superior resistance to signal attenuation) to avoid load mismatch issues.

- Misconception 4: Selecting general-purpose models for explosion-proof environments—non-compliant and posing safety hazards

Hazards: In hazardous environments such as chemical and oil & gas facilities, using non-explosion-proof transmitters will fail safety inspections and may trigger accidents (e.g., explosions, fires). This violates intrinsic safety standards and fails to block signal interference and abnormal voltages in hazardous areas.

Correct Approach: In hazardous environments, Ex ia II CT6 intrinsically safe transmitters must be selected and used in conjunction with Qidian's dedicated intrinsically safe barriers to ensure compliance with on-site explosion-proof regulations while meeting isolation and anti-interference requirements, thereby eliminating safety hazards.

5.3 Customization Recommendations

For scenarios where standard models cannot meet requirements—such as special signals, non-standard operating conditions, or multi-channel integration—we provide customized solutions that balance adaptability and practicality. These solutions can be flexibly adjusted based on actual on-site needs, while leveraging Qidian's core technologies to ensure that customized products offer the same stability and accuracy as standard products.

---Customization for Special Signals: In addition to standard signals (RTDs, thermocouples), we can adapt to signals from special sensors (such as RTDs with custom ranges or less common thermocouple models). Input signal types and ranges can be customized; Output signals can be customized to special specifications (such as signals other than 0-20mA or 0-10V), while signal conditioning circuits are optimized to ensure precise signal conversion and meet signal acquisition requirements in special scenarios. Software-based nonlinear correction is supported to enhance signal linearity.

---Customization for Non-Standard Operating Conditions: For non-standard environments such as extreme high or low temperatures (beyond -40°C to +85°C), severe corrosion, or intense vibration, we offer customizable wide-temperature, corrosion-resistant, and vibration-resistant models. We optimize housing materials and internal structures to enhance the device's environmental adaptability; power supply voltage can be customized (e.g., 12V DC, 48V DC) to accommodate special on-site power supply scenarios; For special environments such as high humidity and high dust levels, reinforced dustproof and moisture-proof structures can be customized to enhance the device's protection performance.

---Multi-channel integration customization: For scenarios requiring centralized data acquisition from multiple points (e.g., 16-channel or 32-channel inputs), multi-channel integrated models can be customized. These models integrate signal isolation, transmission, and power distribution functions into a single unit, reducing the number of devices and cabling while saving control cabinet space; Supports independent channel configuration (each channel can be individually set for input/output signals) to accommodate varying temperature measurement requirements at different locations. The optimized integrated structure ensures stability during simultaneous operation of multiple channels, while the low-power design reduces heat generation and extends service life.

---Customization Process: Confirm on-site conditions (signals, environment, load, etc.) → Contact the Qidian technical team to discuss requirements → Provide a customized solution and specifications → Sample testing → Mass production. This ensures the customized product fully meets on-site non-standard requirements while providing the same after-sales support as standard products.

**VI. Installation and Commissioning Guidelines**

This module serves as a practical field installation guide specifically designed for Qidian BSR (Resistance Temperature Detector) / BSC (Thermocouple) isolated temperature transmitters. Through a standardized process of "Five Steps for Installation, Four Steps for Commissioning, and Five Prohibitions," it provides step-by-step guidance to technicians to complete the installation, effectively minimizing installation issues such as wiring errors, signal interference, and commissioning failures, thereby ensuring the equipment is successfully commissioned on the first attempt.

6.1 Pre-Installation Preparation

6.1.1 Verification of Components

Main Unit: 1 BSR/BSC transmitter (confirm model: BSR-* / BSC-*, and verify that the input signal type matches the on-site sensor).

Standard Accessories: 1 x 35mm DIN rail clip, 2 x mounting screws, 1 x product manual, 1 x terminal cover.

Optional Accessories: Shielded signal cable, intrinsically safe barrier (for explosion-proof environments), power distribution module (if required).

Troubleshooting: Do not install if the main unit housing is damaged, terminals are oxidized, or accessories are missing. Contact the manufacturer immediately for replacement.

6.1.2 Environmental Inspection (Preventing Environmental Failure)

Temperature: The installation area temperature must be between -20°C and +55°C (wide-temperature models available: -40°C to +85°C). Keep the unit away from heat sources such as inverters, motors, and power distribution cabinets (distance ≥ 30 cm).

Humidity: Relative humidity 10%RH to 90%RH, no condensation. In humid environments, prepare moisture-proof enclosures or dehumidifiers in advance.

Interference: Keep away from strong sources of electromagnetic interference (contactors, variable frequency drives, power cables) to avoid signal crosstalk.

Explosion-proof: For chemical/oil and gas applications, ensure that Ex ia II CT6 intrinsically safe barriers are provided, and that the installation area complies with intrinsically safe standards.

6.1.3 Tool List (Prepare in advance to improve efficiency)Essential Tools: Small Phillips screwdriver, wire strippers (for 0.5–2.5 mm² wire), multimeter (with millivolt, resistance, and current ranges), crimping pliers. Safety Equipment: Insulated gloves, voltage tester (essential for safe installation).

4. Safety Precautions (Do Not Touch Red Lines)

Power-Off Operations: Before wiring or installation, all power supplies to on-site sensors, transmitters, and PLC/DCS systems must be disconnected. Verify the absence of voltage with a voltage tester before proceeding.

Explosion-Proof Standards: Wear explosion-proof tools when working in hazardous areas. Ensure junction boxes are properly sealed, and prevent the generation of sparks.

Anti-Static Measures: Discharge static electricity from your body before operation to prevent damage to internal precision chips.

6.2 Grounding Requirements

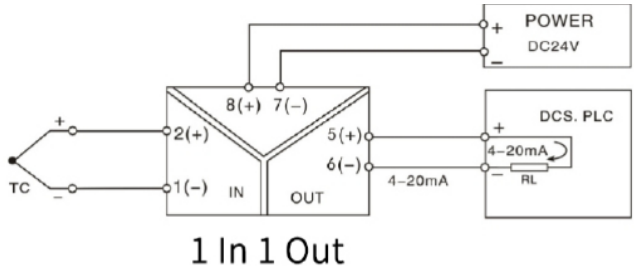
Shield Grounding: The sensor signal shield must be grounded at only one end (connected to the GND terminal) at the transmitter end; the other end must be left floating (do not ground both ends, as this will create a ground loop and cause signal drift).

Ground Resistance: Use a copper-core wire with a cross-sectional area of ≥1.5 mm² for the ground wire; the ground resistance must be ≤4 Ω.

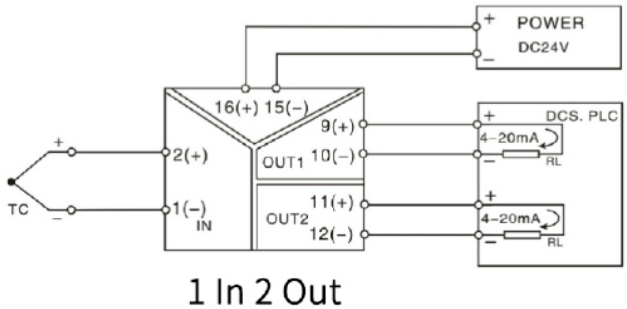
Prohibited Connections: The GND terminal must only be connected to the shielding wire; it must not be connected to the negative terminal of the power supply or the equipment chassis ground to prevent interference.

6.3 Wiring Diagram

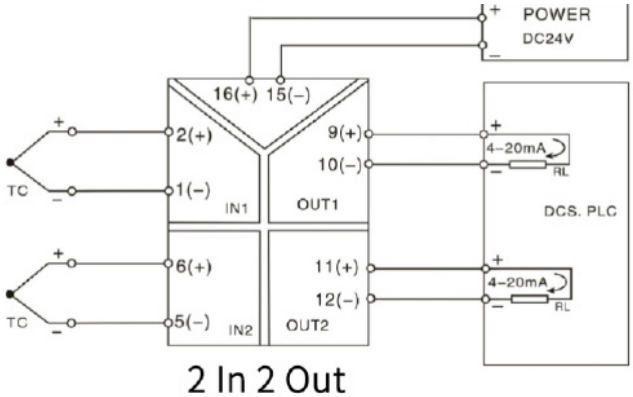
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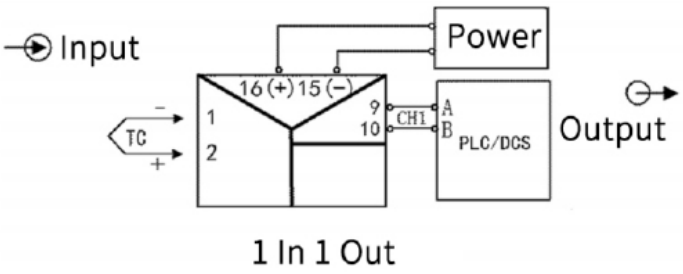

1 In 1 Out



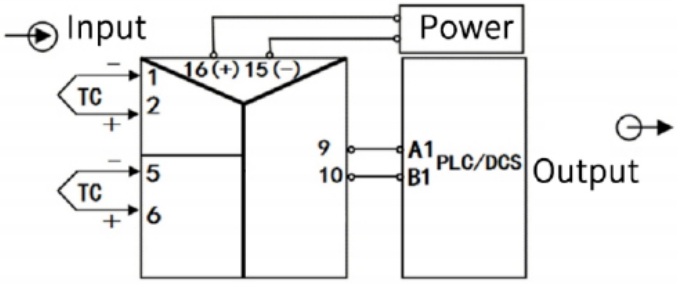

1 In 2 Out




2 In 2 Out

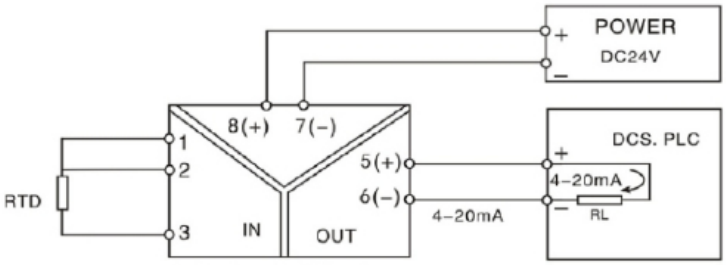



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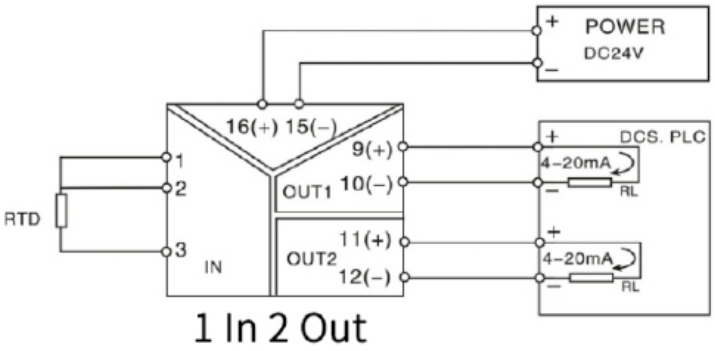



2 In 1 Out

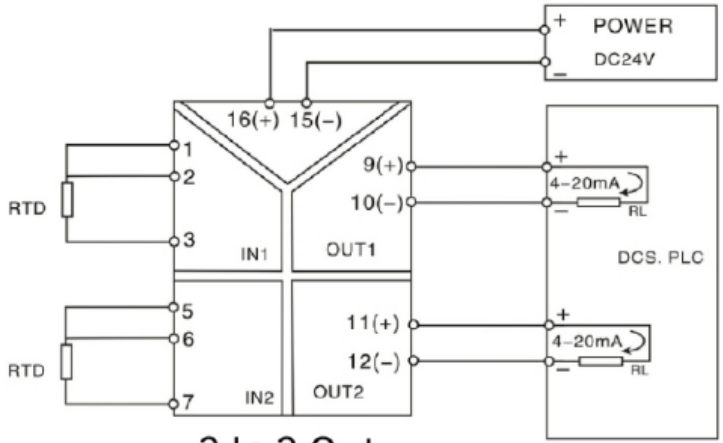
BSR



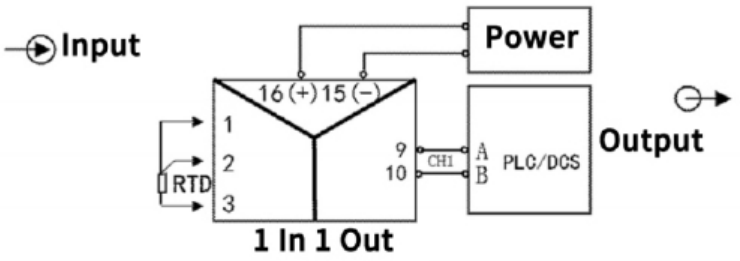

1 In 1 Out



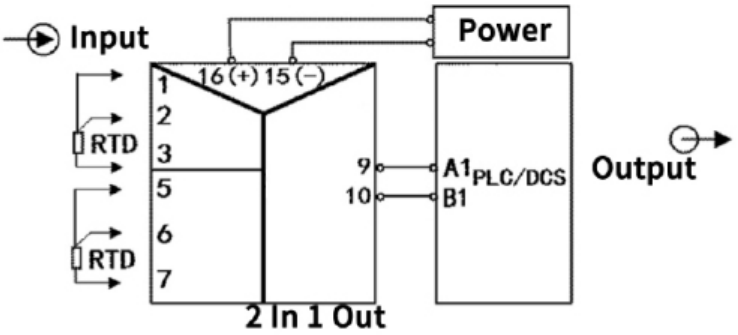

1 In 2 Out




2 In 2 Out




1 In 1 Out




2 In 1 Out

*6.4 Power-On Debugging Procedure*

*Before debugging, please double-check that the wiring is correct and that the power supply is disconnected.*

*6.4.1 No-Load Test (Pre-Power-On Check)*

*Connect only the power supply (DC 18–32 V, typically 24 V); disconnect the input and output signal lines.*

*After power-on, observe the indicator lights:*

*PWR (Power Indicator): Solid green (normal).*

*If off or flashing: Check the power supply voltage and the polarity of the wiring.*

*If ERR (Error Indicator) is on: Check for device malfunctions.*

*6.4.2 Signal Verification (Core Debugging)*

*Restore input connections: Connect the RTD/thermocouple sensor.*

*Restore output connections: Connect a multimeter set to measurement mode to the output terminal.*

*Comparison of Readings:*

*BSR: At room temperature (25°C), the corresponding resistance for a PT100 is approximately 100Ω; the output should correspond to 4mA (lower limit).*

*BSC: At room temperature (25°C), the corresponding millivolt value for a Type K thermocouple is approximately 1mV; the output should correspond to 4mA (lower limit).*

*Temperature Rise Test: Apply a temperature rise signal; the output current should increase linearly in sync with the input up to 20 mA (upper limit).*

*6.4.3 Accuracy Calibration Method (Procedure When Deviation Exceeds Limits)*

*If the measured error exceeds ±0.1% FS, calibration is required:*

*--- Power on and preheat for 15 minutes to stabilize the device.*

*--- Zero calibration: Input the lower limit signal (e.g., PT100 at 0°C), and adjust the ZERO knob on the panel to set the output to 4.00 mA.*

*--- Span calibration: Input the upper limit signal (e.g., PT100 at 100°C), and adjust the SPAN knob on the panel to set the output to 20.00 mA.*

*--- Repeat 2–3 times to confirm that the zero point and span are free of deviation. Tighten the knobs and record the calibration results.*

*6.5 Installation Precautions*

*--- Do not exceed the rated voltage: Never connect to 220V AC or a DC power supply exceeding the 18–32V range, as this will immediately burn out the internal power module.*

*--- Strictly prohibit high-voltage interference: Input/output signal cables must not be laid parallel to or bundled with power cables (380V/220V); they must be routed separately.*

*--- Strictly prohibit exposed installation in humid environments: In humid or condensing environments, a waterproof and moisture-proof enclosure must be installed; otherwise, terminal oxidation and short circuits may occur.*

*---Strictly prohibit omitting safety barriers in explosion-proof environments: In chemical, oil, and gas facilities, Qidian intrinsically safe barriers (such as the QD-6041) must be installed; failure to do so is not only non-compliant but may also damage equipment and cause safety incidents.*

Practical Summary: When installing BSR/BSC temperature transmitters, the key lies in **"Three Isolations and One Precision": terminal wiring must be isolated, shielding and grounding must be standardized, and the supply voltage must be accurate; during commissioning, focus on verifying cold-junction compensation (BSC) and linearity**. Strict adherence to this procedure ensures a 100% installation success rate.

VII. Recommendations for Daily Use and Maintenance

This module focuses on guidelines for daily equipment use and key points for long-term maintenance. Drawing on real-world industrial applications, it provides practical tips, periodic maintenance plans, and quick troubleshooting methods for common issues. These measures are designed to extend equipment lifespan, reduce maintenance costs, ensure long-term stable operation, and meet the daily operational needs of on-site maintenance personnel.

7.1 Daily Usage Guidelines

7.1.1. Precautions for Daily Operations

- Never operate while the power is on: For routine inspections, wiring adjustments, sensor replacements, and other operations, you must first disconnect the power supply to the transmitter and related equipment (sensors, PLC/DCS). Verify that there is no voltage present before proceeding to prevent electric shock, equipment burnout, or damage to precision chips;
- Avoid Accidental Contact with Terminals: When working inside control cabinets, avoid bumping into or touching the transmitter's terminal blocks to prevent loose connections or poor contact, which can cause signal abnormalities. Do not arbitrarily plug or unplug terminal wires; if necessary, insert and remove them gently to avoid damaging the terminals or wires;
- Environmental Maintenance: Keep the transmitter installation area clean and dry. Prevent dust, oil, or water from accumulating on the equipment surface or terminals to avoid terminal oxidation and equipment short circuits. In humid environments, regularly inspect moisture-proofing devices to ensure no condensation occurs;
- Signal Interference Prevention: Do not place equipment that generates strong electromagnetic interference (such as small inverters or relays) near the transmitter. When running temporary wiring, do not bundle high-voltage cables with the transmitter's signal wires to prevent signal crosstalk;
- Strictly Prohibit Unauthorized Modifications: Do not disassemble or modify the transmitter housing, internal circuitry, or terminals without authorization. Do not alter equipment parameters (such as range or compensation method). If adjustments are necessary, contact the Qidian technical team for guidance to avoid equipment damage or loss of warranty eligibility.

7.1.2. Tips for Daily Use

- Signal Monitoring: Monitor the transmitter's output signal daily via the PLC/DCS system. If you observe frequent data fluctuations, no output, or excessive output deviation, promptly investigate wiring, sensor, and environmental interference issues to prevent the fault from escalating;
- Labeling Management: Affix labels to the transmitter housing indicating the model, compatible sensor type, installation date, and responsible person to facilitate future maintenance, model selection/replacement, and fault tracing;
- Wiring Protection: Regularly inspect the transmitter's signal and power cables to prevent crushing, wear, or breakage. Replace damaged cables immediately and ensure proper insulation at connection points to prevent short circuits;
- Power Protection: Avoid excessive voltage fluctuations in the field power supply. Use a voltage regulator to prevent the power module from being damaged by excessively high or low voltages; When equipment is idle for extended periods, disconnect the power supply and implement dust and moisture protection measures.

7.2 Regular Maintenance Plan

Develop tiered maintenance schedules based on the equipment's operating environment and conditions. Focus on inspecting equipment status, wiring, insulation, and accuracy to ensure long-term stable operation and prevent unexpected failures that could cause production downtime.

7.2.1. Daily Inspection (Once per day, for quick troubleshooting of basic issues)

1. Visual Inspection: Check that the transmitter housing is intact and undamaged, and verify that the indicator lights are functioning normally (a steady green PWR light and a steady green OUT light indicate normal operation; a lit red ERR light requires immediate troubleshooting);
2. Signal Check: Use the PLC/DCS to verify that the output signal is stable and matches the actual on-site temperature, with no significant deviation (error ≤ ±0.1% FS);3. Environmental Check: Verify that the temperature and humidity in the installation area are within the equipment's operating range; ensure there is no condensation, dust accumulation, or strong interference from nearby equipment.

7.2.2. Weekly Maintenance (Once a week, focusing on wiring and grounding)

1. Wiring Inspection: Gently press the terminal screws with a screwdriver to confirm that the wiring is secure, with no looseness or detachment; ensure wires are free of damage or oxidation; verify that high-voltage and low-voltage wiring are properly separated (spacing ≥ 10 cm);
2. Grounding Inspection: Verify that the sensor shielding wire is reliably grounded at one end, with grounding resistance ≤4Ω; ensure the GND terminal is not mistakenly connected to the power supply negative terminal or the equipment chassis ground, and that there is no looseness;
3. Cleaning: Wipe the transmitter housing and terminals with a dry, soft cloth to remove dust and oil residue, preventing dust from entering the terminals and causing poor contact.

7.2.3. Monthly Maintenance (Once per month: Accuracy Calibration and Performance Check)

1. Accuracy Calibration: Use a standard signal source to simulate resistance temperature detector (RTD) or thermocouple signals (e.g., PT100 at 25°C corresponds to 100Ω, Type K thermocouple at 25°C corresponds to 1mV). Verify that the transmitter's output signal falls within the standard range. If the error exceeds ±0.1% FS, contact the Qidian technical team for calibration;
2. Insulation Check: Use a multimeter to measure the insulation resistance between the input, output, and power supply terminals to ensure it is ≥100 MΩ, preventing interference or equipment failure caused by reduced insulation;
3. Component Inspection: Check that the rail clips and terminal covers are intact and securely fastened; replace any missing or damaged parts immediately. In explosion-proof environments, verify that the connection between the safety barrier and the transmitter is reliable and that the junction box is properly sealed.

7.2.4. Quarterly Maintenance (Once per quarter; comprehensive inspection and optimization)

1. Comprehensive Inspection: Conduct a thorough inspection of all transmitters, focusing on terminal oxidation and wire aging in long-term operational equipment; promptly replace aged wires and oxidized terminals;
2. Environmental Optimization: Adjust protective measures according to seasonal changes; during high-temperature seasons, verify adequate heat dissipation space; during low-temperature seasons, implement frost protection measures; during humid seasons, strengthen moisture-proofing measures;
3. Fault Tracing: Review recent equipment failure records, analyze root causes (e.g., interference, wiring, environmental factors), and optimize maintenance plans to prevent recurrence of similar issues;
4. Firmware Check: Contact the Qidian technical team to confirm if transmitter firmware updates are available; perform firmware upgrades as necessary to enhance device performance and compatibility.

**7.3 Quick Troubleshooting for Common Issues**

1. Q: The power indicator (PWR) is not lit or is flashing, and the device cannot start normally. How should this be handled?

A: First, troubleshoot the three common causes and their corresponding solutions: ① Abnormal supply voltage (outside the 18–32 V DC range): Use a multimeter to check the supply voltage and adjust it to the standard range; ② Reversed power supply polarity: After powering down, inspect the wiring, correct the positive and negative connections, and retest after powering up; ③ Faulty power supply module: If the issue persists after replacing the power supply, the power supply module is likely damaged; contact the manufacturer for assistance.

2. Q: The error indicator (ERR) is constantly lit, and the device cannot output signals normally. What should I do?

A: Prioritize troubleshooting the following three points to resolve the issue step by step: ① Abnormal input signal: Check if the sensor is intact and if the wiring has a short circuit or is loose; repair and then power on again; ② Device overload: Disconnect the output load and observe if the error light turns off; if it does, adjust the load to the appropriate range; ③ Internal circuit failure: If the above steps are ineffective, it indicates a fault in the device's internal circuitry; contact the Qidian manufacturer for troubleshooting and repair.

3. Q: The output signal shows no change or has excessive deviation, making it impossible to accurately monitor the temperature. How should I troubleshoot this?
A: Follow these steps to troubleshoot and resolve the issue one by one: ① Wiring issues: Check if the sensor wiring is loose or reversed; tighten the terminals and correct any reversed connections; ② Signal interference: Check if there are any devices emitting strong electromagnetic interference near the transmitter; separate high-voltage and low-voltage wiring to eliminate interference; ③ Accuracy drift: Calibrate using a standard signal source. If the deviation still exceeds ±0.1% FS, this indicates accuracy drift that cannot be self-corrected; contact the Qidian technical team; ④ Load mismatch: Verify that the downstream load meets requirements (current output RL ≤ 500 Ω, voltage output RL ≥ 10 kΩ), and adjust the load to the compatible range.

4. Q: The output signal fluctuates frequently, and the data is unstable. What are the causes, and how can this be resolved?
A: There are four common causes and corresponding solutions: ① Poor shield grounding: Inspect the shielding wire to ensure it is grounded at only one end (the transmitter end), with a grounding resistance ≤4Ω; ② Strong electromagnetic interference: Move the transmitter away from interference sources such as inverters and relays, and separate high-voltage and low-voltage wiring; ③ Poor wiring connections: Tighten terminal screws, replace damaged wires, and properly insulate connections; ④ Excessive environmental vibration: Secure the equipment installation to reduce vibration and prevent signal fluctuations caused by loose wiring.

5. Q: The equipment is overheating, and the housing is excessively hot to the touch, posing a safety hazard. How should this be addressed?
A: Immediately follow these steps to prevent equipment damage: ① Poor heat dissipation: Adjust the spacing between devices to allow sufficient ventilation, clean dust and oil from the housing, and improve heat dissipation conditions; ② Abnormal power supply: Use a multimeter to check the supply voltage and adjust it to the standard range of 18–32 V DC; use a voltage regulator if necessary; ③ Overload: Reduce the load on the output side and ensure the load is compatible; ④ Internal short circuit: If the device continues to overheat severely after the above steps, immediately disconnect the power supply. This indicates an internal short circuit, and you must contact the manufacturer for repair.
Based on common on-site failure cases, this document outlines failure symptoms, causes, and troubleshooting methods. Without the need for professional technicians, operations and maintenance personnel can quickly diagnose and resolve issues, minimizing downtime. It also clearly identifies scenarios requiring manufacturer intervention to prevent incorrect operations.

**VIII. Step-by-Step Troubleshooting**
8.1 Troubleshooting and Resolution for No Output
---Troubleshooting Steps
Check Power Supply: Verify that the 24 VDC power supply is normal, with a voltage of ≥12 V, and ensure there are no reversed connections, short circuits, or broken wires.
Check Wiring: Ensure terminals are secure, with no loose or incorrect connections, and that the sensor (RTD/thermocouple) is wired correctly.
Measurement Circuit: Insert an ammeter into the circuit to check the 4–20mA output; if no current is present, disconnect the load and measure the transmitter output separately.
Sensor Inspection: Use a multimeter to measure the sensor's resistance or millivolt reading to determine if there is a broken wire, short circuit, or damage.
Module Self-Test: Power off and restart; observe the indicator lights. If there is still no output, determine that the module is faulty.
---Remedial Actions
Reconnect wiring, correct polarity, and tighten terminals.
Replace the power supply or cables to ensure stable voltage.
Replace the faulty sensor or transmitter module.
---Emergency Workaround
Temporarily replace with a spare transmitter to quickly restore the loop; activate the redundant channel for critical loops.
---Emergency Workaround
Temporarily replace with a spare transmitter to quickly restore the loop; activate the redundant channel for critical loops.
8.2 Troubleshooting and Handling Signal Drift
---Troubleshooting Steps
Environmental Check: Verify if the transmitter installation location is subject to high temperatures, high humidity, strong vibrations, or strong electromagnetic interference.
Wiring Check: Ensure shielded cables are properly grounded and free of loose connections or oxidation.
Calibration Check: Verify zero point and span settings to determine if drift exceeds tolerance limits.
Sensor Inspection: Verify that the insulation of the resistance temperature detector (RTD) and the compensation of the thermocouple are normal.
---Remedial Actions
Improve the installation environment by moving the device away from sources of interference and reinforcing shielding and grounding.
Recalibrate the zero point and span; restore factory settings if necessary.
Replace aged sensors or modules.
---Emergency Workaround
Temporarily increase the sampling filter level and shorten the calibration cycle; switch to a backup sensor at critical points.
8.3 Troubleshooting and Handling of Indicator Light Abnormalities
---Troubleshooting Steps
Power Supply Check: Confirm normal power supply and that the indicator light circuit is fault-free.
Status Assessment: Refer to the manual to distinguish between normal, alarm, and fault light states.
Module Check: Power off and restart; observe whether the indicator light status returns to normal; if not, determine an internal fault.
---Remedial Actions
Resolve power supply issues; replace the indicator light (if removable).
Address the corresponding fault according to the alarm code; reset the module.
---Emergency Workaround
Rely on the measurement signal and disregard indicator light abnormalities; immediately replace the faulty module.
8.4 Troubleshooting and Handling of Alarm Triggering Faults
---Troubleshooting Steps
Identify alarm type: out-of-range, open circuit, sensor failure, loop anomaly, etc.
Sensor testing: Measure resistance/millivolt values to determine if there is an open circuit, short circuit, or out-of-range condition.
Loop inspection: Verify that load resistance, cables, and grounding are normal.
Module reset: Power cycle the system to clear the alarm; if the alarm persists, determine that the module is faulty.
---Remedial Actions
Repair the sensor/wiring and calibrate the range settings.
Replace the faulty module and reset the alarm system.
---Emergency Workaround
Temporarily disable non-critical alarms to prioritize production; quickly isolate and replace the faulty component.
8.5 Troubleshooting and Handling of Interference and Distortion Faults
---Troubleshooting Steps
Environmental Check: Determine if the system is located near strong interference sources such as inverters, motors, or high-voltage cables.
Wiring Inspection: Separate signal cables from power cables; ensure the shielding layer is reliably grounded at one end.
Power Supply Inspection: Install power filters to ensure clean power supply.
Grounding Inspection: System grounding resistance ≤4Ω; no multiple grounding points or ground loops.
---Remedial Actions
Optimize wiring, add shielding, and move away from interference sources.
Install filters and isolators; improve the grounding system.
Replace modules or cables with higher interference resistance.
---Emergency Workarounds
Temporarily enable signal isolators and increase filtering parameters; switch critical circuits to backup channels.