BST-I Current Transducer

I. Product Definition

The Qidian BST-I Three-Terminal Isolated AC/DC Current Transmitter is a signal conversion and isolation device designed specifically for industrial automation applications. Its core function is to convert complex AC and DC current signals from industrial field environments into standardized signals that can be directly recognized by PLCs, DCS systems, and data acquisition modules, while simultaneously achieving electrical isolation between the input, output, and power supply terminals. It serves as a "standardization bridge" for the acquisition and transmission of industrial current signals.

Its core functions can be broken down into the following four dimensions:

1. Signal Conversion Function

It outputs standard industrial signals, with a default of 4–20 mA DC, and can also be configured to match voltage signals such as 0–5 V or 0–10 V as needed, achieving unified conversion from non-standard signals to universal signals.

2. Input compatibility with AC and DC current signals, with typical specifications such as AC 0–10 A (expandable to wider ranges), and support for user-defined range configuration;

3. Three-terminal electrical isolation function achieves complete electrical isolation between the input, output, and power supply sides, blocking transmission paths for ground loop currents, high-voltage interference, and electromagnetic interference, thereby preventing a failure on one side from affecting the safety of equipment on other sides.

Signal conditioning and calibration features include built-in zero (ZERO) and span (SPAN) adjustment potentiometers, enabling precise calibration of the output signal. This corrects signal deviations caused by on-site installation and cable loss, ensuring measurement accuracy remains stable within 0.1% FS.

4. Industrial-Grade Compatibility: Powered by a standard 24 VDC industrial supply, it is compatible with the vast majority of automation control systems; the DIN-rail mounting design is compatible with standard 35 mm DIN rails, offering easy installation and fitting into the compact spaces of control cabinets; a wide operating temperature range allows it to adapt to the complex temperature and humidity conditions of industrial environments.

II. Operating Principle and Process

The core principle of the Qidian BST-I transmitter is to achieve safe and precise conversion of current signals through a closed-loop process of "sampling – isolation – conditioning – output." In simple terms, it performs "standardized translation and safety isolation" on the "unregulated current signals" from the field.

Complete Workflow

1. Signal Sampling Stage: The input side connects to AC and DC current signals from industrial sites (such as currents from motors, inverters, and power distribution circuits). Through an internal high-precision sampling circuit, high-current and complex waveform signals are converted into weak, processable primary signals (AC signals undergo simultaneous rectification and RMS conversion to ensure the output signal corresponds linearly to the current RMS value).

2. Three-Port Isolation Stage

Using electromagnetic or optocoupler isolation technology, the device achieves electrical isolation between the input-side sampled signal, the output-side signal, and the power supply. The voltage withstand rating meets industrial standards, blocking transmission paths for ground loop interference, high-voltage surges, and common-mode interference to ensure "mutually independent" safety protection.

3. Signal Conditioning Stage

The isolated signal undergoes amplification, filtering, and linearization to eliminate noise interference and correct signal deviations. Users can manually calibrate the zero and full-scale values using the ZERO/SPAN potentiometers on the panel to match actual field requirements.

4. Standard Output Stage

The conditioned signal passes through a conversion circuit to output a standard signal that is linearly proportional to the original input current (e.g., DC 4–20 mA, where 0 A corresponds to 4 mA and 10 A corresponds to 20 mA). This signal can be directly connected to downstream devices such as PLCs, DCS systems, and data acquisition modules, enabling remote acquisition, monitoring, and control of current signals.

III. Core Value and Solutions to Customer Pain Points

Core Product Value

The core value of the Qidian BST-I Transmitter lies in addressing the four key challenges in industrial current signal acquisition: "non-standard signals, insecure transmission, inaccurate measurements, and susceptibility to interference." It provides stable, reliable, and secure current signal acquisition support for automation systems, reducing equipment failure rates while enhancing system stability and measurement accuracy.

Customer Pain Points and Solutions

Q1: Current signal specifications vary across industrial sites, and backend PLCs/acquisition modules cannot directly recognize them. What should be done?

A: The Qidian BST-I Transmitter can uniformly convert AC and DC current signals of different specifications (such as AC 0-1A, 0-5A, 0-10A, etc.) into standard signals compatible with PLCs/DCS systems (such as DC 4-20mA), effectively performing a "standardization translation" of signals. This allows adaptation to various field signals without the need to replace backend equipment.

Q2: Ground potential differences in field equipment can easily create ground loop currents, leading to signal fluctuations, measurement inaccuracies, or even damage to downstream equipment. How can this be resolved?

A: The product features built-in three-terminal electrical isolation, providing complete electrical insulation between the input, output, and power supply. This completely blocks the transmission of ground loop currents, eliminates interference caused by ground potential differences, protects downstream PLCs and DCS cards from damage, and enhances signal stability.

Q3: Equipment such as inverters and motors generates electromagnetic interference during operation, causing noise and fluctuations in current signals that affect control accuracy. How can this be addressed?

A: The transmitter features built-in filtering circuits and isolation protection, effectively suppressing electromagnetic interference and high-frequency noise in industrial environments. This ensures stable, noise-free output signals and prevents system malfunctions or control deviations caused by interference.

Q4: Cable losses and installation deviations in different field environments can cause signal zero-point and full-scale shifts, resulting in measurement accuracy that falls short of requirements. How should calibration be performed?

A: The panel features built-in ZERO (zero-point) and SPAN (full-scale) adjustment potentiometers. Users can manually calibrate the device based on actual field conditions to correct signal deviations, ensuring measurement accuracy remains within 0.1% FS and meeting high-precision control and metering requirements.

Q5: The industrial site uses a 24V DC power supply, and installation space is limited, making traditional transmitters difficult to install. What should be done?

A: The product uses a 24V DC industrial-standard power supply, directly compatible with the site's power source. It features a 35mm standard DIN rail mounting design, is compact in size, and can be directly installed on control cabinet rails. This ensures convenient installation, saves space, and fits most industrial control cabinet layouts.

Q6: What if you are concerned that the transmitter's long-term operational stability is poor, which could affect system reliability?

A: The product utilizes industrial-grade components and surface-mount technology, with a wide-temperature operating design that can adapt to complex temperature and humidity conditions in industrial environments. It offers strong long-term operational stability and a low failure rate, reducing future maintenance costs and the risk of downtime.

IV. Key Product Specifications

4.1. Basic Electrical Specifications

Input Signal Type: AC Current / DC Current Supported

Standard Input Range (Typical): AC 0–10 A; expandable to AC 0–1 A / 0–5 A / 0–20 A / 0–50 A; DC 0–1 A / 0–5 A / 0–10 A / 0–20 A Range can be customized as needed,
Input Signal Frequency: 50/60 Hz (AC signal); DC (DC signal)
Input Impedance: ≤0.01Ω (current input) Ultra-low input impedance,
Output Signal Type: DC current signal (standard industrial signal)
Standard Output Range: DC 4–20 mA (default); optional DC 0–20 mA / 0–5 V / 0–10 V / 1–5 V Supports multiple standard signal specifications,
Output Load Capacity: Current output: ≤500 Ω (DC 4–20 mA); Voltage output: ≥10 kΩ
Accuracy Class: 0.1% FS (as specified in the image) Full-scale error ≤0.1%,
Linearity Error : ≤±0.05% FS
Repeatability Error : ≤±0.05% FS
Temperature Drift: ≤±50 ppm/°C
Response time : ≤100 ms (typical)
Zero adjustment range : -10% to +10% of input range Zero offset can be manually calibrated using the ZERO potentiometer on the panel
Full-scale adjustment range : 90% to 110% of input range Full-scale offset can be manually calibrated using the SPAN potentiometer on the panel

4.2 Isolation Performance Parameters
Isolation Type:Three-terminal full isolation (input - output - power supply)
Isolation Withstand Voltage Rating (between input / output / power supply): AC 2500 Vrms / 1 min (industrial standard)
Insulation Resistance: ≥100 MΩ (Tested at 500 V DC)
Common-Mode Rejection Ratio (CMRR): ≥100 dB (50/60 Hz)
Differential-Mode Rejection Ratio (DMRR): ≥60 dB
Isolation Bandwidth: DC to 1 kHz

4.3. Power Supply & Power Consumption Parameters
Supply Voltage: DC 24V
Supply Voltage Range: DC 18V–30V (wide-voltage compatibility)
Full-Load Power Consumption: ≤1.5W (typical)
Reverse Polarity Protection:Built-in reverse polarity protection circuit The device remains undamaged if the power supply polarity is reversed, enhancing installation safety
Overvoltage Protection: DC 35V (continuous)

4.4 Environmental Specifications
Operating Temperature: -20°C to +60°C (Industrial Grade)
Storage Temperature: -40°C to +85°C
Operating Humidity: 10%–90% RH (non-condensing)
Protection Rating: IP20 (device body)
Explosion-Proof Rating:Non-explosion-proof (standard industrial applications); optional intrinsically safe version (compatible with Ex ia IIC T4 Ga safety barriers, suitable for hazardous areas)Standard models are designed for non-explosion-proof environments; custom intrinsically safe models are suitable for explosion-proof chemical and petrochemical applications
Vibration resistance:10–150 Hz, amplitude 0.15 mm, 2 hours in each of the X, Y, and Z directions

4.5. Physical Parameters
Mounting Method: Standard 35mm DIN rail mounting
Dimensions: Length 110mm × Width 25.4mm × Height 47mm
Weight: Approx. 120g (Single unit)
Housing Color: Industrial Gray
Housing Material: Flame-retardant ABS engineering plastic Flame-retardant rating V-0,
Terminal Type: Screw-type terminals Secure wiring,
Terminal Wire Gauge Compatibility: 0.5–2.5 mm² (single-strand / multi-strand copper wire)
Indicator Light: No indicator light
Housing Protection Details: Terminal insulation shield design to prevent accidental contact; snap-fit housing installation,

V. Application-Specific Selection Guide
5.1 Key Selection Criteria
1. Signal Type Selection
First, determine whether the signal being measured on-site is AC or DC. The BST-I AC/DC universal model is directly compatible with both power-frequency AC and DC current signals. At the same time, clarify the input range and output signal specifications. Typically, the standard configuration of 0–10 A input and 4–20 mA output is recommended to ensure full compatibility with PLCs, DCS systems, and data acquisition instruments.
2. Channel Selection
For single-loop monitoring, the standard 1-input, 1-output BST-I model is sufficient. For scenarios requiring a single input to supply two control systems, redundant data acquisition, or dual-channel remote transmission, select the 1-input, 2-output extended model to avoid redundant transmitter installations.
3. Power Supply Selection
For standard industrial control cabinets, the 24V DC version is universally selected, which is also the standard power supply configuration for the BST-I. In special field environments where 24V power is unavailable, consult in advance to customize a wide-voltage or AC power supply solution to ensure compatibility with on-site power distribution conditions.
4. Selection Based on Explosion-Proof Requirements
For non-hazardous areas such as general workshops, electrical rooms, and smart manufacturing production lines, directly select the standard gray-cased BST-I general-purpose model. For flammable and explosive areas such as chemical, oil and gas, and pharmaceutical facilities, the intrinsically safe explosion-proof model must be selected and used in conjunction with the corresponding safety barrier; the general-purpose model must not be used as a substitute.
5. Selection Based on Installation Environment
For standard 35mm DIN rail installations inside cabinets, directly select the ultra-slim rail-mounted BST-I. For environments with high dust levels, high humidity, or significant vibration, it is recommended to choose the reinforced version with enhanced insulation and ruggedized terminals to improve long-term stability.

5.2. Application Recommendations by Industry
1. Chemical Industry Applications
Chemical production involves corrosive environments, explosion-proof zones, and strong electrical signal interference. The three-terminal isolated and reinforced BST-I model is the preferred choice. In flammable and explosive environments, it should be used in conjunction with a safety barrier. The input range should be selected based on the current of equipment such as pumps, mixers, and reactors, while the output should be standardized to 4–20 mA to facilitate centralized monitoring.
2. Power Industry Applications
For monitoring power distribution, switchgear, inverters, and energy storage systems, the standard BST-I AC/DC current transmitters are recommended. Prioritize versions with high isolation voltage and high common-mode rejection to withstand strong electromagnetic environments. Customize the measurement range based on circuit current to ensure measurement and protection accuracy.
3. Metallurgy Industry Applications
Metallurgical environments are characterized by high temperatures, high dust levels, significant vibration, and severe electromagnetic interference. We recommend the wide-temperature, high-insulation BST-I model. Its input range covers high current levels, and the three-terminal isolation structure effectively suppresses strong interference, ensuring stable transmission of current signals for rolling mills, electric furnaces, and drive equipment.
4. Pharmaceutical Industry Applications
For pharmaceutical cleanrooms, explosion-proof mixing areas, and automated production lines, prioritize the standard BST-I, which is suitable for sanitary environments. In explosion-proof zones, intrinsically safe configurations must be used to ensure stable, drift-free signals that meet GMP requirements for equipment monitoring.
5. Smart Manufacturing Applications
For monitoring automated production lines, robots, machine tools, and variable-frequency drive equipment, directly select the standard BST-I with a gray housing. Featuring a 1-input/1-output configuration, 24 VDC power supply, and quick DIN-rail mounting, it is compatible with PLC-based centralized data acquisition, offering high cost-effectiveness and convenient deployment.

5.3 Common Selection Pitfalls

1. Incorrect Selection Due to Neglecting Isolation Levels

Focusing solely on signal conversion while neglecting three-terminal isolation, and using non-isolated or weakly isolated products directly in field environments with ground potential differences or strong interference, can cause signal fluctuations and equipment damage. To ensure system safety, the BST-I must be selected in the three-terminal fully isolated version.

2. Incorrect Signal Range Selection Leading to Inaccurate Measurements

If the actual on-site current is significantly higher or lower than the selected range, it can cause over-range saturation or insufficient accuracy. Before selection, the rated current of the motor and circuit must be accurately verified, and the BST-I input range must be matched to the actual maximum value.

3. Ignoring output load matching leads to transmission abnormalities

Failure to account for transmission cable resistance and downstream device impedance can cause the output load to exceed the transmitter's load-carrying capacity, resulting in signal attenuation, low output levels, or no output. When selecting the BST-I, ensure the load resistance does not exceed the permissible range.

4. Safety Hazards from Using General-Purpose Models in Explosion-Proof Environments

Using standard gray-cased BST-I models directly in flammable and explosive hazardous areas poses risks of sparking and ignition, as these models lack explosion-proof and intrinsically safe features. In such scenarios, specialized explosion-proof models must be used in conjunction with safety barriers.

5.4 Customization Recommendations

1. Customization for Special Signals

When non-standard AC/DC currents, mixed signals, wide-frequency signals, or other non-conventional signals are present on-site, specialized input ranges and response speeds can be customized based on the standard BST-I model to achieve precise conversion.

2. Customization for Non-Standard Operating Conditions

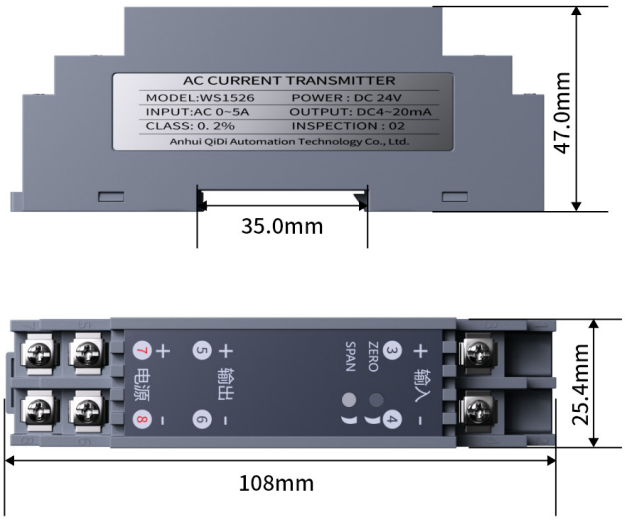
For special operating conditions such as extreme high or low temperatures, high humidity, high corrosion, or strong vibration, customized BST-I models featuring reinforced enclosures, ruggedized terminals, wide-temperature chips, and enhanced insulation structures can be developed to improve environmental adaptability.

3. Multi-Channel Integrated Customization

For scenarios requiring simultaneous acquisition of multiple current signals and space-saving installation, a multi-channel integrated transmitter can be customized to replace multiple single-channel BST-I units, reducing wiring, lowering costs, and facilitating centralized management.

4. Special Output Customization

For applications requiring non-4–20 mA outputs such as 0–5 V, 0–10 V, or 1–5 V, or features like multiple independent isolated outputs and HART communication, the BST-I can be customized to meet these specific requirements.



VI: Installation and Commissioning Guidelines

6.1 Pre-installation Preparation

1. Verification of Components

After unpacking, verify that the product model is the Qidian BST-I three-terminal isolated AC/DC current transmitter with a gray housing. Inspect the exterior for any dents, cracks, or deformation/missing terminals. Check the certificate of conformity and user manual to confirm that the input and output ranges, as well as the power supply specifications, match the order, ensuring there are no issues with incorrect models or mismatched ranges.

2. Environmental Inspection

Confirm that the installation location is inside a control cabinet. The environment must be dry, free from severe vibration, and free from strong corrosive gases. The ambient temperature must be within the range of -20°C to +60°C, with no condensation or standing water. Keep the unit away from strong interference sources such as variable frequency drives, contactors, and high-power cables, and ensure sufficient space is reserved for heat dissipation and wiring.

3. Tool List

Prepare a Phillips screwdriver, wire strippers, a multimeter (current/voltage range), a standard signal source, crimping pliers, and cable labels; if necessary, also prepare auxiliary supplies such as DIN rail cutting tools, electrical tape, and cable ties.

4. Safety Precautions

Before installation, the main power supply and system power must be disconnected; live wiring is strictly prohibited. Wiring personnel must wear appropriate insulation protection to prevent electric shock and short circuits; Verify the supply voltage rating; direct connection to high-voltage power sources is prohibited; in explosion-proof zones, strictly adhere to explosion-proof regulations during installation; unauthorized operations are strictly prohibited.

6.2 Standard Installation Steps

1. Mounting the Rail

Align the BST-I transmitter's mounting clips with the 35mm standard DIN rail, snap them into place from top to bottom, and press down to lock them securely, ensuring the installation is firm and free of looseness; When installing multiple units side-by-side, maintain uniform spacing to prevent poor heat dissipation caused by close contact.

2. Wiring Guidelines

Strictly distinguish between power terminals, input terminals, and output terminals; connect wires according to the labels; mixing connections is strictly prohibited.

Power terminals: Connect to a 24 V DC power supply; distinguish between positive and negative poles; ensure connections are secure with no loose joints;

Input terminals: Connect to the AC or DC current loop being measured; connect in series; pay attention to the current direction;

Output Terminals: Connect to load devices such as PLCs, DCS systems, or data acquisition modules, ensuring the circuit is closed.

3. Grounding Requirements

The housing of three-terminal isolated transmitters does not require forced grounding; the shielding layer of shielded cables should be grounded at a single point as close as possible; grounding both ends simultaneously to form a ground loop is prohibited; the control cabinet enclosure and system ground wires must be reliably connected to earth, with grounding resistance meeting specifications.

6.3. Wiring Diagram Notes

1. Standard Wiring Configuration

Power Supply Side: Connect the positive terminal of the DC 24V power supply to the positive terminal of the transmitter, and the negative terminal to the negative terminal.

Input Side: Connect the AC or DC current circuit under test in series to the transmitter's input terminals.

Output Side: Connect one end of the 4–20 mA output to the positive terminal of the load, and the negative terminal of the load to the negative terminal of the transmitter's output, forming a closed-loop circuit.

2. Shield Grounding Procedure

Shielded cables should be used for analog signal lines whenever possible. The shield should be grounded at a single point on the control cabinet side and left floating and insulated on the field side to prevent interference caused by ground potential differences.

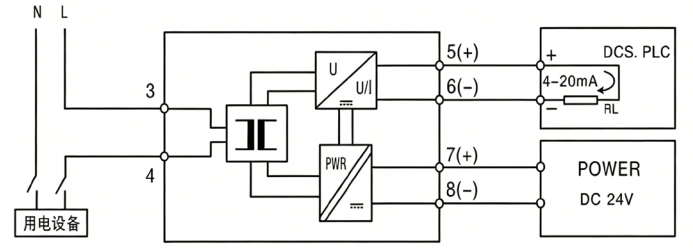
3. Specifications for Isolated Models

The BST-I features a three-terminal fully isolated design, with the input, output, and power supply completely independent of one another. This eliminates the need to consider common ground issues during wiring and effectively breaks ground loops.

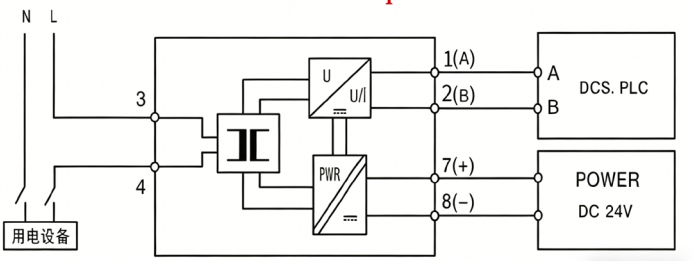
4. Comparison of Common Wiring Errors and Correct Practices

Correct: Power supply, input, and output are wired in separate zones; the shield is grounded at a single point; and load matching is appropriate.

Incorrect: Wiring while the system is energized; reversing positive and negative polarities; routing high- and low-voltage lines in the same conduit; grounding the shield at both ends; and loose terminal connections.

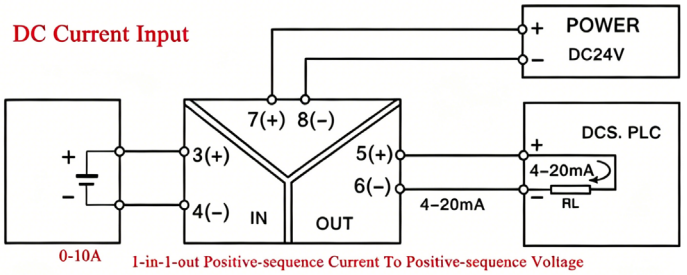


AC Current Input

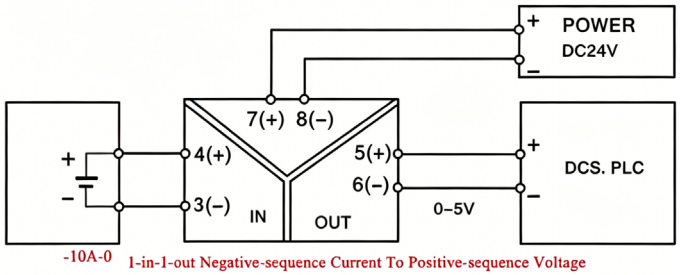


RS485 Output

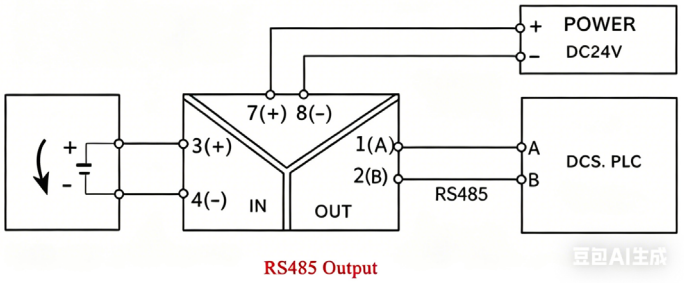
DC Current Input



1-in-1-out Positive-sequence Current To Positive-sequence Voltage



1-in-1-out Negative-sequence Current To Positive-sequence Voltage



RS485 Output

6.4 Power-On Commissioning Procedure

1. No-Load Test

Connect the DC 24V power supply and verify that the device operates without abnormal noises, overheating, or a burning odor. Use a multimeter to measure the power supply voltage and ensure it is within normal range, with no overvoltage or undervoltage conditions. This model does not have external indicator lights; the presence of a normal output signal serves as confirmation of proper operation.

2. Signal Verification

Apply a standard analog current signal and observe whether the output signal corresponds linearly; for example, an input of 0 A should produce an output of 4 mA, and a full-scale input current should produce an output of 20 mA. Use this to determine if the transmitter is functioning normally.

3. Accuracy Calibration Method

If there is a zero-point or full-scale deviation, use a small screwdriver to fine-tune the ZERO (zero-point) and SPAN (full-scale) potentiometers on the panel. Rotate slowly while measuring until the output signal matches the theoretical value.

4. Load Testing

Connect to an actual load to verify that the signal is stable with no fluctuations or attenuation, that the transmission distance and load impedance are within acceptable limits, and that the system collects data normally.

6.5 Installation Precautions

--- Never exceed the rated voltage; do not connect to high-voltage power sources such as AC 220V to prevent internal circuit burnout.

--- Avoid running signal cables in the same cable tray as high-power power lines to prevent signal abnormalities caused by electromagnetic interference.

--- Never install the unit directly in open-air, rain-exposed, or environments with prolonged condensation; it must be used inside a sealed control cabinet.

--- Do not forcibly remove the housing or bend the terminals, as this may damage the internal isolation and sampling circuits.

--- Do not plug or unplug cables or adjust potentiometers while the power is on, to prevent short circuits that could damage the device and the downstream control system.

--- Do not operate the device outside its measurement range for extended periods, as this may cause accuracy drift, reduced linearity, or even permanent damage.

VII: Recommendations for Daily Use and Operation & Maintenance

7.1 Key Points for Daily Inspections

1. Monitoring Signal Stability

Check the current signal curves recorded by the PLC/DCS/host computer daily to ensure there are no sudden jumps, abnormal fluctuations, or out-of-range alarms. Pay close attention to whether the signal response remains linear and stable during motor startup and load changes, with no glitches or delays. If signal drift occurs, record it promptly and investigate the cause.

2. Monitoring of Equipment Operating Temperature and Humidity

Conduct weekly inspections of the temperature and humidity inside the control cabinet. Ensure that the temperature in the transmitter installation area remains within the range of -20°C to +60°C, with no localized overheating. Maintain humidity inside the cabinet below 90% RH and ensure there is no condensation to prevent moisture-induced deterioration of insulation performance or terminal oxidation.

3. Terminal and Visual Inspection

Conduct monthly inspections to ensure the transmitter housing shows no deformation, cracks, or signs of corrosion; verify that terminal blocks are secure, free of dust accumulation, and show no signs of oxidation or discoloration; check that cables show no signs of aging or damage, and that shielding is intact, ensuring good electrical contact.

7.2. Regular Maintenance Plan

1. Equipment Cleaning Frequency and Methods

In standard industrial environments, clean the equipment once every quarter; in dusty environments such as metallurgy and building materials, clean once a month. Before cleaning, disconnect the power supply. Use a dry brush or compressed air (≤0.3 MPa) to blow dust off the housing and terminal blocks. Never allow water or liquid cleaning agents to come into direct contact with the equipment to prevent short circuits or insulation damage.

2. Wiring Tightness Inspection
Conduct a tightening inspection of all terminal blocks every six months, focusing on the screws for the power supply, input, and output terminals to prevent loosening or poor contact caused by equipment vibration or temperature fluctuations. At the same time, verify that the cable shielding is securely grounded and that there is no loosening or detachment.
3. Accuracy Retesting and Calibration Recommendations
In standard applications, perform an accuracy retest every 12 months; in metrology or high-precision control applications, retest every 6 months. Apply a full-scale current using a standard signal source and compare it with the transmitter's output signal. If the error exceeds ±0.1% FS, perform zero and span calibration using the ZERO/SPAN potentiometers on the panel. Record and archive the data after calibration.
4. Insulation and Isolation Performance Testing
Conduct insulation resistance testing on the equipment every 1 to 2 years to confirm that the insulation resistance between the input, output, and power supply terminals is ≥100 MΩ. In environments with strong interference or high humidity, testing frequency may be increased to once a year to prevent isolation failure caused by insulation aging.

7.3 Long-Term Maintenance Tips
1. Dust and Moisture Protection Measures
In environments with high dust levels, install dust filters inside the control cabinet and clean them regularly to reduce dust buildup. In humid or condensation-prone environments, install dehumidifiers or heating modules inside the control cabinet to prevent condensation from coming into direct contact with transmitters. Position equipment away from the cabinet's air intake vents and areas where condensation may drip.
2. Interference Suppression Optimization Techniques
Use shielded twisted-pair cables for signal lines, with the shield grounded at a single end; grounding at both ends is strictly prohibited. Run signal and power cables in separate cable trays, maintaining a minimum distance of 30 cm between them; when crossing, use a perpendicular crossing method. Keep the equipment away from strong interference sources such as variable frequency drives, contactors, and high-power cables; if necessary, install signal isolators or ferrite cores to further suppress interference.
3. Protection Solutions for Extreme Environments
--- High-Temperature Environments: Ensure adequate ventilation and heat dissipation within the control cabinet. Avoid placing transmitters directly against cabinet walls or other heat-generating equipment, and allow sufficient space for heat dissipation;
---Low-Temperature Environments: Select wide-temperature-range transmitters; if necessary, install insulation or heat tracing within the control cabinet to prevent performance degradation of electronic components due to low temperatures;
---Vibration Environments: Install vibration-damping pads on the control cabinet rails; apply threadlocker to the transmitter terminal screws; and periodically inspect the tightness of mounting clips and terminals.

4. Spare Parts and Backup Management
For critical control loops, it is recommended to keep 1–2 spare BST-I transmitters of the same model on hand and periodically power them on to test their performance; establish equipment operation and maintenance records, documenting installation dates, calibration records, and fault resolution details to facilitate future maintenance and fault tracing.

VIII: Troubleshooting & Emergency Procedures
8.1 List of Common Faults
---No Output Signal: The downstream PLC/DCS cannot acquire the transmitter's output signal; the 4–20 mA/RS485 output shows no value or remains at 0.
---Signal Drift / Excessive Deviation: The output signal is stable but deviates from the theoretical value by more than ±0.1% FS, or there is a zero-point/full-scale offset.
--- Signal Interference or Distortion: The output signal exhibits significant fluctuations, frequent jumps, or glitch noise; the signal behaves abnormally when the load changes.
--- No Operational Status Feedback: (Note: This model has no external indicator lights; operational status is determined solely by the output signal.) There is no operational feedback, making it impossible to determine whether the device is receiving power normally.
---Abnormal Heat Generation / Unusual Noises: The transmitter body is abnormally hot, or there are unusual noises or odors coming from inside.

8.2 Analysis of Failure Causes
--- Wiring Issues: Reversed, loose, or faulty connections at power supply, input, or output terminals; signal and power lines routed in the same conduit; shielded cables grounded at both ends; circuit load exceeding the transmitter's load capacity.
---Power Supply Issues: DC 24V supply voltage outside the 18–30V range; excessive power supply ripple; excessive voltage drop in the power supply circuit; reverse polarity or short circuit in the power supply triggering internal protection.
----Signal-related issues: Input current exceeds the transmitter's rated range, causing signal saturation; measured signal frequency or waveform exceeds the device's compatibility range; zero and full-scale points are not calibrated or are improperly calibrated.
---Environmental and Interference Issues: Excessive ground potential difference or ground loop interference causing signal abnormalities; electromagnetic interference generated by devices such as inverters or contactors affecting signal transmission; environmental temperature and humidity exceeding limits, or condensation causing a decline in insulation performance.
---Device-Related Issues: Damage to internal sampling circuits or isolation circuits; aging terminal blocks or damaged internal components; long-term operation beyond the measurement range causing accuracy drift or reduced linearity.

8.3 Step-by-Step Troubleshooting
Fault 1: No Output Signal
Troubleshooting Steps:
Disconnect power and check whether power terminals 7/8 are reversed or loosely connected. Use a multimeter to measure the supply voltage and confirm it is within the DC 18–30 V range to rule out reverse polarity, under-voltage, or over-voltage.
Check whether input terminals 3/4 are connected in series with the circuit under test, and confirm there are no open circuits or loose connections; Check the wiring at output terminals 5/6 (current type) or 1/2 (RS485 type) to confirm the circuit is closed and the load resistance is ≤500Ω (for current output).
After ruling out external faults, apply the rated current using a standard signal source and measure whether the corresponding signal is output at the output terminals.
Remedial Actions:
Retighten terminal screws and correct the polarity of power supply, input, and output wiring;
Replace with a qualified 24 VDC power supply and ensure stable power delivery;
If the output circuit load is too high, reduce the load resistance or add a signal repeater;
If there is still no output, determine that the device itself is faulty and initiate the contingency plan.
Contingency Plan: For critical circuits, temporarily replace the transmitter with a spare unit of the same model. Perform a quick replacement using standard wiring methods to restore system operation.

Fault 2: Signal Drift / Excessive Deviation
Troubleshooting Steps:
Apply 0% and 100% of the full-scale current using a standard signal source, measure the transmitter's output values, and determine whether the deviation is at zero or full scale.
Check if the ambient temperature exceeds the device's operating range; confirm there is no condensation or changes in contact resistance caused by terminal oxidation.
Verify the actual measured current value to ensure it does not exceed the transmitter's rated range; avoid long-term over-range operation to prevent linear drift.
Remedial Actions:
Fine-tune the ZERO (zero point) and SPAN (full-scale) potentiometers on the panel to calibrate the output signal to the standard value;
Clean oxidized terminals and retighten wiring to reduce contact resistance;
If ambient temperature exceeds limits, optimize heat dissipation or insulation measures in the control cabinet to restore the operating environment;
If the deviation exceeds ±0.2% FS and cannot be corrected through calibration, determine it as a device aging failure and replace the unit.
Emergency Workaround: If no spare parts are available on-site,

temporarily adjust the signal range compensation offset in the PLC/DCS to address the deviation, and replace the device during the next scheduled shutdown.

Fault 3: Signal Interference and Distortion
Troubleshooting Steps:
Check whether signal cables are routed in the same cable tray as power cables; confirm that shielded twisted-pair cables are used, with the shield grounded at a single point on the control cabinet side only.
Check whether the control cabinet grounding is reliable and whether the ground potential difference is excessive; verify if any new sources of interference, such as variable frequency drives or high-power equipment, have been installed nearby.
Measure the output signal ripple to determine the type of interference (common-mode or differential-mode).
Remedial Measures:
Reroute signal cables to a separate cable tray, maintaining a distance of ≥30 cm from power cables; ensure vertical crossing when cables intersect;
Change the shielding to single-point grounding, clean up the control cabinet grounding loop, and reduce the ground potential difference;
Install ferrite beads on the signal lines or add signal isolators to suppress electromagnetic interference;
If the issue persists, replace the transmitter with a reinforced version capable of withstanding higher isolation voltage.
Temporary workaround: Temporarily replace the signal cable with one offering better shielding performance, or adjust the PLC/DCS signal filtering parameters to minimize the impact of interference on the control logic.

Fault 4: Abnormal Equipment Heating / Unusual Noise
Troubleshooting Steps:
Immediately disconnect power and check if the supply voltage exceeds 30 V DC; confirm there is no reverse polarity or short circuit in the power supply.
Check the input circuit for short circuits or overloads that may cause the transmitter to sustain high currents for extended periods.
Check for a burning odor and inspect the housing for deformation or burn marks on the terminal block.
Remedial Actions:
Immediately cease use of the device; under no circumstances should power be restored.
Troubleshoot the power supply circuit and the measured circuit to resolve short circuits and overvoltage issues.
If the device shows signs of burn damage or emits a burning odor, it is deemed irreversibly damaged and must be replaced immediately.
Emergency Workaround: Immediately replace with a spare unit of the same model; under no circumstances should the faulty device continue to be used to prevent safety incidents.

8.4 After-Sales Repair Guidelines
1. Criteria for Determining a Malfunction
Contact after-sales support for repair if any of the following conditions occur:
The device produces no output signal, and no external issues are found after checking wiring and power supply;
Signal deviation exceeds ±0.2% FS and cannot be corrected via the ZERO/SPAN potentiometer;
The device exhibits abnormal heat, unusual noise, or a burning odor, or the housing or terminal block shows signs of burn damage;
The device fails the three-terminal insulation resistance test, indicating a failure in isolation performance;
The device experiences functional failures due to non-human factors within the warranty period.
2. Repair Process
Prepare device information: Model BST-I, production batch number (as indicated on the device label), purchase date, description of the fault, and photos of the on-site conditions and wiring.
Contact After-Sales Support: Submit a repair request via the company's official website customer service, your sales contact, or the technical support hotline.
Preliminary Troubleshooting by Technical Support: After-sales engineers will provide remote guidance to assist with basic troubleshooting and confirm whether the issue lies with the device itself.
Return for Repair / Replacement: Once a device malfunction is confirmed, follow the after-sales instructions to process the return for repair or warranty replacement.
3. Warranty Coverage
Standard Warranty Period: 12 months from the date of purchase. During this period, free repair or replacement services will be provided for defects in the device itself resulting from non-human causes.
Exclusions from Warranty: Damage caused by human error (such as connecting wires while the device is powered on, overvoltage, or forceful disassembly), use in environments that exceed the device's specifications, unauthorized disassembly or modification, and damage caused by force majeure are not covered under the free warranty.