BST Voltage Transducer

I. Product Definition

The Qidian BST Series Three-Terminal Isolated AC/DC Voltage Transmitter is an industrial-grade signal isolation and conversion device developed by Anhui Qidian Automation Technology Co., Ltd., specifically designed for the acquisition, isolation, and standardized transmission of voltage signals in industrial environments.

Based on actual product images and industry-standard specifications, its core functionalities are defined as follows:

1. Core Signal Conversion Functions

It can convert AC voltage signals (such as 0–500 V, 0–1000 V, and other wide ranges) or DC voltage signals from industrial sites into standard industrial signals that can be directly recognized by control systems such as PLCs and DCSs, using a linear conversion ratio. The typical output is a 4–20 mA DC current signal, but it also supports customized outputs such as 0–20 mA, 0–10 V, and 0–5 V.

The conversion process supports true RMS measurement and can adapt to various voltage signals, including sine waves and distorted waveforms, ensuring accurate acquisition of non-standard signals.

2. Three-Terminal Isolation Safety Protection

Achieves complete electrical isolation between the input signal terminal, output signal terminal, and power supply terminal, blocking the transmission of high-voltage and strong interference signals from the field to the downstream control system. The isolation withstand voltage exceeds 3000V, meeting industrial safety requirements for explosion protection and surge protection.

3. Signal Conditioning and Calibration

The product panel is equipped with ZERO (zero point) and SPAN (full scale) adjustment potentiometers, supporting on-site zero point and full scale calibration. It adapts to voltage inputs across different ranges, ensuring conversion accuracy (accuracy grade up to 0.1% FS).

Built-in anti-interference circuits suppress electromagnetic interference and ground loop interference in industrial environments, ensuring stable signal transmission.

4. Industrial Adaptability

Featuring a gray-cased modular design with DIN rail mounting, it fits standard industrial rails for easy installation; it supports 24V DC industrial standard power supply, compatible with the vast majority of industrial field power systems.

With a wide operating temperature range (-40°C to 85°C), it meets the demands of harsh industrial environments such as power generation, chemical processing, and metallurgy.

II. Working Principle

The operational process of the BST series voltage transmitters can be broken down into a “4-step closed-loop” system, achieving full electrical isolation and linear conversion throughout:

1. Signal Input and Conditioning Stage

High-voltage/high-interference voltage signals from industrial sites (e.g., AC 0–500 V) enter the transmitter and first pass through the input conditioning circuit:

AC Signals: A miniature isolation transformer proportionally steps down the high-voltage AC signal to a low-voltage AC signal compatible with downstream circuits;

DC Signals: A precision resistor voltage divider circuit steps down the voltage, while a filter circuit removes high-frequency interference and surge spikes to prevent damage to downstream circuits.

2. Signal Conversion and Isolation Stage

The conditioned low-voltage signal enters the core conversion unit:

AC signals: Pass through a root mean square (RMS) conversion circuit, which converts the RMS value of the AC signal into a linear DC signal, eliminating measurement errors caused by waveform distortion;

The converted signal is electrically isolated from the input side and downstream circuits via optocoupler or magnetic isolation technology, blocking direct electrical connections while transmitting the signal to the linear scaling circuit.

3. Linear Scaling and Calibration Stage

The isolated DC signal enters the scaling circuit, where high-precision operational amplifiers and zero/full-scale adjustment potentiometers map the signal to a standard industrial signal at a preset ratio:

Taking a 0–500 V AC input and 4–20 mA DC output as an example: a 0 V input corresponds to a 4 mA output, a 500 V input corresponds to a 20 mA output, and intermediate signals vary in a linear proportion;

Users can calibrate zero-point offset and correct full-scale errors on-site using the ZERO/SPAN potentiometers on the panel to adapt to actual field measurement requirements.

4. Output Drive and Power Isolation Stage

The calibrated standard signal is amplified by the output drive circuit to enhance its load-carrying capacity before being sent to the control system. Simultaneously, the power supply circuit uses an isolated DC/DC module to achieve electrical isolation between the power supply and the input/output terminals, thereby completing full three-point isolation of “input – output – power supply” and completely eliminating ground loop interference paths.

III. Core Values

Q1: What should be done if high-voltage signals from industrial field environments are directly connected to a PLC or control system, posing a risk of module burnout and safety hazards?

A1: The BST series transmitters feature a three-terminal fully isolated design, achieving complete electrical isolation between the input, output, and power supply sides. With an isolation withstand voltage of over 3000V, they completely isolate high-voltage field signals from the backend control system, preventing high voltage and surges from being directly conducted to PLC/DCS modules. This not only protects expensive control equipment but also meets the intrinsic safety protection requirements of industrial environments.

Q2: What should be done if electromagnetic interference and ground loop interference at the field site cause significant voltage signal fluctuations and high measurement errors, thereby affecting system control accuracy?

A2: The BST series transmitters feature built-in professional anti-interference filtering circuits and completely sever ground loop interference paths through three-terminal isolation. This effectively suppresses signal crosstalk caused by electromagnetic radiation and ground potential differences in industrial environments. Combined with a high-precision conversion design of 0.1% FS, this ensures stable signal transmission and accurate measurement data, preventing misjudgments or malfunctions in the control system due to signal fluctuations.

Q3: What should be done when AC and DC voltage signals with different ranges cannot be directly connected to standard control systems and require custom conversion circuits?

A3: The BST series transmitters support a wide range of AC and DC voltage inputs (e.g., AC 0–500 V, DC 0–1000 V), which can be linearly converted into standard industrial signals compatible with PLCs and DCS systems (such as DC 4–20 mA, 0–10 V, 0–5 V, etc.) without the need for custom step-down or conversion modules. They directly interface with the majority of industrial control systems, significantly simplifying the system integration process.

Q4: What should be done if conventional equipment cannot accurately measure non-sinusoidal or distorted AC voltage signals in the field?

A4: The BST series transmitters feature built-in true RMS conversion circuits, enabling precise measurement of various AC voltage signals—including sine waves, distorted waveforms, and asymmetric waveforms. This eliminates measurement errors caused by waveform distortion and meets voltage signal acquisition requirements in complex operating conditions, such as those involving inverters and thyristor devices, ensuring measurement accuracy for complex signals.

Q5: How can we address ground potential differences caused by multiple devices sharing a common ground, which often damage equipment or cause signal crosstalk?

A5: The BST series transmitters utilize three-terminal isolation technology to completely sever direct electrical connections between the input, output, and power supply sides. This eliminates ground loop interference at its source, preventing equipment damage and signal crosstalk caused by ground potential differences between different devices, and ensuring signal stability and equipment safety during multi-device operation.

Q6: What should be done if the on-site voltage signal range does not match the control system interface, making debugging and calibration difficult?

A6: The BST series transmitters are equipped with ZERO (zero point) and SPAN (full-scale) adjustment potentiometers on the front panel, supporting quick, tool-free on-site calibration of zero-point offset and full-scale error. Without the need for complex debugging equipment, they can adapt to actual measurement requirements across different

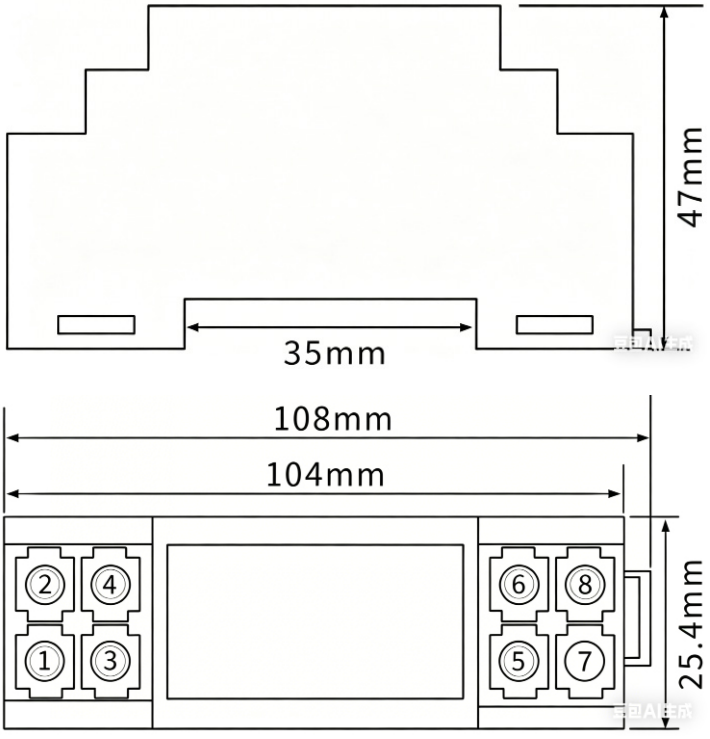
ranges, significantly reducing the difficulty and time required for on-site debugging.
2. Core Value and Benefits for Customers
2.1 Safety Protection: Achieves electrical isolation between high-voltage signals and control systems, preventing damage to expensive PLC/DCS modules caused by on-site high voltage, surges, and static electricity. This reduces equipment failure rates and maintenance costs while ensuring the safety of personnel and equipment in industrial environments.
2.2 Signal Stability: Eliminates the impact of electromagnetic interference and ground loop interference on signals, ensuring the stability and accuracy of voltage measurement data. This prevents control system malfunctions caused by signal fluctuations and enhances the reliability of automation systems.
2.3 System Compatibility: Converts AC and DC voltage signals of varying specifications into universal standard signals, making them compatible with the vast majority of industrial control systems. This simplifies system integration and reduces hardware costs for project retrofits.
2.4 Operational Convenience: Supports on-site zero and full-scale calibration without the need for complex debugging tools; modular DIN-rail mounting fits standard industrial cabinets, enabling efficient and convenient installation and maintenance while reducing on-site construction and debugging time.
2.5 Cost Control Benefits: A single device performs multiple functions—"isolation, conversion, and conditioning"—replacing traditional combinations of step-down modules, isolators, and signal conditioners. This reduces hardware procurement costs and system complexity, improving the project's cost-effectiveness.

IV. Key Product Specifications
4.1. Basic Electrical Specifications
Product Model: BST-U (AC Type)/BST-D (DC Type)
Input Signal Type: AC Voltage (AC)/DC Voltage (DC)
Input Range (Typical): AC: 0–50 V, 0–100 V, 0–250 V, 0–500 V, 0–1000 V
DC: 0–10 V, 0–50 V, 0–100 V, 0–300 V, 0–1000 V Custom ranges available upon request
Output Signal Type: Standard DC current/voltage signals
Output Range (Typical): DC 4–20 mA, 0–20 mA, 0–10 V, 0–5 V, 1–5 V / 4–20 mA is the default standard output
Accuracy Class: 0.1% FS (Typical)
Linearity error: ≤±0.05% FS
Repeatability error: ≤±0.05% FS
Response time: ≤200 ms (AC RMS) / ≤100 ms (DC)
Load capacity: Current output: ≤500 Ω (at 24 V supply)
Voltage output: ≥2 kΩ
Zero / Span adjustment: Adjustable via panel ZERO/SPAN potentiometers
Ripple Rejection: ≥60dB
Signal Measurement Mode : AC: True RMS measurement
DC: Direct voltage divider linear measurement
Adaptive to distorted / non-sinusoidal waveforms
4.2, Isolation Performance Parameters
Isolation Configuration: Three-terminal full isolation (Input - Output - Power Supply)
Input-to-Output Isolation Withstand Voltage: AC 3000V/1min (leakage current ≤ 1mA)
Input-to-Power Supply Isolation Withstand Voltage: AC 2500V/1min (leakage current ≤ 1mA)
Output-to-Power Supply Isolation Withstand Voltage: AC 2500V/1min (Leakage Current ≤ 1mA)
Isolation Resistance: ≥1000MΩ @ DC 500V
Common-Mode Immunity: ≥1000V Common-Mode Voltage Suppression
Differential-Mode Immunity: ≥500V Differential-Mode Spike Suppression

4.3 Power Supply & Power Consumption Parameters
Supply Voltage: DC 24V (typical) Labeled on unit: POWER: DC 24V,
Supply Range: DC 18V–30V (compatible with industrial field voltage fluctuations)
Full-Load Power Consumption: ≤1.5W (at DC 24V)
Current Consumption: ≤60mA (at DC 24V, full load)
Power Supply Ripple Suppression: ≥40dB
Reverse Polarity Protection: Built-in reverse polarity protection circuit Prevents equipment damage caused by on-site wiring errors

4.4 Environmental Specifications
Operating Temperature: -20°C to +60°C (Industrial Standard)
Extended Version: -40°C to +85°C
Storage Temperature: -40°C to +85°C
Operating Humidity: 10% to 90% RH (non-condensing)
Protection Rating: IP20 (Enclosure)/IP30 (Terminals)
Explosion-proof rating: Non-explosion-proof; compatible with intrinsically safe barriers (in conjunction with explosion-proof systems)
Vibration resistance: 10–55 Hz, amplitude 0.75 mm, 2 hours each in X/Y/Z directions
Shock resistance: 10g, 11 ms, half-sine wave, 3 times each in X/Y/Z directions

4.5. Physical Parameters
Mounting Method: Standard 35mm DIN rail mounting
Dimensions: Length × Width × Height: 110mm × 25.4mm × 47mm (typical)
Housing Material: Flame-retardant ABS engineering plastic (V-0 flame-retardant rating)
Housing Color: Industrial Gray (Standard color as shown in photos)
Weight: Approx. 120g (per unit)
Terminal Specifications: Plug-in screw terminals, compatible with 1.0–2.5 mm² wire gauge
Indicator Light Definitions: PWR Power Indicator (Green steady = Power on, Off = No power / Reverse polarity)
Status Indicators: Includes ZERO/SPAN adjustment positions; some models feature a fault alarm light



V. Application-Specific Selection Guide
5.1 Key Selection Criteria
Q1: What should be determined first during the selection process?
A1: First, determine the signal type and measurement range—specifically, whether it is AC or DC voltage, and the exact measurement range. For AC signals, prioritize models with true RMS measurement to avoid measurement inaccuracies caused by waveform distortion.
Q2: How should the number of channels be selected?
A2: For standard applications, a 1-input, 1-output configuration is sufficient for single-system data acquisition. If you need to connect to two systems simultaneously—such as a PLC, data logger, or DCS—we recommend selecting a 1-input, 2-output model with dual isolated outputs to prevent signal interference.
Q3: How should I select the output signal?
A3: Prioritize matching the interface of the downstream equipment: PLC/DCS systems commonly use 4–20 mA; instruments and data acquisition cards commonly use 0–10 V or 0–5 V. Select the model directly according to the control system standards.

Q4: How should I select the isolation rating?
A4: For standard interference environments, choose the standard three-terminal isolation model. For environments with strong electromagnetic interference, large ground potential differences, or high-voltage conditions, you must select the high-isolation, high-voltage-rated model to ensure equipment safety and signal stability.
Q5: How should the power supply be selected?
A5: For industrial field applications, uniformly select models powered by 24 VDC. These support a wide voltage range of 18–30 V, allowing them to adapt to voltage fluctuations. Unless there are special requirements, other power supply options are not recommended.
Q6: What factors should be considered for the installation environment?
A6: Select standard models for indoor cabinet installation; for environments with extreme temperatures, high humidity, heavy vibration, or corrosive conditions, choose models with wide temperature ranges, three-proof (water, dust, and shock) protection, and enhanced vibration resistance; outdoor installations require an additional protective enclosure.
Q7: What should be noted regarding load matching?
A7: For current-output models, ensure the total impedance of the downstream circuit does not exceed the rated load. Excessive load may cause signal attenuation and increased measurement error. If this condition is not met, select a model with higher load capacity or add a signal distributor.
Q8: How should models be selected for explosion-proof applications?
A8: General-purpose models cannot be used directly in hazardous explosion-proof zones. The transmitter must be installed in a safe area and paired with a corresponding safety barrier at the front end to strictly comply with explosion-proof safety regulations.

5.2 Industry Application Comparison Table
1. Chemical Industry
Industry: Chemical
Operating Conditions: On-site AC/DC voltage acquisition; strong electromagnetic interference and significant ground potential differences; requires high isolation protection; signal integration with DCS systems
Key Advantages: Three-terminal full isolation effectively blocks ground loops and interference, preventing high voltage and surges from damaging downstream control equipment; stable and reliable signal transmission
2. Power Industry
Industry: Power
Operating Conditions: Voltage monitoring in distribution cabinets and inverters; involves a large number of non-sinusoidal/distorted waveforms; requires high-precision, true RMS measurement
Key Advantages: Supports true RMS measurement; accurately captures distorted waveforms; high isolation voltage rating; suitable for high-voltage monitoring scenarios
3. Metallurgy Industry
Industry: Metallurgy
Operating Conditions: Severe electromagnetic interference, high temperatures, high dust levels, and significant voltage fluctuations; high demands on signal stability and equipment reliability
Core Advantages: Wide operating temperature range and strong anti-interference capability; three-terminal isolation resists severe electromagnetic interference, ensuring long-term stable measurement
4. Pharmaceutical Industry
Industry: Pharmaceutical
Operating Conditions: Voltage monitoring for equipment in cleanrooms; high cleanliness requirements; signals must be accurately integrated into automated control systems
Key Advantages: Low power consumption with no heat generation; no dust contamination; high accuracy and consistency; suitable for clean environments and GMP-compliant automated control systems
5. Smart Manufacturing / Automated Production Lines
Industry: Smart Manufacturing, Automated Production Lines
Operating Requirements: Voltage acquisition for equipment such as servos and inverters; fast response speed; direct connection to PLCs for real-time monitoring
Core Advantages: Fast response, high accuracy; standard 4-20mA output with plug-and-play functionality; simple installation; low system integration costs
6. New Energy / Rail Transit
Industry: New Energy, Rail Transit
Operating Conditions: Vehicle-mounted or cabinet-mounted installation; extreme temperature fluctuations and high vibration; primarily for high-voltage DC signal acquisition
Key Advantages: Wide temperature range, vibration-resistant structural design, high DC acquisition accuracy, suitable for harsh environments in vehicles and outdoor cabinets

5.3 Common Selection Pitfalls and Guidelines for Avoiding Them
Pitfall 1: Ignoring Isolation Ratings and Focusing Only on Range Matching
Incorrect Practice: Selecting a model based solely on the input voltage range without considering the isolation withstand voltage, which can result in damage to the downstream PLC due to ground potential differences or surges at the site.
Recommendation: In environments with strong interference or multiple devices sharing a common ground, models with three-terminal isolation voltage ≥ 3000 V AC must be selected to avoid safety hazards caused by insufficient isolation.
Misconception 2: Selecting the Wrong Signal Output Type, Leading to Incompatibility with Downstream Equipment
Incorrect Practice: Failing to verify the signal types supported by the PLC or instrument and blindly selecting a 4–20 mA output, resulting in voltage-input devices being unable to recognize the signal.
Solution: Before selection, verify the signal interface type of the downstream equipment and prioritize models that support customizable outputs to avoid signal incompatibility issues.
Misconception 3: Neglecting load matching, leading to signal attenuation or significant measurement errors
Incorrect Practice: Connecting too many loads to the downstream of a current-output transmitter, causing the output current to drop and measurement errors to exceed limits.
Solution: The load resistance for current output should be ≤500Ω. If multiple devices are connected in parallel downstream, calculate the total impedance; if it exceeds the range, select a load-enhanced model or add a signal isolation distributor.
Misconception 4: Incorrectly selecting general-purpose models in explosion-proof environments, creating safety hazards
Incorrect practice: Directly using general-purpose transmitters in explosion-proof zones without safety barriers, which violates explosion-proof regulations.
Solution: In explosion-proof environments, install general-purpose transmitters in the safe area and pair them with associated safety barriers at the front end, or select intrinsically safe models with explosion-proof certification (if required).
Misconception 5: Selecting DC models for AC applications, resulting in severe measurement errors
Incorrect practice: Using DC transmitters to measure AC voltage, leading to inaccurate measurements of non-sinusoidal waveforms and causing system control malfunctions.
Solution: For AC signals, you must select the BST-U model with true RMS measurement; for DC signals, choose the BST-D model. Do not mix the two.

5.4 Customization Recommendations (Solutions for Non-Standard Operating Conditions)
For special signals and non-standard operating conditions, the BST series supports the following customization services:
1. Custom Range Configuration
Application Scenarios: Non-standard voltage ranges (e.g., AC 0–750 V, DC 0–1500 V), custom zero/full-scale offsets (e.g., AC 100–500 V).
Customization Solution: Input/output ranges can be customized according to customer requirements. Calibration is completed prior to shipment, eliminating the need for additional on-site debugging.
2. Multi-Channel/Multi-Output Customization
Application Scenarios: A single input requires simultaneous output of two isolated signals (1-in-2-out); centralized acquisition of multiple signals (2-in-2-out / 4-in-4-out).
Custom Solution: Supports 1-input, 2-output dual-isolated output configuration, with both outputs fully isolated and capable of connecting to different control systems; multi-channel models can be developed as needed.
3. Customization for Special Environments
Application Scenarios: Extreme temperatures (-40°C to +85°C), highly corrosive environments, high humidity, and high-vibration conditions.
Custom Solutions: Customizable wide-temperature models, models with

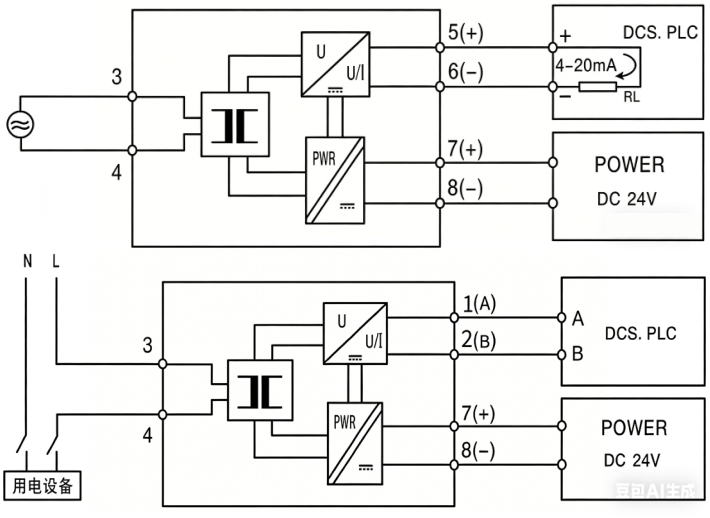
three-proof coatings, and vibration-resistant ruggedized models to adapt to harsh industrial environments.
4. Customization for Special Signals
Application Scenarios: Acquisition of high-frequency AC signals, pulsed voltage signals, and asymmetric waveform signals.
Custom Solution: Optimize the measurement circuitry for special signals, customize response times and filtering parameters, and adapt the system for signal acquisition under specific operating conditions.

VI: Installation and Commissioning Guidelines
6.1. Pre-installation Preparation
1. Checking Accessories
Verify that the product model, input/output range, and power supply specifications match the order.
Inspect the exterior for damage, check that terminals are not deformed, and ensure that potentiometers are secure.
Prepare the following accessories: 35mm DIN rail, terminal blocks, shielded cable, and mounting clips.
2. Environmental Inspection
Installation Location: Inside a control cabinet that is dry, well-ventilated, and free from direct sunlight
Keep away from strong interference sources such as high-voltage busbars, variable frequency drives, and contactors
The environment must be free from excessive dust, corrosive gases, and condensation
3. Tool List
Phillips screwdriver, wire strippers, multimeter (current/voltage range)
Standard signal source (for commissioning), crimping pliers
4. Safety Precautions
Never connect or disconnect wires while the power is on
Verify that the high-voltage input at the site is de-energized to prevent electric shock
Never reverse the polarity or exceed the rated voltage of the power supply to avoid burning out the module

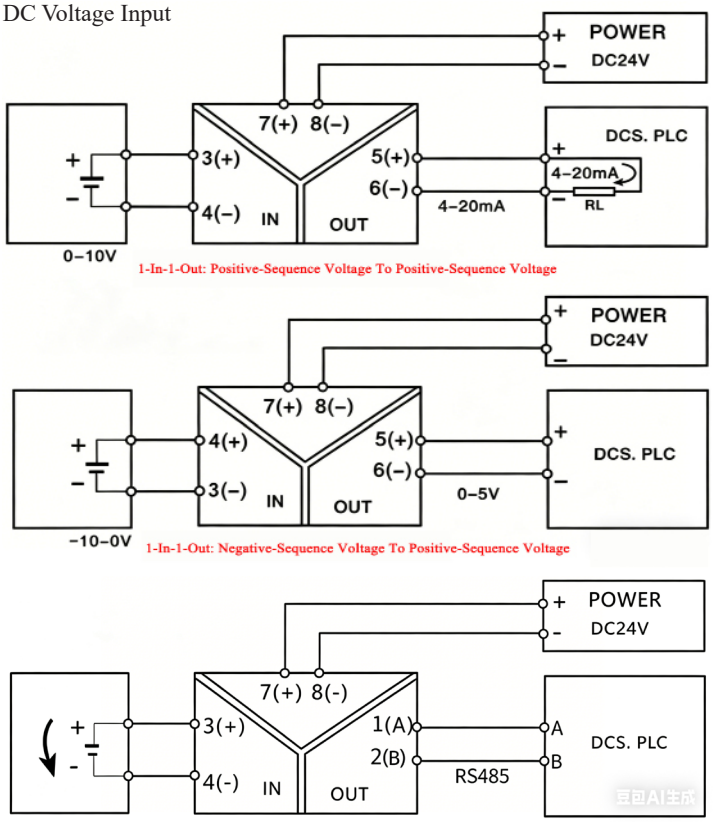
6.2 Standard Installation Steps
6.2.1 Mounting on DIN Rail
Align the transmitter's mounting clips with the 35mm standard DIN rail, press down firmly to secure, and ensure there is no looseness or warping.
6.2.2 Wiring Specifications (Strictly Distinguish Terminals)
Power Terminals: Connect to a 24 V DC power supply; observe positive and negative polarity.
Input Terminals: Connect to the measured AC/DC voltage signal.
Output Terminals: Connect to a PLC, instrument, or DCS acquisition module.
Ensure connections are secure; avoid excessive exposed wire length to prevent short circuits.
6.2.3 Grounding Requirements
Ensure reliable protective grounding of the cabinet.
Use shielded cables for analog signals, with the shield grounded at one end (grounding on the control room side is recommended).
The module itself does not require additional grounding to avoid ground loop interference.

6.3 Wiring Diagram

AC Voltage Input



DC Voltage Input



6.4 Power-On Debugging Procedure
6.4.1 No-Load Test
Connect the 24V power supply; the PWR indicator should remain lit. There should be no overheating or unusual odors, and the output should be at its initial value.
6.4.2 Signal Verification
Input a 0 signal → Check the output zero point
Input a full-scale signal → Check the output full-scale value
Verify that the error is within 0.1% FS.
6.4.3 Indicator Light Diagnosis
PWR green light is steady: Power supply is normal
Light is off: Power supply is not connected, reversed, or module failure
6.4.4 Accuracy Calibration Method
Zero Calibration (ZERO): Apply a 0 V input signal and adjust the potentiometer until the output is 4 mA (or 0 V).
Full-Scale Calibration (SPAN): Apply a full-scale voltage input and adjust the potentiometer until the output is 20 mA (or full-scale voltage).
Repeat fine-tuning 1–2 times to ensure accuracy meets specifications.

6.5 Installation Precautions
Never apply input voltages exceeding the full-scale range to prevent breakdown and damage
Never supply power beyond the rated voltage; do not connect to high-voltage sources such as AC 220V
Never reverse the connections of input, output, or power terminals
Avoid installing in the same cable tray as power cables to prevent strong electromagnetic interference
In humid or condensing environments, ensure proper sealing and protection; otherwise, insulation and isolation performance will be compromised
Do not plug or unplug terminals or adjust internal components while the unit is powered on

7. Daily Use & Maintenance Recommendations
7.1 Key Points for Daily Inspections (Daily/Weekly Quick Checks)
1. Observe Indicator Light Status
Power Indicator (PWR): Normally, the light remains steady green. If it is off, check the power connections and verify that the voltage is within the DC 18–30 V range, or check for reverse polarity or short circuits in the power supply.
Signal Status / Output Indicator (Select Models): If equipped with a signal indicator, it should vary linearly with the input signal under normal conditions; if the light flashes or behaves abnormally, check whether the

input signal is out of range or if the module is faulty.

2. Signal Stability Monitoring
Examine the voltage signal curve acquired at the PLC/DCS end; normal operation is indicated by the absence of abnormal spikes or sustained fluctuations.
If the signal exhibits irregular spikes, prioritize the following checks:
Whether signal cables are routed in the same cable tray as power cables
Whether shielded cables are grounded correctly (single-ended grounding)
Whether new high-interference equipment (such as inverters or welders) has been added on-site
3. Temperature, Humidity, and Environmental Monitoring
During inspections, use an infrared thermometer to measure the module housing temperature. The normal operating temperature should be <60°C; if exceeded, investigate cabinet cooling or abnormal module power consumption.
Check the installation location for condensation or frost. Prolonged humidity levels >90% RH can lead to reduced insulation performance; improve ventilation or install dehumidification equipment.

7.2. Regular Maintenance Plan (Quarterly / Annual)
1. Cleaning Schedule and Methods
Quarterly Cleaning: Use a dry, soft-bristled brush or compressed air (pressure < 0.3 MPa) to remove dust and oil residue from the module surface and terminals. Avoid wiping directly with a damp cloth to prevent short circuits.
Annual Deep Cleaning: Disconnect power before removing the module. Inspect the interior of the terminals for dust accumulation. After cleaning, reinstall the module and ensure the rail latches are securely fastened.
2. Wiring Tightness Inspection (Once Every Six Months)
With the power off, use a screwdriver to tighten all terminal connections (power, input, and output terminals) to prevent loosening or poor contact caused by on-site vibrations.
Pay special attention to the grounding terminals of shielded cables and power supply terminals to prevent signal interference or unstable power supply caused by oxidation or loose connections.
3. Accuracy Retest Recommendations (Annual Calibration)
Use a standard signal source (AC/DC voltage source) to re-test the module's zero and full-scale points:
Apply a 0% range signal to the input, record the output value, and adjust the ZERO potentiometer for calibration if the deviation exceeds ±0.1% FS.
Apply a 100% range signal to the input, record the output value, and adjust the SPAN potentiometer for calibration if the deviation exceeds ±0.1% FS.
Record the data after calibration and maintain an equipment maintenance log. It is recommended to calibrate once every 12 months; in high-interference or high-precision environments, this interval may be shortened to 6 months.

7.3 Long-Term Maintenance Tips (Extending Equipment Lifespan)
1. Dust and Moisture Protection Optimization
Install dust filters inside the cabinet to prevent dust from entering the terminals and circuit boards, and to prevent condensation from corroding the circuitry.
In humid or coastal environments, place desiccant inside the cabinet, or select extended-range modules with an IP30 protection rating.
2. Long-Term Interference Mitigation
Use shielded twisted-pair cables throughout the signal path. Ground the shield only at one end (control room side); do not ground both ends.
Maintain a distance of ≥20 cm between the module and high-interference equipment such as inverters and contactors, or install a metal shielding enclosure to isolate interference.
A DC 24V filter may be installed on the power supply side to suppress ripple and surges, thereby protecting the module's power supply circuit.
3. Protection Against Extreme Environments
High-temperature environments: Ensure adequate cabinet ventilation and heat dissipation. Maintain a minimum clearance of ≥10 mm around the module to prevent localized overheating caused by dense installation of multiple modules.
Low-Temperature Environments: In environments below -10°C, use wide-temperature modules (-40°C to +85°C) to prevent startup failures in standard modules under low-temperature conditions.
Vibration Environments: Periodically inspect the rail clips and terminal blocks; use terminal locks to secure them if necessary to prevent terminals from coming loose due to vibration.

VIII: Troubleshooting and After-Sales Guidance
8.1. Q&A on Common Faults, Causes, and Solutions
Q1: After on-site installation and power-up, the transmitter has no output at all (current/voltage is 0). What should I do?
A1:
Cause:
Power supply not connected or reversed: The positive and negative terminals (7/8) are connected incorrectly, or the 24 VDC power supply is not connected.
Loose Wiring / Poor Contact: The screws on the input (3/4) or output (5/6) terminals are not tightened.
Load limit exceeded: For current output models, the load resistance at the output exceeds 500Ω, preventing the module from driving the load.
Module hardware damage.
Troubleshooting Steps:
Power-off verification: Use a multimeter to measure the voltage at terminals 7/8 to confirm it is within the DC 18–30V range and that the polarity is correct (reverse connection will trigger protection lockout; correct as needed).
Tighten Terminals: Tighten the input, output, and power supply terminals one by one to ensure good contact.
Verify Load: For current output models, ensure the total load is ≤500Ω. If exceeded, reduce the number of parallel devices or replace the output driver.
Emergency Replacement: If the wiring and power supply are normal, the module is deemed damaged. Immediately replace it with a spare module and contact after-sales service for repair.

Q2: What should I do if signal values are unstable, fluctuate, or exhibit significant interference ripple?
A2:
Causes of the fault:
Incorrect shielding wire handling: The shield is grounded at both ends, creating ground loop interference; or the shield is not grounded.
Improper wiring: Analog signal cables are routed in the same cable tray or bundled alongside power cables (contactors, inverters).
On-site electromagnetic interference: High-power equipment such as inverters and welders generate strong electromagnetic radiation due to frequent start-stop cycles.
Poor grounding: Excessive grounding resistance in the cabinet prevents the dissipation of interference signals.
Solutions:
Proper grounding: Immediately remove the grounding connection at one end of the shield and switch to single-end grounding (recommended at the control room or PLC side).
Rewiring: Power and signal cables must be routed in separate cable trays, maintaining a distance of ≥20 cm, and avoiding parallel routing.
Add anti-interference measures: Install a 24V DC filter at the power input (7/8) and a signal isolator at the signal output.
Check grounding: Ensure the cabinet protective grounding (PE) resistance is ≤4Ω.

Q3: What should be done if the transmitter output value has significant deviation, drift, or inaccurate zero/full-scale readings?
A3:
Causes of Failure:
No zero/full-scale calibration: Factory default values do not match the on-site measurement range.
Input signal overload: Input voltage exceeds the transmitter's upper range limit, causing core circuit saturation.
Environmental temperature drift: Long-term operation at high or low temperatures causes component parameter drift.
Terminal oxidation or poor contact: Dust accumulation or oxidation on terminals causes unstable contact resistance.
Solutions:
On-site calibration: Apply a 0% range input signal and adjust the ZERO potentiometer to the initial output value (e.g., 4 mA); apply a 100% range input signal and adjust the SPAN potentiometer to the full-scale output value (e.g., 20 mA).
Verify Range: Ensure the input voltage does not exceed the range; if it does, reduce the input or replace with a higher-range model.

Optimize Environment: Improve cabinet ventilation and heat dissipation; in harsh environments, replace with a wide-temperature or ruggedized model.

Clean and Tighten: Disconnect power, clean dust and oxidation from terminals, and retighten connections.
Q4: What should I do if the power indicator (PWR) is off, flashing, or displaying an abnormal color?
A4:
Causes:
No power supply / Reversed polarity: No DC 24V power supply is connected, or the positive and negative terminals are reversed.
Power supply failure: Power supply voltage is too low (<18V) or the power supply module is damaged.
Internal power circuit failure.
Troubleshooting Steps:
Check Power Supply: Measure the voltage at terminals 7/8 to ensure it is within the 18–30V operating range and that the polarity is correct.
Replace the power supply: Temporarily replace with a stable 24V DC switching power supply for testing to rule out a power supply failure.
Temporary use: If only the indicator light is damaged but the module output is normal, continue using it and replace the indicator light later.

Q5: The output signal is saturated (clamped at the maximum or minimum value). What should I do?
A5:
Causes:
Input signal out of range: The input voltage remains consistently above the upper limit, causing the signal to be clamped.
Output short circuit / loose connection: Short circuit or poor contact at the output terminals (5/6).
Damaged output circuit.
Resolution:
Limit input: Check the voltage of the device under test to ensure it does not exceed the transmitter's range.
Troubleshoot output: Disconnect power and inspect terminals 5/6; clear any short circuits and retighten connections.
Mode Switching: In emergency situations where current output is restricted, temporarily switch to voltage output mode (0-10V) for connection.

8.2, After-Sales Repair Guidelines (Standardized Process)

Q6: If the issue is determined to be hardware damage and repair is required, what is the specific process?
A6:
Required Documentation (Mandatory):
Product model (e.g., BST-U), input/output range, date of manufacture (DATE label number).
On-site photos of the fault: Clearly photograph the wiring diagram, terminal status, and indicator light status.
Fault description: Provide a detailed description of the symptoms (e.g., "Output remains constant at 20mA when input is 500V").
Contact channels:
Contact the original sales representative or account manager.
Or call the official technical support hotline or email, providing the required information to request after-sales service.
Remote Diagnosis:
Cooperate with technical staff for remote troubleshooting to confirm that the fault is not caused by human error.
After-Sales Handling:
Within the warranty period (12 months): Free replacement with a new unit for non-human-caused damage (e.g., damage from lightning strikes or overvoltage is not covered by the warranty).
Outside the warranty period: A repair quote will be provided; after customer confirmation, return the unit for repair.
Q7: What situations are considered human-caused damage and are not covered by the warranty?
A7:
Burnout caused by incorrect wiring (e.g., direct connection of 220V AC power to the input terminals).
Failures resulting from unauthorized disassembly or soldering of circuit boards.
Damage caused by failure to follow the installation instructions, or by use in harsh environments involving excessive temperature, pressure, or non-compliance with explosion-proof ratings.
Mechanical damage to the housing or terminals caused by physical impact or compression.