DC Current & Voltage Transducer

I. Product Definition

The Qidian PA-19 Single-Phase DC Current/Voltage Transmitter (Black Housing Model) is a three-terminal isolated electrical signal transmitter designed specifically for industrial automation applications. Its core function is to convert raw DC current and voltage signals collected from the field into standard industrial signals through isolation, conditioning, and linear conversion, thereby ensuring the safe, accurate, and stable transmission and adaptation of electrical signals.

It serves as a "signal bridge" between high-voltage and complex signals at the field level and backend PLCs, DCS systems, industrial PCs, and digital display instruments. It is widely applicable in electrical measurement, automatic control, and dispatch systems across industries such as power generation, petrochemicals, rail transit, metallurgy, and municipal engineering.

Summary of Core Functions

1. Signal Conversion: Linearly converts non-standard or high-amplitude DC current (e.g., 0–100 A) and DC voltage (e.g., 0–300 V) input signals into standard industrial output signals. Typical output specifications include 4–20 mA, 0–20 mA, 0–5 V, and 0–10 V, compatible with the data acquisition standards of the vast majority of industrial control systems.

2. Three-Point Electrical Isolation: Achieves complete electrical isolation between the input side (field signals), output side (control system), and auxiliary power supply side, eliminating ground loop interference and preventing high-voltage and surge signals from entering downstream equipment.

3. Signal Conditioning and Anti-Interference Capabilities: Built-in filtering circuits suppress spikes, noise, and common-mode interference in field signals, ensuring the stability and measurement accuracy of the output signal, and making the device suitable for industrial environments with strong electromagnetic interference.

4. Linear Transmission and High-Precision Measurement Capabilities: Utilizing precision circuit design, the device achieves a linear correspondence between input and output signals, ensuring measurement errors remain within an extremely narrow range and meeting the accuracy requirements for electrical data acquisition in industrial settings.

5. Adaptability and Expansion Features: Supports multiple auxiliary power supply specifications (such as 24 V DC, 220 V AC, etc., subject to specific model), compatible with various power supply scenarios without the need for additional power conversion modules.

II. Working Principle and Process

Layman's Explanation of the Principle

The PA-19 transmitter acts like a "signal translator with isolation protection." Its operation can be broken down into four core steps:

1. Signal Acquisition and Input Processing: The device's input terminals receive DC current or voltage signals from the field. These signals first pass through current-limiting and voltage-limiting protection circuits for preprocessing, preventing overvoltage or overcurrent damage to internal circuits while simultaneously performing preliminary filtering to remove high-frequency noise interference from the field.

2. Three-Port Isolation Conversion: Through isolation circuits (such as linear isolation or magnetic isolation technology), the field signal on the input side, the power supply signal on the power side, and the control signal on the output side are electrically isolated. There is no direct electrical connection between the three, which not only blocks ground loop current interference but also prevents high voltages and surge impacts from the field from being directly conducted to the downstream control system.

3. Signal Linear Conditioning: The isolated signal enters a high-precision operational amplifier and linear correction circuit, where it is amplified or attenuated according to a preset range ratio. This converts the raw signal into a standard electrical signal that maintains a strict linear relationship with the input signal, while simultaneously performing temperature drift compensation to ensure stable accuracy across a wide temperature range.

4. Standard Signal Output: The conditioned signal passes through the output circuit and is converted into a user-specified standard industrial signal (such as a 4–20 mA current signal or a 0–10 V voltage signal). It is then output from the output terminals to a PLC, DCS, or digital display instrument, enabling standardized signal transmission and acquisition.

III. Core Value and Solutions to Pain Points

1. Signal Interference Leading to Inaccurate Measurements and Control Failures

Q: When motors, variable frequency drives, and high-power equipment are operating in industrial environments, they generate strong electromagnetic interference, resulting in inaccurate electrical signal acquisition and even causing PLC malfunctions or equipment shutdowns. Can the PA-19 transmitter resolve this issue?

A: Yes, it can. The PA-19 transmitter features built-in three-terminal isolation circuits and multi-stage filtering circuits, effectively suppressing common-mode, differential-mode, and ground-loop interference in the field. This ensures the stability and accuracy of the output signal, prevents control failures caused by signal distortion, and enhances system operational reliability.

2. High Voltage / Surge Impacts at the Field Level Damaging Expensive Back-End Equipment

Q: High voltage and surge signals from the field's high-voltage power systems can easily infiltrate control equipment such as PLCs and DCS systems, causing circuit board burnout and system failure. This results in high maintenance costs and significant downtime losses. Can the PA-19 transmitter provide protection?

A: Yes, it provides reliable protection. The PA-19 transmitter achieves complete electrical isolation between the input, output, and power supply terminals. This effectively establishes an "electrical firewall" between the high-voltage field equipment and the back-end control equipment, blocking the transmission path of high voltage and surge signals. This prevents back-end equipment from being damaged by breakdown, significantly reducing equipment repair costs and downtime risks.

3. Incompatibility Between Field Signal Specifications and Control Systems

Q: Field-acquired DC current/voltage signals come in a variety of specifications, while the acquisition channels of PLCs and DCS systems only support standard signals. Direct connection is not possible, requiring additional custom conversion modules, which are costly and have poor compatibility. Can the PA-19 transmitter adapt to this?

A: Yes, it can adapt. The PA-19 transmitter supports multiple input ranges (covering common industrial DC current/voltage specifications) and can output mainstream standard signals such as 4-20mA, 0-20mA, 0-5V, and 0-10V. It enables rapid adaptation of non-standard signals to control systems without the need for custom modules, thereby reducing system retrofitting and deployment costs.

4. Ground Loop Current Causing Signal Zero-Point Drift and Data Fluctuations

Q: If the ground potentials of field devices and the control system are inconsistent, ground loop currents can form, leading to signal zero-point drift and data fluctuations, which affect the accuracy of data acquisition. Can the PA-19 transmitter resolve this issue?

A: Yes, it can. The PA-19's three-terminal isolation design completely breaks the ground loop between the input and output sides, eliminating interference caused by ground potential differences. This ensures a stable signal zero point and accurate data acquisition, eliminating the need for additional grounding measures and simplifying system wiring.

5. Harsh Industrial Environments and Poor Long-Term Operational Stability

Q: Industrial sites often face issues such as temperature fluctuations, high humidity, and heavy dust. Conventional transmitters are prone to malfunctions and drift, requiring frequent maintenance and disrupting production continuity. Can the PA-19 transmitter adapt to such harsh environments?

A: Yes, it can. The PA-19 features an industrial-grade black flame-retardant housing with excellent protective performance. It also

incorporates a wide-temperature circuit design, enabling long-term stable operation under the temperature and humidity conditions commonly found in industrial environments. This reduces the likelihood of failures and maintenance frequency while extending the equipment's service life.

IV. Key Product Parameters & Specifications

4.1 Basic Electrical Parameters

1. Input Parameters (DC Current / Voltage)

DC Current Input Specifications: Standard ranges support 0–1 A, 0–5 A, 0–10 A, 0–20 A, 0–50 A, and 0–100 A (customizable upon request)

DC Voltage Input Specifications: Standard ranges support 0–5 V, 0–10 V, 0–50 V, 0–100 V, 0–300 V, and 0–500 V (customizable and expandable upon request)

Input Power Consumption: Current-type ≤ 0.1 VA, Voltage-type ≤ 0.2 VA (Reduces the load impact on the measured circuit)

Overload capacity: Current-type supports 1.5 times rated current for continuous operation, 20 times rated current for short-term surge (1 second); Voltage-type supports 2 times rated voltage for continuous operation

Input impedance: Current input impedance ≤0.1Ω, voltage input impedance ≥100kΩ (Reduces signal loss)

2. Output Parameters (Standard Industrial Signals)

Current Output Specifications: 4–20 mA (recommended, two-wire compatible), 0–20 mA, 0–10 mA

Voltage Output Specifications: 0–5 V, 0–10 V, 1–5 V

Load Capacity: For current output, maximum load resistance ≤ 600 Ω; for voltage output, minimum load resistance ≥ 2 kΩ

Output Ripple: ≤0.5% FS (ensures signal purity, suitable for high-precision data acquisition applications)

Response Time: ≤400 ms (low signal conversion and output delay, meets real-time control requirements)

3. Accuracy and Linearity

Measurement Accuracy Class: ±0.2% FS, ±0.5% FS (Class 0.5 recommended for standard applications; Class 0.2 available for high-precision applications)

Linearity error: ≤±0.1% FS

Temperature drift: ≤±100 ppm/°C (Stable accuracy across a wide temperature range)

Annual stability: ≤±0.2% FS (No significant drift during long-term use, reducing calibration frequency)

4.2 Isolation Performance Parameters

Isolation method: Full electrical isolation between the input, output, and auxiliary power supply sides, completely breaking ground loops

Power-Frequency Withstand Voltage: AC 2000 Vrms/1 min between input and output; AC 2000 Vrms/1 min between input and power supply; AC 1500 Vrms/1 min between output and power supply; no breakdown or flashover

Insulation Resistance: Insulation resistance between each isolation terminal ≥ 100 MΩ (under DC 500 V test conditions)

Common-Mode Immunity: Common-Mode Rejection Ratio (CMRR) ≥ 100 dB, effectively suppressing interference caused by ground potential differences in the field

Differential-Mode Immunity: Differential-Mode Rejection Ratio (DMRR) ≥ 60 dB, filtering out spikes and noise interference signals in the field

4.3 Power Supply & Power Consumption Parameters

Typical Supply Voltage: DC 24 V (supports wide-range DC 18 V–36 V, accommodating power fluctuations in industrial environments)

Optional Power Supply Specifications: AC 220V (custom model, suitable for scenarios without DC power)

Rated Power Consumption: When powered by DC 24V, static power consumption ≤ 0.6W; full-load power consumption ≤ 1.5VA; when powered by AC 220V, power consumption ≤ 2VA

Power Supply Ripple Suppression: ≥40dB, suitable for industrial field environments with significant power supply ripple

Power Distribution Output: No additional power distribution output (dedicated to signal isolation and transmission; no additional load requirements)

4.4 Environmental Adaptation Parameters

Operating Temperature: -10°C to +60°C (standard model); optional wide-temperature model: -25°C to +70°C, suitable for outdoor, low-temperature, and high-temperature industrial environments

Storage temperature: -40°C to +85°C

Operating humidity: ≤95% RH (no condensation, no corrosive gases)

Protection rating: IP20 (enclosure protection; suitable for installation inside distribution cabinets; protects against finger contact with live parts and ingress of solid foreign objects of medium diameter)

Explosion-proof compatibility: No explosion-proof certification; suitable for use in non-hazardous areas; For explosion-proof applications, must be used in conjunction with intrinsically safe barriers (e.g., Zener barriers, isolating safety barriers), compatible with Ex ia IIC T4 Ga explosion-proof systems

Vibration resistance: Complies with GB/T 17626 standard; withstands vibration impacts of 10–150 Hz and 0.15 mm amplitude; suitable for typical vibration conditions in cabinet installations

4.5 Physical Parameters

1. Installation Method

Installation Type: Standard 35 mm DIN rail mounting, compatible with conventional industrial distribution cabinet rails. Easy to install and remove without additional fasteners.

Installation Orientation: Vertical installation (terminals can face up or down; no mandatory orientation restriction). Single-row rail mounting allows for tight side-by-side installation with other modules.

2. Dimensions (refer to standard dimensions of black-housed transmitters of the same specification)

Overall Dimensions: Approx. 119 mm (L) × 75 mm (W) × 55 mm (H) (Fits standard distribution cabinet installation space without occupying excessive rail width)

Terminal Specifications: 4 screw terminals on each side (top and bottom), compatible with wire gauges of 0.5–2.5 mm², terminal screw size M3, recommended torque 0.5–0.8 N·m

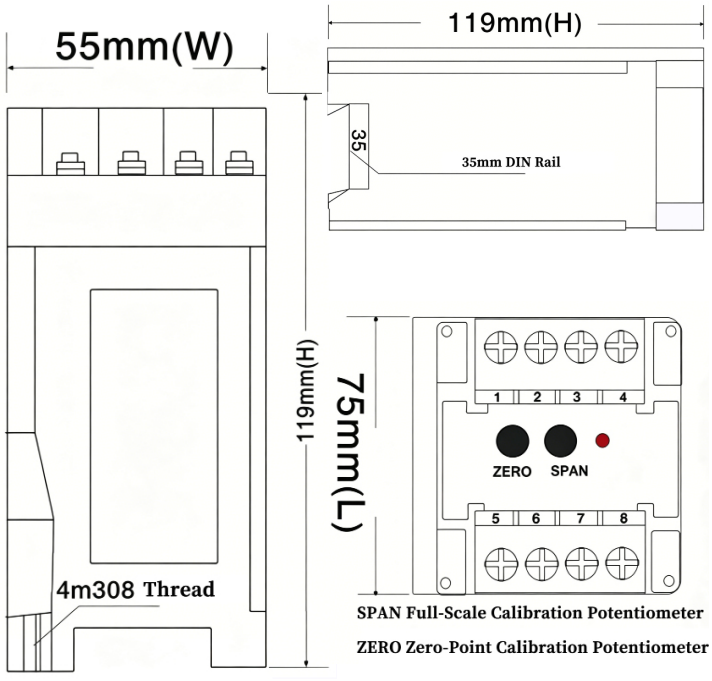
Housing Structure: One-piece flame-retardant plastic housing; top and bottom feature terminal blocks; front panel displays labeling; sides include rail clips and anti-drop mechanisms

3. Weight and Materials

Unit Weight: Approx. 150g (per unit, excluding packaging); lightweight design reduces load on mounting rails

Housing Material: Black flame-retardant ABS engineering plastic; meets UL94 V-0 flame-retardant rating; heat-resistant and anti-aging, suitable for long-term use in industrial environments

Protective Features: Insulated covers on terminal areas prevent accidental contact with live terminals; dust-proof design at housing seams minimizes dust ingress into internal circuits



V. Application-Specific Selection Guide

5.1 Key Selection Criteria

1. Signal Type: First, determine whether the input signal at the site is a DC current signal or a DC voltage signal. Simultaneously, specify the output signal specifications. The mainstream options are 4–20 mA current signals (compatible with standard channels on PLCs and digital display meters) and 0–10 V voltage signals. Prioritize compatibility with the control system's data acquisition standards to avoid signal incompatibility issues.

2. Number of Channels: The PA-19 series supports 1-input, 1-output single-channel signal conversion by default, suitable for single-channel DC current or voltage acquisition scenarios. If you need to output two signals of the same standard simultaneously (e.g., one to a PLC and one to a digital display meter), a 1-input, 2-output configuration can be customized without requiring additional transmitters.

3. Power Supply: Prioritize the DC24V power supply specification, which is widely used in industrial settings and compatible with the vast majority of PLC and control cabinet power systems. If DC power is unavailable on-site, the AC220V model can be selected, eliminating the need for an additional power conversion module.

4. Explosion-proof requirements: For standard non-hazardous areas, the general-purpose PA-19 transmitter may be selected; for applications in explosion-hazardous areas such as chemical or pharmaceutical facilities, it must be used in conjunction with an intrinsically safe barrier. Select a model with explosion-proof compatibility; direct use of the general-purpose model in explosion-hazardous areas is strictly prohibited.

5. Installation Environment: For standard distribution cabinets in normal temperature environments (-10°C to +60°C), the standard model is suitable; for outdoor applications, high-temperature or low-temperature workshops, high-humidity environments, or dusty conditions, select a wide-temperature transmitter and ensure the protection rating meets IP20 or higher requirements.

6. Isolation Level: For standard industrial applications, the basic three-terminal isolation model is sufficient; however, if the site experiences severe electromagnetic interference (e.g., near variable frequency drives or high-power motors), a high-voltage isolation model (AC 2000 Vrms/1 min or higher) must be selected to enhance interference resistance and safety protection.

7. Measurement Range Considerations: Select the appropriate input range based on the actual signal range at the site. Prioritize specifications that match the full scale of the measured signal to avoid reduced measurement accuracy due to an excessively wide range or damage from overload caused by an insufficient range.

5.2. Selection Recommendations for Industry Scenarios

1. Chemical Industry Scenarios: Chemical industry sites are typically characterized by strong electromagnetic interference, and some areas are classified as explosion-hazardous zones. We recommend selecting the PA-19 series three-terminal high-isolation transmitters. Match the input range to the on-site DC current/voltage signal range, and prioritize a 4–20 mA output signal; When used in hazardous areas, the transmitters must be paired with intrinsically safe barriers. DC24V power supply is the preferred option to accommodate installation requirements within explosion-proof control cabinets. Additionally, select the wide-temperature model to adapt to the significant temperature fluctuations typical of chemical plant environments.

2. Power Industry Applications: In power industry applications such as DC power panels and substations, where DC busbar current and voltage signals need to be acquired, the PA-19 series high-precision transmitters (accuracy class ±0.2% FS) are recommended. The input range covers standard DC signal specifications in power systems. These transmitters use 24 V DC power supply, and the high-isolation, high-voltage-resistant models are suitable for the high-voltage and high-interference environments of power systems, ensuring signal acquisition stability and accuracy.

3. Metallurgical Industry Applications: Given the high temperatures, high dust levels, and strong electromagnetic interference typical of metallurgical sites, we recommend the PA-19 series wide-temperature transmitters, which operate within a temperature range of -25°C to +70°C. The high-isolation, anti-interference model is designed to handle interference generated by high-power equipment. The input range is matched to the DC control signals found in metallurgical environments, while the output utilizes a 4–20 mA current signal with enhanced anti-interference capabilities, making it suitable for the harsh installation conditions inside metallurgical control cabinets.

4. Pharmaceutical Industry Scenarios: The pharmaceutical industry primarily operates in cleanrooms, which demand high equipment stability and cleanliness. In non-explosion-proof areas, the standard PA-19 transmitter can be selected; a 24 V DC power supply with a 1-input, 1-output configuration is sufficient to meet signal acquisition needs. For scenarios involving explosion-proof workshops, the transmitter must be used in conjunction with an intrinsically safe barrier. Additionally, select low-power, low-heat models to prevent equipment heat from affecting the workshop environment.

5. Smart Manufacturing Scenarios: In smart manufacturing production lines, which are typically controlled by PLCs or DCS systems, we recommend the PA-19 series general-purpose transmitters. The 1-input, 1-output configuration is suitable for single-channel signal acquisition. For output signals, prioritize standard 4-20mA or 0-10V signals to ensure compatibility with mainstream PLCs and industrial controllers. The 24V DC power supply is compatible with automation control cabinet power systems. Measurement ranges can be customized according to production line signal requirements, meeting the standardized signal acquisition needs of smart manufacturing production lines.

5.3 Common Selection Pitfalls

Pitfall 1: Ignoring isolation ratings and focusing solely on signal conversion: Some users focus only on signal conversion during selection, neglecting the importance of three-terminal isolation. This leads to ground loop interference and high-voltage surges entering downstream equipment, causing issues such as burned-out PLC cards and data fluctuations. When selecting equipment, prioritize confirming the isolation voltage rating to ensure it meets on-site safety protection requirements.

Misconception 2: Selecting the wrong signal range, resulting in range mismatch issues: Failing to select the input range based on the actual signal range at the site during selection. For example, selecting a 0–100 A range when the measured signal is 0–5 A results in a significant drop in measurement accuracy; or selecting a 0–50 A range when the measured signal is 0–100 A leads to overloading and damage to the transmitter. During selection, the actual range of the on-site signal must be precisely matched.

Misconception 3: Neglecting load matching, leading to output signal distortion: When selecting a current output signal, the load resistance of the downstream equipment is not considered. For example, if the input impedance of a PLC acquisition channel is too high and exceeds the transmitter's maximum load resistance limit, this causes the output signal to drop and results in inaccurate data acquisition. During selection, the maximum load capacity of the current output must be verified to ensure it matches the load requirements of the downstream acquisition equipment.

Misconception 4: Selecting general-purpose models for explosion-proof environments, creating safety hazards: Some users directly use general-purpose transmitters in explosion-hazardous areas such as chemical and pharmaceutical facilities without pairing them with explosion-proof safety barriers or selecting explosion-proof models, creating safety risks. When selecting a model, clearly identify the explosion-proof rating of the site area and choose a compatible model according to explosion-proof system requirements.

Misconception 5: Inappropriate power supply selection leading to unstable device operation: Failing to select the transmitter's power supply method based on on-site conditions—such as choosing a DC24V model when the site only supports AC220V, or selecting a DC24V model without considering power supply ripple and fluctuation ranges—can

cause the transmitter to malfunction.When selecting a model, verify the on-site supply voltage and fluctuation range to choose the appropriate power supply specifications.

5.4 Customization Recommendations

1. Custom Solutions for Special Signals: If non-standard DC current or voltage signals are present at the site (such as non-standard ranges, low-level signals, or high-current/high-voltage signals), we can provide customized range services. We tailor input and output specifications based on the user's actual signal range and can also customize special output signals (such as 0–20 mA, 1–5 V, and other non-standard signals) to meet the conversion requirements for non-standard signals.

2. Custom Solutions for Non-Standard Operating Conditions: For special operating conditions (such as ultra-high or ultra-low temperature environments, high humidity, highly corrosive, or high-vibration scenarios), we can provide wide-temperature-range and ruggedized transmitters to enhance the equipment's environmental adaptability. For environments with high electromagnetic interference, we can provide transmitters with high isolation voltage and strong anti-interference capabilities to enhance the equipment's immunity to interference.

3. Multi-Channel Integrated Customization Solutions: For simultaneous acquisition of multiple DC current/voltage signals, multi-channel integrated transmitters can be customized to convert and output multiple signals simultaneously, reducing the number of individual devices and saving installation space in distribution cabinets. We also support custom multi-channel configurations such as 1-in-2-out and 2-in-2-out to meet the signal acquisition needs of complex control systems.

4. Special Installation and Interface Customization Solutions: For unique installation scenarios, we can customize mounting structures compatible with non-standard rails or tailor terminal interface specifications to meet specific on-site wiring requirements. If integration with third-party systems is required, models with auxiliary functions can be customized to fulfill users' personalized installation and integration needs.

VI. Installation and Commissioning Guidelines

6.1 Pre-installation Preparation

1. Component Inspection: After unpacking, inspect the equipment to ensure there is no damage to the exterior and that all terminals are secure. Verify that the model, measurement range, and power supply specifications match the order. Confirm that all included screws and rail clips (if applicable) are present and free from damage or missing parts.

2. Environmental Check: Ensure the installation environment is not in a flammable or explosive area, with an ambient temperature between -10°C and +60°C, relative humidity ≤95% RH, and no condensation. Install the device away from sources of strong electromagnetic interference, such as variable frequency drives and high-power motors, and maintain a minimum distance of 10 cm from high-voltage power lines.

3. Tool List: Prepare a Phillips screwdriver (matching the terminal screw size), wire strippers, a multimeter (DC/AC range), electrical tape, and cable ties; if calibration is required, prepare a signal source or standard signal generator with the corresponding range.

4. Safety Precautions: Before installation, disconnect power from all relevant circuits on-site and verify that the circuit under test is de-energized; never connect or disconnect terminal blocks while the circuit is energized to avoid the risk of short circuits or electric shock; when working in humid environments, wear insulated gloves to prevent electrical leakage.

6.2 Standard Installation Steps

1. DIN Rail Mounting: The PA-19 transmitter uses a standard 35mm DIN rail mounting. Align the rail clips on the back of the device with the rail, then press the device vertically downward. A "click" sound indicates proper installation. To remove the device, gently pry open the clips with a flathead screwdriver and lift the device upward.

2. Wiring Specifications:

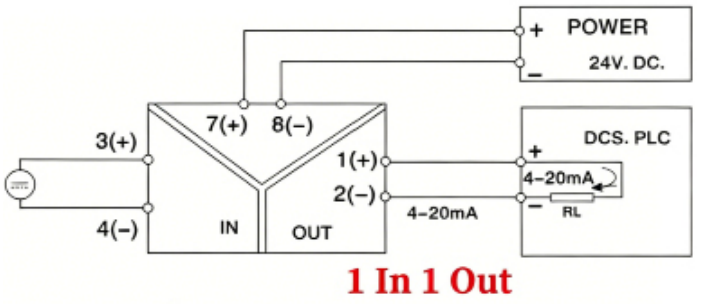
Power Terminals: For the 24 VDC model, connect the positive and negative power terminals according to the terminal markings; reverse connection is strictly prohibited. For the 220 VAC model, distinguish between the live wire (L) and neutral wire (N); there is no need to distinguish between positive and negative terminals. Ensure all connections are secure and free of looseness.

Input Terminals: For DC current/voltage input signals, strictly follow the "+" and "-" polarity markings on the terminals. Current inputs must be connected in series with the circuit under test, and voltage inputs must be connected in parallel with the circuit under test. Reversing or misconnecting the polarity is strictly prohibited.

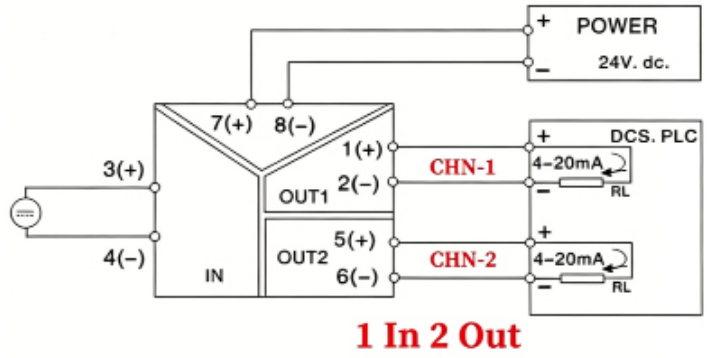
Output Terminals: Connect output signals according to the labeled "+" and "-" polarities. For two-wire or three-wire current outputs, verify the wiring configuration of the downstream PLC or instrument to prevent signal distortion caused by reversed load connections.

3. Grounding Requirements: The device enclosure does not require additional grounding (IP20 protection rating; rail mounting provides default grounding via the rail). If on-site interference is severe, the device's grounding terminal (if present) may be reliably connected to the control cabinet's grounding busbar, with a grounding resistance ≤4Ω. Shielded cables must be grounded at a single point on the control cabinet side to prevent ground loops.

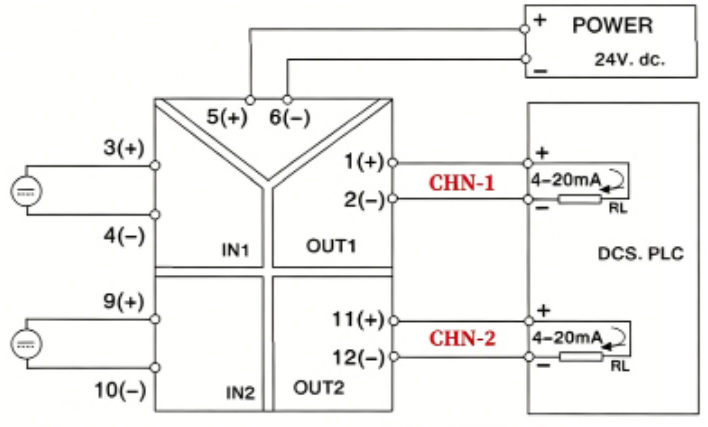
6.3 Wiring Diagrams and Specifications



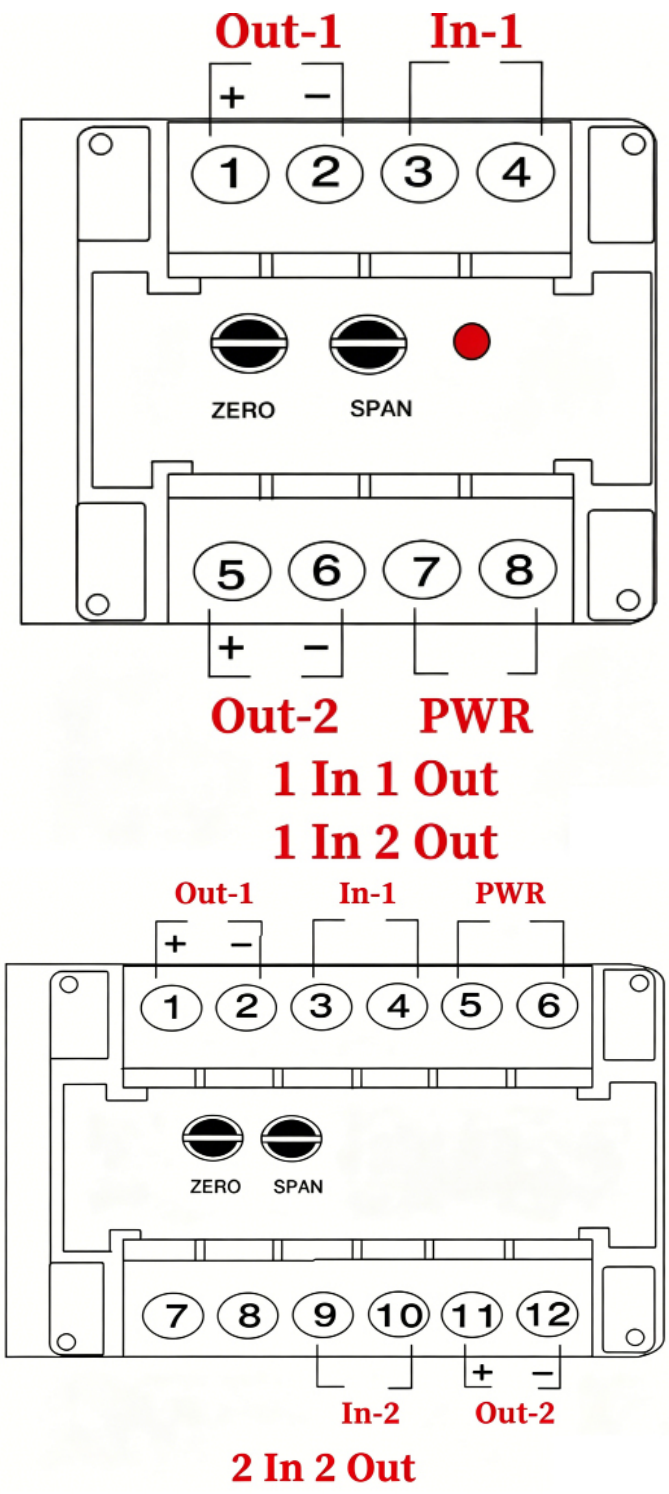
1 In 1 Out



1 In 2 Out



2 In 2 Out



3. Comparison of Common Wiring Errors and Correct Practices

☒ Correct: Current inputs are connected in series, voltage inputs are connected in parallel, power supply/input/output terminal polarities are not reversed, the shielding wire is grounded at one end, and the load resistance is properly matched.

☒ Incorrect: Current inputs are connected in parallel, voltage inputs are connected in series; reverse power supply connection causes equipment burnout; short-circuiting the negative terminals of the input and output destroys the three-terminal isolation; grounding both ends of the shield wire, creating ground loop interference; load resistance too high, resulting in a low output signal.

6.4 Power-On Debugging Procedure

No-Load Test: After wiring is complete, double-check all terminal connections for accuracy, confirm that the power supply voltage matches the transmitter specifications, and turn on the power. Observe the device indicator lights (if any); a lit power indicator indicates normal power supply with no alarm alerts.

Signal Verification: Apply the signal from the circuit under test and measure the transmitter's output signal with a multimeter; when the input signal is 0%, the output signal should be the corresponding zero-point value (e.g., 4 mA/0 V); when the input signal is 100%, the output signal should be the corresponding full-scale value (e.g., 20 mA/10 V). Observe whether the signal changes linearly.

Indicator Status Check: A steady power indicator light indicates normal power supply; if the light is flashing or off, check the power connections and verify that the supply voltage is normal. For models without an alarm indicator, the device's operating status can be determined by checking whether the output signal is stable.

Accuracy Calibration Method: If the output signal is off, calibration can be performed using the "ZERO" and "SPAN" potentiometers on the device panel:

Zero calibration: Apply a 0% input signal and adjust the ZERO potentiometer until the output signal reaches the zero-point reference value (e.g., 4 mA/0 V).

Full-scale calibration: Apply a 100% input signal and adjust the SPAN potentiometer until the output signal reaches the full-scale reference value (e.g., 20 mA/10 V). Repeat the calibration 2–3 times to ensure linearity meets requirements.

6.5 Installation Precautions and Protective Measures

Overvoltage is strictly prohibited: For the DC24V model, the supply voltage must not exceed DC36V; for the AC220V model, the supply voltage must not exceed AC264V. Overvoltage will directly burn out the internal circuitry of the device.

Avoid high-voltage interference: Transmitter wiring must be routed separately from high-voltage lines, with a minimum distance of 10 cm; Use shielded cables for output signals, with the shield grounded at one end, and avoid sharing cable trays with equipment such as inverters or motors.

Protection Measures for Humid Environments: The installation location must be free from condensation. If on-site humidity is high, install a dehumidifier inside the control cabinet; wrap terminal connections with insulating tape to prevent moisture from entering the terminals and causing short circuits or corrosion.

Other precautions: Never perform wiring or disassembly operations while the equipment is powered on; never use standard transmitters in flammable or explosive hazardous areas; after installation, avoid subjecting the equipment to severe vibration to prevent terminal loosening or damage to internal components.

VII. Recommendations for Daily Use and Maintenance

7.1 Key Points for Daily Inspections

1. Signal Stability Monitoring: Check the transmitter's output signal daily via the PLC, DCS, or digital display to ensure there are no signal jumps, zero-point drift, or sawtooth fluctuations. If abnormal fluctuations exceeding ±1% FS are detected, investigate potential interference or wiring issues.

2. Equipment Status Check: Observe whether the transmitter's power indicator light (if present) remains steady, with no alarm or flashing indicators; check that the equipment housing shows no abnormal heat or odors, and that the terminal area has no signs of arcing.

3. Monitoring of Installation Environment Temperature and Humidity: Check the temperature and humidity of the installation environment weekly to ensure the temperature remains within the range of -10°C to +60°C, with humidity ≤95% RH and no condensation; if condensation occurs inside the distribution cabinet, activate the dehumidification device promptly.

Wiring Condition Inspection: Inspect the wiring terminals once a month to check for loose or oxidized cables, and ensure the shielding layer is intact with no damage or detachment.

7.2. Regular Maintenance Plan

1. Cleaning and Maintenance Cycle: Clean the transmitter surface quarterly. Use a dry, soft-bristled brush or compressed air to remove dust and oil residue from the housing and terminal areas to prevent dust accumulation, which can lead to poor heat dissipation or terminal short circuits. Never wipe the equipment directly with liquid cleaning agents.

2. Wiring Tightness Inspection: Tighten all terminal blocks every six months. Re-tighten them to the specified torque for the terminal screws (recommended: 0.5–0.8 N·m) to prevent loose connections caused by vibration or thermal expansion and contraction. Simultaneously, inspect the cable insulation for signs of aging or damage.

3. Recommendations for Accuracy Verification: Perform an annual accuracy calibration on the transmitter by applying 0%, 50%, and 100% of full scale (FS) signals from a standard signal source to verify that the output signals meet specifications. If the deviation exceeds ±0.5% FS, perform zero and span calibration using the ZERO/SPAN potentiometers, and record the data after calibration is complete.

4. Rail and Installation Inspection: Inspect the transmitter's rail mounting status every six months to ensure the device is secure and has not come loose or fallen off, and that the rail clips are intact and free of fractures. Simultaneously, verify that the device has not shifted from its installation position and that the safety distance from high-voltage equipment meets requirements.

7.3 Long-Term Maintenance Tips
1. Dust and Moisture Protection:
During installation, prioritize distribution cabinets with higher IP protection ratings, or install dust-proof insulating covers over terminal areas to minimize dust ingress;
In humid environments, place desiccants inside the distribution cabinet or install dehumidification modules to prevent moisture-induced corrosion of equipment terminals and circuit boards;
Never spray any liquids or corrosive substances onto the equipment surface to prevent damage to the housing and internal components.

2. Anti-Interference Optimization Measures:
Use shielded cables for output signals, and ground the shield only at one end on the control cabinet side to avoid creating ground loops;
Maintain a minimum distance of 10 cm between the transmitter and strong interference sources such as inverters and high-power motors; route signal cables separately from high-voltage power lines and do not share the same cable tray;
If on-site interference is severe, install a power filter at the transmitter's power input to further suppress power supply ripple interference.

3. Protection Against Extreme Environments:
In high-temperature environments, ensure adequate ventilation and heat dissipation in the distribution cabinet. Avoid exposing the transmitter to high temperatures for extended periods; consider installing cooling fans.
In low-temperature environments, prioritize transmitters designed for wide temperature ranges. Additionally, implement insulation measures for the distribution cabinet to prevent accuracy drift caused by low temperatures.
In high-vibration environments, install anti-vibration clips on the transmitter mounting rails to minimize the impact of vibrations on terminals and internal components.

VIII. Troubleshooting & Emergency Procedures
8.1. List of Common Faults
The transmitter has no output signal; the downstream PLC/instrument cannot acquire data
The output signal exhibits zero-point drift, data jumps, or significant deviations
The device's power indicator is off or flashing; there is no indication of normal power supply
The output signal shows sawtooth fluctuations or spike interference; data is unstable
Output signal remains fixed at a specific value (e.g., full-scale or zero), unable to vary with input changes

8.2. Analysis of Fault Causes
1. Wiring errors: Reversed polarity of power supply / input / output terminals; loose connections; reversed current/voltage input configurations (e.g., current signals connected in parallel, voltage signals connected in series); incorrect shield grounding.

2. Power Supply Abnormalities: Supply voltage exceeds the device's rated range (e.g., DC24V models consistently overvoltage to 36V or higher), excessive power supply ripple, or power supply line contact issues causing power interruptions.
Signal Overload / Out-of-Range: Input signal exceeds the transmitter's rated range, triggering internal protection circuits, or input signal amplitude is too small, falling below the transmitter's detection lower limit.

3. Environmental Interference: Severe electromagnetic interference at the site, the transmitter being too close to high-voltage equipment, or both ends of the shielded cable being grounded, creating a ground loop, which causes signal distortion.

4. Hardware Damage: Prolonged operation under overpressure or overcurrent conditions has caused internal circuits to burn out, or terminal corrosion and component aging have rendered the device inoperable.

8.3 Step-by-Step Troubleshooting
1. Fault: Transmitter has no output signal
Troubleshooting Step 1: Check whether the power supply terminals are wired correctly and whether the supply voltage is within the rated range (DC 18V–36V). Use a multimeter to measure the voltage at the power supply terminals to confirm normal power supply.
Troubleshooting Step 2: Check the wiring of the input/output terminals. Confirm that the input signal type matches the transmitter specifications (current signals in series, voltage signals in parallel), and that the output signal load resistance does not exceed the maximum limit (≤600Ω).
Troubleshooting Step 3: Use a multimeter to measure the transmitter's output terminals to confirm if a signal is present; if no output is detected, try replacing the power supply or temporarily swapping in a transmitter of the same model for testing to determine if the issue is a hardware failure.
Contingency Plan: If a spare transmitter is available on-site, temporarily replace the faulty unit to quickly restore signal acquisition and prevent system downtime.

2. Fault: Signal drift, data fluctuations
Troubleshooting Step 1: Check the shield grounding method to ensure it is grounded at only one end on the control cabinet side, with no grounding at both ends; inspect the signal cable for damage and ensure it is routed separately from high-voltage power lines.
Troubleshooting Step 2: Input a fixed-range signal using a standard signal source and verify the output signal deviation. If the deviation exceeds ±0.5% FS, perform zero and span calibration using the ZERO/SPAN potentiometers.
Troubleshooting Step 3: Inspect the installation environment to ensure the transmitter is located away from interference sources such as variable frequency drives and high-power motors. If necessary, install a power filter or replace the transmitter with a high-isolation model.
Workaround: Temporarily relocate the transmitter to a position away from interference sources, or replace it with a model of the same specification featuring a high-interference-resistant design to mitigate signal drift.

3. Fault: Abnormal indicator light (not lit / flashing)
Troubleshooting Step 1: Check the power supply circuit for short circuits or overloads; confirm that the circuit breaker for the power supply has not tripped and that the supply voltage is stable.
Troubleshooting Step 2: Check whether the transmitter's power terminals are loose or oxidized; retighten the terminal connections and replace the terminals if necessary.
Troubleshooting Step 3: If the power supply is normal but the indicator light still does not respond and there is no output signal, it is highly likely that the internal power circuit of the device is damaged; the device must be replaced.
Contingency Plan: Use a multimeter to directly measure the output signal. If the signal is normal, it can be determined that the indicator light is faulty but does not affect the device's functionality; continue using the device and arrange for a replacement later. If the signal is abnormal, immediately replace the device with a spare unit.

4. Fault: Signal Interference and Distortion (Sawtooth Fluctuations)
Troubleshooting Step 1: Check whether the signal cables share the same cable tray with high-voltage power lines. Route the signal cables separately, maintaining a distance of at least 10 cm from high-voltage power lines.
Troubleshooting Step 2: Check whether the shielding layer of the shielded cable is intact and confirm that the single-ended grounding is undamaged; replace the shielded cable if necessary.
Troubleshooting Step 3: Install a power filter at the transmitter's power input to suppress power supply ripple interference; if on-site interference is severe, replace the transmitter with a model featuring high isolation and voltage resistance.

Contingency Plan: Temporarily install an RC filter circuit at the signal output to filter out spike interference signals and mitigate data fluctuation issues.

5. Fault: Output signal remains constant (locked)
Troubleshooting Step 1: Check whether the input signal is a fixed value, or if there is a short circuit or open circuit in the input line, causing the transmitter to receive no valid input signal.
Troubleshooting Step 2: Check whether the input signal exceeds the transmitter's rated range, causing the internal protection circuit to lock up. Reduce the input signal to within the rated range and restart the device to restore normal operation.
Troubleshooting Step 3: If the input signal is normal but the output remains unchanged, it is highly likely that the transmitter's internal circuitry is damaged; the device must be replaced.
Contingency Plan: Replace with a spare transmitter to resume signal acquisition and prevent disruption to the control system's operation.

8.4. After-Sales Repair Guidelines
1. Criteria for Determining a Malfunction:
After completing the above troubleshooting steps, if the device's power supply, wiring, and input signal are confirmed to be normal but there is still no output or the signal is abnormal;
The device exhibits physical damage (e.g., cracked housing, burnt terminals, unusual internal odor);
Signal deviation remains greater than ±1% FS after calibration and cannot be corrected via potentiometer adjustment;
The device experiences non-human-induced hardware failure within the warranty period.

2. Repair Process:
Compile device information: model specifications, measurement range, power supply method, installation environment, fault symptoms, and troubleshooting process;
Contact after-sales technical support and submit the device information and fault description;
Provide photos of the device, wiring diagrams, test data, and other materials as instructed by after-sales support;
If the issue is determined to be a device quality problem, apply for warranty repair or replacement according to the procedure.

3. Warranty Coverage:
A 12-month warranty is provided starting from the date of manufacture;
During the warranty period, hardware failures caused by non-human factors or non-environmental factors will be repaired or replaced free of charge;
The following situations are not covered by the warranty: operation under overvoltage or overcurrent conditions, burnout caused by wiring errors, intentional damage, or failures resulting from force majeure (such as lightning strikes or fire).
Contact Information:
Technical Support Hotline: 19715617532
After-sales Email: sales008@qd-zdk.com
Online Customer Service: Contact us via the Anhui Qidian Automation Technology Co., Ltd. official website or Alibaba store for after-sales inquiries.