PA-20 AC Current Transducer

I. Product Definition

The Qidian PA-20 Single-Phase AC Current Transmitter (black housing, three-terminal isolated type) is an electrical signal transmitter designed specifically for industrial field applications. It linearly converts single-phase AC current signals (such as 0–1 A or 0–5 A) from current transformers (CTs) into standard industrial control signals (such as DC 4–20 mA, 0–10 V), enabling the safe acquisition, isolated transmission, and standardized output of current from industrial high-voltage circuits. It provides signals that can be directly read by downstream devices such as PLCs, DCS systems, and digital display meters, and is widely used in current monitoring applications for motors, pumps, fans, and power supply lines.

Its core functions can be broken down into the following four dimensions:
1. Signal Acquisition and Conversion: Precisely samples single-phase AC current at power frequency (50/60 Hz) and converts non-standard AC current signals into industrial-standard DC analog signals, achieving "standardized adaptation" of the signals.

2. Three-Port Electrical Isolation: The input, output, and auxiliary power supply ports are fully isolated from one another. Additionally, the housing provides insulation protection, effectively blocking high-voltage surges, electromagnetic interference, and ground loop interference in industrial environments, ensuring signal purity and equipment safety.

3. Linear Transmission and High-Precision Measurement: Features a built-in high-precision signal conditioning circuit to ensure a linear relationship between input and output signals. Measurement accuracy reaches ±0.2% FS (typical accuracy ±0.5% FS), supporting continuous overloads of 2 times the rated current and short-term overloads of 10 times the rated current (10 seconds).

4. Standardized Installation and Compatibility: Features a black flame-retardant engineering plastic housing, supporting 35mm standard DIN rail mounting or base screw mounting. It adapts to common industrial control cabinet installation environments and is compatible with various auxiliary power supply specifications, including AC220V and DC24V.

II. Working Principle

In simple terms, this transmitter acts as an "AC current translator + safety isolation barrier" in industrial settings, "translating" the AC current signal from the high-voltage side into a standard signal that downstream equipment can interpret, while simultaneously blocking high-voltage interference to protect control equipment. Its complete workflow consists of four core stages:
1. Current Sampling Stage
The measured AC current (typically a 0–5 A or 0–1 A secondary current output from a current transformer) is connected to the transmitter's input terminals. Through an internal precision current transformer, primary signal isolation and step-down conversion are achieved, transforming the high-voltage, high-current signal into a low-voltage, low-amplitude AC signal. This simultaneously provides primary electrical isolation, preventing high-voltage current from directly entering the downstream circuitry.

2. Signal Conditioning and Isolation Stage
The sampled AC signal enters a three-terminal isolation module, which uses magnetic or optical isolation components to achieve complete electrical isolation between the input, output, and power supply, thereby completely eliminating ground loop interference and high-voltage crosstalk paths. At the same time, the built-in signal conditioning circuit filters and amplifies the signal, eliminating electromagnetic noise from industrial environments to ensure signal purity.

3. AC/DC Conversion and Linear Calibration Stage
The isolated AC signal enters the AC/DC conversion circuit, where an RMS detection chip converts the AC signal into a DC signal that is linearly proportional to the input current. Simultaneously, the built-in linear compensation circuit and adjustable potentiometers (SPAN range adjustment, ZERO zero-point adjustment) perform linear correction and zero-point calibration on the signal, ensuring a strict linear correspondence between the input and output signals.

4. Standard Signal Output Stage
The calibrated DC signal passes through a power amplifier circuit, where it is converted into an industry-standard 4–20 mA current signal or 0–10 V voltage signal. This signal is then transmitted via the output terminals to downstream devices such as PLCs and DCS systems, enabling real-time data acquisition and monitoring.

III. Core Value

3.1 Overview of Core Value
The core value of this transmitter lies in addressing the four major challenges of current signal acquisition in industrial environments: "safety, compatibility, immunity to interference, and stability." It provides reliable current data support for industrial control, energy management, and equipment operation and maintenance. The specific benefits are as follows:
1. Safety Protection: The three-terminal isolation design achieves electrical isolation between high-voltage and low-voltage systems, preventing high voltage from entering control circuits and damaging precision equipment such as PLCs and DCS systems, while also reducing the risk of electric shock to personnel.

2. Signal Adaptation Value: Converts non-standard AC signals output by current transformers into industry-standard signals, resolving signal compatibility issues between different devices and enabling data integration across devices and systems.

3. Interference Resistance and Stability Value: Utilizes isolation, filtering, and linear correction circuits to suppress electromagnetic interference and ground loop interference in industrial environments, ensuring stable signal transmission and preventing measurement and control errors.

4. Long-Term Operation and Maintenance Value: Utilizing imported components and featuring high integration, the device requires no periodic calibration and supports overload protection, thereby reducing maintenance costs and extending service life.

3.2 Pain Points - Solutions
1. Pain Point: Direct connection between high-voltage circuits and control circuits in industrial environments can easily lead to high-voltage interference, damaging precision control equipment such as PLCs and potentially causing safety incidents.
Q: How can high-voltage interference be prevented from damaging control equipment when high-voltage and low-voltage circuits are directly connected in industrial environments?
A: The Qidian PA-20 transmitter achieves complete electrical isolation across its input, output, and power supply ports, establishing a secure "high-voltage – low-voltage" isolation barrier. The internal isolation module blocks the path for high-voltage signals to enter the control circuit. Even if high-voltage fluctuations occur on the current transformer side, they will not affect downstream PLCs or DCS equipment. This also reduces the risk of electric shock when personnel come into contact with low-voltage circuits, ensuring dual safety for both equipment and personnel.

2. Pain Point: The non-standard AC signal output by current transformers cannot be directly recognized by control devices such as PLCs and DCS systems, requiring the construction of complex signal conversion circuits.
Question: How can the non-standard AC signal from a current transformer be adapted for industrial control devices such as PLCs and DCS systems?
A: The Qidian PA-20 transmitter can directly interface with the current transformer's output signal (e.g., AC 0–5 A) and linearly convert it into industry-standard signals (e.g., DC 4–20 mA, 0–10 V) without the need for additional conversion circuits. These standard signals can be directly recognized and read by PLCs, DCS systems, digital displays, and other devices, enabling seamless data integration between different devices and simplifying the system integration process.

3. Challenge: The electromagnetic environment in industrial settings is complex. Motor start-stop cycles, inverter interference, and ground loop interference can cause current signal distortion and fluctuations, leading

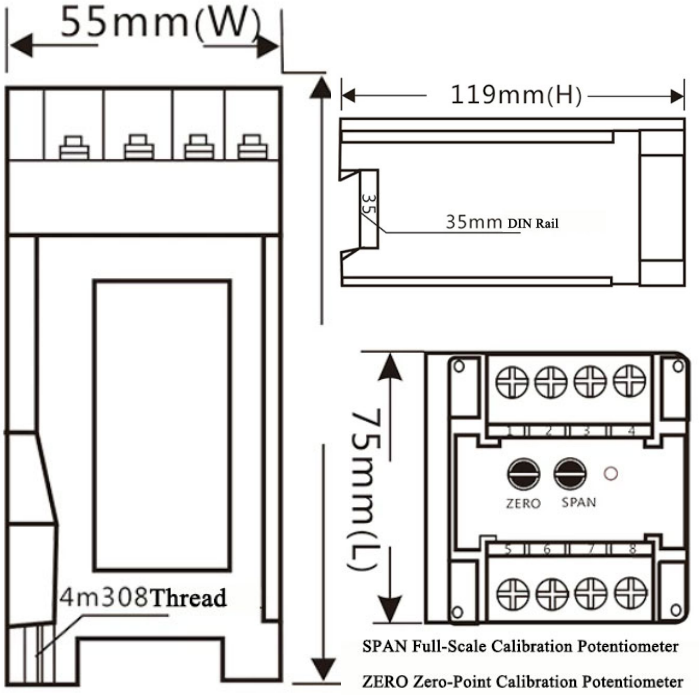
to measurement errors and control failures.
Q: How can we ensure the stability and accuracy of current signal acquisition in industrial environments with severe electromagnetic interference?
A: The Qidian PA-20 transmitter features built-in multi-layer anti-interference design: First, three-terminal isolation blocks ground loop interference; second, a built-in filter circuit suppresses high-frequency electromagnetic noise; third, a high-precision linear correction circuit ensures signal linearity. These designs effectively resist electromagnetic interference in industrial environments, ensuring measurement accuracy remains stable within ±0.2% to ±0.5% FS and preventing measurement and control errors caused by signal distortion.

4. Pain Point: During long-term operation of industrial equipment, current signal acquisition devices are prone to drift due to environmental influences, requiring frequent calibration and increasing operational and maintenance costs.
Q: Given the complex industrial field environment, how can we reduce the need for periodic calibration of current transmitters and lower operational and maintenance costs?
A: The Qidian PA-20 transmitter utilizes imported components and a highly integrated circuit design, offering excellent temperature stability and long-term stability, thereby eliminating the need for periodic calibration. It also supports on-site adjustment via zero (ZERO) and span (SPAN) potentiometers; should signal drift occur, it can be quickly adjusted on-site without returning the unit for factory calibration, significantly reducing maintenance time and costs.

5. Pain Point: Industrial control cabinets have limited installation space, and installation methods vary across different devices, making installation and commissioning time-consuming and labor-intensive.
Q: Given the limited installation space in industrial control cabinets, how can transmitter installation and commissioning be completed quickly?
A: The Qidian PA-20 transmitter features a standard 35mm DIN rail mounting design and also supports base screw mounting, making it compatible with the installation environments of the vast majority of industrial control cabinets; The terminal labels are clear (input, power, and output terminals are labeled 1-2, 3-4, and 5-6, respectively), making wiring simple. Combined with the zero and span adjustment potentiometers on the housing, installation and commissioning can be completed quickly on-site without the need for complex tools.







IV. Key Product Parameters & Specifications

4.1 Basic Electrical Parameters

Input Specifications

Standard Input Signals: AC 0–1 A, AC 0–5 A (compatible with the secondary output of current transformers; supports user-defined range expansion)

Input Load: ≤0.2 VA (extremely low load consumption on current transformers, preventing any impact on front-end measurement accuracy)

Overload Capacity: Continuous overload of 2 times rated current; short-term overload of 10 times rated current (lasting 10 seconds, with no risk of damage)

Input Frequency: 50/60 Hz (Compatible with industrial frequency power systems, conforming to mainstream domestic power supply standards)

Output Specifications

Standard Output Signal: DC 4–20 mA (Passive/Active selectable, specifications shown in the image are DC 4–20 mA), DC 0–10 V, DC 0–5 V

Output Load Capacity: Maximum load resistance for current-type output ≤500 Ω (for DC 4–20 mA); minimum load resistance for voltage-type output ≥10 kΩ

Output Ripple: ≤0.5% FS (no load)

Output Linearity: ≤±0.1% FS

Accuracy and Response

Measurement Accuracy Class: ±0.2% FS (as specified in the image), with an economical version supporting ±0.5% FS available

Temperature Drift: ≤±50 ppm/°C (within the -10°C to 60°C operating range)

Response Time: ≤400 ms (time from input step change to output reaching a stable value)

Zero / Range Adjustment: Built-in ZERO (zero point) and SPAN (range) potentiometers; supports on-site calibration and adjustment

4.2, Isolation Performance Parameters

Isolation Structure: Complete electrical isolation of the three ports (input, output, and auxiliary power supply) (three-port isolation); the housing is also isolated from the circuitry

Dielectric Withstand Voltage:

Between input and output: AC 2500 Vrms/1 min (no breakdown, no flashover)

Between input and power supply: AC 2500 Vrms/1 min

Between output and power supply: AC 2500 Vrms/1 min

Insulation Resistance: ≥100 MΩ (under DC 500 V test conditions)

Interference Immunity: Complies with industrial-grade EMC standards; resistant to electromagnetic interference, ground loop interference, and surge interference in industrial environments; signal transmission stability improved by over 60%

4.3 Power Supply & Power Consumption Specifications

Auxiliary Power Supply Specifications

Standard Power Supply: AC 220V (as indicated in the image, 50/60 Hz); Optional: DC 24V, DC 12V, AC 110V
Power Supply Range: The AC 220V version supports a wide-range input of AC 85–265V; the DC 24V version supports a wide-range input of DC 18–36V
Power Consumption Specifications
Full-load power consumption: ≤2.5W (current ≤100mA when powered by DC 24V; current ≤12mA when powered by AC 220V)
No-load power consumption: ≤1W (reduces standby power consumption, suitable for low-power operation and maintenance scenarios)
Power Output: No additional power output functionality; this is a pure signal transmission device

4.4 Environmental Adaptation Parameters
Temperature and Humidity Range
Operating Temperature: -10°C to +60°C (standard industrial environments); optional wide-temperature version: -20°C to +70°C
Storage Temperature: -40°C to +85°C
Operating Humidity: ≤95% RH (no condensation or dew formation)
Protection and Explosion-Proof Rating
Protection Rating: IP20 (dust-proof enclosure; prevents finger contact with internal live parts; suitable for installation inside control cabinets)
Explosion-Proof Rating: No explosion-proof certification; non-explosion-proof device; must not be installed directly in flammable or explosive hazardous areas; if used in explosion-proof environments, must be used in conjunction with safety barriers and explosion-proof control cabinets
Installation Environment Requirements: Install inside an industrial control cabinet free of corrosive gases, strong vibrations, and strong electromagnetic radiation; avoid direct sunlight and rain exposure

4.5. Physical Parameters
Mounting Method: Supports 35mm standard DIN rail mounting (mainstream mounting method); can also be mounted using base screws, compatible with the installation standards of most industrial control cabinets
Dimensions (refer to standard dimensions for products of the same specification)
Length × Width × Height: 119 mm × 75 mm × 55 mm (including terminal block)
Terminal Pitch: Standard PCB terminal pitch, compatible with multi-strand or single-strand wires up to 2.5 mm²
Weight: Approx. 180g (per unit, excluding accessories; lightweight design reduces load on the mounting rail)
Housing Material and Protection Details
Housing Material: Black flame-retardant engineering plastic (ABS+PC alloy), featuring V-0 flame-retardant rating, high-temperature resistance, anti-aging properties, and strong insulation
Housing Protection Details: The terminal area features anti-misinsertion markings and insulating barriers to prevent short circuits between adjacent terminals; the housing surface has a matte finish for scratch and wear resistance, and is clearly marked with terminal labels, parameter specifications, and calibration instructions for convenient on-site debugging
Indicator Light Definition: No dedicated indicator lights (the device shown in the image has no power or alarm indicators); the device's operational status must be determined via output signals or an external meter

V. Application-Specific Selection Guide
5.1 Key Selection Criteria
1. Signal Type: First, confirm the output signal specifications of the front-end current transformer (e.g., AC 0–1 A/0–5 A). Simultaneously, verify the input signal types supported by the back-end PLC/DCS/digital display meter (e.g., DC 4–20 mA/0–10 V). Ensure that the transmitter's input and output signals are fully compatible to prevent equipment recognition issues caused by signal incompatibility.

2. Number of Channels: The Qidian PA-20 is designed as a single-phase, single-channel (1 input, 1 output) unit. Select the model based on the actual number of circuits to be monitored: for monitoring a single circuit, choose the standard model; for monitoring multiple independent circuits, it is recommended to configure separate devices for each circuit or consult regarding multi-channel integration solutions.

3. Power Supply Type: Select the appropriate model based on the existing power supply conditions within the control cabinet: For standard applications, prioritize the 24 VDC model (the mainstream power supply for industrial control cabinets); if a 24 VDC power source is unavailable, choose the 220 VAC model (as indicated in the image) to avoid the need for an additional power supply module.

4. Explosion-proof Requirements: The Qidian PA-20 is a non-explosion-proof general-purpose model without explosion-proof certification; it must not be installed directly in flammable or explosive hazardous areas. If used in chemical explosion-proof workshops, oil and gas facilities, or similar environments, additional intrinsic safety barriers and explosion-proof control cabinets must be installed, or a dedicated model with explosion-proof certification must be selected.

5. Installation Environment: Verify the environmental conditions at the installation site: For standard installation inside a control cabinet, the standard model may be selected directly; for high-humidity, dusty, or high-vibration environments, select a model with a higher IP rating or install a protective enclosure; for extreme high or low-temperature environments (below -20°C or above +70°C), select a wide-temperature custom version.

6. Accuracy and Load Considerations: For high-precision measurement applications (such as power consumption monitoring), prioritize models with ±0.2% FS accuracy; for general monitoring applications, the economical ±0.5% FS version is suitable. Additionally, calculate the input load resistance of the downstream equipment to ensure the transmitter's output load remains within the permissible range (e.g., for DC 4–20 mA models, the load must be ≤500 Ω).

5.2. Selection Guidelines for Industry Applications
1. Chemical Industry Scenarios: For current monitoring of motor-pump units, circulating water systems, and reactor agitator equipment in chemical production, prioritize the standard PA-20 transmitter with three-terminal isolation and AC 220 V or DC 24 V power supply. When used in conjunction with an intrinsically safe barrier, it meets signal acquisition requirements within workshop explosion-proof cabinets. Additionally, the isolation design suppresses electromagnetic interference caused by the start-stop operations of on-site variable frequency drives and motors, ensuring signal stability.

2. Power Industry Applications: For current monitoring in substation secondary circuits, low-voltage distribution panels, and power lines, the high-precision PA-20 transmitter (±0.2% FS) is selected. It adapts to the secondary-side AC 0–5 A input signal from current transformers, converting it into a DC 4–20 mA signal for integration into power monitoring systems. This enables precise acquisition of power parameters and energy consumption statistics, while the three-terminal isolation design prevents high-voltage interference from damaging monitoring equipment.

3. Metallurgy Industry Scenarios: For current monitoring of fans, motors, and heating furnaces on metallurgical production lines, the wide-temperature version of the PA-20 transmitter, powered by 24 V DC, is selected. It is designed to fit the power distribution environment within on-site control cabinets. Its high-interference-resistant design withstands the effects of strong electromagnetic radiation and dusty conditions typical of metallurgical sites, ensuring real-time monitoring of equipment operating currents and providing overload warnings.

4. Pharmaceutical Industry Scenarios: For current monitoring of purified water systems, air conditioning units, and production equipment in pharmaceutical workshops, the standard PA-20 transmitter with an IP20 protection rating is selected. It is designed to fit the installation environment within cleanroom control cabinets. Its high-precision signal output meets the stable operational monitoring requirements of pharmaceutical production equipment, while the design without additional power output eliminates the risk of contamination.

5. Smart Manufacturing Scenarios: For current monitoring of automated production lines, robotic workstations, and conveyor systems, the standard PA-20 transmitter with 24V DC power supply is selected. It is compatible with mainstream power distribution specifications within industrial

control cabinets. The single-channel design (1 input, 1 output) enables independent current monitoring of individual equipment, providing reliable current data support for equipment condition monitoring and fault early warning.

5.3 Common Selection Pitfalls

Pitfall 1: Ignoring isolation level requirements: Failing to consider ground-loop interference and high-voltage crosstalk risks in industrial environments, and selecting transmitters with no isolation or low isolation levels, resulting in signal distortion and equipment damage. The correct approach is to select the PA-20 series, which features three-terminal isolation and an insulation withstand voltage of ≥2500 V AC, to suit complex industrial environments.

Pitfall 2: Selecting the Wrong Signal Range Specifications: Failing to verify the output range of the front-end current transformer (e.g., mistakenly selecting an AC 0–5 A model instead of an AC 0–1 A model), or mismatching the signal type with the back-end equipment (e.g., selecting a current output model when the PLC only supports voltage signals), resulting in signal recognition failure or measurement errors exceeding limits; the correct approach is to confirm the range and type of input and output signals before selection to avoid mismatches.

Misconception 3: Neglecting load matching: Failing to calculate the input load resistance of the downstream equipment, resulting in the load connected to a DC 4-20mA output model exceeding the 500Ω limit, causing signal voltage drop and insufficient output; the correct approach is to verify the load resistance during selection, and if the load is too high, choose a custom model with signal amplification functionality.

Misconception 4: Incorrectly selecting general-purpose models for explosion-proof environments: Directly using non-explosion-proof PA-20 general-purpose models in flammable and explosive chemical, oil, and gas environments poses safety hazards; the correct approach is to use intrinsically safe barriers and explosion-proof control cabinets in such environments, or to select specialized models with explosion-proof certification; direct installation in hazardous areas is prohibited.

Misconception 5: Incorrect adaptation to the installation environment: Directly using the standard PA-20 model in outdoor or semi-outdoor environments with high dust levels or strong vibrations, without considering the protection rating and vibration resistance, leads to frequent equipment failures; the correct approach is to select a customized version with a high protection rating and vibration resistance for such environments, or to install a protective enclosure.

5.4 Customization Recommendations

1. Custom Signal Solutions: For non-standard input signals (e.g., AC 0–10 A, AC 0–20 A) or non-standard output signals (e.g., DC 0–20 mA, RS485 Modbus signals), we offer signal range customization services for the PA-20 series. We adjust input/output specifications according to user requirements to achieve standardized conversion of non-standard signals.

2. Custom Solutions for Non-Standard Operating Conditions: For special operating conditions such as extreme high and low temperatures (-20°C to +70°C), high humidity, and strong vibration, we offer customized PA-20 transmitters in wide-temperature and high-protection versions. These feature optimized component selection and enclosure protection design to adapt to non-standard industrial environments.

3. Multi-Channel Integration Customization: For multi-loop current monitoring applications, we offer customized multi-channel transmitter solutions based on the PA-20 technology platform. These integrate multiple single-phase current transmitter modules into a single enclosure, supporting simultaneous signal acquisition and isolated output for multiple loops, thereby reducing the installation space required within control cabinets.

4. Power Supply and Interface Customization Solutions: For special power supply requirements (e.g., 12V DC, 110V AC) or interface needs (e.g., LED status indicators, optimized terminal blocks), we offer customization services for the PA-20 series' power specifications and external interfaces to meet users' specific on-site power distribution and installation requirements.

5. Accuracy and Functionality Customization Solutions: For high-precision metering applications, we offer custom versions with ±0.1% FS accuracy; for applications requiring alarm functionality, we can integrate a relay output module into the standard PA-20 to provide current over-limit alarm signals.

VI. Installation and Commissioning Guidelines

1. Pre-installation Preparation

1. Component Verification

Upon delivery, verify that the product model is the Qidian PA-20 single-phase AC current transmitter, featuring a black standard housing and a three-terminal isolated structure. Check that the housing is undamaged, the terminals are not deformed, and the labels are clearly printed. Confirm that the product body is intact with no dents or scratches, that all included components are present, and that the specifications fully match the procurement parameters (input range, output signal, and power supply specifications).

2. Environmental Inspection

The device must be installed exclusively in a sealed control cabinet. The installation area must remain dry, free of condensation, corrosive gases, severe vibration, and strong impacts; it must be kept away from sources of strong electromagnetic interference such as variable frequency drives, high-power contactors, and high-frequency heating equipment; ambient temperature and humidity must fall within the product's rated operating range. Direct installation in open areas with standing water, dust accumulation, or flammable and explosive hazards is prohibited.

3. Tool List

Prepare a Phillips-head insulated screwdriver, wire strippers, a multimeter, insulated gloves, cable ties, and cold-pressed terminal blocks. Select copper-core cables with appropriate cross-sectional area; shielded twisted-pair cables are preferred for control signal circuits.

4. Safety Precautions

Always follow the principle of working with the power off. Before wiring, disconnect the front-end high-voltage circuit, auxiliary power supply, and rear-end control system power supply. Run high-voltage and low-voltage circuits separately, and ensure operators wear insulated protective gear. Do not insert or remove terminal blocks while the system is energized to prevent electric shock and module breakdown.

6.2 Standard Installation Steps

1. Mounting the Rail

The device is compatible with 35mm standard DIN rails. Align the latches on the back of the transmitter with the slots on the rail, press down vertically, and secure it firmly once you hear the latches click into place. For wall-mounted installation, use the mounting holes on the base to tighten the screws, ensuring the device is flush with the mounting surface and free from looseness or wobbling.

2. Wiring Specifications

Strictly distinguish between the three independent terminal groups and follow the principle of isolated wiring for each section:

Input Terminals: Connect the secondary AC current signal from the front-end current transformer. Connect only within the rated AC current range; do not connect high-voltage power lines in series.

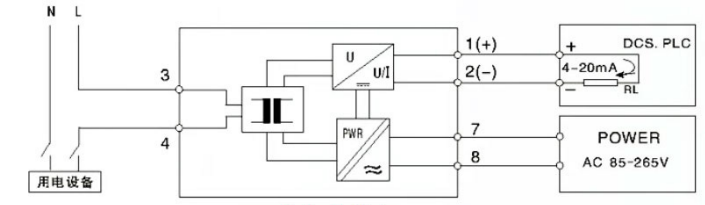
Power Terminals: Connect the device's auxiliary power supply; distinguish between AC and DC specifications and strictly match the rated supply voltage;

Output Terminals: Connect to downstream data acquisition devices such as PLCs, DCS systems, and digital displays; current and voltage output terminals must not be interchanged.

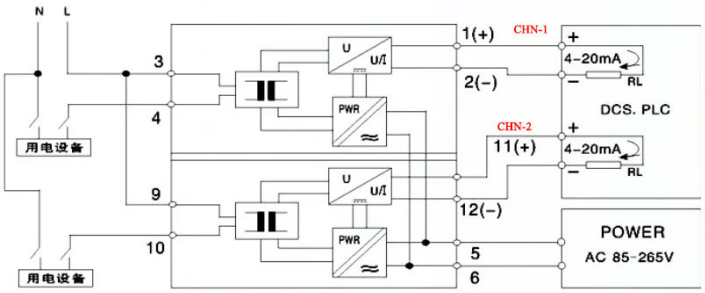
3. Grounding Requirements

Ensure reliable connection to the control cabinet's unified protective grounding. Ground the signal shield at a single point—only on the control system side; leave the shield at the transmitter end floating (ungrounded). Ensure the metal mounting rails of the equipment are properly bonded to the cabinet's equipotential grounding to suppress ground loop interference and enhance isolation protection.

6.3, Textual Explanation of Wiring Diagram

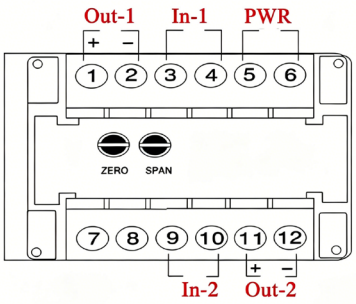


1 In 1 Out

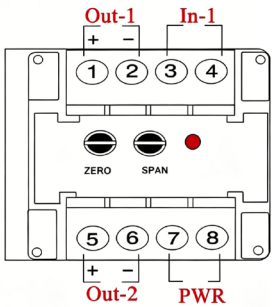


2 In 2 Out

New Type Wiring



2 In 2 Out



1 In 1 Out
1 In 2 Out

PA-20 features a three-terminal isolated layout with clearly defined terminal zones: three sets of independent interfaces—current input terminals, auxiliary power terminals, and analog output terminals—are electrically isolated from one another; all terminal numbers are clearly printed on the side of the housing, and wiring must strictly follow the terminal markings.

2. Dedicated Wiring Specifications for Isolated Models
In isolated models, the input, power supply, and output circuits are completely electrically independent; circuits must not be mixed, short-circuited, or run through the same cable. AC input circuits must be routed separately; power cables and signal output cables must be routed in separate cable trays, maintaining a reasonable distance to prevent signal crosstalk.

3. Shielded Cable Wiring Requirements
For analog output shielded twisted-pair cables, connect one end of the outer shield to the grounding busbar in the central control cabinet. On the transmitter side, cut the shield and wrap it with insulation to prevent loop current interference caused by double-ended grounding.

4. Comparison of Correct and Incorrect Wiring Practices
Correct practices: Separate wiring for each circuit, one-to-one terminal connections, single-ended shield grounding, and power supply voltage matching specifications;
Incorrect practices: Short-circuiting input and output terminals, running high- and low-voltage cables in the same conduit, double-ended grounding, connecting current signals beyond the range, and improper connection of AC and DC power supplies. The above operations will directly compromise the isolation structure, causing signal corruption or equipment burnout.

6.4 Power-On Commissioning Procedure
1. No-Load Test
After wiring is complete, re-inspect the circuit to confirm there are no misconnections, missing connections, or short circuits. First, connect the auxiliary power supply and observe the device's operating status under no-load conditions. Since this unit has no indicator lights, use a multimeter to verify that the supply voltage is stable and normal.

2. Signal Verification
Connect a standard analog current signal to the input. Use a multimeter to measure the value at the transmitter's output terminal, compare it with the theoretical standard value, and determine whether the signal conversion is linear and stable. Apply the signal gradually throughout the process to avoid sudden high-current surges.

3. Equipment Status Assessment
The PA-20 has no power indicator or fault alarm indicator; therefore, data feedback serves as the basis for assessment. If the power supply is normal, there are no error messages or overheating, and the output signal is continuous and stable, the equipment is considered to be operating normally. If there is no output or the value remains fixed, a wiring or power supply fault is suspected.

4. Calibration Method
The device is equipped with adjustable ZERO (zero) and SPAN (range) potentiometers. Under no-load conditions, adjust the zero potentiometer to ensure the lower limit output value precisely returns to zero. Apply a rated full-scale input signal and adjust the range potentiometer so that the upper limit output matches the standard rated value. After calibration, seal the adjustment points to prevent accidental shifts later.

6.5 Installation Precautions
--- Never exceed the rated supply voltage. Do not connect to a high-voltage power source outside the device's rated supply range to prevent internal circuit breakdown and isolation module failure.
--- Avoid high-voltage interference. Do not bundle power cables, inverter output lines, and signal control lines together or run them through the same conduit. Prolonged exposure to strong electromagnetic radiation can cause measurement drift and degradation of isolation performance.
--- Strictly control protection against humid environments. In high-humidity or condensation-prone environments, additional dehumidification and sealing measures must be implemented for the control cabinet. Do not drill holes in the enclosure or install the unit exposed outdoors to prevent moisture intrusion, which can lead to reduced insulation and electrical leakage or short circuits.
--- Do not disassemble the enclosure or modify internal circuits without authorization. Damaging the original three-terminal isolation structure will directly compromise isolation protection, leading to safety hazards and measurement failures.
--- Do not operate the device beyond its rated range or capacity for extended periods. Avoid prolonged high-current overloads to extend the equipment's service life and ensure long-term measurement stability.

VII. Recommendations for Daily Use and Operations & Maintenance
7.1 Key Points for Daily Inspections
1. Monitoring Signal Stability
Daily, check the current/voltage signal curves output by the transmitter via the PLC/DCS system backend. Focus on identifying anomalies such as signal jumps, glitches, irregular fluctuations, or values that remain unchanged for extended periods. Compare the current values under the same load with the readings from the front-end ammeter to confirm there are no significant deviations. If a persistent deviation exceeding ±0.5% FS occurs, mark it for investigation.

2. Equipment Appearance and Condition Inspection
Conduct a weekly visual inspection of the transmitter housing to ensure the black casing is free of damage, deformation, or excessive heat; verify that the terminal area is free of dust accumulation, moisture, or signs of oxidation and corrosion; check that wiring terminals are secure with no signs of arcing or burn marks; ensure mounting rail clips are tight and the equipment is stable with no movement or shifting.

3. Monitoring of Installation Environment Temperature and Humidity
Monitor the temperature and humidity data inside the control cabinet daily to ensure the ambient temperature remains stable between -10°C and +60°C, and humidity is ≤95% RH (no condensation). If condensation occurs inside the control cabinet or the temperature exceeds 60°C, promptly activate dehumidification and cooling equipment to prevent performance degradation caused by high temperature and humidity.

4. Load and Power Supply Status Check
Periodically use a multimeter to measure the transmitter's auxiliary power supply voltage to confirm that it falls within the rated range (e.g., the AC220V version supports 85–265 V AC, and the DC24V version supports 18–36 V DC) and that there are no significant voltage fluctuations; Simultaneously, verify the load resistance of downstream equipment to ensure the DC 4–20 mA output load does not exceed the 500 Ω limit, thereby preventing signal abnormalities caused by excessive load.

7.2. Regular Maintenance Plan
1. Equipment Cleaning Schedule and Methods
Basic Cleaning: Dust the transmitter housing and terminal areas every 3 months. Use a dry, soft-bristled brush to remove surface dust. Never use wet cloths or organic solvents to wipe the housing or terminals, as this may cause insulation degradation or housing corrosion. In high-dust environments (such as metallurgical workshops), monthly cleaning is recommended.
Deep Cleaning: Perform a comprehensive dust removal inside the control cabinet every 12 months, focusing on removing dust accumulated around the transmitter mounting rails and terminal blocks to prevent short circuits or poor heat dissipation caused by dust buildup.

2. Wiring Tightness Inspection Schedule
Standard Environments: Inspect and tighten all terminal screws every 6 months using an insulated screwdriver to prevent loose connections or poor contact caused by vibration.
High-Vibration Environments (e.g., motor rooms, fan rooms): Inspect every 3 months, focusing on tightening the terminal screws for input and power circuits to prevent sparking due to loosening.
Recommendations for Accuracy Retesting and Calibration
Standard operating conditions: Perform an accuracy retest every 12 months. Apply a signal within the rated range using a standard current source, measure the output signal with a multimeter, and compare it to the theoretical value. If the error exceeds ±0.5% FS, perform on-site calibration using the ZERO/SPAN potentiometers;

3. High-precision metering applications (e.g., power consumption statistics): Perform accuracy verification every 6 months to ensure the error remains within ±0.2% FS. Maintain records of calibration results for archiving;
Calibration Method: Under no-load conditions, adjust the zero potentiometer to precisely set the lower limit output to zero; apply a standard full-scale input signal, adjust the span potentiometer to match the upper limit output to the standard rated value; after calibration, seal the adjustment points to prevent accidental shifts.

4. Random Inspection of Isolation Performance
Conduct random inspections of the transmitter's insulation withstand voltage every 24 months. Use an insulation tester to measure the insulation resistance between input and output, input and power supply, and output and power supply, ensuring the insulation resistance is ≥100 MΩ; immediately replace any equipment that fails the inspection to prevent safety hazards caused by isolation failure.

7.3 Long-Term Maintenance Tips
1. Optimization of Dust and Moisture Protection
Dust prevention measures: Install dust filters at the control cabinet's air intake and clean them regularly; in high-dust environments, use control cabinets with an IP rating of IP40 or higher, or install dust covers over the transmitters;
Moisture Protection Measures: Install dehumidification modules or desiccants inside the control cabinet to prevent condensation; apply insulating silicone grease to terminal block areas to prevent oxidation and moisture absorption; do not drill holes in the transmitter housing or install cooling fans to prevent moisture and dust intrusion.

2. Tips for Optimizing Interference Resistance
Wiring Optimization: Route power circuits and signal circuits in separate cable trays; maintain a distance of ≥20 cm between power cables and signal cables; do not run them in the same conduit. Signal output lines must use shielded twisted-pair cables; the shield should be grounded at only one end (on the central control cabinet side), while the shield on the transmitter side should be left floating and insulated to eliminate loop current interference caused by dual grounding;
Grounding Optimization: Ensure the control cabinet is properly bonded to ground, and ensure the transmitter mounting rail is securely connected to the cabinet's grounding busbar. Avoid installing transmitters near sources of strong electromagnetic radiation, such as variable frequency drives, high-power contactors, and high-frequency heating equipment; install a metal shielding enclosure if necessary.

3. Protection Solutions for Extreme Environments
High-temperature environments (>60°C): Install cooling fans or air conditioning inside the control cabinet to reduce internal temperatures; prioritize the use of wide-temperature custom transmitters to prevent component aging caused by prolonged high-temperature operation;
Low-Temperature Environments (<-10°C): Install insulation and heating modules inside the control cabinet to prevent equipment from being exposed to low temperatures for extended periods, which can affect the stability of signal conditioning circuits;
Corrosive Gas Environments (e.g., chemical processing plants): Select corrosion-resistant control cabinets or install corrosion-resistant enclosures around the transmitters; regularly inspect the enclosures for corrosion or damage.

4. Long-Term Decommissioning and Standby Equipment Maintenance
Long-term decommissioned equipment: Remove it from the control cabinet and store it in a dry, well-ventilated warehouse free of corrosive gases to prevent moisture and dust accumulation; before storage, insulate the terminals by wrapping them with insulating tape to prevent oxidation and rust;
Standby equipment: Power on the unit once every 6 months and run it under no-load conditions for 1 hour to check the power supply and output status, preventing component failure due to moisture accumulation during long-term storage.

VIII. Troubleshooting & Emergency Procedures
8.1. List of Common Faults
Fault 1: Transmitter has no output signal; no data feedback from downstream PLC/DCS
Fault 2: Output signal drift or fluctuation; values do not match actual current
Fault 3: Signal interference or distortion; curve exhibits glitches, jumps, or a fixed offset
Fault 4: Abnormal equipment heating; excessive housing temperature
Fault 5: Equipment shows no response after power-on; completely inoperative

8.2 Analysis of Fault Causes
Wiring-related causes: Reversed input/output/power terminals; loose or faulty terminal connections; shielding wire grounded at both ends; interference caused by routing high- and low-voltage cables in the same conduit;
Power supply-related causes: Supply voltage outside the rated range; poor contact in the power supply circuit; excessive power supply ripple; poor grounding in the power supply circuit;
Signal Overload Causes: Front-end current transformer output exceeds range; transmitter operates continuously above rated current; rear-end load resistance exceeds upper limit;
Environmental Interference Causes: Installation location near inverters or high-power equipment; temperature and humidity in control cabinet exceed limits; ground loop interference; strong electromagnetic radiation;
Equipment Damage Causes: Aging of internal circuit components; breakdown of isolation modules; signal conditioning circuit failure; terminal short circuits and burnout.

8.3 Step-by-Step Troubleshooting (Troubleshooting and Resolution for Specific Faults)
1. Fault: No output signal; no data feedback from the downstream system
Troubleshooting Steps:
Use a multimeter to measure the voltage at the auxiliary power supply terminals to verify that the supply voltage is within the rated range (e.g., AC 85–265 V for the AC 220 V model, DC 18–36 V for the DC 24 V model);
With power disconnected, inspect the terminal blocks to ensure there are no reversed connections, loose connections, or broken wires in the input, output, or power circuits;

Disconnect the downstream load and use a multimeter to directly measure the transmitter's output terminals to determine if the fault lies with the downstream equipment;
Remedial Actions:
In case of power supply abnormalities, replace the power supply with a stable one or tighten the power supply connections;
In case of wiring errors, rewire according to the terminal definitions and ensure that the shielding wire is grounded at one end;
In case of a downstream load failure, disconnect the faulty device and test using a spare PLC channel.
Emergency Workaround: Temporarily replace the transmitter with a spare unit of the same model to prioritize the restoration of current monitoring for critical equipment; the faulty device should be returned to the factory for repair at a later time.

2. Fault: Output signal drift, value fluctuations
Troubleshooting Steps:
Verify that the transmitter's input range matches the output of the front-end current transformer to ensure no out-of-range operation;
Check the temperature and humidity inside the control cabinet to ensure no impact from high temperatures or condensation;
Apply a rated signal using a standard current source, retest the transmitter's accuracy, and determine if there is a zero-point or span offset;
Check terminals for oxidation and wiring for looseness, which may cause poor contact.
Remedial Actions:
Out-of-range issues: Replace the transmitter with one suitable for the range, or adjust the front-end current transformer ratio;
Excessive temperature/humidity: Activate dehumidification/cooling equipment in the control cabinet to improve the installation environment;
Accuracy drift: Calibrate the zero point and span on-site using the ZERO/SPAN potentiometers, and seal the adjustment points after calibration;
Terminal issues: Polish off the oxidation layer on the terminals and retighten the wiring.
Emergency workaround: Temporarily connect a high-precision digital ammeter to monitor the current in place of the transmitter; restore the original setup once the equipment has been calibrated or replaced.

3. Fault: Signal interference and distortion, with jagged or erratic curves
Troubleshooting steps:
Check whether signal cables are routed in the same conduit or cable tray as power cables; confirm there is no parallel interference;
Check the shielding grounding method to ensure it is grounded at only one end (on the control cabinet side) and not grounded on the transmitter side;
Check the equipment installation location to ensure it is far from strong interference sources such as variable frequency drives and high-power contactors;
Check whether the control cabinet grounding is reliable to ensure there is no ground loop interference.
Remedial Measures:
Wiring Optimization: Route signal cables in a separate cable tray, maintaining a distance of ≥20 cm from power cables;
Grounding Optimization: Re-route the shielded cables to ensure single-point grounding only on the central control cabinet side, while optimizing the cabinet's equipotential bonding;
Interference Source Isolation: Install a metal shielding plate between the transmitter and strong interference sources, or adjust the installation location;
Filtering: Install a signal isolator at the transmitter's output to suppress high-frequency interference.
Emergency Workaround: Temporarily install a signal isolator with filtering capabilities in series with the output circuit to filter out interference signals; remove it once the wiring modifications are complete.

4. Fault: Abnormal equipment heating, excessive housing temperature
Troubleshooting Steps:
Use an infrared thermometer to measure the housing temperature and confirm whether it exceeds +70°C;
Check if the supply voltage is too high, exceeding the rated range;
Check whether the load resistance at the output exceeds the transmitter's output limit (e.g., for DC 4–20 mA models, load ≤ 500 Ω);
Check for terminal short circuits and internal circuit overloads.
Remedial Actions:
Excessive supply voltage: Adjust the power supply voltage to the rated range; replace the regulated power supply.
Excessive load: Reduce the load resistance at the output end, or replace the transmitter with one that includes signal amplification.
Terminal short circuit: Disconnect power, inspect wiring, resolve the short circuit, and replace damaged terminals;
Poor heat dissipation: Clean dust from the control cabinet, turn on cooling fans, and improve ventilation.
Emergency workaround: Immediately disconnect power and deactivate the faulty device; replace it with a spare transmitter to prevent equipment burnout or safety hazards caused by overheating.

5. Fault: No response after power-on; completely non-operational
Troubleshooting Steps:
Confirm that the power supply circuit has not tripped and that no fuses have blown;
Use a multimeter to measure the voltage at the power supply terminals to confirm the absence of power;
Check whether the power supply terminals are burnt out or the internal circuitry has shorted;
Replace the power supply module for testing to rule out power supply faults.
Remedial Actions:
Power supply circuit failure: Restore power supply; replace blown fuses or tripped circuit breakers;
Terminal burnout: Replace damaged terminal blocks and rewire according to specifications;
Internal circuit breakdown: The device is damaged and cannot be repaired on-site; it must be returned to the factory for repair or replacement.
Emergency Workaround: Immediately replace with a spare transmitter of the same model to restore equipment monitoring; send the faulty device directly for repair.

8.4 After-Sales Repair Guidelines
1. Criteria for Determining a Malfunction (Situations Requiring Repair)
The device has no output signal; after checking the wiring, power supply, and load, all are normal, yet the device still cannot resume operation;
The output signal deviation consistently exceeds ±1% FS and cannot be corrected by on-site calibration;
The device housing is excessively hot, terminals are burnt, or the housing is damaged, posing a safety hazard;
Insulation withstand voltage test fails to meet standards, indicating a failure in isolation performance;
No response after power-on; power supply is normal but the device shows no reaction.

2. Repair Process
Record the device model, specifications, purchase date, installation environment, fault symptoms, and troubleshooting process;
Contact your sales representative or after-sales customer service to submit device fault information, on-site photos, and test data;
Cooperate with the after-sales engineer for remote technical guidance to determine if on-site repair is possible;
If factory repair is required, package the equipment according to after-sales instructions, complete the repair request form, and ship it to the designated address;
After repair is completed, follow after-sales instructions to complete installation and commissioning, and verify equipment functionality.

3. Warranty Coverage
The Qidian PA-20 series single-phase AC current transducers come with a 12-month warranty from the date of manufacture;
During the warranty period, free repair or replacement services are provided for equipment failures not caused by human error or environmental factors;
The following situations are not covered by the warranty: unauthorized disassembly or modification of the equipment; damage caused by over-range or over-voltage operation; corrosion or burnout resulting from an installation environment that does not meet requirements; failures caused by human error or force majeure (such as lightning strikes or floods).