Combined Temperature & Pressure Transmitter

I. Product Definition

The QDW90A-WY PT100 Temperature and Pressure Transmitter is an integrated, high-precision measurement device designed specifically for industrial field applications. It integrates both a pressure measurement unit and a PT100 platinum resistance temperature measurement unit within a single compact housing, enabling simultaneous, real-time acquisition of pressure and temperature signals from the medium. It linearly converts these physical quantities into standard industrial electrical signals for output (commonly 4-20mA current signals, RS485 digital signals, etc.), achieving "dual measurement with a single transmitter."

As a core front-end sensing device in industrial automation and process control, it is widely applicable in scenarios such as petroleum, chemical processing, water treatment, hydraulics and pneumatics, HVAC, and smart manufacturing. It supports online monitoring of media including liquids, gases, and steam, serving as a key foundational component for operational data acquisition, equipment protection, and closed-loop process control.

Its core functions can be broken down into the following modules:

1. Pressure Measurement Function: Based on a diffused silicon piezoresistive pressure sensor core, it converts medium pressure into an electrical signal. After amplification and linear compensation, it outputs a standard signal. It supports various measurement types, including gauge pressure, absolute pressure, and vacuum, with measurement ranges covering common industrial scenarios (e.g., 0–1.6 MPa, 0–40 MPa, etc.).

2. Temperature Measurement Function: Integrates a PT100 platinum resistance temperature sensor. Utilizing the temperature-resistance characteristic of platinum, it converts the medium temperature into a resistance signal. After processing by the transmission circuit, it outputs a standard temperature signal. The temperature measurement range covers -50°C to 200°C (expandable as needed), meeting the temperature monitoring requirements for most industrial media.

3. Signal Conditioning and Output: Equipped with built-in signal conditioning circuits, an AD conversion unit, and a microprocessor, the device amplifies, filters, performs nonlinear compensation, and corrects for temperature drift on the raw pressure and temperature signals. It ultimately outputs stable, linear standard industrial signals, supporting dual independent outputs or single-bus digital output, and is compatible with mainstream industrial control systems such as PLCs, DCSs, and industrial PCs.

4. Integrated Design and Protection Features: Features a fully stainless steel integrated structure, with media-contacting parts made of 304/316L stainless steel, suitable for various corrosive media. Equipped with IP65/IP67-rated HART connectors, it offers splash-proof, dust-proof, and moisture-proof capabilities, making it suitable for complex industrial environments.

5. Anti-Interference and Stability Assurance: Built-in surge protection, overvoltage protection, and reverse polarity protection circuits effectively counteract electromagnetic interference, voltage fluctuations, and reverse polarity issues in industrial environments, ensuring long-term stable operation and reducing the risk of failure.

II. Working Principle

2.1 Overall Workflow

The operation of the integrated temperature and pressure transmitter can be divided into four core stages: "Physical Signal Acquisition → Signal Conversion and Conditioning → Data Processing and Compensation → Standard Signal Output," achieving a complete conversion from physical parameters of the medium to industrial standard signals:

1. Physical Signal Acquisition Stage: The medium comes into contact with the stainless steel pressure-sensing diaphragm and temperature probe at the front end of the transmitter. Pressure acts on the Wheatstone bridge in the diffused silicon core, while temperature is detected through changes in the resistance of the PT100 platinum resistance thermometer. This simultaneously converts the physical quantities of medium pressure and temperature into weak electrical signals (resistance/voltage changes).

2. Signal Conversion and Conditioning Stage: The acquired weak raw signals are fed into the built-in signal conditioning circuit, where they are amplified by an instrumentation amplifier and filtered by an RC filter circuit to remove on-site electromagnetic interference noise. At the same time, preliminary linear correction is applied to the signal to eliminate the inherent errors of the sensor core itself.

3. Data Processing and Compensation Stage: A microprocessor performs analog-to-digital (AD) conversion on the conditioned signal, converting the analog signal into a digital signal. It then applies built-in temperature compensation and nonlinearity compensation algorithms to correct for the sensor element's temperature drift error and pressure nonlinearity error. Additionally, the PT100 temperature signal is fitted to a calibration curve to ensure measurement accuracy.

4. Standard Signal Output Stage: The processed digital signal undergoes digital-to-analog (D/A) conversion to produce standard industrial output signals, such as dual-channel 4–20 mA current signals for pressure and temperature, or RS485 Modbus-RTU digital signals. These signals can be directly connected to control systems such as PLCs and DCSs to enable remote data acquisition and monitoring.

2.2 Analysis of Module Principles

1. Pressure Measurement Principle (Diffused Silicon Piezoresistive)

The pressure sensing core of the transmitter is a diffused silicon piezoresistive element, which integrates a Wheatstone bridge. When the medium pressure acts on the stainless steel pressure-sensing diaphragm, the pressure is transmitted to the silicon core via the internal filling fluid. The silicon wafer deforms under pressure, causing changes in the resistance values of the four arms of the bridge, which disrupts the bridge balance and outputs a weak voltage signal proportional to the pressure. After amplification and compensation, this signal is converted into a standard signal corresponding to the pressure range (e.g., 0–1.6 MPa corresponds to a 4–20 mA current).

2. Temperature Measurement Principle (PT100 Platinum Resistance Type)

The core characteristic of the PT100 platinum resistance is that its resistance value increases linearly with rising temperature. At 0°C, the resistance is 100 Ω; for every 1°C increase in temperature, the resistance increases by approximately 0.385 Ω. The transmitter's internal circuitry supplies power to the PT100 via a constant current source, converting the change in resistance into a voltage signal. After amplification and analog-to-digital (AD) conversion, the actual temperature value is calculated using the built-in PT100 calibration table and finally converted into a standard temperature signal for output.

3. Integrated Design Principle

The transmitter integrates the pressure sensing element and the PT100 temperature probe within a single stainless steel housing. The front end features a unified medium contact surface, allowing the medium to simultaneously contact both the pressure-sensing diaphragm and the temperature probe, thereby enabling simultaneous acquisition of pressure and temperature data. The built-in dual-channel signal processing circuit processes the pressure and temperature signals separately. After unified compensation by the same microprocessor, the two sets of measurement data are output synchronously through independent output channels or a digital bus, eliminating the need to install two separate transmitters and achieving "one device, two functions."

III. Core Value and Solutions to Pain Points

3.1 Core Product Value

The core value of the QDW90A-WY PT100 integrated pressure and temperature transmitter lies in its integrated design, which resolves the traditional pain point of "separate monitoring of pressure and temperature" in industrial settings. At the same time, through high-precision and high-stability measurement capabilities, it delivers multiple benefits to users, including cost reduction, efficiency improvement, simplified installation, and enhanced reliability:

1. Dual-parameter measurement with a single device, reducing procurement and O&M costs: A single unit simultaneously monitors both pressure and temperature parameters, eliminating the need to purchase two separate transmitters and reducing equipment procurement costs; it also reduces the number of devices, thereby lowering the workload and costs associated with subsequent calibration, maintenance, and replacement.

2. Simplified installation and improved on-site construction efficiency: Installation requires only a single process opening, reducing the number of pipe openings and lowering the difficulty and time costs of on-site construction; it also reduces the number of joints and cables, lowering the risk of leaks and improving the overall reliability of the system.

3. High-precision synchronized measurement for improved data consistency: The pressure and temperature sensing units are integrated into a single device with identical media contact points, enabling simultaneous acquisition of both parameters. This eliminates discrepancies in media conditions and measurement asynchrony caused by separate installations, thereby enhancing the consistency and accuracy of process control data.

4. High Stability for Complex Industrial Environments: Featuring an all-stainless-steel integrated structure, IP67 protection rating, and comprehensive anti-interference and protection circuits, the unit is suitable for industrial sites with high humidity, dust, and strong electromagnetic interference. It ensures long-term stable operation and reduces the risk of equipment failure and downtime.

5. Standard Signal Output, Compatible with Mainstream Control Systems: Supports standard industrial signal outputs such as 4-20mA and RS485, allowing direct connection to PLCs, DCS systems, and industrial PCs without the need for additional conversion modules. This ensures strong adaptability and facilitates system integration.

3.2 Core Pain Points and Solutions

1. Pain Point: Traditional separate monitoring requires installing two transmitters for pressure and temperature, resulting in high procurement costs, complex installation, and a higher risk of leaks.

Q: What are the issues with using two independent transmitters to monitor both pressure and temperature simultaneously in industrial settings? How does this product address them?

A: There are three core issues with traditional separate monitoring: First, procurement costs double, as two devices must be purchased simultaneously; Second, high installation costs, as two process ports must be cut into the pipeline, making construction difficult and time-consuming; Third, high risk of leakage—each additional transmitter adds another joint and another potential leak point, posing long-term safety hazards.

The QDW90A-WY integrated temperature and pressure transmitter features a unified design, enabling simultaneous monitoring of both pressure and temperature with a single device, reducing procurement costs by over 40% compared to two separate units; It requires only a single process port for installation, reducing construction steps and time; simultaneously, it minimizes the number of joints, thereby reducing the risk of leaks at the source and enhancing system safety.

2. Pain Point: When two transmitters are installed separately, their positions in contact with the medium differ, leading to unsynchronized and inconsistent measurement data, which affects process control accuracy.

Q: Will installing pressure and temperature transmitters separately result in inaccurate data? Can this product solve this problem?

A: Yes, it will. In traditional separate installations, the pressure transmitter and temperature probe are mounted at different locations on the pipeline. As the medium flows, slight variations in pressure and temperature occur, causing the data collected by the two devices to not reflect the actual conditions of the same operating scenario. This affects the accuracy of process control and can even lead to misjudgments of process parameters. In this product, the pressure sensing element and the PT100 temperature probe are integrated on the same media-contacting surface, enabling simultaneous acquisition of both parameters. This ensures that the measured data represents the actual values under the same operating conditions, significantly improving data consistency and providing precise, reliable data support for process control and optimization.

3. Pain Point: Industrial field environments are complex; issues such as electromagnetic interference, voltage fluctuations, humidity, and dust can easily cause transmitter failures, affecting production continuity

Q: Industrial environments are harsh, and transmitters are frequently subject to interference and failures, leading to inaccurate data or even shutdowns. Can this product handle such conditions?

A: Yes. This transmitter features multiple protective designs tailored for complex industrial environments:

Built-in surge protection, overvoltage protection, and reverse polarity protection circuits to withstand power voltage fluctuations, reverse connections, and lightning surges;

A fully stainless steel integrated housing combined with an IP67-rated HART connector provides dust, moisture, and splash resistance, making it suitable for damp and dusty environments;

Built-in filtering and anti-interference circuits resist electromagnetic interference from on-site equipment such as variable frequency drives and motors, ensuring stable signal output, reducing the risk of equipment failure and downtime, and safeguarding production continuity.

4. Pain Point: High equipment maintenance costs; two transmitters require separate calibration and maintenance, resulting in heavy workloads and low efficiency

Q: When monitoring both pressure and temperature simultaneously, the calibration and maintenance of two transmitters create a heavy workload. How can this be simplified?

A: With traditional separate monitoring, the pressure transmitter and temperature probe require separate periodic calibration and maintenance, doubling the workload and making it easy for maintenance schedules to become out of sync.

This integrated temperature and pressure transmitter is a single, unified device. Only a single unit requires periodic calibration and maintenance, significantly reducing the maintenance workload. Additionally, troubleshooting a single device is simpler than troubleshooting two separate units, improving operational efficiency and lowering labor costs.

5. Pain Point: In some scenarios, space is limited, making it impossible to install two transmitters simultaneously, which restricts the implementation of monitoring solutions.

Q: The space around the on-site piping is too narrow to accommodate two transmitters. Is there an alternative solution?

A: Yes. This integrated temperature and pressure transmitter features a compact, all-in-one design that enables dual-parameter monitoring with a single unit. It requires only the installation space of a standard pressure transmitter, making it suitable for scenarios with limited space, such as narrow piping or equipment enclosures. This resolves space constraints, allowing data collection in scenarios where dual-parameter monitoring was previously impossible.

IV. Key Product Parameters & Specifications

4.1 Basic Electrical Parameters

Product Model QDW90A-WY (PT100 Combined Pressure and Temperature Transmitter)

Measured Parameters Pressure + Temperature (Simultaneous acquisition of two parameters)

Pressure Measurement Core Diffused Silicon Piezoresistive Pressure Sensor

Pressure Measurement Range Standard: 0–0.1 MPa to 0–100 MPa (Customizable for vacuum, absolute, or combined ranges)

Pressure Measurement Accuracy ±0.2% FS (Typical); ±0.5% FS (Economy)

Pressure Nonlinearity Error ≤±0.1% FS

Pressure Hysteresis Error ≤±0.1% FS

Pressure Repeatability Error ≤±0.05% FS

Temperature Measurement Core Class A PT100 platinum resistance thermometer (compliant with IEC 60751 standard)

Temperature Measurement Range -50°C ~ +200°C (standard); extendable to -200°C ~ +500°C (custom)

Temperature Measurement Accuracy ±0.15°C (Class A PT100, 0–100°C range)

Temperature Resolution 0.01°C

Signal Output Type Dual Analog Output: 4–20 mA (Pressure) + 4–20 mA (Temperature)

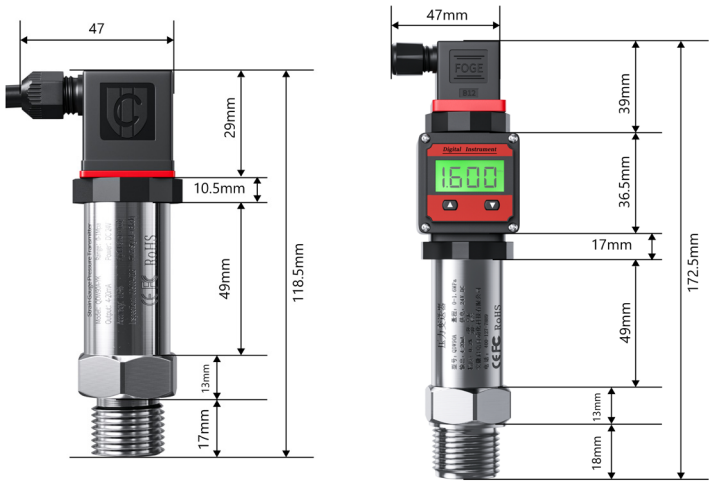
Single Digital Output: RS485 Modbus-RTU (simultaneous output of pressure/temperature data)
Mixed output: 4–20 mA (pressure) + RS485 (temperature, custom)
Output load capacity 4–20 mA: ≤500 Ω (when powered by 24 V DC)
Response time Pressure: ≤5 ms; Temperature: ≤2 s (in-line measurement)
Long-term stability Pressure: ≤±0.1% FS/year; Temperature: ≤±0.05 °C/year

4.2 Isolation Performance Parameters
Signal Isolation Method: Built-in electrical isolation (three-terminal isolation: power supply – signal – ground; available as an option for custom models)
Isolation Withstand Voltage: Between input / output / power supply: AC 1500 V, 1 min, no breakdown (custom models can reach AC 2500 V)
Insulation Resistance: ≥100 MΩ @ 500 V DC
Common-Mode Rejection Ratio (CMRR) ≥100 dB (50 Hz/60 Hz)
Differential-Mode Rejection Ratio (DMRR) ≥80 dB
Electromagnetic Interference (EMI) Resistance Complies with GB/T 17626 standard; resistant to electromagnetic interference from industrial frequency converters and motors

4.3 Power Supply & Power Consumption Parameters
Typical Supply Voltage 24 V DC (Wide-range option available: 12–36 V DC)
Supply Voltage Range Standard: 18–30 V DC; Wide-range custom: 9–36 V DC
Full-Load Power Consumption ≤1.5 W (with dual 4–20 mA outputs)
Power Distribution Capability No additional power distribution (standard model); optional 5V/12V DC power distribution (custom model, max. load 50mA)
Power Supply Protection Built-in reverse polarity protection, overvoltage protection, and surge protection (compliant with IEC 61000-4-5 standard)
Ripple Suppression ≥60dB (100Hz–10kHz)

4.4 Environmental Specifications
Operating Temperature -40°C to +85°C (electronic components)
Media Temperature Range -50°C to +200°C (standard); extendable to -200°C to +500°C (custom, requires heat dissipation device)
Storage Temperature -40°C to +100°C
Operating Humidity 0–95% RH (non-condensing)
Protection Rating IP67 (Hirschmann connector + fully sealed stainless steel housing)
Explosion-Proof Rating Optional: Ex ia II C T4 Ga (Intrinsically Safe, requires use with safety barriers certified to safety standards)
Compatible Safety Barrier Models Optional: P+F KFD2-STC4-Ex1, MTL5541 (for intrinsically safe applications)
Vibration Resistance 10–2000 Hz, 10g, 2 hours in each of the XYZ directions (complies with GB/T 2423.10 standard)
Shock Resistance 100g, 11 ms, half-sine wave (complies with GB/T 2423.5 standard)

4.5. Physical Parameters
Mounting Method Threaded direct-mount (standard), suitable for installation on pipes or equipment enclosures
Standard Connection Threads G1/4, G1/2, M20×1.5 (NPT1/4, NPT1/2 available upon request)
Housing Material 304 stainless steel (standard); 316L stainless steel (corrosion-resistant custom version)
Diaphragm Material 316L stainless steel (standard); Hastelloy C276 (customized for highly corrosive media)
Temperature Probe Material 316L stainless steel, integrated with the diaphragm
Electrical Connector Hirschmann waterproof connector, black nylon housing, with red locking ring
Dimensions (standard model) Overall length: approx. 118.5 mm;
Stainless steel body diameter: approx. 26 mm;
Electrical connector width: approx. 30 mm;
Threaded section length: approx. 15 mm (G1/2 thread)
Weight approx. 150 g (standard model, without cable)
Housing Protection Details 1. Fully stainless steel laser-sealed welded construction, no risk of leakage;
2. HARTING connector with built-in silicone O-ring, IP67 waterproof and dustproof;
3. Encapsulation process for electronic components, providing moisture, shock, and condensation resistance;
4. Dead-angle-free design on media-contacting surfaces, preventing dirt buildup and facilitating cleaning
(Note: Dimension diagram annotations:
Top: HARTING electrical connector (30mm wide, 35mm high, with FOGE logo and B12 specification marking)
Middle: Red locking ring + hex nut (diagonal 32mm, for secure installation)
Lower section: Stainless steel body (diameter 26mm, length approx. 60mm, with laser-marked model number/specifications)
Bottom: Male threaded port (standard G1/2, length 15mm, with hex locking nut))



V. Application-Specific Selection Guide
5.1 Key Selection Criteria
1. Selection Based on Signal Type
When the field control system primarily relies on standard analog data acquisition via PLCs or DCSs, prioritize the dual-channel 4–20 mA analog output version. This configuration features one independent channel for pressure signals and another for PT100 temperature signals, offering simple wiring and strong universal compatibility. When long-distance transmission, multi-device networking, or centralized monitoring via a host computer is required, prioritize the RS485 Modbus-RTU digital signal output version. A single communication bus can simultaneously transmit both pressure and temperature data, offering strong anti-interference capabilities and lower wiring costs; for special system integration requirements, choose a custom analog + digital hybrid output version to accommodate both local instrument display and remote network monitoring.

2. Selection Based on Number of Channels
For standard single-point applications requiring simultaneous monitoring of one pressure and one temperature channel, the standard single-channel temperature-pressure combo model is sufficient. For scenarios involving multi-point temperature and pressure acquisition on a single device or centralized acquisition in control cabinets, a multi-channel configuration is available. Using the same QDW90A-WY transmitter model across all channels simplifies program configuration, ensures uniform parameter calibration, and facilitates future maintenance and replacement.

3. Selection Based on Power Supply Type
When standard DC distribution cabinets and instrument power supplies are the standard configuration in industrial environments, select the standard 24V DC version, which is compatible with the power distribution standards of most industrial control systems; For sites with significant voltage fluctuations, noticeable line voltage drops, or remote outdoor environments, select the wide-voltage 9–36 V DC version. This supports vehicle power supplies, temporary power sources, and scenarios with long-distance wiring voltage drops, preventing measurement anomalies or device reboots caused by voltage fluctuations.

4. Selection Based on Explosion-Proof Requirements

For standard indoor environments with good ventilation, no flammable or explosive media, and no risk of dust explosions, the general non-explosion-proof standard version is sufficient. It offers high cost-effectiveness and meets routine monitoring needs; For chemical storage tanks, steam pipelines, oil and gas transmission, and environments with flammable or explosive gases and dust, the intrinsically safe explosion-proof version must be selected. It must be used in conjunction with a matching safety barrier to comply with on-site explosion-proof regulations and meet safety production acceptance requirements.

5. Selection Based on Installation Environment
For standard indoor conditions with normal temperatures, dry environments, and no corrosion, the 304 stainless steel standard version provides sufficient protection for stable operation. For outdoor, open-air environments with high humidity, condensation, or dense dust, prioritize the IP67 high-protection version, which withstands rain, dust, and moisture. For applications involving acids, alkalis, corrosive liquids, seawater, or chemical corrosive media, upgrade to the 316L stainless steel or Hastelloy diaphragm corrosion-resistant version to prevent corrosion and damage to the housing and pressure-sensing components; In confined pipe spaces or compact equipment enclosures, directly select the QDW90A-WY compact integrated structure, which requires no additional space for multiple instruments and can be installed with a single threaded connection.

5.2, Selection Guidelines for Industry Applications
1. For applications in the chemical industry—including oil and gas pipelines, reactors, water treatment dosing lines, and environments involving acidic or alkaline media—the QDW90A-WY temperature and pressure transmitter is the standard choice. For corrosive media, select the 316L stainless steel corrosion-resistant version; for flammable and explosive areas, choose the intrinsically safe explosion-proof model. Prioritize RS485 digital output to facilitate centralized monitoring via workshop networking.

2. For power generation applications—including power plant circulating water, boiler auxiliary equipment piping, HVAC and district heating networks, and steam-water circuit monitoring—select the standard 24V DC-powered, dual-channel 4-20mA output version. This is suitable for data acquisition by power plant DCS systems, and its high-protection design withstands the dusty and humid conditions of machine rooms.

3. For the metallurgical industry—specifically steelmaking cooling water circuits, hydraulic oil circuits, and high-temperature medium transport pipelines—select the wide-temperature operating version. This is suitable for on-site conditions with high-temperature radiation and strong vibrations. Prioritize vibration-resistant, long-term high-stability specifications to ensure the long-term accurate acquisition of temperature and pressure data.

4. For clean pipelines, purified water systems, and sealed process fluid lines in the pharmaceutical industry, select models with sanitary-grade designs and 316L food-grade corrosion-resistant materials. The dead-space-free design prevents dirt accumulation and facilitates easy cleaning. Standard analog output ensures compliance with pharmaceutical workshop automation control systems.

5. For smart manufacturing automation lines, hydraulic and pneumatic systems, air compressor pipelines, and intelligent fluid control equipment, compact standard models are selected. The 4–20 mA output enables rapid data acquisition by PLCs, while the integrated design saves internal installation space, making them suitable for standardized mass production line integration.

6. For HVAC and water treatment industries—including municipal water supply, heating networks, wastewater process piping, and pump station equipment—select the IP67 high-protection version. Designed for outdoor installation, it withstands wind, rain, and humid environments. An optional RS485 networking version is available to facilitate remote data collection and scheduling for smart water management and heating networks.

5.3 Common Selection Pitfalls

1. Neglecting to select the appropriate electrical isolation rating and directly choosing standard non-isolated versions. In industrial environments with frequent interference from variable frequency drives and motors, this can lead to signal drift, value fluctuations, and unstable data. Subsequently, additional isolation modules must be installed, increasing retrofit costs and labor.

2. Arbitrarily selecting the wrong pressure and temperature ranges. Choosing a range that is too large results in insufficient measurement accuracy under low-load conditions, while selecting a range that is too small—exceeding the rated parameters of the operating conditions—causes instrument overload, sensor damage, and permanent failure, rendering the device unusable in the long term.

3. Neglecting output load matching during selection: When using a 4–20 mA output, failure to account for on-site line resistance and PLC input impedance can result in loads exceeding the transmitter's rated range, leading to signal attenuation, linearity distortion, and inaccurate data acquisition.

4. In flammable and explosive hazardous environments, generic non-explosion-proof models are arbitrarily selected instead of conforming to regulations by choosing explosion-proof models and matching safety barriers. This failure to meet safety production acceptance standards creates safety hazards and results in high costs for subsequent rectification and rework.

5. In corrosive environments, standard 304 stainless steel versions are still used without upgrading to corrosion-resistant materials. Long-term exposure to acids, alkalis, seawater, and chemical media can lead to diaphragm corrosion, leaks, and rusting of the housing, shortening the equipment's service life.

6. In scenarios requiring separate monitoring of temperature and pressure, pressure transmitters and temperature probes are still selected individually, overlooking the advantages of integrated solutions. This results in multiple pipe openings, increased leakage points, higher procurement and installation costs, and data synchronization issues.

5.4 Customization Recommendations
1. Custom Signal Options: For on-site requirements involving non-standard signal interfaces, we offer customizable 0-5V or 0-10V voltage outputs. We also provide mixed outputs combining pressure analog signals with temperature via RS485, as well as multi-protocol communication adapters. This ensures compatibility with legacy non-standard control systems without the need for additional conversion modules.

2. Customization for Non-Standard Operating Conditions: For media with extreme high or low temperatures, strong corrosion, or high viscosity prone to clogging, we can customize extended temperature probes, heat dissipation structures, and corrosion-resistant special alloy diaphragms. Non-standard installation threads such as NPT threads, special flange connections, and extended threaded interfaces can all be customized as needed.

3. Electrical and Structural Customization: For applications requiring higher isolation voltage, enhanced anti-interference capabilities, or reinforced surge protection, a three-terminal reinforced isolation version is available. For confined spaces or embedded equipment, we offer compact designs and customizable cable exit directions.

4. Bulk Integration Customization for Multiple Scenarios: For production lines and project engineering applications requiring bulk deployment, we offer unified customization of measurement ranges, output formats, and labeling specifications. This facilitates on-site installation and wiring, program configuration, and the interchangeable use of spare parts, thereby reducing long-term operational and maintenance costs.

VI. Installation and Commissioning Guidelines

6.1 Pre-installation Preparation

1. Verification of Accessories

Upon receipt of the QDW90A-WY PT100 Temperature and Pressure Transmitter, first verify the completeness of the standard accessories item by item: main unit, stainless steel mounting nuts, HART waterproof connector O-rings, certificate of conformity, and parameter nameplate; For custom versions, additionally verify the extended threads, heat dissipation components, explosion-proof certification labels, and isolation version specification labels. Confirm that the model, pressure range, temperature range, and output signal type match the order specifications, and ensure there are no defects such as surface dents, stripped threads, housing deformation, or damaged connectors.

2. Environmental Inspection

The installation site must be verified in advance: actual operating pressure and medium temperature must not exceed the transmitter's rated range and temperature tolerance; the installation location must avoid equipment emitting strong electromagnetic radiation, such as high-power variable frequency drives, motors, and contactors, and must be kept away from high-temperature heat sources, open flames, and areas with severe vibration; for outdoor or humid environments, ensure there is no prolonged water accumulation or direct exposure to water spray; in dusty or condensation-prone environments, ensure adequate ventilation; In explosion-proof zones, strictly verify the on-site explosion-proof zone classification and confirm the use of intrinsically safe models; the unauthorized installation or use of general-purpose models in hazardous areas is strictly prohibited.

3. Tool List

Essential installation tools: adjustable wrench, Allen wrench, Phillips screwdriver, insulated wire strippers, multimeter, standard signal calibrator, electrical tape, shielded signal cable, waterproof electrical sealant; for threaded installations, prepare Teflon tape or high-temperature-resistant gaskets to seal pipe joints and prevent leaks.

4. Safety Precautions

Before installation, the power supply to on-site equipment must be disconnected, and the valves for the pipeline medium must be shut off. Work may only proceed after pressure has been relieved and the system has cooled down. Direct disassembly or assembly under pressure or in high-temperature conditions is strictly prohibited. Strictly adhere to low-voltage electrical safety regulations during wiring operations. Do not expose bare wires or connect/disconnect connectors while live; in explosion-proof environments, do not disassemble the transmitter housing or modify internal circuits without authorization. Wiring must comply with explosion-proof wiring standards; shielded cables must be grounded at a single point; multiple parallel grounding points are prohibited; when handling corrosive media, wear protective gloves to avoid direct skin contact with acidic or alkaline substances.

6.2 Standard Installation Steps

1. Mounting the Transmitter Body

This product features a direct threaded mounting design without a rail mounting structure and is suitable for direct installation on pipes, tanks, or equipment interfaces:

Apply PTFE tape evenly to the process interface threads or install a sealing gasket; the wrapping direction must align with the thread tightening direction;

Manually screw the transmitter into the interface. After ensuring vertical alignment, use a wrench to grip the transmitter's hexagonal locking position and tighten it. Do not apply force to the electrical connector area to prevent loosening or damage to internal wiring;

The preferred installation orientation is vertically upward, though horizontal or sideways installation is also permitted. Do not use the pressure sensor probe upside down for extended periods to avoid sediment buildup that could affect measurement accuracy;

After installation, check that the connection is sealed and leak-free, and ensure the housing is securely fastened with no wobble or mechanical stress.

2. Wiring Specifications

Distinguish between the power supply terminals, pressure signal output terminals, and temperature signal output terminals, and strictly connect the positive and negative terminals accordingly:

The power supply uniformly uses 24 V DC. The power cable has distinct positive and negative terminals; reverse connection is strictly prohibited;

4–20 mA Analog Output: Connect the positive signal wire to the positive terminal of the PLC/DCS analog input, and the negative wire to the system's common negative terminal;

RS485 Communication Version: Distinguish between the A and B differential signal wires; connect A to the system's A terminal and B to the system's B terminal. Do not reverse the connections;

All wiring must use flame-retardant shielded cables with a cross-sectional area suitable for standard industrial control applications (0.75–1.5 mm²);

After connecting the HART connector, ensure the waterproof seal is firmly compressed and the locking ring is tightened to ensure dust and water resistance.

3. Grounding Requirements

The transmitter's metal housing must be grounded separately for protective grounding, with a grounding resistance ≤4 Ω, to effectively shield against external electromagnetic interference;

Cables with shielding must be grounded at a single end—grounded only at the control cabinet end. The shielding at the transmitter's field end must remain floating (ungrounded) to prevent signal drift and value fluctuations caused by ground loops;

The isolated version features internal electrical isolation; the housing must be grounded independently and must not be connected to the negative terminal of the power supply;

In explosion-proof environments, grounding must strictly follow intrinsically safe grounding specifications; sharing a grounding busbar with high-voltage circuits is prohibited.

6.3 Textual Specifications for Wiring Diagrams

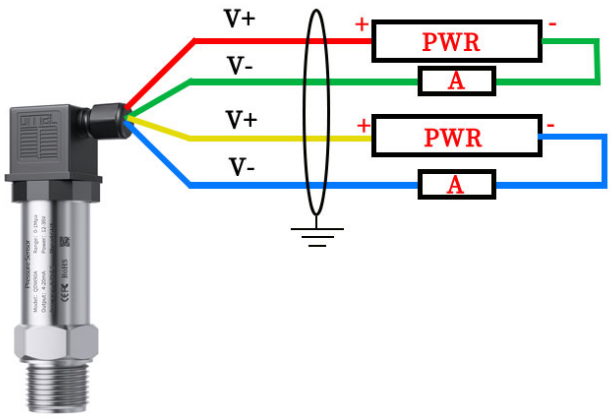
1. Standard Dual-Channel 4-20mA Version Wiring Definitions

Power terminals: DC24V positive, DC24V negative

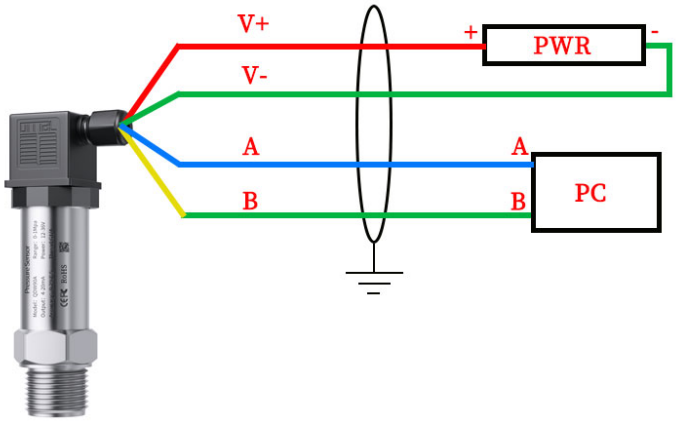
Pressure signal terminals: Pressure 4-20mA positive, Pressure 4-20mA negative

Temperature Signal Terminals: Temperature 4-20mA Positive, Temperature 4-20mA Negative

Specification Requirements: The power supply and the negative terminals of both signal lines may share a common ground. The shielding layer must be connected to the control cabinet ground at a single point. Cables must be routed away from 380V high-voltage cables, with a minimum separation distance of 20 cm.



2. RS485 Modbus Digital Model Wiring Definition



3. Wiring Specifications for Isolated Models
In isolated power supplies, the power supply, input, and output terminals are electrically isolated from one another. Short-circuiting the power supply negative terminal to the signal negative terminal to share a common ground is strictly prohibited. Each terminal must be connected independently to the corresponding system terminals, and the enclosure must be grounded separately for protection; it must not be grounded to the signal loop to minimize common-mode interference as much as possible.

4. Dedicated Wiring Specifications for Power Distribution Models
These models feature a built-in power distribution output, eliminating the need for an external power supply. Simply connect them to the system's signal acquisition terminals. Strictly separate the positive and negative terminals of the power distribution output; do not short-circuit the load, as this will damage the internal power supply circuit.

5. Correct vs. Incorrect Wiring Comparison
Correct practices: Distinguish between positive and negative terminals; categorize and route signal wires; ground shielding at a single point; seal and secure connectors; ensure reliable enclosure grounding.
Incorrect practices: Reversed power connection; reversed signal polarity; routing high- and low-voltage wires in the same conduit; grounding both ends of the shielding layer; twisting connectors instead of tightening threads; exposed wiring without sealing.

6.4 Power-On Commissioning Procedure
1. No-Load Test
After installation and wiring are complete, do not apply medium pressure; keep the system in a no-load, idle state. Recheck the wiring to ensure there are no short circuits, incorrect connections, or exposed wires. Confirm that the supply voltage is stable within the rated range of 18–30 V DC, then close the circuit breaker to power on the system. After power-on, the device will automatically initialize; wait 30 seconds for it to enter normal measurement mode.

2. Signal Calibration
In the no-load state, record the initial pressure zero-point value and ambient temperature value, and compare them with the actual on-site reference values. Connect a standard signal calibrator to the circuit to calibrate the full-scale pressure point and intermediate points, as well as the ambient temperature and high-temperature points. Observe whether the output 4–20 mA current or RS485 data corresponds linearly and whether the error is within the product's allowable accuracy range.

3. Indicator Status Assessment
After the device powers on normally, the power indicator remains steadily lit in green, indicating normal power supply and hardware operation; the data indicator flashes slowly and steadily, indicating that pressure and temperature signals are being normally acquired and output; if the indicator is off, it indicates a power supply failure; if it remains steadily lit without flashing, it indicates an open circuit in the signal loop or a sensor element malfunction; rapid flashing indicates an out-of-range condition or a short circuit fault.

4. Calibration Methods
In case of zero drift, perform zero-point calibration under no-load, pressure-free conditions. If the range deviation is excessive, correct the range coefficient via Modbus parameters on the host computer or local fine-tuning parameters. After calibration, allow the unit to stand undisturbed under operating conditions for 10 minutes. If the readings show no drift or fluctuation, the calibration is successful, and the unit is ready for formal operation.

6.5 Installation Precautions
1. Never operate the device under overpressure or excessive temperature conditions. Prolonged exposure of the medium pressure or temperature beyond the rated range will directly damage the pressure-sensing core and PT100 temperature sensor, resulting in permanent failure.

2. Never use power supplies outside the specified range. Do not connect to 220V AC or DC voltages exceeding 36V to prevent burning out the internal circuitry.

3. Avoid running wiring in close proximity to high-voltage equipment such as variable frequency drives, motors, and contactors. Do not route high- and low-voltage cables through the same conduit to prevent electromagnetic interference that could cause signal fluctuations and measurement inaccuracies.

4. In damp, rainy, or outdoor environments, it is strictly prohibited to operate the device without installing a waterproof seal or properly tightening the HART connector. Failure to do so may allow moisture to enter the interior, causing circuit oxidation and short-circuit failures.

5. Do not disassemble the transmitter housing or modify the internal wiring or sealing structure. Disassembly will compromise the protection rating and explosion-proof performance, and will void the warranty.

6. Do not forcefully pull on cables or bend connectors during installation. This may cause internal solder joints to come loose or wires to break, leading to intermittent signal failures.

VII. Recommendations for Daily Use and Operation & Maintenance
7.1 Key Points for Daily Inspections
1. Visual Inspection of Appearance and Installation Status
Conduct daily visual inspections of the overall appearance of the QDW90A-WY temperature and pressure transmitter. Check that the stainless steel housing shows no rust, deformation, or leaks; ensure that threaded installation interfaces have no media leakage, looseness, or displacement; verify that the locking ring on the HART electrical connector is intact and secure, and that the sealing gasket shows no signs of aging, cracking, or detachment; ensure that the overall protective structure remains fully sealed.

2. Signal Stability Monitoring
Continuously monitor the pressure and temperature measurement data displayed on the host computer, PLC, and DCS backend systems. Verify that the readings remain stable without frequent fluctuations, unexplained sudden changes, or persistent offsets. Pay particular attention to data responsiveness during changes in process load. If value drift, sudden jumps, or prolonged freezing occur, promptly document the operating conditions and investigate the status of the wiring and equipment.

3. Operating Conditions, Temperature, Humidity, and Environmental Inspection
Continuously monitor the ambient temperature and humidity around the transmitters to ensure they remain within the product's rated operating temperature and humidity ranges. Ensure there is no visible condensation, standing water, direct water spray, or excessive dust accumulation at the site. Keep the equipment away from open flames, high-temperature radiation sources, and equipment with strong vibrations to prevent accelerated component aging caused by prolonged exposure to harsh environments.

4. Power Supply and Operational Status Inspection
Periodically check whether the on-site supply voltage remains stable within the rated range of 18–30 V DC, with no sudden voltage fluctuations or transient drops. Observe the status of the device's operational indicator lights: a steady power light and regular flashing of the signal light indicate normal operation. Immediately document and address any abnormalities, such as lights that do not illuminate, remain off, or flash rapidly.

5. Inspection of Media Conditions
Verify whether the actual pressure and temperature of the measured medium are consistently approaching or exceeding the transmitter's rated range to prevent prolonged overpressure or overtemperature operation. In corrosive environments, inspect the interfaces for minor corrosion or scale buildup to prevent blockage of the pressure-sensing diaphragm and PT100 temperature probe, which could affect measurement accuracy.

7.2. Regular Maintenance Schedule
1. Cleaning Frequency Guidelines
In standard industrial environments, perform external cleaning every 3 months; in environments with heavy dust, high humidity, or chemical corrosion, clean once a month. Use a dry, soft cloth to wipe dust, oil, and debris from the housing and connector surfaces. Do not rinse directly with water or wipe with strong acid or alkali solvents to avoid damaging the housing's surface protection and sealing structure.

2. Wiring and Fastening Inspection Schedule
Conduct a comprehensive wiring inspection every six months: Check that the internal terminals of the HARTING connectors are free of looseness, oxidation, or loose connections; ensure the outer sheath of shielded cables is free of damage, aging, or tensile stress; verify that grounding terminals are secure and rust-free, and that grounding wires are intact with no breaks; confirm that threaded pipe fittings are tight with no looseness. Frequent disassembly is not required; only retightening inspections are necessary.

3. Recommendations for Accuracy Retesting and Calibration
Under standard operating conditions, perform dual-channel accuracy re-testing for pressure and temperature along with zero-point calibration every 12 months; for critical processes in precision control, pharmaceutical, and chemical applications, re-test every 6 months; use a standard signal calibrator to compare the 4–20 mA output or RS-485 communication data, and perform online fine-tuning calibration for zero-point drift and minor range deviations to ensure measurement accuracy consistently meets factory specifications.

4. Spare Parts and Aging Replacement Maintenance
For equipment that has been in continuous operation for 24 months, focus on inspecting the aging of sealing O-rings and connector insulation components, and replace seals as appropriate based on operating conditions. In highly corrosive or high-vibration environments, it is recommended to establish a spare parts rotation mechanism and keep spare transmitters of the same model on hand to facilitate rapid replacement in the event of a failure, ensuring uninterrupted production line operation.

7.3 Long-Term Maintenance Tips
1. Long-Term Dust and Moisture Protection
Always ensure that the HART connectors are fully tightened and the internal sealing O-rings are properly seated to prevent moisture and dust from entering through the wiring ports. In outdoor, open-air, or humid environments, use an additional waterproof junction box for protection to prevent direct exposure to rain and internal condensation caused by diurnal temperature fluctuations. The device's electronic chamber features a fully potted structure. Do not attempt to disassemble the housing or compromise the seal, as doing so will permanently void its dust and moisture protection.

2. Optimized Maintenance for Interference Resistance
When routing cables, ensure signal lines and 380V power cables are routed in separate channels or conduits, maintaining a minimum distance of 20 cm; do not route them in the same conduit or channel. Strictly implement single-ended grounding for shielded cables: ground only at the control cabinet end, leaving the shielding layer at the field transmitter end floating to prevent signal drift caused by ground loops; When installing additional equipment such as variable frequency drives or variable frequency motors in the vicinity, consider adding signal isolators and ferrite core filters to further mitigate electromagnetic interference.

3. Special Protection for Extreme Environments
High-temperature conditions: Avoid prolonged exposure of the transmitter to open flames or high-temperature pipe walls. If necessary, install heat-dissipating buffer joints to reduce the temperature of the housing;
Low-temperature and severe cold conditions: Ensure proper insulation and heat tracing of piping to prevent the medium from freezing and causing damage to the pressure-sensing element due to expansion, while also preventing frost and condensation on the equipment housing;
Highly Corrosive Conditions: For long-term exposure to acids, alkalis, wastewater, or chemical media, select versions with 316L stainless steel or corrosion-resistant alloy diaphragms. Regularly clean scale buildup from the interfaces to prevent corrosion perforation and probe failure;
High-Vibration Conditions: Install vibration-damping mounting brackets on the piping to prevent the transmitter from resonating with the pipeline over time, thereby reducing fatigue and aging of internal components and extending the service life of the entire unit.

4. Operating, Usage, and Maintenance Guidelines
Under no circumstances should the device be operated under overpressure, excessive temperature, or reverse pressure conditions. Do not arbitrarily alter the on-site wiring configuration or terminal definitions. Store idle or spare equipment in a dry, well-ventilated indoor environment; avoid outdoor storage to prevent moisture damage and rust. During storage, power the device once every six months to perform a no-load self-test and maintain stable circuit performance.

VIII. Troubleshooting & Emergency Response
8.1 List of Common Faults
No output when the transmitter is powered on; no signal feedback for pressure or temperature
Slow signal drift, zero-point offset; values change gradually on their own under static conditions
Measured values fluctuate significantly, fluctuating between high and low, with unstable data
Abnormal device indicator states, such as no light, constant illumination, or frequent rapid flashing
System triggers out-of-range alarms, over-temperature alarms, or fault alarms
No signal on a single temperature or pressure channel, while the other channel measures normally
During long-distance communication, RS485 disconnects, experiences packet loss, or cannot read data
Operating conditions are normal, but measured values are significantly too high or too low, with severe accuracy deviation

8.2 Analysis of Failure Causes
1. Wiring-related causes
Reversed power supply polarity; misaligned signal line polarity; crossed or reversed A/B communication lines; loose connections at HART connectors; loose wire terminals; oxidized or exposed wire cores; shielding grounded at both ends; ground loop interference caused by running high- and low-voltage lines through the same conduit.

2. Power Supply Issues
Supply voltage is below 18 V DC or above 36 V DC; excessive power supply ripple, unstable voltage regulation, or severe voltage drop in temporary power sources; short circuits in the power supply circuit, or insufficient power capacity of the external power supply resulting in inadequate load-carrying capability.

3. Signal Overload and Range Mismatch Causes
Actual medium pressure or temperature exceeds the transmitter's rated range, causing core saturation and component overload; selection of a range that is too small, resulting in zero-point drift due to long-term operation near the upper limit; downstream PLC acquisition load resistance exceeds the allowable range for 4–20 mA, causing the signal to be pulled down and distorted.

4. Environmental Interference Causes
Installation too close to variable frequency drives, high-power motors, or contactors, resulting in strong electromagnetic radiation; high humidity, condensation, water ingress into junction boxes, or dust accumulation causing reduced insulation; prolonged resonance in high-vibration environments leading to loose internal solder joints and parameter drift.

5. Causes Related to Equipment Damage
Corrosion, blockage, or crystallization of the pressure-sensing diaphragm; aging or broken wires in the PT100 temperature probe; internal circuitry breakdown due to lightning surges or overvoltage; water ingress and moisture due to seal failure, leading to oxidation and corrosion of circuit boards.

8.3 Step-by-Step Troubleshooting
1. No output from the unit; completely no signal
Troubleshooting Steps
Step 1: Use a multimeter to measure the supply voltage and confirm it is within the normal range of 18–30 V DC;
Step 2: Disconnect power and re-inspect wiring; verify that power supply polarity and signal terminals are correctly connected and free of loose connections;
Step 3: Check if the HART connector is loose, if water has entered the O-ring, or if terminals are oxidized and discolored;
Step 4: Disconnect the downstream load; power on the transmitter under no-load conditions to rule out short circuits in external wiring.
Repair Measures
Correct the power supply polarity, re-crimp the terminals, and replace damaged shielded cables; if the power supply is unstable, replace it with a regulated power supply; if water has entered the connector, dry it thoroughly and reseal and tighten it.

Emergency Workaround
If immediate on-site repair is not possible, temporarily replace the transmitter with a spare QDW90A-WY of the same model. Install it by aligning the threads and connecting the terminals as originally wired to quickly resume process monitoring.

2. Signal Drift, Spontaneous Zero-Point Shift
Troubleshooting Steps
Confirm that there is no gradual voltage increase or temperature gradient at the site; check for prolonged exposure to high-temperature radiation or significant environmental temperature fluctuations; verify whether the shielding cable is grounded at both ends or if there is improper grounding.
Remedial Measures
Perform zero-point calibration under no-load conditions; modify the shielding cable to be grounded at a single point in the control cabinet; move the unit away from high-temperature heat sources and add thermal insulation; clean scale and impurities from the diaphragm surface.
Emergency Response
Temporarily apply a small offset compensation on the host computer; perform a full-system calibration and environmental remediation during the next shutdown window.

3. Value Fluctuations, Interference Distortion, and Data Instability
Troubleshooting Steps
Observe whether there are variable frequency drives or motors in the vicinity that frequently start and stop; check whether high- and low-voltage circuits are routed through the same conduit; measure whether the grounding is reliable and whether the grounding resistance exceeds the standard.
Remedial Measures
Route signal lines and power cables separately, maintaining a distance of at least 20 cm; add ferrite core filters and install signal isolators; standardize single-point grounding and clean up loose ground connections.
Emergency Measures
Temporarily add digital filtering and smoothing/averaging algorithms in the program to stabilize the displayed data; subsequently perform on-site wiring modifications to address interference.

4. Abnormal Indicator Light Status
Indicator light does not illuminate: Check for lack of power supply, reversed polarity, or damaged internal power circuitry; correct power connections; if the light remains off despite normal voltage, determine that the equipment has a hardware failure.
Indicator light stays on without flashing: Open circuit in the signal loop, broken probe wire, or stuck range; check signal line continuity section by section and replace damaged cables.
Indicator light flashing rapidly: Overpressure, overtemperature, short circuit, or internal malfunction; immediately stop the process, reduce pressure, and cool down; disconnect power and inspect the circuit for short circuits.

5. No Signal on a Single Channel (Pressure Normal / Temperature Not Displayed or Vice Versa)
Troubleshooting Steps
Rule out issues with the shared power supply; test the output circuit of the faulty channel separately; verify whether the corresponding signal terminal connections are loose or broken.
Remedial Actions
Re-crimp the signal wires for the corresponding channel; if wiring is normal but there is still no output, determine that the transmitter circuit or sensor element for that channel is damaged.
Emergency Measures
Temporarily activate on-site backup single-point temperature and pressure measurement points for emergency monitoring; replace the entire transmitter during a shutdown.

6. RS485 Communication Disconnection, Unable to Read Data
Troubleshooting Steps
Verify whether lines A and B are reversed; Check if the bus is configured in a star topology and if the terminating resistors are mismatched; verify that the address code and baud rate settings match those of the host computer.
Remedial Actions
Swap the A/B wiring; switch to a daisy-chain bus configuration; match the terminating resistors; standardize communication parameters (address, baud rate, parity bit).
Emergency Measures
Temporarily switch to individual 4-20mA analog signal acquisition; rectify the communication bus configuration at a later date.

8.4 After-Sales Service Request Guidelines
1. Criteria for Determining Service Requests
The following situations warrant an immediate service request; do not attempt to disassemble or repair the unit on-site:
All power and wiring connections are normal, yet there is no output and the indicator lights are completely off;
The unit was not subjected to overpressure or overtemperature, yet readings are severely inaccurate and cannot be calibrated or restored;
Water ingress in the housing, corrosion or damage, burnt connectors, or obvious signs of internal burnout;
The PT100 temperature channel or pressure channel is permanently unresponsive;
Complete device failure caused by lightning strikes, power surges, or high-voltage interference.

2. Repair Process
Record the complete product model: QDW90A-WY, measurement range parameters, and serial number;
Record the fault symptoms, installation environment, duration of use, and on-site power supply and wiring configuration;
Take photos of the product nameplate, visible damage, and on-site installation and wiring;
Contact the manufacturer's after-sales service, provide specifications + fault description + photos, and request technical guidance or arrange for repair or replacement;
Return the faulty equipment via the original shipping method as instructed by after-sales service, noting the cause of the fault and operating conditions.

3. Warranty Coverage
With proper installation and use within rated operating conditions, the entire unit is covered by a 12-month warranty;
During the warranty period, free repair or replacement is provided for non-human-caused damage and non-violation of overpressure or overtemperature usage;
The following situations are not covered by the free warranty: unauthorized disassembly or modification, damage from external impact, forced disassembly under pressure, out-of-range or overloaded use, damage caused by exposure to strong acids, strong alkalis, or strong corrosives without selecting a corrosion-resistant model, and unauthorized modification of wiring circuits.

4. Daily After-Sales Recommendations
It is recommended to keep 1–2 spare units of the same model (QDW90A-WY) on-site at the project location. In the event of a sudden failure, these can be immediately substituted to ensure uninterrupted production line operation, while the faulty unit is returned to the factory for repair, thereby achieving zero downtime maintenance.