Plug-in Level Transmitter

I. Product Definition

Anhui Qidian Automation Technology Co., Ltd.'s QDY30B Series Stainless Steel Plug-in Level Gauge / is an integrated smart instrument specifically designed for industrial on-site liquid level monitoring. Its core function is to convert the liquid level height signal within a container into standard industrial electrical signals (such as 4-20mA current signals or RS485 digital signals), and to display the liquid level value intuitively via an on-site digital display, thereby enabling real-time monitoring, remote transmission, and automatic control of the liquid level.

This product is a straight-rod capacitive / hydrostatic level transmitter featuring a fully stainless steel straight-insertion probe structure. It operates by being directly inserted into the liquid medium without the need for venting cables. It integrates level sensing, signal processing, data display, and signal output functions, making it widely applicable for level measurement in storage tanks, reactors, and water tanks, particularly for monitoring liquid media that are non-corrosive and at ambient temperature and pressure. It also features an explosion-proof design, ensuring safe operation in hazardous areas.

Key Features:

1. Real-time Level Measurement: Accurately captures the liquid level height, supports customization for different measurement ranges, and covers standard level measurement requirements from 0–1 m to 0–20 m.

2. On-site Data Display: Equipped with a high-brightness LCD display, it allows for direct on-site reading of liquid level values with switchable units (m, cm, mm, etc.), eliminating the need for additional secondary instruments.
Standard Signal Output: Converts liquid level data into industry-standard 4-20mA current signals or RS485 Modbus-RTU digital signals, enabling direct integration with industrial control systems such as PLCs, DCSs, and digital display controllers to achieve remote monitoring and automatic control.

3. Explosion-proof Safety Protection: Features an explosion-proof housing design compliant with industrial explosion-proof standards, enabling stable operation in hazardous environments such as chemical and petroleum facilities where flammable and explosive gases are present.

4. High Stability and Interference Resistance: Equipped with a built-in signal processing circuit featuring temperature drift compensation and electromagnetic interference (EMI) resistance, ensuring stable measurement accuracy even in complex electromagnetic environments typical of industrial sites.

5. Plug-and-Play Maintenance-Free Design: Features an integrated all-stainless-steel probe design with no moving parts, eliminating issues such as pressure tube blockages or cable corrosion. Requires virtually no routine maintenance after installation, reducing operational and maintenance costs.

6. Wide Range of Operating Conditions: Supports measurement of liquid media under normal temperature and pressure conditions. Probe materials are available in 304 or 316L stainless steel, making it suitable for liquids of varying cleanliness levels and mild corrosiveness, such as clean water, wastewater, mildly acidic or alkaline solutions, and oil-based media.

II. Working Principle

The QDY30B series of stainless steel direct-insertion level transmitters primarily utilize the hydrostatic level measurement principle, though some models can be customized with capacitive sensing solutions upon request. The following provides a simplified explanation of the working process using the hydrostatic method as an example:

1. Pressure Sensing: A high-sensitivity pressure sensor is built into the tip of the stainless steel probe at the bottom of the transmitter. When the probe is immersed in the liquid medium, the sensor directly senses the hydrostatic pressure generated by the liquid's weight, calculated by the formula:
$P = \rho \times g \times h$
Where: P is the liquid static pressure, ρ is the density of the measured liquid, g is the acceleration due to gravity, and h is the liquid level height. In other words, the higher the liquid level, the greater the static pressure sensed by the probe; the two are in a strictly linear relationship.

2. Signal Conversion Stage: The pressure sensor unit converts the collected static pressure signal into a weak electrical signal (such as a millivolt-level voltage signal) and transmits it to the signal processing circuit inside the meter. The circuit amplifies, filters, temperature-compensates, and linearly corrects the signal to eliminate measurement errors caused by changes in ambient temperature and fluctuations in medium density, ensuring signal stability and accuracy.

3. Data Display and Output Stage: The processed digital signal is transmitted via two channels:
One path is transmitted to the meter's LCD display, where it is directly displayed as a liquid level value for easy on-site reading;
The other path is converted into a standard industrial signal (such as a 4–20 mA current signal), output through the transmitter's terminal block, and connected to a PLC, DCS, or digital display instrument to enable remote monitoring, data logging, and automatic control (such as high/low level alarms and pump start/stop control).
The entire workflow forms a closed-loop system of "pressure acquisition → signal conversion → data processing → display/output," enabling continuous, real-time level monitoring without any manual intervention.

III. Core Value and Solutions to Pain Points

3.1 Core Product Value

1. Accurate and Stable Level Monitoring: Addresses the issues of traditional level transmitters being susceptible to environmental interference and high measurement errors, providing high-precision measurement data with an accuracy of ±0.5% FS to deliver reliable level data support for industrial production.

2. Plug-and-Play Maintenance-Free Design: Replaces the vented cable structure of traditional submersible level transmitters, eliminating failures caused by cable corrosion, blockages, or breakage. Requires virtually no maintenance after installation, significantly reducing operational and maintenance costs.

3. Explosion-Proof Safety for Hazardous Environments: Featuring an explosion-proof housing design compliant with industrial safety standards, it addresses safety and compliance requirements for liquid level monitoring in flammable and explosive environments such as chemical and petroleum industries.

4. Integrated On-Site Display and Remote Control: Equipped with a built-in digital display, eliminating the need for additional secondary instruments. It also supports standard signal output, accommodating both on-site direct reading and remote monitoring needs, and is compatible with automated control systems.

5. Wide Range of Operating Conditions: The all-stainless-steel probe is available in various materials to accommodate multiple liquid media. It supports customization for different measurement ranges, meeting liquid level measurement requirements across various industries and scenarios.

6. High Interference Resistance: Built-in electromagnetic interference (EMI) suppression circuitry ensures stable operation in industrial environments with strong electromagnetic interference, such as those near variable frequency drives (VFDs) and motors, preventing misoperations caused by signal fluctuations.

3.2 Key Pain Points and Product Solutions

1. Customer Pain Points: Traditional submersible level transmitters use venting cables that are prone to corrosion, aging, and blockage by liquids, leading to frequent malfunctions. This requires regular maintenance and replacement, resulting in high operational costs and production delays.
Product Solution: The QDY30B features a fully stainless steel, straight-insert integrated probe structure with no venting cables or exposed, vulnerable hoses. The entire unit contains no components prone to

clogging or corrosion.
Direct Customer Benefits: Virtually maintenance-free operation reduces costs associated with spare parts replacement and manual repairs. The equipment ensures long-term stable operation, preventing production downtime caused by level instrument failures.

2. Customer Pain Point: In flammable and explosive environments such as chemical, wastewater, and oil and gas facilities, standard level gauges lack explosion-proof capabilities, posing safety hazards during on-site use and failing to meet safety inspection compliance requirements.
Product Solution: The entire unit features an explosion-proof display housing design with a sealed, explosion-proof structure, making it suitable for use in hazardous areas.
Direct Benefits for Customers: Meets safety standards for explosion-proof environments, passes safety inspections, and eliminates safety incidents caused by instruments in flammable and explosive environments, ensuring more compliant and worry-free production.

3. Customer Pain Point: Limited on-site space and reluctance to install additional secondary display instruments make it inconvenient to view real-time liquid levels, forcing operators to rely on remote monitoring from the central control room.
Product Solution: Features a built-in high-definition LCD local digital display; once installed, liquid level values can be read directly on-site without the need for secondary instruments.
Direct Benefits for Customers: Saves on the cost of purchasing and wiring secondary instruments; allows for direct on-site level monitoring during inspections; enables intuitive and efficient operation, saving time and budget.

4. Customer Pain Points: Industrial sites contain numerous variable frequency drives, motors, and power distribution cabinets, resulting in strong electromagnetic interference. This causes level signal drift and significant fluctuations, leading to false alarms and erroneous start/stop commands in PLCs and control systems.
Product Solution: Features built-in high-precision signal conditioning circuits, automatic temperature compensation, and anti-interference filtering design. The metal housing provides shielding, ensuring stable and linear signal output.
Direct Benefits for Customers: Accurate level measurement data without drift; control system logic remains stable; reduces false alarms and equipment malfunctions; production control is smoother and more reliable.

5. Customer Pain Points: Diverse on-site media and varying measurement heights make it difficult to match standard level transmitters—which have fixed ranges and limited material options—to specific operating conditions, resulting in complicated selection processes.
Product Solution: Supports multi-range customization with probe options in 304 or 316L stainless steel, suitable for various media including clean water, wastewater, mildly acidic or alkaline solutions, and oils.
Direct Benefits for Customers: A single brand with multiple specifications can fully cover the operating conditions of various tanks, tanks, and reactors in the workshop. Selection is simple without the need for repeated comparisons, offering strong adaptability and high versatility.

6. Customer Pain Points: Traditional level gauges are cumbersome to install with complex wiring, requiring on-site commissioning by professionals, making installation time-consuming and labor-intensive.
Product Solution: Features a standard threaded plug-in installation design that screws directly into the top. Wiring is simple, and the device is ready for use immediately upon powering on, eliminating the need for complex calibration or commissioning.
Direct Benefits for Customers: Installation is quick and hassle-free, requiring only a standard electrician to complete the work. This saves on on-site commissioning labor costs and installation time, allowing for rapid deployment.

7. Customer Pain Points: Conventional level transmitters only provide local display and cannot be integrated into PLC or DCS control systems, making automated remote monitoring impossible.
Product Solution: Comes standard with a 4-20mA analog signal and offers optional RS485 communication output, ensuring seamless compatibility with various industrial automation systems.
Direct Benefits for Customers: Easily integrates with automation control systems to enable remote level monitoring, automatic high/low-level start/stop functions, and interlock control, facilitating the intelligent upgrade of production facilities.

IV. Key Product Parameters & Specifications

4.1 Basic Electrical Parameters
Measurement Range: 0–1 m to 0–20 m (customizable)
Measurement Accuracy: ±0.5% FS
Non-linearity Error: ≤±0.2% FS
Repeatability Error: ≤±0.1% FS
Hysteresis Error: ≤±0.1% FS
Signal Output Type: Standard 4–20 mA analog current signal; optional RS485 Modbus-RTU digital signal
Output Load Capacity: Maximum load resistance for 4–20 mA output ≤500 Ω
Resolution: 0.01% of full scale
Temperature Compensation Range: -20°C to +80°C (full-range digital temperature compensation)
Response Time: ≤100 ms
Communication Baud Rate (RS485 model): 1200–115200 bps (configurable)
Address Coding: Station numbers 1–255 (customizable)

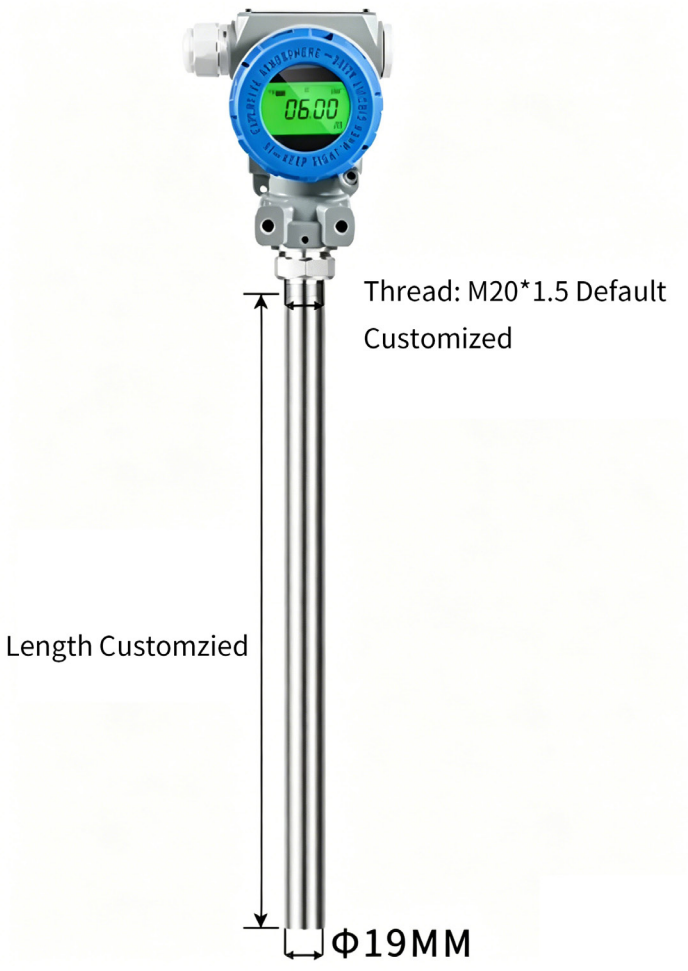
4.2 Isolation Performance Parameters
Input/Output Electrical Isolation: Integrated design featuring electromagnetic and opto-electrical isolation
Isolation Withstand Voltage: AC 2000 V for 1 minute between input, output, and power supply without breakdown
Insulation Resistance: ≥100 MΩ (DC 500 V)
Common-Mode Rejection Ratio (CMRR): ≥80 dB
Interference Immunity: Complies with industrial EMC standards; resistant to high-frequency interference from inverters, motors, and power distribution cabinets
Signal Isolation Method: Fully isolated architecture; eliminates ground loop interference and potential difference crosstalk
Surge Protection: Built-in lightning and surge protection circuits, suitable for industrial environments with lightning strikes and transient high-voltage surges

4.3 Power Supply & Power Consumption Parameters
Standard Supply Voltage: DC 24V (18–36V DC wide-voltage compatible)
Allowed Supply Voltage Range: DC 18V–36V
Reverse Polarity Protection: Supports protection against reversed polarity of the power supply; will not damage the instrument
Full-Load Power Consumption: ≤1.2W
Standby Power Consumption: ≤0.8W
No external power distribution output; no need for additional external power supply to the sensor; operates on a single 24V DC power supply

4.4 Environmental Adaptation Parameters
Operating Temperature Range: -20°C to +80°C
Ambient Operating Temperature: -30°C to +70°C
Storage Temperature: -40°C to +85°C
Operating Relative Humidity: 10% RH to 90% RH (non-condensing)
Storage Relative Humidity: 5% RH to 95% RH (non-condensing)
Protection Rating: IP65 (instrument head); fully sealed, waterproof, and corrosion-resistant for the submerged portion of the probe
Explosion-Proof Rating: Ex d II CT6 (flameproof type)
Compatible Safety Barrier Models: Standard configuration compatible with intrinsically safe isolation safety barriers and Zener-type safety barriers; suitable for use with intrinsically safe circuits in chemical and petrochemical explosion-proof zones
Applicable Media: Clean water, sewage, industrial wastewater, oils, and mildly acidic or alkaline liquids (316L probe suitable for mildly corrosive conditions)
Vibration resistance: Complies with GB/T 13306 standard; stable operation in industrial environments with continuous vibration

4.5 Physical Parameters
Installation Method
Standard external thread top-mounted direct insertion installation

Standard thread specifications: M27×2, G1½, G2 (customizable)
Installation Configuration: Direct insertion and fixation onto tank tops, pool covers, or reactor flanges/threaded interfaces; no brackets or pressure-transmitting tubes required
Dimensions
Indicator Head: Length × Width × Height 110mm × 85mm × 60mm
Probe Diameter: Φ20mm standard stainless steel straight-insert probe
Probe Length: Customizable according to range, from 1000mm to 20000mm
Overall Structure: Separate display unit + integrated straight-insert probe, seamless welded construction
Total Weight
Standard 1-meter range total weight: approx. 1.2kg
Weight increases by approximately 0.25 kg for every additional 1 meter of probe length
Housing Material and Protection Details
Indicator Housing: Aluminum alloy explosion-proof die-cast housing with anti-corrosion electrostatic coating
Probe Material: Standard 304 stainless steel; optional 316L stainless steel
Seal Material: High-temperature and corrosion-resistant fluororubber seals
Cable Exit: Explosion-proof sealed cable gland, waterproof, dustproof, and corrosion-resistant
Structural Protection: Fully sealed welding process, no leakage at weld seams; sealed protection for the sensing unit at the lower end of the probe rod to prevent silt, sand, and debris accumulation and blockage
Surface Treatment: Instrument housing treated for oxidation resistance, corrosion resistance, and resistance to acid and alkali exposure in outdoor environments; probe rod with brushed finish for rust prevention, ensuring no rusting even during long-term submersion



V. Application-Specific Selection Guide
5.1 Key Selection Criteria
1. Signal Type Selection
Basic Monitoring / PLC Integration Scenarios: Prioritize models with 4–20 mA standard current signal output. These offer strong compatibility and work with the vast majority of industrial PLCs, DCS systems, and digital display controllers without requiring additional communication modules.
Remote Data Acquisition / Host Computer Monitoring Scenarios: Prioritize models with RS485 Modbus-RTU digital signal output. These support multi-device networking and centralized data upload, and are compatible with industrial IoT platforms and remote monitoring systems.
Mixed Signal Requirements: Customize models with dual 4-20mA + RS485 signal output as needed to simultaneously meet on-site control and remote monitoring requirements.

2. Range Selection
The measurement range must cover the maximum liquid level at the site. It is recommended to allow a 10% safety margin to avoid measurement errors and equipment damage caused by operating at full scale.
For example: If the actual maximum liquid level at the site is 8 m, it is recommended to select a model with a 0–10 m range rather than a 0–8 m range to ensure long-term stable operation.
For special depth applications (>20 m), contact the manufacturer to customize an extended probe range.

3. Probe Material Selection
Fresh water, ordinary wastewater, and neutral media applications: The standard 304 stainless steel probe offers high cost-effectiveness and meets general corrosion resistance requirements.
Weakly acidic/alkaline or mildly corrosive media (e.g., pharmaceutical wastewater, chemical diluents): Upgrade to a 316L stainless steel probe to enhance corrosion resistance and extend the equipment's service life.
Highly corrosive media: This model is not recommended; use level transmitters with special corrosion-resistant structures (e.g., PTFE-lined) instead. Contact the manufacturer for alternative solutions.

4. Selection Based on Explosion-Proof Requirements
Non-explosive environments (e.g., standard water treatment plants, residential building water tanks): Select the non-explosion-proof base model to reduce procurement costs.
Explosive hazardous areas (e.g., chemical storage tank areas, oil and gas processing workshops, pharmaceutical explosion-proof workshops): Must select the flameproof explosion-proof model (Ex d II CT6), and must be equipped with safety barriers and explosion-proof junction boxes that comply with regulations to meet safety inspection and acceptance requirements.

5. Selection Based on Installation Environment and Thread Specifications
Installation Method: The default installation method is top-mounted direct thread insertion. Select the appropriate thread based on the thread specifications of the tank or reservoir interface at the site. Standard options include M20×1.5, M27×2, G1½, G2, etc. Non-standard threads can be customized.
Scenarios with Limited Installation Space: Confirm the on-site top installation height and ensure sufficient space is reserved for probe installation to prevent the probe from being too long to fully insert.
Scenarios with Media Containing Impurities or Prone to Silting: Prioritize custom probe models with anti-clogging structures at the probe tip to minimize the impact of silt and impurities on the sensing unit.
Power Supply Selection
Standard industrial applications: Default 24V DC power supply, compatible with the vast majority of industrial site power systems, supporting a wide voltage range of 18–36V.
Special power supply scenarios (e.g., no 24V DC power source): Contact the manufacturer to customize an AC 220V model with a built-in power conversion module to meet on-site power requirements.

5.2. Recommended Selection for Industry Scenarios
1. Chemical Industry Scenarios
For applications such as chemical storage tanks, reactors, and wastewater tanks, the QDY30B explosion-proof level transmitter is the preferred choice. Select 304 or 316L stainless steel for the probe material based

on the characteristics of the medium. The signal type should prioritize the 4-20mA + RS485 dual-output model, which is compatible with intrinsically safe circuits in explosion-proof zones and used in conjunction with safety barriers. Additionally, the measurement range should be customized based on tank depth to ensure compliance with the chemical medium's corrosion resistance, explosion-proof safety, and automated monitoring requirements.

2. Power Industry Applications
For operating conditions such as power plant cooling towers, circulating water tanks, boiler feedwater tanks, and wastewater treatment tanks, we recommend the QDY30B standard or explosion-proof model. The standard 304 stainless steel probe material is sufficient to meet measurement requirements for clean water and industrial circulating water. The 4-20mA signal type is the preferred choice, as it is compatible with power plant DCS control systems. The measurement range is customized based on the depth of the tank / tank depth. Special attention should be given to the device's electromagnetic interference (EMI) resistance to ensure stable operation in strong electromagnetic environments.

3. Metallurgical Industry Applications
For applications such as metallurgical recirculating water tanks, cooling water tanks, and wastewater treatment tanks, the QDY30B enhanced anti-interference model is recommended. For the probe material, prioritize 316L stainless steel, which is suitable for industrial wastewater in the metallurgical industry that contains impurities and is mildly corrosive. Select the 4-20mA signal type, and choose the appropriate thread specification based on the on-site installation interface. Pay close attention to the device's vibration resistance and electromagnetic interference immunity to ensure compatibility with the complex environments of metallurgical sites characterized by strong vibrations and intense electromagnetic interference.

4. Pharmaceutical Industry Applications
For applications such as pharmaceutical mixing tanks, purified water storage tanks, and wastewater treatment systems, the QDY30B sanitary-grade model is recommended. The probe material should preferably be 316L stainless steel to ensure no secondary contamination of the media-contacting parts. In explosion-proof workshops, explosion-proof level transmitters must be selected. Signal types can be chosen as 4-20mA or RS485 based on control system requirements, with the measurement range customized according to tank height to meet the pharmaceutical industry's multiple requirements for cleanliness, explosion-proof safety, and automated monitoring.

5. Smart Manufacturing and Water Treatment Industry Applications
For applications such as smart water treatment plants, automated wastewater treatment stations, and smart tank control systems, we recommend the QDY30B RS485 communication model. It supports multi-device networking and remote data upload. The probe is standardly made of 304 stainless steel, making it suitable for both clean water and wastewater media. The RS485 Modbus-RTU signal type is the preferred choice for compatibility with industrial IoT platforms and remote monitoring systems. Additionally, the measurement range is customized according to the depth of the tank / tank, the measurement range is customized to meet the requirements of intelligent, unmanned operation and maintenance.

5.3 Common Selection Pitfalls
Pitfall 1: Neglecting Isolation Levels, Leading to Signal Interference and Equipment Damage
Some users focus solely on measurement range and signal type during selection, neglecting ground loop interference and electromagnetic interference (EMI) issues in industrial environments. Choosing level transmitters with no isolation or low isolation levels results in signal fluctuations, data drift, and even damage to PLC input modules. Correct Approach: Prioritize models with fully isolated designs to ensure electrical isolation between power supply, input, and output, thereby resisting electromagnetic interference in industrial environments.

Misconception 2: Incorrect Signal Range Selection Affects Measurement Accuracy and Equipment Lifespan
To save costs, some users select models with a range that exactly matches the actual on-site liquid level, leaving no safety margin. This causes the equipment to operate at full scale for extended periods, compromising measurement accuracy and service life. Alternatively, selecting a range that is too large results in insufficient measurement resolution at low liquid levels, leading to inaccurate data. Correct Approach: The selected range should exceed the maximum on-site liquid level by 10%–20%. Additionally, choose an appropriate range based on the typical liquid level range to balance accuracy and equipment lifespan.

Misconception 3: Neglecting load matching, leading to abnormal signal output
Some users fail to consider the maximum load capacity of the 4–20 mA signal during selection. Connecting secondary instruments or PLC modules that exceed the transmitter's load range results in low signal output, failure to transmit data normally, or even damage to the transmitter's output circuitry. Correct Approach: When selecting a model, verify the transmitter's maximum load resistance and ensure the total load of downstream devices does not exceed the transmitter's capacity. For 4–20 mA models, the maximum load is ≤500 Ω; this must be calculated based on the on-site wiring length and the impedance of downstream devices.

Misconception 4: Selecting General-Purpose Models in Explosion-Proof Environments, Posing Safety and Compliance Risks
Some users in flammable and explosive hazardous areas, such as chemical and oil & gas facilities, select non-explosion-proof general-purpose level transmitters, which pose safety hazards and fail to pass safety inspections. Correct Approach: In explosion-proof environments, models with the corresponding explosion-proof rating must be selected. This flameproof explosion-proof model is suitable for the vast majority of explosion-proof zones. Additionally, safety barriers and explosion-proof junction boxes compliant with regulations must be used to ensure on-site safety and compliance.

Misconception 5: Ignoring Medium Characteristics, Leading to Equipment Corrosion and Damage Due to Incorrect Probe Material Selection
Some users fail to consider the corrosiveness of the medium and directly select the standard 304 stainless steel probe for weak acids, alkalis, or media containing chloride ions, resulting in probe corrosion, perforation, and equipment failure. Correct Approach: When selecting a model, clearly identify the medium's composition, concentration, and temperature. For mildly corrosive media, prioritize 316L stainless steel probes; for highly corrosive media, contact the manufacturer to request specialized corrosion-resistant models.

5.4 Customization Recommendations (Solutions for Special Scenarios)
1. Custom Signal Solutions
In addition to the standard 4-20mA and RS485 signals, voltage signal output options such as 0-5V and 0-10V can be customized according to user requirements. Dual-protocol models, such as 4-20mA + HART or RS485 + Modbus, are also available to meet the communication needs of special control systems or smart instruments. Additionally, multi-signal output models can be customized to accommodate scenarios requiring simultaneous connection to different control systems.

2. Custom Solutions for Non-Standard Operating Conditions
Customization of Non-Standard Threads and Mounting Methods: In addition to standard threads such as M20×1.5 and M27×2, we support customization of non-standard mounting interfaces, including flange mounting and chuck mounting, to accommodate the installation requirements of special storage tanks and reactors.
Custom Probe Shafts: We offer extended probe shafts (>20 m), thickened probe shafts, probe shafts with anti-clogging/anti-silting structures, or probe shafts with special anti-corrosion coatings to accommodate non-standard media conditions such as those containing impurities, high viscosity, or mild corrosion.
Wide Temperature Range / Special Environment Customization: We can customize high-temperature-resistant and low-temperature-resistant probes to accommodate special media such as high-temperature hot water and low-temperature refrigerants, or provide models with higher protection ratings (IP67/IP68) for harsh outdoor environments exposed to rain, humidity, and dust.

3. Multi-Channel Integration and Customized System Solutions
We can provide integrated solutions comprising a level transmitter + signal isolator + safety barrier + secondary display instrument based on user requirements, enabling a complete end-to-end solution from level measurement to signal transmission and on-site display, eliminating the need for users to select and configure components themselves. We also support customized multi-channel level monitoring system solutions to meet centralized monitoring needs for multiple storage tanks and reservoirs, offering one-stop services including equipment selection, wiring diagrams, and commissioning guidance.

4. Industry-Specific Custom Solutions
To address the unique requirements of industries such as pharmaceuticals, food processing, and chemicals, we offer industry-specific models including sanitary-grade, intrinsically safe explosion-proof, and anti-scaling variants. We also support the customization of models accompanied by compliance documents such as calibration certificates and explosion-proof certification, ensuring compliance with industry safety regulations and certification requirements.

VI. Installation and Commissioning Guidelines
6.1 Pre-installation Preparation
1. Verification of Components
After unpacking, verify that the product model, measurement range, probe length, and thread specifications match the order.
Inspect the instrument's exterior: ensure the display, probe, and threads are free of dents or deformation; check that the digital display is intact; and confirm that the explosion-proof seals are undamaged.
Confirm that all accessories are included: explosion-proof gland, sealing gasket, installation manual, and certificate of conformity (if required).

2. Environmental Inspection
At the installation site, verify the specifications of the tank/tank top connection. Ensure the thread matches the transmitter and that the connection point is free of burrs and debris.
Confirm medium conditions: Ensure that the medium temperature, corrosiveness, and impurity content align with the instrument selection requirements. Avoid using non-316L probes with highly corrosive media.
In explosion-proof environments, verify the on-site hazardous area classification. Ensure the instrument's explosion-proof rating meets site requirements, and that no open flames or high-temperature sources compromise installation safety.

3. Tool List
Common Tools: Adjustable wrench, Allen wrench, screwdrivers (flathead/Phillips), wire strippers, multimeter.
Installation Aids: PTFE tape, sealant (if required), electrical tape, cable ties, grounding flat bar/cable.
Commissioning Tools: Signal generator (for 4–20 mA calibration), multimeter (for voltage/current measurement), insulation resistance tester (optional for explosion-proof environments).

4. Safety Precautions
Power must be disconnected before installation in explosion-proof environments. Opening the cover and connecting wires while the system is energized is strictly prohibited; power may be restored only after installation is complete.
Wear a safety harness when installing at heights. If the probe is long, two people must work together to prevent bending or deformation of the probe.
If the on-site medium is a flammable or explosive liquid, sparks must be strictly avoided during installation, and explosion-proof tools must be used.
Verify that the on-site grounding system is intact, and ensure the instrument's grounding terminal is securely connected to prevent static electricity buildup.

6.2 Standard Installation Procedure
1. Mechanical Installation (Top-Mounted Threaded Installation)
Clean the mounting interface on the top of the tank or tank, remove debris and burrs from the threads, and ensure the interface is flat.
Apply PTFE tape (or sealant) evenly to the transmitter's external threads, winding in the same direction as the tightening direction to ensure a leak-tight seal.
Align the transmitter probe vertically with the mounting interface and slowly screw it in until the threads are tightened (do not apply excessive force to avoid damaging the threads). Ensure the probe is inserted completely vertically into the medium, with no tilting or wobbling.
Adjust the orientation of the display so that the digital screen faces a position convenient for on-site observation. Tighten the explosion-proof gland to ensure a secure seal.

2. Wiring Specifications (Terminal Identification)
Open the side cover of the instrument to reveal the internal terminals. Identify them according to the labels:
+24V: Power supply positive terminal (connect to the positive terminal of a 24V DC power supply)
GND/-24V: Power supply negative terminal (connect to the negative terminal of a 24V DC power supply)
OUT+: 4-20mA signal output positive terminal (connect to the positive terminal of the analog input on a PLC or secondary instrument)
OUT-: 4-20mA signal output negative terminal (connect to the negative terminal of the PLC or secondary instrument's analog input)
(Additional terminals for RS485 models) A/B: RS485 communication terminals (A connects to the A end of the communication cable, B connects to the B end of the communication cable)
Wiring Requirements:
Keep wire stripping length between 8–10 mm; ensure no bare copper wires are exposed; crimp terminals must be secure.
Do not connect more than two wires to a single terminal; use terminal blocks to connect multiple wires.
Use flame-retardant shielded cable; ground the shield at one end only (ground only at the control cabinet side; do not ground at the instrument end).

3. Grounding Requirements
The instrument housing grounding terminal must be connected to the on-site protective grounding system, with a grounding resistance ≤4Ω, to prevent electromagnetic interference and static electricity effects.
In explosion-proof environments, the instrument grounding must be reliably connected to the on-site explosion-proof grounding network; sharing the grounding circuit with high-voltage equipment is strictly prohibited.
The signal shielding wire must be grounded at a single point on the control cabinet side only; the shielding layer at the instrument end must be left floating to prevent ground loop interference.

6.3, Wiring Diagram Notes
1. Wiring Specifications for Standard 4-20mA Models
Power Circuit: DC 24V power supply positive terminal → +24V terminal; DC 24V power supply negative terminal → GND terminal.
Signal Circuit: OUT+ terminal → PLC / secondary instrument AI+; OUT- terminal → PLC / secondary instrument AI-.
Shielding Wire Handling: Ground the cable shield on the control cabinet side; do not ground it at the instrument end to avoid ground loop interference.
Correct vs. Incorrect Comparison:
Incorrect: Reversing the power and signal terminals causes the instrument to malfunction or produce abnormal output; grounding both ends of the shielding wire creates ground loop interference.
Correct: Wire strictly according to terminal labels; ground the shielding wire at a single end; ensure no cross-connections or loose connections in the circuit.

2. RS485 Model Wiring Specifications
Power Circuit: Same as the 4-20mA model; connect +24V to the positive power supply terminal and GND to the negative power supply terminal.
Communication Circuit: Connect terminal A to communication bus line A and terminal B to communication bus line B; a terminating resistor (120Ω) must be installed at the end of the bus.
Shielding Wire Handling: Ground the communication cable shield at a single point on the control cabinet side; leave it floating at the instrument end. Grounding at both ends of the bus must be consistent.
Correct vs. Incorrect Comparison:
Incorrect: A/B terminals are reversed, causing communication failure; terminating resistor is not connected, resulting in bus signal reflection and data packet loss.

Correct: A/B wires are connected according to their labels; a 120Ω terminating resistor is connected at the bus end; the shield is grounded at a single point.

3. Dedicated Wiring Specifications for Explosion-Proof Environments
Explosion-proof certified cable glands must be used. The cable outer diameter must match the gland seal to ensure explosion-proof sealing.
After wiring is complete, the instrument's explosion-proof cover must be tightened to ensure the explosion-proof surfaces are properly sealed. Operating the instrument with the cover open is strictly prohibited.
Intrinsically safe circuits must be equipped with a safety barrier. The safety barrier must be installed in the safe area, and the instrument-side cables must comply with intrinsically safe explosion-proof requirements.

6.4 Power-On Commissioning Procedure
1. No-Load Test
After wiring is complete, recheck that the power and signal terminal connections are correct and that grounding is reliable.
Slowly apply power and observe whether the instrument's digital display lights up and whether the instrument exhibits abnormal heating or unusual noises.
Under no-load conditions (probe not immersed in liquid), the instrument should display a liquid level value of "0.00" with no alarm indication.

2. Signal Calibration
4–20 mA Model: Use the current range of a multimeter, connect it in series with the signal loop, and measure the output current.
When the liquid level is 0% (no load), the output should be 4 mA; when the liquid level is 100% (full scale), the output should be 20 mA, with a linearity error of ≤±0.5%.
RS485 Model: Use a Modbus debugging tool to connect to the instrument's communication port, read the liquid level data, and confirm that data is being uploaded normally and that the address and baud rate match.

3. Indicator Lights / Digital Display Status Assessment
Normal Status: The digital display shows a stable liquid level value with no flickering or garbled characters.
Abnormal Status:
Digital display is off: Check the power connections and ensure the supply voltage is within the 18–36 V DC range.
Displays "Err" or garbled characters: Check for loose connections in the signal circuit, excessive electromagnetic interference, or power cycle the unit to reset.
Constant Output (e.g., consistently 4mA or 20mA): Check if the probe is clogged, if the medium has overflowed the measurement range, or if the signal terminals are reversed.

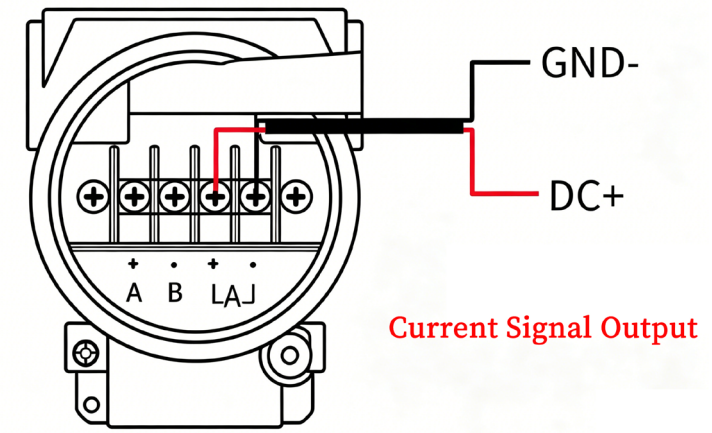
4. Calibration Methods
Zero Calibration: Place the probe at the lowest liquid level of the medium (or in an empty state). Use the instrument buttons (or a host computer) to set the zero point, ensuring the output is 4mA and the displayed liquid level is 0%.
Full-scale calibration: Place the probe at the highest liquid level (or fill with liquid to the corresponding height), set the full-scale value, and ensure the output is 20 mA and the displayed level is 100%.
Linearity calibration: Select an intermediate level point (e.g., 50% of the range) and check if the output current is 12 mA. If the error exceeds ±0.5%, perform zero and full-scale calibration again.

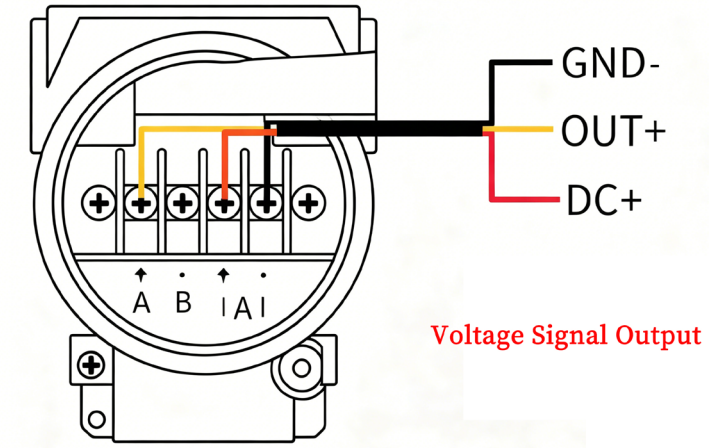
6.5 Installation Precautions and Protective Measures
1. Do Not Exceed Supply Voltage Limits
The supply voltage must not exceed 36 V DC, as this will burn out the instrument's power circuit; it must also not fall below 18 V DC, as this will prevent the instrument from functioning properly.
Do not use a direct 220 V AC power supply. If AC power is required, use the supplied 24 V DC power module.

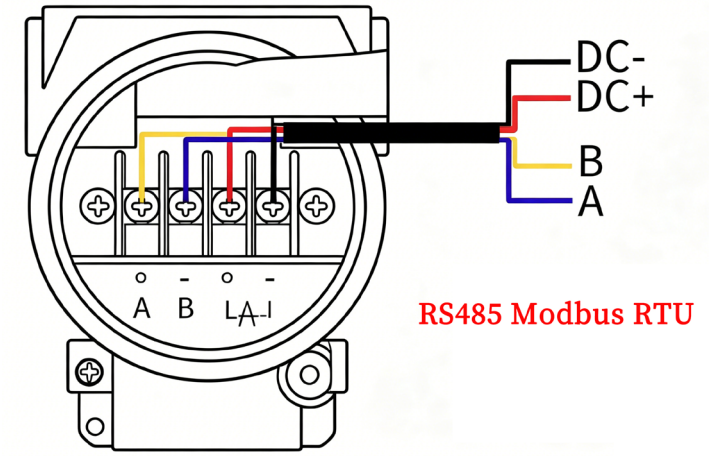
2. Avoid High-Voltage Interference
Instrument cables must be routed separately from power cables and variable frequency drive (VFD) cables, maintaining a minimum distance of 30 cm to prevent signal fluctuations caused by electromagnetic interference.

3. Protection Against Humid/Harsh Environments
For outdoor installations, install a rain cover over the instrument to prevent rainwater from splashing directly onto the meter face, which could compromise the explosion-proof seal and electrical safety.
In humid or dusty environments, regularly inspect the explosion-proof gland and the instrument's sealing cap for looseness to prevent moisture and dust from entering the instrument.
When the medium contains a large amount of silt or impurities, a clog-proof protective cover may be installed at the end of the probe to prevent impurities from accumulating and blocking the sensing unit.

4. Mechanical Installation Precautions
Never strike or bend the probe with force. The probe is a precision component; bending or deformation may cause measurement errors or damage to the sensor unit.
Do not overtighten the threads during installation to avoid damaging the tank interface or the instrument threads, which could lead to seal failure and leakage.
Never install the instrument in locations subject to severe vibration. Prolonged intense vibration may affect the instrument's stability; install vibration-damping brackets if necessary.







VII. Recommendations for Daily Use & Operation and Maintenance

7.1 Key Points for Daily Inspections

1. Level Display and Value Inspection

Visually inspect the QDY30B LCD display on-site daily to confirm that the real-time level readings are stable, with no sudden fluctuations, garbled characters, or stuck values. Compare the on-site display with remote data from the central control PLC or host computer to ensure consistency between the on-site display and the backend data, with no discrepancies or delays.

2. Signal Stability Monitoring

For the standard 4-20mA version, periodically observe whether the output current remains linear and stable, with no sudden spikes or drops and no frequent fluctuations. For the RS485 communication version, verify that data is continuously uploaded to the host computer without packet loss, disconnections, or communication interruptions. If signal abnormalities are detected, promptly investigate wiring and interference issues.

3. Operating Temperature, Humidity, and Environmental Inspection

Inspect whether the ambient temperature and humidity around the instrument are within the product's permissible range to avoid prolonged exposure to extreme high or low temperatures and high-humidity environments prone to condensation. In outdoor and poolside areas, pay close attention to whether the instrument housing shows signs of condensation, water ingress, or moisture damage. In explosion-proof zones, strictly prohibit the accumulation of flammable debris around the instrument or the obstruction of ventilation and heat dissipation spaces.

4. Visual and Structural Condition Inspection

Verify that the stainless steel plug-in probe is vertical with no tilting or bending, and that the surface shows no significant corrosion, scaling, or extensive buildup of mud or sand. Ensure the instrument housing has no cracks, the explosion-proof seal cap is secure, and the cable gland is tight with no water ingress. The overall structure must be intact with no mechanical damage.

5. Power Supply and Operational Status Inspection

Verify that the supply voltage remains stable within the standard range of DC 18–36 V, with no sudden voltage fluctuations or transient voltage drops. Ensure the instrument operates without abnormal overheating, odors, or unusual noises. Immediately shut off the power and investigate if abnormal temperature rises occur.

7.2. Regular Maintenance Plan

1. Specifications for Overall Cleaning Intervals

Standard water treatment plants, clean water conditions: Clean the exterior and probe surface every 3 months;

Sewage, high-impurity, or high-dust conditions: Clean once a month;

Chemical processing or mildly corrosive conditions: Clean every 2 months and inspect for surface corrosion;

Clean the meter head and probe with a dry cloth or clean water. Never rinse the explosion-proof meter head directly with water, and never use strong acids or alkalis to wipe the housing.

2. Wiring and Fastening Inspection Schedule

Conduct a comprehensive wiring and fastening inspection every six months: Check that power terminals, signal terminals, and RS485 communication terminals are free of looseness, oxidation, and loose connections; Verify that grounding cables and shielding wires are securely crimped, and that explosion-proof cable glands are properly sealed and locked in place to prevent cable displacement or poor contact caused by prolonged vibration.

3. Inspection of Sealing and Protective Components

Annually inspect the instrument head's sealing gasket, explosion-proof joint surfaces, and cable gland seals for signs of aging, hardening, or deformation; replace any failed seals immediately to prevent moisture or dust from entering the internal circuitry and causing malfunctions.

4. Recommendations for Accuracy Retesting and Calibration

Conduct an accuracy comparison retest every six months by comparing the actual on-site liquid level with the instrument display and central control system data. If the error exceeds the allowable range, promptly recalibrate the zero and full-scale points to restore measurement accuracy. In scenarios with significant operating fluctuations or media prone to scaling, it is recommended to retest every three months.

Communication and Auxiliary Circuit Maintenance (RS485 Model)

Inspect the communication bus, terminating resistors, and branch connection points annually to ensure the bus shielding is properly grounded, free of damage, and without exposed wires. In multi-device network configurations, regularly verify device addresses and baud rate parameters to prevent communication failures caused by parameter discrepancies.

7.3 Long-Term Maintenance Tips

1. Long-Term Dust and Moisture Protection

For indoor installations, ensure the control cabinet remains well-ventilated and dry to prevent condensation and dust accumulation inside the cabinet. For outdoor installations, a rainproof and sunshade protective cover must be installed to prevent direct exposure to rain and sun-induced aging. When the instrument is idle for an extended period, keep it in standby mode without powering it off; utilize its low power consumption to dissipate internal moisture and prevent circuit board oxidation due to humidity.

2. Long-Term Measures for Interference Suppression

Use shielded cables for all instrument signal and communication lines, strictly ensuring that the shield is grounded at a single point to eliminate ground loop interference caused by grounding at both ends. Route power cables and inverter cables separately from instrument signal lines, maintaining a safe distance; do not run them through the same conduit or lay them parallel over long distances. In environments with strong electromagnetic interference, install signal isolators to ensure long-term, stable signal transmission quality.

3. Specialized Protection for Extreme Environments

High-Temperature Environments: Avoid prolonged exposure of instruments to direct sunlight or close proximity to heat sources. Allow sufficient space for heat dissipation to prevent accelerated circuit aging.

Low-Temperature Environments: In severe winter conditions, verify the instrument's low-temperature operating range in advance to prevent prolonged exposure to sub-zero temperatures, which can cause LCD response delays and sensor accuracy drift.

Corrosive Conditions: In environments containing weak acids, alkalis, or chloride ions, prioritize the 316L stainless steel probe version. Regularly inspect the probe surface for corrosion and predict replacement intervals in advance;

High-Vibration Conditions: Install the instrument away from vibration sources such as large motors and pumps. If necessary, add vibration-damping pads to mitigate long-term vibration damage to internal circuits and the probe structure.

4. Long-Term Shutdown Maintenance Guidelines

When equipment is idle for an extended period, there is no need to remove the instrument; however, the meter face must be wrapped to protect against dust, and cable connectors must be protected against water. Before restarting and putting the equipment back into service, perform a visual inspection, tighten all connections, and conduct a no-load zero-point calibration. Only resume normal operation after confirming that everything is in order.

VIII. Troubleshooting & Emergency Procedures

8.1 List of Common Faults

No display when the instrument is powered on; no indicator lights respond; no signal output

The 4–20 mA signal remains constant, always at 4 mA or 20 mA, and does not change with liquid level

Level signal drift; frequent value fluctuations; readings fluctuate wildly and are unstable

RS485 communication failure; host computer cannot read data; frequent disconnections and packet loss

On-site digital display shows garbled characters, black screen, or values freeze and do not refresh

High/low level alarms trigger without cause under normal operating conditions; control system malfunctions

Measurement deviation increases after prolonged use; error between

actual level and instrument display exceeds tolerance
In humid or outdoor environments, condensation forms inside the meter housing, or slight water seepage occurs at seals

8.2 Analysis of Core Causes of Malfunctions
1. Wiring-related causes
Reversed power supply polarity; signal terminals mixed with power terminals; shielding wire grounded at both ends, creating a ground loop; reversed RS485 A/B wires; loose, oxidized, or faulty connections at terminals.

2. Power supply-related causes
Supply voltage below 18 V DC or above 36 V DC; excessive power supply ripple; insufficient adapter power; high contact voltage drop in the power supply circuit; damage to the power supply circuit caused by transient surges.

3. Load and Impedance Mismatch Causes
Excessive load resistance connected to the 4–20 mA output, exceeding the transmitter's allowable load range; impedance mismatch between secondary instruments or PLCs and the signal input, causing signal attenuation and distortion.

4. Environmental Interference Causes
Signal lines are laid in parallel with power cables or variable frequency drive (VFD) cables within the same conduit; strong electromagnetic interference generated by on-site motors, distribution panels, or VFDs; lack of shielding grounding or improper grounding.

5. Operating Conditions and Installation-Related Causes
The probe rod is tilted, deformed due to stress; the sensing surface is covered with sediment; insufficient margin was left during range selection; excessive installation vibration causes internal components to shift.

6. Equipment Damage-Related Causes
Long-term exposure to high temperature and humidity causes internal circuit aging; water ingress due to seal failure; corrosion and damage to the sensing unit; lightning surges causing signal circuit breakdown.

8.3 Step-by-Step Troubleshooting
Fault 1: No display or output upon power-up
Troubleshooting steps:
Use a multimeter to measure the supply voltage and confirm it is within the normal range of DC 18–36 V.
Check whether the positive and negative power terminals are reversed or if any terminals are loose or disconnected.
Inspect the cable gland of the explosion-proof meter to check for water ingress and whether there is condensation or short circuits inside.
Disconnect all downstream loads, power on the transmitter alone for testing, and rule out short circuits in external circuits.
Remedial Actions: Correct the wiring, replace with a qualified 24V DC power supply; Re-crimp and tighten the terminals; for moisture-damaged instruments, power off and dry them or return them to the factory for repair.
Contingency Plan: Temporarily replace with a spare transmitter of the same model to restore production monitoring.

Fault 2: Signal remains fixed, stuck at 4 mA or 20 mA
Troubleshooting Steps:
Check whether the probe is completely detached from the liquid level, jammed by debris, or has its sensing end completely covered and blocked by silt.
Verify whether the selected measurement range is severely mismatched with actual operating conditions.
Check whether the signal output terminals are short-circuited or whether the positive and negative circuits are connected in series.
Remedial Actions: Clean debris accumulated on the probe tip and reinstall the transmitter vertically; recalibrate the zero and full-scale points; resolve the signal circuit short-circuit fault.
Contingency Plan: Temporarily monitor manually using a fixed value and calibrate or replace the probe during a scheduled shutdown window.

Fault 3: Signal Drift, Frequent Value Fluctuations
Troubleshooting Steps:
Check whether signal cables run in close proximity to or are routed in the same cable tray as power cables.
Check whether the shielding wire is grounded at both ends; confirm that it is grounded at a single point in the control cabinet.
Measure ground resistance to confirm that protective grounding is reliable and free from multi-point common-ground interference.
Check for interference caused by nearby variable frequency drives or high-power motors that start and stop frequently.
Remedial Measures: Route signal cables separately and away from power lines; ensure shielding is grounded at a single point; install signal isolators to reduce interference; relocate the instrument away from strong electromagnetic sources.
Contingency Plan: Temporarily increase the filter parameters at the central control station to smooth out fluctuating data.

Fault 4: RS485 Communication Failure, Disconnection, or Packet Loss
Troubleshooting Steps:
Verify whether the A and B communication lines are reversed and check for broken or loose connections on the bus.
Verify that the instrument's address and baud rate match the host computer's settings.
Check whether the 120Ω terminating resistor is missing at the bus end or if branch lines are excessively long.
Remedial Actions: Swap the A/B wires and reconnect; standardize communication parameters; install a terminating resistor at the bus end; shorten the length of branch wiring.
Contingency Plan: Perform debugging via direct single-point connection; temporarily disable multi-device networking.

Fault 5: Garbled display, black screen, or values not updating
Troubleshooting Steps:
Check if the supply voltage is too low or if there are excessive voltage fluctuations.
Check if the meter housing is damp or has condensation, or if the seal has deteriorated and allowed water ingress.
Check for strong electromagnetic radiation on-site interfering with the LCD driver circuit.
Remedial Actions: Replace with a stable 24V DC power supply; replace the sealing gasket and ensure protection against rain and moisture; relocate the device to avoid strong interference sources.
Contingency Plan: Rely on remote data monitoring via the central control system for temporary monitoring; replace the on-site meter when maintenance is scheduled.

Fault 6: Unexpected Level Alarms or System Malfunctions
Troubleshooting Steps:
Confirm whether signal fluctuations or interference have caused instantaneous value jumps that trigger the threshold.
Check if alarm parameters are set too sensitively or if the hysteresis is set too low.
Check for poor grounding or ground loop interference causing instantaneous signal jumps.
Remedial Actions: Optimize wiring and shielding grounding; appropriately increase the alarm hysteresis parameter; install a signal isolator to stabilize the output.
Contingency Plan: Temporarily raise the alarm threshold to avoid frequent false triggers.

Fault 7: Excessive measurement error; accuracy exceeds specifications
Troubleshooting Steps:
Long-term use without regular calibration has caused zero-point and full-scale drift.
Scale buildup or corrosion on the probe surface has altered sensing characteristics.
Uncompensated or failed compensation for drastic changes in ambient temperature.
Remedial Actions: Recalibrate zero and full-scale accuracy; clean or replace corroded probe rods; verify that suitable material models are selected.
Contingency Plan: Record deviation values and apply numerical compensation corrections at the central control station.

Fault 8: Condensation on the meter face, minor water seepage
Troubleshooting Steps:
Check whether the explosion-proof seal cap and gland seal gaskets are aged or loose.
No rain protection outdoors; significant day-night temperature differences causing internal condensation.
Remedial Measures: Retighten the explosion-proof cover and gland; replace aged seals; install an outdoor rain and sun shield.
Emergency Plan: Briefly disconnect power to allow natural drying; replace sealing components promptly afterward.

8.4, After-Sales Repair Guidelines
1. Criteria for Determining Faults and Reporting Repairs
In the following situations, do not attempt to disassemble the unit yourself; submit a service request directly:
No response at all when powered on; failure to operate even after replacing the power supply;
Water ingress into the meter housing, internal corrosion, or signs of burned circuit boards;
Deformed or broken probe, or physical damage to the sensor unit rendering it uncalibratable;
Measurement accuracy remains severely out of specification and cannot be restored after multiple troubleshooting and debugging attempts;
Permanent damage to the instrument caused by lightning strikes or power surges.

2. Service Request Process
Provide the complete product model (QDY30B), measurement range, output type (4-20mA/RS485), and date of purchase.
Describe the on-site operating conditions: medium type, installation environment, fault symptoms, and error status.
Provide photos of the on-site wiring, the instrument's exterior, and screenshots of abnormal data from the central control system.
Contact the manufacturer's after-sales technical support for remote troubleshooting guidance; if the issue cannot be resolved remotely, proceed with the mail-in repair or replacement process.

3. Warranty Coverage
Under normal operating conditions and in the absence of human-caused damage, the entire unit is covered by the manufacturer's standard warranty;
Failures occurring within the warranty period that are not caused by disassembly, unauthorized modification, or overpressure operation will be repaired or have parts replaced free of charge;
Damage resulting from accidental impact, unauthorized opening or modification, overvoltage supply, or misuse in highly corrosive or non-standard operating conditions is not covered by the free warranty; paid repair services are available.

4. Usage Precautions (Additional Reminders for Service Requests)
It is strictly prohibited to disassemble the explosion-proof meter head, supply power at voltages exceeding the rated level, use standard 304 probes in highly corrosive environments, or forcefully bend the probe. Unauthorized disassembly will void the explosion-proof certification and warranty coverage.