# Ultrasonic Level Meter

## I. Product Definition

The QDY70A.11 integrated ultrasonic level sensor is a non-contact, intelligent level measurement instrument developed by Anhui Qidian Automation Technology Co., Ltd., specifically designed for liquid/material level monitoring in industrial settings. It integrates an ultrasonic transducer, signal processing unit, display unit, and output unit into a single device, eliminating the need for additional secondary instruments. It directly performs the entire liquid level measurement process—from signal transmission and echo reception to data processing and signal output.

Its core functions and features comprehensively cover the following aspects:

1. Non-contact liquid/material level measurement: Without direct contact with the measured medium, it enables continuous, real-time, non-intrusive measurement of liquid levels and material levels for liquids, solid particles, and powders. It is unaffected by the medium's corrosiveness, viscosity, or toxicity, and avoids issues such as corrosion, material buildup, and blockages common in contact-type sensors.

2. Intelligent Signal Processing and Computation: Equipped with a built-in high-performance microprocessor, it employs adaptive gain adjustment, echo recognition algorithms, and false echo suppression algorithms to effectively filter out common industrial interference signals—such as tank wall reflections, agitator interference, foam interference, and vapor interference—thereby enhancing measurement stability and reliability.

3. Standardized Industrial Signal Output: Supports the 4–20 mA analog current signal output commonly used in industrial settings, allowing direct connection to PLCs, DCS systems, or display instruments to enable remote transmission and centralized monitoring of level data; select models support RS485 digital communication output (Modbus protocol) to meet the equipment interconnection requirements of digital factories.

4. Wide Measurement Range and High Accuracy: The measurement range spans from 0–1 m to 0–30 m, accommodating various operational conditions; measurement accuracy reaches 0.25% F.S., with a resolution of up to 1 mm, meeting the high-precision requirements for liquid level data in industrial process control.

5. Industrial Design with High Protection Rating: Featuring an IP65-rated housing made of engineering plastic, the device is suitable for harsh industrial environments—including indoor and outdoor settings, as well as humid and dusty conditions—and operates reliably within a wide temperature range of -20°C to +60°C.

6. Convenient Commissioning and Display Functions: Equipped with a transparent viewing window on top, along with a built-in LCD display and buttons, it supports on-site parameter configuration, range calibration, echo viewing, and fault code display. Basic commissioning and status monitoring can be completed without the need for host computer software.

7. Maintenance-Free, Long-Life Design: With no moving mechanical parts, there is no risk of wear or jamming. Once installed, it requires no frequent maintenance, significantly reducing on-site operational costs and downtime risks.

## II. Working Principle

The operating logic of this level transmitter is similar to an industrial version of the "Echo Locator" game:

---Transmitting sound waves: The ultrasonic transducer (probe) inside the instrument emits a beam of ultrasonic pulses at a fixed frequency toward the surface of the measured medium. This sound wave travels in a straight line at a speed of 340 m/s (in air at room temperature).

--- Sound Wave Reflection: Upon striking the surface of the measured medium, the ultrasonic pulse is reflected back, forming an echo signal that is then received by the transducer.

--- Timing and Calculation: The microprocessor inside the instrument records the time difference between the transmission of the sound wave and the reception of the echo. Using the formula "Distance = Speed of Sound × Time Difference ÷ 2," it calculates the distance from the transducer to the surface of the medium.

---Level Data Conversion: Based on the preset installation height (distance from the tank bottom to the transducer), the instrument subtracts the calculated distance from the installation height to determine the current actual liquid level.

---Signal Output and Display: The liquid level data is converted into a 4–20 mA current signal or a digital signal for output to the control system. Simultaneously, the liquid level value is displayed in real time on the local screen, completing a full measurement cycle.

Additional Notes

To ensure measurement accuracy, the instrument incorporates a built-in temperature compensation algorithm that automatically corrects for sound velocity deviations caused by ambient temperature changes, thereby eliminating the impact of temperature on measurement results.

The instrument also filters and identifies received echo signals, prioritizing the strongest valid echo while filtering out false echoes generated by tank walls, agitators, and foam, ensuring the accuracy of measurement data.

## III. Core Value and Solutions to Pain Points

3.1 Core Product Value

The QDY70A.11 integrated ultrasonic level transmitter provides industrial customers with a ***"non-contact, maintenance-free, highly stable, and easy-to-install"** level measurement solution. It fundamentally addresses the pain points associated with traditional contact-type level sensors, delivering the following core benefits to customers:

1. Significantly reduced O&M costs: Non-contact measurement eliminates mechanical wear, material buildup and clogging, and the risk of corrosion damage. It requires virtually no maintenance after installation, reducing labor and material costs associated with regular inspections and sensor replacements, and avoiding production downtime losses caused by sensor failures.

2. Adaptability to complex and harsh operating conditions: It operates stably in environments with corrosive, viscous, or toxic media, as well as in dusty, foamy, or steamy conditions. There is no need to worry about sensor contamination or damage from the medium, expanding the range of applicable scenarios for level measurement.

3. Enhanced Measurement Stability and Reliability: Intelligent echo processing algorithms effectively suppress various interference signals in industrial environments, preventing production errors or equipment malfunctions caused by false level data, and ensuring stable operation of production processes.

4. Simplified Installation and Commissioning: The integrated design eliminates the need for additional secondary instruments. Installation is simple and convenient, requiring only a threaded mounting hole on the tank top for secure mounting; Local display and button-based configuration allow parameter settings to be completed without specialized tools, reducing on-site commissioning time.

5. Compatibility with Existing Industrial Control Systems: With 4–20 mA analog and RS485 digital signal outputs, the device can be directly integrated into mainstream industrial control systems such as PLCs and DCSs without additional modifications, enabling rapid remote monitoring and automated control of liquid level data.

6. Enhanced Data Accuracy and Control: High-precision measurement enables fine-grained control of liquid levels, helping customers optimize material ratios, manage tank filling and discharge, prevent overflow or empty tank incidents, and improve the controllability and safety of production processes.

3.2 Key Pain Points Q&A

1. Customer Pain Points: Contact-type level transmitters (such as float-type or submersible models) are prone to corrosion, material buildup, and blockages, resulting in frequent failures and the need for regular replacement.

Solution: The QDY70A.11 integrated ultrasonic level transmitter employs a non-contact measurement solution. The probe never comes into direct contact with the measured medium throughout the entire process, making it unaffected by the medium's corrosiveness, viscosity, or toxicity. This eliminates the risk of sensor contamination, blockage, or corrosion damage at the source.
Direct Benefits: Significantly reduces sensor replacement frequency, lowers long-term labor and material costs for operation and maintenance, and completely prevents production downtime and tank overflow/emptying incidents caused by sensor failure, ensuring production continuity.

2. Customer Pain Point: Industrial environments involve complex interferences such as agitator noise, tank wall reflections, foam, steam, and dust, often causing level transmitters to produce false level data and affecting the accuracy of production control.
Solution: Equipped with a built-in high-performance microprocessor and intelligent signal processing algorithms, the system features adaptive gain adjustment, false echo suppression, and automatic temperature compensation. It precisely filters out interference signals, locks onto valid echoes, and corrects for sound velocity deviations caused by ambient temperature changes, ensuring stable and reliable measurement data.
Direct Benefits: Completely resolves level data distortion caused by interference, preventing production errors and equipment malfunctions triggered by false level readings. This ensures the safety and stability of the production process while enhancing control accuracy.

3. Customer Pain Points: Traditional level transmitters are complex to install, requiring additional secondary instruments and on-site wiring. Commissioning is difficult, time-consuming, and labor-intensive, demanding a high level of expertise from installation personnel.
Solution: Features an integrated all-in-one design that combines the ultrasonic transducer, signal processing unit, display unit, and output unit into a single device, eliminating the need for additional secondary instruments; supports threaded tank-top mounting, allowing for quick installation with only standard mounting holes required; equipped with a local display and button-based debugging functions, enabling range calibration, parameter settings, and troubleshooting without specialized host computer software.
Direct Benefits: Installation and commissioning time is reduced by over 80%. On-site deployment can be completed without specialized technical personnel, significantly lowering project implementation costs and on-site construction complexity, and enabling rapid integration and monitoring of level data.

4. Customer Pain Points: The on-site environment is humid and dusty, and some applications require outdoor installation. Conventional level transmitters have low protection ratings, making them susceptible to water and dust ingress, resulting in damage and a short service life.
Solution: Features an IP65-rated high-protection housing design with a main body made of corrosion-resistant engineering plastic, effectively resisting dust and moisture. Suitable for harsh industrial environments—including indoor, outdoor, humid, and dusty conditions—and supports stable operation in a wide temperature range of -20°C to +60°C.
Direct Benefits: Significantly enhances the equipment's environmental adaptability, reduces equipment damage caused by environmental factors, extends the equipment's service life, and lowers failure rates and maintenance costs in harsh operating conditions.

5. Customer Pain Point: The level sensor's signal output is incompatible with existing industrial control systems, requiring the additional configuration of signal conversion modules, which increases project costs and creates potential system failure points.
Solution: Supports the 4–20 mA analog current signal output commonly used in industrial settings, allowing direct connection to the vast majority of PLCs and DCS systems; optional RS485 digital communication output (Modbus protocol) meets the device interconnection needs of digital factories and IoT platforms, eliminating the need for additional conversion modules.
Direct Benefits: No need to retrofit existing control systems; direct compatibility with existing equipment reduces additional procurement costs and system failure points, enabling rapid remote transmission and centralized monitoring of liquid level data to meet automation and digital production requirements.

6. Customer Pain Points: Field inspections cannot directly view liquid level data or equipment status, relying instead on host computer monitoring; this results in low troubleshooting efficiency and high operational complexity.
Solution: Equipped with a transparent viewing window and an LCD display on the top, it supports local real-time display of current liquid level values, equipment status, and error codes. On-site inspections and basic debugging can be completed without a host computer, enabling rapid identification of equipment issues.
Direct Benefits: Improves on-site inspection efficiency, reduces the workload of O&M personnel, enables rapid troubleshooting of equipment failures, shortens downtime, and ensures long-term stable operation of equipment.

**IV. Key Product Parameters & Specifications**

4.1 Basic Electrical Parameters
(Measurement Performance, Signal Output, Accuracy, and Resolution)
Model: QDY70A.11 (Integrated Ultrasonic Level Sensor)
Measurement Principle: Ultrasonic Pulse Reflection Method (Non-contact)
Measurement Range (Standard): 0–5 m, 0–10 m, 0–15 m (Customizable to 0–20 m/30 m)
Dead Zone: ≤0.3 m (Increases slightly with range)
Emission Angle: ≤12° (Narrow beam, high interference resistance)
Measurement Accuracy: ±0.25% FS (Full Scale)
Resolution: 1 mm (<2 m) / 2 mm (2–5 m) / 5 mm (5–10 m) / 10 mm (>10 m)
Repeatability: ≤1 mm
Update Rate: 1–10 s adjustable (default 2 s)
Temperature Compensation: Built-in digital temperature sensor, automatic sound velocity compensation (-20°C to +60°C)
Output Signal (Standard): 4–20 mA DC analog (load ≤ 500 Ω)
Output Signal (Optional): RS485 Modbus-RTU (Digital Communication)
Relay Output (Optional): 2 programmable relays (Contact Rating: 250 VAC/10 A, 30 VDC/10 A)
Display: LCD (Real-time on-site level, echo strength, temperature, error codes)
Keypad operation: 3 keys (SET/▲/▼), for local range calibration, parameter configuration, and echo viewing

4.2 Isolation Performance Parameters
(Electrical Isolation, Interference Immunity, Safety Features)
Input/Output Isolation: Electrical isolation between power supply and 4–20 mA output (isolation voltage ≥ 1500 V AC, 1 min)
Communication Port Isolation (RS485): Opto-isolation, isolation voltage ≥2500 V AC
Immunity Level: Complies with GB/T 17626 Industrial EMC Standard
Electrostatic Discharge: ±8 kV (contact) / ±15 kV (air)
Electrical Fast Transient: ±2 kV (power supply) / ±1 kV (signal)
Surge: ±2 kV (common-mode) / ±1 kV (differential-mode)
False Echo Suppression: Intelligent echo recognition algorithm, automatically filters out interference from tank walls, agitation, foam, and steam
Signal Filtering: Multi-stage digital filtering (time / intensity / slope), stable output
Insulation Resistance: ≥20 MΩ (500 VDC)

4.3 Power Supply & Power Consumption Parameters
Supply Voltage (Standard): 24 V DC ±10% (2-wire / 3-wire)
Optional Power Supply: 12–36 V DC (wide-range), 220 V AC (custom 4-wire)
Full-Load Power Consumption: ≤3.6 W (24 V DC)
Operating Current: ≤150 mA (24 V DC)
Power Distribution Output: None (self-powered, no external power supply required)
Reverse Polarity Protection: Automatic protection against reversed power supply polarity; does not damage the circuit
Overvoltage Protection: Automatic shutdown at ≥40 V DC
Surge Protection: Built-in TVS diodes for protection against power surges

4.4 Environmental Adaptation Parameters
(Temperature, Humidity, Protection, Explosion-Proof, Operating Conditions)
Operating Temperature: -20°C to +60°C (entire unit)

Storage Temperature: -40°C to +70°C
Operating Humidity: 10% to 95% RH (non-condensing)
Protection Rating:
Enclosure: IP65 (dust-tight, protected against water jets)
Probe: IP67 (short-term immersion)
Explosion-proof rating (optional): Ex ia IIC T6 Ga (intrinsically safe, compatible with safety barriers)
Compatible safety barrier models: Zener-type / Isolation-type safety barriers (e.g., MTL5042, P+F KFD2-STC-Ex1)
Process Pressure: Atmospheric pressure (-0.02 MPa to +0.1 MPa)
Media Compatibility: Liquids, granular/powdered materials; resistant to mild corrosion, viscous substances, foaming, and steam
Installation Altitude: ≤2000 m (customizable for higher altitudes)

4.5. Physical Parameters (including dimension notes)
1) Mounting Methods
Standard Mounting: G1½ male thread (vertical mounting on tank top / tank roof)
Optional Mounting: Flange DN80/DN100, bracket mounting

2) Dimensions (Unit: mm, excluding mounting accessories)
Total Height (H): Approx. 260
Housing Diameter (D): Approx. 110
Probe Diameter (d): Approx. 60
Thread Length (L): Approx. 25 (G1½)
LCD Window Dimensions: Approx. 45×25
Cable Entry Specifications: M20×1.5 (waterproof connector, compatible with Φ6–Φ12 cables)

3) Weight
Net Weight: Approx. 2.1 kg
Gross Weight (including packaging): Approx. 2.4 kg

4) Housing Material and Protection Details
Top Cover / Housing: PBT + 30% glass fiber (flame-retardant grade, UL94 V-0), resistant to aging, corrosion, and extreme temperatures
Probe: PP (polypropylene), resistant to weak acids, weak alkalis, sewage, and general chemical media
Seal Ring: EPDM (ethylene propylene diene monomer), resistant to aging and ozone, waterproof and dustproof
Fasteners: 304 stainless steel, rust- and corrosion-resistant
Surface Finish: Matte blue housing, scratch-resistant, UV-resistant
Protection Details:
Fully sealed potting process, internal moisture and condensation protection
Waterproof cable connector, locking seal, IP65 watertight
Probe and housing molded as a single unit, seamless, water ingress prevention




**V. Application-Specific Selection Guide**
This section is designed specifically for field technicians, procurement personnel, and commissioning engineers. It addresses challenges such as difficult selection, mismatched components, and inadequate adaptation to operating conditions. Based on the product features of the QDY70A.11 integrated ultrasonic level transmitter and drawing on real-world operating conditions across the industry, it provides standardized selection recommendations to avoid selection errors and enhance equipment compatibility and operational stability.

5.1 Key Selection Criteria
1. Signal Type Selection: For conventional industrial automation control systems, the 4-20mA analog output model is the preferred choice, as it can be directly integrated with general-purpose control devices such as PLCs, DCS systems, and digital display instruments. For applications requiring remote networking, data upload to IoT platforms, or centralized communication management across multiple devices, select the version equipped with RS485-Modbus communication to meet digital remote control requirements.

2. Channel Selection: For independent level monitoring of a single tank, water basin, or silo, the standard single-channel model QDY70A.11 is sufficient. For scenarios requiring simultaneous monitoring of multiple storage tanks or water treatment basins within a facility, there is no need to select a multi-channel integrated model; instead, deploy multiple independent single-channel instruments. This approach simplifies wiring, ensures isolated fault handling with no mutual interference, and facilitates easier maintenance.

3. Power Supply Selection: For mainstream industrial automation applications, the standard 24V DC model is universally adopted, compatible with common on-site industrial control power supplies. For outdoor monitoring scenarios without stable DC power, such as simple outdoor water tanks, the wide-voltage 12–36V DC version is recommended. For fixed monitoring points in indoor pump rooms or factory buildings, a custom 220V AC model can be selected as needed.

4. Selection based on explosion-proof requirements: For general applications under normal temperature and pressure conditions—where there are no flammable or explosive gases or volatile hazardous media—the standard general-purpose model is sufficient. For high-risk scenarios involving flammable or explosive media, such as petrochemical plants, oil and gas storage facilities, hazardous chemical storage tanks, and enclosed explosion-proof workshops, intrinsically safe (IS) level transmitters must be selected and used in conjunction with safety barriers to strictly comply with explosion-proof safety regulations.

5. Selection based on installation environment: For indoor, dry, dust-free, and ambient-temperature environments, the standard integrated model is sufficient; for outdoor, open-air installations, sites exposed to rain, high dust levels, or severe moisture and condensation, prioritize models with an IP65 high-protection rating; for monitoring scenarios involving weakly acidic or alkaline corrosive media, sewage, wastewater, or chemical waste liquids, prioritize models with corrosion-resistant probe configurations; For tank interiors with high-temperature steam or heavy fog, prioritize standard models equipped with intelligent echo suppression and automatic temperature compensation.

6. Medium Selection: For clear water, tap water, firefighting water, and general industrial wastewater, the standard-range base model is sufficient; For viscous liquids, wastewater containing impurities, and applications with significant surface foam, prioritize models with a narrow beam angle to avoid measurement errors caused by foam; For solid level monitoring of materials such as grain, pulverized coal, and sand and gravel powders, prioritize verifying the measurement blind zone and transmission angle to ensure compatibility with unobstructed installation points at long distances.

7. Selecting the measurement range: For shallow pools, small water tanks, and low-level liquid storage containers, choose the 0–5 m short-range specification; for medium-sized storage tanks and water treatment reaction tanks, choose the 0–10 m or 0–15 m medium-range specifications; For large vertical storage tanks and elevated water reservoirs, select the 0-20m or 0-30m long-range specifications. When selecting models, ensure

sufficient measurement margin is reserved to avoid affecting measurement accuracy due to full-scale operation.

5.2. Application Recommendations for Industry-Wide Scenarios
1. Chemical industry: Various raw material storage tanks, waste liquid collection tanks, and chemical reactor level monitoring: Prioritize corrosion-resistant probes paired with the explosion-proof QDY70A.11 model. Utilize non-contact measurement to avoid corrosion from aggressive media, and employ intelligent anti-interference algorithms to eliminate interference from steam and mist in chemical environments. Standard 4-20mA signals enable automated level interlock control; in high-risk chemical areas, uniformly select explosion-proof models to ensure production safety.

2. Power Industry: For level and material level monitoring in power plant circulating water tanks, condensate tanks, desulfurization wastewater tanks, and ash storage silos, standard models with high protection ratings are sufficient. These are suitable for the high-dust, high-humidity environments typical of power plants, providing stable level data output. When integrated with plant control systems, they enable automatic water level regulation without complex maintenance, making them ideal for continuous, uninterrupted power plant operations.

3. Metallurgy Industry: For level monitoring in metallurgical cooling water tanks, industrial liquid storage tanks, and raw material batching silos, select vibration-resistant and highly interference-resistant versions of integrated ultrasonic level transmitters. These withstand external influences such as equipment vibrations and electromagnetic interference in metallurgical environments, accurately and stably collecting level data to meet the continuous production monitoring requirements of metallurgical production lines.

4. Pharmaceutical Industry: For level monitoring in pharmaceutical purified water storage tanks, drug solution storage tanks, and wastewater treatment stations, select the standard version of the level sensor, which is clean, corrosion-resistant, and free from dust contamination. Its simple structure is easy to clean and meets the pharmaceutical industry's clean environment requirements, enabling precise control of drug solution and purified water reserves and aligning with the industry's refined level control standards.

5. Smart Manufacturing Industry: For level monitoring in storage tanks, material transfer silos, and smart water supply systems on automated production lines, the RS485 communication version QDY70A.11 is the preferred choice. It seamlessly integrates with smart factory management systems to enable automatic data collection, remote monitoring, and threshold alarm triggering, meeting the core requirements of unmanned operation and automated control in smart manufacturing.

6. Comprehensive liquid level monitoring for municipal sewage tanks, integrated wastewater treatment equipment, sedimentation tanks in water treatment plants, and rainwater collection tanks in the water treatment industry. These are mainstream applications for this sector; the standard base model is sufficient. It offers high cost-effectiveness and easy installation, and is compatible with both underground and above-ground water treatment facilities, meeting the full-process liquid level monitoring needs for water supply, drainage, and wastewater treatment.

4.3 Common Selection Pitfalls
1. Ignoring electrical isolation ratings when selecting equipment. In some environments with strong electromagnetic interference or mixed high- and low-voltage circuits, failing to select level transmitters with electrical isolation configurations can easily lead to signal fluctuations, data jumps, and control system signal disruptions. When selecting equipment, ensure that both the power supply and signal output have isolation protection capabilities; in high-interference environments, prioritize verifying isolation parameters.

2. Arbitrarily selecting the wrong measurement range and blind zone specifications. Some users focus solely on selecting a wide measurement range to reduce procurement costs while ignoring the instrument's inherent measurement blind zone. This can result in the inability to detect low liquid levels, or using a narrow-range instrument for high-level tanks, leading to an insufficient measurement upper limit and direct monitoring failure. Before selection, the actual on-site measurement height must be accurately measured to match the corresponding range specifications.

3. Neglecting signal output load matching: When selecting a 4–20 mA output level transmitter, failing to verify the load resistance of the downstream receiving equipment can result in signal transmission instability, inaccurate output current, and distorted remote data if the load exceeds the instrument's standard range, causing errors in automated control operations.

4. Incorrectly selecting standard, non-explosion-proof models for hazardous environments: In mandatory explosion-proof zones such as flammable and explosive chemical plants or enclosed oil and gas storage tanks, using general-purpose level transmitters without explosion-proof certification not only violates safety production regulations but also poses significant safety hazards, making accidents highly likely. The use of standard models is strictly prohibited in high-risk explosion-proof environments.

5. Neglecting the instrument's operating temperature range: In high-temperature workshops, areas exposed to direct sunlight, or extremely cold environments, failure to verify the device's operating temperature range can lead to temperature compensation failure and a significant drop in measurement accuracy. In severe cases, this can directly cause the instrument to shut down and cease normal operation.

6. Confusing the application scenarios of contact and non-contact sensors: In operating conditions involving highly viscous, crystallizing, or wall-adhering media, continuing to follow the selection criteria for contact sensors while ignoring the core advantages of ultrasonic non-contact technology can easily lead to measurement failures and frequent equipment maintenance issues later on.

5.4 Recommendations for Customized Solutions
1. Customized Signal Solutions: In addition to standard 4-20mA and RS485 signals, we can customize 0-5V or 0-10V analog voltage output signals to meet the requirements of legacy control systems or specialized industrial control equipment at the customer's site. We also offer models with dual-signal synchronous output to support simultaneous integration with two different control systems using a single device.

2. Custom Solutions for Non-Standard Operating Conditions: For complex non-standard conditions such as extreme high or low temperatures, highly corrosive media, high-pressure sealed tanks, or measurements requiring ultra-wide ranges and long distances, we can customize extended probes, special corrosion-resistant housing materials, and versions with increased transmission power. We also offer split-type structures to accommodate tight installation spaces or special scenarios where high-temperature probes cannot be directly connected to circuits.

3. Customized mounting solutions: For applications where standard G1½ threaded mounting is incompatible with on-site flange interfaces or non-standard mounting bases, we offer customizable flange mounting structures in various sizes, including DN50, DN80, and DN100. We also provide specialized mounting brackets for side or angled installations to accommodate various irregular tank and tank farm mounting locations.

4. Customized Functional Upgrade Solutions: When basic functions fail to meet operational requirements, additional features can be added, such as high/low level relay alarm outputs, on-site audible and visual alarm integration, level differential calculations, and one-click batch parameter calibration. Additionally, Chinese LCD interfaces and high-brightness outdoor displays can be customized to ensure clear readability under strong outdoor sunlight.

5. Multi-Point Integrated Customization Solutions: For large-scale, multi-point liquid level monitoring projects across industrial sites, we offer customized solutions including dedicated data acquisition terminals and on-site centralized display and control cabinets. These can be paired with multiple QDY70A.11 level transmitters to form a complete liquid level monitoring system. This one-stop solution handles wiring planning, data aggregation, remote reporting, and automatic interlock control, eliminating the need for customers to go through the cumbersome process of selecting and assembling components individually.

6. Customized outdoor protection solutions: For long-term use in harsh outdoor environments such as coastal salt fog, heavy rainfall and intense sunlight, or frigid permafrost, we offer specialized outdoor configurations including reinforced anti-corrosion coating for the entire unit, UV-resistant enclosures, and enhanced low-temperature startup circuits. These features significantly extend the service life of the equipment when used outdoors in open areas.

**VI. Installation and Commissioning Specifications**

6.1 Pre-installation Preparation

1. Checking Accessories

After unpacking, verify that all accessories are included and ensure there are no missing or damaged items:

QDY70A.11 Integrated Ultrasonic Level Transmitter (Main Unit) – 1 unit

M20×1.5 Waterproof Cable Connector – 1 set

304 Stainless Steel Mounting Nut: 1

Certificate of Conformity, User Manual, and Calibration Card: 1 copy each

Optional Accessories: G1½ Threaded Flange, Mounting Bracket, Dedicated Shielded Cable, Safety Barrier (Explosion-Proof Version)

2. Environmental Inspection

Installation Location: Select the vertical center area of the tank/tank top, avoiding interference sources such as tank walls, stiffeners, agitators, and feed ports. Ensure there are no obstructions or obstacles beneath the probe, and that the entire measurement path is unobstructed.

Environmental Conditions: On-site temperature must be within the range of -20°C to +60°C, with humidity between 10% and 95% RH (non-condensing); in explosion-proof zones, confirm the hazardous area classification and ensure compliance with intrinsically safe installation standards.

Medium Conditions: The liquid surface being measured must not exhibit violent fluctuations or significant foam accumulation; in areas with high vapor concentration, allow sufficient installation height to minimize the impact of mist on the echo signal.

3. Tool List

Prepare standard installation tools to ensure smooth installation:

Electrical tools: Multimeter, wire strippers, crimping pliers, Phillips/flathead screwdrivers, electrical tape

Installation tools: Adjustable wrench, spirit level, tape measure, marker pen, electric drill (for drilling holes)

Auxiliary tools: Cable ties, cable clamps, waterproof sealant, grounding wire

4. Safety Precautions

For installation at heights, wear a hard hat and safety harness, and erect safety scaffolding. Throwing objects from heights is strictly prohibited. Before working inside tanks, ventilate the area, test for toxic and hazardous gas concentrations, and ensure safety before proceeding.

Before performing any electrical work, the main power supply to the site must be shut off. Live wiring and live installation are strictly prohibited to prevent electric shock accidents. In explosion-proof zones, strictly adhere to explosion-proof construction regulations; unauthorized operations are prohibited.

Lay cables away from high-temperature pipes, high-voltage cables, motors, and other strong sources of interference to avoid signal interference. For outdoor installations, avoid thunderstorms and ensure proper lightning protection and grounding preparations are in place.

6.2 Standard Installation Procedure

1. Mechanical Installation (Vertical Installation on Tank Top)

Determine the installation location and drill a G1½ standard threaded hole in the tank top. The hole must be flat, free of burrs and deformation, and the diameter must match the thread specifications.

Clean the threaded hole of debris and oil residue, apply a small amount of waterproof sealant, and screw the level sensor probe end vertically into the threaded hole. Use a wrench to gently tighten it, ensuring a tight seal with no looseness. Do not apply excessive force to avoid damaging the threads.

Use a spirit level to calibrate the main unit, ensuring the probe points vertically downward with an inclination angle ≤5°, to prevent measurement inaccuracies caused by sound wave reflection shifts.

After installing the main unit, organize the probe cable and secure it to the outside of the tank with cable ties, leaving 10–20 cm of slack to prevent cable strain from damaging the connectors.

For outdoor installations, install a rain and sun shield on top of the main unit to prevent water damage and sun exposure from aging the housing; in humid environments, wrap waterproof tape around the cable connectors to enhance sealing protection.

2. Wiring Specifications (Power / Output Terminal Differentiation)

Open the main unit's terminal box (loosen the side mounting screws and remove the terminal box cover). The internal terminals are clearly labeled; wire strictly according to the markings:

Power terminals (DC 24V): L+ (positive), L- (negative). Connect to a 24V DC ±10% power supply; compatible with both two-wire and three-wire systems.

Signal Output Terminals (4-20mA): S+ (signal positive), S- (signal negative). Connect to the analog input terminals of a PLC/DCS and connect in series with the loop.

RS485 Communication Terminals (Optional): A (positive), B (negative), GND (ground). Connect to the communication bus using a daisy-chain configuration; enable the terminating resistor as needed.

Relay Terminals (Optional): NO (Normally Open), NC (Normally Closed), COM (Common), connect to alarm circuits to control audible and visual alarms or interlock devices.

3. Grounding Requirements

Main Unit Grounding: Connect the GND grounding terminal inside the terminal box to the field grounding grid using a multi-strand copper grounding wire with a cross-sectional area of ≥1.5 mm². The grounding resistance must be ≤4 Ω to eliminate static electricity and resist electromagnetic interference.

Shield Grounding: Ground the shielding layer of signal and communication cables at one end only (grounded at the main unit end, with the other end left floating) to prevent loop currents from interfering with signals. Ensure the shielding layer is stripped to an appropriate length and crimped securely without loosening.

Explosion-Proof Grounding: For explosion-proof level transmitters, grounding must strictly comply with explosion-proof regulations. The grounding path must be short and direct, with no joints or damage, to ensure explosion-proof safety performance.

6.3 Wiring Diagrams and Specifications

1. Standard Wiring Notations (Textual Diagrams)

Power Supply Wiring: DC 24V positive terminal → L+ terminal, DC 24V negative terminal → L- terminal. Use copper-core cable with a cross-sectional area of ≥1.0 mm².

4-20mA Analog Wiring: S+ terminal → PLC/DCS AI+, S- terminal → PLC/DCS AI-; use shielded twisted-pair cable (≥0.75mm²) for the signal cable.

RS485 communication wiring: A terminal → Bus A line, B terminal → Bus B line, GND terminal → Bus ground; use dedicated shielded twisted-pair cable for the communication cable, and connect a 120Ω terminating resistor in parallel at the bus end.

Relay Wiring: Connect the COM terminal to the power supply; connect the NO terminal to the positive terminal of the alarm device; keep the NC terminal available as needed. Use copper-core cable with a cross-sectional area of ≥1.0 mm² for the relay wiring.

2. Shield Grounding Procedure

The shield must be securely grounded only at the main unit's terminal box; the other end (at the control cabinet) must remain floating. Grounding both ends simultaneously is strictly prohibited. The shield must be tightly crimped to the terminals with no exposed copper wires to prevent short circuits and leakage risks.

3. Dedicated Wiring Specifications for Isolated Models

The power circuit and signal circuit of isolated level transmitters are completely electrically isolated. Power terminals and signal terminals are in separate zones; cross-zone connections are strictly prohibited during wiring. Power positive and negative terminals, as well as signal positive and negative terminals, must be strictly distinguished to prevent reverse or incorrect connections. The isolation voltage is ≥1500 V AC to ensure stable operation in high-interference environments.

4. Comparison of Common Correct and Incorrect Wiring Practices
Correct: Connect the positive and negative power terminals to L+ and L-, respectively; connect the positive and negative signal terminals to S+ and S-, respectively; ground the shield at a single point; ensure all connections are secure and free of looseness.
Incorrect: Reversed power connection (L+ connected to negative, L- connected to positive), which can easily burn out the circuit; signal cables mixed with high-voltage cables, causing signal fluctuations and data distortion; shielding wire grounded at both ends, generating loop current interference; loose connections or exposed copper wires, leading to short circuits and leakage faults.

6.4 Power-On Debugging Procedure
1. No-Load Test
After completing the wiring, verify that all connections are correct and grounding is secure, then turn on the power switch. The host unit's LCD screen will light up and enter self-test mode. The self-test lasts approximately 3–5 seconds; if no error messages appear, the no-load test is successful.

2. Signal Verification
Analog Signal Verification: Use a multimeter to measure the current between the S+ and S- terminals. Under no-load conditions (with no reflection from the probe), the current should be approximately 4 mA. Manually block the probe to simulate a full-scale condition; the current should rise to 20 mA. A current error of ≤±0.1 mA is considered acceptable.
Communication Signal Verification (RS485 Model): The host computer sends communication commands to read the level sensor's address, parameters, and real-time level data. Communication is normal if there are no packet losses or garbled data, and the baud rate and address match correctly.

3. Indicator Light Status Assessment
Power Indicator (PWR): Steady on indicates normal power supply; flashing indicates abnormal power supply or reversed polarity; off indicates no power input.
Signal Indicator (SIG): Slow flashing indicates a normal echo signal and stable measurement; fast flashing indicates a weak signal or significant interference; steady on indicates no valid echo or measurement failure.
Fault Indicator (ERR): Off indicates the device is functioning normally; on indicates a fault (e.g., out-of-range, signal loss, abnormal temperature). Refer to the LCD fault codes to identify the issue.

4. Calibration Methods
Range Setting: Press and hold the SET button for 3 seconds to enter parameter settings. Use the ▲/▼ buttons to set the empty tank distance (height from probe to tank bottom) and full tank distance (height from probe to full liquid level). Save the parameters and exit the settings menu.
Echo Calibration: Enter the echo view interface, observe the echo intensity curve, and adjust the installation position to ensure the strongest valid echo intensity and no false echo interference. Enable the false echo suppression function if necessary.
Accuracy Verification: Fill the tank with clean water. At the 1/4, 1/2, and 3/4 liquid levels, compare the level gauge display with the actual measured values. An error of ≤±0.25% FS is considered acceptable; if the error exceeds this limit, recalibrate the range and investigate sources of interference.
Data Stability Test: Run continuously for 30 minutes. Observe that the liquid level data shows no jumps or drift, with a fluctuation range of ≤±1 mm, to confirm stable and reliable measurement.

6.5 Installation Precautions
1. Never exceed the rated voltage: The device is designed for 12–36 V DC (standard 24 V DC) only. Never connect to 220 V AC or DC voltages exceeding 40 V to prevent burning out internal circuits or damaging the main unit.

2. Avoid High-Voltage Interference: Route cables away from high-interference equipment such as motors, variable frequency drives, transformers, and high-voltage cables, maintaining a distance of ≥30 cm; never run signal cables in the same conduit or channel as high-voltage cables to prevent signal distortion caused by electromagnetic interference.

3. Do not install at an angle: The probe's tilt angle must not exceed 5°. Excessive tilt may cause sound wave reflection shifts or echo loss, resulting in inaccurate measurements or system failure.

4. Keep away from interference sources: Do not install directly above tank walls, feed inlets, or agitators to prevent material impact, liquid splashing, or agitation vibrations from interfering with the echo signal.

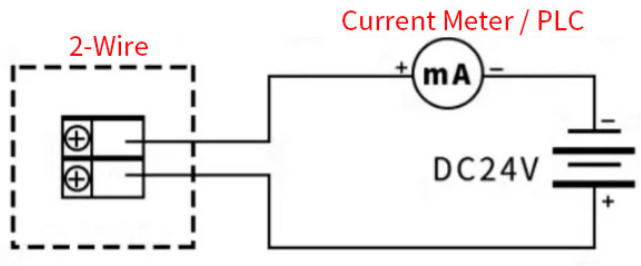
5. Protection in Humid Environments: Direct installation without sealing protection is strictly prohibited in humid or condensing environments; ensure waterproof sealing at junction boxes and cable connectors to prevent moisture from entering the main unit, which could cause short circuits or circuit corrosion.

6. Prohibitions in Explosion-Proof Zones: Non-explosion-proof level transmitters must not be used in explosion-proof zones; it is strictly prohibited to damage the explosion-proof seal structure or modify the equipment without authorization; Wiring and grounding must strictly comply with explosion-proof regulations to eliminate safety hazards.

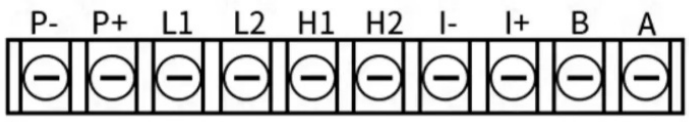
7. Prohibition of Operating at Extreme Range Limits: When selecting a model, reserve a 10%–20% range margin. Long-term operation at full-scale or zero-scale limits is strictly prohibited to avoid affecting measurement accuracy and shortening the equipment's service life.

## Wire

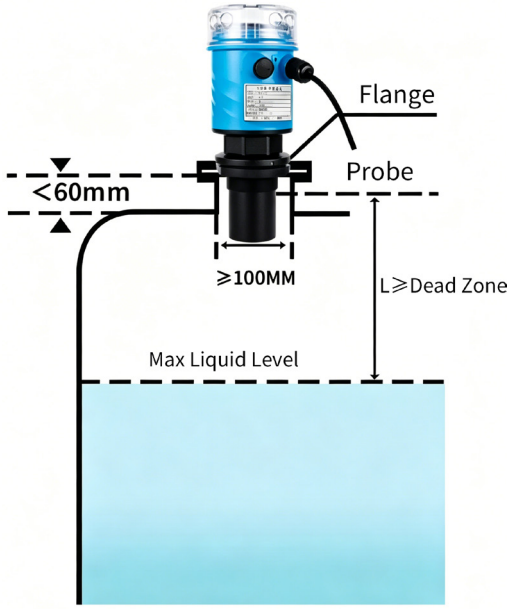
2-Wire Wiring Diagram
Note: Do not use the same 24 VDC power supply as the inverter; an isolator is recommended.



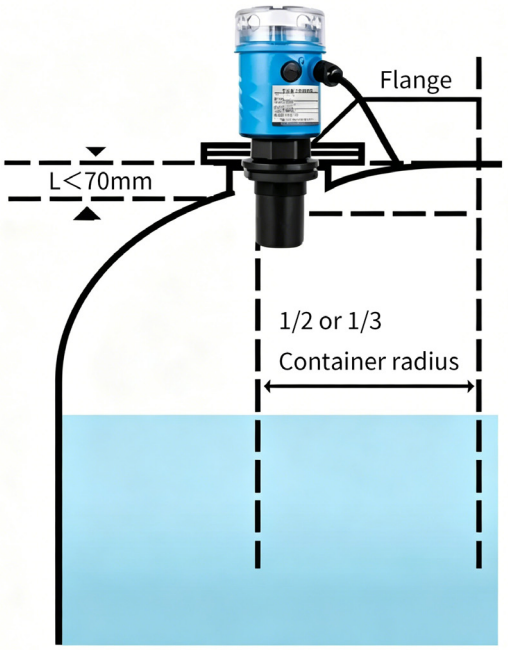

4-Wire Wiring Diagram
P: Power Supply (Optional: AC 220 V or DC 24 V)
L1, L2: Lower Limit
H1, H2: Upper Limit
1-, 1+: 4–20 mA Output
B, A: RS-485 Communication



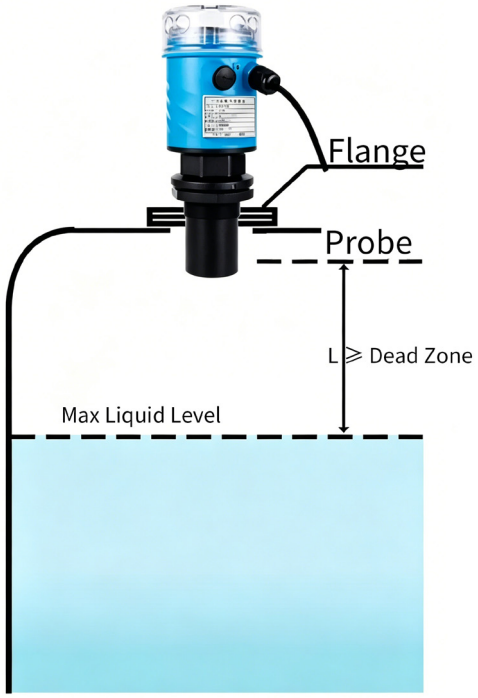
## Installation



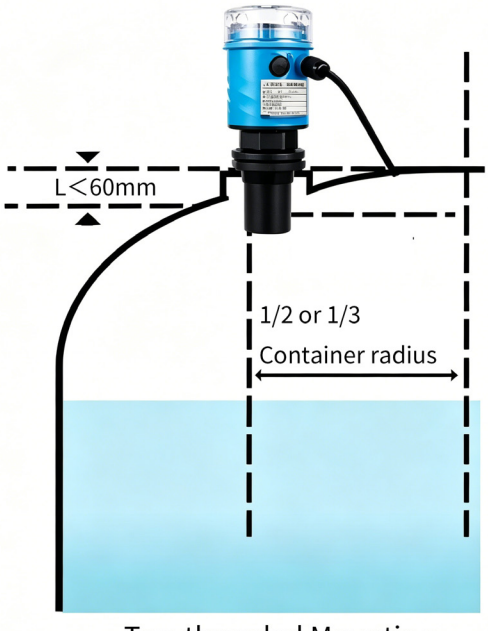

Top Flange Installation




Installation of the Neck Flange




Top Flange Installation




Top-threaded Mounting

**VII. Recommendations for Daily Use & Operation and Maintenance**

This section provides comprehensive operation and maintenance guidance for the entire lifecycle of the QDY70A.11 integrated ultrasonic level transmitter. It outlines tailored daily inspection, periodic maintenance, and long-term care plans for different models—including the standard version, explosion-proof version, and outdoor-specific version—to reduce equipment failure rates, extend service life, and ensure long-term stable operation.

7.1 Key Points for Daily Inspections (Daily / Weekly Mandatory Checks)

1. Visual Inspection of Equipment Status

External Integrity: Check the housing for cracks, deformation, or corrosion; verify that the transparent display window is intact and undamaged; ensure that waterproof cable connectors are securely fastened, free of looseness, and show no signs of water ingress. In outdoor or humid environments, pay special attention to the condition of rain covers and O-rings; for explosion-proof models, verify that explosion-proof seals are undamaged and properly seated.

Probe Surface Condition: Observe whether the probe's emitting surface is clean and free of dust, oil, moisture, or crystallization; if there is light dust, gently brush it off with a soft-bristled brush. Never scrape the probe surface with hard objects to avoid damaging the acoustic emitting surface.

Installation Structural Stability: Verify that the equipment is secure and level, with no displacement or leaks (water or air) at threaded or flanged connections. For outdoor installations, ensure mounting brackets show no rust or deformation.

2. Signal and Operational Status Monitoring

Data Stability: Check the liquid level readings on the on-site LCD display to confirm that data does not jump, drift, or remain at a fixed value for extended periods. A fluctuation range within ±1 mm is considered normal. If data fluctuates frequently, investigate potential sources of interference or the probe's condition.

Indicator Lights / Error Code Diagnosis: A steady PWR power light indicates normal power supply; a slowly flashing SIG signal light indicates a stable echo signal. If the ERR error light illuminates, check the error code to identify issues such as out-of-range readings, signal loss, or abnormal temperatures.

Echo Quality Check: Access the equipment's echo view interface, observe the echo strength curve, and confirm that the valid echo strength is stable with no significant interference from false echoes; if the echo strength remains consistently low, check the probe's cleanliness or installation position.

3. Environmental Conditions Monitoring

Temperature and Humidity Monitoring: Record the on-site ambient temperature and humidity to ensure the equipment operates within the range of -20°C to +60°C and 10% to 95% RH (non-condensing); In

environments with extreme heat, severe cold, or significant condensation, pay extra attention to the device's operating status.
Interference Source Investigation: Ensure there are no new sources of interference on-site, such as high-voltage equipment, variable frequency drives, or high-voltage cables. Maintain a distance of ≥30 cm between the device and high-voltage equipment, and ensure signal cables are free of damage or exposed sections.
Monitoring of Operating Conditions: Pay attention to the state of the medium inside the tank, such as increased foaming, elevated vapor concentration, or significant fluctuations in the liquid level. Adjust equipment parameters (e.g., false echo suppression, filtering time) promptly to prevent measurement anomalies.

7.2. Regular Maintenance Schedule (to be performed monthly / quarterly / annually)
1. Monthly Basic Maintenance (Applicable to Standard, Explosion-Proof, and Outdoor Models)
Probe Cleaning and Maintenance: Wipe the probe's emitting surface with a dry, soft cloth or lint-free paper to remove dust, oil, and moisture. For stubborn stains, gently wipe with a small amount of anhydrous alcohol. Allow the alcohol to evaporate completely before powering on the device. Never rinse the probe directly with water.
Terminal Inspection: After powering down, open the junction box and inspect the power, signal, and ground terminals to ensure connections are secure, free of oxidation, loose, or faulty. Re-crimp any loose terminals and wrap exposed copper wires with electrical tape to prevent short circuits or electrical leakage.
Signal Cable Inspection: Check the cable sheath for damage, aging, or cracking; for outdoor cables, pay special attention to the condition of the UV-resistant jacket. Organize the cables to prevent pulling or crushing; install cable protection conduits for outdoor sections.

2. Quarterly In-Depth Maintenance (Including Accuracy Retesting)
Accuracy Calibration Retest: Compare the device's displayed values with a standard level gauge. Take measurements at the 1/4, 1/2, and 3/4 liquid level marks. If the error exceeds ±0.25% FS, perform range calibration and echo calibration again to correct measurement deviations.
Grounding System Inspection: Measure the continuity between the device's grounding terminal and the grounding grid; grounding resistance must be ≤4Ω. For outdoor and explosion-proof models, pay special attention to inspecting the grounding wire for corrosion or breaks to ensure reliable grounding.
False Echo Suppression Optimization: Based on changes in on-site operating conditions, re-enter the device parameter settings interface to adjust the false echo suppression range and filtering parameters, filtering out newly added tank wall reflections and agitation interference signals.

3. Annual Long-Term Maintenance (Suitable for High-Load / Harsh Conditions)
Comprehensive Unit Inspection: Disassemble the equipment's junction box to inspect internal circuits for moisture or corrosion and check terminal blocks for oxidation; in outdoor or humid environments, fill the junction box with moisture-proof gel to enhance moisture resistance.
Replacement of Aged Seals: Replace the O-rings at the top of the device and at the cable joints to restore IP65 protection; for explosion-proof models, use original manufacturer explosion-proof seals—the use of non-dedicated replacement parts is strictly prohibited.
Full Functional Testing: Simulate operating conditions such as empty tank, full tank, and high/low liquid level alarms to test whether the device's signal output, relay alarms, and RS485 communication functions are normal, ensuring that all functions are operational.
Verify Installation Position: Check whether the installation angle is misaligned (inclination ≤5°) and whether the distances from the tank wall, feed inlet, and agitator comply with specifications. Adjust the installation position if necessary to avoid new sources of interference.

7.3 Long-Term Maintenance Tips (Customized by Operating Conditions)
1. Dust and Moisture Protection Optimization (Dusty / Humid / Condensation Environments)
Dust Protection: In heavily dusty environments, install a dust-blowing device at the probe to periodically clean the probe surface; for outdoor equipment, install a dust- and rain-proof cover to prevent dust accumulation on the display window and probe emitter surface.
Moisture and Condensation Prevention: In humid or condensation-prone environments, place desiccant in the junction box or pot the interior of the equipment with moisture-proof sealant; apply waterproof sealant to cable joints to prevent moisture from entering the equipment via the cables.
Regular Ventilation and Drying: For equipment installed on the top of sealed tanks, periodically open the tank to ventilate, reduce vapor concentration inside the tank, minimize condensation on the probe surface, and prevent acoustic signal attenuation from affecting measurements.

2. Interference Mitigation Optimization (High Electromagnetic / Vibration Conditions)
Signal Cable Protection: Replace standard cables with shielded signal cables; ground the shield at a single end to avoid ground loops caused by grounding at both ends; route cables through galvanized steel pipes to enhance electromagnetic shielding.
Grounding System Upgrade: The equipment is grounded separately and does not share the grounding grid with motors, variable frequency drives, or other devices; use multi-strand copper core grounding cables with a cross-sectional area of ≥1.5 mm² to shorten the grounding path and reduce electromagnetic interference.
Reinforcement for Vibration Conditions: Install vibration-damping pads on equipment mounting brackets to reduce the impact of tank vibrations on the equipment; install locknuts at threaded and flanged connections to prevent equipment loosening or displacement due to vibration.

3. Protection for Extreme Environments (High Temperature / Low Temperature / Outdoor / Explosion-Proof)
High-Temperature Environments: Install sunshades and heat-insulating panels in high-temperature workshops to prevent direct sunlight from hitting the equipment; use high-temperature-resistant probes and regularly check whether the equipment's temperature compensation function is working properly to prevent sound velocity deviations caused by high temperatures.
Low-Temperature Environments: Install low-temperature heat tracing devices on equipment in extremely cold regions to prevent ice formation on the probe surface; use wide-temperature-range equipment to ensure normal startup in environments ranging from -40°C to +70°C, avoiding shutdowns due to low temperatures.
Long-term outdoor use: Periodically apply UV-resistant coatings to equipment housings to prevent aging and fading; install UV-resistant sheathing on outdoor cables to prevent cracking; inspect lightning protection grounding before the thunderstorm season and ensure proper lightning protection measures are in place.
Special Maintenance for Explosion-Proof Models: Do not disassemble explosion-proof equipment without authorization; damaged explosion-proof seals must be replaced with original manufacturer parts; regularly inspect the explosion-proof certification and markings to ensure they are intact, and verify that the equipment complies with explosion-proof safety standards.

**VIII. Troubleshooting & Emergency Response**
8.1 List of Common Faults
Covers over 95% of high-frequency issues encountered in the field, categorized by symptoms for quick reference and identification:
---No Output / Abnormal Output: 4-20mA current is 0mA, fixed at 4mA, or 20mA; no data in RS485 communication, or read failure; relay fails to operate or malfunctions.

---Signal Drift / Inaccuracy: Level display value consistently deviates from actual value; data drifts slowly with temperature or over time; multiple measurements at the same level yield inconsistent values.

---Indicator / Display Abnormalities: PWR power indicator does not light up or flashes; SIG signal indicator flashes rapidly or remains lit; ERR fault indicator remains lit or flashes; LCD has no backlight, distorted screen, garbled characters, or remains frozen.

--- False Alarms / No Alarms: High/low level alarms trigger frequently for no reason; no response when set alarm values are reached; cannot automatically reset after an alarm.

--- Interference, Distortion / Jumping: Level data jumps erratically with large fluctuations; values fluctuate wildly between high and low; echo

curve is chaotic with weak valid signals.

---Echo Loss / Measurement Failure: Displays “No Echo” or “Signal Lost”; unable to detect liquid level below a certain height; abnormal display when the tank is full.

8.2. Analysis of Fault Causes

Break down the root causes across six major dimensions—power supply, wiring, environment, installation, parameters, and hardware—to precisely match them with the observed fault symptoms:

---Wiring Issues: Reversed polarity of power supply, loose or intermittent connections; Incorrect connection of signal line polarity, shield grounded at both ends; reversed A/B communication lines, mismatched terminating resistors; incorrect relay wiring.

---Power Supply: Input voltage exceeds the 12–36 V DC range; significant power supply fluctuations, excessive ripple; insufficient power supply capacity, poor load-carrying capability; power interruption caused by triggered lightning/surge protection.

---Signal Issues: Incorrect range or dead zone settings; inaccurate empty/full tank calibration; unreasonable filter time or false echo suppression parameters; signal overload or insufficient echo strength.

---Environmental Interference: Strong electromagnetic interference (frequency converters, motors, high-voltage cables); Excessive on-site steam, foam, or dust; temperature outside the -20°C to +60°C range; high humidity or water ingress due to condensation.

---Installation-related: Probe tilt >5°; installation location too close to the tank wall, feed inlet, or agitator; connecting pipe too high (>60 mm), causing false echoes; probe surface is dirty, scaled, or iced over.

---Hardware Damage: Probe aging, cracking, or water ingress; internal circuit burnout or component failure; display or keypad malfunction; damage to the surge protection module or communication chip.

8.3 Step-by-Step Troubleshooting

1. No Output / Abnormal Output

Troubleshooting Steps:

① Verify normal power supply (24V DC ±10%) and that the PWR indicator is constantly lit;

② Disconnect power and inspect terminal blocks for loose connections, oxidation, or reversed polarity;

③ Measure the 4–20mA loop resistance (≤500Ω);

④ Verify communication address, baud rate, and wiring (A/B);

⑤ Check if parameters are locked and if the measurement range is correct.

Remedial Actions: Re-tighten connections and correct polarity; replace damaged signal cables; recalibrate after restoring factory settings; in case of communication failure, check the terminating resistor (120Ω) and replace the communication chip.

Emergency Measures: Temporarily replace with a spare level transmitter; monitor current with a multimeter and manually record the liquid level; short-circuit the alarm terminals to prevent interlock shutdown.

2. Signal Drift / Inaccurate Measurement

Troubleshooting Steps:

① Compare the actual liquid level with the displayed value to confirm the direction and magnitude of the drift;

② Check the cleanliness of the probe surface; ensure there is no oil, crystallization, or dust;

③ Verify the empty tank height and full tank range parameters;

④ Check if the ambient temperature is out of range and if temperature compensation is enabled;

⑤ Investigate whether any new sources of interference have been introduced.

Remedial Actions: Clean the probe (gently wipe with anhydrous alcohol, let air dry before powering on); recalibrate the empty tank and full tank levels to ensure accuracy; enable temperature compensation to correct sound velocity deviations; adjust filter parameters to enhance signal stability.

Contingency Plan: Temporarily lock the liquid level value and calibrate during production downtime; manually measure the liquid level at regular intervals and adjust the data accordingly; activate a backup level sensor for parallel monitoring.

3. Indicator Lights / Display Abnormalities

Troubleshooting Steps:

① PWR light is off: Check power supply voltage, fuses, and wiring;

② SIG light is flashing rapidly: Weak echo, high interference, or dirty probe;

③ ERR light is on: Check error codes (out-of-range, no echo, abnormal temperature);

④ No LCD display: Check backlight power supply, ribbon cable, or screen damage.

Remedial Actions: For power failures, replace the power module and rewire; for weak signals, clean the probe, adjust the installation position, and enable false echo suppression; address error codes accordingly (adjust installation height for out-of-range readings, check for obstructions for no echo); for display failures, restart the device or replace the screen.

Emergency Procedures: Retrieve data via a host computer; use a smartphone flashlight to illuminate the screen and view blurred values; power off for 5 minutes, then restart to restore temporary display.

4. False Alarms / No Alarms

Troubleshooting Steps:

① False alarms: Check if alarm threshold settings are appropriate; check for signal fluctuations caused by interference; check if relay contacts are stuck.

② No alarms: Check if the threshold exceeds the measurement range; check if relay wiring is correct; check if the alarm function is enabled.

Remedial Actions: Reset the alarm threshold to a reasonable level (allowing a 10% margin); enhance signal filtering to suppress interference-induced fluctuations; replace stuck relays; ensure correct wiring and enable the alarm function.

Contingency Plan: Temporarily disable the alarm function and monitor the liquid level manually; adjust the threshold to a safe range to prevent false shutdowns; install an audible and visual alarm in parallel for dual protection.

5. Interference Distortion / Data Fluctuations

Troubleshooting Steps:

① Confirm whether there are variable frequency drives, motors, or high-voltage cables nearby;

② Check whether signal cables are routed in the same conduit as high-voltage power lines and whether the shielding layer is grounded at one end;

③ Check the concentration of foam, steam, or dust inside the tank;

④ Verify whether the installation location is close to any sources of interference.

Remedial Measures: Route signal cables through galvanized steel pipes, keeping them at least 30 cm away from high-voltage power lines; ground the shield at one end and leave the other end floating; adjust the installation position to the center of the tank top, away from the tank wall and feed inlet; enable false echo suppression and adjust the filtering time.

Contingency Plan: Temporarily reduce the update rate (extend the filtering time); manually record stable data segments; use non-metallic baffles to shield interference sources and reduce reflections.

6. Lost Echo / Measurement Failure

Troubleshooting Steps:

① Check that there are no obstructions or obstacles beneath the probe;

② Confirm that the liquid level has not entered the blind zone (≥0.3 m);

③ Clean the probe surface to remove condensation, ice, or dirt;

④ Verify the installation angle (≤5°);

⑤ Check for excessive foam or vapor inside the tank.

Remedial Actions: Adjust the installation height to avoid the blind zone; clean the probe to remove deposits; recalibrate the installation angle to ensure vertical alignment; enable foam/vapor suppression mode to enhance echo recognition.

Emergency Plan: Temporarily monitor the liquid level manually and record it at regular intervals; temporarily replace with a contact-type level sensor (e.g., float); remove foam from the tank and reduce vapor concentration.

8.4. After-Sales Repair Guidelines

1. Criteria for Determining a Malfunction (Situations Requiring Repair)

The issue remains unresolved after troubleshooting according to the above steps;

The probe is cracked, has water ingress, or is physically damaged;

Internal circuit burnout, component damage, or inability to power on;

Failure of hardware such as communication chips, displays, or buttons;

Damage to the explosion-proof seal structure or loss of explosion-proof certification markings.

2. Repair Process

Information Required: Equipment model (QDY70A.11), serial number, installation date, fault symptoms, troubleshooting process, and on-site conditions (temperature, medium, interference sources);

Contact Channels: Call the after-sales service hotline, send an email, or contact the purchasing agent;

Technical Coordination: Cooperate with technicians for remote troubleshooting by providing photos, videos, and parameter screenshots;

Resolution Options: Remote repair guidance, return for repair, or replacement with a new unit;

Confirmation and Acceptance: After repair or replacement, on-site debugging must be successful before signing the acceptance form.

3. Warranty Scope

Warranty Period: 12 months from the date of manufacture;

Warranty Coverage: Hardware failures not caused by human error (circuitry, probes, display, etc.), with free repair or replacement of parts;

Exclusions: Damage caused by human error (impact, water ingress, unauthorized disassembly), overvoltage, harsh environments (severe corrosion, high temperatures), aging of consumables (seals, desiccants), or force majeure (lightning strikes, earthquakes).

4. Contact Information (Example; replace with actual information)

After-sales Service Hotline: 86-19715617532

Technical Support: 197-1561-7532

Email: sales008@qd-zdk.com

Address: No. 14, University Science and Technology Park, Fenghuangshan Industrial Park, Xiangshan District, Huaibei City, Anhui Province