QDY3OA-B-FD Clog-Resistant Integrated Submersible Level Sensor

I. Product Definition

1. Product Positioning

QDY3OA-B-FD is a **clog-resistant, integrated level measurement instrument** developed based on **static pressure level measurement technology**. The product integrates pressure sensing, signal transmission, air-venting compensation, and anti-clogging protection into a single unit. The probe can be directly immersed in the liquid being measured to perform continuous level measurement. It is specifically designed for **harsh operating conditions involving media containing silt, suspended solids, fibrous impurities, and high-viscosity substances**, such as wastewater treatment, sedimentation tanks, sludge tanks, municipal water supply and drainage systems, pumping stations, and slurry storage tanks.

2. Core Functions

(1) Liquid Level Measurement and Signal Transmission

--- Continuous liquid level measurement based on the principle of liquid hydrostatic pressure, with a measurement range covering **0–500 m**. Customizable micro-range (0–1 m) and macro-range (0–500 m) options are available to accommodate all scenarios, including shallow pools, deep wells, reservoirs, and storage tanks;

--- Standard accuracy of **0.2% FS**, with Class 0.5 available as an option; zero-point temperature drift ≤ ±0.2% FS, sensitivity temperature drift ≤ ±0.2% FS, and long-term stability ≤ ±0.2% FS/year;

--- Standard **4–20 mA two-wire analog output**, compatible with all mainstream PLC and DCS systems; Optional RS485-MODBUS RTU digital communication supports multi-device networking; 0–5 V, 0–10 V, and 1–5 V voltage outputs are also available upon request;

--- Built-in full-range temperature compensation and nonlinearity correction algorithms automatically offset the effects of temperature changes on medium density and the sensor chip, ensuring measurement accuracy across a wide temperature range.

(2) Specialized Anti-Clogging Structural Design

--- **Primary Interception Protection**: The probe tip is equipped with a removable stainless steel anti-clogging filter screen / deflector hood to intercept large suspended particles such as silt, fibers, fallen leaves, and plastic, preventing them from directly blocking the pressure ports;

--- **Secondary Deflection to Prevent Silt Accumulation**: The pressure ports feature a **45° angled opening** design to prevent silt and sediment from accumulating at the bottom and front of the ports, while utilizing liquid flow to flush the port openings and reduce impurity adhesion;

--- **Tertiary Buffering and Wear Protection**: A buffering structure inside the pressure chamber prevents impurities from directly impacting the sensor diaphragm; fine particles are carried away by the liquid flow and do not accumulate on the diaphragm surface;

--- **Removable Maintenance Components**: The anti-clogging cap and filter screen can be removed and cleaned separately, eliminating the need to replace the entire probe and keeping maintenance costs low; customizable dual-layer filter screens and self-cleaning ports are available to accommodate extreme clogging conditions such as high-concentration sludge and long-fiber slurries;

--- The probe head features a streamlined conical design that minimizes sediment and sludge buildup and adhesion. In flowing water, during aeration, or when liquid levels fluctuate, the probe utilizes fluid shear forces to achieve self-cleaning.

(3) Protection and Environmental Adaptability

--- Overall protection rating of **IP68**; the probe can be submerged in liquid for extended periods and is waterproof, moisture-resistant, and leak-proof;

--- The core sensing diaphragm is made of **316L stainless steel**, the housing is 304 stainless steel, the O-ring is nitrile rubber, and the cable features a waterproof, oil-resistant polyurethane sheath; customizable options include tantalum diaphragms, Hastelloy C-276, fluorocarbon rubber, and PTFE to accommodate special conditions such as severe corrosion, high temperatures, and food-grade hygiene requirements;

--- Standard medium temperature range: **-25°C to 60°C**; low-temperature (-40°C) or high-temperature (85°C) versions are available upon request; ambient temperature range: -40°C to 60°C, suitable for cold northern regions, outdoor environments in the south, and underground utility tunnels;

--- Resistant to mechanical vibration up to 20g (20–5000 Hz), shock resistance up to 100g (11 ms), and overload capacity of 200% FS, suitable for conditions such as pump outlets, flowing water, and water hammer impacts.

(4) Atmospheric Pressure Compensation and Anti-Interference Functions

--- The standard gauge pressure model employs **air-tube cable atmospheric pressure compensation**. An air tube integrated into the cable channels atmospheric pressure from above the liquid surface into the sensor's vacuum chamber, automatically offsetting the impact of atmospheric pressure fluctuations on measurements; no additional calibration is required for open-top vessel measurements;

--- An optional absolute pressure model is available, suitable for sealed pressurized storage tanks, nitrogen-purge storage tanks, and similar scenarios; when paired with a tank-top pressure transmitter, it enables high-precision liquid level calculation;

--- Built-in reverse polarity protection, overvoltage protection, overcurrent protection, and surge protection; EMC interference immunity Level 3, suitable for industrial environments with strong electromagnetic interference.

(5) Operation, Maintenance, and Expansion Features

--- The integrated design requires no vessel cutouts or complex flanges for installation; simply fill with liquid to begin operation, resulting in low installation costs;

--- An optional on-site digital display unit is available to show liquid level values, units, and status locally, and supports parameter configuration via on-site buttons;

--- Supports zero-point reset, span calibration, damping adjustment, and unit switching, allowing for flexible adjustment based on on-site operating conditions;

--- Optional dual-channel relay outputs are available to enable high/low liquid level alarms and automatic interlock control of pumps and valves.

II. Operating Principle

1. Core Measurement Principle (Static Pressure Method)
This product operates based on the physical principle that **liquid static pressure is directly proportional to liquid level height**.
The product employs a design featuring **gauge pressure measurement combined with gas-conduit cable compensation**: the sensor's positive pressure chamber senses the liquid's static pressure, while the negative pressure chamber is connected to the atmosphere above the liquid surface via a gas conduit embedded in the cable, automatically offsetting the effects of atmospheric pressure. As a result, the pressure measured by the sensor is directly proportional to the height of the liquid column. After the microprocessor acquires the pressure signal, it undergoes temperature compensation and nonlinear correction, converts it into real-time liquid level height, and outputs it as a standard electrical signal.

2. Anti-Clogging Structure Workflow
For harsh operating conditions involving impurities and sludge, the product employs a "**three-stage anti-clogging + fluid self-cleaning**" structural design to reduce the risk of clogging at the source. The complete process is as follows:
1. **Large-Particle Interception**: The liquid first passes through the stainless steel anti-clogging filter screen or deflector at the front end of the probe, which filters out large suspended solids such as silt, fibers, and debris, preventing them from directly entering the pressure-sensing channel;
2. **Angled Flow Guidance to Prevent Silting**: The liquid enters the pressure chamber through 45° angled flow holes. The angled openings prevent silt buildup on the bottom surface, while the flowing liquid creates a flushing effect at the orifices, reducing sludge adhesion and deposition;
3. **Buffer Protection Diaphragm**: The cushioning structure inside the pressure chamber ensures that the liquid makes gentle contact with the sensor diaphragm, preventing direct impact and wear from impurities. At the same time, fine particles are carried away by the liquid flow and do not accumulate on the diaphragm surface;
4. **Fluid Self-Cleaning**: The streamlined, conical probe design utilizes fluid shear forces to flush away surface deposits during water flow, aeration, and level fluctuations, thereby reducing adhesion and blockages.

3. Complete Workflow
1. **Pressure Sensing**: After the probe is immersed in the liquid, the static pressure is uniformly transmitted through the fluid passage and silicone oil filling to the 316L stainless steel isolation diaphragm, where a diffused silicon piezoresistive chip converts the physical pressure into a millivolt-level electrical signal;
2. **Signal Conditioning and Digitization**: After the front-end signal is amplified and filtered, it is converted into a digital signal by a high-precision A/D converter;
3. **Compensation and Calculation**: The microprocessor performs temperature compensation and nonlinear correction on the signal. At the same time, it uses atmospheric pressure introduced through a vent tube to offset fluctuations in ambient air pressure, thereby calculating the real-time liquid level;
4. **Signal Output and Display**: One channel is converted into a standard 4–20 mA analog signal (or RS485 digital signal) and transmitted to the control system; an optional on-site digital display can be used to show liquid level and status information locally;
5. **Control and Alarms**: An optional relay output module enables automatic control of pumps and valves, as well as audible and visual alarms when liquid levels exceed preset high or low thresholds.

4. Integrated Sealing Principle
The product features a **fully sealed, integrated structure**: the probe housing and cable are sealed using a dual-seal design consisting of mechanical compression and epoxy resin potting. The internal air vent tube is physically isolated from the signal wires. With an overall protection rating of IP68, the device can be submerged in liquid for extended periods, preventing water, moisture, and contaminants from entering the internal circuitry and ensuring long-term operational reliability.

III. Core Value and Customer Benefits
1. Core Value
Clog-Resistant and Durable: Specifically designed with a clog-resistant structure to handle harsh operating conditions involving sludge, impurities, and fibers, this solution addresses the common issues of frequent clogging, measurement failure, and short service life associated with conventional submersible level transmitters, significantly reducing maintenance frequency and replacement costs.

High Precision and Stability: Utilizing diffused silicon digital sensing technology combined with full-range temperature compensation, measurement accuracy is 5 to 10 times higher than that of traditional float and magnetic flip-plate level transmitters. It exhibits minimal long-term drift and remains unaffected by bubbles, liquid level fluctuations, or changes in medium density, ensuring stable and reliable data.

Cost Savings in Installation and O&M: The integrated design eliminates the need for vessel cutouts or complex mounting brackets, allowing for immediate use upon installation; Installation costs are only 1/3 to 1/5 of those for magnetic flip-plate level gauges and radar level transmitters; the clog-resistant design significantly reduces cleaning, replacement, and inspection costs.

Value of Full-Scenario Adaptability: With a measurement range covering 0–500 m, the device offers customizable materials, temperature ratings, explosion-proof features, and output options, making it suitable for a wide range of industry scenarios, including open tanks, closed storage tanks, deep wells, reservoirs, wastewater treatment, chemical processing, and food processing.

Digital Integration Value: Supports standard industrial signals and bus protocols, allowing direct integration with PLC/DCS/SCADA systems to enable remote monitoring, data acquisition, and automatic control, supporting industrial automation and smart water management upgrades.

2. Typical Customer Challenges Addressed
Addresses issues in wastewater treatment, sedimentation tanks, sludge tanks, and similar scenarios where conventional level transmitters are frequently clogged by silt and impurities, resulting in inaccurate measurements and frequent malfunctions;

Addresses issues with traditional float and magnetic flip-plate level transmitters—which have moving mechanical parts—such as jamming, wear and tear,

short service life, and frequent maintenance;

Addresses issues with standard submersible level transmitters, such as seal failure, water ingress into cables, and damage from long-term immersion;

Addresses issues caused by atmospheric pressure fluctuations and temperature changes, such as level measurement drift and inaccurate data;

Addresses challenges in scenarios such as deep wells, reservoirs, and underground utility tunnels, including difficult installation, inability to monitor remotely, and high inspection costs;

Addresses issues with special media—such as highly corrosive, high-temperature, and high-viscosity substances—where conventional level transmitters are unsuitable.

IV. Key Challenges and Solutions

Q1: Sediment and fibrous impurities in wastewater tanks, sedimentation tanks, and sludge tanks can easily clog the probes of level transmitters. Standard submersible level transmitters fail within 1 to 2 months. What can be done?

A: Standard submersible level transmitters feature straight pressure-taking ports with flat bottoms, making them highly susceptible to sediment and suspended solids that settle and cause blockages. Additionally, impurities adhere to and wear down the sensor diaphragm, leading to measurement failure and equipment scrapping. Frequent replacements not only incur high procurement costs but also cause interruptions in level monitoring, potentially triggering production accidents such as overflow or dry-running pumps.

Solution: The QDY3OA-B-FD anti-clogging model features a three-stage anti-clogging design: a removable stainless steel filter screen at the front intercepts large particles; a 45° angled fluid guide hole prevents sediment buildup at the bottom; and a streamlined conical probe utilizes the fluid's self-cleaning action; This physical design significantly reduces the likelihood of clogging. Additionally, the filter screen can be removed and cleaned separately without replacing the entire unit, extending its service life by 3 to 5 times in environments with sludge and impurities.

Q2: Traditional float-type and magnetic flip-plate level gauges often jam or malfunction and are difficult to maintain. Is there a solution without moving parts?

A: Float-type and magnetic flip-plate level transmitters rely on mechanical moving parts such as floats and magnets to operate. In environments containing sludge, impurities, or high-viscosity media, they are highly prone to jamming, sticking, and malfunction. They require regular cleaning and replacement of floats, resulting in a heavy maintenance burden. Additionally, due to mechanical wear, their service life is typically only 1–3 years.

Solution: Submersible hydrostatic level transmitters have no moving parts and measure liquid level based on hydrostatic pressure, eliminating issues with jamming or wear. The clog-resistant version further optimizes the pressure-transmitting structure to handle harsh conditions involving impurities. The overall service life can reach 5 to 10 years, with maintenance requirements amounting to only one-tenth of those for traditional mechanical level transmitters.

Q3: When measuring liquid levels in open tanks or reservoirs, changes in atmospheric pressure and temperature fluctuations cause data drift and inaccurate readings. How can this be addressed?

A: Standard absolute pressure-type level transmitters cannot compensate for atmospheric pressure fluctuations; weather changes and pressure variations can result in measurement errors of several centimeters or even tens of centimeters. Temperature changes can also cause variations in medium density and sensor zero-point drift, further amplifying the error.

Solution: The standard QDY3OA-B-FD model employs gas-conduit cable atmospheric pressure compensation. A built-in gas conduit within the cable channels atmospheric pressure at the liquid surface into the sensor's negative pressure chamber, automatically offsetting pressure fluctuations. Additionally, it features built-in full-range digital temperature compensation that corrects for temperature drift in real time within the range of -25°C to 60°C, ensuring measurement accuracy across various environments.

Q4: Submersible level transmitters are constantly immersed in water, making them prone to water ingress, seal failure, and cable aging. How can this be addressed?

A: Conventional submersible level transmitters often have poor sealing processes; after prolonged immersion, water seeps in through cable connectors and housing seams, causing circuit short-circuits and sensor damage. Low-quality cables crack and degrade over time due to prolonged immersion, leading to water ingress and signal interruption.

Solution: The product features an IP68 fully sealed, integrated design. The probe and cable are secured with a dual-seal system combining mechanical clamping and epoxy resin potting. The cable is encased in a polyurethane sheath that is waterproof, oil-resistant, hydrolysis-resistant, corrosion-resistant, and age-resistant. It can operate while submerged in liquid for extended periods, preventing water ingress and failure, and significantly enhancing seal reliability.

Q5: In scenarios such as deep wells, reservoirs, and underground utility tunnels, installation is difficult and inspection costs are high. How can remote monitoring be achieved?

A: Traditional level transmitters require drilling holes in the walls of containers or tanks and installing mounting brackets, which is difficult and costly in environments like deep wells and reservoirs. Remote locations cannot be wired or transmit data remotely, necessitating regular manual inspections—a process that is inefficient, costly, and poses safety risks.

Solution: Submersible level transmitters require no drilling for installation; simply submerge the probe in the liquid and secure the cable at the top, reducing installation costs by over 70%. They come standard with 4–20 mA signal transmission and offer optional RS-485 digital communication, allowing direct integration with SCADA or IoT platforms to enable real-time remote monitoring and anomaly alarms, thereby significantly reducing the frequency and cost of manual inspections.

Q6: In chemical and pharmaceutical applications involving highly corrosive and high-temperature media, standard level transmitters corrode and fail quickly. How should we select the right model?

A: In strong acids, strong alkalis, organic solvents, and high-temperature media, standard 304 stainless steel level transmitters experience rapid corrosion and leakage of their diaphragms and housings, rendering the equipment unusable and potentially causing safety risks due to media leakage.

Solution: The QDY30A series supports full material customization: diaphragms are available in 316L stainless steel, tantalum, Hastelloy C-276, and Monel; seals can be selected from fluorocarbon rubber, perfluoroether rubber, or polytetrafluoroethylene (PTFE); low-temperature (-40 ° C) and high-temperature (85 ° C) models are available to accommodate special operating conditions such as highly corrosive environments, high temperatures, and food-grade hygiene requirements, while maintaining anti-clogging design and measurement accuracy.

Q7: For high-viscosity slurries, pulp, and media containing long fibers, standard anti-clogging level transmitters are still prone to clogging. What can be done?
A: With a standard single-screen anti-clogging design, in applications involving high-viscosity, long-fiber, or high-concentration sludge, fibers can become entangled in the screen and slurry can coat the diaphragm, leading to clogging and measurement inaccuracies.
Solution: A customized, enhanced anti-clogging solution featuring a dual-layer filter screen, large-aperture flow guidance, and self-cleaning ports can be implemented: the outer coarse filter screen intercepts large particles, while the inner fine filter screen filters out microscopic impurities. Additionally, the flow guidance structure is optimized and integrated with aeration and backflush ports to enable periodic cleaning of the probe. Alternatively, a version equipped with a scraping and washing device can be selected to handle extreme clogging conditions.

Q8: Can submersible level transmitters be used in sealed, pressurized storage tanks or nitrogen-sealed tanks? Will the measurements be accurate?
A: Standard gauge-pressure submersible level transmitters designed for open tanks will be affected by the vapor pressure inside sealed, pressurized storage tanks, resulting in significant measurement errors and rendering them unusable.
Solution: For sealed, pressurized applications, select an absolute pressure submersible level transmitter. Additionally, install a pressure transmitter at the tank top to measure the vapor pressure. The control system can then subtract the vapor pressure from the total pressure to obtain the accurate liquid column pressure, which is used to calculate the liquid level height. Alternatively, a dual-probe differential pressure solution can be used directly to achieve high-precision liquid level measurement in sealed tanks.

Q9: When selecting submersible level transmitters, people often focus only on measurement range and accuracy. Why do these devices frequently prove unsuitable for field conditions or have a short service life?
A: There are numerous common pitfalls in selecting submersible level transmitters: ignoring the corrosiveness of the medium and impurity content, leading to incorrect material selection and clogging resistance ratings; neglecting installation environment temperature and pressure, resulting in incorrect temperature ratings and compensation methods; overlooking cable length and protection ratings, causing seal failure; and failing to consider output signal and system compatibility, leading to integration issues.
Solution: During selection, the following must be confirmed in sequence: ① Medium composition, impurity content, and corrosiveness to match the diaphragm material and anti-clogging rating; ② Medium temperature and ambient temperature to match the temperature rating; ③ Open or sealed vessel to match gauge pressure or absolute pressure types; ④ Installation depth, cable length, and protection rating; ⑤ Compatibility of the output signal with the control system; ⑥ Whether explosion-proof or intrinsically safe certification is required. The QDY30A series supports full parameter customization to precisely match on-site operating conditions.

Q10: Are the measurement results of submersible level transmitters affected by medium density? What should be done if density changes?
A: The measurement principle of hydrostatic level transmitters is based on liquid density. If the medium density changes (e.g., due to changes in concentration or temperature), this will directly cause errors in level measurement; standard level transmitters lack density compensation, resulting in significant errors in scenarios with density fluctuations.
Solution: For media with stable density, simply enter the actual medium density during calibration; for scenarios with significant density fluctuations, use a density meter for real-time density compensation, or select a model with temperature compensation to correct for density changes caused by temperature; for stratified media (such as an oil-water interface), use a dual-probe differential pressure solution and calculate the interface height based on density parameters.

Key Product Specifications & Detailed Specifications

I. Basic Electrical Parameters

Measurement Principle	Diffused Silicon Piezoresistive Static Pressure Measurement, Gauge Pressure Type (Atmospheric Pressure Compensation via Gas-Conduction Cable)
Measurement Range	0–0.5 m to 0–500 m; custom ranges available
Measurement Accuracy	Standard: 0.2% FS; Optional: 0.5% FS
Overload Pressure	200% FS
Response Time	≤8 ms (rise to 90% FS; software-adjustable damping)
Zero-Point Temperature Drift	±0.2% FS
Sensitivity Temperature Drift	±0.2% FS
Long-Term Stability	±0.2% FS/year
Output Signal	1. Two-wire: 4–20 mA (standard) 2. Three-wire: 0–5 V / 1–5 V / 0–10 V 3. Digital Output: RS485 Modbus RTU (optional)
4–20 mA loop load	0–600 Ω @ 24 V DC
Built-in protection	Reverse polarity protection, overvoltage protection, current limiting protection, surge protection, EMC interference immunity
Resistant to mechanical vibration	20 g, 20–5,000 Hz, no performance degradation
Resistant to mechanical shock	100 g, 11 ms

II. Power Supply & Power Consumption Specifications

Supply Voltage	DC 12–32 V, typically 24 V DC
Full-Load Power Consumption (4–20 mA, 2-wire)	≤0.5 W
Full-Load Power Consumption (RS485, Digital)	≤0.8 W
2-Wire Quiescent Current	4 mA (zero) to 20 mA (full scale); current determined by the loop
Power Distribution Output	The probe body has no power output; versions with a field-mounted digital display can provide a 5 V low-power output (optional)
Power Supply Ripple Requirements	≤100 mVpp

III. Environmental Adaptation Parameters

Media Operating Temperature	Standard: -25°C to +60°C; customizable versions available for low temperatures down to -40°C and high temperatures up to 85°C. Anhui Qidian...
Ambient Air Temperature	-40°C to +60°C
Relative Humidity	0–95% RH, non-condensing (upper terminal box)
Storage Temperature	-40°C to +125°C.
Protection Rating	Probe body IP68 (suitable for long-term immersion); top terminal box IP65/IP67
Explosion-Proof Rating (Optional Explosion-Proof Version)	Ex ia II C T6 Ga (intrinsically safe)
Intrinsically Safe Barrier Compatibility Parameters	Ui ≤ 28 V, Ii ≤ 100 mA, Pi ≤ 0.7 W; isolated safety barriers are recommended, as they offer better interference resistance than Zener-type safety barriers
Media Compatibility	Standard configuration is suitable for clean water, wastewater, sediment-laden wastewater, and mildly corrosive liquids; tantalum or Hastelloy diaphragms are available for highly corrosive media

Installation Method: Drop-in suspension type; secured by a lifting eye at the top of the cable; optional guide rod and bottom counterweight; no need to drill holes in the tank

Dimensions: Probe barrel outer diameter Φ28mm; barrel length L=110mm; maximum outer diameter of front anti-clogging filter screen Φ34mm; height of anti-clogging flow guide L1=35mm; **Total probe length (casing + anti-clogging head) ≈ 145 mm** Cable exit at the rear: PU gas-conducting cable routed through an M12 waterproof compression nut

Weight: Bare probe (excluding cable) ≈ 260 g; polyurethane gas-conducting cable approx. 75 g/meter

Housing Material: Probe body: 304 stainless steel; Anti-clogging flow guide screen: 304 stainless steel removable screen; Pressure-sensing diaphragm: 316L stainless steel (standard; optional Hastelloy or tantalum diaphragms)

Seal Material: Standard: Nitrile rubber (NBR); Optional: Fluorocarbon rubber (FKM), perfluoroelastomer (FFKM)

Cable Specifications: Waterproof five-core polyurethane (PU) cable designed specifically for gas conduction, with a built-in independent gas conduit; cable length customized as required

Protective Structure Details:

1. Probe tail: Dual sealing via epoxy resin potting and mechanical compression, providing waterproof and leak-proof protection

2. Anti-clogging design: Removable double-layer filter screen + 45° angled fluid inlet, with conical streamlined flow guidance; the filter screen can be removed and cleaned separately

3. The cable's gas conduit features a dedicated channel, physically isolating the gas conduit from the signal wires to prevent moisture from entering the sensor's negative pressure chamber

4. The vent port at the upper end of the cable must remain unobstructed and dry; blocking the vent port is strictly prohibited |





Scenario-Based Selection Guide

I. Key Selection Criteria

1. Signal Type Selection: For standard pump set interlocks and single-point liquid level monitoring, prioritize 4–20 mA two-wire output, which is compatible with the vast majority of PLCs and DCS systems and offers strong resistance to interference over long-distance cabling; For scenarios involving multi-instrument networks, centralized level data acquisition, or remote parameter reading and modification, select RS485 Modbus RTU digital output; for short-distance signal acquisition on-site or in simple control cabinets, 0–5 V or 0–10 V voltage output may be chosen. Voltage output is only suitable for short-distance wiring within 50 meters, as long-distance transmission is prone to signal attenuation.

2. Channel Selection: For monitoring a single-point water tank, a single sedimentation tank, or an independent water tank, select the single-channel standard QDY30A-B-FD; For simultaneous monitoring of multiple tanks within a single control system, configure one transmitter for each level measurement point and network them via an RS485 bus to achieve multi-channel data acquisition; If you need to simultaneously measure liquid level and medium temperature from the same probe, select the dual-channel integrated version, which outputs both liquid level and temperature signals from a single probe, reducing on-site wiring.

3. Power Supply Selection: If a 24V DC power source is available nearby in an industrial control room, select the standard DC 12–32V two-wire power supply, which is the mainstream power solution for this product; For unmanned locations such as reservoirs or rivers where there is no fixed mains power supply, select the low-power version, which is compatible with solar panels and battery power; The voltage output version uses a three-wire independent power supply and requires a separate DC power circuit. Be sure to distinguish between two-wire and three-wire wiring configurations to avoid damaging the

instrument due to incorrect power connections.

4. Selection Based on Explosion-Proof Requirements: For ordinary, non-flammable and non-explosive open sewage tanks and clear water tanks, directly select the general-purpose standard model QDY30A-B-FD; For open hazardous chemical tanks containing flammable or explosive media, or wastewater equalization tanks containing flammable vapors, the Ex ia Ⅱ C T6 intrinsically safe version must be selected, paired with an intrinsically safe barrier with matching parameters. The safety barrier must be installed in the safe area; direct connection of a 24V power supply in the hazardous area is strictly prohibited. For sealed, pressurized storage tanks containing flammable or explosive media, direct use of submersible transmitters is not recommended; prioritize differential pressure level measurement solutions.

5. Selection Based on Installation Environment: For wastewater containing silt, fibrous suspended solids, or sludge sediment, as well as in sedimentation tanks and aeration tanks, the FD anti-clogging model must be used; for clean water or water tanks free of impurities, standard submersible transmitters may be used without an anti-clogging head; if the medium exhibits weak acid or alkali corrosion, upgrade to a 316L diaphragm; For highly corrosive media, select Hastelloy or tantalum diaphragms paired with fluorocarbon rubber seals; if the medium temperature exceeds 60°C or falls below -25°C, custom high-temperature or low-temperature versions are required; If strong electromagnetic interference from variable frequency drives or high-power motors is present on-site, install an external 4–20 mA signal isolator to eliminate ground loops; If on-site space is limited or the tank is shallow, verify the probe's external dimensions and select the short-casing version; For river channels or deep well locations, extend the vent cable as needed, allowing for a 1–2-meter margin in cable length.

6. Range Selection: Select the measurement range by adding a **10%–20% margin to the maximum actual liquid level height** to prevent damage caused by the instrument exceeding its range due to momentary liquid level surges; in shallow tanks with low liquid levels, do not use instruments with a wide measurement range, as this will significantly reduce measurement accuracy; for deep wells and reservoirs at great depths, use the long-cable version and verify the cable's tensile strength.

II. Recommended Model Selection for Industry Applications

Chemical Industry: Open wastewater tanks, neutralization tanks, and chemical wastewater tanks containing suspended solids. For media containing small amounts of sediment and fibrous impurities, the QDY30A-B-FD anti-clogging model is recommended, which comes standard with a 4–20 mA output; For media with weak acidic or alkaline corrosion, upgrade the diaphragm to 316L; for highly corrosive wastewater, select a Hastelloy diaphragm paired with a fluorocarbon rubber seal; for applications involving flammable volatile gases, select the intrinsically safe explosion-proof model equipped with an isolated safety barrier; submersible products are not recommended for sealed, pressurized chemical storage tanks; prioritize differential pressure level measurement solutions.

Power Industry: Power plant circulating water tanks, industrial wastewater tanks, ash water settling tanks, and fire protection water tanks. Since ash water and rinse water contain silt and impurities, prioritize the QDY30A-B-FD anti-clogging model, with a 4–20 mA signal connected to the power plant's DCS system; when circulating water temperatures are high, select a custom high-temperature version; Power plants have numerous variable-frequency drives and strong electromagnetic interference; it is recommended to install signal isolators in the control room; fire protection fresh water tanks contain clean media, so standard submersible transmitters may be selected without the need for anti-clogging structures.

Metallurgical Industry: Metallurgical wastewater treatment tanks, turbid ring water tanks, and sedimentation tanks contain large amounts of silt and iron oxide scale particles, which can easily clog standard level probes. The QDY30A-B-FD anti-clogging model is the preferred choice, featuring a removable filter screen for easy periodic cleaning; if the medium contains corrosive metal ions, select a 316L diaphragm; In environments with significant on-site vibration, verify the product's vibration resistance specifications during selection, and secure the cable to prevent the probe from swinging and pulling on it.

Pharmaceutical Industry: Pharmaceutical wastewater tanks and cleaning wastewater collection tanks—the medium contains drug residues and a small amount of suspended solids; the QDY30A-B-FD anti-clogging model is recommended; for sanitary clean water tanks and purified water tanks, submersible types are not recommended; prioritize sanitary-grade level measurement solutions; For wastewater subject to acid or alkali corrosion, upgrade to corrosion-resistant diaphragms and fluororubber seals; for wastewater tanks in explosion-proof workshops, select intrinsically safe models equipped with safety barriers, and strictly adhere to intrinsically safe circuit wiring standards.

Smart Manufacturing Industry: Factory production wastewater collection tanks, cooling water tanks, and underground collection wells—where production line impurities and metal shavings tend to accumulate—select the QDY30A-B-FD anti-clogging version; For centralized monitoring scenarios involving multiple production lines and tanks, select models with RS485 output and connect via bus networking to the industrial control system; when workshop control cabinets are located at a considerable distance, prioritize 4–20 mA analog output to enhance long-distance signal stability; in production line environments with strong electromagnetic interference, use signal isolation modules.

Municipal Environmental Protection and Water Utilities Industry: Inflow wells, equalization tanks, sludge settling tanks, and pump station collection wells at wastewater treatment plants—where the medium contains fibers, sludge, and suspended impurities—represent the core application scenarios for this product; the QDY30A-B-FD anti-clogging model is recommended; Reservoirs, rivers, and municipal water treatment clear water tanks—where the water is clean—can use standard submersible models without anti-clogging features; for remote, unmanned monitoring sites, low-power consumption and wireless data acquisition modules can be added.

III. Common Mistakes in Product Selection

1. Ignoring the Isolation Level: Many users confuse medium isolation with electrical signal isolation. They mistakenly believe that the probe comes with built-in electrical isolation and use it directly in field environments with ground potential differences, resulting in signal drift and sudden value fluctuations; The QDY30A-B-FD probe features only diaphragm-based media isolation and has

no built-in electrical isolation. In operating conditions with ground loops or strong interference, a separate signal isolator must be installed on the control room side. In explosion-proof applications, intrinsically safe energy isolation relies on external safety barriers; the instrument itself cannot provide intrinsically safe energy isolation, so safety barriers must not be omitted.

2. Incorrect signal range selection: Selecting a model based solely on the typical liquid level height without allowing a 10%–20% range margin results in the signal exceeding the range during liquid level surges or momentary overflows; selecting an excessively large range for shallow tanks reduces the proportion of the effective measurement range, significantly lowering actual measurement accuracy; some users select a model based solely on the total height of the vessel, ignoring the installation clearance required for the probe, which causes the probe to strike the bottom and become damaged.

3. Neglecting load matching: When selecting a 4–20 mA two-wire output, the total loop resistance is not calculated; if the loop load exceeds the 600 Ω upper limit, the signal cannot reach full scale, resulting in abnormal readings. For long-distance wiring, the cumulative load caused by wire resistance is not accounted for, leading to low signal levels. For voltage-type outputs, wiring length is not controlled, causing voltage drop and signal distortion during long-distance transmission.

4. Incorrect Selection of General-Purpose Models in Explosion-Proof Environments: In flammable and explosive hazardous areas, standard non-explosion-proof QDY30A-B-FD models are purchased and put into service without configuring an intrinsically safe barrier, posing safety hazards; some users confuse intrinsically safe and flameproof types, using submersible intrinsically safe level transmitters in sealed, high-pressure combustible tanks—where the submersible structure is inherently unsuitable for the operating conditions—creating a risk of medium leakage.

5. Neglecting medium-material compatibility: In sewage and sludge applications, standard NBR seals are used directly; when exposed to oily, acidic, or alkaline wastewater, they age rapidly and fail. In highly corrosive environments, standard 316L diaphragms continue to be used; the diaphragms corrode and perforate, rendering the instrument inoperable. Ignoring medium temperature leads to the direct use of the standard -25 to 60°C version for high-temperature media, causing seals to age rapidly and leak.

6. Misconceptions in cable selection: For vented cables, only the length submerged in water is calculated, without allowing for routing clearance; sealing off the vent port causes atmospheric pressure compensation to fail, resulting in continuous drift in level measurements; using standard PU cable sheaths in corrosive liquid environments leads to cable cracking and water ingress.

IV. Customization Recommendations: Description of Custom Solutions for Special Signals, Non-Standard Operating Conditions, and Multi-Channel Integration

1. Customization for Special Signals: When standard 4–20 mA or RS485 cannot meet requirements, three-wire voltage outputs of 0–5 V, 1–5 V, or 0–10 V can be customized; If the HART protocol is required for intelligent commissioning, HART digital communication can be added; for low-power monitoring scenarios in the field, a low-power version can be customized to support solar power and reduce quiescent current; two relay digital outputs can be added to enable on-site high/low liquid level alarms and pump start/stop interlocks directly at the probe end, eliminating the need for PLC programming.

2. Customization for Non-Standard Operating Conditions: For high-concentration sludge and long-fiber wastewater, we offer custom dual-layer, reinforced anti-clogging filters and enlarged flow-guiding orifices; an external backflush port can be added to periodically purge the probe and prevent sludge buildup on the membrane. For highly corrosive environments, we provide custom Hastelloy and tantalum diaphragms, paired with FEP (polytetrafluoroethylene) cable sheathing and fluororubber seals; For high-temperature media, a high-temperature version rated up to 85°C is available; for low-temperature applications, a cold-resistant version rated down to -40°C is available; for shallow tank applications, a short-body probe with a shortened housing is available; for seawater environments with high chloride ion concentrations, a solution using materials resistant to seawater corrosion is available; an integrated dual-parameter probe for level and temperature can be added to simultaneously measure liquid level and temperature.

3. Multi-Channel Integration Solutions: For centralized monitoring of multiple tanks, select the RS485 bus-type QDY30A-B-FD; multiple instruments can be connected to a single bus and integrated with a PLC or IoT gateway, reducing the amount of cabling required; The multi-channel data acquisition system can be paired with a signal isolation module set, ensuring each signal channel is independently isolated to prevent interference between channels; the complete solution can include a wiring protection box and surge protection modules for use in outdoor environments and pump stations—areas prone to frequent lightning strikes; it can also be paired with a field digital display to provide on-site liquid level readings while simultaneously transmitting signals remotely; the complete delivery package may include mounting brackets, counterweights, and cable fasteners, ensuring a fully integrated solution.

4. Customized Special Structures: Extended guide-rod mounting structures can be customized to prevent the probe from sinking directly into the sludge layer at the bottom of the tank; cables with scratch-resistant, wear-resistant sheaths can be customized for tanks containing floating debris that could easily damage the cables; explosion-proof solutions can be equipped with complete safety barriers and explosion-proof junction boxes, and the entire system comes with explosion-proof documentation to meet safety inspection and acceptance requirements.

Installation and Commissioning Specifications

I. Pre-Installation Preparation

1. Verification of Components
Unpack and inventory the complete set of materials: QDY30A-B-FD level probe, custom-length PU vent cable, and stainless steel lifting eye; optional accessories include a counterweight, guide rod bracket, field-mounted digital display, intrinsically safe barrier, signal isolator, and lightning protection module. Verify that the model, measurement range, output type, and explosion-proof version match the order; check that the probe's anti-clogging filter screen is free of dents or deformation and that the pressure-taking holes are unobstructed; inspect the cable sheath for damage, crushing, or kinks; and verify the certificate of conformity and factory calibration certificate. For explosion-proof models, additionally check that the explosion-proof markings and certification documentation are complete.

2. Environmental Inspection

Confirm that there are no large, sharp, or hard objects inside the tank to prevent the probe from striking or scratching the cylinder or filter screen during insertion; confirm that the medium temperature is within the instrument's rated medium temperature range; for explosion-proof applications, verify the on-site hazardous area classification—intrinsically safe instruments may only be installed in Zones 0, 1, or 2, and safety barriers must be placed in safe areas; Inspect the cable routing to ensure it is kept away from strong interference sources such as variable frequency drives, high-power motors, and contactors; confirm the location of the vented junction box at the upper end of the cable—it must be placed in a dry, well-ventilated area, and **the vent opening of the vent tube must never be sealed or submerged in water**; check the thickness of sludge at the bottom of the tank; if necessary, install a counterweight or guide rod to raise the probe to prevent it from becoming buried in sludge and causing measurement failure.

3. Tool List

Phillips screwdriver, wire strippers, crimp terminals, multimeter (DC voltage and milliampere ranges), cable ties, cable clamps, electrical tape, waterproof junction box, cable cutters; in explosion-proof environments, use explosion-proof-rated wiring tools exclusively; the use of junction boxes without explosion-proof certification is prohibited.

4. Safety Precautions

For work in sewer systems, obtain the necessary confined space work approval, ensure proper ventilation and gas detection, and assign a designated supervisor; the 24V DC power supply must be disconnected before performing live wiring; In explosion-proof areas, strictly adhere to the installation specifications for intrinsically safe circuits; plugging or unplugging intrinsically safe circuits while energized is strictly prohibited; lower the probe slowly to avoid cable tugging or tangling; do not drag the probe by pulling the cable directly, as concentrated tension inside the cable may damage the gas conduit and cause measurement drift.

II. Standard Installation Steps

1. Secure the Bracket / Suspension Point: Secure a lifting eye bracket or rail bracket to the top platform of the tank or equalization tank. The bracket's load-bearing capacity must exceed the combined weight of the probe and cable to prevent sagging due to prolonged immersion. If installing a guide rod, secure it vertically to ensure the probe hangs vertically without tilting.

2. Lowering the Probe: Slowly lower the anti-clogging probe into the liquid. Maintain a distance of at least 200 mm between the bottom of the probe and the sludge layer at the bottom of the tank to prevent the sludge from burying the anti-clogging filter screen. Keep the probe vertical and avoid contact with the tank wall to minimize swaying caused by water flow.

3. Cable Securing: Secure the cable in sections to the bracket using cable clamps, allowing a small amount of slack to prevent the cable from being pulled by water level fluctuations; route the cable away from high-velocity water flow and floating debris to prevent the cable sheath from being cut. Route the upper end of the cable into a dry junction box.

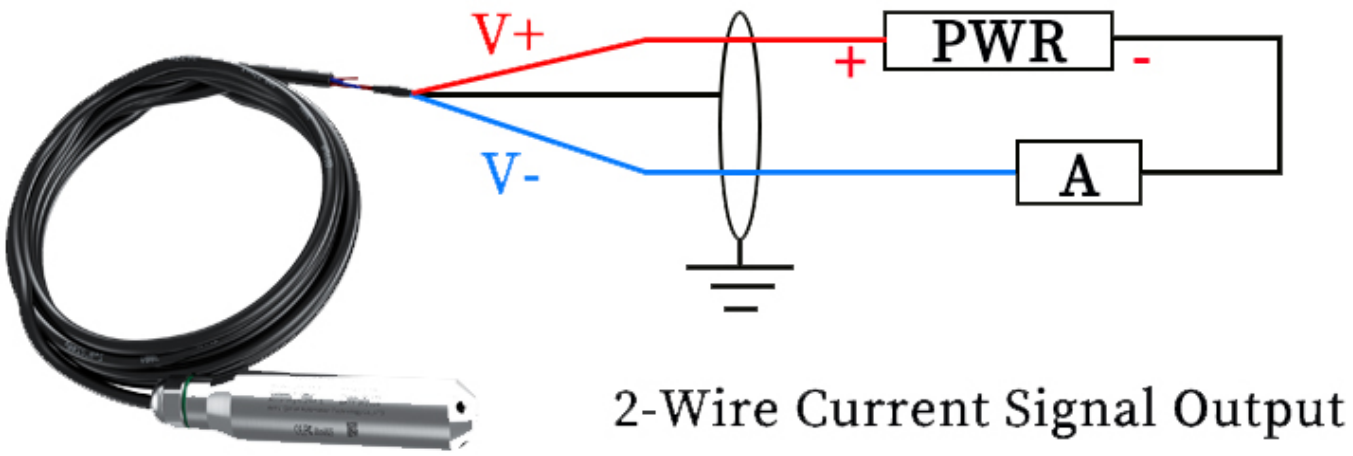
4. Wiring Specifications (Distinguish between 2-wire 4–20 mA and RS485 digital types)

--- 2-wire 4–20 mA (standard configuration): Connect the transmitter's positive terminal to the positive terminal of the 24 V DC power supply; connect the transmitter's negative terminal to the PLC's analog input terminal; connect the other end of the PLC's input terminal to the negative terminal of the 24 V DC power supply; The entire circuit is a single series circuit.

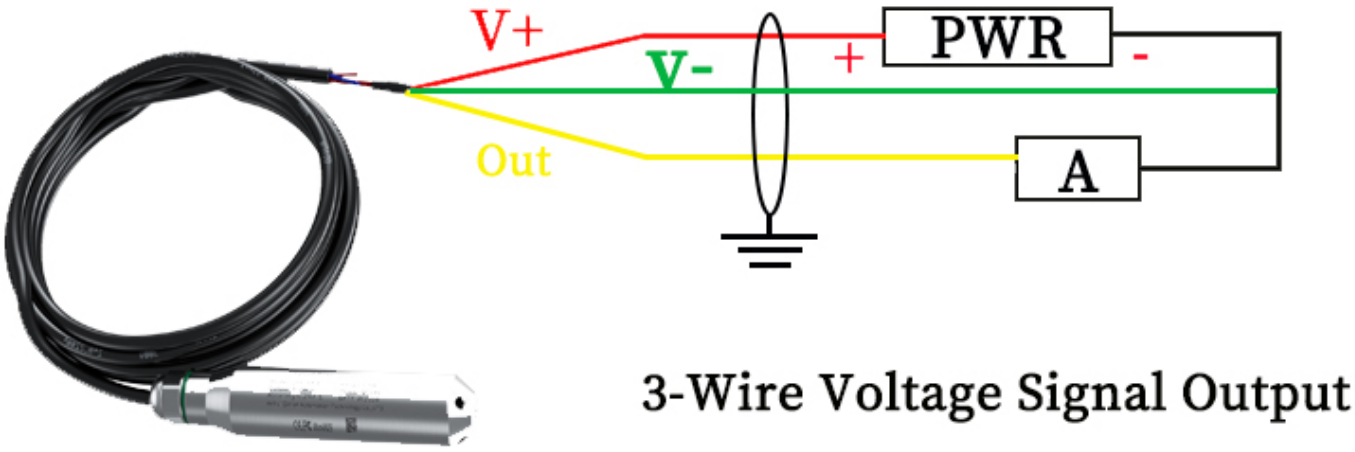
--- RS485 Digital Output: Connect Line A to the host's A terminal and Line B to the host's B terminal; ensure that A and B are not reversed; the power line must be connected independently to the 24V DC power supply.

- - Shielding wire handling: The cable shield must be **grounded at a single point**—grounded only at the control room junction box end. The shield at the probe end must remain floating (ungrounded) to prevent ground loops caused by grounding at two locations.

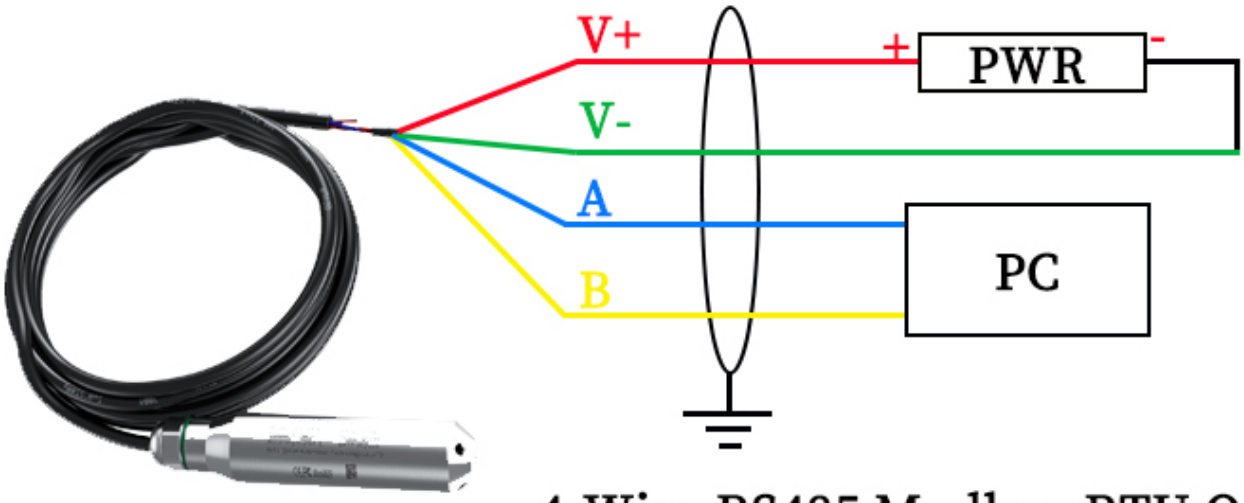
5. Grounding Requirements: The grounding terminal on the control room side must be connected to the protective ground, with a grounding resistance ≤4Ω; for intrinsically safe circuits in explosion-proof environments, the safety barrier housing must be separately and reliably grounded; instrument signal wires must not be run through the same conduit as 380V power cables; they must be routed through separate conduits with a minimum spacing of ≥30 cm.



2-Wire Current Signal Output



3-Wire Voltage Signal Output



4-Wire RS485 Modbus RTU Output

III. Text Version of the Wiring Diagram

1) 2-Wire 4–20 mA Standard Model (Most Common: QDY30A-B-FD)

Circuit connection sequence: DC 24 V power supply positive terminal → Instrument + terminal → Instrument – terminal → PLC analog input (AI) channel → DC 24 V power supply negative terminal

- Terminal labeling: Red wire = power positive, black wire = signal negative, shield = shield ground
- Shielded cable: Ground the shield at the control room end; at the probe end, strip the shield and wrap it with electrical tape to leave it floating. **Do not ground the shield at either end**

Power Supply Notes: The two-wire system has no separate power output; the 4–20 mA loop current is supplied by the 24 V circuit.

2) RS485 Digital Output Version

- Power wires: Connect + and – to 24 V DC
- Communication wires: A and B; connect A to A and B to B; do not cross A and B
- Shield: Still grounded at a single point in the control room; add a terminating resistor (120 Ω) at the end of the bus (on the instrument at the very end of the bus)

3) Isolated Type (with External 4–20 mA Isolator)

Connect the level transmitter's 4–20 mA output to the isolator's input; connect the isolator's output to the PLC; the isolator is powered separately to achieve electrical isolation between the instrument side and the control system, thereby eliminating ground loops.

4) Intrinsically Safe Version with Safety Barrier Wiring

Hazardous Area: Connect the level transmitter cable to the **hazardous side terminals** of the safety barrier; Safe Area: Connect the 24V power supply and the PLC to the safe side terminals of the safety barrier; Ground the safety barrier housing; **It is strictly prohibited to install the safety barrier in the hazardous area near a liquid tank**.

Correct vs. Incorrect Wiring Comparison
Correct Practice: Signal wires and power lines are routed through separate conduits; shielding is grounded at a single point; the vent at the upper end of the vented cable is open to allow airflow; two-wire circuits are connected in series.
Incorrect Practices: Both ends of the shielding wire are grounded; power and signal wires are routed through the same conduit; the vent opening of the vented cable is sealed and submerged in liquid; the two-wire circuit is connected directly in parallel to the power supply; A and B communication lines are connected in reverse; the safety barrier is omitted from the explosion-proof circuit.

IV. Power-On Commissioning Procedure
1. No-Load Test (Probe may be placed in air): After completing the wiring, double-check the circuit to ensure there are no short circuits, then turn on the power. Connect a multimeter in series with the circuit to measure the current; with no liquid level in the air, the theoretical output should be approximately 4 mA.

2. Signal Verification: Immerse the probe in clear water at a known depth and observe the output signal. When the liquid level reaches full scale, the output should be close to 20 mA; intermediate liquid levels should correspond linearly to 4–20 mA. For RS485 models, use the commissioning software to read the liquid level values.

3. Indicator Light Status Assessment: For versions with an optional digital display, a steady light when powered on indicates normal power supply; a flashing light indicates a communication failure or a short circuit; no light indicates a power supply abnormality or a broken wire. For probes without a display, use the multimeter's milliampere reading to determine the status.

4. Accuracy Calibration Methods:
Zero-Point Calibration: With the probe suspended in the air and no liquid pressure applied, perform a zero-point calibration; the output should be locked at 4 mA;
Full-scale calibration: Place the probe at the liquid depth corresponding to full scale, perform a full-scale calibration, and lock the output at 20 mA;
Software damping: If the water level fluctuates significantly on-site, increase the internal damping parameter of the instrument to smooth out value fluctuations caused by liquid level fluctuations; save the parameters after calibration is complete.

Note: Set the calibration medium according to the actual liquid density at the site; different densities will result in measurement errors.

V. Installation Precautions
1. Never exceed the power supply voltage limit: The supply voltage must not exceed the upper limit of 32 V DC; excessive voltage will directly burn out the transmitter's circuitry. Do not use AC power directly.

2. Avoid High-Voltage Interference: Instrument signal cables must not be routed through the same cable tray or conduit as cables for variable frequency drives or high-power motors; when near high-power equipment, add shielding and install signal isolators.

3. Protection in Humid Environments: Use a waterproof junction box with an IP65 rating or higher; for outdoor and pump station applications, ensure the junction box has drainage holes to prevent water accumulation inside; seal cable entry points with waterproof sealant.

4. Other Precautions: Do not block the ventilation ports of the internal air-venting tubes in the cable; do not bury the probe directly in silt; do not drag the cable to pull the probe; in applications where the probe is submerged for extended periods, do not replace the original PU air-venting cable with standard PVC cable; for explosion-proof models, do not bypass the safety barrier and connect directly to a 24V power supply.

Recommendations for Daily Use & Operations and Maintenance

I. Key Points for Routine Inspections

1. Signal Stability Monitoring: Continuously monitor the liquid level readings on the central control panel or local digital display, focusing on identifying anomalies such as sudden jumps, erratic drifts, or static readings. For the standard 4–20 mA version, periodically record the loop milliampere values and compare them with the output corresponding to the theoretical liquid level; for the RS485 digital version, monitor communication messages to check for packet loss, disconnections, or garbled data; For intrinsically safe explosion-proof models, pay special attention to the safety barrier status indicator; if a safety barrier fault alarm is triggered, immediately cease operation and troubleshoot the circuit.

2. Inspection of the Medium and Probe Appearance: In addition to remote monitoring, conduct on-site visual inspections of the probe's condition, observing water flow and floating debris within the tank; Pay particular attention to whether the anti-clogging flow-guiding filter screen is entangled with fibers or coated with sludge; check for any noticeable tilting of the probe or signs of impact from floating debris; inspect the cable for scratches, crushing, or pulling caused by hard objects, and check the cable sheath for whitening, aging, or cracking.

3. Temperature and Humidity Monitoring: Monitor the medium temperature to ensure that the long-term operating temperature does not exceed the instrument's rated range; Check the temperature and humidity inside the upper vented junction box; ensure there is no condensation or water accumulation inside the junction box; for outdoor installations, record the ambient temperature and increase inspection frequency during periods of high heat and direct sunlight or low winter temperatures that cause freezing.

4. Vent Port Inspection (Critical! Unique to Submersible Level Transmitters): Inspect the vent opening of the air conduit at the upper end of the cable; it must remain unobstructed and dry, free of water accumulation, dust, or insect nests; If the vent port becomes blocked, atmospheric pressure compensation fails and the level reading will drift continuously; this is the most common failure point for submersible level transmitters.

5. Installation Structure Inspection: Inspect the top lifting eye, bracket, and mounting clips to ensure there is no looseness or corrosion; verify that the

counterweight and guide rod remain in their fixed positions without displacement, and that the probe has not sunk into the sludge at the bottom of the tank.

II. Regular Maintenance Plan (Cleaning intervals, tightening, and retesting requirements specified by operating conditions)
1. Probe Cleaning Intervals

--- Municipal wastewater, sludge tanks, and conditions containing large amounts of fibrous impurities (primary application scenarios for QDY30A-B-FD): Remove the probe **every 1–2 months**, disassemble the anti-clogging filter screen, and clean it; For high-concentration sludge and wastewater containing long fibers, shorten the cleaning interval to once every 2–4 weeks. Clean the filter screen and probe housing by rinsing with low-pressure clean water; do not use stiff brushes or sharp, hard objects to scrape the 316L pressure-sensing diaphragm, as scratching the diaphragm will permanently damage the sensor.

--- Recirculating water and chemical wastewater tanks containing small amounts of silt: Clean the anti-clogging filter screen once every 3 months.

--- Clean media such as clear water tanks and reservoirs: Clean once every six months to one year; as there is generally no significant sediment buildup, a visual inspection is sufficient.

--- After cleaning, reassemble the filter screen, confirm that the flow-through holes are unobstructed, and then lower it back into the liquid.

2. Wiring and Fastening Inspection Schedule

Inspect terminal connections quarterly; for outdoor, damp, or high-vibration pump stations and metallurgical wastewater tanks, shorten the interval to once every 2 months.

Inspection items: Check for loose, oxidized, or verdigris-covered terminals inside the junction box; check for moisture in shielding wire and power cable connectors; check for aging or cracking of waterproof sealing gaskets; For intrinsically safe explosion-proof circuits, check the wiring of safety barriers and the tightness of grounding terminals, as well as whether the explosion-proof junction box seal is intact. Be sure to disconnect power before performing any tightening operations; strictly adhere to intrinsically safe work procedures when performing maintenance in explosion-proof areas.

3. Recommendations for Accuracy Recalibration

Normal operating conditions: Perform accuracy calibration once every 6 months; for harsh conditions such as sewage, highly corrosive environments, or high vibration, recalibrate every 3 months.

Verification Method: Use the clean water comparison method by immersing the probe in clean water to a known depth and comparing the instrument reading; alternatively, perform pressure calibration in a laboratory. During verification, perform zero-point calibration simultaneously and fine-tune the full-scale range if necessary; for RS485 models, save the parameters after calibration. If the error exceeds the product's accuracy specifications, check whether the diaphragm or filter screen is clogged or corroded, then recalibrate.

> Calibration of explosion-proof instruments must be performed offline in a safe area; do not open the cover for calibration in hazardous areas.

4. Cable Aging Inspection: Conduct a comprehensive cable inspection once a year, focusing on signs of aging, cracking, and hardening of the PU sheath; in environments involving long-term immersion or oil-containing media, assess annually whether the cable needs to be replaced.

III. Long-Term Maintenance Tips: Dust and Moisture Protection, Interference Mitigation, and Protection Against Extreme Environments

1. Dust and Moisture Protection

Select junction boxes with an IP65 or higher protection rating; ensure the box has small drainage holes to prevent rainwater accumulation; place desiccant inside the junction box and replace it regularly; seal cable entry points with waterproof sealing compound to prevent moisture from entering the box along the cables. Install dust-proof and water-resistant vent caps on the vents of air ducts to block dust and rain from entering the ducts; **the vent caps must not be completely sealed**. When probes are stored as spares, clean and dry them thoroughly, then store them in a dry environment to prevent the diaphragm from being exposed to dust over extended periods.

2. Long-Term Optimization for Interference Resistance

Shield signal cables along their entire length; maintain single-point grounding in the control room to prevent ground loops caused by grounding at both ends; route signal cables and 380V power cables in separate cable trays or conduits, maintaining a distance of ≥30 cm; In cases of severe interference from on-site variable frequency drives or high-power motors, use an external 4–20 mA signal isolator on a long-term basis; a surge protection module may also be added. When networking multiple instruments via an RS-485 bus, install a 120 Ω terminating resistor at the bus end to reduce communication interference, and keep the bus cable as short as possible to minimize line-induced noise.

3. Protection in Extreme Environments

Low-temperature freezing conditions in winter: Place the probe in the unfrozen layer of the water body whenever possible; if the water surface is completely frozen, prevent the ice layer from compressing or impacting the probe; install a protective cover to shield the cable if necessary; in cold regions, select a custom low-temperature version to prevent seal hardening and failure.

High-temperature media conditions: Select the custom high-temperature model; periodically inspect the seals for signs of aging to shorten maintenance intervals;

Seawater and highly corrosive environments with high chloride ion concentrations: Select the tantalum diaphragm + FEP corrosion-resistant cable version; increase the frequency of visual inspections and periodically check for signs of corrosion;

Tanks with abundant floating debris and high water impact: Install a protective cage around the probe to reduce impacts from and entanglement with floating debris;
Unattended outdoor environments: Add a rain- and UV-resistant enclosure to the junction box, install lightning protection, and periodically monitor signal status remotely to reduce the frequency of on-site visits.

4. Maintenance Tips for Different Models
Standard 4–20 mA Models: Focus maintenance on the circuit load and vent holes; periodically retest the milliamp output;
RS485 Digital Models: In addition to routine inspections, periodically check the bus communication status and avoid excessively long bus branches;
Intrinsically Safe Models: Do not arbitrarily replace cables or terminals; test the performance of the safety barrier annually; retain explosion-proof documentation to comply with safety inspection requirements.

Troubleshooting & Emergency Response

I. List of Common Malfunctions

1. No Output: The instrument shows absolutely no signal; the 4–20 mA loop current remains at 0 mA at all times; RS485 models cannot communicate, and the host computer cannot read the liquid level data; when equipped with a digital display, the screen does not light up.

2. Signal Drift: The actual liquid level remains unchanged, but the displayed reading continues to change slowly; the zero point shifts due to weather or diurnal atmospheric pressure changes; the liquid level value rises or falls slowly and erratically.

3. Indicator Light Abnormalities: No indicator light illuminates when power is applied to the optional digital display; the indicator light flashes frequently; the indicator light alternates between red and green to indicate an alarm; the fault light on the intrinsically safe safety barrier remains constantly lit.

4. Alarm Triggering: High and low liquid level alarms are triggered erroneously; alarms sound before the actual liquid level reaches the set threshold; alarms do not trigger even when the actual liquid level exceeds the limit; alarm signals are intermittent.

5. Interference and Distortion: Liquid level readings fluctuate frequently and jitter up and down; reading fluctuations synchronize with the start/stop cycles of variable frequency drives or pumps; random glitches appear in the signal, causing the reading to fluctuate back and forth even when the liquid level is stable.

II. Analysis of Fault Causes

1. Wiring Errors: Power supply positive and negative terminals reversed; parallel wiring in a two-wire circuit; RS485 communication A/B lines reversed; shield grounded at both ends; safety barrier wiring in the explosion-proof circuit reversed; loose, faulty, or short-circuited terminal connections.

2. Power Supply Abnormalities: Supply voltage is below 12 V DC or exceeds 32 V DC; excessive power supply ripple; insufficient power supply capacity; circuit load resistance exceeds the upper limit of 600 Ω; excessive line voltage drop.

3. Signal Overload: Selected measurement range is too narrow, resulting in liquid level exceeding full scale; probe buried in silt, causing sustained pressure overload; diaphragm subjected to transient high-voltage surges.

4. Environmental Interference: Signal cables and high-power electrical cables are routed through the same conduit; electromagnetic interference generated by variable frequency drives, water pumps, or contactors; ground loops formed by two separate grounding points; lightning surges at the site impacting the circuit.

5. Equipment Damage: Water ingress due to cable damage; blockage or water ingress in the vent tube; complete clogging of the anti-clogging filter, causing the medium to adhere to the sensor diaphragm; corrosion, scratches, or damage to the diaphragm; water ingress causing burnout of the probe's internal circuitry; water leakage due to seal aging.

III. Step-by-Step Troubleshooting (Including Troubleshooting Steps, Repair Measures, and Emergency Workarounds)

Fault 1: No output; the instrument shows no signal; the digital display is off
Troubleshooting Steps:
1.Turn off the power and visually inspect the junction box to check for damaged cables or signs of short circuits (such as scorch marks) on the terminals;
2. Use a multimeter to measure the voltage at the power supply terminal and confirm that it falls within the DC 12–32 V range;
3. Check whether the two-wire circuit is configured in series and verify the positive and negative terminals; for RS485 models, inspect the power supply circuit separately, distinguishing between the power supply and communication lines;
4. Check the cable body for breaks, paying particular attention to areas where the cable is bent or pulled;
5. Check whether the vent at the upper end of the vented cable is waterlogged.

Remedial Measures:
--- Loose terminals: Disconnect power, re-crimp and tighten the terminals, and remove any copper oxidation or rust;
--- Reversed polarity: Swap the positive and negative power terminals;
--- Localized cable damage: Repair using a waterproof connector; if the damage is severe, replace the entire gas-permeable cable assembly;
Contingency Plan: If on-site monitoring is urgently required, temporarily replace the probe with a spare QDY30A-B-FD of the same model to restore liquid

level monitoring first; repair the faulty instrument later.

Fault 2: Signal drift—the liquid level remains constant, but the reading continues to shift
Troubleshooting Steps:
① First, check the **vent port of the vent tube** to see if it is clogged, has water ingress, or is sealed shut (the most common failure point for submersible level transmitters);
② Check whether the probe's anti-clogging filter is clogged with sludge or sediment, or if the diaphragm is covered with sludge;
③ Check whether the medium temperature exceeds the instrument's rated range;
④ Verify the shield grounding method to ensure neither end is grounded;
⑤ Perform a zero-point calibration and remeasure the zero-point output.

Remedial Actions:
--- Blocked vent: Clean the vent and install a dust-proof vent cap to ensure unobstructed airflow;
--- Sludge buildup on the filter screen: Remove the probe and rinse the anti-clogging filter screen and the probe surface with low-pressure clean water; do not scrape the diaphragm with hard objects;
--- Zero-point drift: Perform a zero-point reset in air; if the medium density differs from the calibration medium, correct the medium density parameter within the system;
Contingency Plan: Temporarily set up zero-point offset compensation in the control system to maintain monitoring; remove the probe for cleaning during production downtime; do not rely on software compensation for an extended period.

Fault 3: Abnormal Indicator Lights (Digital Display / Safety Barrier Alarm Lights)
Troubleshooting Steps:
① No lights on the display: Check the power supply circuit for an open circuit;
② Indicator lights flashing: Usually indicates a communication failure (RS485 model), a circuit short, or an overload;
③ Intrinsically safe barrier red alarm light: Intrinsically safe circuit failure; check the hazardous side circuit for short circuits or grounding.
Remedial Actions:
Communication flashing: Verify the RS485 A/B wiring; add a 120Ω terminating resistor at the bus end; reduce the number of bus branches;
Safety barrier alarm: Immediately shut off power, isolate the hazardous area circuit, and check for damaged or grounded cables; restart the safety barrier after troubleshooting; if the safety barrier is damaged, replace it directly with the same model;
Contingency plan: In the event of an RS485 bus failure, temporarily switch to a single 4–20 mA backup instrument connected independently to the AI channel.

Fault 4: False Alarm Triggering / Failure to Trigger
Troubleshooting Steps:
① Enter the instrument's parameter interface and verify the high and low liquid level alarm threshold settings;
② Check for signal jitter or interference;
③ Inspect the relay output wiring and ensure there are no loose connections at the relay terminals;
④ Verify that the actual liquid level reading matches the true on-site liquid level to determine whether the issue is caused by incorrect parameters or inaccurate measurement.
Corrective Actions:
Incorrect threshold settings: Adjust the alarm setpoints and appropriately increase the alarm hysteresis to prevent frequent alarm triggers caused by minor level fluctuations;
Loose relay connections: Power down the system and tighten the terminal connections;
Contingency Plan: Temporarily disable the automatic interlock and switch to manual on-site monitoring to prevent erroneous pump starts or stops caused by false alarms. Re-enable the automatic interlock after the fault has been resolved.

Fault 5: Interference-induced distortion; frequent fluctuations and jitter in liquid level readings
Troubleshooting Steps:
1.Verify whether the signal cables are routed through the same cable tray as the 380V power cables and the variable frequency drive (VFD) cables;
2. Check the shield grounding and confirm that it is grounded at a single point in the control room only;
3. Measure the loop load resistance and confirm that the load does not exceed 600Ω;
4.Observe whether the value fluctuations are synchronized with the start/stop cycles of the pump and the variable frequency drive.

Remedial Measures:
- Mixing of high- and low-voltage cables: Route the signal cable through a separate conduit, maintaining a distance of ≥30 cm from power cables;
- Ground loop issue: Remove the shield grounding at the probe end, retaining only the single-point grounding in the control room; install an external 4–20 mA signal isolator;
- Fluctuations in liquid level: Increase the damping setting in the instrument software to smooth out fluctuating signals;
Contingency plan: Temporarily add software filtering on the PLC side to reduce jitter; subsequently install hardware isolation to permanently eliminate interference.

IV. After-Sales Repair Guidelines

1. Criteria for Determining Malfunctions (If any of the following conditions are met, it is recommended to contact after-sales service for repair; on-site disassembly is not recommended)
1.The probe diaphragm is damaged, corroded, or perforated, causing the medium to seep into the sensor;
 Water has entered the probe, and there is still no output after cleaning and checking the wiring;

② Water has entered the probe, and there is still no output after cleaning and checking the wiring;

③ The instrument's zero point and full-scale range cannot be calibrated, and the error consistently exceeds the product's accuracy of 0.2% FS;

④ The internal gas conduit in the cable is broken and cannot be repaired;

⑤ The circuit board is burned out, or components are damaged;

⑥ The explosion-proof structure of the explosion-proof model is damaged, or the explosion-proof marking is compromised.

> Note: The probe features a fully sealed, potted structure. **Users are strictly prohibited from disassembling the probe housing**; unauthorized disassembly will result in immediate voiding of the warranty.

2. Repair Process

1. Gather basic information: Product model QDY30A-B-FD, measurement range, serial number, and installation conditions (medium, temperature, on-site environment);

2. Record the fault symptoms: time of occurrence, symptoms, troubleshooting process, and multimeter test data;

3. Contact after-sales technical support and submit a fault description along with on-site photos (probe, junction box, and installation site);

4. Technical staff will provide remote assistance to troubleshoot and determine whether the unit needs to be returned to the factory;

5. Confirm return for repair: Clean and dry the probe, package it according to specifications, label it with fault information, and ship it back to the factory;

6. After repair is completed, the unit undergoes factory calibration and is returned along with the calibration certificate.

3. Warranty Coverage

--- Warranty Period: 12-month warranty from the date of manufacture; within the warranty period, free repair or replacement of parts is provided for sensor circuit or seal failures not caused by human damage or corrosive media.

- --Exclusions from Warranty Coverage:

① Intentional scratching of the diaphragm or unauthorized disassembly of the probe housing;

② Incorrect model selection or damage to the diaphragm or cable caused by corrosive media;

③ Circuit board damage caused by overvoltage or short circuits;

④ Damage to the cable or probe caused by external impact, dragging, or pulling at the installation site;

⑤ Normal wear-and-tear parts (filter screens, O-rings);