Explosion-proof Float-type Level Gauge

I. Product Definition

The stainless steel explosion-proof float-type level gauge with a straight rod is a contact-type level measurement and control instrument developed based on the principle of buoyancy. It is specifically designed for liquid level monitoring, control, and alarm applications in industrial settings. Featuring an all-stainless-steel body and explosion-proof (flameproof or intrinsically safe) design, the product utilizes the buoy's movement in response to liquid level changes to provide continuous level signal output or discrete alarm signals. It is widely applicable in explosion-hazardous, highly corrosive, and high-temperature/high-pressure environments across industries such as petroleum, chemical, pharmaceutical, and water treatment, offering an industrial level measurement solution that combines high reliability, safety, and strong environmental adaptability.
Core functions cover three key areas:

1. Continuous Level Monitoring and Signal Transmission: As the float rises and falls with the liquid level, it actuates an internal reed switch via a linkage, outputting standard industrial signals (4-20mA/RS485). This enables real-time online monitoring and remote data transmission, supporting integration with industrial control systems such as PLCs and DCS.

2. Digital Level Control and Alarms: Multiple upper and lower limit alarm points can be configured as needed to trigger high/low level alarms, automatically start/stop pumps, and implement valve interlock control, thereby preventing process accidents such as tank overflow, dry running, and material starvation.

3. Safety Protection for Explosion-Proof Environments: Certified for explosion-proof applications, featuring flameproof and intrinsically safe designs. It can be directly deployed in environments with flammable and explosive gases or dust, eliminating safety hazards during liquid level monitoring.

4. Long-Term Stable Operation in Harsh Conditions: The all-stainless-steel body is designed to withstand extreme temperatures, corrosion, and impact, making it suitable for highly corrosive media, high-temperature media, high-pressure vessels, and outdoor environments with high humidity or dust.

5. Flexible Installation and Customization: Supports various installation methods, including flanges and threads. Customizable rod lengths, float specifications, and media-contact materials to suit various industrial equipment such as storage tanks, reactors, and pipelines.

II. Working Principle

The core principle of this product combines buoyancy drive, magnetic coupling, and reed switch signal conversion. Simplified, the process is as follows:
Buoyancy-driven float movement: The float features a hollow, sealed stainless steel structure mounted on a straight rod, allowing it to slide freely along the rod. As the liquid level in the container changes, the float rises and falls in sync with the level due to its buoyancy; the higher the liquid level, the higher the float's position; the lower the liquid level, the lower the float's position.

1. Magnetic coupling transmits position signals: The float contains a built-in permanent magnet, while the rod has a hollow, sealed interior housing multiple reed switches and signal processing circuits. As the float moves up or down, its internal magnet moves with the liquid level. When the magnet approaches a reed switch at a specific position inside the rod, the reed switch is attracted or released by the magnetic force.

2. Signal Conversion and Output: The closing/opening action of the reed switches is detected by the signal processing circuit and converted into a corresponding electrical signal: For continuous level transmitters, the circuit outputs a proportional 4–20 mA current signal or an RS485 digital signal based on the float's position; for switch-type level transmitters, the reed switch action directly triggers a relay to output a switching signal, enabling alarm or control actions.

3. Explosion-Proof and Protective Design: The rod and indicator housing feature a fully sealed explosion-proof design. The internal circuitry is completely isolated from external media and the environment, preventing flammable or explosive media from entering the instrument while also preventing external sparks or high temperatures from being transmitted to hazardous areas, thereby ensuring intrinsic safety.

III. Core Value and Solutions to Pain Points

3.1 Overview of Core Value

The core value of this product is to provide industrial sites with a high-safety, highly reliable, highly adaptable, and low-cost level monitoring and control solution. It addresses the issues of poor reliability, difficult maintenance, and high safety risks associated with traditional level instruments in explosion-proof, highly corrosive, and complex operating conditions, ensuring stable production processes, reducing O&M costs, and preventing safety incidents.

3.2 Pain Points and Solutions

Q: In flammable and explosive environments, conventional level gauges can pose safety hazards. How is this addressed?
A: The Qidian Linkage Straight-Rod Float Level Gauge features explosion-proof (flameproof or intrinsically safe) design and has obtained explosion-proof certification. The indicator head and rod body are fully sealed in an explosion-proof structure, completely isolating the internal circuitry from the hazardous external environment. With no risk of sparks or high-temperature conduction, it is directly compatible with flammable and explosive environments such as petroleum, chemical, and gas industries, thoroughly eliminating safety hazards associated with level monitoring.

Q: In environments with highly corrosive media, standard level gauges are prone to corrosion and damage, resulting in a short service life. How can this be addressed?
A: The main body of the product is made of 304/316L stainless steel. Depending on the characteristics of the medium, corrosion-resistant materials such as PTFE lining can be customized. It withstands corrosion from strong acids, strong alkalis, and organic solvents. Even with long-term exposure to corrosive media, there is no corrosion or leakage, significantly extending the instrument's service life and reducing the costs associated with frequent replacements.

Q: In high-temperature and high-pressure conditions, some level gauges cannot operate stably. How is this addressed?
A: The instruments support custom high-temperature and high-pressure specifications, accommodating medium temperatures ranging from -40°C to 200°C and withstanding pressures up to 10 MPa. The all-stainless-steel rod and sealing structure can withstand high-pressure shocks, ensuring stable level monitoring in high-temperature, high-pressure storage tanks and reactors without leakage or signal drift.

Q: Traditional level gauges are prone to clogging and jamming in viscous or impurity-laden media, leading to monitoring failure. How can this be resolved?
A: The straight-rod design eliminates complex mechanical transmission components. The float features a hollow, sealed structure with no moving parts in contact with the medium, making it resistant to adhesion and blockage by viscous media or impurities. Additionally, large-diameter floats can be customized based on medium characteristics to enhance anti-adhesion capabilities, ensuring stable movement even in wastewater or media containing particles and preventing jamming or failure.

Q: Some level gauges are complex to install and have poor adaptability, making them incompatible with existing equipment. How can this be resolved?
A: The product supports multiple installation methods, including flange mounting (e.g., DN25/DN50/DN80) and threaded mounting (e.g., G1/2, G3/4, NPT, etc.), and can be customized to match the interfaces of the user's storage tanks or equipment. Rod length, float specifications, and the number of alarm points can all be customized as needed to fit various vertical storage tanks, horizontal vessels, pipelines, and other equipment without requiring additional modifications.

Q: Level monitoring and control require manual supervision and cannot be automated with interlocks. How can this be resolved?
A: The instrument can output continuous 4-20mA/RS485 signals, supporting integration with PLC and DCS systems for remote real-time monitoring. Additionally, multiple sets of digital alarm points can be configured to enable high/low level alarms and automatic start/stop interlock control for pumps and valves. This eliminates the need for manual supervision, reduces labor costs, and prevents process accidents caused by human error.

Q: Some level instruments have high maintenance costs and are difficult to troubleshoot. How can this be addressed?
A: The product features a simple design with no wear-prone components, requiring no complex daily maintenance—only periodic cleaning of impurities from the float surface. Troubleshooting is intuitive and convenient, allowing for quick problem identification based on the float position and signal output. Maintenance costs are extremely low, and downtime for maintenance is minimized.

Q: In outdoor, humid, or dusty environments, instruments are prone to damage from moisture and dust accumulation. How is this addressed?
A: The instrument features an IP65/IP67 protection rating. Its fully sealed design provides dustproof, waterproof, and moisture-resistant protection, making it suitable for outdoor open-air storage tanks, humid workshops, and dusty environments. It ensures long-term operation without issues such as moisture ingress, short circuits, or dust accumulation, guaranteeing stable performance in harsh conditions.

IV. Key Product Parameters & Specifications

4.1 Basic Electrical Parameters

Output Signal Type:

Continuous Type: 2-wire 4–20 mA DC (linear output, HART protocol overlay capable, supports square root/linear mode switching); RS485 digital signal (Modbus-RTU protocol)

Switching Type: Relay contact output (SPDT/DPDT, normally open/normally closed selectable)

Measurement Accuracy: ±10 mm (continuous type); ±5 mm (switching type alarm point positioning)

Signal Resolution: ≤1 mm (continuous type, one reed switch set every 10 mm along the rod)

Contact Rating (Switch Type): AC 220 V 1 A (resistive load); DC 24 V 0.5 A (resistive load)

Load Impedance: Maximum load impedance for 4-20mA signal: 620Ω (under 24V DC power supply conditions)

Signal Transmission Distance: ≤1000m (4-20mA signal, shielded twisted-pair cable); ≤1200m (RS485 signal, standard industrial shielded cable)

Contact Life (Switch Type): $\geq 5\times10^4$ cycles (under resistive load)

4.2. Isolation Performance Parameters

Electrical isolation strength: Isolation voltage between input, output, and housing ≥1500 V AC (1 minute, no breakdown)

Signal isolation method: Magnetic coupling isolation (the float and rod have no electrical contact; position signals are transmitted via magnetism)

Explosion-proof isolation structure: The indicator and rod are sealed with explosion-proof/intrinsically safe isolation; the internal circuitry is completely isolated from the external hazardous environment, eliminating the risk of spark leakage

Media isolation performance: The all-stainless-steel rod and float form an integrated sealed structure; the internal circuitry is completely isolated from the measured medium, eliminating the risk of media leakage

Anti-interference isolation capability: Built-in EMC anti-interference circuitry resists strong electromagnetic interference in industrial environments (e.g., from variable frequency drives and motor start/stop events), ensuring no signal drift or false triggering

4.3 Power Supply & Power Consumption Parameters

Supply voltage: Standard 24 V DC (compatible with common industrial power distribution), compatible with wide-range 12 V DC to 36 V DC input

Power Supply Configuration: Two-wire (4–20 mA signal type); Three-wire / Four-wire (RS485 signal type / switch type)

Full-Load Power Consumption: ≤1.5 W (continuous 4–20 mA mode); ≤0.8 W (RS485 standby mode); ≤0.5 W (switch type static mode)

Power Distribution Output: No built-in power distribution output; supports external safety barriers (intrinsically safe models compatible with Zener-type / isolated safety barriers)

Voltage Ripple Tolerance: The device operates stably without abnormalities under power supply voltage fluctuations of ≤10%

4.4 Environmental Adaptation Parameters

Working medium temperature: -40°C to +150°C (standard type); -60°C to +200°C (high-temperature custom type); -40°C to +80°C (corrosion-resistant PTFE-lined custom type)

Operating Ambient Temperature: -40°C to +80°C (instrument panel mounting environment); -20°C to +60°C (intrinsically safe instrument panel)

Storage Temperature: -50°C to +85°C (uninstalled unit)

Relative humidity: ≤95% RH (non-condensing)

Protection rating: IP65 (standard flameproof type); IP67 (intrinsically safe type / outdoor custom type, short-term immersion protection)

Explosion-proof rating:

Flameproof type: Ex d IIC T6 Gb (suitable for Zone 1/Zone 2 flammable and explosive gas environments, maximum surface temperature ≤85°C)

Intrinsically Safe Type: Ex ia IIC T6 Ga (Suitable for Zone 0/Zone 1/Zone 2 hazardous areas; must be used with associated safety barriers)

Compatible Safety Barrier Models: The intrinsically safe type is compatible with isolated safety barriers from brands such as P+F and MTL (e.g., MTL5541, P+F KFD2-STC4-EX1)

Media Compatibility: Media density ≥0.5 g/cm³ (reliable float operation); media viscosity ≤1.25 St (no risk of adhesion or sticking); supports corrosive media (316L stainless steel / PTFE-lined custom options), media containing impurities, and viscous media (Custom large-bore floats available)

4.5. Physical Parameters

Installation Methods:

Flange Mounting: Standard DN50/DN80/DN100/DN150 HG/T20592 flanges; custom non-standard flanges available

Threaded Mounting: Standard pipe threads such as G1/2, G3/4, NPT1/2, NPT3/4, suitable for small storage tanks and pipelines

Dimensions (based on standard specifications, customizable upon request):

Indicator Head Dimensions: Diameter 90mm × Height 110mm (Explosion-proof type with blue cover); Diameter 100mm × Height 120mm (Intrinsically safe type with yellow-green cover)

Rod Diameter: φ16mm/φ20mm/φ25mm (Standard type); φ32mm (High-pressure custom type)

Rod Length: 300mm–6000mm (standard customizable range; can be customized based on user tank height)

Float Dimensions: φ45mm × L60mm (Standard Type); φ63mm × L80mm (Large-Bore / Viscous Medium Custom Type)

Total Height: Indicator Head Height + Rod Length + Float Height (e.g., for a rod length of 1000mm, the total height is approximately 1170mm)

Weight: Approx. 1.8 kg for standard 1000mm rod length (304 stainless steel); approx. 3.2 kg for 2000mm rod length (304 stainless steel); weight increases with dimensions for custom extended or thickened specifications

Housing Material and Protection Details:

Dial Housing: Die-cast aluminum alloy (powder-coated surface for corrosion and oxidation resistance); 304 stainless steel (custom corrosion-resistant type)

Rod Material: 304 stainless steel (standard type); 316L stainless steel (for highly corrosive media); 304 stainless steel lined with PTFE (for strong acid and strong alkali media)

Float Material: 304 stainless steel (standard type); 316L stainless steel (for highly corrosive media); stainless steel lined with PTFE (for highly corrosive media)

Sealing and Protection: The stem and indicator housing are sealed with fluorocarbon rubber/silicone rubber O-rings; the bottom of the stem is welded with a stainless steel plug to ensure a leak-free seal; the indicator housing cable entry uses an explosion-proof cable gland, providing IP65 or higher protection

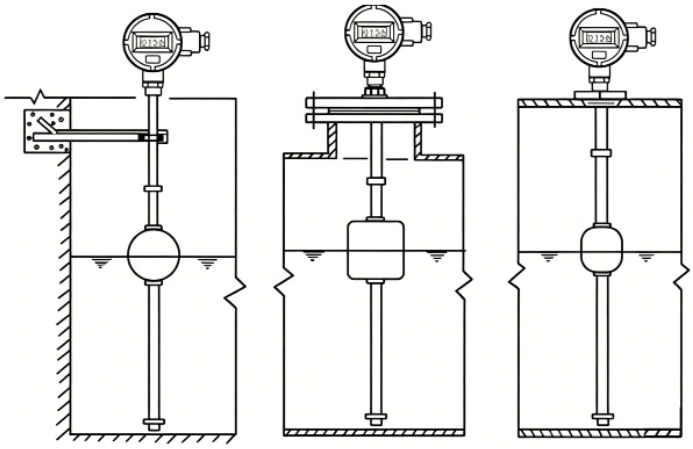
Indicator Light Definitions: Standard explosion-proof models have no external indicator lights; intrinsically safe models offer optional PWR power indicator (green) and ALM alarm indicator (red) for status monitoring

Corrosion Protection: All metal components are passivated; the indicator head surface features a weather-resistant powder-coated finish to withstand corrosion in outdoor, humid, and acidic/alkaline environments



Flange Mounting **Threaded Mounting** **Bracket Mounting**

Note: Threads, insertion depth, and flanges can all be customized.



Bracket Mounting **Flange Mounting** **Threaded Mounting**

V. Application-Specific Selection Guide

5.1 Key Selection Criteria

1. Signal Type Selection

Digital signals: Suitable for applications requiring only high/low level alarms and pump/valve interlock control. Relay contact output models are recommended, as they allow for the configuration of 1 to 3 alarm points to meet simple process interlock requirements.

Continuous Analog Signals (4–20 mA): Suitable for scenarios requiring real-time remote transmission of liquid level data and integration with PLC/DCS systems. Supports linear output and can be combined with the HART protocol to enable remote parameter calibration, making it ideal for continuous monitoring and process control.

Digital Signal (RS485/Modbus-RTU): Suitable for multi-instrument networking and Industrial Internet of Things (IIoT) data acquisition scenarios. Supports parallel communication among multiple instruments, allowing remote reading of liquid level values and device status. Ideal for smart manufacturing and centralized control scenarios.

2. Channel Selection

Single-Channel: Features a single-float, single-rod design, suitable for single-point level monitoring or continuous monitoring scenarios. It offers low cost and a simple structure, making it ideal for standard storage tanks and small reactors.

Multi-Channel Customization: Supports customizable configurations with multiple reed switches or multiple floats to enable multi-point level alarms or segmented level monitoring. Suitable for large storage tanks and multi-stage process control scenarios.

3. Power Supply Selection

Two-wire 24V DC Power Supply: Suitable for 4-20mA continuous signal models. Requires no additional power supply, simplifies wiring, and reduces on-site cabling costs. Ideal for explosion-proof environments and scenarios with complex wiring.

3-Wire / 4-Wire 24V DC Power Supply: Suitable for RS485 digital signal and digital I/O signal models. The power supply and signal circuits are separated, providing stronger interference resistance and making it suitable for industrial environments with high levels of electromagnetic interference.

4. Selection Based on Explosion-Proof Requirements

Non-explosion-proof environments: Standard aluminum alloy housing + IP65 protection. Suitable for water treatment and general industrial storage tank applications without flammable or explosive media, offering lower costs.

Explosion-proof environments: Ex d IIC T6 Gb flameproof type. Suitable for Zone 1/Zone 2 environments with flammable or explosive gases/dust, such as petrochemical plants and gas stations. No additional associated equipment is required; it can be installed and used directly.

Intrinsically Safe Applications: Ex ia IIC T6 Ga intrinsically safe type, suitable for Zone 0/Zone 1/Zone 2 hazardous areas. Requires use with isolated or Zener-type safety barriers, ideal for high-safety-level chemical and pharmaceutical explosion-proof applications.

5. Selection Based on Installation Environment

Installation Method: Select based on equipment interfaces. Flange mounting is suitable for large storage tanks and reactors (recommended standard flanges: DN50/DN80); threaded mounting is suitable for small pipelines and small storage tanks (recommended standard threads: G1/2, NPT1/2).

Medium Characteristics: For standard media, select 304 stainless steel rod body + float; for mildly corrosive media, select 316L stainless steel; for highly corrosive media, select custom models with stainless steel lined with PTFE; for viscous or impurity-containing media, select custom models with large-diameter floats to prevent jamming.

Ambient Temperature and Humidity: For standard environments, select the standard model (-40°C to +80°C); For high-temperature environments (>150°C), use the high-temperature custom model; for humid/dusty environments, use models with IP67 protection rating.

6. Other Key Selection Criteria

Medium Density: For medium densities ≥0.5 g/cm³, standard floats function normally; for low-density media (e.g., light oil), a custom low-density float is required to ensure sufficient buoyancy.

Shaft Length: Customize based on the effective liquid level height of the tank or container. The shaft length must cover the entire liquid level monitoring range while allowing sufficient space for the float to move freely, preventing contact with the tank bottom or top.

5.2. Selection Recommendations for Industry Applications

1. Chemical Industry Applications

Applicable Conditions: Acid and alkali storage tanks, organic solvent reactors, and storage tanks for flammable and explosive media, where strong corrosion resistance, explosion-proof protection, and high/low temperature and high-pressure conditions are required.

Recommended Models: Intrinsically safe or flameproof explosion-proof types, with 316L stainless steel or PTFE-lined rod and float, 4-20mA + HART signal or RS485 digital signal, flange mounting, customizable for high-temperature and high-pressure applications, supporting multiple alarm point settings to meet chemical process interlocking and explosion-proof safety requirements.

2. Power Industry Applications

Applicable Conditions: Power plant water treatment systems, condensate tanks, and acid-base neutralization tanks, where conditions include high humidity, strong electromagnetic interference, and media containing impurities.

Recommended Models: IP67-rated standard models, 304 stainless steel construction, 4-20mA continuous signal or digital switch signal, supports

customization for EMC interference resistance, suitable for outdoor open-air installation, meeting power plant requirements for continuous liquid level monitoring and pump/valve interlock control.

3. Metallurgical Industry Applications
Applicable Conditions: Metallurgical industrial cooling water circulation systems, acid and alkali waste liquid storage tanks, and high-temperature medium storage tanks, where high temperatures, strong corrosion, particulate impurities, and strong electromagnetic interference are present.
Recommended Model: High-Temperature Custom Model + 316L stainless steel construction, large-diameter float with anti-adhesion design, 4-20mA signal + anti-interference circuitry, supports high-pressure customization, suitable for complex on-site conditions in metallurgy, ensuring stable level monitoring.

4. Pharmaceutical Industry Applications
Applicable Conditions: Pharmaceutical purified water tanks, pharmaceutical reaction vessels, and disinfectant solution storage tanks, where sanitary-grade requirements, mild corrosion, explosion-proof protection, and cleanroom environments are required.
Recommended Model: Sanitary-grade custom model (polished stainless steel), 316L stainless steel rod and float, dead-zone-free structural design, optional explosion-proof (flameproof or intrinsically safe) versions, 4-20mA or RS485 signal, compliant with pharmaceutical industry clean production and explosion-proof safety standards.

5. Smart Manufacturing Scenarios
Applicable Conditions: Liquid storage tanks for automated production lines and centralized liquid supply systems, with requirements for multi-device networking, remote data acquisition, and automated interlock control.
Recommended Model: RS485/Modbus digital signal type, supports parallel communication among multiple instruments, customizable multi-channel monitoring, IP67 protection rating, compatible with industrial IoT data acquisition and centralized control systems to enable real-time level data upload and automated control.

6. Water Treatment Industry Applications
Applicable Conditions: Sewage tanks, clear water tanks, and chemical dosing tanks, where conditions involve impure or viscous media and humid environments.
Recommended Model: Standard 304 stainless steel construction, large-diameter float with anti-adhesion design, digital or 4-20mA signal output, IP65 protection rating, threaded/flanged mounting. Suitable for low-cost, high-reliability level monitoring in water treatment applications.

5.3 Common Selection Misconceptions
Misconception 1: Ignoring isolation ratings and directly using general-purpose models in explosion-proof environments
Some users directly select non-explosion-proof general-purpose level transmitters for flammable and explosive environments. General-purpose instruments lack explosion-proof sealing structures, and sparks from internal circuits may trigger explosions in the medium, posing serious safety hazards. Depending on the hazardous area classification, explosion-proof (flameproof) or intrinsically safe models must be selected; the direct use of general-purpose models in explosion-proof environments is strictly prohibited.

Misconception 2: Selecting the wrong signal range or output type, resulting in incompatibility with the control system
Some users mistakenly select digital signal instruments for applications requiring continuous remote transmission of level data, or choose 4-20mA signal instruments without HART protocol, which prevents remote parameter calibration. This results in the inability to integrate with PLC/DCS systems or causes difficulties in subsequent maintenance. Before selection, confirm the signal type and protocol requirements of the control system and select a model with a matching signal output.

Misconception 3: Neglecting load matching, leading to abnormal signal transmission
For 4-20mA signal-type instruments, failing to verify the system's load impedance and directly connecting to a load with excessive impedance (>620Ω) results in unstable signal output, accuracy drift, or even instrument failure. It is necessary to calculate the system's load impedance in advance to ensure operation within the instrument's maximum load impedance range; if necessary, select a model with signal isolation.

Misconception 4: Ignoring medium characteristics, leading to instrument sticking or corrosion-induced failure
Using standard small-diameter floats in applications with viscous or impurity-laden media, or using 304 stainless steel in highly corrosive environments, can cause the float to become stuck due to medium adhesion or result in corrosion damage to the rod and float, causing the instrument to fail prematurely. Select appropriate float specifications and materials based on the medium's density, viscosity, and corrosiveness, such as large-diameter floats, 316L stainless steel, or custom PTFE-lined models.

Misconception 5: Mismatched installation methods and equipment interfaces leading to installation failure
Failure to verify equipment interface specifications in advance results in the selection of flange or threaded models that do not match the tank/vessel interfaces during instrument selection. This prevents on-site installation, necessitating additional equipment modifications or instrument replacements, which impacts project schedules. Before selection, confirm the equipment interface dimensions and standards to ensure the corresponding installation method and specifications are selected.

5.4 Customization Recommendations
1. Custom Signal Solutions
For legacy control systems without standard signal compatibility, special signal outputs (such as 0-5V or 0-10V voltage signals) can be customized. Alternatively, RS485 signal models with specific industrial protocols (such as PROFIBUS or CANopen) can be integrated to ensure compatibility with legacy systems.
For applications requiring wireless transmission, we can customize wireless level transmitters with built-in LoRa/NB-IoT modules. These enable remote uploading of level data without the need for wiring, making them suitable for remote storage tanks or locations where wiring is not feasible.

2. Custom Solutions for Non-Standard Operating Conditions
Custom probe lengths: For extra-large storage tanks (probe length > 6000 mm) or small equipment (probe length < 300 mm), probes of corresponding lengths can be customized. The probe support structure is optimized to prevent swaying of long probes from affecting measurement accuracy.
Customization for Special Media: For low-density media (<0.5 g/cm³), we provide custom low-density floats; for highly corrosive media, we offer fully PTFE-lined rods and floats; for high-temperature and high-pressure conditions, we provide thickened stainless steel rods with high-pressure sealing structures capable of withstanding pressures up to 10 MPa.
Sanitary/Cleanroom Customization: For cleanroom environments in the pharmaceutical and food industries, we offer custom-made stainless steel components with internal and external polishing (Ra ≤ 0.8 μm). The design features a dead-space-free structure, supports high-temperature steam sterilization, and complies with GMP standards.

3. Multi-Channel Integrated Customization Solutions
Multi-Point Level Monitoring Customization: Customizable multi-group reed switch configurations enable multi-segment level monitoring or the setup of multiple alarm points, suitable for segmented level monitoring of large storage tanks and multi-level process interlock control scenarios.
Multi-Float Integrated Customization: For monitoring scenarios involving stratified media (such as oil-water separation), we offer a multi-float structure that simultaneously monitors the interface positions of different media, enabling synchronized monitoring of stratified liquid levels.
Multi-Signal Integrated Customization: A single instrument simultaneously outputs 4-20mA analog signals and RS485 digital signals, supporting both local control systems and remote data acquisition systems to meet data transmission needs across multiple scenarios.

VI. Installation and Commissioning Specifications

6.1 Pre-installation Preparation

1. Verification of Accessories

After unpacking, verify the completeness of the unit and all accompanying accessories one by one, including the explosion-proof float-type level gauge main unit, explosion-proof cable gland, dedicated mounting flange/threaded connector, sealing gaskets, grounding bolts, mounting hardware, product certificate of conformity, explosion-proof certification, instruction manual, and accompanying terminal block accessories; Confirm that the rod and float show no deformation, dents, or scratches, and that the welds are intact; ensure the explosion-proof housing of the indicator has no cracks and the threaded cable entry is intact; verify that all seals are free from aging, damage, or missing parts.

2. Environmental Inspection

Confirm that the installation site is within a hazardous area permitted by the corresponding explosion-proof rating, with no highly corrosive gases in the air and no severe vibration or impact; Ensure the container's installation interface is flat, free of burrs and deformation, and that the interior is free of debris accumulation or large welding slag to prevent obstruction of the float's vertical movement; ambient temperature, humidity, and pressure must fall within the product's rated operating range. For outdoor installation, avoid low-lying areas prone to water accumulation and locations exposed to prolonged direct sunlight.

3. Tool List

Prepare an adjustable wrench, socket wrench, Phillips/flathead screwdrivers, wire strippers, crimping pliers, multimeter, electrical tape, shielded twisted-pair cable, grounding wire, spirit level, Teflon tape, and explosion-proof sealing compound. When working in explosion-proof zones, use explosion-proof tools only; striking with ordinary iron tools to generate sparks is strictly prohibited.

4. Safety Precautions

Work must be performed with the power disconnected in explosion-proof environments; it is strictly prohibited to install or remove instruments while they are energized. In flammable and explosive areas, open flames are prohibited, and the use of wireless devices such as mobile phones at close range is prohibited. Workers must wear anti-static work clothes and insulated protective gear. Before installation, ensure that the process vessel on-site has been depressurized and drained of residual media to prevent injuries from media leakage; strictly follow explosion-proof electrical installation standards; do not alter the instrument's explosion-proof structure without authorization, and do not enlarge holes or modify cable entry ports without permission.

6.2 Standard Installation Steps

1. Body Mounting

This product features a top-mounted straight-rod linkage structure and is installed vertically using a flange or threaded connection on the top of the vessel.

Place the supplied sealing gasket on the flange face of the installation surface. Insert the level gauge rod vertically into the vessel from the top, ensuring the rod remains perfectly vertical throughout the entire process. Secure the flange by tightening bolts diagonally and evenly. For threaded installations, wrap an appropriate amount of PTFE tape around the threads and tighten vertically; do not twist or force the threads to avoid damaging the threads or sealing structure.

After installation, use a spirit level to verify the vertical alignment of the rod to prevent the float from becoming stuck against the tube or tank wall.

2. Wiring Specifications (Distinction Between Power / Input / Output Terminals)

The instrument's wiring compartment is equipped with dedicated terminals, with strictly defined functions:

Power terminals: DC24V positive, DC24V negative

Signal output terminals: 4-20mA signal positive, signal negative; RS485 Line A, RS485 Line B

Relay/Digital I/O Terminals: Common (COM), Normally Open (NO), Normally Closed (NC)

Wiring must use shielded twisted-pair cable exclusively, with individual cable cross-sectional area controlled between 0.75–1.5 mm^2; when cables pass through explosion-proof cable glands, the sealing compound must be firmly compressed to ensure explosion-proof, dustproof, and waterproof performance; all terminals must be securely crimped, with no loose connections, disconnections, or exposed bare wires.

3. Grounding Requirements

The explosion-proof housing of the instrument must be reliably grounded, with a grounding resistance ≤4Ω; a dedicated grounding wire must be installed separately; sharing a grounding busbar with high-power equipment such as motors or variable frequency drives is prohibited; the shielding layer must be grounded at a single point, with grounding performed uniformly only on the control cabinet side; the shielding layer at the instrument end must remain floating (ungrounded) to prevent the formation of loop currents that could introduce interference.

6.3, Wiring Diagram Text Specifications

1. 4-20mA Two-Wire Explosion-Proof Wiring Specifications

Connect the positive terminal of the 24V DC power supply to the instrument's + terminal

Connect the instrument signal - terminal to the DC 24V negative terminal

Connect the instrument signal + terminal to the positive terminal of the PLC or secondary instrument's analog input

The circuit forms a standard two-wire current loop and requires no additional power supply

Ground the shield at a single point on the control cabinet side; on the instrument side, wrap the shield with insulating tape and leave it floating.

2. RS485 Modbus Digital Wiring Specifications

Connect to a separate DC24V power supply (positive and negative terminals); use an independent circuit that does not share power with the signal circuit

Connect the RS485 A wire to the device's A terminal and the B wire to the device's B terminal

For daisy-chain wiring of multiple instruments, a terminating resistor may be added to the last device for impedance matching

Shielded twisted-pair cable must be routed separately throughout the entire run, away from power cables.

3. Wiring Specifications for Explosion-Proof Relay/Digital I/O

Supply the meter with a dedicated 24 V DC power source.

Connect the common terminal (COM), normally open (NO), and normally closed (NC) terminals to an intermediate relay or PLC digital I/O inputs as required.

The load must not exceed the rated capacity of the contacts; directly driving high-power loads is strictly prohibited.

4. Wiring Specifications for Isolated / Intrinsically Safe Models with Safety Barriers

Intrinsically safe models must be connected to an external isolated safety barrier; the instrument side is the intrinsically safe end, and the other side of the safety barrier connects to conventional equipment in the control room; intrinsically safe return cables must not be routed in the same conduit as high-voltage cables, and a safe distance must be maintained; the explosion-proof wiring compartment must be completely sealed, and omitting sealing connectors is strictly prohibited.

5. Comparison of Correct and Incorrect Wiring

Correct: Secure wiring, no exposed wires at terminals, shield grounded at a single point, explosion-proof connectors crimped tightly, vertical routing away from power lines.

Incorrect: Shield grounded at both ends, high-voltage and signal lines routed in the same conduit, loose or faulty connections, unsealed explosion-proof connectors, unauthorized extension of wiring chamber leads that compromise the explosion-proof structure.

6.4 Power-On Commissioning Procedure

1. No-Load Test

After installation and wiring are complete, do not introduce the medium; keep the vessel empty. After verifying that the wiring is correct, grounding is reliable, and all explosion-proof seals are securely tightened, slowly apply power. Observe that the instrument shows no abnormal heating, no unusual noises, no false alarm triggers, and that the power supply status is normal.

2. Signal Verification
Use a multimeter to measure the circuit current or communication signals:
4-20mA Type: Simulate changes in liquid level; the corresponding output current should vary linearly between 4mA and 20mA, with no sudden jumps or drift.
RS485 Type: Use a host computer or debugging software to read the device address and liquid level values; communication should be stable with no packet loss.
Digital Type: Manually move the float to simulate high and low liquid levels; the corresponding relay contacts should engage and disengage reliably.

3. Indicator Light Status Assessment
A steady green power indicator light indicates normal power supply; a red alarm indicator light indicates that the set liquid level alarm point has been reached; if the indicator light is off, check the supply voltage, whether the positive and negative terminals are reversed, and whether the terminals are loose.

4. Calibration Method
Raise the liquid level to the low-level zero point and confirm that the lower output limit corresponds to 4 mA; raise it to the full-scale high level and confirm that the upper output limit corresponds to 20 mA. If any deviation is present, linear calibration can be performed using the accompanying debugging software or the internal fine-tuning potentiometer on the meter. Repeat the verification 2–3 times to ensure measurement accuracy meets on-site process requirements.

6.5 Installation Precautions
1. Overvoltage supply is strictly prohibited. The standard DC 12–36 V rated range must be strictly adhered to. Do not connect directly to AC 220 V power to avoid burning out internal circuits and explosion-proof components.

2. It is strictly prohibited to install the meter in the same cable tray or conduit as variable frequency drives, high-power motors, or power cables. A minimum clearance of 30 cm must be maintained to prevent signal drift or false triggering caused by strong electromagnetic interference.

3. Do not install the instrument at an angle, horizontally, or upside down; it must be mounted vertically on the ceiling. Failure to do so may cause the float to jam and result in measurement failure.
In damp, open-air, or outdoor environments, never omit the explosion-proof sealing connectors and waterproof gaskets. Do not leave the wiring compartment open for extended periods to prevent condensation, water ingress, and corrosion of internal circuits.

4. It is strictly prohibited to cut, drill holes, or modify the instrument's explosion-proof housing without authorization. Damaging the explosion-proof structure will result in the immediate loss of explosion-proof certification and pose a significant safety hazard.

5. Do not disassemble or install the instrument while the medium has not been completely drained or the container has not been depressurized, to prevent personal injury or equipment damage caused by medium splashing or pressure surges.

VII. Recommendations for Daily Use and Maintenance
This module establishes standardized, practical daily maintenance guidelines for the full range of rod-type, all-stainless-steel, explosion-proof level transmitters. Taking into account the specific characteristics of digital, 4–20 mA analog, RS485 communication, and flameproof/intrinsically safe models, these guidelines are designed to help extend equipment lifespan, reduce downtime due to failures, and ensure long-term measurement accuracy and compliance with explosion-proof safety regulations.

7.1 Key Points for Daily Inspections
1. Inspection of Equipment Appearance and Structure
Conduct daily on-site visual inspections of the level gauge's indicator, rod assembly, and float to assess their overall condition. Check for deformation, bending, corrosion, weld leaks, or cracks in the housing; ensure the sealing surfaces of explosion-proof indicators are secure, cable entry explosion-proof connectors are tight, and sealing gaskets show no signs of aging or exposure; verify that the float slides freely up and down without sticking, and that there is no interference from debris inside the tank.

2. Signal Stability Monitoring
Monitor the level transmitter readings in real-time from the central control room: For continuous 4-20mA and RS485 models, verify that the readings are stable, without sudden jumps or unexplained drift; for switch-type models, ensure that high/low level alarms are not triggered erroneously or cycling frequently without cause. If signal fluctuations, sudden value changes, or alarm malfunctions occur, immediately mark the issue and investigate the wiring and potential sources of interference.

3. On-Site Temperature, Humidity, and Operating Condition Monitoring
During routine inspections, verify that the on-site temperature and humidity of the installation environment remain within the instrument's rated operating range; in high-temperature conditions, confirm that the instrument housing does not exhibit abnormal overheating; in humid, open-air, or semi-outdoor environments, focus on checking the wiring compartment for condensation or signs of water ingress; in explosion-proof zones, strictly prohibit the unauthorized storage of flammable or explosive materials, and ensure normal ventilation and heat dissipation.

4. Operational Status and Interlock Function Inspection
In coordination with on-site processes, periodically verify that pumps, valves, and interlock devices operate logically and normally when the liquid level reaches high or low set points; confirm that the instrument's alarm and power indicator lights correspond to actual operating conditions, with no abnormal phenomena such as dim lighting, failure to illuminate, or frequent flashing.

7.2 Periodic Maintenance Plan
1. Cleaning Frequency Guidelines
General water treatment and clean water environments: Clean dust and deposits from the float and rod surfaces every 3 months;
Environments with oily, viscous, or chemical media: Clean deposits from the float monthly to prevent buildup that could cause insufficient buoyancy or jamming;
High-dust and outdoor environments: Dust the meter housing and explosion-proof terminal box every 2 months to ensure proper heat dissipation and maintain seal integrity.

2. Wiring and Fastening Inspection
Conduct a comprehensive tightening maintenance every six months: Check whether the terminals inside the explosion-proof junction box are loose, oxidized, or have poor contact; verify that the ground wire and shielding wire connections are secure; cross-check and retighten flange mounting bolts to prevent seal leakage caused by thermal expansion and contraction; inspect threaded mounting points for looseness or potential water leakage.

3. Accuracy Retesting and Functional Verification
Conduct accuracy retesting and functional verification every six months:
Simulate the full range of high and low liquid levels to verify that the 4-20mA output's 4mA and 20mA zero and full-scale points are within specifications;
For RS485 models, connect to the system to read the address and liquid level values, and verify that the actual on-site liquid level matches the central control display;
For digital models, test each high and low liquid level alarm point individually to ensure the normally open and normally closed contacts operate sensitively and reliably;
If any deviations are found, recalibrate according to commissioning specifications and record the results for future reference.

4. Explosion-Proof Structure Compliance Inspection
Annual specialized explosion-proof maintenance: Inspect the explosion-proof housing for dents or damage, check the explosion-proof surfaces for scratches, and ensure the sealing gaskets are intact; unauthorized disassembly or modification of the explosion-proof structure is strictly prohibited; ensure that the wiring of intrinsically safe safety barriers is intact and the models match, and that there is no unauthorized

replacement of associated equipment, to ensure the long-term validity of the explosion-proof certification.

7.3 Long-Term Maintenance Tips
1. Long-Term Dust and Moisture Protection
In outdoor, humid, or dusty environments, ensure that all explosion-proof cable glands are fully compressed and sealed, and keep the terminal compartments closed and not exposed; organize and secure excess cables to prevent exposure to rain or water immersion; for equipment that will be idle for an extended period, wrap the instrument housing to protect against dust and moisture, preventing moisture-induced oxidation of internal circuit boards.

2. Long-Term Measures for Optimized Interference Resistance
Use shielded twisted-pair cables throughout the signal lines, run them through separate conduits, and maintain a safe distance from variable frequency drives, high-power motors, and power cables; strictly adhere to single-end grounding specifications for the shielding layer to prevent loop current interference caused by grounding at both ends; in strong electromagnetic environments, install signal isolators and shielded grounding bars to ensure long-term signal stability without drift.

3. Specialized Protection for Extreme Environments
High-temperature conditions: Avoid prolonged direct exposure of the meter head to radiant heat; install sunshades or heat-insulating baffles as necessary to reduce the temperature rise of the housing.
Low-temperature and severe cold environments: Select low-temperature-rated models in advance to prevent condensation and ice formation in the wiring compartment, ensuring the seal remains intact.
Highly Corrosive Chemical Environments: Regularly inspect the surfaces of 316L and PTFE-lined materials for corrosion. Report minor pitting in advance to arrange for replacement, preventing sudden leaks or failures;
Outdoor Weather Exposure: Keep the meter head installed vertically with the cable outlet facing downward to prevent rainwater from flowing back into the terminal compartment along the cables.

4. Maintenance During Long-Term Idle Periods
When the equipment is idle for an extended period, position the float in the middle safety position and clean any residual medium from the surface; disconnect the power supply, seal the wiring port, and ensure it is properly wrapped to protect against dust and water. Before putting the equipment back into service, conduct a visual inspection, recheck the wiring, and perform a power-on calibration. Only proceed with process use after confirming everything is in order.

VIII. Troubleshooting & Emergency Procedures
This module is specifically designed for on-site maintenance personnel. It covers all common fault scenarios, including no output, signal drift, abnormal indicator lights, false alarms, and interference-induced distortion. It provides detailed cause analysis and step-by-step troubleshooting methods for each issue, along with clear guidelines for emergency procedures and after-sales repair protocols. This helps users quickly identify problems, perform repairs independently, and minimize production downtime losses.

8.1. List of Common Faults
No signal output after powering on the instrument, no level readings on the central control panel, and no action on digital inputs
Level is normal but the signal drifts continuously, readings fluctuate, or levels fluctuate erratically
Power/alarm indicator lights are off, constantly on, or flashing abnormally
High/low level alarms trigger without cause before the set point is reached, or pumps/valves start/stop incorrectly
Electromagnetic interference or distortion at the site causes erratic readings, communication dropouts, or intermittent connectivity
The float moves jerkily or gets stuck; it does not respond sensitively to liquid level changes
No communication or signal feedback when an intrinsically safe explosion-proof model is used with a safety barrier

8.2. Analysis of Fault Causes
1. Wiring-related causes
Reversed positive and negative terminals; reversed signal lines A/B; shield grounded at both ends; loose or faulty connections; bare wires touching the housing; mixing of intrinsically safe and non-intrinsically safe circuits.

2. Power Supply Issues
Supply voltage exceeds the DC 12–36 V range, excessive voltage ripple, insufficient power supply capacity, excessive voltage drop in the supply circuit, or the power supply negative terminal is left floating.

3. Signal Load Issues
4–20 mA loop load impedance exceeds specifications, RS485 lacks a terminating resistor, or digital I/O load exceeds contact capacity.

4. Environmental Interference Causes
Signal wires routed in the same conduit as power cables; proximity to variable frequency drives (VFDs) or high-power motors; chaotic on-site grounding; grounding resistance below specifications.

5. Equipment and Operating Conditions Causes
Float ball scaling, adhesion, or jamming; deformation of the float rod; aging or damage to internal reed switches; water ingress or condensation in the explosion-proof terminal chamber; circuit aging due to high-temperature corrosion.

6. Installation and Structural Causes
Installation at an angle; the rod is too close to the tank wall; the float is obstructed by debris; the installation length does not match the liquid level measurement range.

8.3 Step-by-Step Troubleshooting (Fault Diagnosis + Repair + Emergency Plan)
Fault 1: No output or response when the instrument is powered on
Troubleshooting Steps
First, use a multimeter to measure the supply voltage and confirm it is within the standard 24 VDC range;
Check whether the power supply polarity is reversed and whether the terminals are loose or oxidized;
Inspect the signal wires section by section for breaks, short circuits, or loose connections;
Check the explosion-proof terminal box for water ingress, condensation, or wire corrosion;
Check whether the float is stuck in a fixed position and cannot move freely.
Repair Measures
Correct the power supply polarity and re-crimp and tighten the terminals; replace damaged signal wires; Drain accumulated water from the junction box and reseal it; remove debris from the tank, adjust the vertical alignment of the rod, and resolve the float jam.
Emergency Workaround
Temporarily use a digital switch to implement a manual high/low level interlock, and replace or repair the instrument during a scheduled shutdown window.

Fault 2: Signal Drift, Value Fluctuations, Unstable Level Display
Troubleshooting Steps
Check whether the shielded twisted-pair cable is routed entirely through independent conduit and whether it runs parallel to power lines;
Verify that the shielding layer is not improperly grounded at both ends;
Measure ground resistance to confirm it is ≤4Ω;
Move away from strong interference sources such as variable frequency drives and motors, and check for the absence of isolation measures;
Re-measure the 4-20mA load impedance to ensure it is within specifications.
Remedial Measures
Strictly implement single-end grounding at the control cabinet; Route signal cables independently, maintaining a distance of at least 30 cm from power cables; install signal isolators and optimize the on-site grounding busbar; reduce the loop load to within the permissible range.
Emergency Workaround
Temporarily lock the liquid level at a fixed value via the central control system to maintain basic process operations, and rectify the wiring and grounding during nighttime low-load periods.

Fault 3: Abnormal Indicator Lights (Not Lit / Constant On / Flashing)
Troubleshooting Steps
Power indicator light is off: First check for power supply, correct polarity, and blown fuses;
Alarm light is constantly on for no reason: Check for incorrect wiring (COM/NO/NC) or abnormal alarm point settings;
Indicator light is flashing: Most often caused by excessive power supply ripple, poor circuit contact, or electromagnetic interference.
Remedial Measures
Recalibrate power supply and wiring definitions; replace the voltage regulator to reduce ripple; Tighten terminals and clean oxidized contacts; recalibrate the liquid level alarm points.
Temporary Workaround
Temporarily disregard the indicator light status and control the process based on a comparison between the central control system's liquid level readings and the actual on-site liquid level.

Fault 4: False alarms when liquid level is within range; incorrect pump/valve start/stop
Troubleshooting Steps
Check if the float ball surface has heavy scaling, causing buoyancy deviation and false triggering of alarm points;
Verify whether the float is installed at an angle or if the rod is misaligned, causing the reed switch to malfunction;
Check whether the switch contacts are sticking or if internal components are worn out;
Investigate whether external electromagnetic interference is causing false contact actuation.
Remedial Actions
Disassemble and clean oil and scale from the float surface; recalibrate and securely reinstall the float vertically; replace worn-out relay contacts; add shielding and isolation, and move the unit away from sources of strong electrical interference.
Emergency Workaround
Temporarily switch to manual control of pump and valve operation, disable automatic interlocks, and prevent process tank overflows or dry-running incidents.

Fault 5: Communication Disconnection, Intermittent RS485 Connection, Interference, or Distortion
Troubleshooting Steps
Check whether A and B signal wires are reversed or the wiring sequence is incorrect;
Verify that terminal resistors are installed in multi-unit networks and that address conflicts do not exist;
Check for unshielded cables, excessively long runs, or too many intermediate connectors.
Remedial Actions
Swap the A/B wire sequence; install 120Ω terminating resistors at the ends; standardize device communication addresses; replace with standard shielded twisted-pair cable and reduce the number of intermediate connectors.
Emergency Workaround
Temporarily read data via individual unit communication; suspend multi-unit networking; perform unified wiring rectification later.

Fault 6: Float Ball Stuck, Unresponsive Up/Down Movement
Troubleshooting Steps
Foreign objects, welding slag, or viscous media coating the float;
Deformed float rod or installation at an angle too close to the tank wall;
Excessively high media viscosity or use of a float with an undersized specification.
Remedial Measures
Clean foreign objects and scale from the float surface; ensure the float rod is installed vertically; replace with a large-diameter, anti-adhesive float suitable for viscous media.
Emergency Workaround
Conduct manual, scheduled on-site inspections to verify the actual liquid level; temporarily suspend automatic control based on the instrument.

8.4, After-Sales Repair Guidelines
1. Criteria for Determining Faults and Reporting Repairs
If the following situations occur and cannot be resolved on-site, you may request official after-sales repair:
Damage to internal components, reed switch failure, or no electrical response from the entire unit;
Damage to the explosion-proof housing or sealing structure, resulting in loss of explosion-proof safety performance;
Severe deformation of the rod, weld seam leakage, or permanent failure of the float;
Persistent failure that cannot be resolved for normal operation after thoroughly checking wiring, power supply, grounding, and interference.

2. Repair Process
Record the product model, rod length, installation conditions, and fault symptoms;
Take photos of the instrument's exterior, terminal blocks, and on-site installation environment;
Contact Qidian Technology's after-sales service, providing the model, operating conditions, fault description, and photographic evidence;
Technical staff will provide remote guidance for a secondary troubleshooting. If the issue cannot be resolved remotely, proceed with the return for repair, replacement, or on-site service process.

3. Warranty Coverage
Under normal operating conditions, the product is covered by the standard manufacturer's warranty provided there is no human-caused damage or unauthorized disassembly or modification;
Warranty coverage includes: internal circuit failures, natural wear and tear of reed switches, leaks in the main body welds not caused by external force, and manufacturing defects;
Exclusions from warranty coverage: Unauthorized disassembly that compromises the explosion-proof structure; deformation caused by accidental impact; improper overvoltage or overcurrent supply; unauthorized on-site wiring modifications; damage resulting from use of unsuitable materials in corrosive environments.

4. Usage Guidelines
It is strictly prohibited to disassemble the explosion-proof meter or modify its internal structure. It is strictly prohibited to operate the device under excessive temperature or pressure conditions, or to use it with improper power supply. Failures resulting from installation or commissioning that do not comply with specifications are not covered by the free warranty.