Magnetic Flip-Type Level Gauge

I. Product Definition

Anhui Qidian Automation Technology Co., Ltd.'s QDY70A Series Magnetic Flip-Type Level Gauge (with Remote Magnetic Switch and Float Magnetic Coupling) is a direct-reading level measurement instrument designed based on the principle of magnetic coupling. It integrates three major functions: local display, remote signal output, and level switch alarm, making it widely applicable for liquid level monitoring in storage tanks, reactors, and pressure vessels in industries such as chemicals, petroleum, power, metallurgy, pharmaceuticals, and water treatment.

This product is a non-contact liquid level measurement instrument. It operates by using a magnet inside the float to drive the external flip-plate/magnetic coupling assembly, eliminating the need for sensitive components to come into direct contact with the medium. It offers advantages such as high-pressure resistance, corrosion resistance, and leak prevention, making it one of the mainstream instruments used in industrial settings to replace glass tube level gauges and achieve visual liquid level monitoring.

Core Features Summary:

1. On-site visual level display: The level height is directly indicated by red and white flip-flaps. The device operates normally without a power supply, providing intuitive and clear readings, eliminating the need for secondary instruments during on-site inspections.

2. Magnetic coupling for non-contact measurement: As the float rises and falls with the liquid level, the magnetic field coupling from the magnet drives the external flip-flop or remote transmission components. With no mechanical transmission parts, there is no sticking or wear.

3. Remote signal output (optional): Compatible with 4-20mA/RS485 transmitters to convert liquid level height into standard industrial signals, enabling integration with PLC/DCS control systems for remote monitoring and data acquisition.

4. Magnetic Switch Alarm (Optional): Upper and lower limit magnetic switches can be installed to provide high/low level alarms and pump start/stop interlock control, meeting the safety interlock requirements of automated production.

5. Multiple Installation Options: Supports both side-mounted and top-mounted configurations, suitable for various installation scenarios including atmospheric storage tanks, pressure vessels, underground storage tanks, and horizontal tanks.

6. Wide Range of Operating Conditions: The main body is available in 304 or 316L stainless steel, suitable for clean water, wastewater, oils, and weakly acidic or alkaline media. Custom high-pressure and high-temperature versions are also available to meet the operational requirements of various industries.

7. Leak-Proof and Explosion-Proof Safety Design: Fully sealed structure with complete isolation between the float and the flip-plate assembly, eliminating the risk of media leakage; Optional explosion-proof remote transmission components are available for use in flammable and explosive hazardous areas.

II. Working Principle

The core working principle of the QDY70A series magnetic flip-plate level gauge is the magnetic coupling effect. Simply put, “the float moves up and down with a magnet, driving the external flip-plate/sensor through the tube wall.” The entire process consists of three stages:

1. The float rises and falls in sync with the liquid level

The main body of the level gauge is a sealed stainless steel connecting tube connected to the storage tank via flanges or interfaces, ensuring that the liquid level inside the tube matches that of the tank. The density of the float inside the tube is lower than that of the measured medium, causing it to float up and down in sync with the rising and falling liquid level. A strong magnet is installed inside the float, moving with it.

2. The magnet drives the external flip plates to flip

On the outside of the connecting tube, a row of red and white magnetic flip plates (also called magnetic flip columns) is installed, each containing a small magnet. When the float, carrying the internal magnet, moves to a certain position, the magnetic field passes through the wall of the connecting tube and acts on the magnet in the corresponding flip-plate, causing the flip-plate to rotate 180 degrees: flip-plates below the liquid surface appear red (or yellow), while those above the liquid surface appear white, forming a clear liquid level demarcation line that directly indicates the liquid level height.

3. Remote Transmission / Alarm Function Expansion (Optional)

Models with remote transmission: A magnetic coupling transmitter is installed next to the flip-plate assembly. The magnetic field from the float activates the reed switch array inside the transmitter, converting the liquid level height into a resistive signal. This signal is then converted via circuitry into a 4-20mA current signal or an RS485 digital signal, which is transmitted to the control system for remote monitoring.

Models with Magnetic Switches: Reed switches are installed at the set liquid level positions. When the magnet on the float passes the switch position, the switch activates, outputting a digital signal to trigger high/low level alarms or pump start/stop control.

The entire operation requires no power supply for local display; remote transmission and alarm functions only require power to the associated components. This achieves a triple functionality of “local direct reading + remote monitoring + safety interlock,” with no mechanical transmission or contact wear throughout the process, ensuring exceptional stability.

III. Core Value and Solutions to Pain Points

1. Customer Pain Points: Traditional glass tube level gauges are fragile and prone to leakage; they cannot be used in high-temperature, high-pressure environments, posing safety hazards, and require frequent maintenance and replacement at high costs.

Product Solution: Features a fully stainless steel sealed structure with no fragile glass components; the main body can be customized for high-pressure and high-temperature specifications; the float is completely isolated from external flaps/components, fundamentally eliminating the risk of medium leakage.

Direct Benefits for Customers: Completely eliminates safety hazards associated with glass breakage and medium leakage; ensures long-term stable operation in pressure vessels and high-temperature environments; significantly reduces maintenance and replacement costs; and enables safer, more worry-free production.

2. Customer Pain Points: In explosion-proof hazardous areas or sites without power, powered electronic level gauges cannot be used, yet there is a need for intuitive and reliable on-site level display.

Product Solution: The on-site red-and-white flip-flap display requires no power supply. It is driven by pure mechanical magnetic coupling, eliminating the risk of electrical sparks and ensuring safe use in explosion-proof environments. It continues to display the liquid level normally even after a power outage, unaffected by power supply failures.

Direct Benefits for Customers: Stable, direct-reading liquid level display is achievable even in power-free and explosion-proof environments. No additional power supply or wiring is required, meeting safety and regulatory compliance requirements, ensuring uninterrupted production and unrestricted on-site inspections.

3. Customer Pain Points: Liquid levels can only be monitored remotely via the central control system; on-site inspections cannot provide an intuitive reading of the liquid level, resulting in a disconnect between central control and on-site data and low efficiency in troubleshooting.

Product Solution: Features a built-in local flip-flap display that provides an intuitive and clear view of the liquid level, allowing for direct reading during inspections without needing to operate the central control system; it can also be paired with a remote transmitter to synchronize on-site display data with remote monitoring data.

4. Customer Pain Points: The medium contains impurities and is prone to crystallization. Contact-type level gauges are susceptible to clogging and corrosion, requiring frequent disassembly, cleaning, and maintenance, which affects production continuity.
Product Solution: The float moves in a sealed tube, avoiding direct contact with impurities and crystallizing media inside the tank, eliminating the risk of clogging or corrosion; the all-stainless-steel construction resists weak acid and alkali corrosion, eliminating the need for frequent disassembly and cleaning during long-term use.
Direct Benefits for Customers: Avoids downtime for maintenance caused by instrument clogging or corrosion; significantly extends the maintenance-free period of equipment; ensures production continuity; reduces labor and material costs associated with disassembly, cleaning, and replacement.

5. Customer Pain Points: The instrument can only display liquid level and cannot directly trigger high/low level alarms or pump start/stop control, requiring the installation of a separate level switch, which results in complex wiring and high costs.
Product Solution: A magnetic switch can be directly installed on the level gauge body to enable high/low level alarms and pump start/stop interlock control, eliminating the need for a separate level switch. This simplifies wiring and enhances equipment integration.
Direct Benefits to Customers: Reduces the number of on-site devices and wiring costs, enabling "one gauge for multiple functions." It also minimizes potential failure points associated with multi-device interlocks, resulting in more stable interlock control and simpler operation and maintenance.

6. Customer Pain Points: Limited installation space in storage tanks/reaction vessels, inconsistent side-mount/top-mount interfaces, and incompatibility with standard level gauges, leading to difficult selection and high customization costs.
Product Solution: Supports both side-mount and top-mount standard installation configurations. Flange specifications and connection methods can be customized to match on-site interfaces, accommodating various installation scenarios such as atmospheric tanks, pressure vessels, and underground horizontal tanks.
Direct Benefits for Customers: A single device adapts to the vast majority of installation scenarios without requiring additional modifications to tank interfaces. It offers strong installation adaptability, simplifies selection, and reduces costs associated with non-standard modifications and customization.

7. Customer Pain Points: Electronic level gauges are susceptible to electromagnetic interference and temperature drift, resulting in significant fluctuations and instability in measurement data, which fails to meet the stable monitoring requirements of industries such as chemicals and power generation.
Product Solution: The local flip-flop display is unaffected by electromagnetic interference or temperature changes, ensuring stable and reliable readings; the remote transmission components feature a magnetic coupling non-contact design, offering strong anti-interference capabilities and stable, linear output signals.
Direct Benefits to Customers: Level data remains unaffected by complex on-site electromagnetic environments and temperature fluctuations. Both display and remote transmission signals are stable and reliable, preventing false alarms and control errors, and ensuring smooth production control operations.

8. Customer Pain Points: Media and operating conditions vary significantly across different industries. Generic level gauges have limited material options and measurement ranges, making them unsuitable for many applications, resulting in difficult selection and short service life.
Product Solution: Supports customization across multiple measurement ranges; the main body is available in 304 or 316L stainless steel, suitable for clean water, wastewater, oils, and weakly acidic or alkaline media. Additionally, it supports customization for high-pressure, high-temperature, and corrosion-resistant linings to meet the operational requirements of various industries.
Direct Benefits for Customers: Customized materials and specifications tailored to specific needs ensure a perfect match between the equipment and operating conditions, significantly extending service life. There is no need to repeatedly replace instruments of different models, simplifying selection and keeping costs under control.

IV. Key Product Parameters & Specifications

4.1 Basic Electrical Parameters (Applicable to Both Remote Transmitters and Magnetic Switches)
Measured Media: Clean water, wastewater, diesel, engine oil, hydraulic oil, various light oils, and industrial liquids with weak acidity or alkalinity
Measuring Range: Standard range 300 mm to 6000 mm; extended ranges available upon request
Measurement Accuracy: Local display ±5 mm; Remote transmission accuracy ±0.5% FS
Remote Signal Output: Standard 4–20 mA DC current signal; optional RS485 Modbus-RTU digital signal
Signal Output Load: 4–20 mA maximum external load resistance ≤600 Ω
Digital Output: Passive dry-contact magnetic switch, normally open/normally closed (customizable)
Switch Contact Rating: AC 220V/1A; DC 24V/2A
Response Speed: Level rise/fall response time ≤0.5s
Applicable Medium Density Range: ≥0.45 g/cm³
Operating Pressure Ratings: Atmospheric pressure, 1.6 MPa, 2.5 MPa, 4.0 MPa (multiple pressure ratings available)

4.2 Isolation Performance Parameters
Electrical Isolation Method: Full three-terminal isolation for power supply, input level signal, and output signal
Isolation Withstand Voltage: 2500V AC withstand voltage between power supply and signal for 1 minute without breakdown
Insulation Resistance: ≥120MΩ at room temperature (tested at 500V DC)
Interference Suppression: Common-mode interference rejection ratio (CMRR) ≥85dB, effectively resisting electromagnetic interference from inverters and motors
Magnetic Isolation: Non-contact magnetic coupling isolation measurement; the medium chamber and electrical chamber are completely physically isolated
Surge Protection: Built-in surge and lightning protection circuits, suitable for complex industrial outdoor power environments
Ground Loop Suppression: Fully isolated architecture, completely eliminating signal offset caused by potential differences at different points in the field

4.3 Power Supply & Power Consumption Parameters
Standard Operating Voltage: 24 V DC
Wide Voltage Range: Stable operation from 18 V DC to 36 V DC
Polarity Protection: Features reverse polarity protection; components will not be damaged if polarity is reversed
Full-Load Power Consumption (Remote Transmitter): ≤1.5 W
Standby Power Consumption: ≤0.9 W
Passive Local Display: Flip-type visual display requires no power supply; functions normally during power outages
No built-in external power output; supplies power only to the unit's remote transmission module and switch module
Power Supply Requirements: Use an industrial DC regulated power supply with low ripple; avoid using switching power supplies

4.4 Environmental Adaptation Parameters
Measured Medium Temperature: Standard model: -20°C to +120°C; High-temperature custom model: up to +200°C
On-site Operating Temperature: -35°C to +75°C
Equipment storage temperature: -45°C to +85°C
Operating environmental humidity: 10% RH to 95% RH, no condensation or moisture
Storage environmental humidity: 5% RH to 98% RH
Overall protection rating: Level sensor body IP67; Remote transmission junction box IP65
Explosion-proof rating: Intrinsically safe Ex ia II CT6 or flameproof Ex d II CT6 (optional)
Compatible Safety Barriers: Compatible with both intrinsic safety level remote transmission isolation safety barriers and Zener safety barriers
Vibration Resistance: Complies with industrial site vibration standards; suitable for long-term stable installation near pumps and equipment units
Installation Altitude: Normal operation at ≤4500 meters

4.5 Physical Parameters

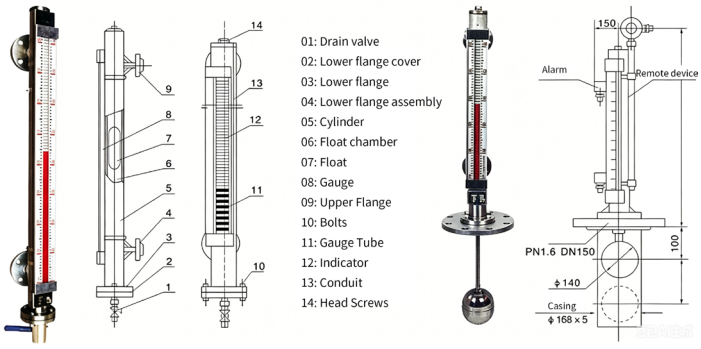
1. Installation Methods
Main installation types: Side-mount through-type and top-mount direct-entry type
Flange connection standard: Chinese National Standard HG/T20592; standard flanges: DN15, DN20, DN25, DN40, DN50
Connection methods: Flange connection, threaded connection, and clamp connection are all available upon request
Compatible Tank Types: Vertical storage tanks, horizontal storage tanks, reactors, buffer tanks, water treatment tanks, oil storage equipment

2. Dimensions
Main measuring tube outer diameter: Standard Φ50 mm
Flip-flop indicator strip width: 42 mm
Remote transmission junction box dimensions: Length 95 mm × Width 72 mm × Height 58 mm
Overall width (including flip-flap): Max. 110mm
Total equipment height: Customized according to measurement range and on-site liquid level height
Float outer diameter: Custom-made float designed for the 配 套 piping system, featuring strong sealing and smooth, jam-free movement

3. Total Weight
1-meter range, 304 stainless steel base model: Approx. 3.8kg
Weight increases by approximately 1.3 kg for every additional 1-meter measurement range
Installing a remote transmission module + magnetic switch adds approximately 0.7 kg to the total weight

4. Housing Material and Protection Details
---Main measurement tube material: Standard 304 stainless steel; upgraded 316L stainless steel; PTFE lining available for highly corrosive environments
--- Float Material: Sealed, one-piece 304/316L stainless steel float, internally filled with an inert medium; will never fail due to water ingress
--- Flap Housing Material: Corrosion-resistant aluminum alloy housing with electrostatic powder coating for rust prevention and aging resistance
---Remote Junction Box: Cast aluminum explosion-proof and dustproof junction box with sealing gaskets that resist deformation under high and low temperatures
---Internal Magnet: High-stability permanent magnet that does not demagnetize, ensuring a long service life
---Seal Material: Fluorocarbon rubber seals suitable for all operating conditions, resistant to oil, water, and weak acids/alkalis
---External protection: Brushed finish with anti-corrosion treatment; remains rust-free and fade-resistant during long-term outdoor use
---Leak-proof design: Fully seamless welding process; no leakage points in pressure-bearing areas; suitable for storing hazardous chemicals

Magnetic Float Level Gauge



V. Universal Core Structure (Shared Base Components for Side-Mounted and Top-Mounted Models)
1. Measuring Body (Main Tube / Float Chamber)
Function: Connects to the measured vessel to form a pressure-equalized chamber; provides a vertical guide channel for the float; isolates the medium from external electrical components.
Structure:
Side-Mounted Type: A bypass tube with dual upper and lower interfaces, featuring flanges or threads at both ends. The middle section houses the float chamber, with a drain valve at the bottom and a vent valve at the top.
Top-Mounted Type: A vertical, long guide tube with a flange at one end, inserted into the vessel. The lower end of the tube is sealed, while the upper end connects to the flip-flap chamber; openings in the side walls ensure medium flow.
Materials: 304/316L stainless steel (standard), 304 lined with PTFE (highly corrosive), PP/PVC (low-temperature weak acids), titanium alloy (highly corrosive).
Specifications: Outer diameter Φ40/Φ50/Φ60 mm; wall thickness 2–5 mm; pressure rating 0.6–4.0 MPa; Measuring range: 300–6000 mm (customizable for extra-long lengths).

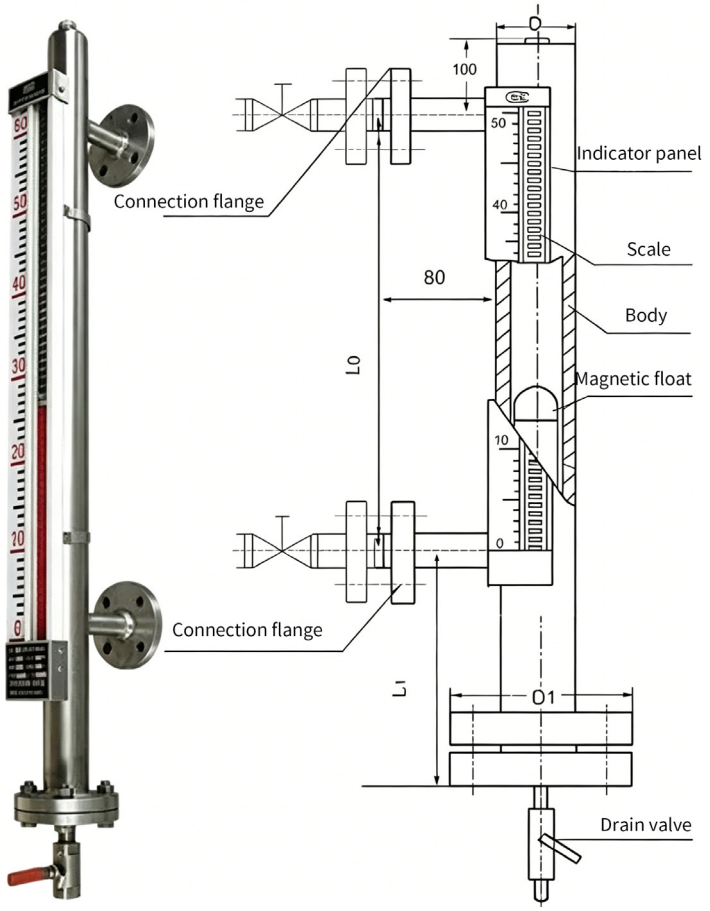
2. Magnetic Float
Function: As the liquid level rises or falls, the built-in permanent magnet drives the flap to flip via magnetic coupling, acting as a “mechanical sensor” for the liquid level signal.
Structure:
Housing: Sealed cylindrical/spherical, seamless welded 304/316L stainless steel, leak-proof.
Internal: Encapsulated neodymium-iron-boron permanent magnet (high remanence, non-demagnetizing), filled with inert sealing medium (water-resistant).
Density: Precisely matched to the measured medium (≥0.45 g/cm³), ensuring the float always remains afloat on the liquid surface.
Types:
Side-Mounted: Long cylindrical design, adapted to the inner diameter of the bypass pipe, ensuring smooth, jam-free movement.
Top-Mounted: Short cylindrical / disc-shaped design, mounted on the outer side of the top-mounted guide tube, sliding along the tube with the liquid level.

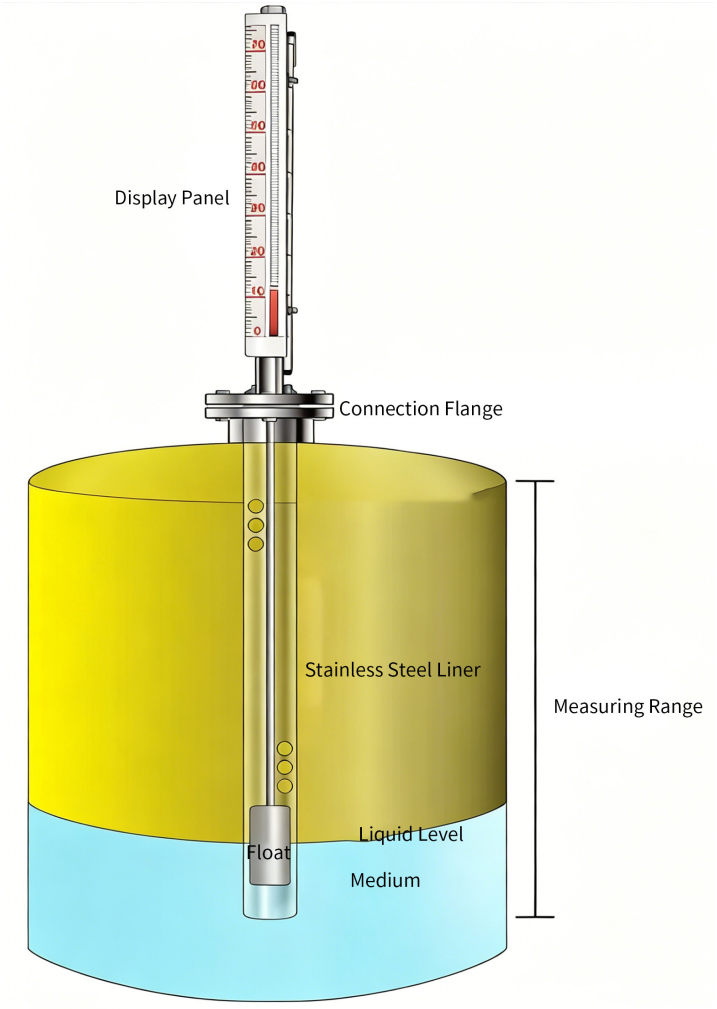
3. Magnetic Flip-Type Level Gauge
Function: Converts the float’s magnetic signal into a visual red-and-white interface, providing an intuitive display of liquid level height.
Structure:
Flip-type strips: Composed of dozens of rectangular magnetic flip columns, each with one red side and one white side, containing built-in micro-magnets, spaced 10 mm apart (accuracy ±5 mm).
Housing: Electrostatic powder-coated aluminum alloy / stainless steel, dustproof and waterproof, protecting the flip-plate columns from external damage.
Scale: High-precision laser engraving, marked with range graduations and percentage scales; optional luminescent / LED illumination (for nighttime reading).
Installation: Secured to the outside of the main tube via snap-fits or bolts, aligned parallel to the float chamber.

4. Connection and Sealing Components
Flanges: Chinese Standard HG/T20592, American Standard ANSI, DN15–DN50, same material as the main body, with sealing surfaces.
Seals: Fluororubber (oil-resistant / temperature-resistant), PTFE (highly corrosive environments), temperature range: -20°C to +200°C.
Fasteners: Stainless steel bolts + locknuts, suitable for high-temperature and high-pressure conditions, leak-proof.

5. Functional Expansion Modules
Remote Transmitter: Reed switch array / Hall effect sensor, 4-20mA/RS485 output, mounted along the outer side of the conduit, using magnetic coupling to detect the float position.
Magnetic Switch (Alarm / Control): Passive dry contact, normally open / normally closed, AC 220V/1A, DC 24V/2A; for upper/lower limit alarms and pump start/stop interlocks.
Drain / Vent Valves: Bottom drain (anti-clogging), top vent (anti-air lock), stainless steel ball valves, pressure rating ≥1.6 MPa.

Heating Jacket: Steam / electric heating, prevents crystallization and solidification of low-temperature media, suitable for chemical and low-temperature applications.





2. Unique Structure of the Side-Mounted Magnetic Flip-Type Level Gauge (Bypass Pipe Type)

1. Overall Structural Layout

Installation: Two openings are drilled in the side wall of the vessel, top and bottom, with flanges connected at both ends. The main pipe forms a U-shaped communicating vessel with the container, ensuring the liquid level is fully synchronized.

Appearance: Vertical, elongated shape with the flip-type chamber centered. The top and bottom flanges are symmetrical, featuring a drain at the bottom and a vent at the top. The structure is symmetrical and provides a secure installation.

2. Specific Component Details

Upper and Lower Connecting Tubes: Short tubes connect the vessel to the main tube, with diameters ranging from DN15 to DN25, ensuring unobstructed media flow without dead zones.

Float Guide Grooves: Longitudinal grooves are machined into the inner wall of the main tube to prevent float rotation and jamming, ensuring smooth vertical movement.

Side-Mounted Bracket: An optional L-shaped stainless steel bracket is available for mounting on the vessel sidewall to support the instrument's weight and prevent deformation.

3. Structural Features

No Pneumatic Pressure Balancing Issues: The communicating vessel automatically balances pressure, eliminating "false sticking" and ensuring rapid level response (≤0.5 s).

Easy Maintenance: The bottom drain valve allows direct removal of the float for cleaning or replacement without disassembling the main body.

No Strict Range Limitations: Modules can be segmented and assembled to accommodate ultra-long level measurements exceeding 6 meters.

3. Top-Mounted Magnetic Flip-Plate Level Gauge (Direct-Entry Type) Exclusive Structure

1. Overall Structural Layout

Installation: A single opening is made at the top of the vessel; the flange is inserted vertically, with the guide tube extending deep into the vessel interior. The flip-plate housing is mounted on the top or an external bracket.

Appearance: Vertical rod-shaped design featuring a top flange and indicator housing, with a long guide tube extending downward. The float is mounted on the outside of the guide tube, resulting in a compact, space-saving structure.

2. Specific Component Details

Top-Mounted Guide Tube: An extra-long seamless tube extending to the maximum liquid level, with through-holes in the side walls (to allow media flow) and a retaining ring at the bottom (to prevent the float from falling out).

Float Limit Structure: Limit rings are installed at the top and bottom of the tube to restrict the float's travel, preventing it from exceeding the measurement range or colliding with the flap chamber.

Pressure Balancing Device: An exhaust valve is installed at the top of atmospheric pressure vessels to balance the air pressure inside and outside the tube, preventing level sticking; pressure vessels do not require additional venting.

Anti-Tipping Bracket: For measurement ranges exceeding 2 meters, a cable or triangular bracket is provided to secure the tube, preventing swaying and tipping.

3. Structural Features

No side wall openings required: Suitable for wall-mounted or sealed vessels, reducing potential leakage points and ensuring high safety.

Resistant to lateral interference: Unaffected by fluid impact or vortices inside the vessel, ensuring high stability.

Slightly more complex maintenance: Requires disassembly of the top flange to remove the tube and float; suitable for applications where frequent maintenance is impractical.

VI: Application-Specific Selection Guide

6.1 Key Selection Criteria

1. Selection Based on Installation Type

If the side wall of the on-site vessel has top and bottom connection ports, prioritize the use of side-mounted magnetic flip-plate level gauges. These offer convenient installation and simplify future drainage and maintenance, making them suitable for the vast majority of vertical storage tanks, reactors, and liquid storage tanks; If the site only has a top mounting port and no openings can be made in the tank sidewall, directly select a top-mounted magnetic flip-plate level gauge. This single-flange vertical insertion installation does not damage the tank sidewall structure and is suitable for sealed storage tanks, deeply buried tanks, and elevated storage tanks.

2. Selection of Signal Output Types

If only visual on-site level monitoring is required and no integration with an automated control system is needed, select the basic, purely mechanical model, which operates normally without electrical components or power supply; If integration with a PLC, DCS, or industrial control instrument is required for remote level monitoring, select the model with 4-20mA analog remote output; if integration with an industrial IoT network or multi-device networking for centralized data collection is required, prioritize the model with RS485 Modbus communication output; if automatic start/stop based on high/low level limits or alarm interlocks are required, install a passive magnetic level switch and configure it as normally open or normally closed contacts as needed.

3. Selecting the Measurement Range

Select the model based on the actual effective liquid level height of the container, allowing for a safety margin of approximately 10 cm. Do not select the size based directly on the tank's maximum capacity to prevent the float from contacting the upper or lower limits during operation, which could cause measurement failure. Use short-range models for small tanks with low liquid levels, and extended custom ranges for large oil storage tanks or large water treatment tanks. Custom manufacturing is available for non-standard sizes.

4. Selection of Material for Measured Media

For measuring neutral media such as clean water, general industrial water, and oil at ambient temperatures, a 304 stainless steel body is sufficient to meet operational requirements. For pharmaceutical-grade purified water, mildly corrosive chemical liquids, or media containing chloride ions, upgrade to a 316L stainless steel body. For strong acids, strong alkalis, or highly corrosive chemical media, select models with a PTFE-lined corrosion-resistant structure to completely isolate the device from media corrosion damage.

5. Pressure and Temperature Selection

For liquid storage equipment operating at ambient temperature and pressure, select standard low-pressure general-purpose models; for high-pressure reactors and pressurized sealed vessels, match the pressure rating (1.6 MPa, 2.5 MPa, or 4.0 MPa) based on the actual on-site operating pressure; for standard ambient-temperature conditions, select general-purpose ambient-temperature models; for high-temperature media such as high-temperature thermal oil and hot water, select custom high-temperature-resistant structures paired with high-temperature-resistant sealing components.

6. Explosion-Proof Rating Selection

For environments without flammable or explosive gases—such as standard industrial plants, water treatment facilities, and civilian water storage equipment—select standard non-explosion-proof models. In hazardous explosion-proof zones—such as chemical industrial parks, oil and gas storage facilities, and hazardous chemical warehouses—explosion-proof remote transmission components must be selected. These must match the corresponding explosion-proof rating and be used in conjunction with safety barriers to meet on-site safety production and safety inspection standards.

7. Power Supply Selection

Mechanical flip-flap displays require no external power supply throughout their operation and are unaffected by on-site power outages. When installing remote transmitters and electrical switching components, a standard industrial 24V DC power supply is uniformly adopted. This is compatible with mainstream on-site industrial control power systems, supports stable wide-voltage input, and requires no additional dedicated power supply equipment.

8. Channel and Function Configuration Selection

For independent level monitoring of a single tank, select the single-channel standard configuration; for centralized monitoring of multiple storage tanks within a facility, uniformly select instruments with the same communication protocol specifications to facilitate unified system networking and management; for single-monitoring needs requiring only local display, ensure that remote transmission and limit switch functions are fully configured for automated control and interlocking scenarios to achieve multi-functional integration using a single instrument.

6.2 Industry Application Recommendations

1. For various raw material storage tanks, reactors, waste liquid collection tanks, and hazardous chemical storage containers in the industrial sector, prioritize the QDY70A explosion-proof and corrosion-resistant magnetic level gauge. For media with low corrosion, select 304 stainless steel; for highly corrosive media, choose 316L or PTFE-lined structures. In high-risk explosion-proof zones, pair the gauge with an explosion-proof remote transmission module and a safety barrier. Select either side-mounted or top-mounted configurations based on the tank structure. The standard configuration includes upper and lower limit magnetic switches to enable over-limit level alarms and automatic interlocks for material conveyance. Additionally, integrate the 4-20mA remote transmission signal into the chemical plant's central control system to achieve centralized monitoring of liquid levels across the entire facility.

2. For power industry applications such as power plant circulating water pools, cooling water tanks, demineralized water tanks, and industrial oil storage tanks, the QDY70A general-purpose anti-interference side-mounted magnetic flip-plate level gauge is recommended. A 304 stainless steel body is sufficient to meet operational requirements. Given the strong electromagnetic environment on-site, the anti-interference remote transmission version is selected. It outputs a standard analog signal for integration into the power plant's DCS control system. On-site inspections rely on the visual flip-plate display, eliminating the need for complex additional functions. Stability, durability, and low maintenance are the core selection criteria.

3. In the metallurgical industry, for production cooling storage tanks, sewage treatment tanks, and recirculation and makeup tanks, the QDY70A reinforced magnetic float level gauge—designed to withstand vibration and contaminants—is selected. The side-mounted structure is prioritized to facilitate regular drainage and removal of impurities from the medium. The use of 316L stainless steel enhances overall resistance to contamination and corrosion. Electrical configurations are simplified, with on-site visual monitoring as the primary method, ensuring stable long-term operation of the equipment in environments characterized by vibration and high dust levels.

4. In the pharmaceutical industry, for purified water storage tanks, solution preparation tanks, pharmaceutical intermediate storage tanks, and aseptic liquid storage equipment, the sanitary-grade QDY70A magnetic float level gauge is selected. A uniform 316L food-grade stainless steel material is used, featuring a simple structure with no sanitary dead zones. Cleanrooms utilize spark-free safety designs, while cleanroom explosion-proof areas are equipped with intrinsically safe remote transmission components, strictly adhering to pharmaceutical industry clean production standards while balancing on-site visual readings with automated process level control.

5. In the water treatment industry—including municipal sewage tanks, water purification tanks, reclaimed water systems, and integrated wastewater treatment equipment—the economical QDY70A standard side-mounted level gauge is widely adopted. For conventional clean water and sewage applications, a 304 stainless steel body is used; for long-distance monitoring of large tanks, extended-range custom models are selected. Remote transmission signals can be integrated into smart water management platforms as needed, and when paired with level switches, they enable intelligent control of automatic tank refilling and drainage.

6. In the smart manufacturing industry, for storage tanks, lubricant tanks, and automated fluid supply systems on automated production lines, the integrated QDY70A multifunctional magnetic flip-plate level gauge is selected. These units are uniformly configured with RS485 communication for remote transmission and dual-limit magnetic switches, supporting unmanned operation modes on automated production lines. The standardized specifications facilitate unified equipment commissioning and maintenance, and meet the requirements of smart factories for centralized data collection and automatic start-stop control.

6.3 Common Selection Pitfalls

1. Neglecting Electrical Isolation Levels

Many customers focus solely on measurement range, material, and installation method during selection, neglecting the electrical isolation performance of the remote transmission module. In environments with multiple potential differences or strong electromagnetic interference, selecting non-isolated, simplified remote transmission models can easily lead to signal drift, data fluctuations, and inaccurate data acquisition by the central control system. In severe cases, this can even interfere with the normal operation of downstream industrial control modules. Correct selection requires prioritizing a three-terminal fully isolated configuration to accommodate complex industrial power environments.

2. Incorrect Selection of Measurement Range

Blindly matching a level transmitter with the maximum tank height without allowing for a safety margin results in insufficient operating space for the float, leading to jamming and failure at the upper measurement limit. Conversely, some customers select an excessively large range to save costs, causing reduced measurement accuracy in the low-level range and significant reading errors, which directly impact on-site production decisions. Selection must account for daily operating levels and include a reasonable safety margin.

3. Neglecting Signal Load Matching

When selecting models with 4-20mA remote output, the total load resistance caused by downstream secondary instruments and cable length is often not calculated. Connecting downstream equipment that exceeds the instrument's rated load range results in insufficient output current, signal transmission interruptions, and missing data. During the selection phase, the total load resistance of the on-site downstream system must be confirmed to ensure it remains within the instrument's permissible load range.

4. Incorrect Use of General-Purpose Models in Explosion-Proof Environments

Selecting standard, non-explosion-proof remote level transmitters for hazardous areas containing flammable or explosive gases poses significant safety risks and will fail fire safety and chemical safety inspections. The cost of subsequent rectification is extremely high. In all designated explosion-proof zones, models with the corresponding explosion-proof rating must be strictly selected; the use of general-purpose models as substitutes is strictly prohibited.

5. Ignoring Medium Characteristics and Arbitrarily Selecting Materials

Failing to distinguish between the medium's acidity or alkalinity, chloride ion content, and operating temperature conditions, and uniformly selecting a standard 304 stainless steel body will result in long-term failures such as tube wall corrosion, leaks, and float damage, significantly shortening the equipment's service life. Before selection, the medium's composition, concentration, and operating temperature must be clearly identified to precisely match the appropriate corrosion-resistant material.

6.4 Customization Recommendations

1. Custom Signal Solutions

In addition to standard 4-20mA current signals and RS485 digital signals, we can customize 0-5V or 0-10V voltage output signals to meet the requirements of customers' legacy equipment or specialized industrial control systems. We also support simultaneous analog and digital dual-signal output, enabling a single instrument to interface with two different control systems. Furthermore, we offer customizable versions with HART protocol for intelligent remote transmission, compatible with high-end smart industrial control equipment.

2. Custom Solutions for Non-Standard Operating Conditions

If the flange dimensions or connection threads of on-site tank interfaces do not conform to standard national specifications, we can customize various non-standard flanges, special-shaped connection interfaces, and unique thread structures as required; For low-temperature, easily solidifying, or high-viscosity, easily crystallizing media, steam tracing or electric heating insulation structures can be installed to prevent media solidification from affecting normal float operation; for use in harsh outdoor environments, we can customize reinforced protective housings and integrated rain- and dust-proof structures to enhance outdoor weather resistance; for extremely high or low non-standard operating temperatures, specialized temperature-resistant components and sealing accessories can be customized.

3. Structural and Functional Customization Solutions

For use in confined spaces, compact, reduced-diameter level gauges can be customized; for large horizontal storage tanks, tilt-adaptive mounting structures can be customized; for real-time multi-point level alarm and control, multiple sets of independent magnetic switches can be installed on the level gauge body to achieve multi-stage level indication and tiered control; for sealed tanks without drainage capabilities, the bottom drainage structure can be eliminated to optimize overall sealing performance.

4. Multi-Scenario Integrated Customization Solutions

For centralized liquid level monitoring projects involving multiple storage tanks within a facility, we offer bulk customization services for units with identical parameters and communication specifications. Parameters are uniformly configured during commissioning to facilitate subsequent system networking and centralized operation and maintenance; We can provide a complete set of supporting equipment, including dedicated level signal isolators, explosion-proof safety barriers, and field digital display instruments, to achieve a one-stop, end-to-end customization solution covering the entire chain from field measurement, signal transmission, and field display to central control data acquisition, eliminating the hassle of customers having to select and configure components themselves.

5. Industry-Specific Custom Solutions

For sterile production environments in the food and pharmaceutical industries, we offer custom polished sanitary-grade models with no dead zones; for marine and vehicle-mounted mobile liquid storage equipment, we provide custom shock-resistant, reinforced structures designed to withstand vibrations; and for underground and enclosed liquid storage equipment, we offer custom low-power, sealed models that fully comply with the specific usage standards of these niche industries.

VII: Installation and Commissioning Specifications

7.1 Pre-installation Preparation

1. Verification of Components

Unpack the product and verify that the overall model, mounting type, measurement range, main body material, and pressure rating match the order specifications. Check that the level gauge main tube, flanges, and flip-flap indicator show no deformation or dents; ensure the float is intact with no damage, and that the flip-flap rotates smoothly and freely. Inventory all accompanying accessories, including connecting gaskets, fastening bolts, drain valves, vent valves, remote transmission junction box assemblies, magnetic switch assemblies, as well as the product certificate of conformity and installation manual, to confirm that all accessories are complete and nothing is missing.

2. Environmental Inspection

Confirm that the dimensions of the tank flange connections and the center distance at the installation site fully match the specifications of the level gauge flange, and ensure that the installation location allows for sufficient maintenance space; Verify in advance that the on-site medium temperature, operating pressure, and medium corrosivity comply with the instrument's rated parameters; installation under conditions of excessive temperature or pressure is strictly prohibited; in explosion-proof zones, confirm the on-site hazard level in advance and verify that the instrument's explosion-proof certification meets the site's usage requirements; clear debris, oil stains, and flammable or explosive materials from the vicinity of the installation site to ensure a safe and tidy construction environment.

3. Tool List
Basic installation tools include adjustable wrenches, socket wrenches, Phillips and flathead screwdrivers, a spirit level, PTFE tape, sealing gaskets, and fastening screws; wiring and commissioning tools include wire strippers, terminal crimping tools, a multimeter, electrical tape, and flame-retardant shielded cable; auxiliary tools include lifting ropes, mounting brackets, and cleaning rags. Prepare safety protective equipment in advance for work at heights.

4. Safety Precautions
Before tank installation, the system must be shut down, depressurized, and completely drained of any residual media; installation under pressure or with liquid present is strictly prohibited. In flammable or explosive environments, explosion-proof tools must be used, and open flames or electrical sparks are strictly prohibited throughout the entire installation process. Ensure fall protection measures are in place for high-altitude installation work. For long-range level gauges, use a two-person team for hoisting to prevent bending or deformation of the main pipe. Electrical wiring must be performed with the power completely disconnected; opening the cover to wire while the system is energized is strictly prohibited. When working in areas with corrosive media, ensure proper personal protection to prevent skin contact and injury.

7.2 Standard Installation Procedures
1. Installation Steps for Side-Mounted Magnetic Flip-Type Level Gauges
First, clean any debris and residual contaminants from the inner walls of the upper and lower side-mounting flanges on the vessel. Place the sealing gasket flat against the flange mating surface. Align the upper and lower flanges of the level gauge with the corresponding flanges on the vessel. After ensuring a stable alignment, tighten the flange bolts diagonally and evenly. Do not tighten bolts on one side only to prevent flange deformation and leakage. Use a spirit level to calibrate the verticality of the gauge, ensuring the main pipe is vertical and free of tilt to prevent the float from getting stuck during movement; After installation, open the top vent valve and bottom drain valve, and recheck the connection points for leaks. Finally, secure the side remote transmission assembly and the magnetic switch mounting bracket.

2. Installation Steps for Top-Mounted Magnetic Flip-Plate Level Gauges
Clean the top flange opening of the tank and place a thickened sealing gasket; Lower the entire top-mounted level gauge vertically and steadily into the tank through the top interface, ensuring the guide tube is vertical, centered, and free of deviation; after aligning with the flange holes, evenly tighten all mounting bolts and ensure a proper top seal; for long-span instruments with a range exceeding two meters, install external reinforcement brackets for support and fixation to prevent the guide tube from swaying or deforming; adjust the flip-plate indicator orientation for easy on-site reading, and complete the mechanical structure fixation.

3. Electrical Wiring Specifications
Open the sealing end caps of the remote transmission junction box and the switch junction box. Strictly distinguish wiring according to terminal markings: distinguish between positive and negative terminals for power supply, and between input and output terminals for signals; Standard terminal definitions for remote transmitters: Connect the DC24V positive terminal to the power supply positive terminal, and the DC24V negative terminal to the power supply negative terminal; connect the signal output positive terminal to the positive terminal of the central control system's analog input, and the signal output negative terminal to the negative terminal of the central control system's analog input; For RS485 communication models, strictly distinguish between Line A and Line B; do not reverse the connections. Magnetic switches are passive dry contacts with no polarity distinction; they can be directly connected in series to the alarm circuit and start/stop control circuit.

4. On-site Grounding Requirements
Connect the metal flange of the level gauge to the equipment protective ground wire at the nearest point; the overall grounding resistance must be controlled within 4 ohms; The grounding terminal on the remote transmitter housing must be reliably grounded to dissipate on-site electrostatic interference; the shielding layer of the signal cable should be grounded at a single point only at the central control cabinet end, while the shielding layer at the instrument's on-site end should remain floating (ungrounded) to prevent ground loops that cause signal fluctuations; in explosion-proof areas, the instrument must be connected to a dedicated explosion-proof grounding network and must not share grounding lines with ordinary power equipment.

7.3, Wiring Standards and Correct/Incorrect Comparison
1. Standard Wiring for 4-20mA Remote Transmitter Models
Connect the positive and negative terminals of an external 24V DC regulated industrial power supply to the instrument's power supply terminals. Connect the two signal output cables directly to the analog input terminals of a PLC, DCS, or secondary display instrument. Use flame-retardant shielded signal cables throughout the entire circuit, and ensure wiring is neat and free of tangles. Correct practice: Keep power and signal lines separate; ensure terminals are securely crimped with no exposed copper wires. Incorrect practice: Mixing power and signal lines, damaged or exposed cables, or loose or faulty terminal connections—these issues can easily cause the instrument to have no output or result in signal interference.

2. Standard Wiring for RS485 Communication Models
Use a unified bus-style wiring configuration: connect all A wires and B wires of instruments of the same specification in parallel. Install a 120Ω terminating resistor at the end of the communication bus to ensure stable communication. Set the communication address and baud rate uniformly for all instruments, ensuring consistency with the host computer's parameters. Correct practices include maintaining a consistent sequence for A and B wires and keeping the bus wiring simple; incorrect practices include reversing A and B wires, haphazard multi-branch wiring, and omitting the terminating resistor, which directly lead to communication failure and frequent data packet loss.

3. Magnetic Switch Wiring Specifications
Both high- and low-level alarm switches are passive digital switches that can be freely connected to a 220V AC circuit or a 24V DC control circuit. Set them to normally open (NO) or normally closed (NC) mode according to on-site requirements. No external power supply is required; they can be triggered normally by simply connecting them in series with the control circuit. Correct practices include keeping the wiring simple and ensuring the contact load does not exceed the rated current; Incorrect practices include connecting to excessively high load currents, which can easily cause the switch contacts to burn out and fail.

4. Shielded Cable Handling Specifications
For all long-distance signal transmission cables, the outer shielding layer must be grounded uniformly at only one end (the control room end). At the instrument installation site, the shielding should be neatly trimmed, left suspended, and wrapped with insulating tape. Grounding both ends simultaneously is strictly prohibited to eliminate signal interference caused by potential differences at the source.

7.4 Power-On Commissioning Procedure
1. Initial No-Load Testing
After all mechanical installation and electrical wiring are complete, conduct a comprehensive re-inspection of flange sealing, wiring tightness, and correct cable routing. After confirming there are no leaks or miswired connections on-site, slowly connect the instrument's power supply; Observe whether the flip-flap display flips normally; ensure the remote transmission module does not overheat, produce abnormal noises, or display any error indicators when powered on.

2. Test Operation with Medium Injection
Slowly open the inlet and outlet valves of the container to steadily inject the medium into the tank. Observe whether the level gauge float rises and falls smoothly with the liquid level, and whether the red and white flip-flaps follow the liquid level precisely without any sticking or erratic flipping; Throughout the process, inspect the flange connections and valve body welds to ensure there are no leaks or dripping.

3. Signal Calibration
For the 4-20mA remote transmission model, the standard output should be 4mA when the liquid level is at zero, and 20mA when the liquid level reaches full scale. The output should be linear and stable at intermediate liquid levels. Measure the current values with a multimeter; the test is considered qualified if the error is within the standard accuracy range; For RS485 models, connect to the host computer's debugging software

to read real-time liquid level data and verify that the on-site display data matches the backend acquisition data exactly.

4. Magnetic Switch Operation Debugging
Manually adjust the liquid level up and down to the set alarm points to test whether the high-level and low-level switches can accurately trigger on/off actions. Confirm that alarm signals and start/stop interlock signals are transmitted normally. The switch installation position can be fine-tuned according to on-site requirements to achieve precise point control.

5. On-Site Accuracy Calibration
If there is a discrepancy between the on-site display and the actual liquid level, fine-tune the zero and full-scale parameters of the remote transmitter to complete linear calibration. If the mechanical flip-flap exhibits localized inaccuracies in flipping, fine-tune the installation position of the indicator to ensure precise alignment between the float's magnetic field and the flip-flap, thereby guaranteeing accurate visual readings.

7.5 Installation Contraindications and Protective Measures
1. Strictly Prohibit Overpressure and Overtemperature Operation
Strictly adhere to the instrument's rated pressure and temperature parameters. Do not force installation or use under conditions exceeding the rated pressure or temperature, as this can easily cause deformation of the main body, seal failure, and media leakage, leading to safety incidents.

2. Strictly Prohibit Overvoltage Power Supply
The standard power supply for remote transmission instruments is 24 V DC, with an acceptable voltage range of 18 V DC to 36 V DC. Do not connect directly to 220 V AC mains power, and do not connect to DC voltages exceeding 36 V to prevent direct burnout of the internal transmitter circuitry.

3. Avoid High-Voltage Interference During Wiring
Instrument signal lines must not be routed in the same conduit or laid in close proximity to high-power motor cables, variable frequency drive (VFD) power cables, or high-voltage power supply cables. Maintain a safety clearance of at least 30 centimeters between these two types of lines to minimize signal drift and data fluctuations caused by electromagnetic interference.

4. Avoid Forceful Installation Procedures
Tighten flange bolts evenly in a diagonal pattern. Do not apply excessive force when tightening, as this may cause flange cracking or stripped threads; Striking or bending the main pipe of the level gauge is strictly prohibited, as is forcefully pressing the float, to prevent damage to internal components and measurement failure.

5. Protection Against Dampness and Outdoor Environments
For outdoor installations, adequate protection against rain and sunlight must be provided. Regularly inspect the sealing gaskets of junction boxes to prevent rainwater or moisture from entering the electrical compartment and causing short circuits. For installations in damp underground locations, ensure cables are properly waterproofed, and prevent water accumulation or condensation at terminal locations.

6. Protection Against Media Impurities
When measuring media containing silt, crystals, or viscous substances, the bottom drain valve must remain in use. Ensure a channel is reserved for periodic drainage and cleaning to prevent the accumulation of impurities that could jam the float and cause the level measurement to malfunction.

VIII. Recommendations for Daily Use & Maintenance
8.1 Key Points for Daily Inspections
1. On-site Status Inspection
Conduct daily on-site inspections of the red-and-white flip-flap display on the level gauge. Observe whether the flip-flaps operate smoothly and responsively, with no sticking, failure of individual flip-flaps, or color confusion. Verify that the scale readings on the flip-flap display match the actual liquid level in the tank, with no obvious visual discrepancies. Confirm that the float moves normally in response to changes in the liquid level, with no sticking or stalling issues. For side-mounted models, pay special attention to ensuring that the connecting pipes at the top and bottom are free of liquid accumulation or blockages. For top-mounted models, check that the external float slides smoothly without any misalignment.

2. Signal Stability Monitoring
For models equipped with 4-20mA remote transmission, review the liquid level data collected by the central control system daily to confirm that values are stable with no sudden jumps, unexplained signal loss, or value drift; for models with RS485 communication, monitor the continuity of data uploads to the host computer to ensure no offline disconnections, data loss, or communication interruptions; For equipment fitted with magnetic switches, periodically test the high and low limit trigger states to confirm that alarm signals and interlock control signals are outputting normally, with no false triggers or malfunctions.

3. Monitoring of Operating Conditions (Temperature and Humidity)
Monitor the ambient temperature of the instrument's installation site and the working temperature of the medium in real time to ensure they remain within the product's rated temperature range at all times; in humid workshops and water treatment areas, closely monitor ambient humidity to prevent long-term high humidity and condensation from corroding junction boxes and electrical components; in high-temperature environments, keep the equipment away from open flames and heat sources; in low-temperature environments where freezing is a concern, monitor changes in ambient temperature and implement freeze protection measures in advance.

4. Visual Inspection of Appearance and Sealing Integrity
Conduct daily inspections to ensure the main body of the level gauge is free of rust, deformation, and weld seam leaks; check that there are no fluid seepage or dripping at flange connection surfaces and gasket seals; verify that the top vent valve and bottom drain valve close tightly without leakage; confirm that the enclosures of remote transmission junction boxes and switch junction boxes are intact, with sealing covers securely fastened, and that there is no water ingress, dust accumulation, or loose gaps.

5. Power Supply and Wiring Inspection
For models with remote transmission requiring power, check daily to ensure the on-site supply voltage remains stable within the standard range of 18V to 36V DC, with no sudden voltage surges or drops, or transient voltage sags; inspect external signal cables for signs of aging, chafing, crushing, or excessive tension, and ensure wiring is neatly arranged without tangles.

6. Installation Stability Inspection
For long-range side-mounted level gauges, verify that the overall vertical alignment is not offset and that the mounting brackets are secure with no looseness. For top-mounted long-rod level gauges, focus on verifying that the external support and reinforcement structures are free of looseness and wobbling to prevent long-term vibration-induced displacement that could affect the normal operation of the float.

8.2. Regular Maintenance Plan
1. Specifications for Overall Cleaning Intervals
For standard clean water and oil applications, perform a comprehensive exterior cleaning every three months to remove dust and oil residue from the main pipe surface and accumulated dust from the flap gaps; for wastewater, impurity-laden, or scale-prone media, shorten the interval to monthly cleaning to promptly remove dirt and debris adhering to the outer pipe wall; For chemical and corrosive environments, clean and inspect the outer wall for corrosion every two months to predict the replacement cycle in advance. Use only soft cloths for cleaning; do not scrape the main pipe or flip-plate assembly with hard objects.

2. Internal Medium Drainage and Cleaning Schedule
Side-mounted magnetic flip-plate level gauges rely on a bottom drain valve for drainage. Under normal operating conditions, drain the system once every quarter to thoroughly remove sediment, sludge, and accumulated debris from the chamber. In applications with high levels of impurities, drain the system monthly to prevent impurities from accumulating and jamming the internal float. Top-mounted level gauges do not have a bottom drain structure; every six months, depending on usage conditions, disassemble and inspect the unit to clean deposits from

the outer walls of the guide tube, ensuring the float slides freely.

3. Wiring and Connection Tightness Inspection
Conduct a comprehensive wiring inspection and maintenance every six months. Tighten each terminal for the remote power supply, signal output, RS485 communication, and magnetic switch connections to prevent terminal loosening, oxidation, or loose connections caused by prolonged vibration. Thoroughly inspect the grounding lines and shielded cables to ensure crimping points are secure and reliable. Reorganize tangled wiring and correct non-standard routing methods.

4. Periodic Inspection of Sealing Components
Conduct a comprehensive annual inspection of all rubber gaskets, flange seals, and internal waterproof O-rings in junction boxes to check for hardening, aging, cracking, or deformation. Immediately replace any components found to have failed seals to prevent water seepage, ingress, or air leaks at the source.

5. Recommendations for Re-measurement and Calibration of Measurement Accuracy
Under normal, stable operating conditions, conduct accuracy re-verification every six months. Compare the actual readings from the on-site flip-flop gauge with the remote transmission data from the central control system and manual level measurements. If the error exceeds the standard range, promptly recalibrate the zero and full-scale points of the remote transmitter. For sites with significant fluctuations in medium density or complex operating environments, it is recommended to perform accuracy verification every three months to ensure the accuracy and reliability of measurement data.

6. Specialized Maintenance of Functional Components
After one year of use, conduct on-and-off performance tests on each high- and low-level limit switch, and adjust their installation positions to ensure precise trigger points. Perform an annual signal linearity test on the remote transmission module to identify and address signal attenuation caused by component aging. If the flip-flop indicator exhibits sluggish response, promptly adjust the installation spacing to restore magnetic coupling sensitivity.

8.3 Long-Term Maintenance Tips
1. Long-Term Dust and Moisture Protection Measures
For indoor installations, maintain a well-ventilated and dry environment around the equipment to prevent moisture and dust accumulation in enclosed cabinets. For outdoor magnetic flip-plate level gauges, install dedicated rain and sun protection covers to shield against direct rain, sun exposure, and wind and sand erosion. For equipment that will be idle for an extended period, there is no need to disassemble the entire unit. Instead, ensure the junction box is properly sealed and the exterior is wrapped to prevent dust ingress. Keep the equipment in a low-power-on state to utilize its own power consumption to dissipate internal moisture, thereby preventing moisture-induced oxidation and damage to the circuit boards.

2. Long-Term Operation Solutions for Interference Suppression
All remote signal transmission cables must use double-shielded, flame-retardant cables. Strictly adhere to the single-end grounding standard for shielded cables: grounding is performed only at the control cabinet end, while the shielding layer at the field instrument end is left floating and insulated to completely eliminate ground loop interference. Instrument signal lines must be laid separately from high-power factory power cables, inverter output lines, and high-voltage cables, maintaining a safe distance—they must not share conduits or run parallel over long distances. In areas with strong electromagnetic interference, signal isolators can be installed to further stabilize the output signal and prevent data fluctuations and disruptions.

3. Specialized Protection for Different Materials and Operating Conditions
The standard 304 stainless steel level gauge must not be used long-term in environments with high chloride ions or strong acids and alkalis to prevent pitting corrosion and rust on the pipe walls; For the 316L stainless steel model, regularly inspect the degree of medium corrosion to manage the service life; For the PTFE-lined corrosion-resistant model, avoid sudden temperature changes (rapid heating or cooling) to prevent the protective coating from peeling or cracking; For the float, avoid heavy impacts during long-term use to protect the internal permanent magnet from demagnetization or loss of magnetic properties, thereby extending the overall service life.

4. Special Protection Techniques for Extreme Environments
During use in extremely cold winter conditions, close the top vent valve in advance to ensure a sealed environment. If necessary, install a heat tracing system to prevent the medium inside the chamber from freezing and causing the main pipe to crack or the float to jam. In high-temperature operating conditions, strictly control the medium temperature to ensure it does not exceed the rated upper limit, and regularly replace high-temperature-resistant sealing components. When installing near high-vibration equipment, add vibration-damping mounting hardware to minimize damage to the instrument's internal components and structure caused by mechanical vibrations.

5. Maintenance Guidelines for Shutdown and Idle Periods
During prolonged periods of equipment shutdown or inactivity, prioritize draining any residual medium from the level gauge chamber to keep the interior of the tube dry and clean; disconnect the external power supply, organize and store external connection cables, and ensure waterproof protection for cable ends; before restarting and putting the equipment back into service, sequentially perform a visual inspection, tighten all connections, conduct a no-load zero-point calibration, and test the float operation; only proceed to introduce the medium and commence formal operation after confirming that all checks are satisfactory.

IX. Troubleshooting & Emergency Response
9.1 List of Common Faults
The level indicator flap does not move, is stuck, or does not flip in response to changes in liquid level
The indicator flap flips erratically, displays colors in reverse, or some flaps do not respond
The remote transmission module does not output a 4–20 mA signal, and the central control system cannot collect data
Remote signal values drift, fluctuate erratically, or are unstable
RS485 communication failure, device offline, or data packet loss preventing reading
Magnetic switch fails to actuate; does not trigger alarms or start/stop signals upon reaching liquid level
Magnetic switch triggers erroneously without cause; frequently outputs signals without liquid level changes
Leakage or dripping occurs at instrument flange or valve body connections
Indicator light does not illuminate after powering on the remote transmission unit; module overheats abnormally
Significant deviation between actual liquid level and on-site flip-flop readings or remote transmission data

9.2 Analysis of Core Causes of Failure
1. Mechanical Structural Causes
Accumulation of impurities and sludge in the chamber causing the float to jam; float deformation or sticking; demagnetization of the internal magnet in the float; misalignment of the flip-flop assembly; misalignment of the guide structure; crystallization of the medium causing adhesion to the float and obstructing operation.

2. Installation and Sealing Issues
Uneven tightening of flange bolts; aging or damaged gaskets; pinholes in welded joints; pressure exceeding the rated pressure range; excessive deviation from vertical alignment causing leaks and operational abnormalities.

3. Electrical Wiring Issues
Reversed polarity of power supply terminals, incorrect polarity of signal lines, reversed RS485 communication A/B lines, loose or faulty terminal connections, exposed wiring causing short circuits, and incorrect shield grounding.

4. Power Supply and Load-Related Causes
Power supply voltage exceeding the normal range of DC 18–36 V, excessive power supply ripple, insufficient power supply capacity,

load resistance of downstream data acquisition devices exceeding specifications, and excessive line voltage drop causing signal attenuation.

5. Environmental Interference Causes
Signal cables laid in close proximity to power cables; strong electromagnetic interference generated by on-site variable frequency drives and high-power motors; ground loop interference caused by multiple grounding points at the site; and electrical leakage due to a humid environment.

6. Component Failure Causes
Aging of components in the remote transmission module; failure of reed switches due to wear; oxidation or burning of magnetic switch contacts; aging and damage to electrical components caused by prolonged exposure to high temperature and humidity; internal circuit breakdown due to lightning surges.

9.3 Step-by-Step Troubleshooting
Fault 1: Magnetic flip-plate is stuck and does not move with changes in liquid level
Troubleshooting Steps: First, depressurize and drain the medium from the chamber; open the bottom drain valve to clean out internal sludge and debris; check if the float is deformed or damaged from impact; inspect the main pipe for scale or crystallization that may obstruct the float's movement; verify that the instrument is installed vertically and not tilted.
Remedial Actions: Thoroughly clean debris from the chamber; correct the instrument's vertical alignment; replace deformed floats with new, compatible ones; and perform regular drainage maintenance for media prone to scaling.
Contingency Plan: Temporarily rely on manual observation of the tank liquid level and complete cleaning and repairs during a shutdown window.

Fault 2: Incorrect flip-flop movement or partial failure
Troubleshooting Steps: Check whether the overall installation position of the flip-flop indicator is misaligned or too far from the main pipe; verify if there is external strong magnetic field interference at the site; inspect whether the internal magnetic plates of the flip-flop have fallen off or are damaged.
Remedial Measures: Readjust the installation position of the flip-flop to bring it closer to the measuring main pipe and away from large permanent magnet equipment at the site; replace damaged flip-flop components immediately.
Contingency Plan: Use the flap readings within the normal range as a temporary reference.

Fault 3: No Signal Output from Remote Transmission
Troubleshooting Steps: Use a multimeter to verify that the supply voltage is normal; confirm that the power supply has no open circuits or reversed connections; open the junction box to check for loose or faulty terminals; disconnect the downstream load and test the instrument's output independently to rule out short circuits in the external wiring.
Remedial Actions: Correct power connections, tighten all terminal connections, replace the regulated DC power supply; if internal circuitry is damaged, replace the remote transmission module directly.
Contingency Plan: Temporarily rely on visual readings from the on-site flip-flop to manage production control.

Fault 4: Remote transmission signal drifts or fluctuates; values are unstable
Troubleshooting Steps: Check whether signal cables are routed in the same conduit as power lines; confirm whether the shielding wire is incorrectly grounded at both ends; Investigate interference from the startup and shutdown of high-power electrical equipment in the vicinity; verify that instrument grounding complies with standards.
Remedial Actions: Route signal cables separately and away from power lines; strictly enforce single-end grounding of shielded cables at the control cabinet; install signal isolators to enhance interference resistance; ensure equipment protective grounding complies with standards.
Contingency Plan: Temporarily increase data filtering parameters in the central control system to stabilize displayed values.

Fault 5: Abnormal RS485 Communication, Disconnection, or Loss of Connection
Troubleshooting Steps: Verify the correct wiring sequence for communication ports A and B; check if the instrument's communication address and baud rate match the host computer's parameters; inspect whether the communication bus is excessively long or lacks a terminating resistor.
Remedial Actions: Swap reversed communication lines, standardize communication parameters across the entire station, install a 120Ω terminating resistor at the bus end, and minimize the length of branch wiring.
Contingency Plan: Connect and debug each instrument individually; temporarily suspend multi-device networked data collection.

Fault 6: Magnetic Switch Fails to Activate at Liquid Level
Troubleshooting Steps: Check if the switch is installed off-center from the standard position; inspect for open circuits or loose connections; verify if the float magnet's magnetic strength has weakened, preventing detection; confirm that the contact load does not exceed the rated capacity.
Remedial Actions: Fine-tune the installation position of the magnetic switch up or down; tighten control wiring; demagnetize and promptly replace the float; connect the control circuit strictly in accordance with the rated contact capacity.
Contingency Plan: Manually monitor the liquid level on-site and temporarily operate equipment manually.

Fault 7: Magnetic Switch Triggers Unintentionally
Troubleshooting Steps: Check for external magnetic field interference on-site; verify if the switch is installed too close to the main pipe; investigate whether wiring leakage or signal crosstalk is causing false triggering.
Remedial Measures: Adjust the installation spacing of the switch to keep it away from sources of electromagnetic interference; organize the control wiring and ensure proper insulation protection.
Contingency Plan: Temporarily disable the automatic interlock function and switch to manual operation mode.

Fault 8: Liquid Seepage and Leakage at Flange and Valve Body Joints
Troubleshooting Steps: Uneven tightening of flange bolts; aged or damaged gaskets; long-term operation of the equipment under excessive pressure; microscopic pinholes in the welds.
Remedial Actions: Retighten flange bolts diagonally and evenly; replace with new high-temperature, corrosion-resistant gaskets; strictly maintain operating pressure within the rated range; return to factory for weld repair if leakage is severe.
Contingency Plan: Reduce internal tank pressure during operation; shut down the system at an appropriate time to replace the seals.

Fault 9: Remote Transmission Module Has No Power or Abnormal Heating
Troubleshooting Steps: Excessively high supply voltage; long-term reversed polarity of power supply; short circuits due to moisture in internal wiring.
Remedial Measures: Replace with a compliant 24V DC regulated power supply; correct wiring connections; power off and dry modules affected by moisture; directly replace burned-out modules.
Contingency Plan: Disable remote transmission functions and use only the on-site visual display.

Fault 10: Significant Overall Error in Liquid Level Measurement
Troubleshooting Steps: No zero-point or full-scale calibration performed during prolonged use; change in medium density; presence of a dead zone at the installation location.
Remedial Actions: Re-calibrate zero-point and full-scale accuracy; select a float matching the actual medium density; re-select an installation location to avoid the dead zone.
Contingency Plan: Manually enter the deviation value at the central control terminal to temporarily correct the acquired data.

9.4 After-Sales Service Request Guidelines
1. Criteria for Determining Faults and Requesting Service
Do not attempt to disassemble or repair the unit yourself if the following faults occur; contact the manufacturer directly to request after-sales service:
Severe deformation of the float, water ingress causing complete failure and rendering the unit unusable;

Cracks in the main measuring tube, or extensive corrosion and damage that cannot be repaired;
Internal circuitry of the remote transmission module or magnetic switch is burned out, with no response when powered on;
The fault persists despite repeated troubleshooting and repair attempts;
Unauthorized disassembly of the explosion-proof structure has compromised its integrity, resulting in complete seal failure;
The device has sustained structural damage due to lightning strikes, water submersion, or severe external impact.

2. Standard Repair Request Process
Compile the complete product model number (QDY70A), clearly specifying the installation type, measurement range, dimensions, material specifications, and equipped functions;
Clearly describe the on-site operating conditions, medium type, working pressure and temperature, as well as specific fault symptoms;
Take and submit on-site photos of the equipment, wiring diagrams, and screenshots of fault data;
Prioritize remote video troubleshooting guidance from manufacturer technicians; if the issue cannot be resolved remotely, proceed with the process for mail-in repair, replacement, or on-site service.

3. Official Warranty Coverage
Under normal industrial operating conditions, the entire unit is covered by the manufacturer's standard warranty for non-human-induced damage;
Within the warranty period, faults not caused by unauthorized modifications, excessive temperature or pressure, or incorrect wiring will be repaired free of charge, and replacement parts will be provided free of charge;
Wear-and-tear parts such as sealing gaskets and small flip-flap components are considered standard consumables and are not covered by the free warranty;
Damage resulting from violent disassembly, unauthorized circuit modifications, use beyond specified operating conditions, or impact from external forces is not covered by the free warranty; the manufacturer may provide paid repair services.

4. Warning Against Improper Operation
It is strictly prohibited to cut or grind the main pipe of the level gauge, open the explosion-proof junction box, alter the internal structure, or replace the float with a non-original manufacturer part. Improper operation will not only cause permanent damage to the equipment but will also immediately void the warranty for the entire unit. Furthermore, it will compromise explosion-proof safety performance and create on-site safety hazards.