RF Admittance Material Switch

Core Product Perception

I. Product Definition
The RF Admittance Level Transmitter (RF Admittance Level Switch) is a point-level industrial level detection instrument used for high/low-level alarms in solid powders, granular materials, viscous liquids, and slurries; it is classified as a contact-type level switch.
The instrument consists of two main components: an electronic control unit and a probe/sensor assembly. Anhui Qidian's series is divided into three main versions: standard, high-temperature, and corrosion-resistant:

1. Standard Type: Designed for standard room-temperature operating conditions, suitable for dry granules, ordinary powders, and non-corrosive media. It comes standard with a 304/316L stainless steel probe and is suitable for high- and low-level alarms in most general-purpose silos and hoppers, enabling monitoring of full and empty levels.

2. High-Temperature Model: Features an additional thermal insulation and heat dissipation structure, paired with high-temperature-resistant seals and high-temperature-resistant sensor cables. It can withstand high-temperature material conditions and is used in applications involving high-temperature powders, drying silos, and heat-treatment hoppers. It isolates the tank from high temperatures and protects the internal electronic circuitry from damage caused by high temperatures.

3. Corrosion-Resistant Type: The probe is fully coated with PTFE/ETFE or made of Hastelloy, providing resistance to acid and alkali corrosion. It is used for corrosive chemical powders, acidic slurries, and saline media to prevent the sensor body from being corroded by the medium.

Summary of Core Functions:
1. Single-point level detection with a digital output signal for high-level "full bin" and low-level "empty bin" alarms, enabling interlock protection for silos to prevent material overflow, shortages, or supply interruptions.
2. Features material buildup compensation to distinguish between actual material contact and residual material adhering to the probe surface, reducing false triggers caused by adhered material. This is the key advantage of radio-frequency admittance over conventional capacitive level switches.
3. Supports multiple output options: NPN/PNP transistor outputs, SPDT relay dry contacts, and NAMUR intrinsically safe signals, compatible with PLCs, DCS systems, audible and visual alarms, valves, and feeder interlock controls.
4. Supports top-mount and side-mount installation methods; probe lengths can be custom-made to non-standard specifications to fit silos, hoppers, pipes, storage tanks, and mixing tanks.
5. Optional explosion-proof versions (intrinsically safe / flameproof) are available for use in hazardous areas with flammable and explosive dust or chemical solvents.
6. Built-in fault diagnosis automatically detects probe wire breaks or short circuits and triggers a fault alarm.

Important Distinction: Radio-frequency admittance operates as a limit switch, determining only whether "material is in contact with the probe" and does not continuously measure material level height. For continuous material level measurement, radar, weight-drop, or continuous radio-frequency admittance level transmitters must be used.

II. Working Principle
Simple Explanation: Radio-frequency admittance technology is an advancement based on traditional capacitive detection; it measures admittance (a combined parameter of capacitance and resistance) rather than simply capacitance.

1. The instrument generates a high-frequency RF signal and applies it to the probe's sensing assembly; the probe acts as a sensor, forming a sensing loop with the silo wall and the ground.

2. When the material inside the silo is not in contact with the probe, the admittance value between the probe and the silo wall remains stable at a baseline value, and the instrument determines that there is no material present.

3. When material comes into contact with the probe, its dielectric constant and conductivity alter the admittance value between the probe and the silo wall; the instrument continuously monitors these admittance changes in real time. If the change exceeds a preset threshold, the instrument detects the presence of material and immediately inverts the switch output signal to trigger an alarm or interlock.

4. Key Point: When a thin layer of material (dust or viscous slurry) adheres to the probe surface, the instrument uses a material buildup compensation circuit to identify this thin layer and automatically offset the admittance interference caused by it, preventing false alarms due to surface buildup; the system will only trigger an action when a large amount of material directly envelops the probe.

Workflow:
Instrument power-on initialization → Acquisition of reference admittance value to complete self-calibration → Continuous real-time scanning of probe admittance parameters → Comparison with preset thresholds while simultaneously performing deposit compensation calculations → Determination of material-present or material-absent status → Driving the output circuit to generate a switch signal; continuous self-check of the probe circuit; if a break or short circuit occurs, a fault alarm is immediately triggered.

III. Core Value
The RF Admittance Level Switch addresses the challenges of level monitoring in industrial silos and hoppers, reliably enabling high- and low-level interlocks. It offers significant advantages over conventional capacitive switches and rotary paddle level switches:

1. Built-in material buildup compensation resists interference from material adhesion and scaling on the probe, significantly reducing false alarms and making it suitable for powdered materials and viscous slurries.
2. Simple structure with no motor or rotating blades, eliminating issues such as blade jamming, wear, and motor burnout; maintenance requirements are far lower than those of rotary paddle switches.
3. Wide range of compatible media: capable of measuring dry powders, granules, moist powders, slurries, and viscous liquids; high-temperature and corrosion-resistant versions are available to accommodate complex operating conditions.
4. Fast response time and stable signal; resistant to dust and minor vibration interference; suitable for silos in industries such as dust removal, metallurgy, chemicals, building materials, and grain.
5. Explosion-proof models are available to meet safety interlock requirements in hazardous dust environments and chemical workshops.
6. Simple installation with top- or side-mount options; probe length can be customized to accommodate different silo depths.

Key Pain Points + Product Solutions
Q1: Conventional capacitive level switches frequently trigger false alarms when a thin layer of powder or slurry adheres to the probe. How can this be resolved?
A1: Choose the Anhui Qidian RF Admittance Level Switch, which features a built-in material buildup compensation algorithm. This algorithm automatically compensates for signal interference caused by thin layers of material adhering to the probe, distinguishing between thin material buildup and actual material accumulation to reduce false triggers caused by buildup.

Q2: Rotary paddle level switches have rotating blades that can easily become jammed with powder, frequently burning out the motor and requiring frequent repairs. How can this be addressed?
A2: RF admittance level switches are solid-state electronic instruments with no moving parts; they have no motors or blades, so there are no issues with material jamming or wear. They are virtually maintenance-free, reducing spare part consumption and downtime for repairs.

Q3: The temperature of the material in the silo is very high, causing standard level switch transmitters to be damaged by heat and rendering them unable to monitor high-temperature powders. How should we select the appropriate model?
A3: Select a high-temperature RF admittance level switch equipped with thermal insulation and heat dissipation components to isolate the electronic transmitter from the high temperatures inside the silo. This solution is suitable for drying silos and high-temperature powder applications, ensuring stable monitoring of both high and low material levels.

Q4: The material is corrosive (acidic or alkaline), and standard stainless steel probes corrode and perforate quickly, resulting in a short instrument service life.
A4: Select a corrosion-resistant RF admittance level switch with a probe fully coated in PTFE/ETFE or made of Hastelloy. These materials resist acid, alkali, and salt spray corrosion, making them suitable for corrosive chemical powders and slurries, thereby extending the instrument's service life.

Q5: Are there no automatic warnings for silo overflow or empty silos, leading to raw material waste and production line shutdowns?
A5: When the RF admittance level switch detects full or empty levels, it rapidly outputs a switch signal that connects to a PLC to control the feed valve and discharge conveyor, enabling automatic interlocking to prevent overflow and shutdowns due to material shortages.

Q6: Is the site a flammable and explosive dust workshop where standard level instruments fail to meet explosion-proof safety standards?
A6: Intrinsically safe or flameproof versions of the RF admittance level switch are available. These models have obtained explosion-proof certification and can be directly applied in dust-explosion-prone and hazardous chemical areas, meeting safety interlock standards.

Q7: The material is conductive and moist, causing signal drift and unstable readings in standard level switches.
A7: The RF admittance level switch simultaneously measures a combined admittance signal comprising resistance and capacitance, rather than relying solely on capacitance. This provides better adaptability to conductive and moist materials, with signal stability superior to that of traditional capacitive switches.

Q8: Is installation space in the silo limited, requiring flexible adjustment of the detection length to accommodate different silo depths?
A8: Probe lengths can be custom-made to non-standard specifications and support various mounting methods, including top and side mounting. Probe lengths for standard, high-temperature, and corrosion-resistant models can all be adjusted as needed to accommodate various hoppers and storage tanks.

Product Core Parameters & Specifications

Parameter Item	Specification	Remarks
Detection Principle	Radio frequency admittance (comprehensive admittance measurement of capacitance + resistance, active shielding for material build-up prevention)	Different from traditional pure capacitance switches, with built-in material build-up compensation
RF Excitation Frequency	50kHz~100kHz	Low-power RF signal
Minimum Medium Dielectric Constant	≥1.6	Conductive media can be relaxed

Signal Output Types	NPN/PNP transistor output; SPDT single-pole double-throw relay; NAMUR intrinsically safe signal; independent fault alarm output	Material level alarm + fault alarm dual signals can be configured simultaneously
Transistor Output Load Capacity	Max. 200mA	Connect to PLC digital DI channel
Relay Contact Capacity	250VAC 5A (non-inductive load); 3A (inductive load); 30VDC 5A	Passive dry contact, can drive valves, sound & light alarms
Response Time	≤0.5s; action delay continuously adjustable from 1~60s	Delay used to suppress material splashing and vibration disturbance
Repeat Detection Accuracy	Conductive material: ≤2mm; insulating powder: ≤10mm	Point-type switch, NOT continuous height measurement
Self-diagnosis Function	Automatically identify probe short-circuit, probe open circuit and circuit faults, and output fault alarm signals	Fail-safe mode of high/low level for fault status is customizable

2. Isolation Performance Parameters

Parameter Item	Specification	Remarks
Power Loop Insulation Resistance	≥100MΩ @ DC250V	Insulation between power supply to housing and signal loop
Dielectric Withstand Voltage	1500VAC, 1min no breakdown	Between power terminals and housing
Probe Shield Isolation Structure	Three-electrode active shielding (measuring electrode + shielding electrode + ground electrode)	The shielding electrode eliminates signal interference caused by material build-up on the upper section of the probe, core technology of RF admittance
Isolation Withstand Voltage between Intrinsically Safe Side & Safe Side	3000VAC 1min	For intrinsically safe explosion-proof models, matched with safety barrier
Signal Loop Isolation	No built-in signal isolation inside instrument; external switch isolation module required for heavy interference conditions	The isolation module cuts ground loop and suppresses inverter interference
Probe Spark Protection	Built-in probe current limiting protection circuit	Suppress static electricity and friction sparks of materials to protect front sensing loop

3. Power Supply & Power Consumption Parameters

Parameter Item	Specification	Remarks
Standard Supply Voltage	DC18~30V, typical DC24V	Mainstream power supply for industrial automatic control
Optional Power Supply Version	AC85~264V AC power supply version	For sites without DC power supply
Full Load Power Consumption (DC24V)	≤2.5W for standard & anti-corrosion type; ≤3W for high-temperature type	
Power Supply for NAMUR Intrinsically Safe Model	DC8.2V intrinsically safe power supplied by matched safety barrier.	Special for intrinsically safe loop
Power Distribution Output	DO NOT connect directly to DC24V No external power distribution output from instrument	Only receives external power supply and cannot supply power to other sensors
Power Supply Ripple Tolerance	≤100mVpp	Compatible with switching power supply to reduce noise impact

4. Environmental Adaptation Parameters

Parameter Item	Standard Type	High-temperatureType	Anti-corrosion Type	Remarks
Medium (Process) Temperature	-40℃ ~ +80℃	-40℃ ~ +250℃ (with heat insulation & heat dissipation assembly)	-40℃ ~ +120℃	Max. 120℃ for PTFE coated anti-corrosion type; ceramic probe customizable for higher temperature
Transmitter Ambient Temperature	-40℃ ~ +70℃	-40℃ ~ +70℃ (heat dissipation isolation, transmitter not exposed to high temperature)	-40℃ ~ +70℃	Electronic unit temperature limit unified; high-temperature version isolates tank heat via heat sink
Storage Temperature	-40℃ ~ +80℃	-40℃ ~ +80℃	-40℃ ~ +80℃	For warehouse and spare instruments
Relative Humidity	10%~95%RH, non-condensing	10%~95%RH, non-condensing	10%~95%RH, non-condensing	No long-term condensation inside junction box
Protection Class	IP66	IP66	IP66	Die-cast aluminium transmitter with sealing cover; IP67 optional
Optional Explosion-proof Grade	Ex ia IIC T6; Ex d IIC T6; Dust explosion-proof Ex tD A21 T85℃	Ex ia IIC T6; Ex d IIC T6; Dust explosion-proof Ex tD A21 T85℃	Ex ia IIC T6; Ex d IIC T6; Dust explosion-proof Ex tD A21 T85℃	All three types can be customized to explosion-proof version
Matched Safety Barrier	NAMUR intrinsically safe matched isolated safety barrier, PHD series NAMUR input safety barrier recommended	NAMUR intrinsically safe matched isolated safety barrier, PHD series NAMUR input safety barrier recommended	NAMUR intrinsically safe matched isolated safety barrier, PHD series NAMUR input safety barrier recommended	Safety barrier installed in safe area; intrinsically safe cable laid separately
Working Pressure	-0.1~16bar	-0.1~16bar	-0.1~16bar	High-pressure version customizable up to 40bar

5. Physical Parameters

Parameter Item	Specification	Remarks
Mounting Method	Top mounting, side mounting; thread / flange; remote split mounting (optional)	Thread G1"/G1.5"; flange customizable to HG/T national standard
Transmitter Outline Dimension	Φ85mm × H110mm (excluding probe)	"Drawing marking: Transmitter outer diameter Φ85mm; junction box height 110mm; side cable port M20×1.5"
Probe Size	Probe diameter Φ16mm; probe length 100~3000mm custom-made	Standard: 316L solid rod; High-temp: ceramic insulation + heat sink; Anti-corrosion: PTFE fully coated probe
Instrument Total Weight	Standard 500mm probe: approx.1.2kg; each extra 100mm probe +0.14kg	High-temperature type with heat sink: +0.4kg for same length
Transmitter Housing Material	Die-cast aluminium with polyester anti-corrosion coating	Explosion-proof type with thickened explosion-proof aluminium housing
Probe Material	Standard Type: 316L stainless steel; High-temperature Type: 316L + ceramic insulation; Anti-corrosion Type: 316L base with PTFE/ETFE full coating, Hastelloy C optional	Do NOT scratch PTFE coating of anti-corrosion probe with hard objects
Seals	Standard: FKM fluoro rubber; EPDM optional for low temp; Ceramic seal for high-temp type	Select according to medium working condition
Cable Entry	M20×1.5 cable gland with sealing washer	Cable outer diameter Φ6~Φ10mm

Scenario-Based Selection Guide

I. Key Selection Criteria

1. Signal Type: For interfacing with standard PLC digital DI channels, prioritize NPN/PNP transistor outputs; for directly driving valves, audible and visual alarms, or relay circuits via passive dry contacts, select SPDT relay outputs; for safety interlock circuits in flammable and explosive hazardous areas, select NAMUR intrinsically safe signals; If both level alarm and instrument fault signals need to be acquired simultaneously, configure the dual-output version. The RF admittance level switch is a point-switch instrument that outputs only on/off alarm signals and does not provide a continuous 4–20 mA level height signal.

2. Number of Channels: A single RF admittance level switch supports only one detection channel and can monitor only one high-level or low-level point; If a silo requires simultaneous monitoring of both full and empty levels, two instruments must be installed; in scenarios involving multiple silos and multiple monitoring points, multiple instruments are installed independently, and signals are aggregated to the central control system.

3. Power Supply: The vast majority of automation projects use standard 24 V DC power supply, compatible with factory PLC systems; In situations where no DC power is available on-site and only mains power is present, an AC 85–264 V version may be selected; NAMUR intrinsically safe models cannot be directly connected to 24 V DC and must rely on a matching isolation safety barrier to provide a dedicated intrinsically safe power supply.

4. Explosion-Proof Requirements: For standard non-explosion-proof facilities and non-hazardous materials at normal temperature and pressure, select the standard non-explosion-proof model; In flammable and explosive areas, such as those with chemical solvents or combustible dust, select intrinsically safe or flameproof models based on the on-site hazard zone classification; dust-explosion-proof silos require models certified for dust explosion protection; intrinsically safe instruments must be paired with safety barriers of matching specifications. Safety barriers must be installed in safe areas, and intrinsically safe cables must be routed separately—they must not be run through the same conduit as power cables.

5. Installation Environment: For dry granular materials at normal temperatures and non-corrosive powders, select the standard model; for high-temperature powders (medium temperatures exceeding 80°C, up to 250°C), drying hoppers, and high-temperature dust collection silos, select the high-temperature model, which uses thermal insulation and heat dissipation components to isolate the tank's high temperatures and protect the instrument's electronic components; For applications involving acids, alkalis, salt-containing, or corrosive powders and slurries, select the corrosion-resistant model, with the probe fully coated in PTFE/ETFE or made of Hastelloy; Installation methods support top-mount and side-mount configurations, with threaded or flanged connections; probe lengths can be custom-made to meet specific silo insertion depths; In facilities with high levels of on-site vibration or strong electromagnetic interference, ensure the selection includes a solution for an external signal isolation module.

6. Medium Characteristics: When selecting a model, confirm the material's dielectric constant, conductivity, viscosity, and adhesion; for moist materials or those prone to sticking to the tank walls, prioritize using the instrument's built-in buildup compensation function; for highly viscous and strongly adhesive media, prioritize corrosion-resistant, low-adhesion coated probes; if the medium pressure exceeds 16 bar, evaluate a custom high-pressure version in advance.

II. Selection Guidelines for Industry Applications

1. Chemical Industry: For storage tanks containing dry, non-corrosive granular raw materials, use standard RF admittance level switches with threaded mounting and NPN/PNP output; for reaction vessels containing acid, alkali, or salt slurries, as well as corrosive powdered materials, use corrosion-resistant PTFE-fully-coated probes; for silos storing high-temperature, dried chemical powders, use high-temperature models equipped with heat sinks; For solvent storage tanks and dust silos in explosion-proof workshops, use intrinsically safe or flameproof versions; for viscous media prone to material buildup, prioritize the active shielding and buildup compensation features of RF admittance sensors to reduce false alarms.

2. Power Generation Industry: For demineralized water tanks and standard dry ash silos in power plants, use standard RF admittance sensors; for high-temperature dust monitoring in boiler fly ash and dust collection hoppers, use high-temperature models; for desulfurization absorption towers and applications involving corrosive slurries, use corrosion-resistant models; for outdoor dust collection silos, prioritize IP66 protection rating; in dust explosion-hazard zones, use dust explosion-proof models for high/low level interlocks to prevent silo blockages and ash overflow.

3. Metallurgical Industry: For recirculating cooling hoppers and standard ore particle silos, use standard-type models; for high-temperature ash silos in sintering dust collection systems and high-temperature powder hoppers in heat treatment, use high-temperature models; for pickling tanks and storage tanks containing corrosive process powders, use corrosion-resistant models; in smelting workshops with strong vibrations and high dust concentrations, prioritize instruments with excellent vibration resistance during selection, and rely on the material buildup compensation function to address thick layers of dust accumulation.

4. Pharmaceutical Industry: For purified water tanks and clean powder raw material silos, select standard sanitary-grade RF admittance sensors; for acid and alkali cleaning solution storage tanks and corrosive pharmaceutical solutions and slurries, select corrosion-resistant models; in cleanrooms, prioritize simple flange mounting structures to minimize material accumulation; in explosion-proof cleanrooms where solvent volatilization occurs, select intrinsically safe models compatible with clean production interlock alarms.

5. Smart Manufacturing and Turnkey Equipment Integration: For small hoppers on automated production lines and plastic pellet storage silos, use standard models, prioritizing NPN/PNP transistor outputs for interfacing with equipment PLCs; for level monitoring on high-temperature drying production lines, use high-temperature models; for automated tanks containing corrosive additives or slurries, use corrosion-resistant models; For bulk integration into complete equipment sets, output types and electrical connectors can be standardized to facilitate assembly and replace mechanical level switches that are prone to jamming.

III. Common Mistakes in Instrument Selection

1. Neglecting the Isolation Level: Focusing solely on the instrument itself during selection while ignoring the need for electromagnetic interference isolation at the field level. In workshops with a high concentration of variable-frequency drives and high-power motors, if the instrument itself lacks built-in signal isolation and is connected directly to a PLC, ground loops may form, causing signal jitter and false triggers. In intrinsically safe applications, omitting the required safety barrier—under the mistaken assumption that the instrument provides its own energy isolation—and connecting it directly to a 24 V DC power supply poses safety compliance risks and may even result in instrument burnout. In high-interference environments, an external digital isolation module must be installed to cut off ground loops.

2. Incorrect selection of signal type and expected functionality: Mistaking an RF admittance point switch for a continuous level measurement instrument and expecting to read real-time material level height; connecting a NAMUR intrinsically safe signal directly to a standard 24 V DC digital channel; connecting a relay's passive dry contact directly to a PLC's active DI channel, resulting in abnormal signal recognition. Clarify project requirements before selection: Use RF admittance for point-level alarms, and select continuous measurement instruments such as radar or continuous RF admittance for continuous level height measurement.

3. Neglecting Load Matching: When using NPN/PNP transistor outputs, if the downstream load exceeds the maximum rated limit of 200 mA, the output circuit will fail; If the load on the relay contacts exceeds the 5 A rated capacity, frequent arcing will burn out the contacts; failure to verify the load and voltage parameters of the PLC's digital input module before selection results in the instrument's actuation signal failing to toggle properly.

4. Incorrect Selection of General-Purpose Models in Explosion-Proof Environments: In flammable and explosive dust environments or hazardous chemical areas, standard non-explosion-proof general-purpose instruments are purchased and installed directly; when selecting explosion-proof models, the explosion-proof rating does not match the on-site hazard zone classification; explosion-proof instruments are selected but paired with standard non-explosion-proof wiring accessories, compromising the explosion-proof structure and resulting in a loss of explosion-proof compliance.

5. Mismatch between operating conditions and instrument models: Conventional models are used directly in high-temperature environments without heat dissipation or thermal isolation structures, causing the instrument head to be damaged by heat conduction from the tank; ordinary 316L stainless steel probes are used for corrosive media, leading to rapid corrosion by acidic or alkaline substances; in environments with high adhesion and thick buildup, standard capacitive switches are used without the active shielding compensation structure based on radio frequency admittance, resulting in continuous false alarms.

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

1. Customization for Special Signals: When standard outputs cannot meet project interlock requirements, we support the customization of dual independent outputs—one for level alarm and one specifically for instrument fault diagnosis alarm; A NAMUR intrinsically safe signal version can be customized to meet SIL safety interlock circuit evaluation requirements; internal response delay, fail-safe mode (fail-high/fail-low), and detection sensitivity can be factory-set according to project-specific parameters; custom fault alarm logic is supported to meet process safety requirements.

2. Customization for Non-Standard Operating Conditions: When medium temperature or pressure exceeds standard parameter ranges, customized solutions with higher temperature and pressure resistance can be evaluated; For highly corrosive media, the probe material can be upgraded to Hastelloy C or titanium; probe lengths can be customized to any non-standard length within the 100 mm to 3,000 mm range; for hygienic pharmaceutical applications, polished probes and sanitary chuck interfaces can be customized; for limited installation spaces, a split-type structure can be customized, with the sensing probe installed in the tank and the electronic display unit remotely located in a safe, low-temperature area, connected by a specialized high-temperature-resistant sensing cable; For highly adhesive materials, the length of the probe's shielded section can be optimized to further enhance resistance to material buildup.

3. Multi-Channel Integration Solutions: A single instrument supports only single-point detection; when a silo requires monitoring at both high and low points, two RF admittance sensors are combined. For multi-silo or multi-point level monitoring projects, an integrated junction box can be provided to consolidate multiple switch signals and feed them into the central control system; The entire solution can be equipped with signal isolation modules and surge protection modules to provide unified interference protection; for turnkey automation projects, we provide an integrated BOM package including instruments, mounting flanges, protective cages, and brackets, reducing the customer's design workload; for bulk equipment deployment scenarios, we standardize output types and cable gland specifications to simplify production line assembly and spare parts inventory management.

Installation and Commissioning Specifications

I. Pre-Installation Preparation

1. Verify Components: Upon unpacking, verify that the instrument model, probe specifications, and version (Standard / High-Temperature / Corrosion-Resistant) match the order; inspect the probe to ensure there is no bending, deformation, or impact damage; For corrosion-resistant models, verify that the PTFE/ETFE coating is free of damage or scratches; for high-temperature models, confirm that the thermal insulation and heat dissipation components are complete; take inventory of the included sealing gaskets, thread seal tape, flange fasteners, and cable glands; for explosion-proof models, additionally verify the explosion-proof markings and certification; for split-type versions, check that the sensor cable is intact and undamaged; also take inventory of accessories such as protective cages and mounting brackets.

2. Environmental Inspection: Confirm that the tank opening dimensions match the instrument's thread or flange specifications; avoid installation locations near feed inlets, areas subject to direct material impact, and zones affected by agitators; for powder-handling applications, the side-mounting position should be inclined downward by 15°–30° to facilitate material flow and reduce persistent material buildup; verify that the medium's temperature, pressure, and corrosive properties do not exceed the rated parameters of the selected model; In explosion-proof areas, verify the hazard zone classification; intrinsically safe and flameproof instruments may only be used in their corresponding hazard zones; inspect the on-site grounding grid to ensure grounding resistance is ≤4 Ω; plan wiring routes, ensuring power and signal lines are laid separately.

3. Tool List: Adjustable wrench, hex wrench, Phillips screwdriver, wire strippers, crimping pliers, digital multimeter, electrical tape, PTFE tape, cable ties; Explosion-proof operations must use dedicated explosion-proof tools; For work in sealed tanks or confined spaces, provide gas detectors and ventilation equipment, and assign on-site supervisors.

4. Safety Precautions: Before working inside the tank, disconnect the power supply to upstream and downstream equipment, depressurize the vessel, drain the medium, and purge the tank of gases if necessary; All wiring operations must be performed with the power disconnected; when tightening instruments, grip only the lower hexagonal process connection; do not rotate the instrument housing to prevent internal sensor leads from being twisted off; allow the tank to cool down before installation in high-temperature conditions; handle probe rods with care when lowering them to avoid impact damage to internal insulation; never plug or unplug cables in explosion-proof circuits while they are live; intrinsically safe cables must not be routed through the same conduit as power cables.

II. Standard Installation Procedures

1. Mechanical Fastening: For threaded installation, wrap Teflon tape around the external thread and use a wrench to tighten the hexagonal section; do not rotate the gauge head. For top-mounted installation, the probe should point vertically downward, maintaining a safety clearance of ≥25 mm between the probe and the tank wall or internal components. For side-mounted installation in powder applications, the probe should be tilted downward at an angle of 15° to 30°. For flange installation, tighten the bolts diagonally and evenly; for bypass pipe installation, the instrument can be secured using a guide rail bracket; for high-temperature models, ensure that the heat sink is fully exposed outside the tank after installation and is not covered by insulation material; for split-type models, install the sensor probe inside the tank and place the electronic display unit in a safe area away from high temperatures and dust impact, connecting the two with a dedicated sensor cable.

2. Wiring Specifications: Distinguish Between Power Supply, Input, and Output Terminals:
Three-wire NPN/PNP transistor output: V+ is the positive power supply terminal, V- is the negative power supply terminal, and OUT is the signal output terminal; connect OUT to a PLC digital DI channel;
SPDT relay output: V+ and V- are the instrument power supply terminals; COM: Common terminal; NO: Normally Open contact; NC: Normally Closed contact; these are passive dry contacts. The contact circuit is independent of the meter's power supply circuit and can directly drive audible and visual alarms or valve coils;
NAMUR Intrinsically Safe Two-Wire System: Connect the two signal wires to the hazardous side of the safety barrier; direct connection to a 24 V DC power supply is strictly prohibited;
Split-type: Connect the sensor probe cable to the meter's dedicated sensor terminals, and wire strictly according to the cable markings;
M20 cable gland connection: Pass the cable through the sealed cable gland; complete terminal wiring inside the box; after wiring is complete, tighten the gland to ensure a secure seal; after wiring the explosion-proof junction box is complete, the box cover threads must be fully screwed into place to ensure the explosion-proof seal.

3. Grounding Requirements: The instrument's PE protective terminal must be reliably connected to the field protective ground, with a grounding resistance ≤4Ω; the shielding layer of shielded cables must be grounded at a single point on the control room side only; the shielding layer on the instrument side must be wrapped with insulating tape and left floating—grounding at both ends is prohibited; the housing of flameproof instruments must be reliably grounded; The housing of the accompanying safety barrier must be grounded separately; the instrument signal ground wire must be kept separate from the power ground wires of high-power motors and variable frequency drives to prevent ground loops caused by common-ground interference.



III. Written Explanation of the Wiring Diagram

1. Three-wire NPN/PNP (24 V DC, Standard / High Temperature / Corrosion-Resistant Universal)

Terminal Definitions: 1 = V+ (DC 24V positive), 2 = V- (DC 24V negative), 3 = OUT (signal output), PE (protective ground); connect the brown wire to V+, the blue wire to V-, and the black wire to the OUT signal line; use shielded twisted-pair cable, with the shield grounded at the control room end and left floating at the instrument end after being wrapped in insulating material. The instrument has no built-in power distribution output; in environments with strong interference, connect the instrument's output to the input of an external digital signal isolation module, and then connect the isolation module's output to the PLC.

2. SPDT Relay Output (Common to all three models)

Terminals: V+, V— power supply terminals; COM common, NO normally open, NC normally closed; passive contacts; the load is connected in series between COM and NO/NC; the contact circuit is independent and not affected by the instrument's power supply circuit.

3. NAMUR Intrinsically Safe Model

A two-core signal cable is connected to the hazardous side of the safety barrier; Connect the 24 V DC power supply and the PLC to the safe side of the safety barrier; install the intrinsically safe shielded cable separately, with the shield grounded at a single point; do not share conduit with power cables.

4. M20 Cable Gland Universal Junction Box: Pass the cable through the gland's sealing gasket into the junction box; complete the terminal connections; insulate any unused wire ends; and tighten the gland nut.

Comparison of Correct and Incorrect Wiring

Correct: Shielded cable grounded at a single point in the control room only; power and signal cables routed through separate conduits; power supply positive and negative terminals not reversed; NAMUR circuit paired with a safety barrier; explosion-proof enclosure lid fully tightened and sealed; unused terminals insulated.

Incorrect: Shielding grounded at both ends, causing ground loops; signal wires run through the same conduit as variable frequency drive and motor power cables; NAMUR circuit directly connected to 24 V DC, causing instrument burnout; relay contact load exceeds rated capacity; junction box entry port facing upward, allowing rainwater to enter; explosion-proof box cover not fully tightened, compromising explosion protection.

IV. Power-On Commissioning Procedure

1. No-Load Test: After all wiring is complete, double-check the circuit to ensure there are no short circuits; before powering on, ensure the probe is in the air and not in contact with any material; apply power, use a multimeter to measure the supply voltage, and confirm that the voltage is within the rated range; observe the instrument's power indicator light—if the power supply is normal, the light will remain on; In the air-free, material-free state, the instrument detects "No Material" and outputs the corresponding switch state; for relay models, measure the on/off status of the COM/NO/NC terminals; for transistor models, use a multimeter to measure the output level.

2. Signal Verification: Simulate material coverage by immersing the probe in liquid or placing a conductive material close to it; the instrument should invert the output signal. Remove the simulated medium, and the instrument should return to its original state; You can set an action delay of 1–60 seconds within the instrument to suppress false triggers caused by material spillage or tank vibration; for highly adhesive powder applications, you can fine-tune the material buildup compensation parameters to optimize anti-adhesion performance; repeat the test 3–5 times to ensure stable and reliable operation.

3. Indicator Light Status Interpretation: Green light on = Power supply normal; Yellow light = Material level activation indicator; illuminates when material covers the probe; Red light on = Fault alarm (probe short circuit, probe wire break, circuit failure); Red light flashing = Continuous material buildup warning; For split-type models, the indicator lights are located on the remote electronic display.

4. Calibration Method: The RF admittance has been factory-calibrated; zero-point calibration is not required under normal operating conditions; On-site commissioning requires only a switch-point verification to ensure reliable switching when material contacts or disengages from the probe; for special media conditions, access the instrument's parameter menu to adjust detection sensitivity, material buildup compensation, and response delay; during commissioning, verify the interlock logic to ensure that high-level and low-level alarm logic align with process requirements; after commissioning, save the parameters and conduct repeated tests to confirm reliable interlock operation.

V. Installation Precautions

1. Never exceed the rated voltage: The DC version must not be powered by more than 30 V DC; NAMUR intrinsically safe models must never be directly connected to 24 V DC; do not connect the DC version of the instrument to 220 V AC, as overvoltage will immediately burn out the internal circuit board; it is recommended to install surge protection devices at the power supply input.

2. Avoid High-Voltage Interference: Instrument signal cables must not share cable trays or conduit with variable frequency drives (VFDs), high-power motors, or contactor power cables; the minimum spacing between them must be ≥30 cm; in environments with severe VFD interference, install external digital signal isolation modules and surge arresters; prioritize the use of shielded twisted-pair cables.

3. Protective Measures for Humid Environments: Select IP66-rated instruments for outdoor use or in humid pump rooms; position the cable entry port of the junction box facing downward to prevent rainwater and condensation from entering; place desiccant inside the junction box and replace it regularly; cable glands must be fully tightened to ensure a seal; in explosion-proof environments, ensure sealing gaskets are not missing or damaged; install split-type electronic display units in dry, well-ventilated areas.

4. Other Precautions: Do not install the probe in locations subject to continuous impact from the material; do not position the probe in direct contact with the tank wall or internal supports; for high-temperature models, do not remove the heat sink, and do not wrap the heat dissipation components with thermal insulation material; for corrosion-resistant models, do not allow hard objects to scratch the PTFE coating; do not rely on the meter head to bear lateral forces acting on the probe; do not forcibly pull on the cable or the M20 cable gland.

Recommendations for Daily Use & Operations and Maintenance

I. Key Points for Routine Inspections

1. Signal Stability Monitoring: The central control system continuously monitors the status of level switches, focusing on identifying issues such as irregular and frequent signal fluctuations, stuck states, and false alarms. For models with NPN/PNP transistor outputs, record changes in the output status; For SPDT relay output models, check whether the contacts operate crisply and whether there is any chattering; for NAMUR intrinsically safe models, simultaneously inspect the corresponding safety barrier indicator lights—if the safety barrier triggers an alarm, immediately mark the issue and troubleshoot the circuit. Determine whether signal abnormalities are caused by material splatter, medium adhesion, or instrument hardware failure.

2. Temperature and Humidity Monitoring: Monitor the actual temperature of the medium to ensure it does not exceed the instrument's rated temperature range. For high-temperature models, focus inspections on the heat sink to ensure unobstructed ventilation in the cooling area and that no powdered material has accumulated and encased the heat dissipation components; for split-type instruments, focus on monitoring the ambient temperature and humidity of the remote electronic display unit, ensuring the ambient temperature of the electronic unit does not exceed 70°C. Inspect the interior of the junction box; prolonged condensation or water accumulation is not permitted; increase inspection frequency in outdoor and humid pump room environments.

3. Probe Exterior Inspection: Conduct a visual on-site inspection of the probe's condition. For standard models, check the probe surface for scaling or powder buildup; for high-temperature models, inspect the ceramic insulation sections for cracks or damage; for corrosion-resistant models, focus on the PTFE/ETFE coating to ensure there are no scratches or peeling. Verify that a safe clearance is maintained between the probe and the tank wall or internal components, and that the probe is not subject to continuous direct impact from material.

4. Connector and Cable Inspection: Check that the M20 cable gland seal is intact and secure; for explosion-proof models, verify that the junction box cover threads and sealing gaskets are intact and secure. Inspect the cable sheath for crushing, scratches, or cracks due to aging, paying particular attention to areas where the cable is bent or subjected to tensile stress.

5. Installation Structure Inspection: Check the tightness of threads and flanges. For side-mounted instruments, ensure the probe is tilted downward at an angle of 15° to 30° to facilitate material flow. For high-temperature models, verify that the heat sink is exposed and not covered by insulation material. For split-type models, check that the sensor cable is securely fastened and not excessively stretched.

II. Regular Maintenance Plan

1. Cleaning Intervals, Categorized by Operating Conditions:

For clean, dry particulates and non-corrosive media at ambient temperatures, perform visual inspections on standard-type instruments every 6 to 12 months; cleaning may be postponed if no obvious buildup or scaling is observed. For wastewater and media with minor scaling, inspect and clean standard- and corrosion-resistant-type instruments every 3 months. For highly viscous, strongly adhesive powders or slurries, clean deposits from the probe surface every 1–2 months. Cleaning of high-temperature models must be performed after shutdown and tank cooling; corrosion-resistant models may only be cleaned with low-pressure clean water—the use of wire brushes or hard objects to scrape the PTFE coating is strictly prohibited.

2. Wiring and Fastening Inspection: For standard indoor conditions, inspect terminal connections quarterly; for outdoor environments or high-vibration metallurgical/powder processing workshops, shorten the interval to once every 2 months. After powering down, open the junction box to check terminals for looseness, oxidation, or verdigris; retighten connections and inspect the insulation wrapping of shielded cables; Disassemble the M20 gland to inspect the pins for oxidation; clean them and retighten the gland. For explosion-proof maintenance, strictly adhere to explosion-proof work procedures; inspect the seals and threads of the explosion-proof junction box; simultaneously tighten the safety barrier terminals in the intrinsically safe circuit.

3. Recommendations for Accuracy Retesting: Under normal operating conditions with clean media, perform a functional retest every 6 months; In harsh operating conditions involving corrosion, high temperatures, dust, or strong vibrations, perform retests every 3 months. RF admittance instruments do not require zero-point calibration; instead, use a simulated material method for calibration: confirm the "no material" state in empty air, then use material close to the probe to simulate the presence of material, verify that the signal stabilizes and switches, and repeat the test 3–5 times. During recalibration, verify the instrument's response delay and material buildup compensation parameters; for split-type instruments, simultaneously verify signal transmission between the sensor probe and the remote display unit. Perform offline calibration on explosion-proof instruments; do not open the cover for debugging in hazardous areas. Archive recalibration records. If operation becomes unstable, first investigate material buildup on the probe or cable damage; only after ruling out external factors should a hardware failure be diagnosed.

4. Periodic Inspection of Sealing Components: Gaskets and O-rings are consumable parts. Inspect them annually under normal operating conditions; inspect them every six months under high-temperature or acidic/alkaline corrosive conditions. Replace them promptly if hardening, cracking, or swelling occurs to prevent the medium from seeping into the meter head.

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

1. Dust and Moisture Protection: Keep the cable entry ports of junction boxes facing downward to prevent rainwater and condensation from entering; ensure that sealing gaskets on cable glands and explosion-proof junction boxes are not missing or damaged; place desiccant inside junction boxes and replace it regularly. For instruments installed in dust-prone areas, simple dust covers can be fitted over the instrument faces to reduce dust accumulation on the faces and heat sinks. Long-term standby instruments should be cleaned, dried, and stored in a dry, well-ventilated warehouse; corrosion-resistant probes should be properly protected to prevent scratches to the protective coating.

2. Interference Suppression Optimization: Use shielded twisted-pair cables for signal lines; the shield should be grounded at a single point on the control room end only, while the shield at the instrument end should be insulated and left floating—grounding at both ends is prohibited. Instrument signal cables must be routed separately from variable frequency drive (VFD) and high-power motor power cables, maintaining a minimum distance of 30 cm and using separate conduit. In cases of severe on-site interference, install external digital signal isolation modules and surge protection devices. In multi-unit RF admittance multi-point monitoring scenarios, route the signal cables for each instrument independently to minimize mutual inductive interference.

3. Protection in Extreme Environments

High-temperature conditions (high-temperature type): Keep the heat sink exposed and unobstructed; do not wrap the heat dissipation components with insulation materials; regularly clean dust accumulation from the heat sink; install the split-type meter head in a well-ventilated, shaded location away from high-temperature tanks; avoid repeated bending or pulling of the sensor cable.

Highly Corrosive Conditions (Corrosion-Resistant Model): Protect the PTFE/ETFE coating throughout installation and maintenance; if the coating is damaged, the medium will rapidly corrode the base material—promptly assess and repair or replace the instrument upon discovering damage; regularly inspect the coating at the base of the probe.

Low-Temperature Environments: Use EPDM seals suitable for low temperatures to prevent seal hardening and failure; avoid the probe being compressed by ice layers; install a protective cage if necessary.

High-Dust Silos: Maintain a downward tilt angle for side-mounted probes to reduce powder accumulation; use the instrument's delay function appropriately to minimize temporary false alarms caused by material impact; avoid locations where material from the inlet directly impacts the probe.

Operation and Maintenance in Explosion-Proof Areas: Do not arbitrarily replace intrinsically safe or flameproof instruments with non-original parts; after maintenance, the cover of the explosion-proof junction box must be fully tightened to restore the explosion-proof seal; intrinsically safe cables must not share cable trays with power cables.

Troubleshooting & Emergency Response

I. List of Common Faults
1. No Output: No switch signal output after the instrument is powered on; NPN/PNP and relay circuit states do not toggle; no signal feedback from the NAMUR intrinsically safe circuit; the instrument's indicator lights do not illuminate at all.

2. Signal Drift: The material level conditions are stable, but the level switch frequently malfunctions; false alarms indicate the presence of material in the air, yet the probe is covered by material without triggering an alarm; As dust and scale accumulate, the instrument's status gradually drifts.

3. Indicator Light Abnormalities: The power indicator light does not illuminate when powered on; the operation indicator light flashes erratically; the red fault light remains on or flashes intermittently; the indicator light status on a split-type display does not match the actual operating conditions of the field probe; the fault light on the NAMUR safety barrier remains on continuously.

4. Abnormal Alarm Triggering: High or low level alarms are triggered prematurely before the material reaches the monitoring point; alarms fail to trigger even when the probe is completely covered by material; alarm signals are intermittent, appearing and disappearing sporadically.

5. Interference and Distortion: Under stable material level conditions, the signal exhibits random fluctuations and frequent reversals; false alarms occur simultaneously whenever the variable frequency drive or water pump starts or stops; glitches in the signal cause frequent false operations in the interlock circuit.

II. Analysis of Failure Causes
1. Wiring Errors: Reversed polarity of the power supply; NAMUR intrinsically safe instruments connected directly to a 24 V DC power supply; both ends of shielded cables grounded simultaneously, creating a ground loop; incorrect connection of NPN/PNP or relay terminals; loose connections or short circuits in cables inside M20 gland boxes; Signal wires and power cables are routed through the same conduit; wiring in explosion-proof junction boxes does not comply with standards, compromising the explosion-proof integrity.

2. Power Supply Abnormalities: Supply voltage is below 18 V DC or exceeds 30 V DC; excessive ripple in the switching power supply results in insufficient load-carrying capacity; excessive voltage drop in long cables leads to insufficient power supply to the instrument; the NAMUR safety barrier is damaged and cannot output the rated intrinsically safe power supply.

3. Signal Overload: The load on the output of NPN/PNP transistors exceeds the rated upper limit of 200 mA; the load on relay contacts exceeds 5 A, causing arcing, erosion, and sticking of the contacts; a short circuit in the downstream PLC digital input circuit causes overload damage to the output circuit.

4. Environmental Interference: Electromagnetic interference generated by variable frequency drives, high-power motors, and contactors; instruments and power cables routed through the same cable trays or conduits; multiple ground points at the site creating ground loops; signal disturbances caused by static electricity from material friction and tank vibrations; persistent material buildup and scaling on the probe.

5. Equipment Damage: Probe bending or breaking due to impact; cracking of high-temperature ceramic insulation; damage to the corrosion-resistant PTFE/ETFE coating, leading to probe corrosion by the medium; water ingress causing internal circuit boards to burn out; damage to split-type sensor cables and broken conductors; damage to the heat sink, resulting in high-temperature heat conduction that burns out the meter's electronic components.

III. Step-by-Step Troubleshooting

Fault 1: No output; the instrument shows no signal, and the indicator light is off

Troubleshooting Steps:

① Turn off the power, open the junction box, and check the cable sheath for damage and the terminals for signs of short circuits or burn marks;

② Use a multimeter to measure the voltage at the power supply input to confirm that it falls within the instrument's rated range;

③ Verify terminal definitions and distinguish between NPN/PNP, relay, and NAMUR wiring configurations;

④ Focus on checking areas where cables are bent or pulled to determine if there is a break in the conductors;

⑤ For split-type models, inspect the sensor cable between the probe and the remote meter head.

Troubleshooting Measures:

Loose or oxidized terminals: Disconnect power, tighten the terminals, and remove any copper oxide buildup;

Reversed power polarity: Swap the positive and negative power terminals;

Oxidation of M20 connector pins: Clean the pins and retighten the gland; for localized cable damage, apply waterproof repairs; replace the cable entirely if the damage is severe.

Contingency Plan: When production cannot be halted, replace the faulty instrument with a spare RF admittance meter of the same model for temporary monitoring; repair the faulty instrument during the next scheduled downtime.

Fault 2: Signal drift, with no change in material condition, and frequent false alarms from the instrument

Troubleshooting Steps:

① Visually inspect the probe on-site for powder buildup, scaling, or material adhesion; for high-temperature models, check the ceramic insulation; for corrosion-resistant models, check the protective coating;

② Verify the internal response delay parameters of the instrument; a delay setting that is too short can easily cause false alarms;

③ Check the shielded cable grounding method to confirm whether both ends are grounded;

④ For high-temperature models, check whether the heat sink is encased in powder, causing abnormal instrument head temperature;

⑤ Clean the probe and test it in air under no-load conditions to observe the signal status.

Remedial Measures:

Material buildup or scaling on the probe: Shut down the system to clean the probe; for corrosion-resistant models, use only low-pressure clean water for rinsing—never scrape the PTFE coating with hard objects;

Unreasonable delay parameters: Increase the instrument's response delay (1–60 s) to suppress material splash and vibration-induced disturbances;

Grounding error: The instrument's shielding layer is insulated and left floating; it is grounded at a single point in the control room only.

Emergency Plan: Temporarily add software filtering to the PLC interlock program to suppress false triggers; This is only a temporary measure; after shutdown, the probe must be cleaned to resolve the issue permanently—do not rely on software compensation long-term.

Fault 3: Abnormal indicator lights, fault light alarm

Troubleshooting steps:

① Power indicator light is off: Prioritize checking the power supply circuit for open circuits;

② Action light flashes erratically: Most likely due to loose connections, poor cable contact, or persistent material buildup;

③ Red fault light remains on: Probe breakage, insulation damage, open circuit in the sensing loop, or circuit board failure;

④ Red alarm on the NAMUR safety barrier: Check whether the hazardous-side cable is grounded or shorted.

Remedial Measures:

Loose connections: Turn off the power, tighten the terminals, and re-terminate the cables;

Safety barrier alarm: Disconnect the hazardous-side circuit and inspect for cable damage; if the safety barrier is damaged, replace it directly with one of the same specifications;

If the probe is broken or the insulation is damaged and cannot be repaired on-site, arrange for factory repair.

Emergency Plan: In explosion-proof environments, do not open the cover for maintenance in hazardous areas; temporarily switch to manual on-site inspections and suspend automatic interlocks to prevent unintended operation of valves and conveying equipment.

Fault 4: Abnormal alarm triggering, false alarms, or no alarms

Troubleshooting Steps:

 Enter the instrument parameters menu, verify the high- and low-level action logic, and confirm that it matches the process requirements;

 Simulate the material covering and leaving the probe, repeat the test 3–5 times, and verify the switch action status;

 Check the relay contacts for burnout or sticking; verify the load size in the transistor output circuit;

 In powder applications, check for material bridging on the probe; in liquid applications, check for continuous splashing of material impacting the probe.

Remedial Actions:

Incorrect action logic settings: Modify the instrument's high/low-level switching logic, increase the alarm hysteresis, and reduce false triggers caused by minor disturbances;

Stuck relay contacts: Replace the instrument.

Emergency Plan: Temporarily disable the automatic interlock and switch to manual monitoring; once the fault has been resolved, re-enable automatic control to prevent unintended start-up or shutdown of conveying equipment and valves.

Fault 5: Interference distortion, signal jitter, random inversion
Troubleshooting Steps:
① Verify whether the signal cables share the same cable tray or conduit with the inverter and motor power cables;
② Check the shield grounding method and confirm whether there is multi-point grounding;
③ Measure the downstream load to ensure that NPN/PNP and relay loads do not exceed the rated limit;
④ Observe whether signal jitter is synchronized with the start/stop cycles of the pump and the variable frequency drive.

Remedial Measures:
Mixing of power and control circuits: Run signal wires through separate conduits, maintaining a distance of ≥30 cm from power cables;
Ground loop interference: Modify the shield grounding to single-point grounding in the control room and install external digital signal isolation modules;
Medium disturbance: Increase the instrument response delay to mitigate disturbances caused by transient vibrations.
Contingency Plan: Temporarily enable software filtering on the PLC side to reduce the impact of signal jitter on interlocks; subsequently, completely eliminate interference by retrofitting the cable installation and installing isolation modules.

IV. After-Sales Repair Guidelines
1. Criteria for Determining Malfunctions (If any of the following conditions occur, contact after-sales service for repair; do not disassemble the instrument on-site)
① The probe is broken or bent; cracks in the high-temperature ceramic insulation; extensive damage to the corrosion-resistant PTFE/ETFE coating, with the medium corroding the base material;
② Water has entered the instrument; after reconnecting the wires, cleaning, and troubleshooting, there is still no output and the indicator light does not illuminate;
③ The instrument's operational logic is disrupted; repeated calibration attempts fail to stabilize the display, and the red fault indicator remains lit;
④ Internal wire breakage in the split-type sensor cable or damage to the heat sink;
⑤ Burned-out circuit board or damaged components;
⑥ Damage to the explosion-proof housing or threaded structure of explosion-proof instruments, or damage to the explosion-proof marking, resulting in loss of explosion-proof compliance.
Important Note: The instrument head features a sealed, integrated design. Users are strictly prohibited from disassembling the housing on their own; unauthorized disassembly will result in immediate voiding of the product warranty.

2. Repair Process
Compile basic information: product model, version (Standard / High-Temperature / Corrosion-Resistant), probe specifications, and serial number; Record on-site operating conditions: medium type, temperature, pressure, and whether the site is a hazardous area;
Thoroughly document the failure symptoms: time of occurrence, symptoms, troubleshooting steps already taken, multimeter test data, and include photos of the probe, junction box, and installation site;
Contact after-sales technical support, submit the documentation, and have an engineer assist with remote troubleshooting;
Remote troubleshooting confirms a hardware failure and assesses whether the unit needs to be returned to the factory;
Before returning the instrument to the factory, clean and dry it, pack it according to specifications, and label the outer packaging with the failure details;
After factory repair is completed, recalibrate the instrument and return it with a test report.

3. Warranty Coverage
Warranty Period: The warranty is valid for 12 months from the date of shipment. During the warranty period, free repairs or replacement of parts will be provided for failures of circuit boards, sensor components, or seals caused by neither human error nor medium corrosion.
Exclusions from Warranty Coverage:
① Human-caused impacts or scratches to the probe, or unauthorized disassembly of the instrument housing;
② Damage to the probe or cable caused by incorrect model selection or medium corrosion;
③ Circuit board burnout caused by overvoltage or short circuits;
④ Damage to the probe or cable caused by external impact, pulling, or bending;
⑤ Normal wear-and-tear parts such as sealing gaskets and O-rings;
⑥ Issues occurring after the warranty period has expired.