Smart Pressure Switch Controller

I. Product Definition

The QDKG Smart Digital Pressure Switch Controller is an industrial-grade intelligent pressure control device that integrates real-time pressure monitoring, digital display visualization, digital I/O control, and analog signal transmission. Designed specifically for industrial automation and fluid control applications, it replaces traditional mechanical pressure switches to achieve high-precision, programmable pressure monitoring and closed-loop control.

Complete List of Core Functions:

1. Real-time Pressure Monitoring and Digital Display

Equipped with a built-in high-precision pressure sensor, it continuously captures pressure values within pipelines or equipment and displays them intuitively via a 4-digit red LED display. It supports unit conversion between kPa, MPa, bar, and PSI (depending on the model).

Automatic polarity detection: negative pressure (vacuum) is automatically displayed with a "-" symbol, while positive pressure is displayed without a symbol. Over-range alarms are supported (displaying "-HI-" or "-LO-").

2. Dual Digital Output Control (SP1+SP2)

Provides 2 independent programmable digital outputs, supporting selectable NPN/PNP output types. Normally open (NO) and normally closed (NC) modes can be customized via buttons.

Switching points can be set anywhere within the full measurement range. Supports setting of actuation pressure and hysteresis pressure to prevent frequent switching caused by pressure fluctuations. Response time ≤ 10 ms; switching load capacity ≤ 200 mA; compatible with control devices such as PLCs and relays.

3. Analog Transmitter Output (Optional)

Optional 4–20 mA standard industrial current signal output is available, providing a linear correspondence with pressure values. This enables remote transmission of pressure signals and acquisition by secondary instruments or PLCs, meeting closed-loop control requirements.

4. Programmable Parameters and Commissioning

Equipped with mode and up/down arrow buttons, the device supports on-site, tool-free commissioning. Parameters such as switching points, hysteresis, units, output mode, and display resolution can be set directly without an external programmer.

Supports one-button factory reset, simplifying equipment maintenance procedures.

5. Industrial-Grade Protection and Stability

Features a stainless steel pressure port and corrosion-resistant housing design with an IP65 protection rating. Supports a wide operating temperature range of -20°C to 60°C and includes reverse polarity protection, overpressure protection, and overload protection, making it suitable for complex industrial environments.

CE certified, with full-scale linear deviation ≤ ±2 counts and temperature drift error ≤ 5 counts / full scale ≤ 50 ppm/°C, ensuring strong long-term operational stability.

II. Working Principle

The operational process of this smart pressure switch is like that of a "pressure security guard with eyes and hands," consisting of four core steps:

Step 1: Pressure Sensing

The fluid pressure inside the pipeline or equipment is transmitted through the stainless steel threaded ports at both ends of the device to the internal high-precision pressure sensor. The sensor converts the invisible physical pressure into a proportional, faint electrical signal, completing the "physical pressure → electrical signal" conversion.

Step 2: Signal Processing

The faint electrical signal first passes through an analog-to-digital converter (A/D) to become a digital signal, which is then transmitted to the built-in microprocessor (CPU). The CPU filters, calibrates, and linearly corrects the signal to eliminate on-site interference and temperature effects, calculating an accurate real-time pressure value.

Step 3: Display and Evaluation

On one hand, the processed pressure value is displayed directly on the LED display, allowing on-site personnel to visually monitor the current pressure status;

On the other hand, the CPU compares the real-time pressure value with the SP1/SP2 switch points and hysteresis values preset by the user:

When the pressure reaches or exceeds the set threshold, the corresponding digital output is immediately triggered (NPN/PNP signal is turned on or off);

Simultaneously, the analog output circuit generates a 4–20 mA current signal corresponding to the pressure value for acquisition by remote systems.

Step 4: Control Execution

The output digital and analog signals are transmitted to external control devices such as PLCs, relays, and solenoid valves to automatically perform actions including equipment start/stop, pressure regulation, and fault alarms, thereby achieving closed-loop pressure control.

III. Core Values

1. Overcoming the Limitations of Mechanical Switches to Achieve High-Precision, Stable Control

Completely replacing traditional mechanical pressure switches, this solution utilizes high-precision electronic sensing technology combined with digital calibration algorithms to address industry challenges such as contact wear, temperature drift, and frequent false triggering. Full-range error ≤ ±2 counts; switch points can be freely set across the entire range with customizable hysteresis. This effectively filters out pressure fluctuation interference, prevents chaotic equipment start-stop cycles, ensures more stable industrial system operation, and significantly reduces losses and safety hazards caused by erroneous equipment shutdowns and startups.

2. Visual Digital Display + On-Site Tool-Free Calibration: Doubling Efficiency

Equipped with a 4-digit high-definition LED display, it provides real-time, intuitive visualization of pipeline/equipment pressure values. It supports multiple unit conversions and automatically alerts for over-range or under-pressure conditions, putting an end to the era of "blind calibration." With the panel mode button and up/down adjustment keys, there is no need for external pressure gauges or programmers. Parameters such as switch points, hysteresis, and output modes can be set on-site with a single button press. Commissioning is completed in minutes, significantly shortening the equipment commissioning cycle and improving troubleshooting efficiency by over 80%.

3. Fully Compatible Output Design, Suitable for Most Industrial Control Systems

Supports seamless switching between NPN and PNP output types. Dual independent digital outputs (SP1 + SP2) can control different equipment actions separately. Additionally, a 4–20 mA standard analog transmitter output is available as an option, providing a linear correspondence to pressure values. Compatible with all major PLCs, relays, solenoid valves, and host computer systems. No need for additional signal conversion modules—it integrates directly with existing automation architectures, reducing system integration costs and maximizing adaptability.

4. Industrial-Grade Protection and Multi-Layer Safeguards for Long-Term Stable Operation in Complex Environments

Featuring an IP65-rated design with a corrosion-resistant stainless steel pressure port and a moisture- and dust-proof housing, it is suitable for complex industrial environments such as those with high humidity, dust, and extreme temperatures. Built-in circuit protections—including overvoltage protection, reverse polarity protection, and overload protection—enable operation in a wide temperature range of -20°C to 60°C. It offers strong long-term operational stability and a service life far exceeding that of traditional mechanical switches, significantly reducing equipment replacement frequency and maintenance costs.

5. Suitable for Automation and Smart Factory Upgrades, Enabling Remote Pressure Monitoring and Closed-Loop Control

With an optional 4–20 mA analog output, real-time pressure signals can

be transmitted remotely to a PLC or host computer, enabling centralized monitoring, recording, and analysis of pressure data. This provides reliable pressure data support for unmanned automated production lines and smart factory upgrades. It facilitates the implementation of closed-loop pressure control, helping enterprises achieve intelligent equipment upgrades and improve production management efficiency.

IV. Key Product Parameters & Specifications

4.1 Basic Electrical Parameters

Measurement Performance

Measured Media: Liquids, gases, steam (compatible with non-corrosive media; stainless steel corrosion-resistant interfaces available for special media)

Pressure Range: -0.1 MPa to 100 MPa (Supports full-range customization for vacuum and positive pressure; common specifications include 0–1 MPa, 0–10 MPa, 0–60 MPa, etc.)

Display Accuracy: ±0.5% FS (typical value ±0.25% FS), full-range linear deviation ≤±2 digits

Resolution: 1 kPa (0.001 MPa), supports MPa/bar/kPa/PSI unit switching

Temperature drift error: ≤50 ppm/°C (full scale), zero drift ≤0.1% FS/year

Response time: ≤10 ms, switch action delay can be custom-set (0–5 s)

Output Signal Specifications

Digital Outputs: 2 independent SP1/SP2 outputs, supports NPN/PNP type switching, normally open/normally closed modes programmable

Switching Load Capacity: ≤200mA (24V DC), voltage drop ≤4V (at 20mA load), with overcurrent protection

Analog Output (Optional): 4–20 mA standard industrial current signal, linearly corresponding to 0–full-scale pressure, load resistance ≤500 Ω, accuracy ±0.1% FS

Output Protection: Built-in short-circuit protection and overcurrent protection, maximum current ≤100 mA (automatic cutoff when out of range)

Display and Operation

Display: 4-digit red LED display, display range -1999 to 9999; displays "-HI-" for over-range and "-LO-" for under-range

Control Buttons: 3-button layout (Mode / Up / Down), supporting parameter settings, unit switching, hysteresis adjustment, and factory reset

Status Indication: Two red LED indicators (SP1/SP2) corresponding to switch operating status; illuminate when active

4.2 Isolation Performance Parameters

Electrical Isolation Characteristics

Signal Channel Isolation: The pressure sensing unit and control circuit feature a built-in isolation design to eliminate ground loop interference; electromagnetic interference resistance meets Industrial Grade III standards

Insulation Strength: Insulation resistance between input/output and housing ≥100 MΩ (DC 500 V); withstand voltage ≥1500 V AC (no breakdown for 1 minute)

Anti-Interference Design: Built-in digital filter circuit filters out on-site electromagnetic interference and power supply ripple interference to prevent false triggering

Media Isolation Protection

Sensor Isolation Diaphragm: Made of 316L stainless steel, it is corrosion-resistant and resistant to media contamination. It isolates the media from the circuitry to prevent the media from damaging internal components.

Sealing Protection: Utilizes fluorocarbon rubber/nitrile rubber seals with an IP65 protection rating. The media and circuitry are completely isolated to prevent the ingress of moisture and dust.

4.3 Power Supply & Power Consumption Parameters

Power Supply Specifications

Supply Voltage: 12–30 V DC (typical 24 V DC, calibration voltage 24 V DC); supports wide-range input voltage to accommodate power fluctuations in industrial environments

Polarity Protection: Built-in reverse polarity protection circuit prevents equipment damage from reverse connection; supports voltage fluctuations of ±20% at 24 V DC

Power Consumption Parameters

No-Load Power Consumption: ≤30mA (24V DC supply, no-load condition)

Full-Load Power Consumption: ≤60mA (24V DC supply, with both digital and analog outputs active simultaneously)

Power Distribution Output: No additional power distribution output; all outputs are signal outputs and cannot directly drive high-power loads (requires use with relays or contactors)

4.4 Environmental Adaptation Parameters

Temperature and Humidity Range

Rated Operating Temperature: -20°C to +60°C (stable operating range for electronic components)

Extreme Operating Temperature: -40°C to +70°C (short-term operation without damage; accuracy not guaranteed)

Medium Temperature: -20°C to +85°C (optional heat dissipation devices or diaphragm remote transmission for special high-temperature media)

Relative Humidity: 20%–90% RH (non-condensing; additional protection required in humid environments)

Protection and Explosion-Proofing

Protection Rating: IP65 (IEC 60529 standard), dust-tight and splash-proof; suitable for humid and dusty industrial environments

Explosion-proof rating: Standard models do not have explosion-proof certification; intrinsically safe models are available for explosion-hazardous environments. Compatible safety barrier models: Zener safety barriers (e.g., MTL5042), explosion-proof rating Ex ia II C T4 Ga

Shock and vibration: Complies with Group III standards of the Ministry of Electronics Industry's environmental testing, capable of withstanding industrial site vibrations and shocks

Other environmental adaptability

Electromagnetic Interference (EMI) Resistance: Complies with the GB/T 17626 industrial electromagnetic compatibility standard; resistant to electromagnetic interference from on-site equipment such as variable frequency drives and motors

4.5. Physical Parameters

Mounting Method

Standard Mounting: Direct threaded mounting; supports horizontal/vertical installation; compatible with pipe and equipment threaded interfaces

Process Connection: Standard external threads G1/4, G1/2, M20×1.5 (other specifications available upon request), made of stainless steel for corrosion resistance and pressure tolerance

Electrical Connection: M12 aviation connector (waterproof), compatible with 4-pin cables, plug-and-play wiring for easy installation and maintenance

Dimensions

Main Unit Dimensions: Length × Width × Height ≈ 103mm × 45mm × 35mm (excluding threaded connection and aviation connector)

Threaded Connection Dimensions: G1/4 thread length approx. 12mm, hexagon face-to-face dimension 17mm, for easy wrench installation

Aviation Connector Dimensions: Diameter approx. 12mm, standard cable length 3m (extensions available upon request)

Weight and Materials

Unit Weight: Approx. 200g (excluding cable), lightweight and easy to install

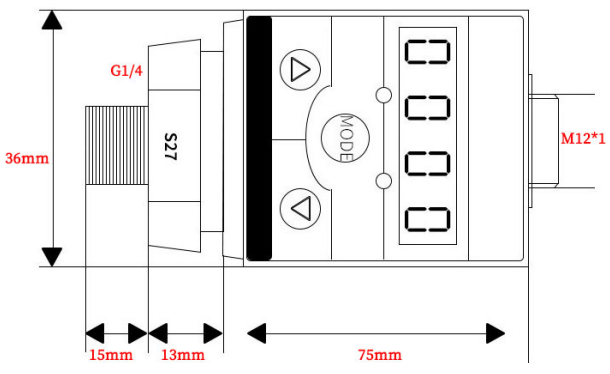
Housing Material: ABS engineering plastic + stainless steel pressure port, corrosion-resistant and impact-resistant, beige housing, suitable for industrial environments

Protection Details:

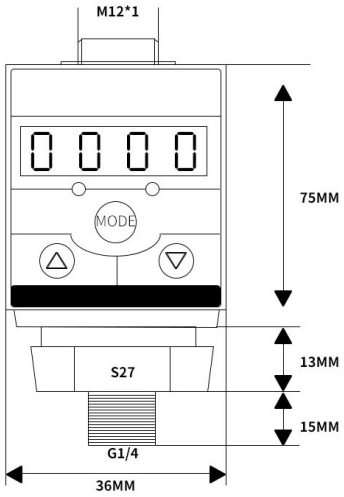
Rubber O-rings at housing seams provide IP65 water and dust resistance

Fluorocarbon rubber gaskets at threaded connections prevent media leakage

The aviation connector features a locking, waterproof design, and the cable connection includes a strain relief structure to prevent cable pull-out and ensure secure wiring







V. Application-Specific Selection Guide

5.1 Key Selection Criteria

1. Signal Type

First, clarify the signal requirements of the control system: If only equipment start/stop control is needed, select a pure digital model (NPN or PNP); If both control and remote pressure monitoring are required, select a dual-output model featuring “digital + 4–20 mA analog”; if integrating with an imported PLC or special control module, ensure the output type (NPN/PNP) fully matches the controller’s input logic to avoid signal incompatibility.

2. Number of Channels

For monitoring a single pressure point on a single device (e.g., pressure control of a single pipeline), select a standard single-channel or dual-channel digital model; If monitoring both high and low pressure thresholds is required (e.g., dual-control for high-pressure shutdown and low-pressure startup), prioritize the SP1+SP2 dual-channel independent digital model, where both channels can be configured with separate setpoints and hysteresis to achieve dual-logic control; For multi-device interlocking control scenarios, select models with the appropriate number of channels based on interlocking requirements, or use expansion modules to achieve multi-channel coordination.

3. Power Supply Method

Most industrial sites use 24V DC power by default, compatible with standard PLC and sensor power supplies; If voltage fluctuations are present on-site (e.g., 12–30 V DC wide-voltage power supply), select a model supporting wide-voltage input to ensure stable operation within ±20% voltage fluctuations; For special scenarios without a DC power supply, AC 220 V models can be customized, eliminating the need for additional power conversion modules and facilitating retrofits of legacy equipment.

4. Explosion-Proof Requirements

For standard environments without flammable or explosive media, the standard general-purpose model is sufficient; for explosion-proof environments such as chemical plants, oil and gas facilities, and dusty workshops, intrinsically safe custom models must be selected. Additionally, verify the compatible safety barrier model (e.g., the MTL series Zener safety barrier) to ensure the explosion-proof rating meets the site’s zone classification requirements; explosion-proof models must be accompanied by explosion-proof certification documents, and the use of general-purpose models in explosion-proof environments is strictly prohibited.

5. Installation Environment

For standard indoor or dry workshop environments, standard IP65-rated models are sufficient; for outdoor or workshop environments with humidity, dust, or water spray, verify the IP65 protection rating and select models with waterproof aviation connectors to prevent moisture and dust ingress; for extreme high or low-temperature environments (below -40°C or above +70°C), custom wide-temperature versions are required to ensure stable operation of electronic components and sensors under extreme conditions.

6. Medium and Measurement Range Considerations

For conventional media such as water and air, select models with standard 316L stainless steel interfaces; for corrosive media (acidic or alkaline solutions), choose corrosion-resistant models (e.g., with Hastelloy diaphragms); for vacuum applications, select models with negative pressure ranges; for high-pressure applications, select models with corresponding pressure-rated ranges. Never exceed the specified measurement range to prevent equipment damage or safety hazards.

5.2. Application-Specific Selection Guidelines

1. Chemical Industry Applications: For pressure monitoring and safety interlocks in chemical pipelines and reactors, we recommend models with corrosion-resistant diaphragms and dual-channel digital + analog outputs. These enable simultaneous high-pressure alarm shutdown and low-pressure interlock protection, with 4–20 mA signals transmitted to the DCS system for centralized monitoring. In explosion-proof zones, intrinsically safe models must be used in conjunction with chemical-grade safety barriers to comply with safety production regulations.

2. Power Industry Applications: For pressure control in steam turbines, boiler feedwater systems, and hydraulic oil stations, we recommend models with wide operating temperature ranges and electromagnetic interference (EMI) resistance. These models are powered by 24V DC and are compatible with power plant PLC systems. The dual digital outputs allow separate configuration of high and low pressure alarms, while the analog signal is transmitted to the host computer for real-time monitoring of equipment operating status.

3. Metallurgy Industry Applications: For pressure monitoring in rolling mill hydraulic systems and blast furnace cooling water circuits, we recommend models with IP65 protection and resistance to vibration and shock. These are suitable for the complex environments of metallurgical workshops, which involve high temperatures, dust, and intense vibration. Dual digital outputs enable equipment overload protection and fault interlocks, preventing equipment damage caused by abnormal pressure.

4. Pharmaceutical Industry Applications: For pressure control in pharmaceutical purified water and water-for-injection pipelines, we recommend models featuring sanitary-grade stainless steel connections and a dead-space-free design to prevent contamination from media residue. The digital display allows for intuitive monitoring of pipeline pressure, while the digital output integrates with pharmaceutical workshop automation control systems to meet GMP production standards.

5. Smart Manufacturing Scenarios: For closed-loop pressure control in automated production lines and smart equipment, we recommend dual-channel digital models with analog output. The NPN/PNP compatible design integrates with various industrial robots and PLCs, enabling remote pressure data acquisition and coordinated equipment control to facilitate the intelligent upgrade of unmanned production lines.

6. Water Treatment Industry Scenarios: For pressure monitoring in water supply and drainage pipelines and filtration equipment, we recommend models with a wide measurement range and IP65 protection. Dual digital outputs enable pump start/stop control and filter clogging alarms, while analog signals are transmitted to the central control system to achieve intelligent pressure regulation of water supply and drainage networks.

5.3 Common Selection Pitfalls

Pitfall 1: Neglecting isolation levels, leading to signal interference and false triggers

Focusing solely on measurement range and output type while ignoring the isolation level of signal channels can result in pressure signal fluctuations and false switch triggers in electromagnetic interference environments with dense concentrations of variable frequency drives and motors. Failure to select models with built-in isolation design allows ground loop interference to affect equipment stability and may even damage control modules.

Misconception 2: Incorrect signal range selection, resulting in insufficient measurement accuracy or damage due to overrange

During selection, focusing solely on the rated range without considering the actual on-site pressure fluctuation range can lead to insufficient measurement accuracy in the low-pressure range if the range is too wide,

or sensor damage due to overrange caused by instantaneous pressure surges if the range is too narrow; failing to reserve a 10%–20% range margin makes the system unable to handle on-site pressure fluctuations.

Misconception 3: Neglecting load matching, leading to output signal failure
Failure to verify the load capacity of digital outputs results in direct driving of high-power relays or contactors, exceeding the device's 200mA load limit and causing the output module to burn out; or mismatching NPN/PNP output types with PLC input logic, preventing the controller from recognizing the signal and rendering control functions inoperable.

Misconception 4: Selecting General-Purpose Models for Explosion-Proof Environments, Creating Safety Hazards
In environments with flammable or explosive media, using general-purpose models without explosion-proof certification poses a risk of sparks from the device circuitry triggering an explosion, violating safety regulations. Additionally, without a safety barrier matching the corresponding explosion-proof rating, even intrinsically safe models cannot function properly in explosion-proof zones, creating serious safety risks.

Misconception 5: Ignoring Installation Thread Specifications, Resulting in On-Site Installation Issues
Failure to verify the thread specifications of on-site pipe connections during selection and directly choosing a generic G1/4 interface results in incompatibility with on-site M20×1.5 or G1/2 interfaces, requiring the purchase of additional adapters and affecting installation efficiency and sealing integrity; failure to consider installation space constraints leads to interference between the device and on-site piping, preventing proper installation.

5.4 Customization Recommendations (Explanation of Custom Solutions for Special Scenarios)
1. Custom Solutions for Special Signals
If the on-site control system does not support standard 4–20 mA signals, models with 0–5 V or 0–10 V voltage signal outputs can be customized, or models with RS485 Modbus-RTU digital signal outputs can be customized to enable remote communication of pressure data and multi-device networking. For special control requirements, single-channel or multi-channel independent programmable digital outputs can be customized, with customizable normally open/normally closed modes and delayed action logic.

2. Custom Solutions for Non-Standard Operating Conditions
For corrosive media applications, corrosion-resistant models with Hastelloy or titanium alloy diaphragms can be customized to handle special media such as strong acids and strong alkalis; For extreme high- and low-temperature conditions, wide-temperature models (-40°C to +125°C) can be customized, or heat sinks can be added to accommodate high-temperature media; For sanitary pharmaceutical and food applications, quick-connect chuck-type sanitary interfaces can be customized with a dead-space-free design to prevent media residue and meet industry production standards.

3. Multi-Channel Integrated Customization Solutions
For centralized monitoring of multiple pressure points, we offer customizable multi-channel integrated pressure switches that monitor 2–4 pressure signals simultaneously, reducing on-site installation space and wiring costs;
For multi-device interlocking control, we offer models with logic programming capabilities to enable interlocking control and interlock protection of multiple pressure signals, meeting the demands of complex automation systems.

4. Special Power Supply and Protection Customization Solutions
For retrofitting legacy equipment without DC power supplies, we offer customizable models powered by AC 220V/110V, eliminating the need for additional power conversion modules. For applications requiring high protection, we provide models with an IP67 rating, suitable for harsh environments such as outdoor, humid, or water-spray conditions. For explosion-proof applications, we offer intrinsically safe and flameproof models with various explosion-proof ratings, complete with full explosion-proof certification documentation to meet the requirements of different zones.

VI. Installation and Commissioning Guidelines
6.1 Pre-installation Preparation
1. Verification of Components
After unpacking, verify that the equipment model, range, and output type match the order; inspect the equipment for any dents or scratches, ensure threaded connections are not deformed, and check that the LED display and buttons are undamaged; confirm that all accessories are included: stainless steel pressure connection gaskets, waterproof aviation connectors, mounting nuts (if required), product manual, and certificate of conformity.

2. Environmental Check
Confirm that the medium temperature and ambient temperature at the installation site are within the device's rated operating range (-20°C to +60°C); ensure the installation location is free from strong electromagnetic interference sources (such as variable frequency drives or high-power motors) and is not subject to severe vibration or impact; verify that the medium is not highly corrosive. If measuring corrosive media, confirm in advance that the device's diaphragm material is compatible.

3. Tool List
Prepare an adjustable wrench (matching the hex size of the threaded connection), an Allen wrench (for terminal blocks), a multimeter (voltage/current range), wire strippers, and electrical tape; for explosion-proof environments, additional explosion-proof tools must be prepared; it is strictly prohibited to strike the equipment with ordinary metal tools.

4. Safety Precautions
Before installation, the valve for the pipeline medium must be closed, and the pressure in the pipeline must be released; installation under pressure is strictly prohibited. Before powering on, verify that the supply voltage matches the device specifications to avoid overvoltage. Installation in explosion-proof environments must comply with local explosion-proof regulations; disassembling the device or aviation connectors while energized is strictly prohibited.

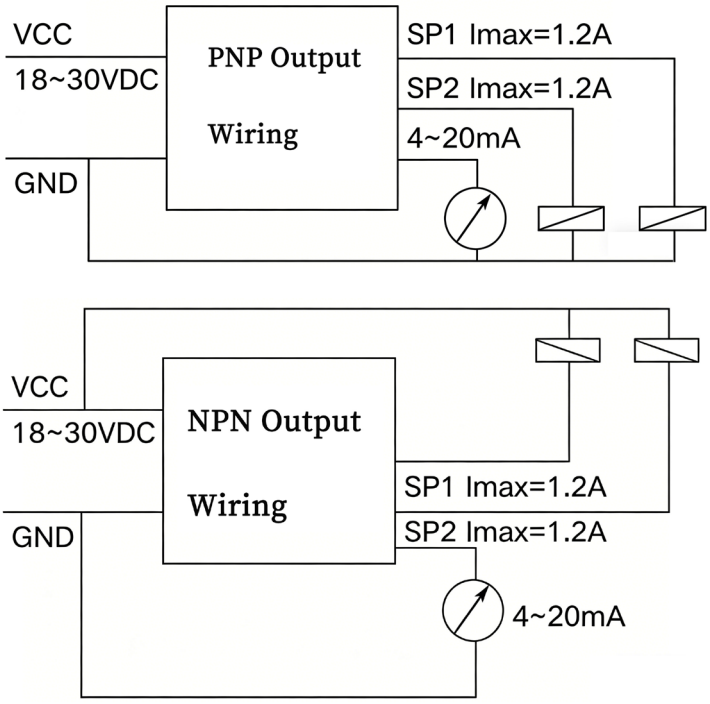
6.2 Standard Installation Steps
1. Direct Threaded Installation
Step 1: Place the sealing gasket over the device's threaded connection. Screw the device into the pipe connection by hand, ensuring the threads are aligned. Do not force the device into place, as this may damage the threads.
Step 2: Secure the device's hexagonal section with a wrench and slowly tighten it to a torque of 20–30 N·m. Avoid excessive torque, which may damage the sensor or sealing gasket.
Step 3: Adjust the device orientation so that the digital display and buttons face the operator side for convenient on-site commissioning and monitoring.

2. Electrical Wiring Specifications
Step 1: Loosen the locking nut on the aviation connector, thread the cable through the connector, strip the cable insulation, and crimp the terminals according to the terminal definitions.
Step 2: Distinguish between power terminals and signal terminals: power terminals (DC 24V+, DC 24V-), digital output terminals (SP1, SP2), and analog output terminals (4–20 mA+, 4–20 mA-). Never connect terminals with reversed polarity.
Step 3: Insert the terminals into the corresponding sockets on the aviation connector, tighten the screws to secure them, ensuring there is no looseness or loose connections, then tighten the connector nut to ensure a watertight seal.

3. Grounding Requirements
The device housing must be reliably grounded with a grounding resistance of ≤4Ω to prevent electromagnetic interference from affecting signal stability. The shielding layer of the analog output cable must be grounded at a single point—grounded only on the control cabinet side, with the device side left floating—to prevent ground loop interference.
The power supply negative terminal and the signal negative terminal must be grounded separately to prevent power supply ripple from interfering with pressure signal acquisition.

6.3 Wiring Diagrams and Specifications

Hirschmann	M12-4P	5-Pin Aviation Connector	M12-5P
			
1: VCC	1: VCC (BRO)	1: VCC (RED)	1: VCC (BRO)
2: GND	2: SP2 (WHI)	2: SP2 (WHI)	2: SP2 (WHI)
3: 4-20mA	3: GND (BLU)	3: GND (BLU)	3: GND (BLU)
	4: SP1 (BLK)	4: SP1 (BLK)	4: SP1 (BLK)
		5: 4-20mA(GRA)	5: 4-20mA(GRA)



3.1 Wiring Specifications for Isolated Models

Isolated models feature built-in isolation circuits for power and signal channels; the power ground and signal ground are independent of each other and do not require a common ground.

Analog output cables must use shielded twisted-pair cables; the shield must be grounded only on the control cabinet side and left floating on the device side.

Digital output circuits are supplied with independent power and are isolated from the PLC input circuits to prevent PLC power fluctuations from affecting the device.

6.4 Power-On Commissioning Procedure

1. No-Load Test

After installation, do not connect any medium. Power on the device to verify: the LED display lights up and shows the current pressure value (atmospheric pressure or zero when no medium is present), and the initial status of the SP1/SP2 indicator lights matches the set mode.

Use a multimeter to measure the voltage at the power terminals to confirm it is within the range of DC 24V ±10% and that the voltage is stable with no fluctuations.

2. Signal Calibration

Digital Signal Calibration: Slowly apply pressure to the device. When the pressure reaches the SP1 setpoint, the SP1 indicator light should illuminate. Use a multimeter to measure the continuity between the SP1 terminal and the power supply common terminal to confirm normal output operation; calibrate the SP2 channel in the same manner.

Analog Calibration: Apply 0%, 50%, and 100% of full-scale pressure to the device. Use the current range on a multimeter to measure the analog output current; the corresponding values should be 4 mA, 12 mA, and 20 mA, with an error of ≤±0.1 mA.

3. Indicator Status Assessment

Normal Status: The LED display shows a stable pressure value with no flickering or garbled characters; The SP1/SP2 indicator lights illuminate only when the switch actuates; there is no constant illumination or false illumination.

Fault Condition: The digital display shows "-HI-" for over-range and "-LO-" for under-range; the indicator light remains on but there is no actual pressure response. Check the switch point settings or wiring.

4. Calibration Methods

Zero Calibration: With no pressure applied to the device, enter parameter setting mode, select zero calibration, and set the current value to 0;

Full-Scale Calibration: Apply full-scale standard pressure to the device, enter parameter setting mode, select full-scale calibration, and set the current value to the corresponding full-scale value;

Hysteresis Setting: Set a reasonable hysteresis value (typically 1%–5% of full scale) based on on-site pressure fluctuations to prevent frequent switching oscillations.

6.5 Installation Precautions and Protective Measures

1. Never exceed the rated supply voltage

The device is rated for 12–30 V DC. Never connect it to a 220 V AC power source or a DC power source exceeding 30 V, as this will directly burn out the device's power circuit; If power supply fluctuations exceed ±20%, a power filter or voltage regulator module must be installed.

2. Avoid High-Voltage Interference

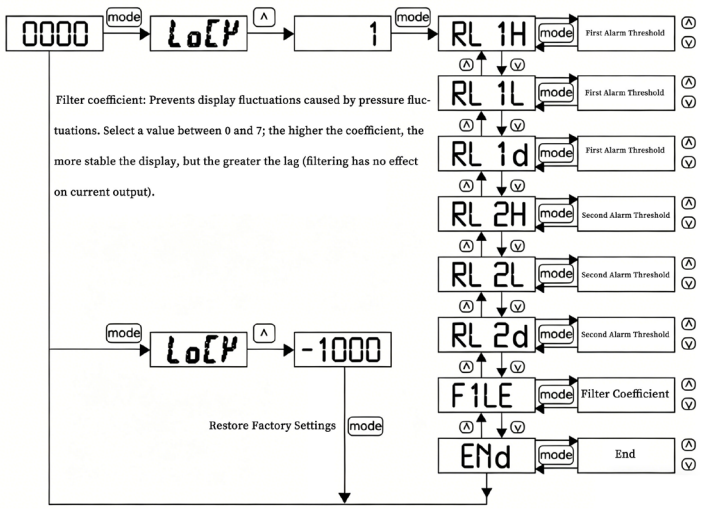
Device cables must be kept away from sources of strong electromagnetic interference, such as variable frequency drives and motors, and routed separately from high-voltage cables, maintaining a distance of ≥30 cm; use shielded twisted-pair cables for analog output lines, with the shield grounded at one end, to prevent signal interference and fluctuations.

3. Protective Measures for Humid Environments

In humid or water-spray environments, ensure that aviation connectors are securely locked in place and that no water seeps into cable interfaces; regularly inspect the sealing rings at the device housing joints for signs of aging; under IP65 protection rating, direct immersion in water is strictly prohibited; for outdoor installations, install a rain cover to prevent direct exposure to rainwater.

4. Other Installation Precautions

Never operate the device beyond its rated range, as this will damage the sensor diaphragm and cause permanent accuracy deviations; during installation, never strike or drop the device to prevent damage to the internal sensors; in explosion-proof environments, never disassemble the device or open the housing while it is energized; power must be disconnected before performing any operations in a safe area.



AL1H: This value is the activation point for Switch 1 (the switch closes when pressure reaches this point, and the indicator light turns on).
AL1F: This value is the release point for Switch 1 (the switch opens when pressure reaches this point, and the indicator light turns off).
AL2H/F: Same as above.
AL1D, AL2D: These values represent the activation delay for Switch 1 (the number of seconds to wait before switching). The minimum unit is 0.01 seconds.
To configure Switch Point 1 as an upper limit alarm output (normally open function), set it to engage at 4 MPa and disengage below 3.95 MPa, with a switching delay of 3 seconds. Configure Switch Point 2 as a lower limit alarm output (normally closed function), set it to disengage at 10 MPa and engage below 9.5 MPa, with a switching delay of 1 second.
Note: Switch points are determined by the configuration of the engagement value and release value. When the engagement value is greater than the release value, it functions as an upper limit alarm output (normally open).
When the engagement value is less than the release value, it functions as a lower limit alarm output (normally closed). The difference between the engagement value and the release value is the switch point hysteresis.

VII. Recommendations for Daily Use & Maintenance

7.1 Key Points for Daily Inspections

1. Digital Display and Status Inspection

Check the equipment's digital display daily to ensure that pressure readings are stable with no fluctuations and that there are no abnormal error messages such as "-HI-" (over-range) or "-LO-" (under-range). Check the SP1/SP2 status indicator lights to ensure they turn on/off synchronously when the switches operate, with no persistent or erroneous illumination, to prevent control logic failure caused by signal abnormalities.

2. Signal Stability Monitoring

Weekly, review the 4–20 mA analog signal curve via the PLC or host computer to confirm that the current value corresponds linearly to the pressure value, with no frequent fluctuations, jumps, or signal interruptions; Use a multimeter to spot-check the on/off status of digital output terminals to ensure timely response without delays or false triggers.

3. Environmental and Operating Condition Monitoring

Inspect the equipment installation environment daily to ensure there is no standing water, condensation, or dust accumulation, and that ambient temperature and humidity remain within the rated operating range (-20°C to +60°C, 20% to 90% RH, non-condensing); Periodically inspect the condition of the pipeline medium to ensure there is no contamination by highly corrosive substances or crystallization blocking the pressure ports, which could affect measurement accuracy.

4. Installation Status Inspection

Inspect the equipment's threaded connections weekly to ensure there are no medium leaks or loosening/displacement; verify that aviation connectors are securely locked in place, cables show no signs of pulling or damage, and mounting clips are not detached, ensuring stable electrical connections with no loose connections or oxidation.

7.2. Regular Maintenance Plan

1. Cleaning Frequency and Guidelines

Clean the equipment surface once a month: Wipe the digital display and housing with a dry, soft cloth to remove dust and oil. Never use corrosive cleaning agents or direct high-pressure water jets to rinse the equipment, as this may damage the IP65 protective coating.
Clean the pressure port filter (if present) once per quarter: Before disassembling the equipment, the pipeline pressure must be fully released. Use compressed air to blow out impurities from the port to prevent medium crystallization or foreign objects from blocking the sensor diaphragm, which could affect measurement accuracy.

2. Wiring Tightening and Insulation Inspection

Tighten the aviation connector terminals quarterly. Check that screws are not loose and that cables show no signs of oxidation or discoloration. Ensure the ground terminal of the analog output cable shielding is secure, with a ground resistance ≤4Ω, to prevent ground loop interference.
Measure the insulation resistance between power and signal terminals with a multimeter every six months to confirm it is ≥100 MΩ (DC 500 V) and that there is no insulation aging or damage, thereby preventing the risk of short circuits.

3. Recommendations for Accuracy Retesting and Calibration

Perform zero-point and full-scale calibration every six months: Apply 0 pressure and full-scale pressure using a standard pressure source, enter the device settings menu, and recalibrate the zero-point and full-scale values to correct for temperature drift and minor deviations caused by long-term use.
Perform a full-range accuracy retest annually: At 0%, 25%, 50%, 75%, and 100% of full-scale pressure, compare the readings on the standard pressure gauge with the device display. If the error exceeds ±0.5% FS, recalibrate or replace the device.

4. Inspection and Replacement of Wear Parts

Inspect the threaded interface gaskets and aviation connector O-rings once a year. If they show signs of aging, cracking, or deformation, replace them promptly with seals of the same specification to restore IP65 protection and prevent media leakage or moisture ingress.

7.3 Long-Term Maintenance Tips

1. Optimizing Dust and Moisture Protection

In workshops with high dust levels, install a transparent protective cover over the device exterior. Regularly clean dust from inside the cover to prevent accumulation that could impair heat dissipation or allow dust to enter device seams. In humid or outdoor environments, install a drainage channel beneath the device to prevent rainwater or condensation from directly soaking the device. Additionally, wrap waterproof tape around cable connectors to enhance water resistance.
If the equipment is to be idle for an extended period, seal the pressure ports with protective caps and store the unit in a dry, well-ventilated indoor environment to prevent the diaphragm from becoming damp or corroded.

2. Anti-Interference Optimization Measures

Equipment cables must be kept away from strong sources of electromagnetic interference, such as variable frequency drives and high-power motors. Route them separately from high-voltage cables, maintaining a distance of ≥30 cm, and avoid running them parallel to each other; Analog output cables must use shielded twisted-pair cables. The shield should be grounded at only one end (on the control cabinet side) and left floating on the device side to prevent signal fluctuations caused by ground loop interference.
A power filter may be installed on the power supply side to filter out mains ripple interference, ensuring the supply voltage remains stable within the range of 24V DC ±10% and preventing voltage fluctuations from affecting the device's operational stability.

3. Protection Measures for Extreme Environments

High-temperature environments (> 50°C): Install heat-dissipating connectors between the equipment and the pipeline to reduce the impact of medium temperature on the sensor; avoid direct exposure of the equipment to sunlight, and install a sunshade to prevent the housing from overheating.
Low-Temperature Environments (<0°C): If the medium is prone to freezing, install a heat tracing system or insulation sleeve to prevent the medium in the pipeline from freezing and damaging the sensor diaphragm; simultaneously, check the insulation of the device housing to prevent buttons and LED displays from malfunctioning due to low temperatures.
High-vibration environments: Install vibration-damping pads at the equipment mounting location to reduce the impact of vibrations on the sensor. Additionally, regularly inspect the equipment's mounting to prevent long-term vibrations from causing threaded connections to loosen or internal components to fail.

4. Ensuring Long-Term Stable Operation

Avoid operating the device at full scale or beyond its rated range for extended periods. It is recommended to maintain the actual operating pressure within 30% to 80% of the full scale range to extend the sensor's service life. Regularly review the device's operation logs, recording data such as pressure fluctuations and signal status, to anticipate potential equipment failures in advance and prevent unexpected downtime.

VIII. Troubleshooting & Emergency Response

8.1 List of Common Faults

No display when the device is powered on; LED display does not light up; unable to start

Digital outputs SP1/SP2 have no output, do not activate, or frequently malfunction

4–20 mA analog signal drifts, fluctuates, or outputs a fixed value

SP1/SP2 indicator lights remain on/off, inconsistent with actual pressure status

Pressure alarms trigger frequently, with irregular start/stop patterns

Signal distortion due to interference; abnormal data read by PLC/host computer

Displays "-HI-" or "-LO-" error messages; unable to operate normally

8.2. Analysis of Fault Causes

Wiring errors: Reversed power supply polarity, incorrect signal terminal connections, incorrect shield grounding, loose or oxidized cables

Power supply abnormalities: Supply voltage outside the 12–30 V DC range, excessive power supply ripple, or insufficient power supply capacity causing voltage drop

Signal overload: Digital output directly driving high-power loads exceeding the 1.2 A load limit; excessive resistance in analog load

Environmental Interference: Proximity to strong electromagnetic interference sources (inverters, motors); cables routed in the same conduit as high-voltage power lines; ground loop interference

Hardware Issues: Damaged sensor diaphragm; internal circuit failure; malfunctioning buttons; damaged display module

Operating Conditions and Parameter Settings: Incorrect range selection; unreasonable switch points or hysteresis settings; filter coefficient too high or too low

8.3. Step-by-Step Troubleshooting

1. No display when device is powered on; LED display is off

Troubleshooting Steps:

Use a multimeter to measure the voltage at the power supply terminals; confirm it is within the range of DC 24V ±10%. If there is no voltage, the power supply circuit is faulty;

Check if the power supply polarity is reversed; verify the terminal definitions on the aviation connector (VCC/GND);

Check if the aviation connector is securely locked and if the terminals are firmly crimped, with no loose connections or oxidation;

Replace with a spare power supply for testing to rule out power supply failure.

Remedial Actions: Reconnect the power supply with correct polarity and tighten the terminals; if the power supply is faulty, replace it with a compatible unit; if there is still no display, determine that it is a hardware failure and initiate the repair process.

Emergency Workaround: If a spare unit of the same model is available on-site, replace and install it directly to restore system operation.

2. No output or frequent false triggering of digital inputs SP1/SP2

Troubleshooting steps:

Enter the device settings menu and verify that the SP1/SP2 setpoints and hysteresis values are set appropriately;

Use a multimeter to measure the continuity of the output terminals; confirm that the terminals are conductive to the power supply common terminal when the pressure reaches the set value;

Check whether the output load exceeds the 1.2A limit or is directly driving high-power equipment;

Verify that the output type (NPN/PNP) matches the PLC input logic; connect the NPN output common terminal to 24V+, and the PNP output common terminal to 24V-;

Check whether the cables are subject to high-voltage interference and route them separately from high-voltage cables.

Remedial Actions: Reset the switch points and hysteresis to appropriate values; use a relay to drive high-power loads; adjust the PLC input common terminal wiring to match the output type; route cables away from interference sources and add shielding measures.

Emergency Workaround: Temporarily increase the hysteresis value to prevent false triggering caused by pressure fluctuations; if the output channel is damaged, switch to another channel for temporary use while contacting after-sales service for repairs.

3. Drift or Jitter in 4-20mA Analog Signals

Troubleshooting Steps:

Use a multimeter set to the current range to measure the output current and verify that the current value remains within the 4–20mA range when the pressure is stable;

Check whether the shielding layer of the analog cable is grounded at only one end (on the control cabinet side) while remaining ungrounded on the device side;

Check whether the load resistance is ≤500Ω; excessive load may cause signal distortion;

Check whether power supply ripple is excessive; install a power filter and retest;

Check whether the device is affected by electromagnetic interference sources such as variable frequency drives or motors.

Remedial Actions: Correct the shield grounding method; replace with a suitable load resistor; install a power filter; replace the cable with shielded twisted-pair cable and route it away from strong interference sources; adjust the equipment installation location if necessary.

Emergency Workaround: Temporarily reduce the filtering time for the PLC's analog input to minimize the impact of signal fluctuations; prioritize using digital control functions to maintain equipment operation while addressing the signal interference issue.

4. Abnormal Indicator Light Status (Constant On / Off)

Troubleshooting Steps:

Verify the normally open (NO) / normally closed (NC) mode settings for SP1/SP2 in the device configuration menu to ensure the indicator light logic matches;

Check the switch point settings corresponding to the indicator light to confirm that the current pressure meets the activation threshold;

Use a multimeter to measure the indicator light power supply terminals to ensure there are no short circuits or open circuits in the indicator light circuit;

Rule out abnormal indicator power supply caused by loose connections.

Remedial Actions: Adjust the normally open/normally closed mode settings to match actual control requirements; recalibrate the switch points; if the indicator hardware is damaged but does not affect output functionality, it may be ignored, or contact after-sales service for replacement.

Emergency Workaround: Rely on the digital signal read by the PLC rather than the status of the local indicator to maintain system operation.

5. Frequent triggering of pressure alarms with irregular start/stop cycles

Troubleshooting steps:

Check for severe fluctuations in pipeline pressure and confirm whether the equipment installation location is subject to water hammer or pressure surges;

Verify the equipment's filter coefficient setting; if the filter coefficient is too low, the system is susceptible to pressure fluctuations;

Check whether the hysteresis value is set too low, causing frequent switching;

Confirm whether the pressure port is blocked, preventing the sensor from properly acquiring pressure signals.

Remedial Actions: Adjust the device installation location to avoid areas prone to pipeline impact; increase the filter coefficient (0–7 levels; higher values provide stronger filtering); increase the hysteresis value to prevent frequent switching fluctuations; disassemble the device and clean debris from the pressure port.

Emergency Workaround: Temporarily raise the alarm threshold to reduce frequent on/off cycles; install a pipeline buffer to stabilize pressure fluctuations, and address the issue thoroughly during the next equipment maintenance window.

6. Signal distortion due to interference, resulting in abnormal data readout by the PLC or host computer

Troubleshooting Steps:

Check whether cables are routed in the same cable tray as high-voltage equipment such as variable frequency drives or motors, with insufficient spacing;

Verify that the shielded cable is grounded correctly and check for ground loop interference caused by grounding at both ends;

Check whether the power supply is shared with high-voltage equipment, which may cause power supply ripple interference;

Check whether the device installation location is affected by strong

electromagnetic radiation.
Remedial Actions: Replace the cable with shielded twisted-pair cable and route it separately from high-voltage cables, maintaining a distance of ≥30 cm; correct the single-ended grounding of the shield; install a power filter; relocate the equipment away from strong interference sources.
Emergency Workaround: Temporarily use digital I/O control functions to maintain equipment operation while optimizing cabling and grounding to eliminate interference sources.

7. Displaying “-HI-” or “-LO-” error messages
Troubleshooting steps:
Confirm whether the current pipeline pressure exceeds the device’s measurement range; “-HI-” indicates over-range, and “-LO-” indicates below the lower limit of the range;
Check whether the device is installed in a location subject to reverse pressure surges, which may have damaged the sensor diaphragm;
Verify the device’s range model to ensure it matches the actual on-site pressure.
Remedial Actions: If the actual pressure exceeds the measurement range, replace the device with one of the appropriate range; if the diaphragm is damaged, return the device for repair or replace it; adjust the device’s installation position to avoid reverse pressure surges.
Emergency Workaround: If the measurement range was selected incorrectly, temporarily adjust the system pressure to operate within the device’s measurement range, and replace it with a suitable model after shutdown.

8.4 After-Sales Service Request Guidelines
1. Criteria for Determining a Malfunction (Situations Requiring Contact with After-Sales Service for Repair or Replacement)
The device shows no display whatsoever when powered on, and fails to start even after checking the power supply and wiring;
The sensor diaphragm is damaged, preventing normal pressure signal acquisition, and the display shows a continuous error;
The output module is burned out, with no digital or analog output;
Internal circuit failure, resulting in severe signal distortion, garbled data, and inability to calibrate;
Water ingress or moisture exposure causing hardware damage, resulting in failure to operate normally.

2. Repair Process
Prepare device information: model (QDKG), range, serial number, and purchase date;
Take photos or videos of the fault symptoms (e.g., error display, wiring status, signal waveforms);
Contact Anhui Qidian Automation Technology Co., Ltd. after-sales service to describe the fault symptoms and troubleshooting process;
Fill out the repair request form according to after-sales instructions; if factory repair is required, pack the device securely to prevent damage during shipping;
Upon receiving the repaired or replacement device, install and commission it according to specifications to confirm normal operation.

3. Warranty Scope and Notes
Warranty Period: 12 months from the date of manufacture; free repair or replacement for faults not caused by human error or force majeure;
Exclusions: Damage caused by human error (e.g., overpressure, incorrect wiring, dropping the equipment), force majeure (e.g., lightning strikes, floods, fires), unauthorized disassembly or repair, and damage caused by corrosive media are not covered by the warranty;
Value-Added Services: Paid repair, calibration, and upgrade services are available outside the warranty period; specific fees are subject to the after-sales quotation.