Electrical-Contact Pressure Gauge

I. Product Definition

The stainless steel magnetically assisted shock-resistant electric contact pressure gauge is an integrated industrial measurement and control instrument that combines **on-site pressure pointer display, magnetically assisted passive switch contacts, oil-filled shock resistance, and a corrosion-resistant stainless steel wetted structure**. It is developed and manufactured by Anhui Qidian Automation Technology Co., Ltd. The instrument uses a Bourdon tube as the pressure-sensing element. The case is filled with damping silicone oil and houses a built-in magnet-assisted electrical contact mechanism. When paired with electrical components such as relays and contactors, it enables automatic start/stop control based on upper and lower pressure limits, audible and visual alarms for out-of-limit conditions, and safety interlock protection.

Complete List of Core Functions:

1. **On-site Visual Pressure Indication**: A large-dial mechanical pointer allows direct reading of the pressure of the medium inside pipes or pressure vessels; no upper-level system is required, enabling on-site personnel to read the value visually.

2. **Upper and Lower Pressure Limit Setting and Passive Switch Output**: The dial features manually adjustable upper and lower limit setting pointers. When the preset pressure is reached, the internal electrical contacts close or open, outputting a passive switch signal for alarms and pump/valve start-stop control.

3. **Magnetically Assisted Contact Protection**: The contacts are equipped with permanent magnets, which use magnetic force to achieve rapid engagement and disengagement. This reduces arc erosion, suppresses false triggering caused by vibration-induced contact chatter, and extends contact life.

4. **Oil-Filled Shock-Absorbing Damping**: The sealed housing is filled with silicone oil damping fluid, which absorbs equipment vibrations and fluid pulsation impacts, suppresses pointer wobble, and ensures stable readings in high-vibration environments such as pumps, air compressors, and hydraulic units.

5. **All-Stainless-Steel Corrosion-Resistant Construction**: Wetted parts, such as the Bourdon tube and fittings, are made of stainless steel, making them suitable for water, hydraulic oil, and mildly corrosive fluids, while providing rust and oxidation resistance.

6. **Wide-Range Pressure Measurement**: Supports a range from negative pressure (vacuum) to high pressure, with customizable ranges (-0.1 MPa vacuum to 100 MPa), and supports dual-scale customization in MPa and psi.

7. **IP65 Sealed Housing**: The metal-sealed housing is dustproof and splash-proof, resisting workshop dust and condensation splashes to protect the internal mechanism and electrical contact assemblies.

8. **Short-Term Overload Protection**: The high-strength stainless steel Bourdon tube is capable of withstanding short-term pressure overloads, and the rear safety relief structure ensures personnel safety under high-pressure conditions.

9. **Integrated Electrical Junction Box**: Dedicated terminal blocks facilitate connection to external control circuits; contacts are compatible with standard control circuits such as AC 220 V and DC 24 V (contact capacity must match the relay).

> Typical Applications: Circulating water pump stations, air compressor systems, hydraulic stations, chemical pipelines, pharmaceutical pure water systems, metallurgical cooling lines, and pressure monitoring for pressure vessels—used for on-site pressure display, pressure-exceeding alarms, and automatic unit start/stop.

II. Working Principle

Layman's Explanation

This pressure gauge is essentially a three-in-one instrument combining a mechanical Bourdon tube pressure gauge, a magnetically assisted electrical contact switch, and oil-filled damping. The pressure of the medium in the pipeline enters the Bourdon tube; the pressure causes the curved Bourdon tube to expand, and this slight deformation is amplified by gears to drive the main pointer. The upper and lower limit set pointers on the dial can be manually adjusted. When the main pointer reaches the set pressure position, the built-in magnet generates a magnetic field that rapidly closes or opens the contacts, sending a switch signal to control a relay for alarm activation or pump start/stop. The case is filled with silicone oil to absorb vibrations, prevent erratic pointer movement, and avoid frequent arcing at the contacts caused by vibrations that could lead to false triggers.

Complete Operating Process

1. Pressure Injection: The gas or liquid medium being measured enters the hollow, curved Bourdon tube inside the instrument through a threaded connection.

Elastic Deformation: The pressure of the medium acts on the inner wall of the Bourdon tube, causing displacement at its free end; the greater the pressure, the greater the displacement. When the pressure is removed, the Bourdon tube returns to its original shape.

2. Mechanical Transmission and Amplification: The connecting rod at the tail end of the Bourdon tube drives the sector gear and the center gear, amplifying the minute displacement and causing the main pointer to rotate on the dial, thereby displaying the pressure value locally.

3. Damping and Pointer Stabilization: The movement is enclosed in silicone oil damping fluid within the case, which absorbs vibrations and medium pulsations, suppresses high-frequency pointer jitter, and maintains stable readings.

4. Magnetically Assisted Contact Operation: The upper and lower limit set points are pre-adjusted on the dial. When the main pointer approaches a set point, a magnet generates a magnetic field that instantly and rapidly closes or opens the contacts, preventing arcing caused by slow contact engagement; the

contacts then close or open the external control circuit.

5. Control/Alarm Output: The contact make/break signal is transmitted to an external relay to trigger audible and visual alarms when pressure reaches the limit, or to automatically start or stop equipment such as water pumps and air compressors. When the pressure drops below the set point, the magnetically assisted contacts quickly open, deactivating the control signal.

III. Core Value & Pain Points

Summary of Core Value:
1. **One Gauge, Two Functions: Local Display + Automatic Pressure Control**: Provides both on-site pointer readings and pressure switch signal output, eliminating the need for separate pressure gauges and pressure switches, thereby saving on procurement costs and installation space.

2. **Magnetically Assisted Structure: Vibration-Resistant and Arc-Proof**: Compared to conventional electric-contact pressure gauges, the magnetic mechanism accelerates contact opening and closing, reducing electrical sparking that erodes the contacts. This prevents false triggering under conditions of severe vibration and significantly extends contact service life.

3. **Oil-filled and shock-resistant, suitable for pumps and hydraulic units**: The silicone oil damping structure eliminates pointer jitter and illegible readings caused by continuous equipment vibration.

4. **Stainless Steel Wetted Parts, Corrosion-Resistant**: The Bourdon tube and fittings are made of stainless steel, making them suitable for water, oils, and mildly corrosive media, and resistant to rust and leaks.

5. **Passive Switch Output, Simple Configuration**: The passive dry-contact signal requires only a matching intermediate relay to integrate into the control circuit, eliminating the need for complex transmitter modules.

6. **IP65 Protection, Suitable for Humid and Dusty Workshops**: The sealed housing is dust- and splash-proof, ensuring long-term stable operation in harsh environments such as pump rooms and metallurgical workshops.

Key Pain Points and Solutions:

Q1: Do continuous vibrations from on-site water pumps and air compressors cause the pointer on standard electric-contact pressure gauges to shake constantly, leading to frequent false tripping of contacts, arcing, and erosion, resulting in frequent instrument failure?
A1: This product features built-in silicone oil damping to suppress pointer jitter. Combined with a magnetically assisted contact mechanism—which uses magnetic force to enable rapid contact opening and closing—it eliminates contact chatter caused by vibration, reduces arc erosion, prevents false alarms or unintended pump starts/stops due to minor pressure fluctuations, and extends the instrument's service life.

Q2: Does your project require on-site inspection personnel to directly monitor pressure, while also needing automatic alarms and automatic pump start/stop when pressure exceeds limits? Does purchasing pressure gauges and pressure switches separately result in high costs, complex piping installation, and space consumption?
A2: The stainless steel magnetically assisted shock-resistant electric contact pressure gauge integrates on-site display and upper/lower limit switch control functions. A single instrument simultaneously performs pressure monitoring and pressure interlock control, reducing the number of instruments required, simplifying the installation of pressure-transmitting piping, and lowering procurement costs.

Q3: When the medium is water, hydraulic oil, or a mildly corrosive substance, do standard electric contact pressure gauges with copper fittings tend to rust, or do their Bourdon tubes perforate and leak, posing safety hazards?
A3: The instrument's Bourdon tube and fittings are all made of stainless steel wetted parts, which are corrosion-resistant and suitable for water, oils, and mildly corrosive media, thereby reducing the risk of leaks caused by media corrosion; for highly corrosive conditions, the wetted parts can be upgraded to 316L stainless steel.

Q4: Do conventional electric-contact pressure gauges have slow contact response, generate arcing when contacts close or open, and suffer from blackened, stuck contacts after prolonged use—leading to safety failures such as failure to alarm or shut down when pressure reaches the set point?
A4: The magnetically assisted structure utilizes permanent magnet force to rapidly engage or disengage contacts the moment pressure reaches the set value, shortening the duration of arcing, reducing contact erosion, ensuring reliable contact operation, and lowering the risk of safety interlock failure.

Q5: Workshop environments are often damp and dusty. Do conventional electric-contact gauges easily allow water and dust to enter, causing the movement to jam and the terminal blocks to oxidize, leading to frequent malfunctions?
A5: The gauge features an IP65-rated sealed metal housing that is dustproof and splash-proof, protecting the internal movement, electrical contact components, and terminal box. It is suitable for damp and dusty operating conditions such as pump rooms and metallurgical facilities.

Q6: What if on-site adjustments to pressure alarm or start/stop thresholds are needed? Isn't replacing the instrument cumbersome and associated with high downtime costs?
A6: The dial features built-in adjustable upper and lower limit setting pointers. There is no need to remove the instrument; simply use a small screwdriver to adjust the pressure control points directly on the dial. Thresholds can be modified conveniently without halting production or replacing the instrument.

Q7: If only digital interlocking is required—without the need for a continuous 4–20 mA remote signal—isn't a pressure transmitter solution too costly, especially since it requires a separate power supply?
A7: This instrument outputs dry contact switches, eliminating the need for a power supply. Simply pair it with a relay to achieve pressure alarms and pump start/stop functions. This results in lower procurement costs and simpler wiring, making it ideal for basic pressure interlocking applications.

Key Product Specifications & Detailed Specifications

I. Basic Electrical Parameters

Project	Specifications
Product Name	Stainless Steel Magnetically Assisted Shock-Resistant Electric Contact Pressure Gauge
Measuring Principle	Bourdon tube pressure sensing + magnetically assisted electric contact switch + oil-filled damping for shock resistance
Dial Specifications	Φ100 mm (standard); optional Φ150 mm
Measured Medium	Liquids, gases (non-crystalline, free of solid particles, and non-corrosive to wetted materials)
Measuring Range	-0.1 to 0 MPa (vacuum), 0 to 0.1 MPa to 0 to 100 MPa; custom composite ranges available
Accuracy Class	Class 1.6; Class 1.0 available upon request (special order)
Electrical Contact Type	Magnetically assisted, passive dry contacts
Contact Rating	AC: 30 VA; DC: 20 W
Contact Operating Voltage	AC 0–220 V; DC 0–24 V
Setting Method	External adjustment screws on the dial for manual adjustment of upper and lower limit set points
Temperature-Induced Error	≤0.4% FS/10 °C (deviation from the 20 ± 5 °C reference temperature)
Vibration Resistance Class	V.H. Class 4
Allowable Static Pressure Load	Continuous operation ≤ 75% of full scale; transient shock ≤ 1.2 times full scale
Material of Wetted Parts	Standard SUS304 stainless steel; optional SUS316L
Internal Damping Medium	Standard silicone oil; glycerin available for low-temperature applications
Connection Thread	M20×1.5 (standard); customizable to G1/2, NPT1/2, etc.

II. Insulation Performance Parameters

Project	Specifications
Media Isolation	Sealed isolation via Bourdon tube
Electrical Isolation	Dielectric withstanding voltage between the measuring chamber and the terminal block: ≥2 kV
Pressure Relief Protection	Safety pressure relief structure on the back

III. Power Supply & Power Consumption Specifications

Project	Project
Instrument Power Supply	Instrument Power Supply
Instrument Power Consumption	Instrument Power Consumption
Signal Output Type	Signal Output Type
Power Distribution Output	Power Distribution Output

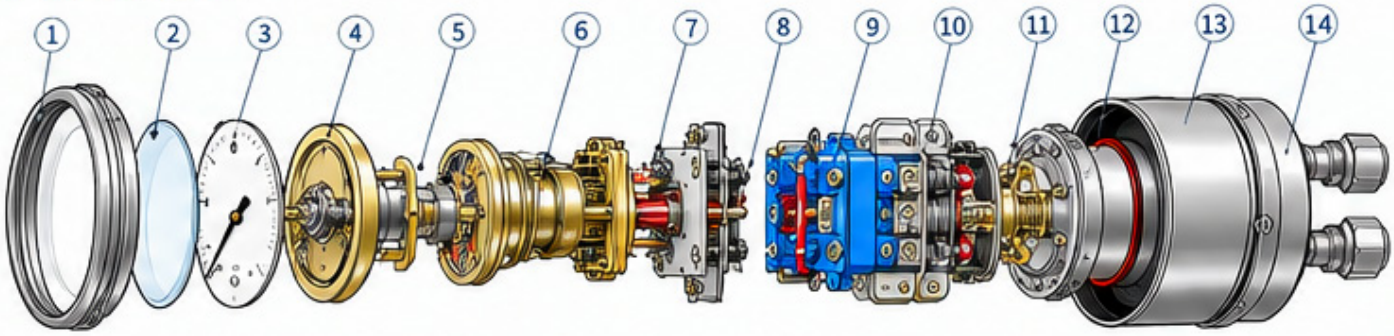
IV. Environmental Adaptation Parameters

Product	Specifications
Operating Temperature	-25°C to +70°C (silicone oil version); -5°C to +70°C (glycerin version)
Storage Temperature	-40°C to +80°C
Operating Relative Humidity	5%–85% RH, non-condensing
Protection Rating	IP65
Explosion-Proof Rating	The main unit is not explosion-proof; the purely mechanical measurement section contains no ignition sources, but there are electrical contacts inside the junction box, so it cannot be used directly in hazardous areas
Compatible Safety Barrier Models	This standard model cannot be used directly in hazardous areas; the explosion-proof version must be used with a safety barrier, while the standard version does not require one
Impact Resistance	Can withstand short-term pressure pulsations; vibration rating: V.H.4

V. Physical Parameters

Product	Specifications
Installation Method	Radial mounting (standard); optional axial mounting with flange
Dimensions (Standard Φ100 Radial Model)	Dial outer diameter: Φ100 mm; case thickness: 44 mm; connection length: 20 mm
Weight	Approx. 0.65 kg (excluding gaskets and valve fittings)
Housing Material	SUS304 stainless steel case; safety glass panel
Junction Box	Plastic sealed junction box with built-in terminal blocks and a cable entry port equipped with a sealing gland

2. Exploded View



No.	Name	English Name	Material	Qty.	Remarks
1	Bezel	Bezel	Stainless Steel 304	1	–
2	Window	Window	Glass / PC	1	–
3	Dial	Dial	Aluminum	1	–
4	Pointer	Pointer	Aluminum	1	–
5	Movement	Movement	Stainless Steel / Brass	1	–
6	Bourdon Tube	Bourdon Tube	Stainless Steel 316	1	Pressure Sensing
7	Transmission	Transmissionl	Stainless Steel / Brass	1	–

No.	Name	English Name	Material	Qty.	Remarks
8	Magnetic-Assisted Contact	Alloy / Magnetic Material	1	•	Pressure Alarm / Control
9	Electrical Terminal	Copper Alloy	1	•	Electrical Connection
10	Rear Cover	Stainless Steel 304	1	–	–
11	Sealing Ring	Rubber / Silicone	2	–	Seal
12	Cable Gland	Stainless Steel	1	–	Cable Entry
13	Process Connection	Stainless Steel 316	1	–	G1/2"
14	Lock Nut	Stainless Steel	1	–	

Scenario-Based Selection Guide

I. Key Selection Criteria

1. Signal Type: This instrument outputs a passive dry-contact switching signal, which only activates or deactivates the contacts when the pressure reaches a threshold, and is used for alarms and start/stop interlocks; it does not output a 4–20 mA signal.

2. Number of Channels: Each instrument provides single-channel pressure measurement and features two sets of built-in independent contacts (upper and lower limits), allowing simultaneous configuration of high-pressure and low-pressure alarms; For multiple independent pressure measurement points, multiple instruments must be configured separately.

3. Power Supply: The instrument body requires no power supply; it relies on mechanical pressure to drive the pointer and contact operation. The contact circuit is powered by an external control system (AC 220 V or DC 24 V); an intermediate relay must be installed in the circuit, and it cannot directly drive high-power loads.

4. Explosion-proof requirements: The standard version contains electrical contacts inside the junction box, which can generate arcing; therefore, it cannot be used directly in potentially explosive atmospheres. For explosion-proof environments requiring similar functionality, a dedicated explosion-proof electric-contact pressure gauge must be selected. The standard version does not require a safety barrier; only the explosion-proof model requires a safety barrier.

5. Installation Environment: Assess the on-site vibration level, temperature, humidity, and dust/condensation conditions. For continuously vibrating operating conditions—such as those involving pumps, air compressors, and hydraulic stations—prioritize this oil-filled, vibration-resistant version; in humid and dusty environments, select an IP65-sealed junction box; if the medium is corrosive, upgrade the wetted parts to SUS316L; in low-temperature environments, replace the damping fluid with glycerin.

6. Range Matching: For stable pressure conditions, the normal operating pressure should be maintained between 1/3 and 2/3 of the upper range limit; for pulsating or shock-prone conditions such as those involving pumps or hydraulic equipment, the operating pressure should not exceed 1/2 of the upper range limit to allow for shock margin and prevent permanent deformation of the Bourdon tube.

7. Installation Configuration: The radial model is suitable for direct pipe mounting; the axial model with flanges is suitable for flush mounting on control cabinet panels. Select the model based on the on-site installation configuration.

8. Media Compatibility: For clean water, compressed air, and hydraulic oil, use standard SUS304 wetted parts; for weakly acidic or alkaline media, use SUS316L; for viscous media or those containing solid particles, a diaphragm isolation device must be installed to prevent impurities from entering the bourdon tube and causing jamming.

II. Recommended Model Selection for Industry Applications

Chemical Industry: For standard non-explosion-proof chemical pump rooms, circulating water pipelines, and heat exchange pipelines that require on-site pressure monitoring and high/low-pressure alarms, select a stainless steel magnetically-assisted, shock-resistant electric contact pressure gauge with SUS304 wetted parts and silicone oil; if the medium is slightly corrosive, upgrade to SUS316L wetted parts; If pump body vibration is present on-site, use oil-filled damping to suppress pointer oscillation; this standard model must not be used in explosion-proof chemical areas—replace it with an explosion-proof electric-contact pressure gauge.

Power Industry: For pressure monitoring of power plant circulating water pumps, air compressor stations, and lubricating oil auxiliary equipment—where pipeline vibration is significant—select the standard radial model of this instrument; set up low-pressure alarms to protect the lubricating oil circuit and high-

pressure alarms to trigger pressure relief; inspection personnel monitor the dial on-site, while the contacts connect to an intermediate relay integrated into the control system; accuracy is generally Class 1.6, but Class 1.0 can be customized for applications requiring high precision at pressure control points.

Metallurgical Industry: Pressure monitoring for hydraulic stations, cooling water pipelines, and dust removal fans. Given the heavy oil contamination and intense vibration at these sites, silicone oil-filled stainless steel magnetically assisted electric contact pressure gauges are recommended. High-pressure hydraulic applications require a high-pressure range. If the gauge needs to be embedded into the panel of a hydraulic control cabinet, select an axial design with flanges. The magnetically assisted contacts reduce chattering and false triggers, enabling overpressure interlock shutdown.

Pharmaceutical Industry: Chillers, air compressors, and purified water pipelines in non-explosion-proof cleanrooms. These applications require on-site pressure display and over-limit alarms; for contact with purified water, the SUS316L wetted version is recommended. Due to large temperature differentials that can cause fogging, anti-fog glass is available as a customization option. When selecting instruments for clean areas, prioritize designs with easy-to-clean exteriors. Choose this model when the instrument is used solely for on/off interlocks and does not require continuous remote transmission.

Smart Manufacturing Industry: For hydraulic stations and air supply control cabinets on automated production lines, as well as on-site pressure monitoring on equipment panels or pipelines, select stainless steel magnetically-assisted, shock-resistant electric-contact pressure gauges; for multiple production lines with multiple measurement points, configure one gauge per pressure point to provide audible and visual alarms for pressure exceedances; if real-time pressure data transmission to a host computer is required, use a combined solution of “on-site interlocking via this gauge + remote transmission via a pressure transmitter.”

Other Scenarios: For HVAC heat pump stations and standard air compressor stations—where pipeline vibration or humid environments are present—select the standard SUS304 silicone oil model. For installation inside low-temperature cabinets, replace the damping fluid with glycerin. In scenarios where only on-site pressure monitoring is required and no interlock control is needed, simply use a standard shock-resistant pressure gauge without adding an electric contact mechanism.

III. Common Mistakes in Selection

1. Ignoring contact capacity and directly driving high-power contactors. The contact capacity of this instrument is limited—maximum 30 VA for AC and 20 W for DC. Many selection engineers directly connect the contacts to high-power loads, causing rapid contact burnout and sticking, as well as interlock failure. An intermediate relay must be added for isolation.

2. Selecting the wrong pressure range—either with insufficient margin or a range that is too wide. If the range is too wide, the proportion of normal operating pressure is too small, leading to significant errors in alarm point settings; if the range is too narrow, water hammer impact pressure can directly exceed the overload limit, causing the Bourdon tube to undergo plastic deformation and become inoperable; in pulsating pressure conditions, the lack of amplification margin significantly shortens the instrument’s service life.

3. Misuse of standard models in explosion-proof environments. The opening and closing of electrical contacts inside the junction box of standard models can generate arcing. Using such models directly in explosion-proof zones with flammable or explosive media poses significant safety hazards; explosion-proof pressure gauges must be selected for such applications.

4. Confusion between switching signals and analog remote transmission requirements. This instrument only outputs a passive switching signal and does not provide a 4–20 mA analog signal; In some projects, it was only discovered after procurement that real-time pressure values could not be transmitted to the PLC, resulting in the instrument being left idle and requiring the addition of a separate transmitter.

5. Neglecting the medium’s corrosion level while focusing solely on vibration resistance. During selection, attention was focused only on vibration resistance while ignoring the medium’s corrosiveness; using 304-grade material directly in acidic or alkaline media caused the Bourdon tube to corrode and perforate, leading to medium leakage. For corrosive media, the instrument should be upgraded to a 316L model or a diaphragm pressure gauge solution.

6. Incorrect selection of installation configurations. Radial-mount models were procured when the instrument needed to be flush-mounted on the panel of an instrument cabinet; axial-mount models with flanges were selected for direct pipe installation, resulting in installation difficulties, stress-induced bending of the instrument, and accelerated damage to the movement.

IV. Customization Recommendations

1. Customization for Special Media and Scales: For corrosive conditions such as weak acids, weak alkalis, and seawater, SUS316L bourdon tubes and fittings can be customized; for low-temperature applications, replace the damping fluid with glycerin; dual-scale dials (MPa/psi) with added safety warning lines can be customized; non-standard threaded connections such as G1/2 and NPT1/2 can be customized.

2. Customization for Non-Standard Conditions: For viscous media or media containing solid particles, diaphragm isolation assemblies can be provided to prevent impurities from clogging the Bourdon tube; for environments with large temperature differentials prone to condensation, anti-fog glass can be customized; special vacuum and high-pressure ranges can be customized individually; the number of contacts and contact action logic (normally open / normally closed) can be adjusted.

3. Multi-Measurement Point Integration Solutions: For multiple pressure monitoring points within the same control cabinet, we offer unified selection and measurement ranges, with radial and axial configurations tailored to your needs; when a measurement point requires simultaneous on-site pointer display, pressure interlocking, and real-time data upload, we employ a “stainless steel magnetically-assisted shock-resistant electric contact pressure gauge + pressure transmitter” dual-monitoring solution for a single measurement point.

4. Customized Support Services: For bulk orders, nameplates and pre-set alarm points can be customized prior to shipment; product test reports are provided for export projects; complete sets of accessories—including buffer tubes, needle valves, sealing gaskets, and intermediate relays—are available to reduce the workload of on-site parts procurement.

Installation and Commissioning Specifications

I. Pre-Installation Preparation

1. Verification of Components

Unpack the unit and verify the instrument model, range, wetted materials (304/316L), damping medium, and mounting type (radial / axial with flange) to ensure they match the order; Check that the case has no dents or scratches, the glass is intact, and the damping oil level in the dial is normal; ensure the main pointer returns to zero under atmospheric pressure, and that the upper and lower limit adjustment screws operate smoothly.

Inspect accompanying accessories: sealing gaskets, needle valves, buffer tubes (optional for pulsating pressure), cables, intermediate relays, and terminal blocks; verify that the pressure relief port on the back is unobstructed.

2. Environmental Inspection

Confirm the ambient temperature at the installation location: Silicone oil models – 25°C to +70°C; Glycerin models – 5°C to +70°C; relative humidity 5% to 85% RH, with no persistent condensation; Keep the unit as far as possible from sources of strong vibration, such as pumps, motors, and variable frequency drives; if this is not possible, use vibration-damping hoses for the pressure-taking lines; Avoid high-temperature radiation and exposure to corrosive gas splashes; Ensure sufficient space is reserved for viewing the dial and for wiring and maintenance; standard models must not be installed in explosion-hazardous areas.

3. Tool List

Adjustable wrench, fixed hex wrench (for gripping the hex socket of the fitting only), small flathead screwdriver (for zero-point and upper/lower limit adjustment), PTFE tape / PTFE gaskets, pressure gauge calibration stand (optional), multimeter, wire strippers, electrical tape, safety goggles, work gloves; pipeline purging tools.

4. Safety Precautions

Before performing piping work or installing/removing instruments, the pressure-conducting lines must be depressurized; it is strictly prohibited to install or remove pressure gauges under pressure. Wear appropriate protective equipment when working with high-pressure or corrosive media.

Purge the pressure-conducting lines in advance to remove welding slag, rust, and other impurities to prevent contaminants from entering the Bourdon tube and causing the pointer to jam.

A condensation bend must be installed for high-temperature media; a buffer pipe must be installed at the front end of pump and air compressor circuits with significant pressure pulsations to reduce pressure surges.

A safety clearance must be maintained in front of the pressure relief port on the back of the pressure gauge; the relief port must not face the operator's work area.

Electrical wiring work must be performed with the power disconnected; contact circuits must be isolated using an intermediate relay; instrument contacts must not be used to directly drive high-power contactors.

II. Standard Installation Procedures

1. Mechanical Piping Installation

--- Radial Model: Install directly on the pipe pressure tap; for the axial model with flanges, cut a hole in the instrument cabinet panel, insert the gauge from the front of the panel, and secure it by tightening the flanges on the back.

-- Threaded Connection: Connect the pressure-taking pipe to the M20×1.5 thread on the back of the pressure gauge; **use a wrench to tighten only the hexagonal part of the fitting—do not rotate the gauge case** to prevent displacement or damage to the internal movement and electrical contact assemblies.

--- Wrap the threads with PTFE tape; do not push the tape into the root of the threads to prevent debris from blocking the pressure-sensing channel. Install a sealing gasket to ensure a tight seal.

--- It is recommended to install a three-way needle valve at the front end to facilitate isolation, pressure relief, and on-site calibration; install a buffer pipe or damper in pulsating operating conditions.

2. Electrical Wiring

--- Open the side-sealed junction box; secure the cable through the stuffing box and tighten the seal. The terminal blocks are divided into a common terminal, upper limit contact, and lower limit contact.

--- Connect the passive dry contacts to the intermediate relay coil circuit; **apply the AC 220 V/DC 24 V power supply to the relay side—the instrument only transmits on/off switching signals**.

--- Once wiring is complete, tighten the stuffing box to ensure the junction box is sealed and meets IP65 protection requirements.

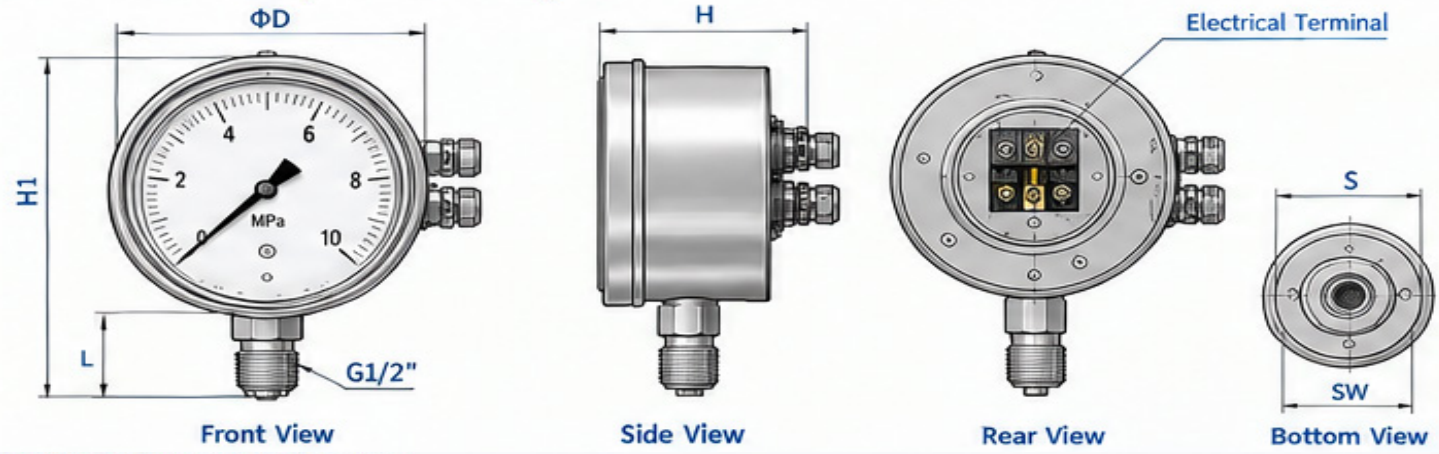
3. Grounding Requirements: The instrument body does not require grounding; the metal enclosure must be grounded for protection in accordance with electrical standards. The enclosure grounding must be independent and not connected to the measurement medium circuit.

III. Written Explanation of the Wiring Diagram

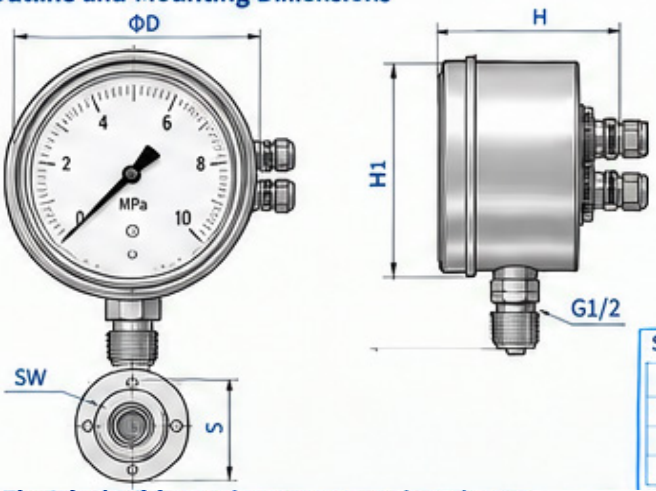
> ☒ Correct Wiring: The meter contacts are connected in series with the intermediate relay coil; the main circuit is controlled by the relay contacts to activate the audible and visual alarms and the contactor; the cable is secured in the stuffing box, and the junction box is sealed.

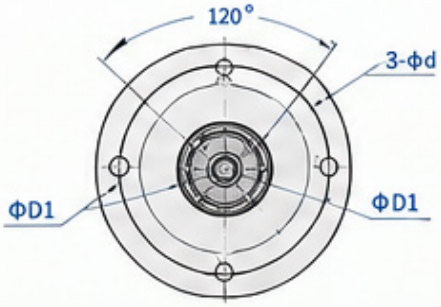
> ☒ Incorrect Wiring: Using the instrument's contacts to directly drive a high-power contactor; not using a relay; cables not sealed, allowing moisture to enter the junction box; loose wire connections at terminals and exposed bare wires.

1. Overall Assembly Structure Diagram



5. Outline and Mounting Dimensions

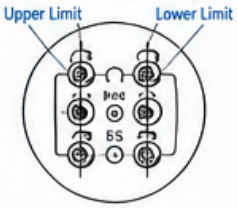




Size (mm)

Model	D	D1	H	H1	L	S	SW	d
Φ60	60	52	42	106	20	22	24	5
Φ100	100	90	52	138	25	27	32	6
Φ150	150	130	62	168	25	32	41	7

6. Electrical Wiring and Contact Operation Diagram



Terminal Definition

Terminal No.	Function	Description
1	Upper Limit NO	Normally Open
2	Upper Limit NC	Normally Closed
3	Lower Limit NO	Normally Open
4	Lower Limit NC	Normally Closed

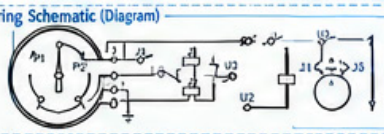
Contact Operation



Wiring Notes

1. Please confirm the terminal function before wiring.
2. Use shielded cable for signal wiring.
3. Ensure correct power supply voltage.
4. Do not exceed the rated current.

Wiring Schematic (Diagram)



1 (Yellow) : Common
2 (Green) : Lower Limit
3 (Red) : Upper Limit

Note: This drawing is for reference only. The actual structure, dimensions and parameters are subject to the actual product.

IV. Commissioning and Calibration Procedure (Replacing Power-On Calibration)

1. No-Load Zero Point Check: Depressurize the pipeline to atmospheric pressure and observe whether the main pointer aligns with the zero mark; if there is a zero-point deviation, use a flathead screwdriver to adjust the dial's zero-point screw to correct it.

2. Setting Alarm Thresholds: According to process requirements, rotate the dial adjustment screw to set the upper and lower limit pointers to the target pressure values.

3. Slow Pressure Increase Test: Slowly open the front needle valve to gradually introduce medium pressure; do not fully open the valve at once to avoid pressure surges. Observe that the pointer rises smoothly without sticking or sudden jumps.

4. Contact Operation Verification: Increase the pressure to the set point. Use a multimeter to measure contact closure and break to confirm that the contacts switch reliably when the set pressure is reached; the contacts should reset normally as the pressure drops. Repeat the test 2–3 times to confirm there is no chattering or false triggering.

5. Indication Calibration (Optional): Connect an external standard pressure source and compare readings at multiple points—zero, 50% FS, and 75% FS—to ensure the error meets Class 1.6 accuracy requirements; affix a calibration label upon completion.

6. Leak Test: Maintain pressure for a period of time and check for medium leakage at threaded joints and gaskets; if leakage is detected, relieve pressure and retighten the seals.

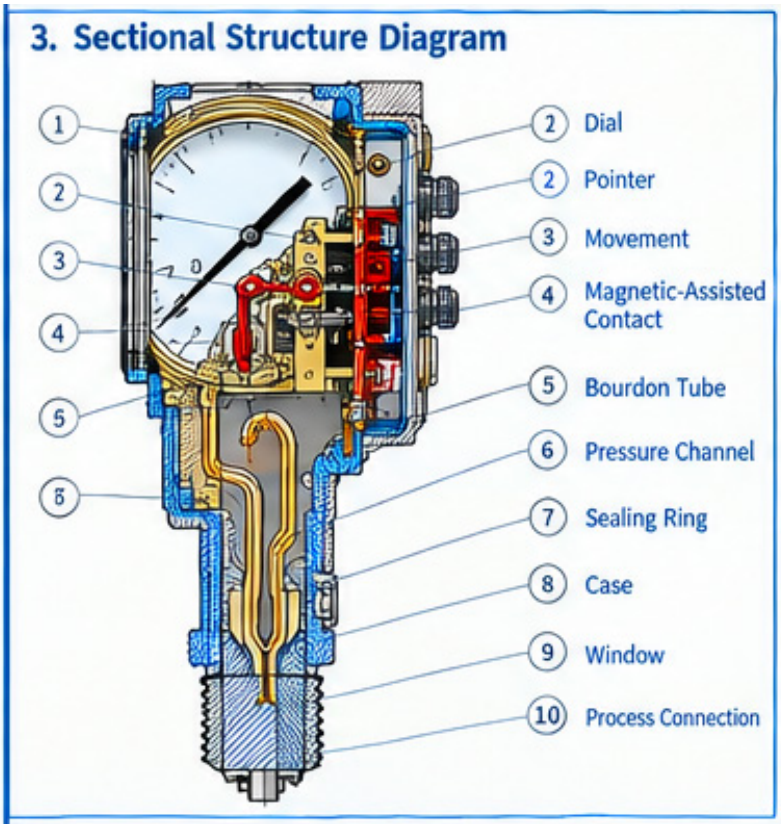
V. Installation Precautions

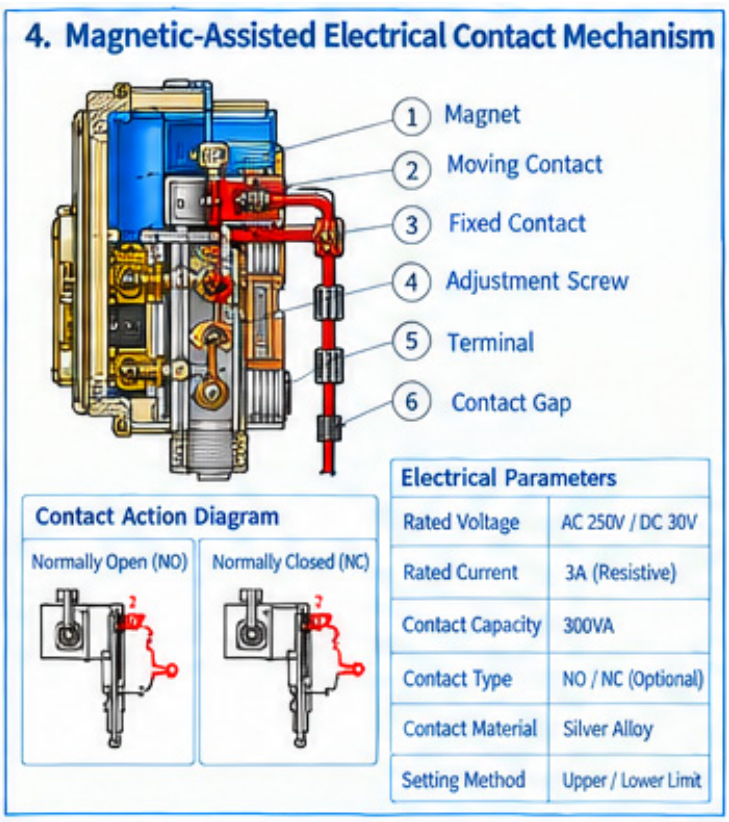
1. Instantaneous overpressure shocks are strictly prohibited during startup: Do not rapidly fully open the valve, as instantaneous pressure shocks can cause permanent deformation of the bourdon tube; under stable operating conditions, the long-term working pressure must not exceed 75% of the full scale (FS), and under pulsating conditions, it must not exceed 60%.

2. Avoid Rigid Transmission of Severe Vibrations: Do not rigidly mount the instrument directly to the pump body or air compressor housing. Use stainless steel vibration-damping hoses for pressure-taking sections at points subject to severe vibrations; otherwise, prolonged vibration may cause silicone oil leakage, chattering of electrical contacts leading to malfunctions, and wear on the movement.

3. Protection in Humid Environments: Install a heater in cabinets where condensation is likely to occur; if the instrument glass fogs up, opt for a custom version with anti-fog glass; do not subject the instrument to prolonged spraying or immersion; keep the junction box properly sealed to prevent moisture from corroding the terminals.

4. Other Prohibitions
--- Do not directly measure high-temperature media exceeding the upper temperature limit of the medium; do not connect to steam pipelines without a condensation bend;
--- Do not use the instrument directly with viscous media or media containing solid particles unless a diaphragm isolation device is installed;
--- Do not open the instrument case to release the damping silicone oil;
--- Do not tap the dial to forcibly reset the pointer;
--- Do not connect the instrument contacts directly to high-power loads without using an intermediate relay, as this can easily cause contact burnout.





Recommendations for Daily Use & Operations and Maintenance

I. Key Points for Routine Inspections
Inspection frequency is categorized by operating conditions: routine pump rooms and cleanrooms are inspected monthly; metallurgical facilities, hydraulic stations, and environments with high vibration and heavy oil contamination are inspected every two weeks; critical locations involving equipment protection interlocks and safety alarms are inspected weekly.

1. Visual Inspection of Exterior: Check the stainless steel case for dents or deformation and the glass panel for cracks; observe the level of damping fluid in the dial—cloudy fluid or a significant drop in level indicates a seal leak; verify that the main pointer returns to zero under atmospheric pressure; inspect the dial for accumulated dust and oil residue. Distinguish between silicone oil and glycerin models; in low-temperature environments, pay close attention to whether the glycerin damping fluid has solidified and turned white.

2. Pressure Reading and Contact Status Monitoring: Compare the pressure gauge readings with the equipment's process conditions; observe that the pointer moves smoothly, without persistent trembling, sticking, or jumping. In conditions with strong pulsations, the damping fluid stabilizes the pointer; if the pointer continues to tremble violently, inspect the condition of the front-end buffer pipe and vibration-damping hose. Periodically manually trigger the process pressure to confirm that the upper and lower limit contacts operate normally and that there are no frequent false alarms.

3. Environmental Temperature and Humidity Monitoring: For silicone oil models, maintain an operating ambient temperature of -25°C to +70°C; for glycerin models, -5°C to +70°C. Keep relative humidity between 5% and 85% RH, ensuring no persistent condensation. Conduct thorough inspections during seasonal transitions when temperature fluctuations are significant. If condensation occurs, promptly activate the cabinet's heating and dehumidification system to prevent oxidation and corrosion of terminals inside the junction box.

4. Inspection of Pressure-Transmitting Piping and Fittings: Check threaded joints and gasket positions for media leaks; ensure pressure-transmitting pipes, needle valves, and buffer tubes show no signs of corrosion or deformation, and that the piping is free of blockages; at locations subject to strong vibrations, pay special attention to vibration-damping hoses to check for fatigue cracks.

5. Electrical Junction Box Inspection: Verify that the junction box packing gland is securely tightened with no signs of water or dust ingress; ensure that terminals are not loose or oxidized and discolored; and check that the cable sheath is free of damage.

6. Operating Load Inspection: Under steady-state conditions, the long-term operating pressure should not exceed 75% of the full scale; under pulsating or shock conditions, it should not exceed 60% of the full scale. Avoid prolonged operation near full scale to prevent plastic deformation of the Bourdon tube.

II. Regular Maintenance Plan

1. Before performing maintenance, close the pressure-taking needle valve and relieve pressure from the pressure-taking lines; before performing electrical maintenance, the power supply to the contact circuit must be disconnected; when handling corrosive media, wear the appropriate protective equipment. Distinguish between the standard SUS304 wetted parts and the corrosion-resistant SUS316L version, and follow the specific maintenance procedures for silicone oil and glycerin damping versions.

2. Cleaning Frequency: Clean once every 6 months in standard indoor environments; clean once every 3 months in metallurgical or pump room environments with heavy dust or oil contamination. Use only a dry, lint-free soft cloth to wipe the case and glass surfaces; never rinse the instrument directly with a high-pressure water jet, and do not use highly corrosive cleaning agents; do not disassemble the case without authorization, as opening the case may cause damping oil leakage or displacement of electrical contact components, resulting in the loss of warranty.

3. Mechanical and Electrical Fastening Inspection: Inspect the pressure gauge connections, panel mounting nuts, and front needle valves every six months; shorten this interval to three months for environments with severe vibration. When tightening, grip only the hexagonal section of the pressure gauge connection; do not rotate the gauge body to prevent displacement of the internal movement and magnetically assisted electrical contact assemblies. For the electrical components, inspect the terminal blocks, tighten any loose cables, and replace terminals if they show severe oxidation; check the stuffing box seals and replace aged seals promptly.

4. Recommendations for Accuracy and Contact Retesting: Measurement points for safety interlocks and process protection should be calibrated once a year; for general patrol and alarm scenarios, calibration may be performed once every 1–2 years; for monitoring points associated with special equipment, follow the calibration cycles specified by local special equipment regulations. Calibration consists of two parts: pressure reading calibration (zero point, 50% FS, 75% FS); and contact operation calibration to confirm that the contacts reliably close and open at the set pressure without chattering. Upon completion of calibration, fill out the record and affix the calibration label; calibration of the glycerin low-temperature model must be performed at a suitable ambient temperature, as increased viscosity at low temperatures can affect readings.

5. Damping Oil and Contact Inspection: During each calibration, simultaneously inspect the condition of the damping oil. If the oil appears black, contains a large number of bubbles, or the liquid level has dropped, this indicates a seal failure; the unit must be returned to the factory for repair, as oil cannot be replenished on-site. Inspect the contacts for signs of burning or blackening; if contacts are stuck or exhibit poor contact, the unit must be returned to the factory for repair.

6. Spare Parts Inventory Management: Establish an instrument inventory ledger to record model, range, wetted materials, damping medium, installation location, and all previous inspection and calibration records; keep spare instruments on hand for critical interlock points to facilitate rapid replacement in the event of a failure.

III. Long-Term Maintenance Tips

1. Dust and Moisture Protection: Keep instrument cabinet doors closed to minimize dust ingress; install temperature-controlled heaters in cabinets prone to condensation due to large temperature differentials; insulate pressure-taking lines to prevent medium condensation; in operating conditions where instrument glass is prone to fogging, use custom anti-fog glass versions. When instruments are removed for long-term storage, place them in a dry environment with a storage temperature range of -40°C to +80°C, away from corrosive gases.

2. Vibration Damping Optimization: For measurement points subject to strong vibrations—such as pumps and air compressors—use stainless steel flexible vibration-damping hoses to isolate the pressure-taking section, avoiding rigid connections; install buffer tubes or dampers at the instrument inlet to reduce the impact of medium pulsations; inspect vibration-damping hoses regularly and replace them promptly if cracks appear.

3. Protection in Extreme Environments: For high-temperature media piping, a condensation elbow must be installed to prevent direct contact between the high-temperature medium and the Bourdon tube; in low-temperature environments, select a glycerin-filled version; for corrosive media, use SUS316L wetted parts, and in severely corrosive conditions, install a diaphragm isolation device; in high-pressure conditions, ensure sufficient safety clearance is reserved for the rear pressure relief port, and the relief port must not face the operator's workstation.

4. Operating Condition Management: Whenever possible, maintain normal operating pressure within the 30%–75% range of the full scale, and limit pulsating pressure surges to 30%–60% of the full scale to preserve the Bourdon tube's elasticity; avoid frequent and severe pressure surges; for pipelines carrying media containing impurities, periodically purge the pressure-transmitting lines to prevent solid particles from entering the Bourdon tube and causing needle jamming.

5. Electrical Circuit Maintenance: Ensure that the intermediate relays in the contact circuit remain in good working order; periodically inspect the condition of the relay coils and contacts; avoid excessive voltage fluctuations in the circuit; and regularly clean dust from the junction box to prevent terminal short circuits.

6. Operation and Maintenance Prohibitions: Do not disassemble or install the pressure gauge while it is under pressure; do not tap the case to calibrate the pointer; do not open the case without authorization to add oil or adjust the internal magnet; do not operate the gauge beyond its full scale range for extended periods; during calibration, increase pressure slowly—do not apply pressure rapidly; strictly prohibit removing the intermediate relay and using the instrument's contacts to directly drive high-power loads.

Troubleshooting & Emergency Response

I. List of Common Malfunctions

1. The pressure-increase pointer does not move, and the pressure-release pointer cannot return to zero (indicating no output): When pressure in the pipeline increases, the main pointer on the dial does not follow the pressure changes; after pressure is released, the main pointer remains at a certain scale and cannot return to zero.

2. Reading drift, large deviation from pressure control setpoint (corresponding to signal drift): When compared to a standard pressure source, the pressure gauge reading exceeds the allowable error for its accuracy class; the reading slowly drifts under stable operating conditions; the set alarm pressure does not match the actual trigger pressure.

3. Contact misoperation/failure to operate (alarm malfunction): Contacts open or close randomly without the pressure reaching the set value, causing false alarms; when the pressure reaches the set value, the contacts do not switch, failing to trigger alarms or interlocks.

4. Continuous Pointer Jitter or Jamming (Interference Distortion): Under stable pressure conditions, the pointer oscillates continuously or jumps erratically; during operation, the pointer gets stuck at a specific scale mark and cannot move.

5. Damping Oil Leakage: The oil level inside the dial drops; the oil becomes cloudy and foamy; silicone oil seeps from the case or glass.

II. Analysis of Failure Causes

1. Pressure-transmitting line faults: The front-end needle valve is closed, or the pressure-transmitting line is blocked; a leak in the line prevents pressure from being transmitted to the gauge; welding slag or impurities from the line enter the Bourdon tube, causing it to jam.

2. Pressure overload or shock: Water hammer or start-stop pressure surges exceed the gauge's allowable overload limit, causing plastic deformation of the Bourdon tube and a permanent zero-point shift.

3. Vibration and Electrical Circuit Issues: Rigid connections allow continuous transmission of equipment vibration, causing contact chattering and false triggering; failure to install an intermediate relay results in contacts directly driving high-power loads, leading to contact arc erosion and sticking; loose wiring and oxidized terminals cause poor circuit contact.

4. Environmental Factors: Condensation and moisture inside the cabinet cause corrosion and short circuits at wiring terminals; at low temperatures, glycerin damping fluid solidifies, affecting pointer movement; medium corrosion causes perforation and leakage in the bourdon tube.

5. Damage to the Instrument Body: Internal gears and hairsprings become jammed; the magnetically assisted electrical contact assembly shifts out of position; seal failure leads to oil leakage; rotating the case during installation damages the movement and electrical contact structures.

III. Step-by-Step Troubleshooting

Fault 1: The pressure gauge needle does not move, and the depressurization needle cannot return to zero
Troubleshooting Steps:
1. Close the front needle valve, depressurize the pressure-transmitting line, confirm the valve status, and check whether the needle valve was accidentally closed.
2.After depressurizing the line, inspect the pressure-transmitting line and blow out any welding slag or impurities.
3. Observe the pointer under atmospheric pressure and attempt to make slight adjustments to the zero-point screw; if the pointer remains completely stationary, this indicates that the Bourdon tube is blocked or the movement is jammed.

Repair Measures: Blockages in the pressure-transmitting lines can be cleared on-site by purging; if impurities have entered the instrument's interior and caused the pointer to jam, on-site repair is not possible, and the instrument must be returned to the factory.
Emergency Workaround: Remove the faulty instrument and replace it with a spare stainless steel magnetically-assisted shock-resistant electric-contact pressure gauge; For temporary operation, install a buffer tube and needle valve at the inlet to ensure pressure display and interlock functions.

Fault 2: Indication drift; alarm trigger pressure deviation exceeds limits
Troubleshooting Steps:
1.Depressurize the piping, check the zero point, and calibrate it using a flathead screwdriver.
2. Connect to an external standard pressure calibration bench for multi-point comparison to verify whether the instrument has been subjected to prolonged pressure surges.
3.Check for corrosion in the medium and inspect the connections and Bourdon tube for leaks.

Remedial Measures: A simple zero-point offset can be corrected on-site; however, if the Bourdon tube has undergone plastic deformation or corrosion-induced perforation, on-site repair is not possible, and the instrument must be returned to the factory for repair or replacement.
Emergency Workaround: Directly replace the instrument at critical interlock measurement points with a spare; remove the faulty instrument for calibration and offline repair.

Fault 3: Contact Malfunction / Contact Fails to Activate Upon Reaching Set Pressure
Troubleshooting Steps:
1.Turn off the power, open the junction box, and check the terminal blocks for looseness or oxidation; verify that the intermediate relay is in good condition.
2. Use a multimeter to test the contact continuity and slowly increase the pressure to test the contact switching.
3. Check for vibration at the site to determine if vibration is causing the contacts to chatter.

Remedial Actions: Retighten any loose connections; replace terminals if they are severely oxidized; if the contacts are burned or stuck, or if the magnetic assist assembly is misaligned—and on-site repair is not possible—return the unit to the factory for repair; install vibration-damping hoses or buffer tubes at locations with significant vibration.

Emergency Workaround: Temporarily bypass the interlock circuit and switch to manual monitoring; replace the instrument with a spare unit as soon as possible to restore the automatic alarm interlock.

Fault 4: Continuous needle fluctuation, needle jumping, or sticking
Troubleshooting Steps:
1. Determine whether the issue is caused by fluid pulsation or the transmission of rigid vibrations from the equipment.
2. Inspect the installation method to confirm whether there is a rigid connection or a lack of vibration-damping hoses or buffer pipes.
3. Observe the damping oil in the dial; a lack of oil or a large number of air bubbles indicates that the damping has failed.

Remedial Measures: Install a buffer pipe if the pulsation is caused by the medium; install a stainless steel vibration-damping hose if the pulsation is caused by rigid piping; if there is a leak in the damping fluid, the instrument must be returned to the factory for repair.
Emergency Workaround: Temporarily reduce the pump's output pressure to minimize pulsation and reduce the impact of vibration; replace the instrument with a spare unit as soon as possible.

Fault 5: Oil Leak from the Case, Declining Oil Level
Troubleshooting Steps:
Visually inspect the case and glass area for silicone oil seepage and check for a drop in the oil level inside the dial.

Remedial Measures: The seal has failed; oil cannot be replenished on-site. The instrument must be returned to the factory for repair or replaced directly.
Emergency Workaround: Stop using the leaking instrument and immediately replace it with a spare pressure gauge to prevent safety risks caused by medium leakage.
General Troubleshooting Sequence: Depressurize → Inspect valves and pressure-taking lines → Check zero point → Inspect wiring and relay circuits → Verify vibration/shock conditions → Determine if the instrument body is damaged.
Safety Reminder: Always depressurize before mechanical disassembly or assembly; always disconnect power before servicing electrical circuits.

IV. After-Sales Repair Guidelines
1. Criteria for Determining Malfunctions (If any one criterion is met, the instrument is deemed to have a hardware malfunction, and a repair request should be submitted)

1. The pressure-sensing tubing is unobstructed and the pressure is normal, yet the pointer is stuck and will not move, and zero-point adjustment is ineffective;
2. The pressure calibration reading consistently exceeds the tolerance range; the Bourdon tube exhibits plastic deformation; and the issue cannot be resolved by zero adjustment;
3. The case is leaking, and the damping oil has leaked out;
4. The contacts are burned and stuck together, or the magnetic assist assembly is damaged, resulting in the contacts failing to switch when the pressure reaches the set point or frequent false triggers;
5. The internal movement gears are jammed, or the hairspring is damaged.

> Note: Blocked pressure supply lines, accidentally closed valves, incorrect range selection, improper installation, water hammer impacts at the site, contact burnout due to failure to install an intermediate relay, and damage caused by medium corrosion are not considered manufacturing defects and are not covered by the free warranty.

2. Repair Process
1. Collect basic information: product model, measurement range, wetted materials (304/316L), damping medium, serial number, on-site operating conditions, fault symptoms, and calibration records.
2. Take and save photos: photos of the instrument nameplate, the faulty dial, and the installation piping and junction box.
3. Contact technical support to submit a description of the fault and the collected materials; a technician will provide remote assistance to troubleshoot the issue. If on-site repair is not possible, a return address will be provided.
4. Remove the instrument, pack it securely, and mail it back, including a note describing the fault inside the package;
5. After factory inspection is complete, the instrument will be repaired or replaced and returned; reinstallation must be performed only after the pipeline has been depressurized and the circuit de-energized.

3. Warranty Coverage
Warranty Period: 12 months from the date of manufacture.
Warranty Coverage: Manufacturing defects in the product itself; hardware failures occurring under proper installation and rated operating conditions will be repaired or replaced free of charge.

Exclusions from Free Warranty Coverage:
--- Disassembly or installation under pressure; damage to the movement or electrical contact components caused by rotating the meter case during installation;
--- Damage caused by overpressure, water hammer, medium corrosion, or blockage by impurities;
--- Unauthorized opening of the meter case, adjustment of internal magnets, or intentional draining of oil;
--- Impact from external forces or broken glass;
--- Contact burnout caused by directly driving high-power loads without installing an intermediate relay;
--- Meters beyond the warranty period.