# WS9050 Temperatrue Transmitter

## I. Product Definition

The WS9050 is a fully isolated temperature transmitter designed specifically for PT100 resistance thermometers. As an industrial signal isolation and conditioning instrument, its core function is to isolate and convert the weak resistance signal from the PT100 into a standard industrial signal (such as 4–20 mA or 0–5 V), thereby enabling reliable acquisition and remote transmission of temperature signals.

1.2 Core Functions

--- Electrical Isolation: Complete electrical isolation between the input, output, and power supply terminals, eliminating ground loops and suppressing common-mode interference.

--- Signal Conversion: Linearizes the non-linear resistance signal from the PT100 into standard current/voltage signals, compatible with control systems such as PLCs and DCS.

--- Interference Resistance: Built-in filtering and long-line compensation resist electromagnetic interference in industrial environments, ensuring stable long-distance transmission.

--- Signal Conditioning: Includes constant-current excitation, linearization, and temperature drift compensation to enhance measurement accuracy and stability.

## II. Working Principle

1.1 Core Process: Input → Isolation → Processing → Output

1.2 Signal Input: The PT100 thermoresistor generates varying resistance values with temperature changes (0°C = 100Ω). The transmitter applies a constant 1.2V excitation voltage to capture this weak resistance signal.

1.3 Three-Port Isolation: Utilizing opto-electrical or magneto-electrical isolation technology, the input side (PT100), output side (control system), and power supply side are made completely electrically independent, with no direct electrical connections, thereby completely blocking the transmission of interference.

2.0 Signal Processing

1. Linearization: Corrects the non-linear characteristics of the PT100 to output a signal strictly proportional to temperature.
2. Amplification and Conditioning: Amplifies the weak resistance signal to a standard level suitable for industrial transmission.
3. Long-Line Compensation: Offsets transmission line resistance errors to support stable transmission over long distances (hundreds of meters).
4. Temperature Drift Compensation: Offsets temperature drift in internal components to ensure accuracy.
5. Signal Output: Outputs standard industrial signals such as 4–20 mA, 0–5 V, and 1–5 V for direct integration into control systems.

Core Advantages of Three-Terminal Isolation

---Completely eliminates signal drift and data fluctuations caused by ground potential differences.

---Protects downstream PLCs/instruments, preventing equipment damage caused by front-end sensor failures (e.g., short circuits, overvoltage).

---Meets the requirements of harsh industrial environments, such as explosion-proof zones and high electromagnetic interference (e.g., near inverters or motors).

## III. Core Value

1. Stable Transmission: Resolves the pain points of “signal distortion and unstable transmission”

Without an isolator: PT100 is directly connected to the system, making it susceptible to ground loops and electromagnetic interference, resulting in signal drift and glitches. Over long distances (>50 meters), errors are significant, and data may even fail to be collected.

With the WS9050: Three-terminal isolation + filtering + long-line compensation ensure stable signals without drift. The 4-20mA output can be transmitted over hundreds of meters with an accuracy of ±0.2%, making it suitable for complex industrial environments.

2. Protecting Equipment: Mitigating the Risk of “Equipment Damage and System Downtime”

Without an isolator: Sensor short circuits, overvoltage, lightning strikes, etc., can directly damage the PLC or instrument input ports, resulting in equipment failure and system shutdown.

With the WS9050: Isolation strength reaches 1500 VDC for 1 minute, insulation resistance ≥100 MΩ. Front-end faults are completely isolated, posing zero risk to downstream equipment and extending the lifespan of the control system.

3. Extended Lifespan: Reducing “Maintenance Costs and Equipment Wear”

Without an isolator: Long-term exposure to interference and overvoltage surges accelerates the aging of sensors and control systems, resulting in high failure rates and the need for frequent repairs and replacements.

With the WS9050: Isolation protection and stable signals reduce electrical stress on equipment, lower maintenance frequency, extend the overall system lifespan, and reduce operational and maintenance costs.

4. Explosion-Proof Compliance: Meets requirements for “high-risk environments and industry standards”

Without an isolator: Non-isolated design cannot disconnect hazardous circuits, failing to meet explosion-proof regulations for chemical, petroleum, and coal mining applications, posing safety hazards.

With WS9050: Three-terminal isolation + CE certification, compliant with industrial explosion-proof and electrical safety standards, suitable for high-risk conditions involving flammable/explosive materials and strong electromagnetic interference.

5. High Adaptability: Resolves “Signal Incompatibility and Integration Difficulties”

Without an isolator: PT100 resistance signals are non-standardized and cannot be directly connected to mainstream control systems, requiring additional custom interfaces and making integration complex.

With the WS9050: Outputs universal standard signals such as 4-20mA and 0-5V, offering plug-and-play functionality and seamless integration with PLCs, DCS systems, recorders, and other devices, thereby simplifying system integration.

## IV. Basic Electrical Parameters

4.1 Input Signal

Input Type: 3-wire PT100 thermoresistor (2-wire/4-wire customization available)

Temperature Measurement Range (Standard):

A：-20℃ ～ 100℃
B：0℃ ～ 100℃
C：0℃ ～ 150℃
D：0℃ ～ 200℃
E：0℃ ～ 400℃
S: User-customized range

Excitation Method: Constant current 0.8 mA / Constant voltage 1.2 V

Input Line Resistance: ≤100 Ω (Max)

Open-Circuit Indication: Outputs ≥25 mA when RTD is open-circuited (4–20 mA type)

2. Output Signal

Standard Output:

1：-1 ～ 5V
2：0~10V
3：0 ～ 5V
4：0 ～ 10mA
5：4 ～ 20mA
6：0 ～ 20mA
S: User-defined

Load capacity:

Current type (4–20 mA): 0–500 Ω

Voltage type (0–5 V/1–5 V): ≥10 kΩ

Accuracy class: ±0.1% (typical) / ±0.2% (Standard)

3. Input Impedance

RTD Input: Constant current drive 0.8mA, compatible with full-range PT100

4.2 Isolation Performance Parameters

1. Isolation Architecture

3-terminal full isolation: Input / Output / Power supply are electrically independent of each other, with no direct connections

2. Isolation Strength

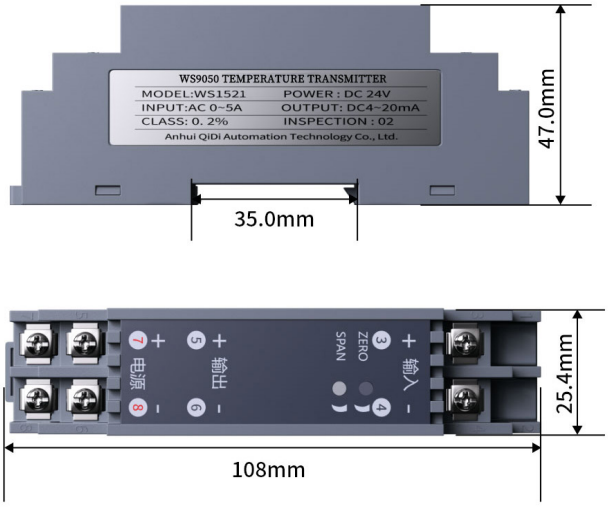
Dielectric strength: 1500 VDC/1 minute (between input–output–power supply)

Insulation resistance: ≥100 MΩ @ 500 VDC
3. Immunity and Response
Electromagnetic Compatibility: Complies with IEC 61326-3 industrial EMC standards; resistant to strong interference from inverters, motors, etc.
Response Time: <300 ms (typical) / <20 ms (high-speed type)
Temperature Drift: <100 ppm/°C (≤±0.01% FS/°C)

4.3. Power Supply & Power Consumption Parameters
1. Supply Voltage
Standard: 24 VDC ±10% (21.6–26.4 V)
Wide-voltage Customization: 12–32 VDC (optional)
2. Power Consumption
Full-load Power Consumption: ≤0.72 W (maximum)Operating Current: <40 mA @ 24 VDC (when outputting 20 mA)
3. Power Supply Output (Optional)
Supports 24VDC power supply for two-wire PT100 sensors, with a maximum load of 50mA

4.4 Environmental Parameters1.
Temperature and Humidity
Operating Temperature: -20°C to +55°C
Storage Temperature: -40°C to +85°C
Operating Humidity: 5% RH to 95% RH (non-condensing)
Storage Humidity: ≤95% RH (non-condensing)
2. Protection and Explosion-Proof Rating
Protection Rating: IP20 (DIN rail mounting, indoor use)
Explosion-Proof Rating: Intrinsically Safe Ex ia II C T4 Ga (can be used with safety barriers)
Compatible Safety Barriers: Qidian WS9000 Series / Universal Intrinsically Safe Barriers

4.5. Physical Parameters
1. Mounting Method
Standard: 35mm DIN rail clip-on (T-type rail)
Mounting Orientation: Vertical or horizontal
2. Dimensions (mm)
Length × Width × Height: 108×22.5×104 (Standard 15mm pitch rail type)
Pin Pitch: Standard 5.08mm
3. Weight and Materials
Weight: Approx. 120 g
Housing Material: Flame-retardant ABS+PC engineering plastic, UL94 V-0
Terminals: Gold-plated copper alloy, withstands ≥500 insertion/removal cycles
4. Indicator Light Definitions
PWR (Green): Steady on when power is normal; flashes during a fault
ALM (Red): Lights up when input is open-circuit or out of range




**V. Selection Guide**
5.1 Five Core Criteria for Selection
1. Signal Type Selection
When connected to a PLC/DCS/recorder: Prioritize 4-20mA current output (interference-resistant, suitable for long-distance transmission)
When connected to a meter or data acquisition module over short distances: 0-5V or 1-5V voltage output is acceptable
When multiple inverters, motors, or high-power equipment are present on-site: Three-terminal fully isolated models must be selected; non-isolated simple modules are strictly prohibited
2. Selecting the Number of Channels
Standard single-point temperature measurement: 1 input, 1 output (standard WS9050 base model)
One temperature signal distributed to two backup systems (DCS + PLC / Local + Remote): Select the 1-input, 2-output isolated model
Centralized multi-point temperature measurement: Prioritize multi-channel temperature acquisition modules; stacking individual units is not recommended as it wastes cabinet space
3. Power Supply Determination
Most industrial cabinets: Standard 24 VDC power supply (compatible with common on-site UPS/switching power supplies)
Legacy equipment/special cabinets: Customizable wide-voltage 12–32 VDC adapters available
Locations without external power supply: This model is not recommended; use passive temperature transmitter modules instead
4. Explosion-Proof Safety Requirements
Standard factories, electrical/mechanical cabinets, pure water systems, HVAC: The general-purpose isolated version is sufficient.
Chemical, oil and gas, dusty environments, pharmaceutical explosion-proof zones: Must select the intrinsically safe explosion-proof version + matching safety barrier; mixing with standard versions is strictly prohibited.
5. Installation Environment Selection
Indoor electrical control cabinets, temperature-controlled environments: Standard version
High-temperature workshops, near furnaces, metallurgical sites: Strictly control operating temperature (temperatures >55°C require prior approval for custom high-temperature/wide-temperature models)
Humid or condensation-prone environments: Increase sealing protection; prioritize cabinet dehumidification; standard IP20 rating does not allow direct outdoor installation

5.2 Common Misconceptions in High-Frequency Selection
Misconception 1: Ignoring isolation levels and arbitrarily purchasing standard modules
On-site applications with variable frequency drives (VFDs) or high-power motors that do not use three-terminal isolation → Signal fluctuations, data drift, and occasional disconnections; extremely high costs for subsequent rectification.
☒ Recommendation: In industrial high-voltage environments, always default to full isolation.
Misconception 2: Randomly selecting PT100 ranges, resulting in mismatched temperature measurement ranges
Actual on-site temperature is 400°C, but a 0–200°C range is selected → Out-of-range alarms and measurement failure.
☒ Recommendation: Add a 20% margin based on the highest on-site temperature and pre-configure the range.
Misconception 3: Ignoring load matching; 4–20 mA signal cannot drive downstream devices
Too many instruments connected to the current output, exceeding the 500 Ω load limit → Signal attenuation and accuracy drift.
☒ Recommendation: When connecting multiple devices in parallel, prioritize using a signal distributor; do not force overloading.
Misconception 4: Mixing standard non-explosion-proof models in explosion-proof environments
Installing general-purpose isolators in explosion-proof zones is non-compliant, will fail safety inspections, and poses significant safety hazards.
□ Strict Requirement: Explosion-proof zones = explosion-proof-rated models + matching safety barriers; both are essential.
Misconception 5: Direct Installation in Outdoor / High-Humidity Environments

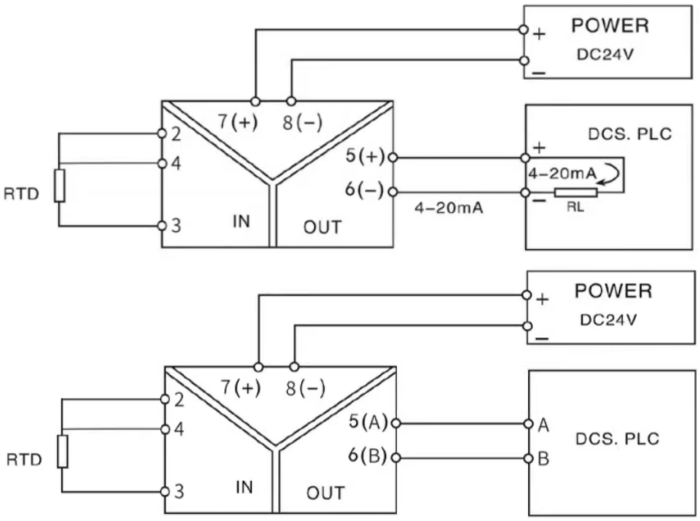
This unit has an IP20 rating and is only suitable for cabinet installation; direct outdoor installation will allow water and condensation to enter, rapidly damaging the terminals and mainboard.

5.3 Customized Upgrade Solutions
--- Custom Signal Configuration
Non-standard voltages, special measurement ranges, sub-zero temperatures, and high temperatures exceeding 400°C can be accommodated through dedicated calibration programs.
--- Customization for Extreme Conditions
Wide temperature tolerance (high and low), high-humidity corrosion resistance, and enhanced EMC protection, suitable for furnaces, mines, and heavy metallurgy.
---Multi-Channel Integration Solutions
Centralized cabinet layout for multiple temperature measurement points, supporting multi-channel module integration to save rail space and simplify wiring.
---Redundancy and Backup Customization
“One-in, two-out” configuration for critical processes, with dual-system redundant signal output to meet safety production, shutdown traceability, and process backup requirements.

**VI. Installation and Commissioning Specifications**
6.1. Pre-installation Preparation
1. Checking Accessories
Main Unit: 1 WS9050 unit
Documentation: Product terminal diagram, range calibration label, certificate of conformity
Accessories: Shielded twisted-pair cable (for PT100 input only), 24VDC power cable, cold-pressed terminals, cable ties, yellow-green grounding wire
Optional: DIN rail clips, explosion-proof sealed connectors (for hazardous areas), signal termination resistors
2. Environmental Inspection
Installation Location: Limited to indoor electrical control cabinets or dust-proof enclosures only; IP20 rating prohibits direct outdoor installation
Ambient Temperature: Cabinet temperature must be between -20°C and +55°C; keep away from variable frequency drives, contactors, and high-power heat sources
Humidity: No condensation, standing water, or corrosive gases; dehumidification or heating modules must be installed in high-humidity cabinets
3. Tool List
Phillips screwdriver, wire strippers, multimeter (for voltage / resistance / 4-20mA), megohmmeter (for insulation testing), label printer
4. Pre-installation Safety Precautions
All work must be performed with the power completely disconnected; live wiring is strictly prohibited.
Explosion-proof zones: Strictly adhere to explosion-proof regulations; power must be disconnected and locked out, voltage tested and tagged; seal and tighten all connectors; seal any unused openings.
High-voltage (220V/380V) and low-voltage (PT100/4-20mA) wiring must be strictly separated.

6.2 Standard Installation Steps
Step 1: Mounting the Rail
Install horizontally using a standard 35mm DIN rail.
Secure the rail with clips; it should not wobble when gently shaken. Leave a ≥5mm cooling gap between multiple units installed side-by-side.
Do not install upside down or at an angle to prevent dust accumulation, condensation, or water ingress.
Step 2: Wiring Zones (Three-color coding to prevent misconnection)
Power Supply: Use a uniform dark-colored wire; strictly distinguish between positive and negative terminals
PT100 Input: Dedicated shielded three-wire or four-wire RTD cable
Signal Output: Shielded twisted-pair cable routed separately to the PLC/DCS
Shielding: Ground at one end only; grounding at both ends is strictly prohibited
Step 3: Mandatory Grounding Requirements
The transmitter housing ground terminal must be reliably connected to the cabinet’s protective ground
Signal shielding: Ground at a single point on the control cabinet side only; leave the sensor end floating (ungrounded)
Separately connect the system analog ground, chassis ground, and power ground to prevent ground loops

6.3, Wiring Specifications




6.4 Standard Power-On and Commissioning Procedure
1. No-Load Check Before Power-On
Use a multimeter to measure the supply voltage: Confirm 21.6–26.4 VDC, with no overvoltage
Verify that all terminals are secure, with no looseness or short circuits
Measure the ambient temperature resistance of the PT100 and compare it to the standard resistance value (matching ambient temperature)
2. Initial Power-On
PWR green light steady: Power supply normal
PWR flashing: Unstable power supply / overload / internal fault; immediately shut down power and troubleshoot
3. Signal Verification
Let the device sit at room temperature for 5 minutes to stabilize
Connect a multimeter in series with the output circuit and measure 4–20 mA:
Lower limit temperature: corresponds to 4 mA
Upper limit temperature: corresponds to 20 mA
Compare with actual on-site temperature and the display on the host computer; recalibrate if the error exceeds the tolerance
4. Indicator Light Fault Diagnosis
PWR green light steady: Normal operation
Red ALM light on: PT100 open circuit, short circuit, out of range, or wiring error
Both lights flashing: Power supply abnormality or module damage
5. Accuracy Fine-Tuning
Fixed-range models are factory-calibrated and require no on-site adjustment; for non-standard ranges, contact the manufacturer for remote calibration or to receive calibration software.

6.5 Strict Installation Prohibitions
□ Strictly prohibit overvoltage supply: Do not connect directly to AC 220V; do not supply power at >30 VDC for extended periods
☒ Strictly prohibit running high-voltage and low-voltage circuits in the same conduit or cable tray; wiring must be separated, isolated, and shielded
□ Strictly prohibit installation in damp environments, exposed to rain, or outdoors; this unit is intended for cabinet-mounted use only (IP20)
☒ Strictly prohibited: Using standard, non-explosion-proof models in hazardous areas without safety barriers or proper sealing.
□ Strictly prohibited: Arbitrarily extending thin wires or connecting loads in parallel, as this causes signal attenuation and may result in the device failing to drive the load.
☒ Strictly prohibited: Grounding both ends of the shielding layer, as this directly causes drift and glitch faults.

**7: Recommendations for Daily Use & Maintenance**

7.1 Key Points for Daily Inspections (Mandatory Daily Checks for Teams / Maintenance Personnel)

1. Quick Troubleshooting of Indicator Lights

PWR steady green: Normal power supply, module operating stably

PWR flashing: Voltage fluctuations, overload, internal malfunction; immediately check the power supply and load

ALM steady red / flashing: PT100 open circuit, short circuit, out-of-range, wiring error, or probe failure

Inspection Mnemonic: Steady green light means safe operation; if red light appears, check the wiring first

2. Signal Stability Monitoring

Real-time observation via HMI / DCS: Temperature curve should show no jumps, no sawtooth fluctuations, and no steady drift

High-interference conditions (inverters, motor start/stop): Focus on whether the signal momentarily drops out

Remote transmission points: Verify the difference between the actual on-site temperature and the system display once a week

3. Cabinet Temperature and Humidity Monitoring

Cabinet temperature: Maintain between -20°C and +55°C; prolonged exposure to high temperatures is strictly prohibited

Cabinet humidity: No condensation or water droplets; in humid environments, closely monitor the operation of the dehumidification module

Modules must not be installed in direct contact with heat-generating terminals, contactors, or power modules; ensure adequate ventilation gaps

7.2. Regular Maintenance Plan (Standardized cycles; can be directly used as an inspection checklist)

1. Cleaning Schedule

Monthly cleaning: Power off and blow dust out of the cabinet (using dry compressed air at low pressure) to prevent dust accumulation causing terminal short circuits

Quarterly deep cleaning: Remove dust from terminal blocks and inspect the integrity of shielded cable jackets

2. Wiring Tightness Inspection (Required every six months)

After powering down the entire system and verifying absence of voltage, tighten power, input, output, and ground terminals one by one

Check cold-pressed terminals for oxidation, looseness, or loose connections

Key verification: PT100 three-wire balance and compliance with single-ended shield grounding

3. Recommendations for Accuracy Recalibration

Standard operating conditions: On-site comparison calibration once a year

Chemical / Pharmaceutical / Critical Measurement Points: Perform accuracy re-verification every six months and retain calibration records

Verification Method: Use a standard resistance box to simulate PT100 resistance → Compare the 4-20mA output with the host computer's readings; contact the manufacturer for re-calibration if the error exceeds the tolerance

7.3 Long-Term Maintenance Tips (Extend Equipment Lifespan, Reduce Failure Rate)

1. Long-Term Dust and Moisture Protection

Install dust filters and moisture-removal modules on the cabinet to prevent condensation and water ingress from corroding circuit boards

High-temperature, high-humidity workshops: Seal gaps around terminal ports with flame-retardant sealant to prevent moisture intrusion

Equipment during long-term shutdown: Maintain a low-level power supply inside the cabinet; utilize the unit's low thermal resistance to prevent moisture and mold

2. Interference Mitigation Optimization (Addressing the Root Cause to Reduce Signal Fluctuations)

Use shielded twisted-pair cables throughout the PT100 input path, routing them through separate conduits

Low-voltage signal cables must never be routed in the same cable tray or cable rack as 380V/220V power lines

Strictly enforce grounding: Ground the module housing and the shielding layer at a single point inside the cabinet to prevent ground loops caused by dual-end grounding

In environments with severe interference: Install additional signal isolators and ferrite ring filters to enhance EMC protection

3. Specialized Protection for Extreme Environments

Near high-temperature furnaces / metallurgical sites: Keep away from heat radiation, install thermal insulation panels, and select wide-temperature custom versions

Corrosive gas environments: Apply anti-corrosion sealing to the cabinet and use corrosion-resistant gold-plated terminals

Explosion-proof zones: Regularly inspect sealed joints and sealing gaskets to eliminate potential explosion hazards

**VIII. Troubleshooting & Emergency Response**

8.1. List of Common Faults (Sorted by Frequency of Occurrence)

On-site faults should be troubleshooting prioritized by "indicator light status → signal behavior." The following are the five most frequent fault categories, covering over 90% of on-site issues:

1. No Output Signal (4-20mA/voltage output is 0 or remains constant)
2. Signal Drift/Fluctuation (Significant fluctuations on the host computer display; continuous increase in deviation from actual temperature)
3. Abnormal Indicator Lights (Not lit, flashing, or abnormal dual-light behavior)
4. ALM Alarm Triggered (Red light constantly on or flashing; no normal output)
5. Signal interference and distortion (output signal exhibits sawtooth-like fluctuations, significantly affected by equipment startup/shutdown)

8.2. Fault Cause Analysis + Step-by-Step Troubleshooting (Follow these steps directly)

Fault 1: No output signal (output is 0, a fixed value, or no display on the host computer)

Core Causes:

- Power supply issues (no power, insufficient voltage, reversed polarity)
- Wiring errors (reversed input/output terminals, PT100 wire break, loose terminal connections)
- Load overload (current output load > 500Ω, voltage output load < 10kΩ)
- Internal module failure (blown fuse, damaged core components)

Step-by-Step Troubleshooting

1. Step 1: Check Power Supply (Easiest to troubleshoot)

Use a multimeter to measure the power supply terminals and confirm the voltage is between 21.6–26.4 VDC (standard supply); if the voltage is 0, check the switching power supply and fuses; if the voltage is normal but the module shows no response, verify whether the positive and negative terminals are reversed (reversal results in no output; some modules may blow the fuse).

2. Step 2: Check Wiring (Most Common Cause)

After powering off, verify terminal connections: Ensure the three PT100 wires correspond to terminals A/B/C, with no reversed connections or broken wires; ensure output terminals (4–20 mA ± / Voltage ±) are correctly wired to the PLC or instrument, and that terminals are securely fastened with no loose connections or insulation stripped over the core.

3. Step 3: Check the Load

Current output type: Measure the total resistance of the downstream load. If it is >500Ω, reduce the number of instruments in parallel or install a signal distributor.

Voltage output type: Confirm that the downstream input impedance is ≥10kΩ; otherwise, replace the module with a high-impedance acquisition module.

4. Step 4: Emergency Replacement and Diagnosis

Replace with a functional module of the same model. If the output is restored, the original module is faulty; if not, continue troubleshooting the PT100 probe (measure the resistance at room temperature with a multimeter; it should be approximately 100 Ω at 0°C; if there is no resistance, the probe is broken).

Fault 2: Signal Drift/Fluctuation (Significant Display Fluctuations, Deviation Beyond Tolerance)

Core Causes:

- Interference (shared wiring for high and low voltage, shield grounded at both ends, ground loops)
- Uneven PT100 lead resistance, loose connections

- Excessive ambient temperature and humidity (high temperature causes module thermal drift; humidity causes terminal corrosion)
- Expired calibration or module aging
Step-by-Step Troubleshooting
1. Step 1: Investigate Interference (Priority)
Check whether signal lines and power lines (220V/380V) share the same cable tray or conduit; if so, route them separately. Ensure the PT100 shield is grounded at a single point inside the cabinet only, with the sensor end left floating, to prevent dual-end grounding.
2. Step 2: Verify Wiring and Leads
Tighten the PT100 terminal connections and ensure balanced resistance across all three leads (use wires of the same gauge and length whenever possible). If leads are excessively long ( $>$ 50 meters), switch to thick-gauge shielded twisted-pair cable to minimize lead-induced errors.
3. Step 3: Check the Environment and Temperature Drift
Check whether the temperature inside the cabinet exceeds 55°C and keep it away from heat sources; in high-humidity environments, verify that the dehumidification module is functioning and check for condensation or oxidation on the terminals; sand down oxidized terminals and retighten them.
4. Step 4: Accuracy Retest and CalibrationUse a standard resistance box to simulate the PT100 resistance value, and compare the output signal with the standard value. If the error exceeds ±0.2%, contact the manufacturer for recalibration; for older modules (in use for over 3 years), direct replacement is recommended.

Fault 3: Abnormal indicator lights (not lit, flashing, or both lights malfunctioning)
Root Causes + Corresponding Solutions (Direct Reference)
- Situation 1: PWR green light off, ALM red light off
Cause: No power supply, blown power fuse, damaged module power connector
Solution: Check the power supply circuit and replace the fuse; use a multimeter to measure the power terminals. If there is no voltage, troubleshoot the switching power supply; if there is voltage, the module is damaged and must be replaced.
- Situation 2: PWR green light is flashing, ALM red light is off
Cause: Unstable supply voltage, module overload, excessive power supply ripple
Solution: Stabilize the supply voltage (install a voltage regulator module); reduce the output load; check the switching power supply ripple; if it does not meet specifications, replace the power supply.
- Situation 3: PWR green light is steady, ALM red light is steady
Cause: PT100 open circuit, short circuit, out of range, or wiring error
Solution: Inspect the PT100 probe (measure resistance) and wiring terminals; verify that the temperature measurement range matches the actual on-site temperature; if out of range, recalibrate.
- Situation 4: Both lights are flashing simultaneously
Cause: Internal module failure, severe power supply abnormality (over 30 VDC)
Solution: Immediately disconnect power and check the supply voltage; replace with a module of the same model; if operation resumes, the original module is damaged.

Fault 4: ALM alarm triggered (red light steady/flashing)
Core Causes:
- PT100 failure (open circuit, short circuit, poor contact)
- Temperature measurement out of range (on-site temperature exceeds the module's calibration range)
- Wiring error (PT100 reversed, output terminals shorted)
- Internal alarm circuit malfunction
Step-by-Step Troubleshooting
1. Step 1: Inspect the PT100 probe
After powering down, use a multimeter to measure the PT100 resistance. If the resistance is 0 (short circuit) or infinite (open circuit), replace the probe; if the resistance is normal, check whether the terminals are loose or reversed.
2. Step 2: Verify the Measurement Range
Confirm whether the actual on-site temperature is within the module's calibrated range (e.g., if the standard range is 0–200°C and the on-site temperature is 250°C, it is out of range). If out of range, contact the manufacturer to recalibrate or replace the module with one of the appropriate range.
3. Step 3: Emergency Troubleshooting
If immediate restoration of operation is required on-site, temporarily short-circuit the PT100 terminals (to simulate a normal resistance signal) to verify if the module resumes output. If output is restored, the issue lies with the PT100 probe or wiring; simply replace the probe.
4. Step 4: Determine Module Failure
If both the PT100 and wiring are normal but the alarm persists, replace the module with the same model. If the alarm clears, the original module has an internal fault.

Fault 5: Signal Interference and Distortion (Sawtooth-shaped fluctuations, affected by equipment start/stop cycles)
Core Causes:
- Electromagnetic interference (from strong sources such as inverters, motors, contactors, etc.)
- Signal cables are unshielded, or the shield is not grounded or is grounded at both ends
- Signal cables run parallel to power cables or are routed in the same conduit
- Poor module grounding, failing to form an effective shielding loop
Step-by-Step Troubleshooting
1. Step 1: Optimize Wiring (Most Critical)
Replace the PT100 input and output signal cables with shielded twisted-pair cables. Route them through separate conduits, maintaining a distance of ≥30 cm from power lines (220V/380V). Strictly avoid routing them in the same cable tray or conduit.
2. Step 2: Standardize Grounding
Reliably connect the module housing to the cabinet's protective ground; ground the signal shield at a single point on the control cabinet side only, leaving the sensor end floating to avoid a ground loop caused by dual-end grounding.
3. Step 3: Strengthen Anti-Interference Measures
In environments with severe interference, install ferrite bead filters at the module's input and output terminals; position the module away from strong interference sources such as variable frequency drives and contactors; install isolation shielding plates if necessary.
4. Step 4: Emergency Optimization
Temporarily reduce the module's filtering response speed (for programmable models) to minimize signal jitter; if no improvement is observed, replace the module with a model featuring enhanced anti-interference capabilities (high isolation grade).

8.3 Emergency Workaround (Minimizing Downtime Losses)
When on-site faults cannot be repaired immediately, the following emergency measures may be taken to ensure production continuity, with a thorough troubleshooting and repair to follow:
1. Emergency response for module failure: Directly replace the faulty module with a spare module of the same model and range, replicate the original wiring and parameters, and quickly restore output; If no spare module is available, temporarily substitute with another PT100 transmitter of the same specifications (ensure matching range and signal type).
2. PT100 Probe Failure Contingency: Temporarily replace with a spare probe; after wiring, verify the resistance value to ensure compatibility with the module's range. If no spare probe is available, short-circuit the PT100 terminals (simulating ambient temperature resistance) to temporarily maintain system operation, and replace the probe promptly afterward.
3. Emergency Response for Interference: Temporarily move signal cables away from strong interference sources; replace original cables with temporary shielded cables and ground them at a single point to ensure signal stability first; optimize cabling after shutting down the system.
4. Emergency Response for Power Supply Abnormalities: If the supply voltage is unstable, temporarily install a voltage regulator module or a backup power supply to prevent module damage from voltage fluctuations, while simultaneously troubleshooting the power supply circuit.

8.4 After-Sales Repair Guidelines (Define Scope, Ensure Efficient Coordination)
1. Criteria for Determining a Malfunction (Situations Requiring Repair)

- The issue remains unresolved after following the troubleshooting steps above (e.g., no module output, abnormal indicator lights that return to normal after replacing the module);
- Physical damage to the module (cracked housing, burnt terminals, water damage or corrosion on the circuit board);
- Severe accuracy deviation (error > ±0.5% as verified by a standard resistance box), which cannot be corrected through calibration;
- Explosion-proof models experiencing loss of explosion-proof integrity or damaged seals that cannot be repaired on-site.

2. Repair Request Process (Concise and Efficient)

1. Prepare repair information: Equipment model (WS9050), installation date, fault symptoms (indicator light status, output status), troubleshooting process, on-site conditions (whether explosion-proof, supply voltage);
2. Contact after-sales support (choose one of the following):
- Official after-sales hotline: 19715617532 (Weekdays 9:00 AM–6:00 PM)
- Official After-Sales Email: sales008@qd-zdk.com (include photos of the fault and parameter screenshots; response within 24 hours);
3. After-Sales Response: Remote guidance provided within 1 hour for routine issues; if the issue cannot be resolved remotely, on-site service will be arranged (arrival within 1–3 business days depending on region);
4. Fault Resolution: For non-human-caused damage, free repair/replacement is provided in accordance with the warranty policy; for human-caused damage, paid repair services are available, with processing proceeding only after confirmation of the quote.

3. Warranty Coverage (Explicit Coverage)

- Warranty Period: 12 months from the date of purchase (whole unit warranty);
- Free Warranty Coverage: Module failures caused by non-human factors or non-excessive operating conditions (e.g., aging of internal components, manufacturing defects) will be repaired or replaced free of charge;
- Exclusions: Damage caused by incorrect wiring, overvoltage, non-compliant use in explosion-proof environments, or excessive environmental conditions (high temperature, humidity, corrosion); wear and tear of consumables such as probes and cables; unauthorized disassembly or modification of modules.

4. Repair Request Guidelines

- Service Requests in Explosion-Proof Zones: Please provide the on-site explosion-proof rating and safety barrier model in advance; our service personnel will visit the site to handle the issue in accordance with explosion-proof regulations;
- Post-Repair: Our service team will provide a repair report and accuracy calibration records to ensure the equipment has returned to normal performance;
- Spare Parts Request: You may contact our service team in advance to request spare modules, probes, and other spare parts to minimize downtime.