Smart Control Instruments

1. Product Definition

The S803/SS803 series of intelligent digital single- and dual-channel bar graph measurement and control instruments are smart secondary instruments designed by Anhui Qidian Automation Technology Co., Ltd. specifically for signal monitoring, control, and alarm applications in industrial environments. They support single-channel (S803) or dual-channel (SS803) signal inputs and intuitively display process variables using both digital and bar graph analog modes. They integrate signal processing, alarm control, analog transmission, and digital communication functions, widely supporting signals from various industrial sensors such as level, pressure, temperature, and flow, thereby achieving the visualization, standardization, and controllability of on-site data.

Their core functions can be broken down into the following dimensions:
1. Signal Acquisition and Compatibility: Supports universal signal input, with a default factory configuration of 4-20mA current signals. It is also compatible with various industrial standard signals, including 0-10V, resistance temperature detectors (Pt100/Cu50), thermocouples (K/E/S, etc.), resistors, and potentiometers, making it suitable for the vast majority of field sensors without the need for additional conversion modules.

2. Dual-Mode Visualization Display:
Digital Display: Features a 4-digit high-precision LED display that shows the engineering value of the process variable (PV) in real time, with an accuracy of up to 0.5% FS. It supports customizable decimal point settings.
Bar Graph Display: A 0–100% percentage bar graph dynamically tracks signal changes, intuitively presenting the trend and current position of the variable. It supports dual-bar comparison display (for dual-loop models), facilitating quick assessment of the variable's status.

3. Multiple Signal Output Types:
Relay Alarm Output: Supports up to 4 relay contact outputs (e.g., 1AL1, 1AL2, 2AL1, 2AL2). Alarm modes such as upper limit, lower limit, deviation, and hysteresis can be configured. The contact capacity meets industrial field control requirements and can directly drive devices such as alarm lights, solenoid valves, and contactors.
4-20mA Transmitter Output: Converts the acquired signal into a standard 4-20mA current signal, enabling remote transmission to upper-level control systems such as PLCs and DCSs, thereby achieving signal standardization and long-distance transmission.
RS485 Modbus RTU Communication: Supports the standard Modbus RTU protocol, enabling bidirectional data communication with host computers, configuration software, and PLCs. It supports multi-device networking to facilitate remote monitoring, parameter configuration, and data acquisition.

4. Intelligent Control and Configuration: Features include auto-tuning, one-button parameter reset, power-off data protection, and key lockout to prevent accidental operation. Supports user-defined parameters such as measurement range, engineering units, alarm points, and transmitter output range to meet the field application needs of various industries.

5. High-Reliability Industrial Design: Features standard DIN rail or panel mounting, wide-range power supply (AC 220 V or DC 24 V optional), and includes anti-interference, surge protection, and overvoltage protection, making it suitable for complex electromagnetic, temperature, and humidity conditions in industrial environments.

II. Working Principle

The operational workflow of the S803/SS803 series instruments can be broken down into four core stages: signal acquisition → signal processing → display output → control/transmission/communication. A simplified explanation is provided below:

1. Signal Acquisition: The instrument uses its internal signal conditioning circuitry to receive raw signals from sensors (such as the 4–20 mA current output from a level transmitter or the resistance/millivolt signals from a temperature sensor). It then filters, amplifies, and performs analog-to-digital conversion on these signals, converting the analog signals into digital signals recognizable by the instrument. This process eliminates on-site interference signals and ensures the stability of data acquisition.

2. Signal Processing Stage: The instrument's built-in microcontroller (MCU) performs computational processing on the acquired digital signals:
Converts the raw signal into actual physical values based on the user-set range and engineering units (e.g., a liquid level of 0–5 m corresponds to 4–20 mA, which is converted and displayed as 0.00–5.00 m);
It determines in real time whether the current value has reached the user-set alarm threshold; if the alarm conditions are met, it triggers the corresponding relay output;
Based on the transmitter output parameters, it linearly converts the signal into a 4–20 mA current signal;
It processes RS485 communication commands and responds to data read and parameter setting requests from the host computer.
Display and Output Section: The processed physical value is displayed in real time as a digital reading via an LED display. Simultaneously, it drives a bar graph module to intuitively present signal trends as percentages (e.g., if the current liquid level is 60%, the bar graph illuminates 60% of the scale). Dual-channel models can display values and bar graphs for both channels simultaneously, enabling multi-variable comparison monitoring.

3. Control / Transmission / Communication Module:
Control Output: When the signal meets alarm conditions, the relay contacts activate to drive external devices for alarm or control (e.g., triggering an alarm light when the liquid level is too high, or closing the feed valve);
Transmission Output: The converted 4-20mA signal is transmitted to a PLC/DCS for centralized monitoring;
Communication Output: Via the RS485 interface, data can be remotely read and parameters configured using a host computer as the central hub. It supports networking multiple instruments to build a small-scale industrial monitoring system.
The entire workflow is closed-loop: the instrument continuously acquires, processes, and outputs signals. At the same time, an internal power-fail protection module saves all user-configured parameters, eliminating the need for reconfiguration after a power outage and restart, thereby ensuring stable system operation.

III. Core Value

3.1 Overview of Core Value
The core value of the S803/SS803 series instruments lies in addressing the five key pain points in industrial field signal monitoring, control, and transmission: signal incompatibility, unintuitive displays, delayed control, lack of data interoperability, and system instability. It provides users with a one-stop signal measurement and control solution. The specific benefits are as follows:
Compatibility with multiple sensor types enables "one instrument for multiple uses," reducing selection and maintenance costs;
Dual-mode display (digital + bar graph) balances precise readings with trend analysis, reducing the risk of on-site misjudgment;
Integrated alarm, transmission, and communication output functions eliminate the need for additional expansion modules, simplifying system architecture;
High-reliability industrial-grade design withstands harsh field environments, minimizing downtime due to failures;
Supports remote communication and networking for centralized data monitoring, enhancing automation management capabilities.

3.2 Key Pain Points and Solutions
Pain Point 1: Diverse sensor signal types in the field require multiple instruments for adaptation, resulting in high procurement, inventory, and maintenance costs
Customer's Core Pain Point: Output signals from various industrial sensors—such as level, pressure, temperature, and flow—are inconsistent, encompassing multiple signal types including current, voltage, RTDs, and thermocouples. Standard instruments typically support only a single signal input, necessitating the procurement of multiple models of measurement and control instruments. This also requires maintaining a large inventory of spare parts, resulting not only in cumbersome selection processes and high procurement costs but also in a significant workload for equipment maintenance, replacement, and operations.

Product Solution: The S803/SS803 instruments feature universal signal input capabilities, fully compatible with 4-20mA and 0-10V standard analog signals, and are compatible with the vast majority of industrial field signals, including Pt100/Cu50 RTDs, K/E/S-type thermocouples, resistors, and potentiometers. This truly achieves "one instrument, multiple uses," allowing a single unit to adapt to various on-site sensor devices without the need for signal conversion modules or instrument replacements.
Direct Benefits: Significantly reduces equipment procurement and spare parts inventory costs; simplifies the equipment selection process; standardizes the models of on-site measurement and control devices; drastically reduces the workload associated with future equipment maintenance, replacement, and operations; and improves the efficiency of on-site equipment management.

Pain Point 2: Traditional pure digital meters offer a limited display, making it impossible to assess trends in operating conditions, which leads to misjudgments and missed issues during inspections.
Core Customer Pain Point: Conventional digital meters only display numerical values, showing only current instantaneous data. They cannot intuitively illustrate trends in operating conditions or the range of equipment operating states. Field inspection personnel cannot quickly determine whether operating conditions are abnormal, making misjudgments and missed issues highly likely and creating potential safety hazards in production.
Product Solution: This series of instruments employs a dual-display mode combining digital readouts and percentage-based light bars. A 4-digit high-precision LED display accurately presents real-time process values, while dynamic light bars track signal changes in real time, intuitively illustrating operational trends and current load distribution. The SS803 dual-channel model supports synchronized comparison of two channels via dual light bars, enabling real-time monitoring of two sets of process data and providing an at-a-glance view of operational status.
Direct Benefits: By balancing data accuracy with operational visualization, inspection personnel can quickly identify abnormal conditions, eliminate misjudgments and missed detections, effectively mitigate production risks, and significantly improve the efficiency of on-site inspections and operational control.

Pain Point 3: Lack of local measurement and control capabilities on-site, resulting in complete reliance on the host computer, delayed fault response, and a high risk of production accidents
Customer's Core Pain Point: Most basic monitoring instruments only provide data display capabilities and lack local alarm and control functions. All interlocking controls and anomaly alarms rely on PLCs and HMI systems. In the event of a host system failure or network outage, the site loses measurement, control, and protection capabilities. Abnormal operating conditions cannot be promptly detected and addressed, making it highly likely to result in production accidents such as tank overflow, overpressure, or overheating.
Product Solution: The S803/SS803 instruments feature built-in multi-channel relay alarm outputs and support various customizable alarm logics, including upper limit, lower limit, deviation, and hysteresis correction alarms. They can operate independently of the host computer without relying on a backend system, enabling on-site local anomaly alarms and equipment start/stop control, and are suitable for various process interlock scenarios.
Direct Benefits: Establishes an independent on-site monitoring and control defense line, eliminating reliance on host computers and networks. It enables instantaneous response to faults and timely early warning and control, effectively preventing production accidents caused by system failures or network outages, and ensuring the stable operation of production processes.

Pain Point 4: Sensor signals cannot be directly connected to PLCs/DCS systems, requiring the installation of conversion modules, resulting in a cumbersome system and susceptibility to signal interference and distortion
Customer's Core Pain Point: The raw signals from some sensors cannot be directly connected to upper-level control systems such as PLCs or DCSs, requiring the purchase of additional intermediate devices like signal isolators and conversion modules. This not only increases equipment costs and complicates wiring but also leads to signal attenuation and electromagnetic interference due to multi-level signal conversion, resulting in data distortion and unstable transmission.
Product Solution: The instrument features a built-in standard 4–20 mA analog transmitter output. It can linearly convert various sensor signals—based on user-defined ranges—into the industry-standard 4–20 mA signal. This eliminates the need for any intermediate conversion devices, allowing direct connection to upper-level equipment such as PLCs, DCSs, and recorders, ensuring stable signal transmission with high linearity.
Direct Benefits: Streamlines equipment architecture and field wiring; saves on procurement costs for intermediate conversion devices; reduces signal relay steps; eliminates signal attenuation, interference, and distortion; ensures accurate and stable data transmission.

Pain Point 5: Field instruments lack remote communication capabilities, relying on manual on-site meter reading; data management is inefficient and cannot be centrally controlled.
Core Customer Pain Point: Traditional measurement and control instruments only support local data viewing and lack remote transmission capabilities. This requires staff to conduct manual on-site inspections and meter readings, resulting in high labor costs and delayed data collection. It prevents real-time data monitoring and historical data traceability, making it difficult to meet the demands of automated centralized control and intelligent production management.
Product Solution: The device comes standard with an RS485 interface and supports the standard Modbus RTU communication protocol, enabling bidirectional data transmission. Supervisory systems and PLCs can read instrument monitoring data in real time, while also supporting remote parameter modification and equipment status queries. Multiple instruments can be networked to enable centralized monitoring and management of equipment across entire workshops or production lines.
Direct Benefits: Enables unmanned remote data collection and equipment control, significantly reducing labor costs associated with manual inspections and meter readings. Data is accessible and traceable in real time, supporting intelligent, refined, and centralized production management.

Pain Point 6: Complex industrial environments; standard instruments have poor interference resistance, leading to data fluctuations, distortion, and high equipment failure rates
Customer's Core Pain Point: Industrial environments involve complex operating conditions such as electromagnetic interference, voltage fluctuations, and significant temperature and humidity variations. Standard consumer-grade or basic industrial instruments have weak interference resistance, making them prone to data fluctuations, value distortion, and equipment crashes. Frequent shutdowns for maintenance severely impact production continuity.
Product Solution: The S803/SS803 is an industrial-grade dedicated measurement and control instrument featuring a professional anti-interference circuit design. It incorporates surge protection, overvoltage protection, and electromagnetic interference (EMI) shielding mechanisms, supports wide-range power supply, and is capable of withstanding harsh on-site conditions such as extreme temperatures, strong electromagnetic interference, and voltage fluctuations, ensuring exceptional operational stability.
Direct Benefits: Completely resolves data distortion and instrument malfunctions under complex operating conditions, significantly reduces equipment failure rates and downtime for maintenance, ensures 24/7 continuous and stable production line operation, and minimizes production losses.

Pain Point 7: Complex instrument parameter settings, prone to user errors by novices, loss of parameters upon power loss, and cumbersome debugging and maintenance
Core Customer Pain Points: Traditional instruments have cumbersome parameter settings and lack protective mechanisms, making it extremely easy for novices to accidentally alter parameters during commissioning, leading to 混 乱 in process parameters. Furthermore, some instruments reset all custom parameters to default upon power loss, requiring re-commissioning every time the equipment is restarted, which significantly increases operational and maintenance workloads.
Product Solution: This series of instruments features optimized operating logic and a simple, intuitive menu. It is equipped with a key lock function to prevent accidental operation, eliminating human-induced parameter errors; It features built-in automatic data protection upon power loss, ensuring that all custom ranges, alarm parameters, and communication

settings are permanently saved. It also supports one-click restoration to factory settings, making commissioning and maintenance convenient and efficient.
Direct Benefits: Lowers the barriers to equipment commissioning and operation, prevents process failures caused by human error, eliminates the need for repeated parameter adjustments, significantly reduces time spent on equipment commissioning and subsequent maintenance, and improves operational efficiency.

IV. Key Product Parameters & Specifications

4.1 S803 Single-Channel Intelligent Digital Bar-Graph Measurement and Control Instrument

1 Basic Electrical Parameters
Input Signal: Universal, freely switchable input
DC Current: 4–20 mA, 0–20 mA
DC Voltage: 0–5 V, 1–5 V, 0–10 V
Resistance Temperature Detectors (RTDs): Pt100, Cu50
Thermocouples: Types K, E, J, T, S, B
Universal compatibility with resistance and potentiometer signals
Measurement Accuracy: Selectable between Class 0.2 and Class 0.5; default 0.5% FS
Display: 4-digit LED numerical display + 101-segment linear analog bar graph
Display Range: User-configurable full range; decimal point position programmable
Alarm Output: Standard 2-channel relay contact output; configurable upper limit, lower limit, deviation, and delay alarms
Transmitter Output: Isolated standard 4-20mA DC current output; programmable output range
Communication Interface: Standard RS485 communication; standard Modbus RTU protocol
Sampling Rate: High-speed sampling at 0.2 seconds per sample
Cold-Junction Compensation: Built-in automatic cold-junction temperature compensation for thermocouples
Input Impedance: Current input ≤120 Ω, voltage input ≥500 kΩ

2 Isolation Performance Parameters
Between Inputs and Outputs: Fully electrically isolated design
Between Inputs and Communication Ports: Electrically isolated
Between Transmitter Output and Input Signals: Opto-isolated
Relay Alarm Port: Passive isolated contacts, no potential interference
Isolation Withstand Voltage: AC 1500 V for 1 minute between input, output, and power supply without breakdown
Common-Mode Rejection Ratio (CMRR): ≥100 dB
Differential-Mode Rejection Ratio (DMRR): ≥80 dB
Power-Frequency Interference Resistance: Stable operation in industrial environments with strong 50 Hz/60 Hz interference

3 Power Supply & Power Consumption Parameters
Standard Power Supply: DC 24V (wide-range DC compatible: 18V–30V)
Optional Power Supply: AC 85–265V universal AC power supply
Total Standby Power Consumption: ≤3.5W
Maximum Power Consumption at Full Load: ≤5W
Sensor Power Output: Standard DC 24V/50mA two-wire transmitter power supply
Power Supply Voltage Regulation Accuracy: ±1%
Reverse Polarity Protection: Built-in reverse polarity protection circuit

4 Environmental Adaptation Parameters
Normal Operating Temperature: -10°C to +60°C
Extreme Operating Temperature: -20°C to +70°C
Storage Temperature: -30°C to +80°C
Operating Relative Humidity: 10% RH to 85% RH, non-condensing
Storage Relative Humidity: 5% RH to 90% RH, non-condensing
Overall Protection Rating: Front panel IP54, housing IP30
Explosion-proof Rating: Intrinsically safe, compatible with field intrinsically safe circuits; can be integrated with safety barriers to form an explosion-proof measurement and control system
Vibration Resistance: Complies with industrial field low-frequency vibration standards
Atmospheric Pressure: 86 kPa to 106 kPa (standard industrial atmospheric pressure environment)

5 Physical Structure Parameters
Mounting Method: Standard panel-mounted flush installation (installed through a cutout in the control cabinet panel)
Overall Dimensions: 96 mm × 48 mm × 110 mm (W × H × D)
Control Cabinet Cutout Dimensions: 92 mm × 45 mm
Net Weight: Approx. 180 g
Main Housing Material: Flame-retardant ABS industrial-grade engineering plastic
Front Panel Material: High-transparency, scratch-resistant PC panel
Wiring Method: Rear screw-type terminal blocks for secure, tamper-proof connections
Button Configuration: 4-button industrial-grade simplified control buttons with parameter lock support
Structural Protection: Internal circuit boards coated with conformal coating for moisture, dust, and corrosion resistance

4.2 SS803 Dual-Channel Intelligent Digital Bar Graph Measurement and Control Instrument

1 Basic Electrical Parameters
Input Channels: Dual independent signal inputs; signals do not interfere with each other
Single-Channel Input Signals: Fully compatible with S803 universal signals
4-20mA/0-10V/Pt100/Thermocouple/Resistance—all supported
Measurement Accuracy: 0.5% FS per channel; consistent accuracy across both channels
Display Configuration: Dual 4-digit LED independent numerical displays + dual independent bar graph synchronized display
Independent Parameters: Range, units, alarm values, and transmission parameters for both channels can be set individually
Alarm Output: Standard 4-channel independent relay alarm output (2 channels for Channel 1, 2 channels for Channel 2)
Transmitter Output: Supports single-channel transmission or dual-channel isolated 4-20mA transmission output (configurable)
Communication: Integrated RS485 Modbus RTU; unified upload of dual-channel data to the host computer
Sampling Rate: Dual-channel synchronous sampling at 0.2 s per channel
Computational Functions: Supports dual-channel difference calculation, difference alarms, and comparison measurement and control functions

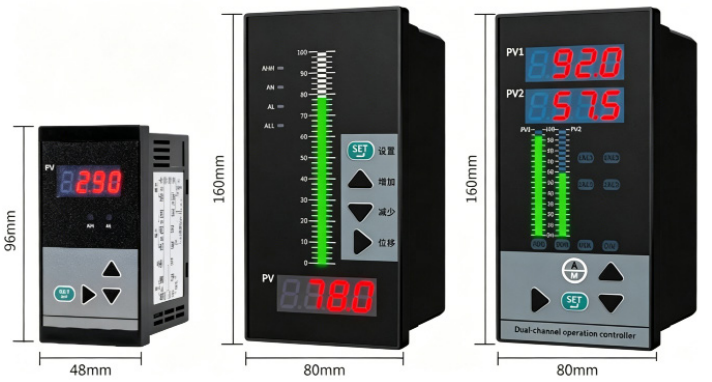
2 Isolation Performance Parameters
Channel 1 and Channel 2: Fully electrically isolated; no signal crosstalk
Dual-channel inputs and power supply system: Fully isolated
Both transmitter outputs are mutually isolated and isolated from the inputs
All four relays provide fully passive isolated outputs
Insulation strength: AC 1500 V withstand voltage isolation between channels
Crosstalk suppression: Dual-channel signal crosstalk suppression <0.1% FS
Communication port is electrically isolated from the dual input channels to eliminate bus interference

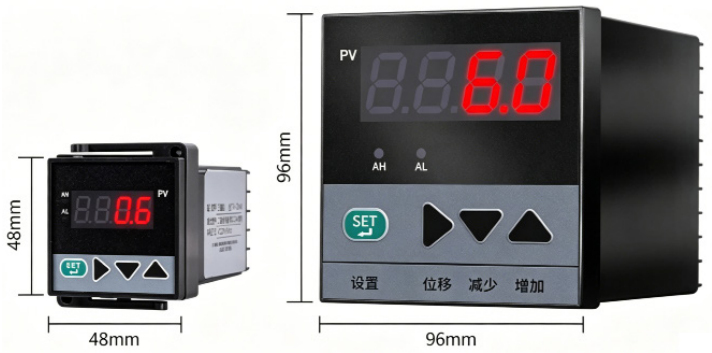
3 Power Supply & Power Consumption Parameters
Standard Power Supply: DC 24V (18V–30V wide voltage range)
Optional Power Supply: AC 85V–265V wide-range AC power supply
Total Standby Power Consumption: ≤5W
Full-Load, Full-Function Power Consumption: ≤7W
External Sensor Power Supply: Dual independent DC 24V power supply outputs, 50mA per channel
Regulated and stable power output; the two channels do not interfere with each other
Built-in triple power protection: overcurrent, overvoltage, and reverse connection

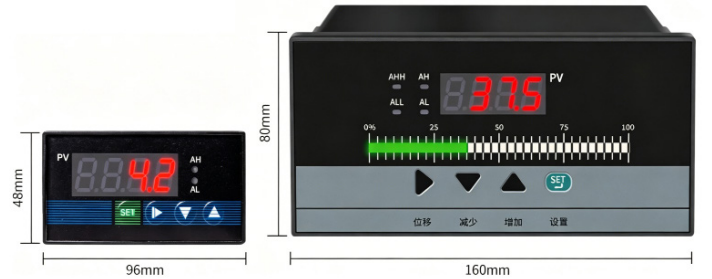
4 Environmental Adaptation Parameters
Operating temperature range: -10°C to +60°C
Extreme operating temperature range: -20°C to +70°C
Storage Temperature: -30°C to +80°C
Operating Humidity Range: 10% RH to 85% RH (non-condensing)
Overall Protection Rating: IP54 (front panel), IP30 (enclosure)
Explosion-Proof Compatibility: Can be used with isolated safety barriers for intrinsically safe explosion-proof environments in chemical and oil/gas industries

5 Physical and Structural Parameters
Mounting Type: Industrial standard 96×48mm panel-mount
Overall Dimensions: 96mm × 48mm × 115mm (W × H × D)
Panel Cutout Dimensions: 92mm × 45mm
Unit Weight: Approx. 210g
Housing Material: Flame-retardant, high-temperature-resistant ABS industrial housing
Display Panel: Highly wear-resistant, oil-resistant PC transparent panel
Wiring Configuration: Rear-mounted wide-pitch screw terminals with separate wiring zones for high and low voltage
Control Buttons: Four-button integrated setup panel with global parameter lock support
Internal Finish: Full-board triple-proof coating for protection against moisture and dust in industrial environments

4.3. Brief Comparison of Core Parameters for the Two Models
Number of Channels
S803: Single-loop, single-channel
SS803: Dual-loop, dual-channel independent measurement and control
Relay Outputs
S803: 4 alarm relays
SS803: 2 independent alarm relays
Transmitter Outputs
S803: Single 4-20mA isolated transmitter
SS803: Supports dual 4-20mA isolated transmitters
Sensor Power Supply
S803: Single 24V power supply
SS803: Dual independent 24V power supplies
Overall power consumption, weight, and depth: SS803 is slightly larger than S803
Mounting cutout dimensions are fully interchangeable between the two models; they can be directly swapped and installed in the same cabinet







V. Application-Specific Selection Guide
5.1 Key Selection Criteria
1. Signal Type
Confirm the output signal of the field sensor: 4–20 mA, 0–10 V, 1–5 V, Pt100, Cu50, K/E/J/T/S/B thermocouples, resistance/potentiometer signals, etc.
Both the S803 and SS803 feature universal inputs that support all of the above signals. No additional matching modules are required for selection; settings can be configured directly via software.
If frequency or pulse signals (e.g., flow pulses) are present, this must be specified in advance so the manufacturer can customize the input parameters.

2. Number of Channels
Single-parameter independent monitoring (e.g., single-tank liquid level, single-point temperature, single pressure channel): Prioritize the S803 single-loop model for its high cost-effectiveness, simple installation, and quick commissioning.
Dual-parameter simultaneous monitoring / comparative control (e.g., inlet/outlet water temperature, tank level and pressure, dual flow rates, or active/standby equipment): The SS803 dual-loop model must be selected. Its two channels are completely independent and do not interfere with each other, enabling differential calculations and alarms.

3. Power Supply Method
Standard industrial control cabinet power supply: DC24V (18–30V wide voltage range). Prioritize DC24V models, which are compatible with PLC/DCS systems and offer stronger interference resistance.
No DC power source available; only AC220V on-site: Select AC85–265V wide-voltage AC models, which require no additional power modules and are ready to use immediately.
The SS803 dual-channel model has slightly higher power consumption (≤7W). When installing multiple units in close proximity, it is recommended to use a centralized 24V DC power supply to reduce heat generation and interference.

4. Isolation and Explosion-Proof Requirements
Standard non-explosion-proof environments (inside control cabinets, general industrial facilities): Standard isolation models are sufficient, providing 1500V AC isolation between input, output, and power supply, which meets conventional anti-interference requirements.
Explosion-hazardous areas (intrinsically safe zones in chemical, oil and gas, and pharmaceutical industries): Intrinsically safe models must be selected and used in conjunction with safety barriers to form an intrinsically safe explosion-proof system; the direct use of non-explosion-proof general-purpose models in hazardous areas is strictly prohibited.
High-interference environments (near variable frequency drives, high-power motors, or high-frequency equipment): Prioritize configurations with **full isolation + high common-mode rejection (≥100dB)**. The S803 and SS803 models come standard with this capability at no additional cost.

5. Output Functionality
Display Only + Alarm: Both the S803 (4-channel relays) and SS803 (2-channel relays) meet this requirement. The relays feature passive dry contacts capable of directly driving audible and visual alarms or interlocks.
Requires remote signal transmission to PLC/DCS: Select models with 4–20 mA isolated transmitter output; the S803 offers single-channel transmission, while the SS803 supports dual independent channels.
Requires communication with a host computer (Modbus RTU): Standard RS485 interface allows direct bus connection; multiple instruments can communicate in parallel, with the SS803 consolidating data from both channels for unified upload.

6. Installation Environment Considerations
Standard control cabinet (panel mounting): Both the S803 and SS803 feature a 96×48 mm standard cutout (92×45 mm) for direct panel mounting, fully compatible with cutouts used by mainstream domestic instruments.
High-Temperature Environments (>50°C): Select the wide-temperature model (-20°C to +70°C) to prevent drift or aging caused by prolonged exposure to high temperatures.

Humid/Dusty Environments (water treatment, outdoor cabinets, mines): The front panel is IP54-rated, the housing is IP30-rated, and the circuit board features a triple-proof coating, providing effective protection against moisture, dust, and corrosion.

5.2 Industry Application Recommendations

1. Chemical Industry

Single-parameter monitoring scenarios (reactor temperature, storage tank pressure, single-tank liquid level): We recommend the S803 single-loop model. Its universal input supports thermocouples and 4–20mA signals, with 2 relays for upper and lower limit alarms and RS485 connectivity to DCS, meeting standard single-point measurement and control requirements in the chemical industry.

Dual-parameter correlation scenarios (reactor temperature + pressure, feed/discharge flow, dual-tank level comparison): We recommend the SS803 dual-channel model. It features independent dual-channel data acquisition, 4 relays for configurable dual-channel alarms, and supports differential calculations, making it suitable for multi-parameter interlock control in chemical applications.

Explosion-proof zones: Regardless of single or dual-channel models, select intrinsically safe versions and use them in conjunction with safety barriers.

2. Power Industry

Single-point monitoring scenarios (boiler drum liquid level, steam pressure, busbar temperature): We recommend the S803 single-loop model, featuring a dual display of bar graph and digital readout for intuitive on-site observation, with 4–20 mA signal transmission to the control room.

Dual-parameter monitoring scenarios (boiler inlet/outlet water temperature, dual-point generator winding temperature, high/low-voltage side pressure): We recommend the SS803 dual-channel model, featuring synchronized comparison display of dual bar graphs and 4 relays for multi-point alarms, suitable for multi-parameter monitoring in power systems.

3. Metallurgy Industry

Single-point high-temperature/pressure monitoring (smelting furnace temperature, pipeline pressure, cooling water flow rate): We recommend the S803 single-channel model, compatible with K/S/B-type thermocouples. It offers strong anti-interference capabilities and is suitable for the strong electromagnetic environments typical of metallurgy.

Dual-parameter coordination scenarios (furnace temperature + cooling water flow, molten steel temperature + mold level): Recommended: SS803 dual-channel model with dual-channel isolation to prevent signal crosstalk, meeting the multi-parameter linkage requirements of metallurgical processes.

4. Pharmaceutical Industry

Single cleanroom parameters (purified water temperature, tank pressure, single-tank liquid level): Recommended: S803 single-channel model, with optional high-precision 0.2/0.5-class accuracy, meeting the pharmaceutical industry's precise measurement requirements.

Dual-parameter scenarios (fermentation tank temperature + pH, purified water inlet/outlet conductivity, dual raw material tank liquid level): Recommended: SS803 dual-channel model, with independent channel settings, supporting simultaneous data logging for both channels, and meeting pharmaceutical GMP data traceability requirements.

5. Water Treatment / Environmental Protection Industry

Single-tank / Single-line Parameters (Wastewater tank level, inlet pressure, single water quality parameter): We recommend the S803 single-channel model. Its 24V power supply can directly drive level transmitters, ensuring simple installation and maintenance.

Dual-Tank / Dual-Pipe Comparison (Inlet + Outlet Flow, Clean Water Tank + Wastewater Tank Level, Upstream/Downstream Pressure): Recommended: SS803 Dual-Channel. Features dual independent 24V power supplies and 4 relays for high/low level interlocks, suitable for multi-tank coordinated control in water treatment.

6. Smart Manufacturing / General Industry

Single-unit, single-point monitoring (equipment temperature, oil pressure, material level): We recommend the S803 single-loop model, which features a compact size and flexible installation, making it suitable for automation equipment control cabinets.

Equipment dual-parameter / dual-station monitoring (spindle temperature + vibration, dual-station pressure, feed/discharge speed): We recommend the SS803 dual-loop model, which provides dual-channel synchronous data acquisition and supports simultaneous upload of two data streams to the MES, making it suitable for multi-station monitoring in smart manufacturing.

5.3 Common Selection Pitfalls

1. Ignoring Isolation Levels and Focusing Only on Price

Pitfall: Selecting non-isolated models for standard applications, or choosing low isolation levels for high-interference environments.

Risks: Signal drift, data fluctuations, communication interruptions, and relay malfunctions.

Correct Approach: The S803/SS803 feature full isolation (AC 1500V) by default; no downgrade is necessary in high-interference environments—prioritize safety and stability.

2. Selecting the Wrong Signal Range and Using the Default Range

Mistake: Using the instrument's default 4–20 mA or 0–10 V range without verifying the sensor's range.

Risks: Display overflow, inaccurate measurements, and alarm failure.

Correct Approach: Program the instrument according to the sensor's actual range; the S803/SS803 supports full-range customization.

3. Ignoring load matching and arbitrarily connecting relays or transmitter outputs

Misconception: Using relays to directly drive high-power loads, or connecting multiple devices in parallel to a transmitter output.

Risks: Burnt-out relay contacts, distorted transmitter output, and instrument damage.

Correct: Relay contacts should only drive low-power loads (≤250 VAC/3 A); contactors must be used for high-power applications; Transmitter output load ≤500Ω; avoid parallel connections.

4. Selecting general-purpose models in explosion-proof environments to save costs

Misconception: Using standard isolated instruments directly in hazardous areas of chemical or oil and gas facilities without safety barriers.

Risk: Sparks may ignite hazardous media, leading to major safety incidents.

Correct: Intrinsically safe models must be selected for explosion-proof zones and used with safety barriers; downgrading or substitution is not permitted.

5. Incorrect channel selection: Forcing dual-parameter applications into a single-loop configuration

Misconception: Using the S803's single-loop switching to display two signals to save costs.

Risk: Inability to monitor simultaneously, data loss, delayed alarms, and interlock failure.

Correct: Dual-parameter applications must use the SS803 dual-loop model, with independent, synchronized data acquisition for both channels; no substitutes are permitted.

5.4 Customization Recommendations

1. Customization for Special Signals

Non-standard millivolt signals, special thermocouples/RTDs, low-frequency pulse/frequency signals: The S803/SS803 supports customizable input parameters and software programming for adaptation without hardware modifications.

High-impedance signals, weak signals (≤1 mV): Customize versions with high input impedance and high gain to reduce interference and drift.

2. Customization for Non-Standard Operating Conditions

Extended temperature range (-30°C to +80°C), high humidity (90% RH, non-condensing), and high vibration (10g): Customized wide-temperature, ruggedized, and IP67-rated versions are available to accommodate extreme operating conditions.

Miniaturized / Special Cutouts: Customized 48×48mm or 72×72mm cutout versions are available to fit non-standard control cabinets.

3. Multi-Channel Integration Solutions
For more than 2 parameters (3–8 channels): We recommend networking multiple S803/SS803 units and connecting them to a host computer via RS485 Modbus RTU. This approach offers lower costs than multi-channel integrated units and provides greater flexibility for maintenance.
Dual-loop + PID Control: The SS803 can be customized with dual-channel PID control outputs to achieve closed-loop temperature/pressure control, suitable for processes requiring precise regulation.

4. Customized Function Combinations
Single Loop + Dual Transmitters: The S803 can be configured with dual 4–20 mA transmitters—one for remote transmission and one as a backup.
Dual Loops + 6 Relays: The SS803 can be configured with 6 independent relays to meet multi-point alarm and interlock requirements.

VI. Installation and Commissioning Guidelines
Applicable Products: S803 Single-Channel Intelligent Light Bar Measurement and Control Instrument, SS803 Dual-Channel Intelligent Light Bar Measurement and Control Instrument
This section serves as a standardized practical guide for on-site installation, providing step-by-step instructions for installation, wiring, and power-up commissioning. It aims to minimize on-site issues such as wiring errors, power supply abnormalities, signal interference, and commissioning failures from the outset. It clearly distinguishes the practical details for both models and aligns with standardized industrial control cabinet installation procedures.
6.1 Pre-Installation Preparation
1. Verification of Accessories
Upon receipt of the equipment, immediately inventory the included components. The S803 Single-Channel model comes standard with the main unit, mounting clips, user manual, and wiring label stickers; the SS803 Dual-Channel model additionally includes dual-channel wiring label cards and dual-circuit power distribution accessories. Confirm that the unit has no dents or bumps, the display has no scratches, and the terminal blocks show no deformation or damage. Only proceed with on-site installation after verifying that all functional components are complete and correct.

2. On-Site Environment Inspection
Conduct a preliminary survey of the installation site conditions. Ensure adequate ventilation inside the installation cabinet and keep the unit away from strong electromagnetic emitters such as variable frequency drives, high-power contactors, and motors. Avoid areas exposed to rain, water accumulation, or heavy dust buildup. Maintain the ambient temperature within the instrument's rated operating range. In humid environments, ensure sufficient ventilation and dehumidification space is provided in advance. In hazardous explosion-proof zones, confirm the installation location for safety barriers beforehand.

3. List of Essential Installation Tools
Prepare a Phillips-head insulated screwdriver, terminal crimping pliers, a multimeter, a signal generator, electrical tape, shielded signal cables, power cables, flexible copper grounding wire, cable ties, and a hole-gauge. Perform insulation testing on all electrical tools in advance to eliminate safety hazards caused by tool leakage.

4. On-Site Safety Precautions
Before installation, the main power supply to the control cabinet must be disconnected, and maintenance warning signs must be posted. Power and signal lines must be routed separately during installation. It is strictly prohibited to connect or disconnect instrument terminals while the system is energized. In explosion-proof areas, strictly adhere to explosion-proof electrical installation standards; non-professional electrical personnel are prohibited from disassembling the internal structure of the instruments. When installing cabinets at heights, ensure proper stabilization and protection to prevent equipment from falling.

6.2 Standard Installation Steps
1. Cabinet Panel Mounting Procedure
Both instrument models use a 96×48 mm standard panel flush-mount installation method. First, precisely cut an opening in the control cabinet panel according to the instrument's mounting dimensions, then remove any burrs from the edges of the opening. Gently slide the instrument body into the mounting hole from the outside of the cabinet until the front panel is flush with the cabinet panel with no gaps. Next, secure the instrument from the inside of the cabinet by snapping the dedicated mounting clips on both sides into place, and tighten the mounting screws to ensure the instrument is secure and level. After installation, gently shake the instrument to test its stability.

2. General Wiring Guidelines
Strictly separate high-voltage circuits from low-voltage signal circuits. Use 1.0–1.5 mm² copper-core cable for power supply lines. Use shielded twisted-pair cable for sensor input signals, 4–20 mA transmitter outputs, and RS485 communication lines. All terminals must be crimped with cold-crimp terminals; do not connect bare wires directly to terminal holes. Apply moderate pressure when crimping to ensure a secure connection while avoiding damage to the terminal base.

3. Terminal and Circuit Zoning
Power terminals must be arranged separately and maintained at a safe distance from signal terminals; analog input terminals must be in a separate zone, while relay and digital output terminals must be grouped together; RS485 communication terminals must be located away from power supply lines to minimize bus signal interference; for the S803 single-loop configuration, only one set of signal lines may be installed; for the SS803 dual-loop configuration, the wiring for Channel 1 and Channel 2 must be strictly separated to prevent the two signal paths from crossing or becoming entangled.

4. Mandatory Equipment Grounding Requirements
The grounding terminal provided on the instrument housing must be reliably connected to the control cabinet's common protective ground, with grounding resistance controlled within 4Ω; shielded signal cables must be grounded at a single point, uniformly grounded at one end inside the control cabinet, while the shielding layer at the instrument end remains floating and ungrounded; the ground wires for high-voltage equipment and the instrument's low-voltage ground wires must be connected to separate grounding bars; sharing a common ground is strictly prohibited.

6.3 Standard Wiring Specifications and Schematic Diagrams by Model
3.1S803 Single-Loop Instrument Dedicated Wiring Specifications
1. Power Supply Wiring
For 24 V DC power supply, strictly distinguish between positive and negative terminals: connect the positive terminal to the positive power supply terminal and the negative terminal to the negative power supply terminal. Reversing the polarity is strictly prohibited. For 220 V AC power supply, there is no distinction between positive and negative terminals; simply connect directly to the AC power supply terminals. Never connect AC high-voltage power to the DC low-voltage terminals.

2. Sensor Input Wiring
Two-wire transmitters are powered directly from the instrument's built-in 24V DC power supply output. Connect the transmitter's signal negative terminal to the instrument's signal negative terminal, and the signal positive terminal to the instrument's signal positive terminal. For resistance temperature detectors (RTDs) and thermocouples, connect them to the corresponding compensation terminals according to the pin definitions. Thermocouples must be paired with compensation cables of the corresponding model.

3. 4-20mA Transmitter Output Wiring
For isolated transmitter outputs with a passive signal, connect the positive terminal to the positive terminal of the PLC's analog input, and the negative terminal to the negative terminal of the analog input. Strictly control the load resistance at the receiving end; it must not exceed the instrument's rated load range.

4. RS485 Modbus RTU Communication Wiring
Connect the Communication A line to the host computer's A terminal, and the Communication B line to the host computer's B terminal. When networking multiple units, use a daisy-chain connection; a terminating resistor may be added at the end of the line to improve communication stability.

5. Relay Alarm Output Wiring

The relay provides a dry contact output. Distinguish between normally open (NO) and normally closed (NC) contacts. Connect to sound and light alarms, solenoid valves, or intermediate contactor control circuits according to the on-site alarm logic. Do not connect directly to high-power motor loads.

6. Shielded Cable Handling Guidelines
Ensure the outer metal mesh of the signal shielded cable is neatly arranged and trim any excess ends. Grounding should be performed only at the control cabinet end. The internal shielding layer of the instrument must not come into contact with any conductive terminals to prevent loop current interference.

3.2 SS803 Dual-Channel Instrument Dedicated Wiring Specifications
1. Independent Wiring for Dual Inputs
Signal lines for Channel 1 and Channel 2 must be completely independently routed. The power supply and signal lines for the two sensors must not be paralleled or share terminals. Strictly distinguish wiring according to channel markings to prevent signal crosstalk or confusion between the two channels.

2. Dual-Channel Power Supply Output Wiring
The instrument features two built-in independent 24 VDC power supply circuits, capable of simultaneously powering two field transmitters separately. The positive and negative terminals of the two power supply circuits must be connected separately; the power supply circuits must not be mixed.

3. Dual Transmitter Output Wiring
The two 4-20mA isolated transmitter outputs are mutually independent and can be connected to two separate control systems. The wiring method is consistent with that of a single loop; the two output lines must not be bundled or twisted together.
Four-Channel Relay Group Wiring
Channel 1 is paired with two relays, and Channel 2 is paired with two relays. Connect them to control circuits in groups according to process alarm requirements, clearly distinguishing the upper and lower limit alarm contacts.
Shared Communication Wiring
Both channels share a single set of RS485 communication terminals, eliminating the need for duplicate communication lines. The host computer can directly read all monitoring data from both channels, simplifying on-site wiring work.

4. Key Points for Comparing Correct and Incorrect Wiring
Correct wiring ensures clear circuit zoning, secure terminal crimping, no polarity reversal, and proper shield grounding; incorrect wiring includes routing high- and low-voltage lines in the same conduit, reversing signal polarity, grounding both ends of the shield, directly driving high-power equipment via relays, and mixing power supply lines with signal lines. All of the above incorrect installation practices are strictly prohibited.

6.4 Complete Power-On Commissioning Procedure
1. No-Load Power-On Test
After verifying that all wiring is correct, turn on the power supply. Observe that the instrument display lights up normally, with no black screen, garbled text, or false alarms. Check that the instrument operates normally, with no overheating, unusual noises, or other abnormalities. After five minutes of stable no-load operation with no issues, proceed to the next step of commissioning.

2. On-Site Signal Connection and Verification
Connect the actual sensor signals from the field. Use the S803 to verify the real-time display values for each channel. Use the SS803 to sequentially verify the display values for Channel 1 and Channel 2. Confirm that the instrument's display values generally match the actual on-site operating conditions, with no significant deviations or data fluctuations.

3. Functional Status Assessment
Observe that the digital display values are stable and the bar graph changes linearly in sync with the signal; when the preset alarm threshold is reached, the corresponding relay activates accurately, and the alarm status is clear and intuitive; after connecting to the host computer, RS485 communication data uploads normally, with no packet loss or lag.

4. Instrument Calibration Method
If slight deviations in readings occur, access the instrument's internal parameter settings interface and perform precise on-site calibration using the zero-point correction and span correction functions. Reset the instrument's internal span parameters to match the sensor's actual measurement range and the on-site engineering units. After calibration, lock the instrument's operation keys to prevent accidental parameter changes.

5. Comprehensive Interoperability Testing
Sequentially test all functions, including upper and lower limit alarm triggers, 4-20mA signal transmission, remote communication for parameter read/write, and local parameter modification. Verify that all output functions operate in proper coordination. After debugging, organize the on-site wiring and tidy up the cabling to complete the installation.

6.5. Strict On-Site Installation Prohibitions
1. Never exceed the rated voltage. DC supply must not exceed 30V, and AC supply must not exceed 265V. Prolonged overvoltage will directly burn out the instrument's power module, causing permanent damage to the equipment.

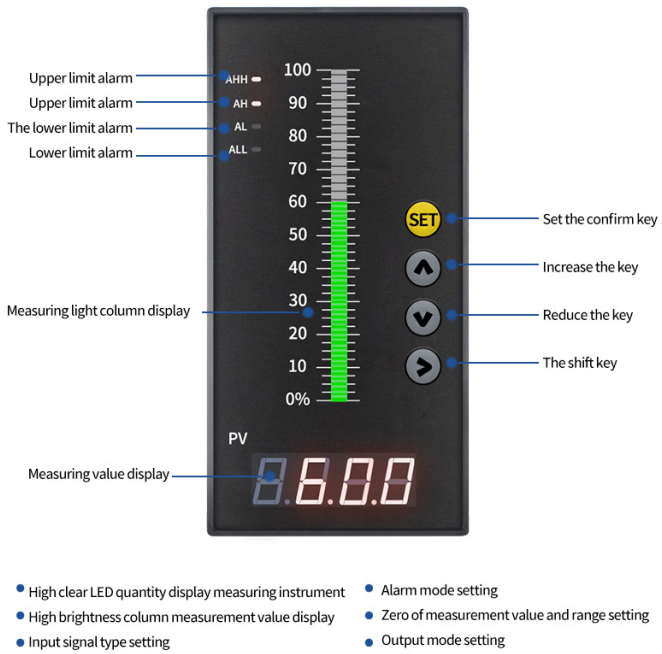
2. Strictly avoid installing the instrument in areas with strong electrical or magnetic interference. Do not install it adjacent to variable frequency drives, variable frequency motors, or high-frequency starting equipment. If proximity cannot be avoided, signal isolation circuits must be added to reduce the impact of electromagnetic interference.

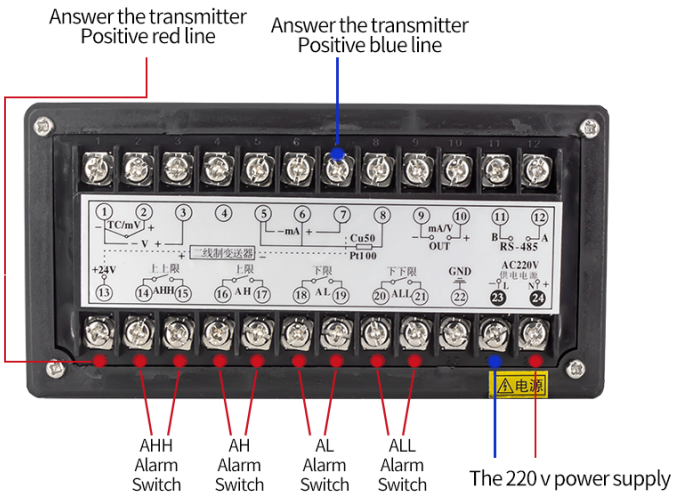
3. In environments with high humidity, outdoor exposure to rain, or corrosive chemical gases, a sealed protective control cabinet must be installed to ensure the instrument is protected against water, moisture, and corrosion. Direct, exposed installation of the instrument is strictly prohibited.

4. Do not arbitrarily modify the instrument's internal hardware circuitry or remove components from the main board. Unauthorized modifications will void the product warranty and may cause measurement inaccuracies, output abnormalities, and other malfunctions.

5. Do not connect multiple devices in parallel to the transmitter output lines. Exceeding the rated load will cause attenuation and distortion of the analog signal, preventing normal data transmission.

6. In explosion-hazardous areas, it is strictly prohibited to bypass safety barriers and install standard-model instruments directly. Strictly adhere to explosion-proof electrical installation standards to prevent safety accidents.

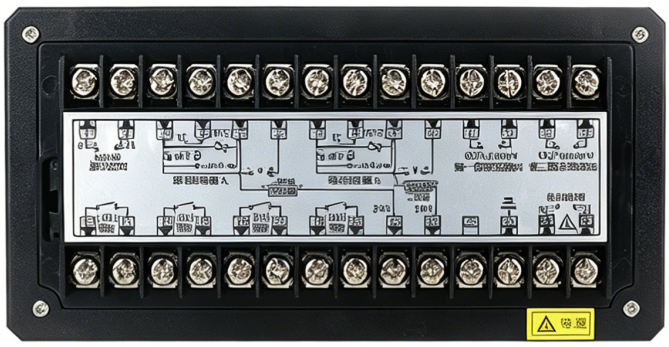




The single-beam display table has four relay outputs

- Instrument internal cold end compensation is optional
- Optional external cold end compensation
- Multi-specification external structure size
- Ac/DC switching power supply mode





VII. Recommendations for Daily Use & Operation and Maintenance

7.1 Key Points for Daily Inspections

1. Key Points for Inspecting the S803 Single-Loop Meter

1. Monitoring Signal Stability

Check daily to ensure the values displayed on the meter's digital display are stable, with no abnormalities such as frequent fluctuations, value overflow, or static readings; verify that the bar graph display follows the signal linearly, with no stuttering or skipped segments. If value fluctuations occur, prioritize checking the shielding and grounding of the signal lines to confirm whether there is electromagnetic interference at the site.

2. Verification of Alarm and Output Status

Observe whether the status of the meter's alarm indicator lights (AH/AL) matches the current operating conditions, ensuring there are no abnormal false lights or failure to illuminate; if there are external audible and visual alarm devices on-site, confirm that the devices respond normally when an alarm is triggered, with no failure to activate or false activation issues.

3. Equipment Temperature, Humidity, and Visual Inspection

Check that the instrument panel is free of condensation and visible dust accumulation, and that the surface has no dents or scratches. Gently touch the instrument housing to confirm there is no abnormal heat (temperature not exceeding ambient temperature + 20°C), and no signs of malfunction such as a burning smell or unusual noises.

4. Power Supply and Communication Status Monitoring

For models powered by 24 V DC, periodically measure the terminal voltage with a multimeter to confirm that the voltage remains stable within the 18–30 V range. For models with RS485 communication, use a host computer to verify that data transmission is continuous, with no packet loss or disconnections.

2. Key Inspection Points for the SS803 Dual-Channel Meter

1. Synchronization Verification of Dual-Channel Signals

Daily, compare the numerical values and bar graph displays of both channels (PV1/PV2) to confirm that both sets of data are stable and normal, with no instances of single-channel data fluctuations or inconsistent bar graph displays. Focus on investigating whether there is cross-interference between the signal lines of the two channels to ensure that the independent operation of both channels is not affected.

2. Multi-Alarm Circuit Status Check

The status of the four alarm indicator lights (1AL1/1AL2/2AL1/2AL2) must correspond one-to-one with the operating conditions of the two channels, with no instances of false lighting, failure to light, or cross-alarm. Pay special attention to the RS485 communication port shared by both channels to verify that the host computer can read data from both channels simultaneously, ensuring no data loss occurs on either channel.

3. Power Distribution and Power Consumption Monitoring

The SS803 features built-in dual 24V power distribution outputs. Regularly verify the voltage at both power distribution terminals to ensure both power supplies are stable and functioning normally, preventing transmitter malfunctions caused by abnormalities in either power supply. Since the unit's power consumption is slightly higher than that of single-channel models, pay close attention to whether the instrument is cooling properly and ensure there is no overheating.

4. Environmental and Visual Inspection

In addition to the S803 standard, pay special attention to the dual-channel signal terminal area to ensure there is no condensation or dust accumulation, preventing short circuits or signal crosstalk caused by moisture.

7.2. Regular Maintenance Plan (Standardized Implementation by Cycle)

1. Cleaning and Maintenance (Performed every 3 months / quarterly)

Panel Cleaning: Wipe the instrument's front panel with a dry, lint-free soft cloth to remove dust and grease. Do not use corrosive liquids such as alcohol or solvents to wipe the display area, as this may corrode the PC panel and cause display blurring.

Terminal Area Cleaning: After powering down, use a dry brush to remove dust and fiber debris from the instrument's terminal area to prevent accumulation that could lead to poor contact or short circuits. In

environments with high humidity or heavy dust (e.g., mines, chemical plants), it is recommended to increase the cleaning frequency to once a month.
Overall Dust Removal from the Control Cabinet: Remove dust from the interior of the instrument cabinet to keep ventilation and heat dissipation channels clear, preventing dust accumulation from affecting instrument cooling and electrical safety.

2. Wiring Tightness Inspection (Performed every 6 months / semi-annually)
With the power disconnected, use an insulated screwdriver to tighten all terminal connections one by one:
Power terminals (AC220V/DC24V), sensor input terminals, transmitter output terminals, RS485 communication terminals, and relay output terminals must all be tightened to the standard torque to prevent loosening or poor contact caused by long-term vibration.
For the SS803 dual-channel model, additionally inspect both input terminals and dual power output terminals to prevent signal abnormalities or unstable transmitter power supply caused by loose terminals.
Simultaneously check whether crimp terminals are oxidized or damaged, and whether the shielding wire jacket is cracked; replace any damaged components immediately.

3. Accuracy Retesting and Calibration (Performed every 12 months / annually)
Signal Verification: Use a standard signal generator to perform full-scale signal verification on the instrument:
S803 Single-Channel: Input standard signals at 0%, 50%, and 100% of the full scale range to verify that the instrument's display error is within 0.5% FS.
SS803 Dual-Channel: Perform the same three-point calibration on Channel 1 and Channel 2 separately to ensure both channels meet accuracy standards and that there is no error caused by crosstalk between channels.
Transmitter Output Calibration: Retest the 4-20mA transmitter output function. Use a multimeter to measure the output current at the corresponding range to confirm good linearity and the absence of offset or attenuation.
Alarm Point Calibration: Simulate operating conditions to trigger upper and lower limit alarms, and verify the deviation between the relay actuation values and the set values. If a deviation is found, enter the parameter settings interface to correct the hysteresis value.
Communication Function Retest: Test the read/write functions of the RS485 Modbus RTU communication to confirm that the host computer can normally read data from both channels and modify parameters without communication anomalies.

4. Inspection of Wear Parts and Protective Measures (Annual)
Check whether the instrument mounting clips are loose or deteriorated, and verify that the sealing gaskets at the cabinet openings are intact to prevent dust and moisture from entering the cabinet through gaps.
For instruments in humid or corrosive environments, inspect the conformal coating. If peeling or bubbling is observed, reapply the coating after powering down to enhance protection.

7.3 Long-Term Maintenance Tips (Extending Equipment Lifespan)
1. Dust and Moisture Protection Optimization (General Maintenance)
Ensure the instrument enclosure maintains a tight seal. Provide drainage holes at the bottom of the enclosure and install a dust cover on the top to prevent dust and moisture from entering. In high-humidity environments (humidity > 85% RH), it is recommended to install desiccants or dehumidification modules inside the enclosure to prevent condensation from corroding terminals and circuit boards.
Do not install liquid piping directly above the instrument to prevent dripping or condensation from entering the instrument; if moisture cannot be avoided on-site, prioritize models with an IP54 front panel and IP30 enclosure protection rating, and regularly inspect the front panel gaskets for signs of aging.

2. Long-Term Interference Suppression Optimization
Signal lines and power lines must be routed in separate conduits or cable trays; routing them in the same conduit is strictly prohibited; All shielded signal cables must be grounded at a single point, preferably on the control cabinet side, to avoid ground loops caused by grounding at both ends.
In high-interference environments (near variable frequency drives or motors), install additional signal isolators or shielded cable trays to reduce electromagnetic interference; terminate RS485 communication lines with a 120Ω terminating resistor to enhance communication stability and minimize signal reflection interference.
Regularly inspect the grounding system to ensure a reliable connection between the instrument's grounding terminal and the control cabinet's protective ground wire, with a grounding resistance of ≤4Ω, to prevent reduced interference immunity caused by loose or broken connections.

3. Protection Techniques for Extreme Environments
High-temperature environments (>50°C): Avoid installing instruments on the top of the cabinet or near heat sources, and ensure sufficient space for heat dissipation; Install cooling fans or air conditioning inside the cabinet to maintain an ambient temperature below 60°C, preventing accelerated aging of internal instrument components.
Low-temperature environments (< -10°C): Prioritize wide-temperature models (-20°C to +70°C) and install insulation or heating modules inside the cabinet to prevent LCD display abnormalities and component performance degradation caused by low temperatures.
Corrosive / Dusty Environments: Regularly clean the instrument's panel and terminal areas; install transparent protective covers if necessary to prevent corrosive gases and dust from damaging the instrument's surface and terminals.

4. Operation and Parameter Protection
During daily operations, non-technical personnel must not arbitrarily modify instrument parameters. Enable the instrument's key lock function to prevent accidental changes to measurement ranges or alarm points.
When powering the instrument on and off, avoid frequent rapid power cycles. It is recommended to wait at least 10 seconds before reapplying power to prevent power surges from damaging the instrument's power supply module.
During long-term shutdowns, disconnect the instrument from power and ensure it is protected against dust and moisture. Store it in a dry, well-ventilated environment to prevent component aging caused by prolonged idle operation while powered on.

VIII. Troubleshooting & Emergency Procedures
8.1 List of Common Faults
No display on the instrument; black screen; fails to start
Measurement signal drifts, fluctuates, or is unstable; excessive display deviation
Abnormal bar graph display; bar graph does not follow changes in digital display values
Relay alarm triggers incorrectly, fails to trigger, or has delayed response
4-20mA Transmitter Output: No signal, inaccurate output values, or output line break
RS485 Modbus RTU Communication: Communication failure, disconnection, garbled data, or packet loss
Input Signal: No response upon connection; instrument cannot recognize sensor signal
Strong On-Site Electromagnetic Interference: Causes data distortion or functional malfunction
Instrument Power-On: Normal power-on but buttons unresponsive; parameters cannot be modified
Instrument: Severe localized overheating or abnormal operational noise

8.2 Summary of Core Causes of Malfunctions
1. Wiring-related causes: Reversed polarity, loose or faulty terminal connections, mixing of high- and low-voltage circuits, incorrect shield grounding, cross-wiring in dual-channel circuits

2. Power Supply Issues: Insufficient supply voltage, overvoltage, excessive power supply ripple, poor power supply contact, or overloaded power distribution output
Parameter Settings: Incorrect range setting, wrong unit selection, alarm threshold deviation, mismatched transmitter range, or incorrect communication address or baud rate

3. Operating Environment Causes: Condensation due to high temperature and humidity, short circuits caused by dust accumulation, electromagnetic interference from high-power inverters, and loose wiring due to vibration
Load Mismatch Causes: Relays directly driving high-power loads,

external loads exceeding transmitter output limits, or transmitter power consumption exceeding the power distribution capacity

4. Hardware Causes: Aging internal circuits, damaged input/output modules, faulty display components, or communication chip malfunctions

8.3 Step-by-Step Troubleshooting and Solutions for Various Faults
1. No display when instrument is powered on; entire screen is black
Causes: Power supply open circuit, abnormal voltage, reversed power terminal connections, or damage to internal power circuit
Troubleshooting Steps
Disconnect the main power supply. Verify whether the positive and negative terminals of the power supply are reversed. For AC power, distinguish between the neutral and live wire connection points
Use a multimeter to measure the input supply voltage; confirm that the voltage for DC24V models is between 18V and 30V, and for AC models, between 85V and 265V
Check whether the circuit breakers and fuses in the control cabinet have blown, and inspect the upstream power supply lines for breaks
With the power off, retighten all power terminals on the instrument to eliminate loose connections
Resolution
Correct the wiring sequence, replace blown fuses, and restore standard supply voltage; if the display remains blank despite normal power supply, determine that it is an internal power supply failure.
Emergency Plan: Directly replace with a spare instrument of the same model to restore on-site monitoring.

2. Measurement values drift or fluctuate; measurement errors are excessive
Causes of Failure: Signal line interference, improper shielding, incorrect range parameters, sensor failure, poor grounding
Troubleshooting Steps
Access the parameter interface to verify that the instrument's internal range, zero point, and full-scale value match the actual parameters of the field sensor.
Check whether the shielded twisted-pair signal cable is grounded at one end only; avoid grounding both ends simultaneously to prevent loop current interference.
Ensure signal lines are not routed in the same conduit as power cables, and keep them away from variable frequency drives and high-power motors.
Disconnect the field sensor and connect a standard signal source to determine whether the fault lies with the instrument or the sensor.
Resolution
Recalibrate the zero point and range; standardize the grounding method for shielded cables; route power and signal lines separately; replace damaged signal cables.
Contingency Plan: Temporarily enable the instrument's filtering parameters and increase the digital filtering intensity to temporarily stabilize on-site readings.

3. Abnormal bar graph display, but digital display is normal
Causes: Abnormal bar graph driver, minor display module malfunction, or incorrect parameter display mode settings
Troubleshooting Steps
Access the instrument's display settings interface to confirm that the bar graph display mode is enabled and that the percentage range matches the actual measurement range.
Power cycle the instrument to restore the basic display operation state.
Observe whether the bar graph remains stationary, has missing segments, or exhibits uneven brightness under a stable signal.
Resolution: Restore the factory default display parameters and perform a reset; if the issue persists, the display component is faulty.

4. Abnormal relay alarms (false alarms / no alarms / delayed alarms)
Causes: Incorrect alarm parameter settings, unreasonable hysteresis values, excessive contact load, or poor circuit connections
Troubleshooting Steps
Verify upper and lower alarm limits, alarm hysteresis, and alarm delay parameters; correct any logical configuration errors
Simulate actual operating conditions to test whether the relay's activation threshold is accurate
Check the power of the external load connected to the relay to ensure it does not exceed the rated capacity of the dry contacts
Check the external alarm output wiring for short circuits or open circuits
Resolution
Reset appropriate alarm thresholds and hysteresis values; install an intermediate contactor for high-power loads; organize the alarm return wiring.
Contingency Plan: Temporarily disable the faulty alarm channel and activate another set of backup alarm contacts as a temporary replacement.

5. No Signal or Inaccurate Output from 4-20mA Transmitter
Causes: Transmitter range not set, reversed output wiring, excessive downstream load resistance, or output module failure
Troubleshooting Steps
Verify that the transmitter output function is enabled within the instrument, and ensure the transmitter range matches the measurement range
Measure the current across the transmitter output terminals and verify the polarity of the wiring
Calculate the total load resistance of the downstream PLC and data acquisition modules; ensure it does not exceed the instrument's rated load
Disconnect the downstream load and perform a no-load test to verify if the instrument's transmitter output functions normally
Resolution
Reconfigure the transmitter parameters, swap the positive and negative output terminals, or split multiple parallel data acquisition devices to reduce the load.

6. RS485 Modbus RTU Communication Failure
Causes: Duplicate communication addresses, mismatched baud rates, reversed A/B lines, messy bus wiring, or mismatched terminating resistors
Troubleshooting Steps
Verify that the instrument's communication address, baud rate, and parity bit exactly match the host system's configuration parameters
Swap the A and B lines of the RS485 connection and retest communication
When networking multiple instruments, check for address conflicts
For long-distance communication, install a 120Ω terminating resistor at the end of the bus
Resolution Measures
Standardize communication parameters across the entire network, ensure proper daisy-chain wiring, and eliminate issues such as broken bus lines or excessive branches.
Contingency Plan: Temporarily communicate with and read data from individual instruments separately; do not perform networked batch data collection for the time being.

7. Sensor Signal Not Recognized by Instrument
Causes: Incorrect input model selection, damaged internal power supply, sensor failure, or misaligned terminal connections
Troubleshooting Steps
In the instrument's input settings, precisely select the corresponding signal type (current, voltage, RTD, thermocouple).
For two-wire transmitters, verify whether the instrument's 24V power supply output is normal.
Connect a known-good sensor for testing to isolate the fault location.
Resolution
Reselect the correct input type, repair the power supply circuit, and replace the faulty sensor on-site.

8. Keypad Malfunction, Parameters Cannot Be Modified
Causes: Key lock enabled, panel keys oxidized due to moisture, program freeze
Troubleshooting Steps
Disable the instrument's key lock function and turn off parameter lock mode
Power off the entire unit, let it sit for 3 minutes, then power it back on to reset
Resolution: Unlock operating permissions and restart the instrument; if physical keys are malfunctioning, return the unit to the factory for repair.
IV. Model-Specific Troubleshooting Notes
S803 Single-Channel
With single-channel signal acquisition, if there is no input or output, prioritize troubleshooting the independent circuit and parameters of that channel. Since there is no channel interference, the troubleshooting

process is simpler; a single-channel power supply failure directly affects the corresponding transmitter.
SS803 Dual-Channel
If one channel is abnormal while the other is normal, the fault is directly attributed to the circuit, parameters, or components of the abnormal channel.
If both channels are abnormal simultaneously, prioritize troubleshooting the shared power supply, shared communication, and the instrument's common power supply section.
If one of the two power distribution circuits fails, only the corresponding channel's transmitter is disabled; the other circuit can continue to operate normally.
If any of the four relay groups fails independently, simply repair the wiring of the corresponding group.

8.5. After-Sales Repair Guidelines
1. Criteria for Determining Faults and Reporting Repairs
If any of the following conditions are met, and issues related to wiring, parameters, or external operating conditions have been ruled out, a formal after-sales repair request may be submitted:
No display at all under standard power supply conditions, with multiple resets proving ineffective
All multi-channel input/output functions have failed; the device still does not operate normally even with standard signal input
Irreversible hardware damage caused by burned-out internal components, deformed casing, or water ingress/moisture
Accuracy severely exceeds specifications; factory nominal accuracy cannot be restored after multiple calibrations
Permanent failure of the communication module, display module, or relay module

2. Standard Service Request Procedure
Document the fault symptoms, model (S803/SS803), serial number, on-site power supply method, and industry application scenario
Take photos of the instrument panel display, on-site wiring layout, and the actual fault scene
Contact the account manager to submit the fault description and supporting materials, and confirm the after-sales resolution plan
Agree on one of three resolution options: on-site troubleshooting, return for repair, or replacement and reshipment
Complete the process by returning the device for inspection or scheduling an on-site service visit

3. Official Warranty Coverage
Under normal industrial operating conditions and provided there is no human-caused damage, the entire unit is covered by the standard warranty.
For non-human-caused hardware failures within the warranty period, repairs and replacement parts are provided free of charge.
Free remote technical guidance, parameter tuning, wiring guidance, and remote troubleshooting services are provided.
Lifetime technical consultation, product selection guidance, and usage optimization services are provided.

4. Exclusions from Free Warranty Coverage
Damage resulting from unauthorized disassembly or modification of the instrument's internal structure, or alteration of the original factory wiring
Physical damage caused by overvoltage, water immersion, impact from external forces, or corrosion from corrosive gases
Port burnout caused by on-site wiring errors or short circuits in external loads
Equipment damage caused by natural disasters or accidents at the construction site
Repairs for hardware failures occurring after the warranty period has expired