AI-8x89G Multi-Loop Intelligent Controller

User Manual

V 9.50

Xiamen Yudian Automation Technology Co., Ltd.

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1 Overview

The Yudian AI-8x89G integrates up to 5 Yudian custom-designed 24BIT high-performance, low-noise, and low-temperature-drift A/D conversion chips. A single module supports a maximum of 8 channels of thermocouple measurement inputs, 8 channels of control outputs, and 2 channels of alarm outputs. In the 4-input, 2-stage cascade mode, the sampling speed and measurement accuracy can be significantly improved, enabling a fast response strategy. The minimum control cycle is only 40mS, which further reduces temperature control errors after RF is activated. Under RF conditions, the control error can be adjusted to below 3 degrees. In the 8-input, 4-stage cascade control mode, the cascade control cost for each loop can be effectively reduced. By adding external expansion modules, the AI-8x89G can support up to 96 measurement and control channels, which can meet the needs of various emerging industries for compact size and multi-loop control. In the expanded mode, the host computer only needs to communicate with a single instrument to control up to 96 measurement and control loops, significantly improving communication efficiency compared to modes that require accessing multiple addressed instruments. Its commonly used parameters allow unlimited write operations from the host computer, ensuring that the instrument's internal memory is not damaged by frequent writes. The parameter write restriction function is enabled only when the Loc setting is configured to a specific value, allowing modification of certain or all instrument parameters. This helps prevent operational anomalies caused by errors in communication software programming. Compared to similar products on the market, the AI-8x89G offers many unique advantages, as outlined below:

● Highly reliable and low-power design, featuring pulse group anti-interference capability tested up to 8KV, high-temperature resistance validated through 100°C aging tests, and typical power consumption of less than 0.3W without output conditions.

● Expandable up to 96 channels of control outputs and 256 channels of alarm outputs, and with input expandability to 96 analog measurement inputs and 16 switch event input channels. Each output channel has 4 alarm settings and input error alarms, totaling 5 alarm signals. All alarm signals can be defined as independent output or common output to conserve alarm output ports.

● Equipped with a new multi-channel operation interface featuring an LED digital display, it allows quick viewing and modification of parameter settings for any channel. All internal register values of the instrument can be edited, enabling emergency operation even in the event of a host computer failure.

● When selecting different numbers of control loops and functions, the usage and register addresses remain completely consistent. This means that customers only need to learn how to use the single model of the AI-8x89 instrument to meet various functional needs, significantly reducing learning costs.

● An operation mode that combines high flexibility and efficiency. All the functions of AI-8x89G can be implemented through reading and writing register parameters. The registers are divided into channel parameters, input/output group parameters, and common parameters. Channel parameters are independent settings for each channel, with 12 parameters per channel, including set values, PID parameters and alarm parameters, etc. Input and output each have 4 sets of different configuration parameters, which can be selected and called by their respective input and output channels. Common parameters are global parameters used across the system, such as baud rate and communication address. Based on the parameter group definition model, the AI-8x89G can significantly reduce the total number of registers while maintaining flexibility and powerful functionality. This simplifies the operation mode and improves the read/write efficiency of the host computer. For example, if the 96 input loops of the of AI-8x89G share the same specifications, all input parameters can be configured to use the first set of parameters. This allows 1 set of input configuration parameters to define the input specifications for all loops. Alternatively, different parameter groups can be selected to define various input specification types. A single AI-8x89G can define up to 4 different input specification types, sufficient to meet the requirements of most application scenarios.

● The host and external expansion modules can be placed separately, allowing flexible and convenient installation in compact cabinet spaces. Input and output modules can be installed near field equipment, with multi-channel input and output signals connected to the host via a single pair of twisted wires, significantly reducing wiring costs. Most input and output expansion modules do not require parameter configuration, offering strong versatility and plug-and-play functionality. This reduces the variety of materials and spare parts needed. The separated design of the input modules consumes only about 0.15W, generates no heat, and can be flexibly placed in temperature-stable areas within the cabinet. This improves cold-junction compensation accuracy for thermocouples, enhancing measurement precision and stability while further reducing wiring costs.

● The AI-8x89G allows virtually unlimited expansion of input and output modules and can be quickly customized to meet customer requirements. When no new mold development is required, the customization cycle is as short as approximately 2 weeks. Additionally, the system reserves a portion of spare registers to facilitate the addition of new functions for customers.

● Provide 4 channels of high-voltage fully isolated thermocouple input specifications, designed for diffusion and oxidation furnaces operating above 900°C. This effectively prevents measurement fluctuations caused by high-temperature leakage from the furnace and thermocouples. Under high-temperature conditions, temperature control accuracy can be better than 0.5°C.

● Support up to four isolated groups of 8 channel thermocouple or mV signal inputs. Each channel can independently select different thermocouple input specifications. Each channel is programmable for computation, enabling the formation of an advanced control system with feedforward + cascade functionality.

● Internal modular output configuration, a single module supports up to 8-channel programmable, freely assignable NPN outputs. It can be specially programmed for a dual-cascade 8-channel output mode or configured as 8-channel conventional non-cascade temperature control system, offering flexible and convenient applications.

● A newly developed cascade control algorithm tailored for the photovoltaic and semiconductor industries introduces independent parameter adjustments for rapid heating and overshoot management without altering PID parameter conditions. This addresses the challenge of balancing these factors, which was previously difficult with PID adjustments alone.

● Core components 100% localization, complete independent intellectual property rights, along with secure and controllable supply chains.

● The installation width of a single module is just 22.5mm, effectively reducing cabinet installation space compared to our previous products and competing models.

● Free on-site installation and commissioning services are offered to photovoltaic industry clients to retrofit existing equipment. By enhancing energy efficiency, production efficiency, and quality, clients can quickly recover their investment costs and achieve additional returns.

2 Model Definition

The AI-8x89G multi-loop controller host features a modular internal IO design, allowing for the installation of up to 3 modules. Modules can be selected and combined freely based on specific requirements. The instrument consists of 4 parts, for example:

AI-8689GD91J1 G71 G71 G61

① ② ③ ④

This indicates a single instrument: ① Basic functionality corresponds to the AI-8689G model. ② and ③ are configured with 4-channel NPN outputs for control purposes. ④ is equipped with the G61 module for alarm outputs. The meanings of each part of the instrument model are as follows:

① indicates the instrument's basic functionality

AI-8689GD91J1 indicates 0.15-level precision, 4-channel cascade controller. 8-channel thermocouple inputs. D91 rail-mounted size, with bottom terminals for 24VDC power supply and RS485 communication interface.

② indicates the module specification installed for the instrument's first output (OUTP): G71 module can be installed.

③ indicates the module specification installed for the instrument's second output (AUX): Modules such as G71 can be installed.

④ indicates the module specification installed for the instrument's third output and communication expansion (ALM/YULINK): Modules such as G61 and S5 can be installed.

Note 1: This instrument is a maintenance-free device utilizing automatic zero adjustment and digital calibration technology. If the instrument is found out of tolerance during metrological verification, cleaning and drying the instrument internally will typically resolve the issue. In the rare event that drying and cleaning fail to restore accuracy, the instrument should be treated as faulty and returned to the manufacturer for repair.

Note 2: Instruments are eligible for free repair during the warranty period. For any instruments requiring repair, please specify the fault symptoms and causes to ensure accurate and comprehensive servicing. Note 3: Common module models and functions are as follows:

Module Name	Functional Description
G61	Three-channel isolated NPN output, can be externally connected to 5~24VDC to drive SSR or intermediate relays. Maximum external voltage: 28VDC. Maximum drive current per channel: 100mA
G71	Four-channel isolated NPN output, can be externally connected to 5~24VDC to drive SSR or intermediate relays. Maximum external voltage: 28VDC. Maximum drive current per channel: 100mA
S5	Optical isolation RS422 communication expansion interface module

Note: For other modules not listed, please refer to the selection manual or contact technical support

3 Technical Specifications

●**Communication Method:**

Bottom RS485bus terminal; Support MODBUS-RTU protocol; Baud rate adjustable from 4800~115200. The bottom RS485 bus terminal can be connected to the company's TCP-MODBUS and EtherCAT communication controllers, supporting the relevant communication protocols. The communication between the host, slave devices, and expansion modules uses an internal dedicated communication protocol, with a reliable communication distance of 30m.

Communication delay: When connected in series, the communication delay for each input or output expansion module node is approximately 10mS (including data transmission time).

●**Input Specifications:**

Thermocouples: K, S, R, E, J, T, B, N, WRe3-WRe25, WRe5-WRe26 etc.

Linear voltage: 0~75mV, 0~20mV, 0~50mV etc.

External expansion input modules: See relevant expansion input module specifications for performance details.

●**Measurement ranges:** K(-200~+1300℃), S(-50~+1700℃), R(-50~+1700℃), T(-200~+350℃), E(0~800℃), J(0~1000℃) , B(200~1800℃) , N(0~1300℃), WRe3-WRe25(0~2300℃) , WRe5-WRe26(0~2300℃)

Linear input: -9990~+32000 , user-defined

● **Measurement Accuracy:** 0.15 class

● **Measurement Temperature Drift:** ≤ 75PPm/°C

● **Control Cycle:** Minimum 20mS (for single-loop control); for multiple loops, each loop occupies 10mS.

● **Control Mode:**

ON/OFF control mode(adjustable hysteresis)

AI artificial intelligence control, incorporating advanced control algorithms with fuzzy logic PID regulation and parameter auto-tuning capability, as well as a manual control mode

Cascade Control

● **Output Specifications (Modular):**

NPN switch output: Maximum voltage 28V , maximum current 100mA. When driving relay coils, a fast recovery diode must be connected in parallel with the coil to absorb reverse voltage

When using external expansion output modules, refer to the relevant module user manual for technical specifications

● **Alarm Functions:** high limit, low limit, deviation high limit, deviation low limit, and other methods

● **Electromagnetic Compatibility:** Complies with IEC61000-4-4 (Electrical Fast Transient Burst) ±6KV/5KHz and IEC61000-4-5 (Surge) 6KV. The instrument operates without crashes or incorrect I/O actions under a 10V/m high-frequency electromagnetic field, with measurement value fluctuations not exceeding ±5%

● **Isolation Withstand Voltage:** ≥2300V between the power terminals and signal terminals, ≥600V between mutually isolated low-voltage signal terminals

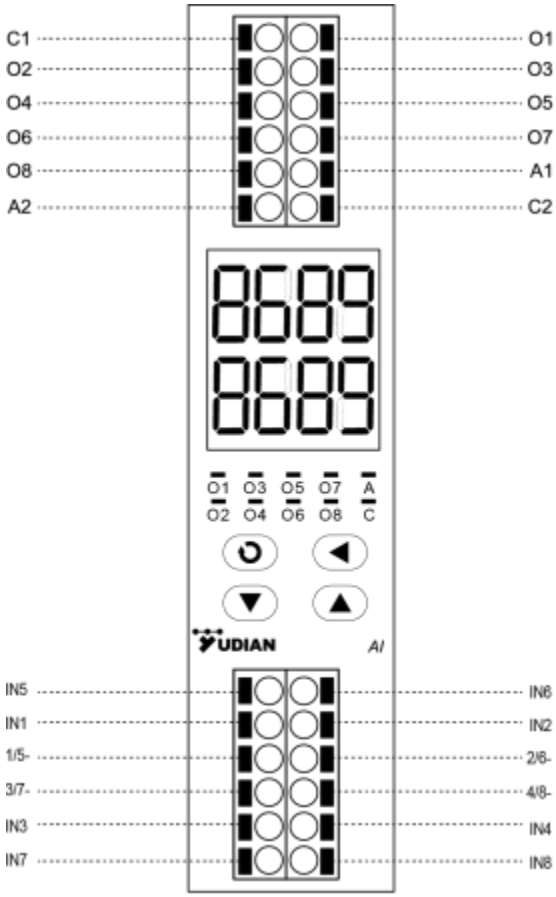
● **Power Supply:** 24VDC, -15% , +10%

● **Power Consumption:** ≤0.3W (when there is no output or external power feed); maximum power consumption of the entire unit ≤3W

● **Operating Environment:** Temperature: -10~60℃; Humidity: ≤90%RH

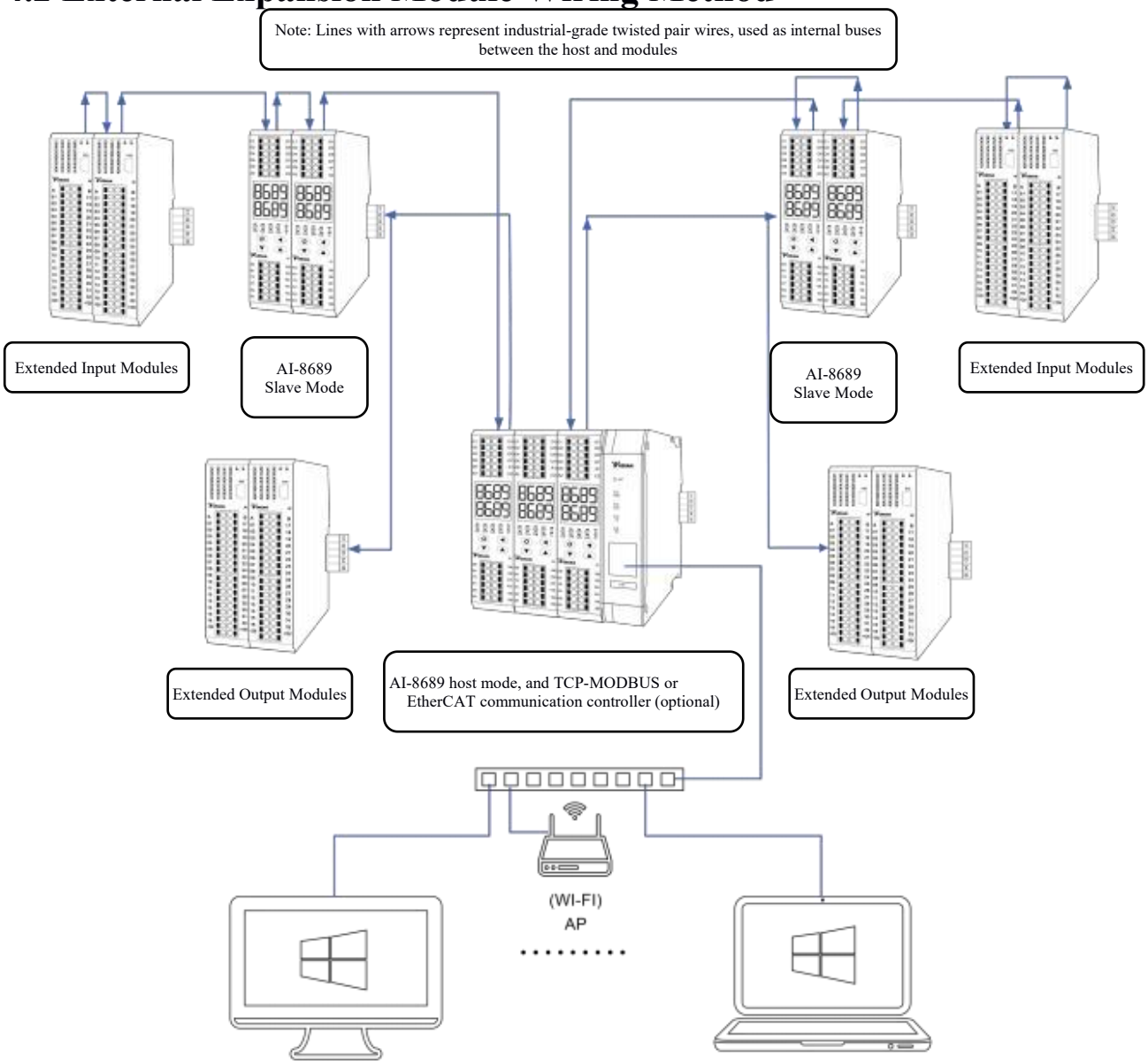
4 Wiring Methods

4.1 Host Wiring Diagram



Note 1: This wiring diagram is for reference only. Due to variations in configuration and version, the wiring diagram provided with the instrument may differ from this manual. Please refer to the wiring diagram provided with the instrument for accuracy. Note 2: If the RS422 interface is selected for installation, the host will not support alarm outputs.

4.2 External Expansion Module Wiring Method



In the extended mode of the AI-8x89G, in addition to the standard bottom bus-type RS485 half-duplex communication interface, an additional S5 full-duplex communication interface is provided. This interface supports independent transmission and reception, specifically designed for communication between the AI-8x89G host, slave units, and extended modules. In addition to setting the AI-8x89G to slave mode as an extension module, Yudian also offers a wide range of extended input/output modules for selection. In addition to the common SSR triggering and linear current/voltage output, extended output modules are available, including zero-crossing trigger for thyristors, intelligent power regulators, valve motor servos, and mechanical relay contacts. Custom modules tailored to specific customer requirements can also be provided. For inputs, apart from conventional thermocouples, RTDs, linear current, and voltage inputs, modules supporting frequency, thermistors, and special specifications are available. For instance, multi-channel input boards capable of withstanding temperatures up to 110°C can be integrated directly into heating equipment. These boards connect externally to the host via communication cables, significantly reducing the wiring required for thermocouples and RTDs.

To ensure real-time communication between the host, slave devices, and expansion modules, the communication connections between slave devices and input modules must adopt a serial connection mode. In this configuration, the input and output communication interfaces of each AI-8x89G slave device and

module are interconnected in series. Output modules can be connected in parallel (using broadcast mode, which requires address configuration) or in series (which can use the default address but requires additional communication ports; this is not currently recommended).

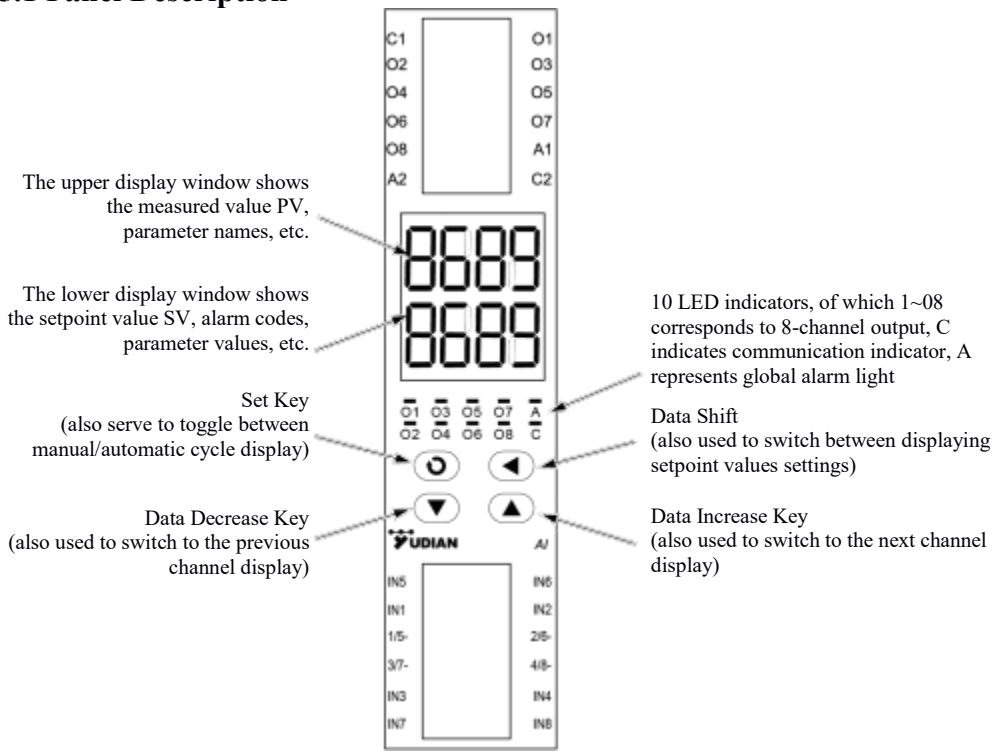
In expansion mode, in addition to improving the speed of the host computer access, the AI-8x89G can achieve many functions that are not available in standalone mode. For example, multiple loops can share the expanded 16 -channel relay alarm outputs, or the common alarm output for each loop. It also allows a single input to be used for multiple PID control loops, or a single PID calculation result to be distributed to multiple different output terminals. Based on the expanded output modules, each loop can have far more resources than in standalone mode, including a greater variety and number of control and alarm outputs.

The AI-8x89G expansion mode wiring diagram is shown below:

Note: The bottom bus of the AI-8x89G host, slave, and expansion modules (including the 24V power supply and RS485communication interface) cannot be directly connected. They need to be wired separately. This is because the bottom bus of the host is used for communication with the host computer or communication controllers such as TCP-MODBUS or EtherCAT, while the bottom bus of the slave and expansion modules is used to transmit output values from the host to the slave or output-type expansion modules. These two buses cannot be connected in parallel. The bottom buses of all host expansion modules can be connected in parallel, but the bottom buses of expansion modules from different hosts must be connected separately. In the AI-8x89G slave mode, it functions solely as an input collection and output module. Its own PID control function will be disabled, and the PID control and allocation of input and output resources will be handled by the host.

5 Display Panel and Keyboard Operation Instructions

5.1 Panel Description

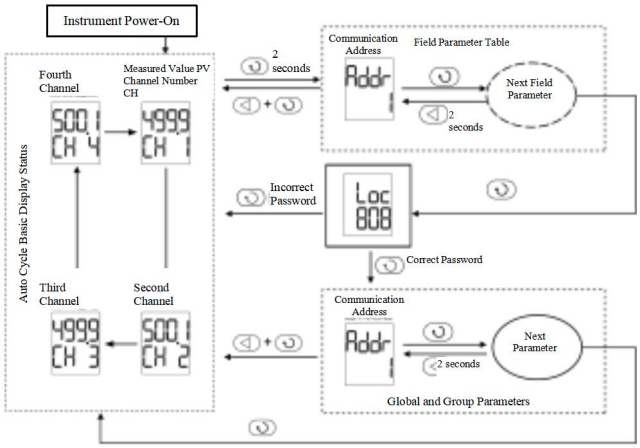


The AI-8x89G comes with a display panel and keyboard operation functionality, allowing for quick viewing and modification of parameters using the Yudian instrument operation style. It also enables convenient operation in case the host computer malfunctions or when it is inconvenient to use.

After the instrument is powered on, it will automatically cycle through the display of the measurement values for each channel. By pressing the Up and Down keys, the users can quickly switch between display channels and fix the display to a specific channel's measurement value. Pressing the Set Key will display the setpoint value for that channel for approximately 2 seconds. After automatically exiting, the display will return to the automatic cycling mode for measurement values. Pressing the Shift Key allows entry into the setpoint setting mode for the currently displayed channel.

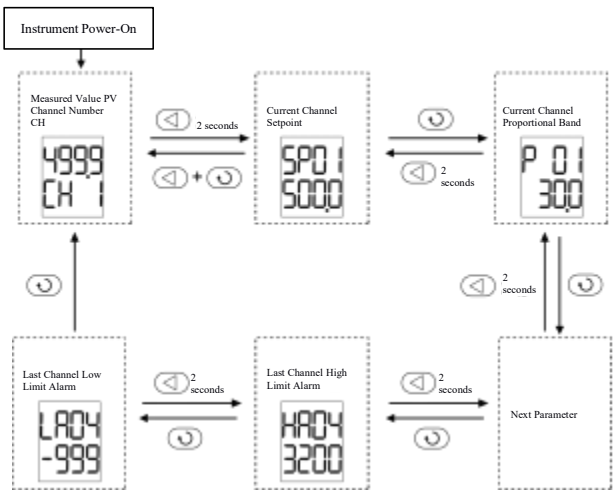
5.2 Global and Group Parameter Setting Methods

Long press the Set Key to enter the group parameter and global parameter configuration mode. The system will first display the shortcut parameters defined by EP parameters. Continue pressing the Set Key to display the LOC parameters, which can be unlocked to access and configure 4 groups of predefined input/output configuration parameters and global functional parameters. (To access the hidden LOC mode, long press the Set Key to enter the group parameter interface, then long press the Shift Key to enter the LOC interface). In the parameter configuration mode, pressing and holding the Shift Key will return to the previous parameter. If the Setup Key is pressed simultaneously, the parameter configuration mode will exit immediately.



5.3 Channel Parameter Setting Methods

Long press the Shift Key to enter the parameter setting mode for the currently displayed channel. This allows displaying and modifying setpoints, PID parameters, and more. If the parameter lock Loc is in the unlocked state, modifications can be made. In the parameter setting mode, pressing and holding the Shift Key allows returning to the previous parameter display. If the Set Key is pressed simultaneously, the parameter setting mode will exit immediately.



6 Communication Protocol and Parameter Register Description

The AI-8x89G instrument can be connected to the host computer via an RS485 serial port, or through the Yudian TCP -modbus or EtherCAT communication controller. The AI-8x89G uses an asynchronous serial communication interface, with interface levels that comply with the specifications of the RS485 standard. The data format consists of 1start bit, 8 data bits, no parity bit or even parity bit, and 1 stop bit. The communication data transmission baud rate is adjustable from 4800~115200 bps. When the baud rate exceeds 28800bps, a high-speed optocoupler communication module is required. For long communication distances, a baud rate of 4800bps is recommended.

The AI-8x89G supports the MODBUS-RTU protocol with the following commands: 03H (read parameters and data), 06H (write a single parameter), 10H (write multiple parameters). It can communicate with other MODBUS devices. To ensure transmission speed, the AI instrument uses the RTU (binary) mode. Communication interface settings can be configured to select 1~2 stop bits, with no parity or even parity.

For the 03H command, up to 32 data can be read at a time, with each data consisting of 2 bytes. For example, the command to read 2 data is as follows:

Instrument address	Read command (function code)	Read parameter address code	Read data length	Check code
XXH	03H	00H 01H	00H 02H	CRC

For the 06H, 1 data is written at a time. The command to send is as follows:

Instrument address	Write command (function code)	Write parameter address code	Write data value	Check code
XXH	06H	00H 01H	03H E8H	CRC

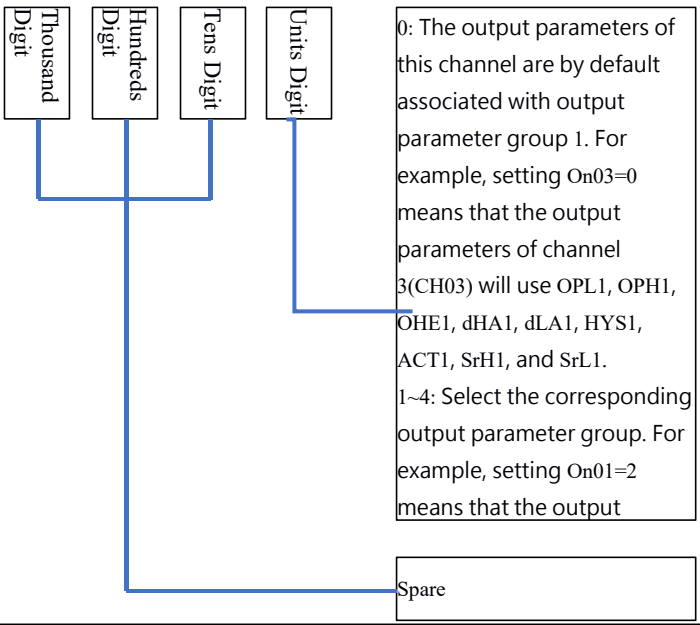
The 10H write command format allows writing up to 16 data at a time, equivalent to a length of 32 bytes. For example, a command to write a single data is as follows:

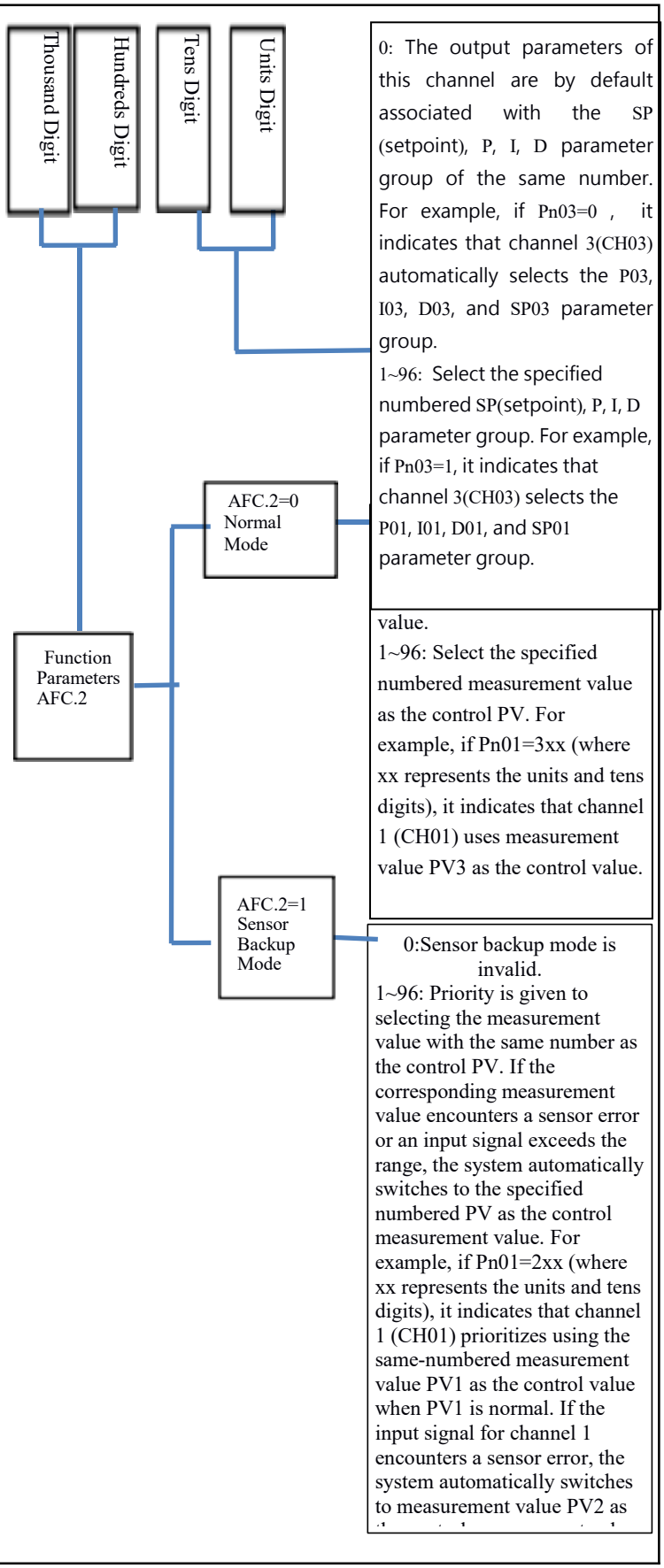
Instrument address	Write command	Write parameter address code	Write number of data	Write bytes	Write data value	Check code
XXH	10H	00H 01H	00H 01H	02H	03H E8H	CRC

The AI-8x89G features 96 sets of channel-independent parameters. Each channel includes 12 parameters: setpoint, proportional band, integral time, derivative time, control mode, output value (also serves as manual value input setting), control output parameter group number and table programming entry address, input channel and allocation of setpoint and PID parameter group, input specification group and input table correction entry address, input offset correction, high limit alarm, and low limit alarm. The configuration group parameters consist of 4 input configuration groups and 4 control output configuration groups (including alarm settings) parameters. Measurement input group parameters include input specifications, filter intensity, scale lower limit, scale upper limit, and other parameters. Output group parameters include output limits, positive and negative deviation alarms, hysteresis, and function configuration parameters. These configuration group parameters apply only to the channels that select the corresponding group parameters. In addition, there are global parameters such as communication address and baud rate. Global parameters are valid for all channels. The parameter addresses are listed in the table below (Note: Depending on the model, some products may not have all parameters).

Hexadecimal Parameter Code	Decimal Parameter Code	Parameter Name	Functional Description
0000H~ 005FH	0000~0095	SP01~SP96 The 1~96 group of preset setpoint values	The setting range: -9990~32000. The setpoint value and PID parameters, a total of 4 parameters, together form a parameter group. The output channels can select different groups as the setpoint value and PID parameters through the PnXX parameter. Generally, the output channel number and PID parameter group number are consistent, but the output channel can also switch to select different numbered setpoint values and PID parameter groups. Different output channels can also share the same PID and setpoint value parameter group.
0060H~ 00BFH	0096~0191	P01~P96 Proportional band	Setting range: 0~32000, with the unit same as the setpoint value.

<table>
<tr><td>00C0H~
011FH</td><td>0192~0287</td><td>I 01~I 96
Integral Time</td><td>Unit: 0.1 seconds, setting range: 0.0~3200.0 seconds.</td></tr>
<tr><td>0120H~
017FH</td><td>0288~0383</td><td>d 01~d96
Derivative Time</td><td>Unit: 0.01 seconds, setting range: -327.60~+327.60 seconds. (The maximum result for auto-tuning is +327.60. If a larger value is needed, the users can write the value as an unsigned 16-bit number. It will be displayed as the corresponding 16-bit signed value on the table.)</td></tr>
<tr><td rowspan="2">0180H~
01DFH</td><td rowspan="2">0384~0479</td><td>In01~In96
Input Channel Configuration Parameter Group Selection</td><td>Setting range: 0~9999. The units digit is set to 1~4 to select the input specification group for the configured measurement channel. Setting it to 0 disables the measurement for that channel. The tens and hundreds digits configure the multi-segment curve correction address for the measurement channel, and setting it to 0 means no correction. For example, setting In01=112 indicates that channel 1 selects the 2nd input configuration group, and the multi-segment curve correction entry address for this channel is d11.</td></tr>
<tr><td>In01~In96
Input Channel Configuration Parameter Group Selection Description</td><td>Thousand Digit
Hundreds Digit
Tens Digit
Units Digit
0: Close the corresponding input measurement channel.
1~4: Select the corresponding input specification group. For example, setting In01=2 means that the input specification for channel 1 (CH01) corresponds to INP2, SCL2, SCH2, FIL2.
5 to 9: Reserved
Used for input nonlinear correction functions
0: Do not enable the multi-point nonlinear correction function
1~95: Input channel multi-point correction entry address. For example, setting In01=11 means that channel 1 selects the first input specification group, enables the input nonlinear correction function, and the correction entry parameter is d1. If only one channel is enabled, a maximum of 97 correction points can be used. For detailed usage, refer to the section below.
Spare</td></tr>
</table>

<table>
<tr><td>01E0H~
023FH</td><td>0480~0575</td><td>Sc01~Sc96
Input Channel Measurement Value Offset</td><td>Setting range: -9990~32000, used for shifting the corrected measurement value. Specifically, if the input channel measurement is turned off, the physical measurement value will be 0. Writing this value is equivalent to assigning the measurement value for that channel through the host machine or program.</td></tr>
<tr><td rowspan="2">0240H~
029FH</td><td rowspan="2">0576~0671</td><td>On01~On96
Output Channel Configuration Parameters</td><td>Setting range: 0~9999 . The units digit is set to 1~4 to select the configuration parameter group for the output channel. The tens, hundreds, and thousands digits are reserved for future functions. When the default value is 0, it associated with output parameter group 1.</td></tr>
<tr><td>On01~On96
Output Channel Configuration Parameter Description</td><td> 
</td></tr>
<tr><td>029FH~
02FFH</td><td>0672~0767</td><td>Pn01~ Pn96
Output Channel PID Configuration Parameter Group and Measurement Channel Selection</td><td>Setting range: 0~9999. The units and tens digits are set from 1~96 to select the PID and setpoint SP parameter groups (96 groups in total). Setting it to 0 will automatically select the PID and setpoint parameter group with the same number. In normal mode (when parameter AFC.2=0), the hundreds and thousands digits are set from 1~96to select the
PV input channel. Setting it to 0 will automatically select the measurement value with the same number as the control PV value. In sensor backup mode (when parameter AFC.2=1), the measurement value with the same number will be prioritized as the control PV value. However, if the PV for the same number is out of range or abnormal, the measurement value for the channel defined by the hundreds and thousands digits of the Pn parameter will automatically be selected as the PV value for this channel.</td></tr>
</table>

		Pn01~Pn96 Output Channel Configuration Parameter Description	

<table>
<tr><td rowspan="2">0300H~
035FH</td><td>0768~0863</td><td>At01~At96 Output Channel Operating Mode</td><td>Set to 0: Execute the APID, i.e. PID control algorithm with AI function. Set to 1: Initiate the At auto-tuning process. Set to 2: Execute the ON/OFF control mode. Set to 3: Execute manual control mode. Set to 4: Stop control and disable output. Set to 1XX: Define a cascade control secondary (inner loop) mode. The setpoint for this channel is scaled using parameters LA as the lower limit and SP as the upper limit. For example, setting At10=101 means that the setpoint for channel 10 is calculated as: Setpoint=LA10+(SP10-LA10)*OP01/25600. Note: If the measured value PV10 is below LA10, a low-limit alarm will still be triggered. If SP10 is less than LA10, cascade control will not be executed. Set to 2XX: Disable PID control. The output of this channel follows the output of channel XX proportionally. The proportional band parameter can be set within a range of 0~3200.0% to modify the relative output ratio. For example, setting At10=206 means the output value of channel 10: OP10=OP6*P10*0.1%, where OP10 follows the output of OP6, and the value of P10 is in units of 0.1%. The valid range of this function XX is 1~16. Set to 3X (X ranges from 1~9, indicating the channel number): Define an intelligent calibration cascade control secondary mode</td></tr>
<tr><td colspan="3">
<table>
<tr><th>AT01~AT96 Definition Description</th><th>Function</th><th>Description</th></tr>
<tr><td>0</td><td>APID Control Model</td><td>Indicate that this channel executes APID, i.e. the PID control algorithm with AI functionality</td></tr>
<tr><td>1</td><td>Auto-tuning</td><td>Indicate that the channel starts the auto-tuning process</td></tr>
<tr><td>2</td><td>Bit Control Mode</td><td>This channel executes the ON/OFF bit control mode</td></tr>
<tr><td>3</td><td>Manual Output Mode</td><td>Switch the channel to manual mode, allowing the output size of the channel to be adjusted by modifying OPxx</td></tr>
<tr><td>4</td><td>Stop Control</td><td>The channel stops control and disables output.</td></tr>
<tr><td>1xx</td><td>Cascade Control Mode</td><td>Set to 1XX (where XX represents the channel number) to define the cascade control secondary control (inner loop) mode. The setpoint for this channel will be scaled by the parameters LA and SP, which serve as the lower and upper limits, respectively. For example, setting At10=101 means that the setpoint for channel 10 is calculated as =LA10+(SP10-LA10)*OP01/25600. Note that if the measured value PV10 falls below LA10, the low limit alarm will still be triggered. If SP10 is less than LA10, the cascade control function will not be executed</td></tr>
<tr><td>2xx</td><td>Follow Output Mode</td><td>Set to 2xx to disable PID control. The output of this channel will follow the output of channel XX proportionally. The proportional band parameter can be adjusted from 0~3200.0% to modify the relative output ratio.
For example: At10=206, it means the output value of channel 10is OP10=OP6*P10*0.1% , i.e. OP10 follows OP6 output, and the value of P10 is in units of 0.1%. The valid range for the channel number xx in this function is 1~16</td></tr>
<tr><td>3X</td><td>Intelligent Calibration Cascade Control Mode</td><td>Set to 3X (X ranges from 1~9, representing the channel number), this defines the intelligent calibration cascade control secondary control mode (note that it only supports heating). In this mode, the secondary control proportional band is defined as the cascade control strength, with units in 0.1% . The secondary control proportional band of 0 indicates that cascade control is disabled (at this point, the secondary control output equals the main control output), and the maximum setting is 120.0% . The secondary control SP parameters and integral parameters are secondary control self-learning parameters (they change automatically during operation). For initial use, refer to similar devices and input values directly, which helps accelerate the adaptation process of the control system. The secondary control derivative parameter defines the learning style of the secondary control, and it is generally recommended to set it to 50.00. Increasing this parameter value helps reduce overshoot, while decreasing it shortens the heating time but may cause some overshoot.</td></tr>
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</td></tr>
</table>

0360H~ 03BFH	0864~0959	OP01~OP96 Output Values of Output Channels	In automatic mode, this channel is read-only and represents the PIDcontrol output value (when in ON/OFF control, 0 indicates off, and 25650 indicates on). In manual mode, this channel is readable and writable, allowing the input to serve as the manual output control value. The value 25600 represents 100% output.
03C0H~ 041FH	0960~1055	HA01 ~HA96 Multifunctional Parameter 1	Setting range: -9990 ~ 32000, multifunctional parameter, it is by default used as the high limit alarm value for the measurement value selected by the first output channel. It can also be defined as a positive deviation alarm or used for scaling definition in transmission output, among other purposes.
0420H~ 047FH	1056~1151	LA01~LA96 Multifunctional Parameter 2	Setting range: -9990~32000, multifunctional parameter. By default, it serves as the low limit alarm value for the measurement value selected by the first output channel. It can also be configured as a negative deviation alarm or for other purposes.
0480H~ 04DFH	1152~1247	SV1~SV96 PID Actual Setpoint	In normal fixed-point temperature control mode, it is simply equal to SP1~SP96 . Note that it is not equal to SP1~SP96 in modes with heating or cooling rate control or cascade control's secondary control mode. When the heating/cooling slope limit function is available, the start setpoint can be defined by writing this parameter. At the same time, by inputting data for multiple channels , synchronized heating and cooling curves for multiple channels can be achieved.
04E0H~ 04E3H	1248~1251	Program Running Segment Number	Represent the segment number currently in operation for 1~4 sets of programs. A segment number between 1~16 indicates the segment currently being executed, while a segment number of 0 signifies that the program segment has stopped. By setting the segment number to a value between 1~16, the program can be initiated from a specific segment.
04E4H~ 04E7H	1252~1255	Running Time of the Current Segment	Represent the running time of the current segment for1~4 sets of programs. When the accumulated time exceeds the preset duration of the program, execution transitions to the next segment. This data can also be read and written, i.e., the host computer can intervene in the execution state of the program by rewriting its own running time.
04ECH~ 04EFH	1260~1263	Program Generator Output Value	Represent the output value generated by the program generator for1~4 sets of programs. The generated value can serve as the program setpoint, an offset for the program setpoint, or as a feedforward control value for the program output (only HCF7) and so on.
04F0H~ 04F3H	1264~1267	Forced Manual Operation	For channels 1~4, setting the value to 1 forces the corresponding channel into manual mode. A value of 0 or any other value allows the channel to operate according to the At parameter. However, if the At parameter is set to a mode greater than 4, such as in cascade control output modes, this parameter will not control the operation.
04F4H~ 04FFH	1268~1279	Alternate Address	Reserved for future version upgrades. Please do not use.
0500H~ 057FH	1280~1407	Program Generator Data	128 program data, divided into 4 groups with 32 data per group, corresponding to 16 segments of the program. The first 32 data belong to the first group, and so on. The program is arranged in the sequence: the value of the first program segment - the duration of the first segment - the value of the next program segment. A negative duration indicates a stop control action. HCF7G replaces the PID computation output value with the program setpoint during program execution. A range of 0~25600 represents an output of 0~100%. Note that if the setpoint exceeds 101%, the PID output value will not be replaced.
04E0H~ 05FFH	1248~1535	Alternate Address	Reserved for future version upgrades. Please do not use.
0600H ~065FH	1536~1631	Channel 1~96 Measurement Values	Read-only; if the host computer needs to transmit measurement values, this can be achieved by disabling the channel and writing to the Sc parameter. The system will automatically refresh this parameter.
0660H ~066FH	1632~1647	Channel 1~8 Measurement Values 32bit Data	Read-only; provide high-resolution 32bit data for channels 1~8 (positive values only). This data is suitable for applications requiring high-resolution displays and can be subjected to secondary filtering defined by the FL32.
0680H~ 06AFH	1664~1711	Alarm Status, 48 Parameters	Each parameter includes the alarm status for 2 channels: the high byte corresponds to odd-numbered channels, and the low byte corresponds to even-numbered channels. BIT0~BIT4 respectively represent alarms for input errors, HA, LA, dHA and dLA. When the alarm lock function is enabled, the lock can be released by writing to this parameter.

<table>
<tr><td></td><td>
<table>
<tr><th>Alarm</th><th>Status Bits</th><th>Description (x or xx represents the channel number)</th></tr>
<tr><td rowspan="6">For even-numbered channels, such as: CH02</td><td>Bit0</td><td>0: Sensor input signal is normal
1: Sensor input error or input signal out of range oral</td></tr>
<tr><td>Bit1</td><td>0: Input signal has not exceeded the set high limit HAxx value
1: Input signal exceeds the set high limit HAxx value, triggering the HA alarm</td></tr>
<tr><td>Bit2</td><td>0: Input signal has not fallen below the set low limit LAxx value
1: Input signal falls below the set low limit LAxx value, triggering the LA alarm</td></tr>
<tr><td>Bit3</td><td>0: Input signal has not exceeded the set high deviation limit dHALx value
1: Input signal exceeds the set high deviation limit dHAx value, triggering the dHA alarm</td></tr>
<tr><td>Bit4</td><td>0: Input signal has not fallen below the set low deviation limit dLAx value
1: Input signal falls below the set low deviation limit dLAx value, triggering the dLA alarm</td></tr>
<tr><td>Bit5~bit7</td><td>Spare</td></tr>
<tr><td rowspan="6">For odd-numbered channels, such as: CH01</td><td>Bit8</td><td>0: Sensor input signal is normal
1: Sensor input error or input signal out of range oral</td></tr>
<tr><td>Bit9</td><td>0: Input signal has not exceeded the set high limit HAxx value
1: Input signal exceeds the set high limit HAxx value, triggering the HA alarm</td></tr>
<tr><td>Bit10</td><td>0: Input signal has not fallen below the set low limit LAxx value
1: Input signal falls below the set low limit LAxx value, triggering the LA alarm</td></tr>
<tr><td>Bit11</td><td>0: Input signal has not exceeded the set high deviation limit dHALx value
1: Input signal exceeds the set high deviation limit dHAx value, triggering the dHA alarm</td></tr>
<tr><td>Bit12</td><td>0: Input signal has not fallen below the set low deviation limit dLAx value
1: Input signal falls below the set low deviation limit dLAx value, triggering the dLA alarm</td></tr>
<tr><td>Bit13~bit15</td><td>Spare</td></tr>
</table>
</td></tr>
<tr><td>06C0H~
06EFH</td><td>
<table>
<tr><td>1728~1775</td><td>Control Status, 48 Parameters</td><td>Read-only. Each parameter includes the control status of 2 channels. BIT0: A value of 0 indicates the auto-tuning state, while a value of 1 indicates the non-auto-tuning state. BIT1: A value of 0 indicates normal control, while a value of 1 indicates the stop control state. Note: This parameter is read-only. To modify the control status, adjust the relevant parameters instead. The system will automatically update this parameter.</td></tr>
</table>
<table>
<tr><th>Control Status</th><th></th><th>Description, this parameter is read-only</th></tr>
<tr><td rowspan="3">Even channels
e.g. CH02</td><td>Bit0</td><td>0: AT auto-tuning in progress
1: Not in auto-tuning mode</td></tr>
<tr><td>Bit1</td><td>0: Normal control mode
1: The current channel is in stop control mode, STOP mode</td></tr>
<tr><td>Bit2~bit7</td><td>Spare</td></tr>
<tr><td rowspan="3">Odd Numbered Channels
e.g. CH01</td><td>Bit8</td><td>0: AT auto-tuning in progress
1: Not in auto-tuning mode</td></tr>
<tr><td>Bit9</td><td>0: Normal control mode
1: The current channel is in stop control mode, STOP mode</td></tr>
<tr><td>Bit10~bit15</td><td>Spare</td></tr>
</table>
</td></tr>
<tr><td>-06F0H~
07FFH</td><td>1776~2047</td><td>Alternate Address</td><td>Reserved for future version upgrades. Please do not use.</td></tr>
</table>

<table>
<tr><td>0800~
0803H</td><td>2048~2051</td><td>InP1~4;
Input Specification Definition</td><td>This parameter is one of the input group parameters and is used to select the input specification. It needs to match the corresponding module. For example, the thermocouple input module must be set to thermocouple as the input specification. There are 4 groups of input parameters, with each group comprising the following 4 parameters: InP, ScL, ScH and FIL. InP is used to select the input specification, and its value corresponds to the following input specification:
<table>
<tr><td>0 K</td><td>13 T (0~300.00℃)</td></tr>
<tr><td>1 S</td><td>17 K(0~300.00℃)</td></tr>
<tr><td>2 R</td><td>18 J(0~300.00℃)</td></tr>
<tr><td>3 T</td><td>25 0~75mV voltage input</td></tr>
<tr><td>4 E</td><td>28 0~20mV voltage input</td></tr>
<tr><td>5 J</td><td>29 0~50mV voltage input or 0~20mA current input</td></tr>
<tr><td>6 B</td><td>30 0~60mV voltage input</td></tr>
<tr><td>7 N</td><td>35 -10~+10mV</td></tr>
<tr><td>8 WRe3-WRe25</td><td>36 -37.5~+37.5mV voltage input</td></tr>
<tr><td>9 WRe5-WRe26</td><td>38 10~50mV voltage input or 4~20mA current input</td></tr>
<tr><td>12 F2 radiation high temperature thermometer</td><td>39 15~75mV voltage input</td></tr>
</table></td></tr>
<tr><td>0804H~
0807H</td><td>2052~2055</td><td>ScL1~4 Linear Input Calibration Lower Limit Value</td><td>Define the lower limit of the linear input scale, with units the same as the measured value.</td></tr>
<tr><td>0808H~
080BH</td><td>2056~2059</td><td>ScH1~4
Scale upper limit</td><td>Define the upper limit of the linear input scale, with units the same as the measured value.</td></tr>
<tr><td>080CH~
080FH</td><td>2060~2063</td><td>FIL1~4
Digital Filtering</td><td>Define the input digital filtering intensity. 0 means no filtering, 1 means median value filtering, 2~999represents integration filtering, with the unit being the sampling period.</td></tr>
<tr><td>0810H~
0813H</td><td>2064~2067</td><td>dHA1~4 Alarm Parameters</td><td>The default is positive deviation alarm, but it can also be defined as an high limit alarm. This is one of the output group parameters. The output parameter group can either select the same numbered parameter group as the input or choose a different parameter group. The instrument has a total of 4 sets of output parameters.</td></tr>
<tr><td>0814H~
0817H</td><td>2068~2071</td><td>dLA1~4 Alarm Parameters</td><td>The default is negative deviation alarm, but it can also be defined as a low limit alarm.</td></tr>
<tr><td>0818H~
081BH</td><td>2072~2075</td><td>AAF1~4 Alarm Function Selection</td><td>AAF.0~AAF.4 select whether the input fault, HA alarm, LA alarm, dHA and dLA alarms are automatically reset or not. If set to 1, the alarm will not automatically reset, and the customer needs to send a write command to clear the corresponding alarm status register in order to release the alarm action.</td></tr>
</table>

	AAF Detailed Explanation	Description	
	Bit0	0: The alarm status will automatically reset after the input signal error is cleared 1: The alarm status will not automatically reset after the input signal error is cleared. To manually reset, write 0 to the corresponding bit in the alarm status parameter for the relevant channel. For odd-numbered channels, write the alarm status bit8=0, and for even-numbered channels, write bit0=0.	
	Bit1	0: After the HA alarm is cleared, the alarm status is automatically reset 1: After the HA alarm is cleared, the alarm status will not automatically reset. To manually reset, write 0 to the corresponding bit in the alarm status parameter for the relevant channel. For odd-numbered channels, write the alarm status bit9=0, and for even-numbered channels, writebit1=0.	
	Bit2	0: After the LA alarm is cleared, the alarm status is automatically reset 1: After the LA alarm is cleared, the alarm status does not automatically reset. To manually clear the alarm, write 0 to the corresponding bit of the alarm status parameter for the corresponding channel. For odd-numbered channels, write the alarm status bit10=0, and for even-numbered channels, write bit2=0.	
	Bit3	0: After the dHA alarm is cleared, the alarm status is automatically reset 1: After the dHA alarm is cleared, the alarm status does not automatically reset. To manually clear the alarm, write 0 to the corresponding bit of the alarm status parameter for the corresponding channel. For odd-numbered channels, write the alarm status bit11=0, and for even-numbered channels, write bit3=0.	
	Bit4	0: After the dLA alarm is cleared, the alarm status is automatically reset 1: After the dLA alarm is cleared, the alarm status does not automatically reset. To manually clear the alarm, write 0 to the corresponding bit of the alarm status parameter for the corresponding channel. For odd-numbered channels, write the alarm status bit10=0, and for even-numbered channels, write bit4=0.	
	Bit5~bit7	Spare	
081CH~ 081FH	2076~2079	HYS1~4 Hysteresis	The unit is the same as the measurement value. It is used as hysteresis for alarms, ON/OFF control, and PID auto-tuning. However, auto-tuning can also use EHYS as the hysteresis through Act.1.
0820H~ 0823H	2080~2083	OPL1~4 Output Lower Limit	Setting range: 0~100, default as output lower limit. It can also be defined as the output value in case of input fault/overrange.
0824H~ 0827H	2084~2087	OPH1~4 Output Upper Limit	Setting range: 0~105, used as the output upper limit.
0828H~ 082BH	2088~2091	OHE1~4 Segmented Power Limit Setting	OPH valid range, with the same unit as the measurement value. This is used to realize the segmented output limit function. When the measured value is less than OHEF, the output is limited by OPH. When the measured value is greater than OHEF, the output is not limited, i.e. is 100%.
082CH~ 082FH	2092~2095	Act1~4 Control Function Selection	Act.0: Set to 0 to select reverse action (heating) or 1 to select direct action (cooling). Act.1: Set to 0 to use the HYS value of this parameter group as the hysteresis for auto-tuning and ON/OFF control. Set to 1 to use the global parameter EHYS as the hysteresis. Act.2: Set to 0 to force the output to 0 when an input fault occurs on this channel. Set to 1 to force the output to OPL when an input fault occurs. Act.3: Set to 0 to define the output lower limit as OPL. Set to 1to fix the output lower limit at 0. Act.4: Set to1 to force the output to the same state as when an input fault occurs if a HA alarm is triggered.

ACT Detailed Explanation	**Description**
Bit0	0: Reverse action mode (heating control) 1: Direct action mode (cooling control).
Bit1	0: For At auto-tuning and (ON/OFF) bit control, the hysteresis value is determined by the corresponding HYS parameter in this group. For example, if On01=2, the hysteresis value for channel 2 will use HYS2. 1: For At auto-tuning (ON/OFF) bit control, the global parameter EHYS is used as the hysteresis
Bit2	0: Indicate that when an input fault occurs on this channel, the output will be forced to 0 1: Indicate that when an input fault occurs, the output will be forced to OPL
Bit3	0: Indicate that when an input fault occurs, the output will be forced to OPL 1: Indicate that the output lower limit is fixed at 0
Bit4	0: During the HA alarm, the output is not affected 1: During the HA alarm, the output will also be forced to the same state as the input fault condition.
Bit5~bit7	Spare

0830H~ 0833H	2096~2099	Srh1~4 Heating Slope Limit Value	Represent the heating rate per minute. A value of 0 means no limit. If the SP value changes, its rate of change will be limited. Upon initial power-up or control activation, the current measured value PV will automatically be used as the initial setpoint. Additionally, if AFC.3=1, any modification to the setpoint SPXX will also automatically use the current measured value PV as the initial setpoint. Note this function does not apply to secondary control channels in cascade control mode. Note that the control cycle CTI value should be set to a value be divisible by 60.0, such as 0.5, 0.8, 1.0, 1.2, 1.5, 2.0 seconds. Setting it to other values, such as 0.9or 1.1 seconds, may result in calculation errors for the heating slope value.
0834H~ 0837H	2100~2103	SrL1~4 Cooling Slope Limit Value	Indicate the cooling rate value per minute. A value of 0 means no limit. The usage is the same as the Srh parameter.
0838H~ 083BH	2104~2107	SPL1~4 Setpoint Lower limit	Belong to the output parameter configuration group, used to set the lower limit of the setpoint for channels 1~4. Note that it only restricts the range of the actual setpoint value SV and does not limit the range of the configured setpoint SP.
083CH~ 083FH	2108~2111	SPH1~4 Setpoint Upper Limit	Belong to the output parameter configuration group, used to set the upper limit of the setpoint for channels 1~4. Note that it only restricts the range of the actual setpoint value SV and does not limit the range of the configured setpoint SP.
0840H	2112	Addr Communication Address	Define the communication address of this device, with a range of 0~88.
0841H	2113	bAud Communication Baud Rate	Define the baud rate, the unit is 0.1K, setting range: 9.6K~115.2K.
0842H	2114	Adn Expansion Input Loops	If the communication input interface of the extended module does not receive sufficient measurement values defined by the Adn parameter, corresponding input fault alarm signals will be triggered. If the actual input exceeds the setpoint, it will have no effect. This parameter is only used to define the range for communication input alarm indications and does not disable measurement channels. To disable measurement channels, the In parameter can be set.
0843H	2115	ACH Total Measurement Loops	Indicate the total number of measurement loops, including both the onboard and extended input modules. For example, if the onboard unit has 8 loops and the extended input module has 16 loops, ACH should be set to 24. This parameter configuration will disable measurement channels. For instance, if it is set to 4, the measurement value acquisition for channels 5 and beyond will be disabled.
0844H	2116	Ctn Number of Control Loops	Indicate the number of control loops enabled. Each control loop occupies 10mS of processing time. If set to 96, the actual control cycle will be at least 0.96 seconds.
0845H	2117	Srun Run/Stop Selection	Under normal circumstances, the instrument operates in automatic control mode; however, each channel can independently disable the At parameter. If Srun is set to 9655, all PID channels will stop control output, enabling a single-command shutdown. If Srun is set to 15, it indicates a control state; however, after a power outage and restart, the system will automatically enter the 9655 global stop state.
0846H	2118	CtI	Define the control period, up to 0.1~5.0 seconds, where 0.1 seconds is the minimum cycle the system can achieve.
0847H	2119	ALAL Alarm Common Output Configuration (require external alarm module expansion)	ALAL.0~4 define whether the following alarms are included in the common output: ORAL input fault, HA alarm, LA alarm, dHA and dLA. Set to 0 for no output, set to 1 for output. Any alarm will trigger the global public alarm output AL action. The global common alarm output requires the alarm output terminal to be installed on the host.
0848H	2120	ALCH Alarm Independent Output Range Configuration (requires an external alarm module expansion)	Define the start and end numbers of the independent alarm output channels for expansion. Although up to 5*97 alarm signals can be generated, note that the maximum number of extended alarm output channels is 256 expansion of the alarm channel outputs. For instance, if each channel requires 4 independent alarms, the difference between the output channel end number and the output channel start number should not exceed 64.

0849H	2121	ALbt Alarm Independent Output Configuration	ALbt.0~4 define whether input fault (including over-range, open circuit, communication disconnection, etc.), HA alarm, LA alarm, dHA and dLA alarms are output. Set to 0 for no output; set to 1 for output. For example, if ALAL=7, ALbt=3, ALCH=16, the extended alarm output module will output 3 common alarms and 32 independent alarm signals. The output terminal numbers 1~3 will correspond to the common input alarm, high limit alarm, and low limit alarm; terminals 4~7 will sequentially correspond to channel 1 input error alarm, channel 1 HA alarm, channel 2 input error alarm, channel 2 HA alarm, and so on. For another example, if ALAL=0, ALbt=31, ALCH=616, the system will output 55 alarm signals, with 5 alarms for each of channels 6~16.
084AH	2122	AFA Function Parameter Configuration A	AFA.0: Set to 0 for HA as the default high limit alarm, or 1 for positive deviation alarm. AFA.1: Set to 0 for LA as the default low limit alarm, or 1 for negative deviation alarm. AFA.2: Set to 0 for dHAas the default positive deviation alarm, or 1 for high limit alarm. AFA.3: Set to 0 for dLA as the default negative deviation alarm, or 1 for low limit alarm. AFA.4: Set to 0 for LA as the default low limit alarm, or 1 for high limit alarm (this adds an additional high limit alarm). AFA.5: Set to 0 for HA and LA alarms to correspond to input channels, or 1 for HA and LA alarms correspond to output channels (note: in this mode, HA and LA should not be configured as deviation alarms). When AFA.6 is set to 0, AL1 follows the definition in ALAL; when AFA.6 is set to 1, AL1 serves as a global alarm. When AFA.7 is set to 0, AL2 follows the definition in ALAL; when AFA.7 is set to 1, AL2 serves as a global alarm.
084BH	2123	AFB Function Parameter Configuration B	When AFB.1=0, the PID group operates in common mode. When AFB.1=1, the instrument switches to a mode with 5 preset PID groups for automatic switching. In this mode, the maximum number of independent PID control channels is 16. The instrument divides the SV and PID parameter groups into 16*6 groups. Groups 1~16 correspond to the PID parameters currently used by channels 1~16. The following 80 PID groups are arranged in 5 sets for each channel, meaning each channel can preset up to 5 sets of PID parameters that automatically switch according to the current SP value. For example: If SP1 is less than SP17, P1, I1, and d1 are automatically set to P17, I17, and d17. If SP1 is greater than SP17 but less than SP18, P1, I1, and d1 are automatically set to P18, I18, and d18. If SP1 is greater than SP18 but less than SP19, P1, I1, and d1 are automatically set to P19, I19, and d19, and so on.
084CH	2124	AFC Function Parameter Configuration C	AFC.0: Select communication parity bit. Set to 0 for no parity, or 1 for even parity. AFC.1=0: Select linear output as 4~20mA or 2~10V; AFC.1=1: Select current output as 0~20mA or 0~10V. AFC.2=0: No sensor backup function; AFC.2=1: With sensor backup function. AFC.3=0: During slope control, setpoint changes do not trigger measurement value start (PV START) function. AFC.3=1: During slope control, changes in the setpoint will trigger the measurement value startup function. Note that when using this function, the maximum number of control channels cannot exceed 4. AFC.4=0: AD converters have better anti-interference performance for a 50Hz power grid. AFC.4=1: AD converters provides better anti-interference performance for a 60Hz frequencies, only suitable for use in countries with 60Hz power grid frequencies. AFC.5=0: The 0851H address host status BIT0~BIT7 port status mode, where 1 indicates output action and 0 indicates no action. AFC.5=1: The 0851H address host status BIT0~BIT7 port, where 0 indicates action and 1 indicates no action. AFC.6=0: When an external expansion module such as YL-1016 is connected, it transmits the output value. AFC.6=1: When an external host is connected, it can transmit the PV measurement value.

084DH	2125	Nonc	Nonc.0~5: Define the output as normally open (NO) or normally closed (NC) for input fault, HA alarm, LA alarm, dHA alarm, dLAalarm, and common alarm, respectively. 0: Normally open (closes when an alarm occurs). 1: Normally closed. Note that if the system is powered off, the relay is disconnected regardless of the settings.
084EH	2126	EAF host sampling parameter configuration; note that this is only valid for the host's sampling rate. The sampling rate of the extended input module is configured by the extension module itself.	EAF=0: The main input refresh rate is automatically selected based on the CTI control cycle parameter setting. For thermocouples and voltage/current inputs, the fastest rate is 20mS per channel. EAF=1: fixed at 20mS per channel. EAF.AB=2: Fixed refresh rate of approximately 40mS per channel EAF.AB=3: Fixed refresh rate of approximately 80mS per channel
084FH	2127	EHYS Additional Hysteresis	If a different hysteresis value is required for auto-tuning and ON/OFF control compared to the HYS alarm hysteresis, EHYScan be selected as the hysteresis value for auto-tuning and ON/OFF control through Act.1.
0850H	2128	dPt	The data range is 0~3, set the display decimal point position of the host operation panel. This setting is only for the convenience of displaying values on the basic operation panel and does not affect the data read by the host computer, the host computer program can handle the decimal point display by itself.
0851H	2129	Host Status	Read-only: BIT0~5 represent the status of 6 I/O ports on the host (O1~O4, AL1, and AL2). A value of 1 indicates output (configurable via AFC.5). A BIT8 is set to 1 indicate a system fault, such as a memory data error, etc, while BIT9is set to 1 to signal the presence of a global alarm.
0852H	2130	Loc Parameter Blocking	When Loc.5 is set to 0, writing to all parameters is allowed; when set to 1, writing to parameters in the 0800H~08FFH range is not allowed. Loc.6 set to 0 or 1 indicates whether single-byte write instructions are allowed or disallowed, respectively. Loc.7 set to 0 or 1 indicates whether multi-byte write instructions are allowed or disallowed, respectively. When writing is not allowed, the instrument will still return the command but will not actually modify the parameter.
0853H	2131	Instrument Model Characteristic Code	Read-only, indicate the instrument model, with a reading of 8689
0854H	2132	Machine Number High Bits	Read-only, indicate the high 4 digits of the machine number.
0855H	2133	Machine Number Low Bits	Read-only, indicate the low 4 digits of the machine number.
0856H	2134	OPCH Output Start Channel	OPCH Local output start channel of this device: When set to 1, output 1 corresponds to channel 1. If set to 5, output 1 corresponds to the output value OP5 of channel 5. This function is used in scenarios where channels 1~4 are only used for calculations without direct output.
0857H	2135	FL32 High-Resolution Measurement Filtering Constant	The unit is the sampling period, with a setting range of 0~999. This parameter applies high-resolution secondary filtering to the 32BIT data of 8 channels, improving the stability of the displayed data. This filtering does not apply to PID regulation. Typically, the workpiece being heated has a larger mass-to-volume ratio than the temperature sensor, so its thermal conductivity is slower than the sensor’s response. By properly setting this filtering parameter, a more accurate representation of the actual internal temperature of the heated workpiece can be obtained.
0858H	2136	AIF1 Heating and Overshoot Adjustment Parameter 1	The default value is 100 . Lower values result in faster heating but increase the likelihood of overshoot. AIF1 is primarily effective for small-range fluctuations, such as those caused by external disturbances that require correction.
0859H	2137	AIF2 Heating and Overshoot Adjustment Parameter 2	The default value is 100 . Lower values result in faster heating but increase the likelihood of overshoot. AIF2 is effective for large-scale fluctuations, such as during power-on heating or significant changes in setpoint values.
0861H~ 088FH	2145~2191	Spare	
0898H~ 08FBH	2200~2099	Input Nonlinearity Calibration Table Data, etc.	This includes input calibration curves, high-temperature furnace output limit curves, etc., with a total of 100 data.
0900H~	2305~	Temporarily Disable Read/Write	

Description:

1. When developing the host computer software, ensure that the instrument responds to each valid command within 0~5mS (Note: this excludes data transmission time and the interval required by the MODBUS protocol, which should be calculated based on different baud rates and data lengths). The host computer must wait for the instrument to return data before sending a new command; otherwise, errors may occur. If the instrument does not respond within the maximum response time, the potential reasons could include invalid commands, incorrect instrument or parameter addresses, communication line faults, the instrument being powered off, or mismatched communication addresses. In such cases, the host computer should resend the command or skip that instrument's address.

2. Except for input errors, all other alarms on the instrument are generated based on the selected input values of the control channels. Typically, the input and control channel numbers are the same, but if they are different, e.g., if control channel 2 selects input channel 1 as the measurement value PV input, then the alarms for channel 2 will be based on the absolute value and control deviation of input channel 1 and will not relate to input channel 2. In particular, if 2 control channels select the same input channel for the measurement value, that channel's measurement value can have up to 8 related alarm settings at most. In addition, for input channels that are not selected, they should typically be disabled. Otherwise, the measurement behavior of that channel may affect the input error flags of the selected input channel associated with the output channel of the same number.

3. If any alarm condition is met, an additional global public alarm signal will be generated. This alarm will not be output from the expansion alarm module but will cause the host's own alarm indicator light to turn on. It can be read from BIT9 of 0851H. If the host is equipped with an optional alarm output module, this alarm can also be output from the host.

4. The instrument will impose a limit on the range of parameter values for addresses between 0800H~088FH. If data outside the allowed range is written, the system will still execute the operation, but it will limit the value to within the acceptable range to prevent system failure due to out-of-range data.

5. When AFB.1=0, the PID group operates in normal mode. When AFB.1=1, it switches to the preset 5-group PID automatic switching mode. In this mode, the maximum number of effective independent PID control channels is 16. The instrument divides the SV and PID parameter groups into 16*6 groups. Groups 1~16 correspond to the PID parameters used by channels 1~16. The next 80 PID groups are arranged in a sequence of 5 groups per channel, meaning each channel can preset up to 5 sets of PID parameters, which will automatically switch according to the current SP value. For example, if SP1 is less than SP17, P1, I1, and d1 will automatically be set to P17, I17, and d17. If SP1 is greater than SP17 but less than SP18, P1, I1, and d1 will automatically be set to P18, I18, and d18. Similarly, if SP1 is greater than SP18 but less than SP19, P1, I1, and d1 will automatically be set to P19, I19, and d19, and so on. This feature needs to be realized in conjunction with APLC.

6 Alarm Explanation

How to set up and drive AL1 and AL2, with related alarm parameters

HA01~HA96: Set as high limit absolute value alarms by default, can beconfigured to be upper deviation alarms through modification of the settings.

LA01~LA96: Set as low limit absolute value alarms by default, can be configured to be lower deviation alarms through modification of the settings.

dHA1~dHA4: Set as high limit deviation alarms by default, can be configured to be high limit absolute value alarms through modification of the settings.

dLA1~dLA4: Set as low limit deviation alarms by default, can be configured to be low limit absolute value alarms through modification of the settings.

AAF1~4: Alarm function selection, set whether the output and status are reset after the alarm is automatically cleared.

HYS1-4: Hysteresis, hysteresis for alarm release.

ALAL: Define whether each alarm is output

ALCH: Used when an extended external alarm output module is utilized.

ALbt: Also used when an extended external alarm output module is utilized.

ALAL1AL2 operation as shown in the table below

ALAL parameter, public alarm parameter,

Bit 0 Input Exception	Bit 1 HA	Bit 2 LA	Bit 3 dHA	Bit 4 dLA	AL1	AL2	AL
1	0	0	0	0	ON when input exception alarm is triggered	Always OFF	ON for any alarm
0	1	0	0	0	ON when the HA alarm is triggered	Always OFF	ON for any alarm
1	1	0	0	0	ON when input exception alarm is triggered	ON when the HA alarm is triggered	ON for any alarm
0	0	1	0	0	ON when the LA alarm is triggered	Always OFF	ON for any alarm
1	0	1	0	0	ON when input exception alarm is triggered	ON when the LA alarm is triggered	ON for any alarm
0	1	1	0	0	ON when the HA alarm is triggered	ON when the LA alarm is triggered	ON for any alarm
1	1	1	0	0	ON when input exception alarm is triggered	ON when the HA alarm is triggered	ON for any alarm
0	0	0	1	0	ON when the dHA alarm is triggered	Always OFF	ON for any alarm
…	…	…	…	…	…	…	ON for any alarm
…	…	…	…	…	…	…	ON for any alarm
1	1	1	1	1	ON when input exception alarm is triggered	ON when the HA alarm is triggered	ON for any alarm

The first 5 bits of NONC correspond to the first 5 bits of the ALAL parameter. If the corresponding alarm bit in the NONC parameter is set to 1, the alarm state is inverted, and the action is also reversed.

For example, if NONC=2 (high limit alarm inverted), and ALAL=2 , the AL1 output will remain active under normal conditions. Until a high limit alarm is triggered for any channel, AL1 will disconnect the action.

This product is restriction of use in the industrial

ADDRESS: No.6 Longku East Road, Xiang'an District, Xiamen, Fujian, 361101, China

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