User's Manual for AI-8*48 Multi-loop Regulator with High Precision

V9.5

Xiamen Yudian Automation Technology Co., Ltd.

Contents

1 Summary

The AI-8X48 by Yudian is a multi-loop PID controller featuring 4-channel high-speed and high-precision sampling capabilities, with the functionality to connect external input and output expansion modules. By adding external expansion modules, the AI-8X48 can achieve 4 to 8 channels of high-performance multifunctional control comparable to single-channel controllers; when cost and size are prioritized, it can handle up to 96 channels of measurement and control, meeting the needs of various emerging industries for compact size and multi-loop control. In expansion mode, a host computer only needs to communicate with one instrument to control up to 96 measurement and control loops, significantly improving communication efficiency compared to modes that require accessing multiple addressed instruments. The common parameters allow unlimited write access by the host computer, and the internal memory of the instrument will not be damaged by frequent writes from the host. The parameter write restriction function only allows modification of specific or all instrument parameters when the Loc is set to a specific value, reducing the likelihood of operational anomalies due to communication software errors. The AI-8X48 also boasts many unique advantages, as follows:

● The AI-8X48 can meet the needs of multi-channel centralized control while also offering the performance of single-channel instruments, with measurement accuracy and temperature drift levels up to 0.05 class and 25PPm/°C products; input amplifier noise is less than 1uV at a 20mS sampling cycle; 120dB anti-interference capability at 50Hz with a 20mS sampling cycle; group pulse anti-interference passes 8KV test; high temperature passes 100 degrees Celsius aging test; built-in PT100 platinum resistance measurement for thermocouple cold junction compensation temperature, significantly improving accuracy over commonly used semiconductor or thermistor sensors.

● Can expand up to 96 control output channels and 256 alarm output channels, with inputs expandable up to 96 analog measurement inputs and 16 digital event input channels. Each output channel has 4 alarm settings and an input error alarm, totaling 5 alarm signals, all of which can be defined as independent outputs or as common outputs to save alarm output ports.

● Supports advanced functions such as heating and cooling slope control, multi-group synchronous output, and input sensor backup; can also set up cascade control functions, with up to 48 cascade control loops possible across 96 channels.

● Comes with an LED digital display interface for quick viewing and modification of any channel parameter settings, can edit the main register values inside the instrument,

allowing emergency operation even if the host computer fails.

● When selecting different numbers of control loops and functions, the usage methods and register addresses remain completely consistent, meaning customers only need to learn how to use the AI-8X48 single model to meet various functional requirements, greatly reducing learning costs.

● Combines high freedom and efficiency in operation modes. All functions of the AI-8X48 can be achieved by reading and writing register parameters, which are divided into channel parameters, input-output group parameters, and common parameters. Channel parameters are independently set for each channel, including set values, PID parameters, and alarm parameters; input and output each have 4 different configuration parameters, which can be selected and called by each input and output channel; common parameters are globally used parameters, such as baud rate and communication address. Based on the parameter group definition mode, the AI-8X48 can greatly reduce the overall number of registers while retaining flexibility and powerful functions, thus simplifying operation modes and improving host computer read and write efficiency. For example, if the 96 input loops of the AI-8X48 are of uniform specification, the input parameters can all select the first group of parameters, so only one set of input configuration parameters needs to be set to define the input specifications for all loops. Different parameter groups can also be selected to define different input specification types, with one AI-8X48 able to define up to 4 different types of input specifications, sufficient for most applications.

● The number of input and output modules that the AI-8X48 can externally connect is almost unlimited and can be quickly customized according to customer requirements.

2 Code Definition

The AI-8X48 multi-loop controller features a modular design for its internal I/O, allowing for the installation of up to 3 modules. These modules can be selected and freely combined according to specific requirements. The instrument is composed of 4 main parts, for example:

AI-8848	D91	J7	G71	N	G61	S2	-24VDC
①	②	③	④	⑤	⑥	⑦	⑧

This indicates a single instrument with the following characteristics:
1. Basic Function: AI8848 type.
2. D91 Rail Mounting Size: Features a 4digit digital tube display.
3. J7 Input Type: Supports universal thermocouple and RTD inputs (fixed input type, nonmodular).
4. Installed 4Channel NPN Output.
5. N: Indicates that no module is installed in this position.
6. G61 Module: Supports 2channel NPN output, which can be used for alarms.
7. Fixed 485 Communication Module S2.
8. Power Supply: 24VDC.

Meaning of Each Part in the Instrument Model:

1. Basic Function of the Instrument:
   8848: Represents a 0.1grade accuracy, 4channel regulator with nonisolated inputs.
   8848G: Represents a 0.1grade accuracy, 4channel regulator with isolated inputs.
   8548: Represents a 0.2grade accuracy, 4channel regulator with nonisolated inputs.
   8548G: Represents a 0.2grade accuracy, 4channel regulator with isolated inputs.
   8148: Represents a 0.2grade accuracy, 4channel regulator with nonisolated inputs, a custom model for specific industries. For details, consult a sales representative.
   8148G: Represents a 0.2grade accuracy, 4channel regulator with isolated inputs, a custom model for specific industries. For details, consult a sales representative.

2. Instrument Size:

D71: Rail mounting size, with a width of only 22.5mm, DIN rail mounting, dualrow LED display, button operation, plugandplay bus terminals for power and communication, and a 4digit digital tube display panel.

D72: Rail mounting size, singlerow 2digit digital tube display panel, capable of displaying the instrument's communication address.

D91: Rail mounting size, dualrow LED display, with button operation.

Note: The D91 size can only handle lowvoltage connections. When using modules like L21 or L3 relay modules, only lowvoltage connections are allowed. To control highvoltage, a 24V intermediate relay must be used, with the relay output controlling the highvoltage.

3. Supported Input Types (Fixed Input Type, NonModular):

J7: Universal thermocouple and RTD input.
J1: Thermocouple input.
J3: 1~5V/0~5V voltage input.
J4: 4~20mA current input.
J9: AC current input, requires a dedicated current transformer.

Note: J7 input is generally used. For other input types, please confirm with the sales representative before placing an order.

4. Main Output (OUTP) Module Specifications:
   D71/D72 Size: Can install G5, G6, G61, G62, X6, and other modules.
   D91 Size: Can install G7, G71, X74, and other modules.

5. Auxiliary Output (AUX) Module Specifications:
   D71/D72 Size: Can install G5, G6, G61, G62, X6, and other modules.
   D91 Size: Can install G7, G71, X74, and other modules.

6. Alarm (ALM) Module Specifications:
   Can install G5, G6, G61, L3, L21, and other modules.

7. Fixed 485 Communication Module S2: Supports MODBUSRTU protocol.

8. Power Supply: The 8x48 series has a fixed power supply of 24VDC.

Additional Notes:

1. MaintenanceFree Instrument: This instrument uses automatic zero adjustment and digital calibration technology. If it exceeds the tolerance during calibration, cleaning and drying the internal components usually resolves the issue. If cleaning and drying do not restore accuracy, the instrument should be treated as faulty and returned to the manufacturer for repair.
2. Warranty: The instrument is covered by a free warranty during the warranty period. For any instruments requiring repair, please clearly describe the fault symptoms and causes to ensure proper and comprehensive repair.
3. Common Module Models and Functions:
   (The specific details of common module models and functions are not provided in the original text. Please refer to the product manual or consult the sales representative for further information.)

Modules	Description
G5	Dual-channel isolated solid-state relay driving voltage output module (12V/30mA, non-energy-saving type).
G6	Triple-channel isolated solid-state relay driving voltage output module (12V/30mA, non-energy-saving type).
G61	Triple-channel isolated NPN output, can be externally connected to 5~24VDC for driving SSR or intermediate relays. Maximum external voltage: 28VDC, maximum driving current per channel: 100mA
G62	Triple-channel isolated PNP output, can be externally connected to 5~24VDC for driving SSR or intermediate relays. Maximum external voltage: 28VDC, maximum driving current per channel: 100mA
G7	Quad-channel isolated solid-state relay driving voltage output module (12V/12mA, non-energy-saving type), only for D91 size.
G71	Quad-channel isolated NPN output, can be externally connected to 5~24VDC for driving SSR or intermediate relays. Maximum external voltage: 28VDC, maximum driving current per channel: 100mA, only for D91 size.
X6	Dual-channel high-precision linear current output module (common negative output, 0.2-grade output accuracy, uses the instrument's internal 12V isolated power supply, maximum output voltage >10.5V). Supports 0~20mA or 4-20mA output definition, non-energy-saving type.
X61	Dual-channel high-precision linear voltage output module (common negative output, 0.2-grade output accuracy, uses the instrument's internal 12V isolated power supply). Supports 0~10V output, low-power energy-saving type.

X72	Dual-channel optically isolated linear current output module with built-in isolated power supply (does not occupy the instrument's internal isolated power supply), maximum output voltage >6V.
X73	Triple-channel optically isolated linear current output module with built-in isolated power supply (does not occupy the instrument's internal isolated power supply), maximum output voltage >6V.
X74	Quad-channel optically isolated linear current output module with built-in isolated power supply (does not occupy the instrument's internal isolated power supply), maximum output voltage >6V, only for D91 size
L21	Compact relay contact switch output module (suitable for alarms).
L3	Dual-channel large-capacity relay contact switch output module.

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

3 Technical Specification

●**Communication:**Bottom RS485 Bus Terminal: Supports MODBUS-RTU protocol; adjustable baud rate from 4800 to 115200.

Compatibility: Can connect with the company's TCP-MODBUS and EtherCAT communication controllers, supporting relevant communication protocols.

Internal Communication Protocol: Used between the host, slave, and expansion modules, with a reliable communication distance of 30m.

Communication Delay: Approximately 10mS per input or output expansion module node in a series connection (including data transmission time).

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

RTDs: Cu50, Pt100, Ni120, etc.

Linear Voltage: 0~75mV, 0~20mV, 0~50mV, 0~10V, 1~5V, 0~1V, etc.

Linear Current: 4~20mA, 0~20mA, etc.

Frequency Input: Performance depends on the relevant expansion input module.

●**Measurement Range:**

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℃）、Cu50(-50~+150℃)、Pt100(-200~+800℃)、Pt100(-80.00~+300.00℃)

Linear Input: -9990~+32000 defined by user

●**Measurement accuracy:** level 0.1(8848); accurancy level 0.05 is available, and AI-8848's input specifications include PT100, S and B type thermocouples, and mV input that support precision of 0.05 level; accurancy level 0.2 (8548);

●**Measurement temperature drift:** ≤50PPm/℃ at level 0.1; ≤25ppm/℃ at level 0.05;

●**Control period:** Under single-loop control, minimum 20mS; Under multi-loop control, each loop 10mS；

●**Regulation mode:**

On-off control mode (dead band adjustable)

AI-PID with fuzzy logic PID regulating and auto tuning with advance artificial intelligence algorithm.

Manual regulating

●**Output specification (Modularized):**

Linear current output: 0~20mA or 4~20mA customized, with resolution about 20000 words, and maximum load 260 ohms (energy-saving type) or 525 ohms

Linear voltage output: 1-5V; 0~10V, with resolution around 10000~20000 words

SSR Voltage output: 5VDC/30mA(energy-saving) or 12VDC/30mA

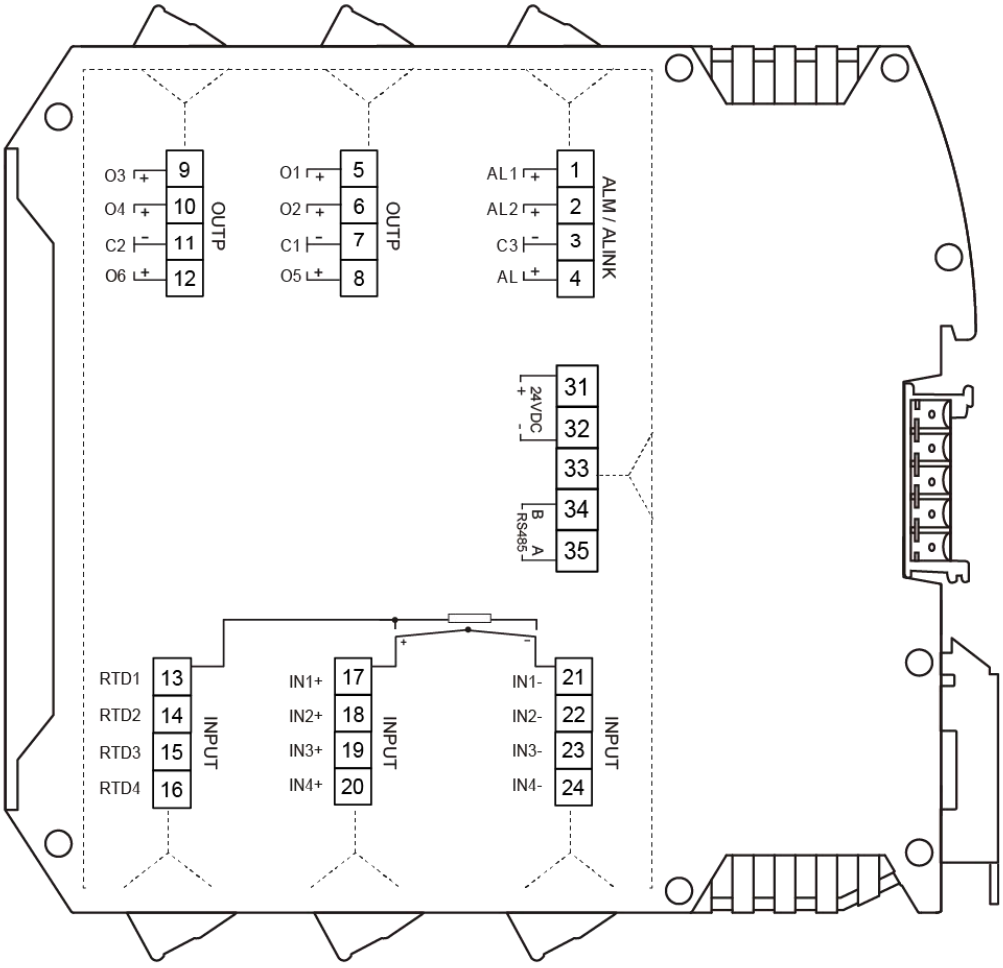
NPN or PNP switch output: maximum voltage 28V, maximum current 100mA. When driving the relay coil, a fast recovery diode must be connected in parallel with the relay coil to absorb reverse voltage

When using externally extended output modules, please refer to the module instructions for relevant technical indicators

● **Alarm function:** 4 types of alarm; high limit, low limit, deviation high limit and deviation low limit
● **Electromagnetic compatibility (EMC):** ±6KV/5KHz according to IEC61000-4-4 (Electrical Fast Transient); 6KV according to IEC61000-4-5 (Electrical Surge) and under the interference of 10V/m high-frequency electromagnetic field, the instrument does not crash, the I/O malfunctions will not emerge either, and the fluctuation of the process value does not exceed ±5% of the range.
● **Isolation withstanding voltage:** Among power, relay contact or signal terminals ≥2300VDC. Among isolated electroweak terminals ≥600V
● **Power supply:** 24VDC, -15%, +10%
● **Power consumption:** ≤0.3W (excluding any output or external power consumption); The maximum power consumption of the whole instrument ≤ 3W
● **Operating ambient:** Temperature -10~60℃. Humidity ≤90%RH

4 Wiring

4.1 Host

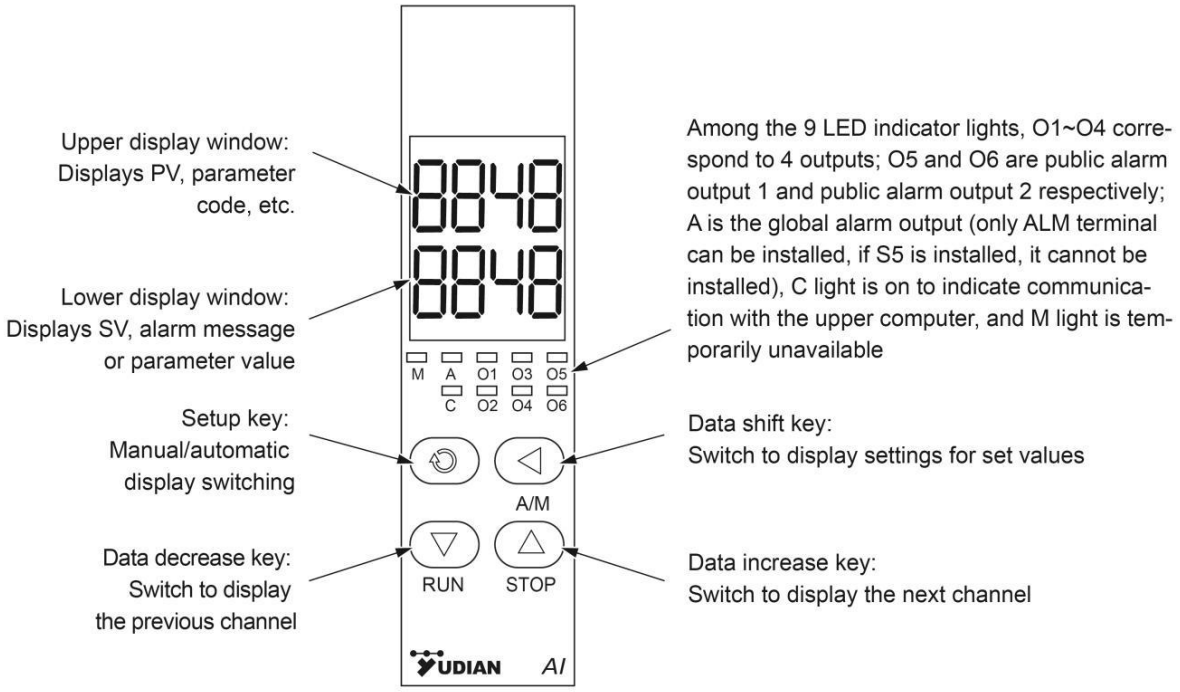


Note 1: This wiring diagram is for reference only. Depending on the configuration and version, the random wiring diagram may not match this manual. Please refer to the random wiring diagram for accuracy.

Note 2: If the two-loop output modules X6 and X61 are installed in the OUTP position, terminals 8 and 12 are empty.

5 Display and Operation

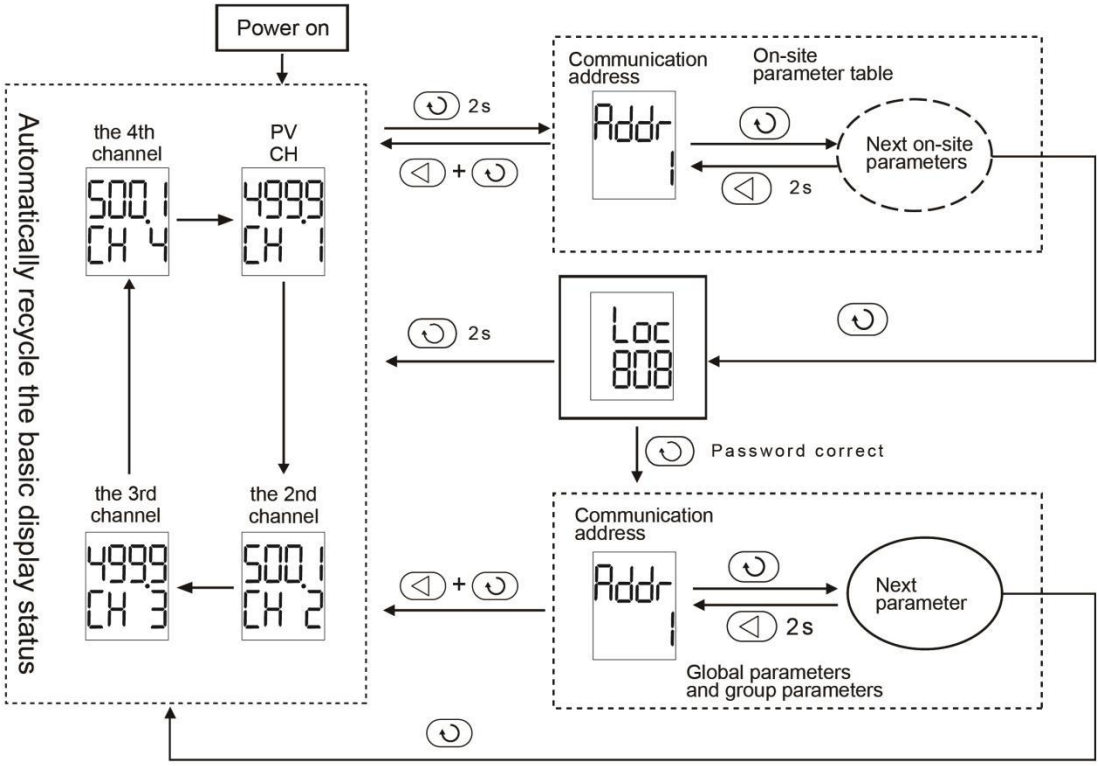
5.1 D71 Panel Description



AI-8*48 comes with a display panel and keyboard, which allows for quick viewing and modification of various parameters with our company's panel mounted instruments, especially when the upper computer malfunctions or is inconvenient to use

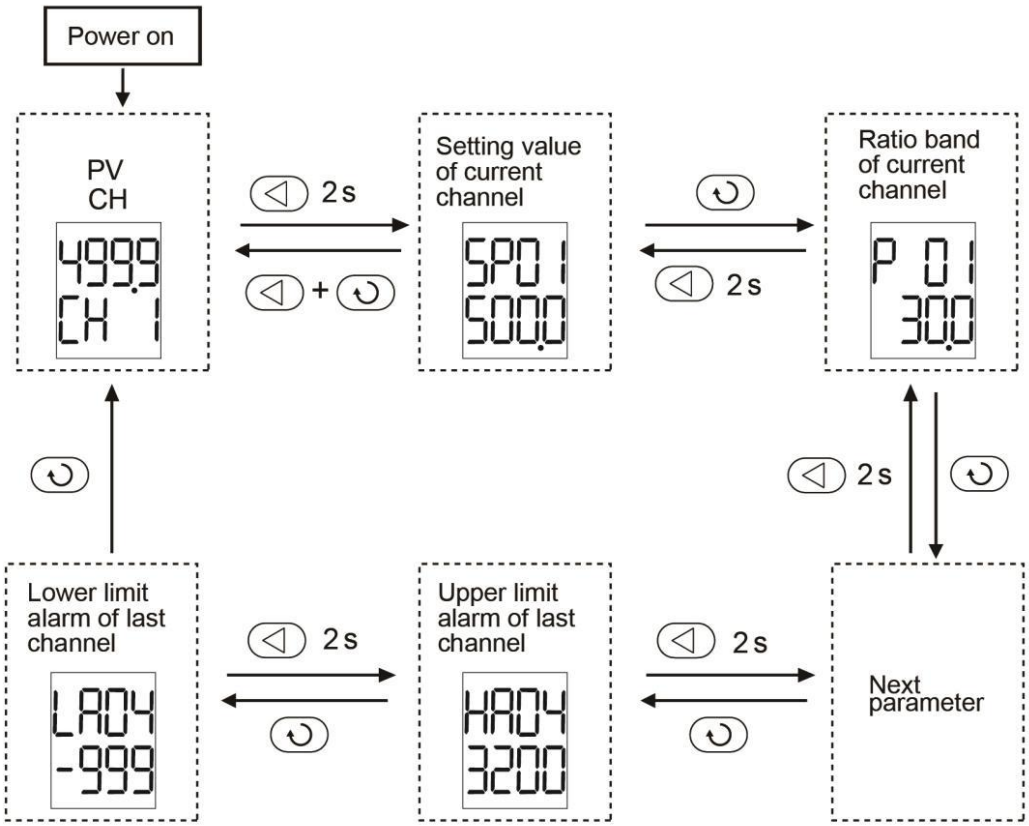
After power on, the instrument will automatically display the process values of each channel in a loop. Pressing the up and down keys can quickly switch the display channel and fixedly display the process value of a certain channel. At this time, pressing the setting button can display the set value of the channel for about 2 seconds. After automatic exit, the automatic cycle display status of the process value will be restored. Press the shift key to enter the current display channel's setpoint setting status.

5.2 Global and Group Parameter Setting



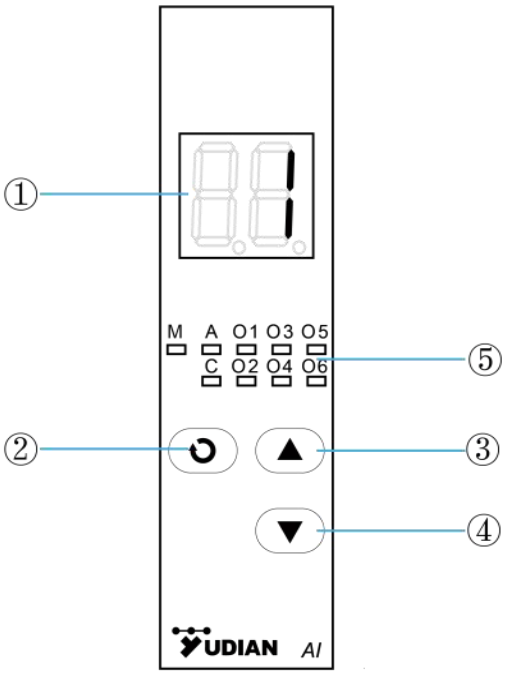
Long press the setting button to set group parameters and global parameters. The shortcut parameters defined by EP parameters will be displayed first. Continuing to press the setting button will display LOC parameters. After unlocking, 4 sets of preset input/output configuration parameters and global parameters can be displayed and set. In the parameter setting status, long press the shift key to exit to display the previous parameter. If the setting key is pressed at the same time, the instrument can immediately exit the parameter setting status.

5.3 Channel Parameter Setting



Long press the shift key to display and edit the set value and PID parameters of the current channel. If the parameter lock Loc is unlocked, it can be edited. In the parameter setting status, long press the shift key to exit to display the previous parameter. If the setting key is pressed at the same time, the instrument can immediately exit the parameter setting status.

5.4 Discription of Panel D72



①Display window: display communication address Addr, etc

②Settings key

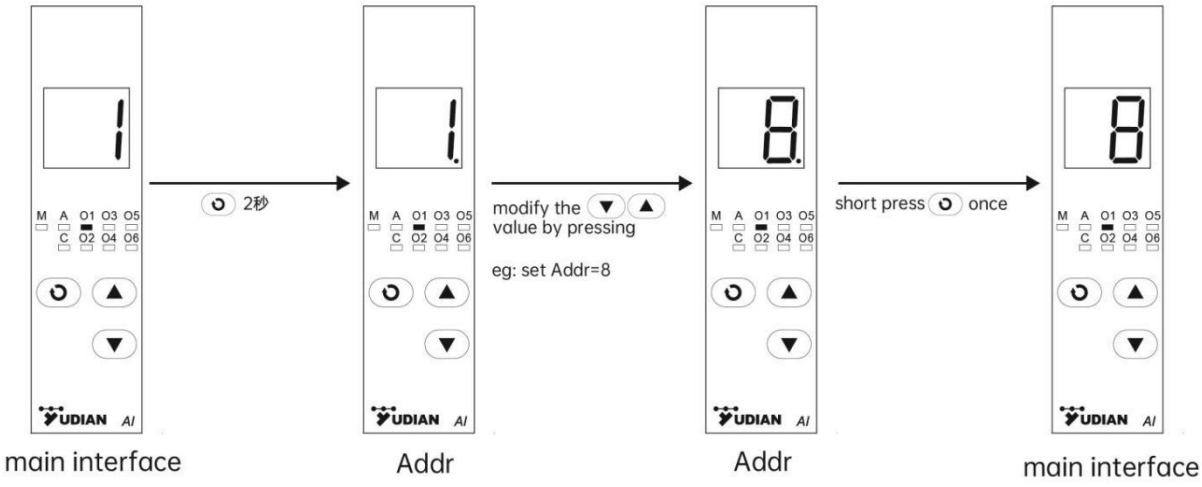
③9 LED indicator lights, O1~O4 correspond to 4 outputs; O5/O6 are public alarm output 1 and public alarm output 2, respectively. A is the global alarm output, and the light C is on to indicate communication with the upper computer; light M is currently not in use

④Data plus key

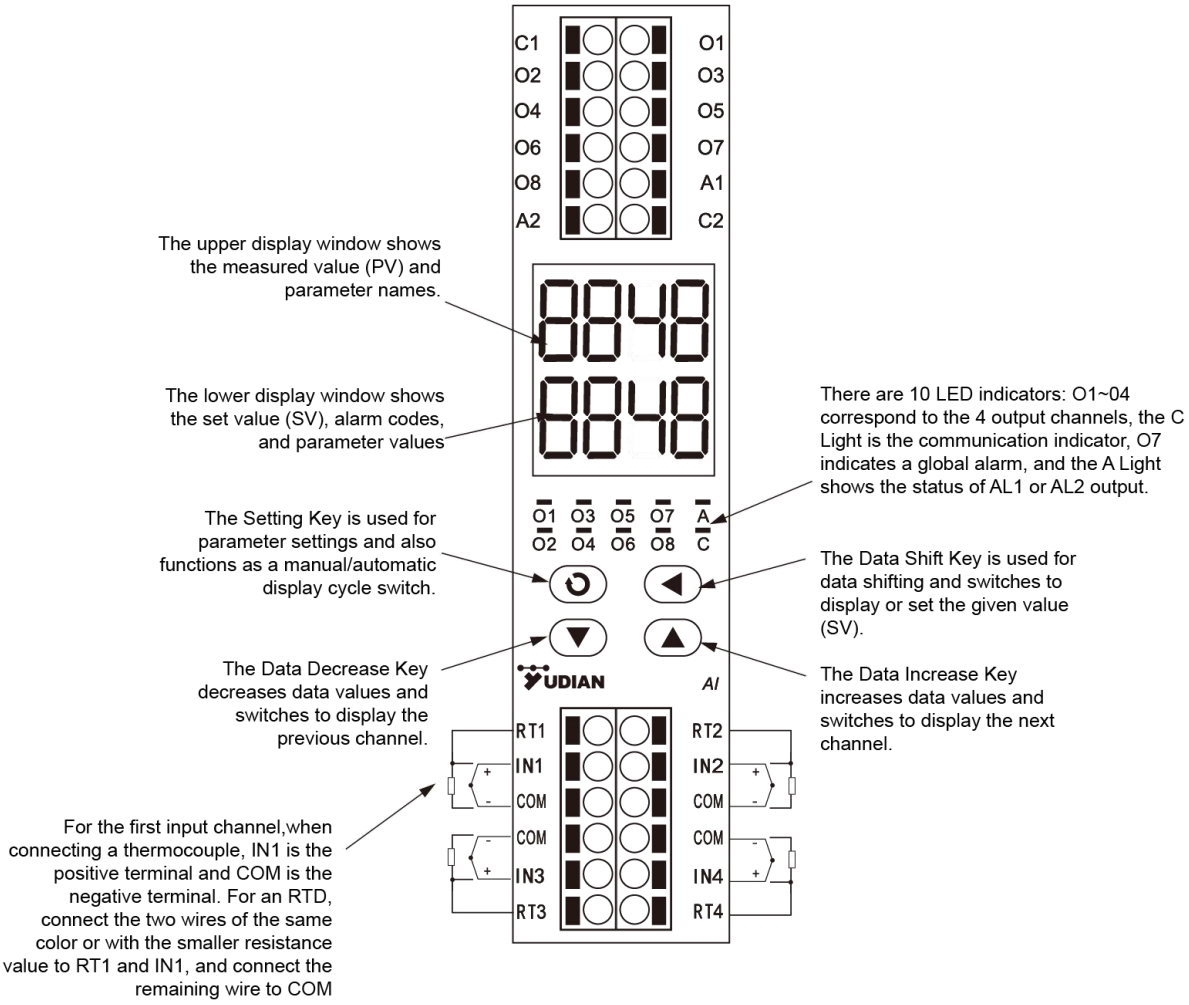
⑤Data minus key

5.5 Operation of Panel D72

After powering on, enter the main interface. Long press for two seconds to enter the Addr setting interface. Users can modify the value by pressing or , and then short press once to save and return to the main interface.



5.6 D91 Front Panel and Wiring Instructions



Main Outputs O1~O8, with the common terminal C1. The number of outputs depends on the instrument's channel count. For example, a 4channel instrument will only have O1~O4.

Alarm Outputs A1/A2, with the common terminal C2.

Wiring Details:

1. When Installing Active Output Modules (e.g., G5, G7, X74, X72):

C1 and C2 are the negative terminals.

O1~O8, A1, A2 are the positive terminals for the corresponding output logic.

2. When Installing NPN Output Modules (e.g., G71, G61):

Common Terminals C1 and C2 should be connected to the negative terminal of the 24V switching power supply.

O1~O8, A1, A2 should be connected to the negative terminal of the solidstate relay (or other devices).

The positive terminal of the solidstate relay (or other devices) should be connected to the positive terminal of the 24V switching power supply.

3. When Installing Relay Modules for ALM (e.g., L21, L3):

C2 is the common terminal.

A1 and A2 are the output logic points for alarms AL1 and AL2.

Note: Only lowvoltage (below 28V) is allowed for these connections.

6 Description of Communication Protocol and Parameter Register

Connect the AI-8*48 instrument to the upper computer using RS485 serial port, or through our company's TCP modbus or EtherCAT communication controller. AI-8*48 adopts asynchronous serial communication interface, and the interface level complies with the provisions of RS485 standard. The data format consists of 1 starting bit, 8 data bits, no parity or even parity bits, and 1 stop bit. The baud rate of communication transmission data can be adjusted to 4800~115200 bps. When the communication baud rate exceeds 28800 bps, a high-speed optocoupler communication module should be used. When the communication distance is long, 4800 bps can be selected.

AI-8*48 supports the instructions 03H (read parameters and data), 06H (write a single parameter), and 10H (write multiple parameters) under the MODBUS-RTU protocol. The AI instrument can communicate with other MODBUS devices and adopts RTU (binary) mode to ensure speed. The communication interface can select 1-2 stop bits, without parity or even parity. The address range of the instrument is 0~80.

03H can read up to 32 data at a time, with 2 bytes per data. For example, the instruction to read 2 data is as follows:

Address	Read	Address Code	Length	Check Code
XXH	03H	00H 01H	00H 02H	CRC

06H writes 1 data each time, the instruction sent is:

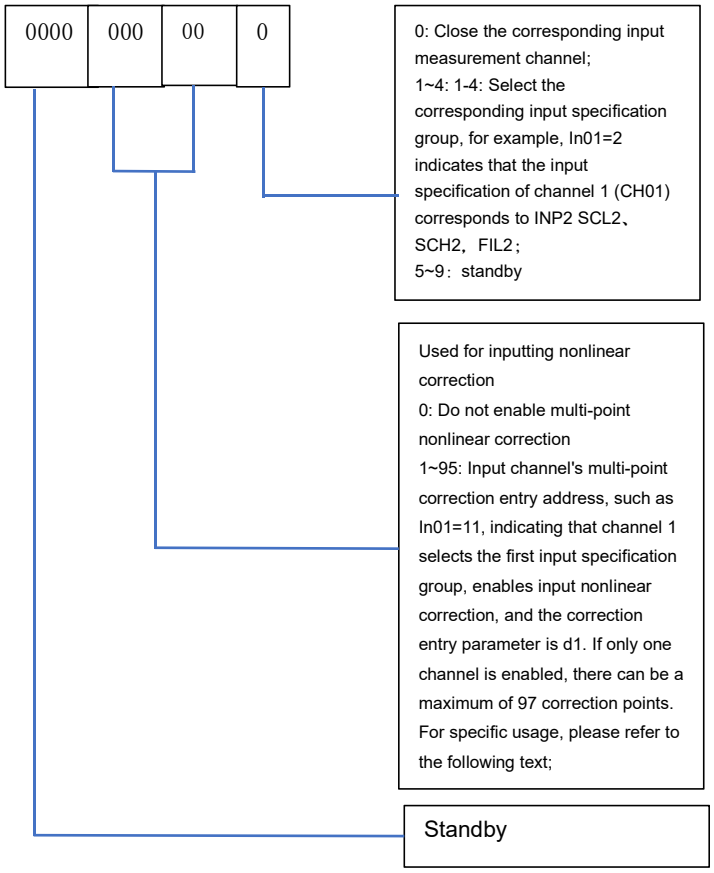
Address	Write	Address Code	Data	Check Code
XXH	06H	00H 01H	03H E8H	CRC

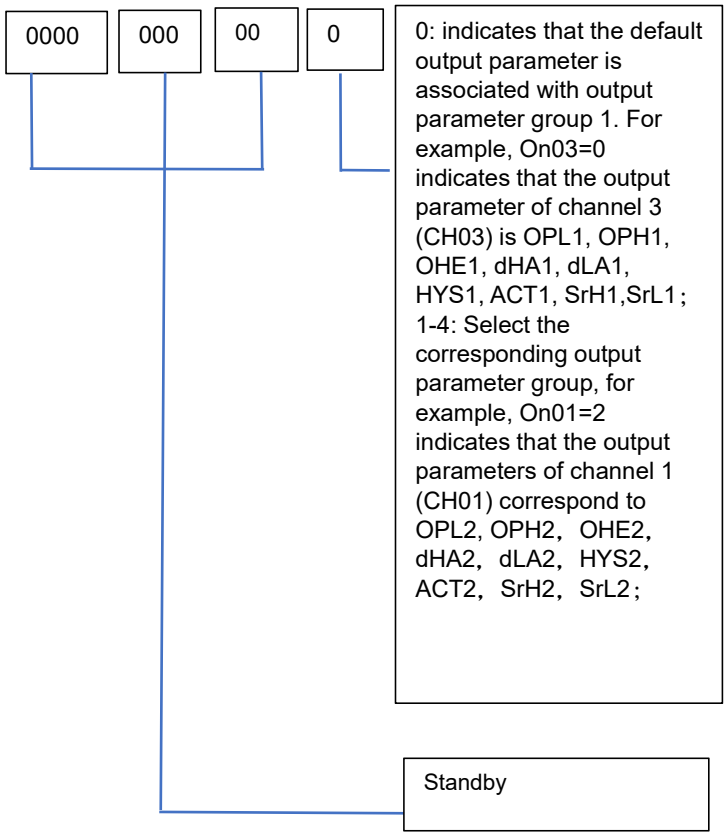
10H can write up to 16 data at a time, which is a length of 32 bytes. For example, the instruction to write a single data is:

Address	Read	Address Code	Quantity	Byte	Data	Check Code
XXH	10H	00H 01H	00H 01H	02H	03H E8H	CRC

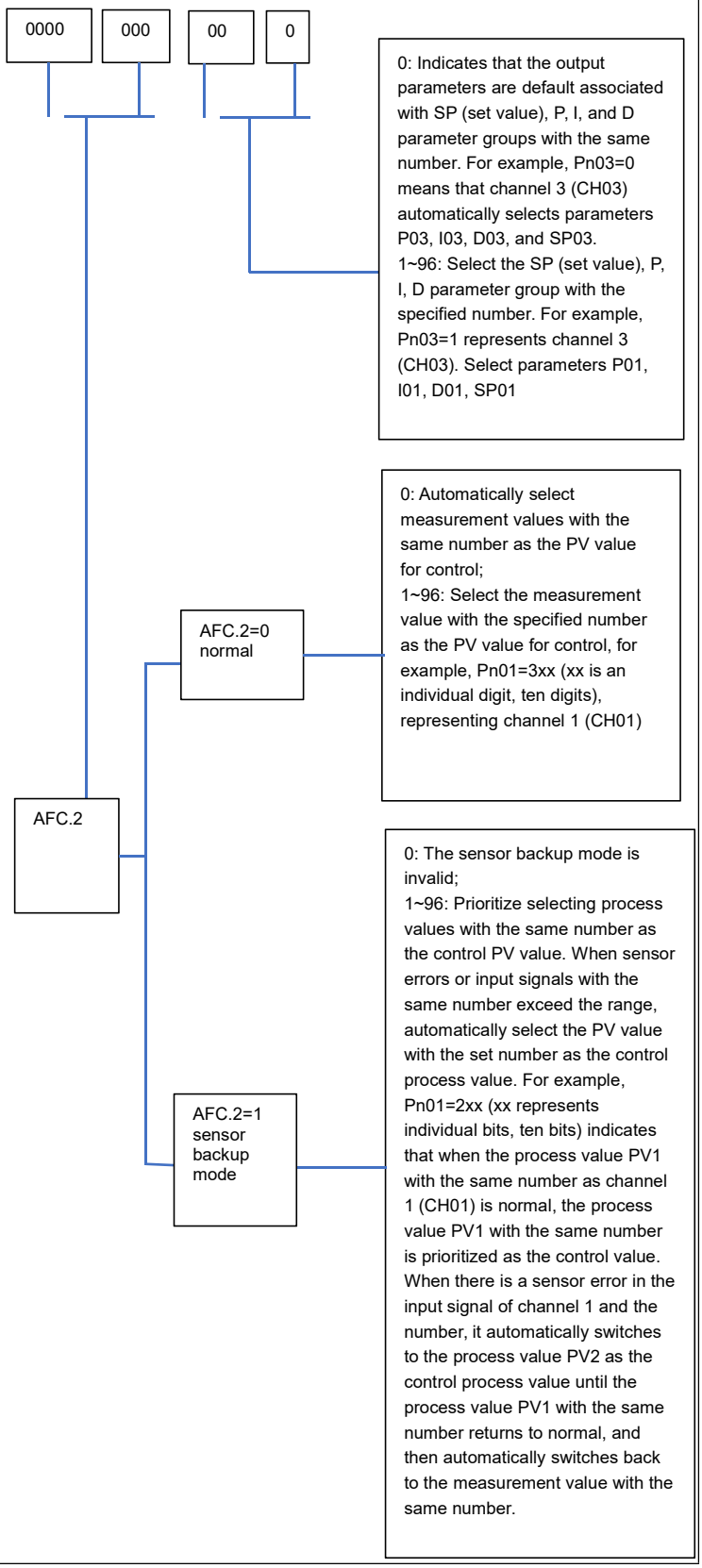
The parameters of AI-8*48 has independent channel parameters, configuration group parameters, and global parameters. There are 12*96 independent channel parameters, including SV, proportional band, integration time, differentiation time, control mode, output value (with setting to write manual value), control output parameter group number and table programming entry address, input channel and SV and PID parameter group allocation, input specification group and input table correction entry address, input translation correction amount, upper limit alarm and lower limit alarm. The configuration group parameters include 4 sets of input configurations and 4 sets of output configurations (including alarm configurations); Measure input group parameters including input specifications, filtering strength, lower and upper scale limits, etc; The output group parameters include output limits, positive and negative deviation alarms, hysteresis, and functional configuration parameters; Configuring group parameters is only valid for channels that select that group parameter, which can be shared by a single or multiple channels. In addition, there are global parameters such as communication address and baud rate, which are valid for all channels. The addresses of each parameter are shown in the table below (note: depending on the functional model, some products do not have all parameters).

Hexadecimal	Decimal	Parameter	Description
0000H~005FH	0000~0095	SP01~SP96 Preset values for groups 1 to 96	Range -9990~32000; The set value and four parameters including PID form a parameter group, The output channel can select different groups as set values and PID parameters through the PnXX parameter. Usually, the output channel number and PID parameter group number are the same, but the output channel can also switch to different numbered set values and PID parameter groups, and different output channels can share the same PID and set value parameter groups.
0060H~00BFH	0096~0191	P01~P 96 Proportional band	Range 0~32000, with the same unit as set value.
00C0H~011FH	0192~0287	I 01~I 96 integration time	Unit 0.1 seconds, with a range of 0.0~3200.0 seconds.
0120H~017FH	0288~0383	d 01~d96 differentiation time	Unit 0.01 seconds, with a range of -327.60~+327.60 seconds. (The maximum automatic result is+327.60. If a larger value is required, the value can be written in unsigned 16 bit format, and the corresponding 16 bit signed value will be displayed on the instrument.)
0180H~01DFH	0384~0479	In01~In96 Instructions for input channel configuration parameter groups	Range 0~9999, single digits 1~4 are the input specification group for selecting the measurement channel configuration. Setting it to 0 means turning off the measurement channel; Ten hundred digits are used to configure the correction address for the multi segment curve of the measurement channel. Setting it to 0 indicates no correction; For example, setting In01=112 means selecting the second set of input configuration parameters for channel 1, and the multi segment curve correction entry address for this channel is d11.

		In01~In96 Instructions for input channel configuration parameter groups	
01E0H~ 023FH	0480~0575	Sc01~Sc96 Translation of the process values of the input channel	Range -9990~32000, used for translating and correcting process values. Specifically, if the process value of the input channel is turned off, the physical process value is 0. Writing this value can be equivalent to assigning a value to the channel process value by the upper computer or program.
0240H~ 029FH	0576~0671	On01~On96 Instructions for output channel configuration parameter groups	Range 0~9999, and the single digit set is 1~4 to select the configuration parameter group for the output channel; Ten hundred thousand reserved functions. When set to 0 by default, it indicates the associated output parameter group 1.

		On01~On96 Instructions for output channel configuration parameter groups	
02A0F~ 02FFH	0672~0767	Pn01~ Pn96 Selection of PID configuration parameter group and process value channel for output channel	Range 0~9999. If the single digit and ten digit are set to 1~96, the PID and SP parameter groups with set values can be selected (a total of 96 groups). If set to 0, the same numbered PID and SP parameter groups with set values will be automatically selected; In normal mode (AFC.2=0), If the hundred and thousand digits are set to 1~96, the input channel of PV can be selected. If set to 0, the same numbered process value will be automatically selected as PV value for control; In sensor backup mode (AFC.2=1), the same numbered process value is prioritized as the PV value. However, if the same numbered PV exceeds the range or is abnormal, the numbered channel process value defined by the Pn parameter hundreds and thousands will be automatically selected as the PV value for this channel.

On01~On96 Instructions for output channel configuration parameter groups



0300H~035FH	0768~0863	At01~At96 Output channel in working mode	0 represents the execution of APID, which is a PID control algorithm with AI functionality; 1 indicates the activation of At; 2 represents the execution of ONOFF control mode; 3 represents the execution of manual control mode; 4 means stop control, turn off output; 5 means to transmit the PV to the output; 1XX is defined as a cascade sub control (inner loop) mode, and the set value of this channel will be set by parameters LA and SP as the lower and upper limit calibration respectively, For example, At10=101, which means that the set value of the 10th channel is LA10+(SP10-LA10)*OP01/25600. It is worth noting that if the process value PV10 is lower than LA10, the lower limit alarm will still be triggered. If SP10 is less than LA10, the cascade control function will not be executed; 2XX means not implementing PID control, and the output of this channel follows the output of XX channel proportionally. The proportional band parameter can be set to 0~3200.0% to adjust the relative output ratio. For example, At10=206, which means that the output value of channel 10 OP10=OP6*P10*0.1%, that is, OP10 follows the output of OP6, and the unit of P10 value is 0.1%. The effective range of this function XX is 1~16. 3X (X ranges from 1 to 9, representing channel number), indicating intelligent calibration cascade control mode.

AT01~AT96	Function	Description
0	APID adjustment	Indicates the execution of APID, which is a PID control algorithm with AI functionality
2	Positional control	Operates ONOFF positional control mode
3	manual output	Switch the channel to manual mode and change the output size of the channel by modifying OPxx
4	STOP	Stop controlling this channel and turn off the output
5	PV Transmitter Mode	Transmits the PV value based on the range. The default transmission range is SCL and SCH. When AFC.6 is set to 1, the range switches to SPL and SPH.
1xx	cascade regulation	1XX (XX represents channel number) is the cascade control sub control (inner loop) mode. The set value of this channel will be set by parameters LA and SP as the lower and upper limits respectively. For example, At10=101, which means that the set value of the 10th channel is LA10+(SP10-LA10)*OP01/25600. It is worth noting that if the process value PV10 is lower than LA10, the lower limit alarm will still be triggered. If SP10 is less than LA10, the cascade control function will not be executed
2xx	Follow output	2XX means not implementing PID control, and the output of this channel follows the output of XX channel proportionally. The proportional band parameter can be set to 0~3200.0% to adjust the relative output ratio. For example, At10=206, which means that the output value of channel 10 OP10=OP6*P10*0.1%, that is, OP10 follows the output of OP6, and the unit of P10 value is 0.1%. The effective range of this function XX is 1~16.

		3X	Intelligent calibration cascade regulation	3X (X range 1~9, representing channel number) is the intelligent calibration cascade control mode (only supports heating effect); In this mode, the sub control ratio band represents the strength of cascade control, with a unit of 0.1%. If the proportion of the sub control is set to 0, it means that the cascade control effect will be cancelled (at this time, the sub control output is equal to the main control output), and the maximum setting is 120.0%; The SP and integral parameters of the sub control are auto-learning parameters (which will automatically change during use). For first-time use, they can be directly input with reference to similar devices, which can accelerate the adaptation process of the control system. The differential parameter of the sub control can define the learning style of the sub control, usually recommended to be 50.00. Increasing the setting of this parameter can reduce overshoot, and reducing this value can shorten the heating time, but there may be some overshoot.
0360H~ 03BFH	0864~0959	OP01~OP96 Output value of output channel		In automatic mode, this channel is read-only and is the output value of PID control (when ONOFF control is used, 0 indicates disconnection, 25650 indicates connection); In manual mode, this channel can read and write, and writing can be used as a manual output value for control. 25600 represents 100% output.
03C0H~ 041FH	0960~1055	HA01 ~HA96 Multi functional parameter 1		Range -9990~32000, AFA. 5 can be used to select the upper limit alarm value as PV of the corresponding input channel or output channel(When the hundreds and thousands of digits of the Pn parameter are not 0, the PV of the input and output channels can be different); It can also be defined as a positive deviation alarm for the output channel
0420H~ 047FH	1056~1151	LA01~LA96 Multi functional parameter 2		Range -9990~32000, multifunctional parameter, default to the lower limit alarm value of the process value selected for the first output channel, or as a negative deviation alarm, etc.
0480H~ 04DFH	1152~1247	SV1~SV96 PID Actual set value		In the normal fixed-point temperature control mode, it is equal to SP1~SP96; But in the sub control mode of rise/fall slope control or cascade control, it is not equal to SP1~SP96. When there is a temperature rise and fall slope limit function, this parameter can be written to define the initial setting value, and multi-channel data can be written to achieve synchronous curve heating and cooling functions for multiple channels.
04F0H~ 04F3H	1264~1267	Forced Manual Operation		For channels 1 to 4, setting this parameter to 1 forces the corresponding channel into manual mode. If set to 0 or any other value, the working state is controlled by the At parameter. However, if the At parameter is set to a mode greater than 4 (e.g., cascade control output mode), this parameter will not affect the control.
04F0H~ 04FFH	1268~1279	Backup address		For future version upgrades, please do not use temporarily
04E0H~ 05FFH	1248~1535	Backup address		For future version upgrades, please do not use temporarily

<table>
<tr><td>0600H
~065FH</td><td>1536~1631</td><td>Process value of Channel 1~96</td><td>Read only; If it is necessary to download process values from the upper computer, the channel can be closed and the Sc parameter can be written to achieve this, and the system will automatically refresh this parameter.</td></tr>
<tr><td>0660H
~066FH</td><td>1632~1647</td><td>Measurement values for channels 1~8, 32-bit data</td><td>Read-only; provide high-resolution 32-bit data (positive values only) for channels 1~8, suitable for applications requiring high-resolution display. This measurement value can be defined for secondary filtering by FL32.</td></tr>
<tr><td rowspan="9">0680H~
06AFH</td><td>1664~1711</td><td>Alarm status, 48 parameters</td><td>Each parameter contains alarm statuss for two channels, with the high byte representing odd channels and the low byte representing even channels. BIT0~BIT4 correspond to input errors, HA, LA, dHA, and dLA alarms respectively. When selecting alarm lock, this parameter can be written to unlock it.</td></tr>
<tr><td colspan="3"><table>
<tr><th colspan="2">Alarm Status</th><th>Description （x or xx represents channel number）</th></tr>
<tr><td rowspan="6">Even channels
eg:CH02</td><td>Bit0</td><td>0: The sensor input signal is normal
1: Sensor input error or input signal out of range or oral</td></tr>
<tr><td>Bit1</td><td>0: The input signal does not exceed the set upper limit HAxx value
1: An HA alarm is triggered when the input signal exceeds the set upper limit HAxx value</td></tr>
<tr><td>Bit2</td><td>0: The input signal has not exceeded the set lower limit LAxx value.
1: The input signal has exceeded the set lower limit LAxx value, triggering an LA alarm.</td></tr>
<tr><td>Bit3</td><td>0: The input signal has not exceeded the set upper limit deviation dHALx value.
1: The input signal has exceeded the set upper limit deviation dHAx value, triggering a dHA alarm.</td></tr>
<tr><td>Bit4</td><td>0: The input signal has not exceeded the set lower limit deviation dLAx value.
1: The input signal has exceeded the set lower limit deviation dLAx value, triggering a dLA alarm</td></tr>
<tr><td>Bit5~bit7</td><td>Standby</td></tr>
<tr><td rowspan="6">Odd channels
eg:CH01</td><td>Bit8</td><td>0: The sensor input signal is normal
1: Sensor input error or input signal out of range or oral</td></tr>
<tr><td>Bit9</td><td>0: The input signal does not exceed the set upper limit HAxx value
1: An HA alarm is triggered when the input signal exceeds the set upper limit HAxx value</td></tr>
<tr><td>Bit10</td><td>0: The input signal has not exceeded the set lower limit LAxx value.
1: The input signal has exceeded the set lower limit LAxx value, triggering an LA alarm.</td></tr>
<tr><td>Bit11</td><td>0: The input signal has not exceeded the set upper limit deviation dHALx value.
1: The input signal has exceeded the set upper limit deviation dHAx value, triggering a dHA alarm.</td></tr>
<tr><td>Bit12</td><td>0: The input signal has not exceeded the set lower limit deviation dLAx value.
1: The input signal has exceeded the set lower limit deviation dLAx value, triggering a dLA alarm.</td></tr>
<tr><td>Bit13~bit15</td><td>Standby</td></tr>
</table></td></tr>
</table>

<table>
<tr><td rowspan="2">06C0H~
06EFH</td><td>1728~1775</td><td>Control status, 48 parameters</td><td>Read only, each parameter contains the control status of 2 channels, BIT0 is 0 for auto-tuning status and 1 for non auto-tuning status; BIT1 is 0, indicating normal control, and 1 indicates a stopped control status; Please note that this parameter should not be written. If it is necessary to change the relevant control status, writing the relevant parameters will be necessary to achieve it, and the system will automatically refresh this parameter.</td></tr>
<tr><td colspan="3">
<table>
<tr><th colspan="2">Control status</th><th>Description(read only)</th></tr>
<tr><td rowspan="3">Even channels
eg: CH02</td><td>Bit0</td><td>0: auto-tuning
1: Non auto-tuning</td></tr>
<tr><td>Bit1</td><td>0: Normal control
1: Currently in stop control mode, STOP mode</td></tr>
<tr><td>Bit2~bit7</td><td>Standby</td></tr>
<tr><td rowspan="3">Odd channels
eg: CH01</td><td>Bit8</td><td>0: auto-tuning
1: Non auto-tuning</td></tr>
<tr><td>Bit9</td><td>0: Normal control
1: Currently in stop control mode, STOP mode</td></tr>
<tr><td>Bit10~bit15</td><td>Standby</td></tr>
</table>
</td></tr>
<tr><td>06F0H~
07FFH</td><td>1776~2047</td><td>Backup address</td><td>For future version upgrades, please do not use temporarily</td></tr>
<tr><td>0800~
0803H</td><td>2048~2051</td><td>InP1~4；
Input specification</td><td>This parameter is one of the input group parameters and can be selected as an input specification. It needs to be matched with the corresponding module. For example, the thermocouple input module must set a thermocouple as the input specification. There are four sets of input parameters, each consisting of four parameters: InP, ScL, ScH, and FIL. InP is used to select input
<table>
<tr><td>0 K</td><td>21 Pt100</td></tr>
<tr><td>1 S</td><td>22 Pt100 (-200.00~+300.00℃)</td></tr>
<tr><td>2 R</td><td>25 0~75mV voltage input</td></tr>
<tr><td>3 T</td><td>27 0~320 ohms resistor 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</td></tr>
<tr><td>6 B</td><td>33 1~5V voltage input (J31)</td></tr>
<tr><td>7 N</td><td>34 0~5V voltage input (J31)</td></tr>
<tr><td>8 WRe3-WRe25</td><td>35 -10~+10mV</td></tr>
<tr><td>9 WRe5-WRe26</td><td>36 -37.5~+37.5mV voltage input</td></tr>
<tr><td>12 F2Radiation high-temperature thermometer</td><td>38 10~50mV voltage input</td></tr>
<tr><td>13 T (0~300.00℃)</td><td>39 15~75mV voltage input</td></tr>
<tr><td>17 K (0~300.00℃)</td><td>42 0~10V(J31)</td></tr>
<tr><td>18 J (0~300.00℃)</td><td>43 2~10V(J31)</td></tr>
<tr><td>19 Ni120</td><td>50 0-20mA(J4)</td></tr>
<tr><td>20 Cu50</td><td>51 4-20mA(J4)</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 linear input time, with units equal to the processs value.</td></tr>
</table>

0808H~ 080BH	2056~2059	ScH1~4 Scale upper limit value	Define the upper limit of linear input time, with units equal to the process value.
080CH~ 080FH	2060~2063	FIL1~4 Digital filtering	Define the strength of input digital filtering, with 0 indicating no filtering, 1 indicating filtering with intermediate values, and 2 to 999 indicating integral filtering, with the unit being the sampling period.
0810H~ 0813H	2064~2067	dHA1~4 Alarm parameters	Works as the default positive deviation alarm, or as an upper limit alarm, and is one of the output group parameters. The output parameter group can be selected with the same number as the input parameter group, or different parameter groups can be selected separately. The instrument has 4 sets of output parameters.
0814H~ 0817H	2068~2071	dLA1~4 Alarm parameters	Works as default negative deviation alarm, or as a lower limit alarm.
0818H~ 081BH	2072~2075	AAF1~4 Alarm selection	AAF. 0~AAF. 4 respectively select input fault, HA alarm, LA alarm, dHA and dLA alarm to automatically reset or not reset. If set to 1, it means that the alarm is not automatically reset. The user needs to issue a write command to clear the corresponding alarm status before the register can release the alarm action.

0818H~081BH

AAF	Description
Bit0	0: Automatic reset of alarm status after input signal error is resolved 1: After the input signal is cleared of the error, the alarm status does not automatically reset. To manually clear the alarm status, the corresponding bit of the channel corresponding to the alarm status parameter needs to be written as 0. write bit8=0 for odd channels, and write bit0=0 for even channels;
Bit1	0: After the HA alarm is cleared, the alarm status will automatically reset 1: After the HA alarm is released, the alarm status will not automatically reset. To manually release the alarm status parameter, write 0 to the corresponding bit of the channel. Write bit9=0 for odd channels and bit1=0 for even channels;
Bit2	After the LA alarm is cleared, the alarm status will automatically reset 1: After the LA alarm is released, the alarm status does not automatically reset. To manually release the alarm status parameter, write 0 to the corresponding bit of the channel. Write bit10=0 for odd channels and bit2=0 for even channels;
Bit3	0: The alarm status will automatically reset after the dHA alarm is cleared 1: After the dHA alarm is cleared, the alarm status does not automatically reset. To manually clear the alarm status parameter, write 0 to the corresponding bit of the channel. Write bit11=0 for odd channels and bit3=0 for even channels;
Bit4	After the 0: dLA alarm is cleared, the alarm status will automatically reset 1: After the dLA alarm is cleared, the alarm status does not automatically reset. To manually clear the alarm status parameter, write 0 to the corresponding bit of the channel. Write bit10=0 for odd channels, and write bit4=0 for even channels;
Bit5~bit7	Standby

081CH~ 081FH	2076~2079	HYS1~4 hysteresis	The same unit as the process value, used as the hysteresis for alarm, ON/OFF control, and PID auto-tuning, but auto-tuning can also be selected to use EHYS as the hysteresis through Act. 1.
0820H~ 0823H	2080~2083	OPL1~4 Output lower limit	Range 0~100, default as output lower limit, or output value when entering fault/over range.

<table>
<tr><td>0824H~
0827H</td><td>2084~2087</td><td>OPH1~4
Output upper limit</td><td>Range 0~105, as the output upper limit.</td></tr>
<tr><td>0828H~
082BH</td><td>2088~2091</td><td>OHE1~4
Segmented power limit setting</td><td>The effective range of OPH, The same unit as the process value, used to implement the restriction function for segmented output; When PV<OHEF, the output is limited by OPH; When PV>OHEF, there is no limit to the output, which is 100%.</td></tr>
<tr><td rowspan="2">082CH~
082FH</td><td>2092~2095</td><td>Act1~4
Selection for control</td><td>If Act.0=0, reverse effect (heating); =1, positive effect (cooling).
If Act.1=0, the HYS value of the auto-tuning and ON/OFF parameter group will be used as the hysteresis; =1, use the global parameter EHYS as the hysteresis.
If Act.2=0, it means that when an input fault occurs in this channel, the forced output is 0; =1, it means that when an input fault occurs, the forced output is OPL.
If Act.3=0, it means that the output lower limit is defined by OPL; =1, it means that the output lower limit is fixed at 0.
If Act.4=1, the HA alarm will also force the output to be the same as the input fault state.</td></tr>
<tr><td colspan="3"><table>
<tr><th>ACT</th><th>Description</th></tr>
<tr><td>Bit0</td><td>0: Reaction (heating control)
1: Positive effect (cooling control);</td></tr>
<tr><td>Bit1</td><td>0: At auto-tuning and (ON/OFF) positional control use the HYS value of this parameter group as the hysteresis value. For example, if On01=2, then the hysteresis value of channel 2 is HYS2;
1: At auto-tuning and (ON/OFF) positional control adopt the global parameter EHYS as the hysteresis</td></tr>
<tr><td>Bit2</td><td>0: Indicates that when an input fault occurs in this channel, the forced output is 0
1: Force output is OPL when input fault occurs</td></tr>
<tr><td>Bit3</td><td>0: Indicates that when there is an input fault, the forced output is OPL
1: Indicates that the output lower limit is fixed at 0</td></tr>
<tr><td>Bit4</td><td>0: Output not affected when HA alarm occurs
1: When the HA alarm occurs, it will force the output to be equivalent to the state when the input fault occurred;</td></tr>
<tr><td>Bit5~bit7</td><td>Standby</td></tr>
</table></td></tr>
<tr><td>0830H~
0833H</td><td>2096~2099</td><td>Srh1~4
Limit value of heating slope</td><td>Indicates the heating rate value per minute, with 0 indicating no limit. If the SP value changes, its rate of change will be limited. When powering on or starting control for the first time, the current PV value will be automatically used as the initial setpoint. In addition, if AFC.3=1, when the setpoint SPXX is edited, the current PV value will also be automatically used as the initial setpoint. Note that this function does not work on the cascade sub control channel; In addition, the value of the control cycle CTI should be divisible by 60.0, such as 0.5, 0.8, 1.0, 1.2, 1.5, 2.0 seconds, etc. If set to other values such as 0.9, 1.1 seconds, etc., there may be calculation errors in the heating slope value.</td></tr>
<tr><td>0834H~
0837H</td><td>2100~2103</td><td>SrL1~4
Limit value of cooling slope</td><td>Indicates the cooling rate value per minute, with 0 indicating no limit. The usage is the same as the Srh parameter.</td></tr>
<tr><td>0838H~
083BH</td><td>2104~2107</td><td>Lower limit of SV for SPL1~4</td><td>Belonging to the output parameter configuration group, the lower limit of the SV for channels 1-4. Note: Only limit the range of actual SV, not the setting range of SP.</td></tr>
<tr><td>083CH~</td><td>2108~2111</td><td>Upper limit of SV</td><td>Belonging to the output parameter configuration group, the upper</td></tr>
</table>

083FH		for SPL1~4	limit of the SVs for channels 1-4. Note: Only limit the range of actual SV, not the setting range of SP.
0840H	2112	Communication address	Define the local communication address, range 0~88.
0841H	2113	bAud	Baud rate, unit is 0.1K, range: 9.6K~115.2K.
0842H	2114	Adn Local Input Loop Count	Defines the number of local input loops.
0843H	2115	ACH Extended Input Loop Count	If the local extended module communication input interface does not receive enough measurement values from the input modules defined by ACH, a corresponding input fault alarm signal will be generated. If the actual input exceeds the set value, it is meaningless. This parameter is only used to define the communication input alarm range and will not be used to disable measurement channels. To disable measurement channels, the In parameter can be set
0844H	2116	Ctn Control loops	Indicates the quantity of enabled control loops; Each control loop will take up 10mS of processing time. If set to 96, the actual control cycle will be at least 0.96 seconds.
0845H	2117	Srun Running / STOP	Normally, instruments are in automatic control mode, but each channel can independently set the At parameter to turn off. If Srun=9655, all PID channels will stop outputting to implement the shutdown command. If Srun=15, it is in a running state. If it is powered off and restarted, it will automatically enter the 9655 global stop state.
0846H	2118	Ctl	Define the control cycle, with a maximum range of 0.0 to 50.0 seconds. A value of 0.0 represents the minimum cycle achievable by the system. For example, if the total number of control loops (Ctn) is 16, the actual execution control cycle will be 0.16 seconds, meaning Ctl cannot be less than 0.16. If Ctl is modified, the instrument should be restarted.
0847H	2119	ALAL Alarm public output (requires externally extended alarm module)	ALAL. 0~4 respectively define whether the input ORAL fault, HA alarm, LA alarm, dHA and dLA alarms are common outputs; Set to 0, no output; Set to 1, output. Any alarm will cause the global public alarm output AL, and the alarm output terminal needs to be installed on the host when outputting the global public alarm.
0848H	2120	ALCH Alarm Independent Output Range Configuration (requires an external alarm expansion module).	Define the starting and ending numbers of output channels for extended independent alarms; Although up to 5 * 97 alarm signals can be generated, it is possible to expand up to 256 alarm output channels. For example, if each channel needs to output 4 independent alarms, then when setting the ending and starting numbers for the output channels, the difference between these two values should not be greater than 64.

0849H	2121	ALbt Alarm independent output content	ALbt.0~4 respectively define whether input faults (including over range, open circuit, and communication disconnection), HA alarms, LA alarms, dHA and dLA alarms are output; Set to 0, no output; Set to 1, output. For example, if ALAL=7, ALBt=3, ALCH=16, Then output 3 common alarm signals and 32 independent alarm signals to the extended alarm output module, where the output terminal numbers 1~3 are common input alarm, upper limit alarm, and lower limit alarm, respectively; The sequence of terminals numbered 4~7 is input error alarm for channel 1, HA alarm for channel 1, input error alarm for channel 2, and HA alarm for channel 2, arranged in reverse order based on these numbers. For example, setting ALAL to 0, ALbt=31， ALCH=616， The system will output 55 alarm signals, with 5 alarm outputs per channel for channels 6~16.
084AH	2122	AFA Function Parameter A	AFA.0=0, HA as the default upper limit alarm; = 1, as a positive deviation alarm. AFA.1=0, LA as the default lower limit alarm; =1, as a negative deviation alarm. AFA.2=0, dHA as the default positive deviation alarm; =1, as the upper limit alarm. AFA.3=0, dLA as the default negative deviation alarm; =1, as the lower limit alarm. AFA. 4=0, LA as the default lower limit alarm; =1, as an upper limit alarm, there is an additional upper limit alarm. AFA.5=0, corresponding input channels for HA and LA alarms; =1, Corresponding output channel (note: HA and LA should not be selected as deviation alarms in this mode); AFA.6=0, define AL1 according to ALAL; =1, AL1 is a global alarm AFA.7=0, define AL2 according to ALAL; =1, AL2 is a global alarm
084BH	2123	AFB Function Parameter B	AFB. 0=0 indicates no multiple sets of PID functions; AFB. 0=1 means multiple sets of PID functions, This mode can preset 5 sets of PID automatic switching. At this time, the maximum number of effective independent PID control channels is 16. The instrument divides the SV and PID parameter groups into 5 * 16 groups, where groups 1-16 are the PID parameters currently used in channels 1-16. The remaining 80 PID groups are arranged in the order of 5 groups per channel, meaning that each channel can preset up to 5 PID groups to automatically switch according to the current SF value. For example, if SP1<=SP17, P1, I1, and d1 are automatically set to P17, I17, and d17; If SP17<SP1<SP18, P1, 11, and d1 are automatically set to P18, I18, and d18. If SP18<SP1<SP19, P1, I1, and d1 are automatically set to P19, I19, and d19. If SP1 is greater than the SP values provided by the 5 groups, the PID parameters remain unchanged. Similarly, channel 2 is associated with the PID groups of channels 22-26, and so on.
084CH	2124	AFC Function Parameter C	AFC.0 displays 0 as no checksum and 1 as even checksum when selecting a communication checksum. AFC.1=0, 4~20mA or 2~10V for linear output; AFC.1=1, 0~20mA or 0~10V for current output is. AFC.2=0, no sensor backup; AFC.2=1, sensor backup available. AFC.3=0, during slope control, the PV START function is not

			executed when the set value changes; AFC.3=1, during slope control, the PV START function is executed when the set value changes. Attention: When using this function, the maximum number of control channels cannot exceed 4 temporarily. AFC. 4=0, AD converter has better anti-interference performance for 50Hz power grid; AFC. 4=1, the AD converter has better anti-interference performance for 60Hz frequency and is only suitable for use in countries with 60Hz grid frequency. AFC.5=0, host status BIT0~BIT7 ports for address 0851H, where 1 indicates output action and 0 indicates no action; When AFC.5=1, host status BIT0~BIT7 port for address 0851H, where 0 indicates action and 1 indicates no action; AFC.6=0, The transmission output scale is defined by the corresponding SCL and SCH; AFC.6=1, Defined by SPL and SPH.。 AFC.7=0: When an external expansion module such as YL-1016 is connected, the output value is transmitted. AFC.7=1: When an external host is connected, the PV measured value can be transmitted.
084DH	2125	Nonc	Nonc.0~5 respectively define the normally open and normally closed outputs corresponding to input faults, HA alarms, LA alarms, dHA alarms, dLA alarms, and public alarms. Setting 0 means normally open (closed when an alarm occurs), and setting 1 means normally closed. Attention: If the system loses power, the relay will disconnect regardless of the settings.
084EH	2126	EAF Host sampling parameters; Only valid for the host sampling rate, as for extended input module, it is configured by the extended module itself.	EAF=0, Automatically set the refresh rate of the main input based on the CTI control cycle parameters, with a maximum of 20mS per channel for thermocouples and voltage/current and 60mS for thermistor input; EAF=1, Fixed at 20mS per channel and 60mS for thermistor input; EAF.AB=2, Fixed at 40mS per route and 120mS for thermistor input; EAF.AB=3, Fixed at 80mS per route and 240mS for thermistor input;
084FH	2127	EHYS Extra hysteresis	If it is required that the self-tuning and ON/OFF hysteresis values are different from the HYS alarm hysteresis value, EHYS can be selected as the self-tuning and ON/OFF hysteresis value through Act. 1.
0850H	2128	dPt	Range 0~3, set the position of the decimal point display on the host operation panel. This setting is only for the display of numerical values on the simple operation panel. The decimal point position does not affect the data read by the upper computer, and the upper computer program can handle the decimal point display on its own.
0851H	2129	host status	Read only, BIT0~5 respectively represent the status of the host's O1~O6 and BIT11 corresponds to AL1, BIT12 corresponds to AL2. Setting it to 1 indicates output (can be defined by AFC. 5). BIT8=1 indicates the presence of system faults, such as memory data errors, etc; BIT9=1 indicates the presence of a global alarm.

0852H	2130	Loc	Set Loc.5=0 to allow writing of all parameters; When Loc.5=1, it is not allowed to write parameters within the range of 0800H~08FFH; Loc.6=0/1 respectively indicates allowing/not allowing single byte write instructions; Loc.7=0/1 respectively indicates allowing/not allowing multi byte write instructions. When writing is not allowed, the instrument can still exit, but the parameters will not be substantially edited.
0853H	2131	Characteristic words for instrument model	Read only, indicating instrument model, reading 8848/8148
0854H	2132	High position	Read only, indicating that the instrument number is 4 digits high.
0855H	2133	Low position	Read only, indicating that the instrument number is 4 digits low.
0856H	2134	OPCH Output Starting Channel	OPCH Local Output Starting Channel: If 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 when channels 1~4 are only used for calculation and not directly output.
0857H	2135	FL32 High-Resolution Measurement Value Filter Constant	The unit is the sampling cycle, with a setting range of 0~999. It performs high-resolution secondary filtering on the 32-bit data of 8 channels to improve the stability of the displayed data. This filtering is not used for PID regulation. Typically, since the mass-to-volume ratio of the heated workpiece is larger than that of the temperature sensor, the temperature conduction lags behind the stable sensor. By reasonably setting this filter parameter, a more accurate internal temperature of the heated workpiece can be obtained.
0858H	2136	AIF1 升温与超调调整参数 1	For use by factory debugging personnel
0859H	2137	AIF2 升温与超调调整参数 2	For use by factory debugging personnel
085AH	2138	AIF3 升温与超调调整参数 3	For use by factory debugging personnel
085BH	2139	dIFA	For use by factory debugging personnel
085CH	2140	SPSr	For use by factory debugging personnel
		OPSn	For use by factory debugging personnel
0861H~ 088FH	2145~2191	Standby	
0898H~ 08FBH	2200~2099	Input data from the non-linear correction table	Including 100 data points such as input calibration curve and high-temperature furnace output limit curve.
0900H~	2305~	Temporarily prohibit reading and writing	

Instructions:

1. When developing upper computer software, note that the instrument should respond to each valid command within

0~5 milliseconds (excluding data transmission time and the interval time required by the MODBUS protocol, which should be calculated based on different baud rates and data lengths). The upper computer must also 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, possible reasons include invalid commands, invalid instrument addresses or parameter addresses, communication line faults, the instrument being powered off, or mismatched communication addresses. In such cases, the upper computer should resend the command or skip the instrument at that address.

2. Except for input errors, all other alarms from the instrument are generated based on the input channel values selected by the control channel. Typically, the input channel and control channel numbers are the same. However, if they are inconsistent (e.g., control channel 2 selects input channel 1 as the measured value PV input), the alarms for channel 2 will be based on the absolute value and control deviation of input channel 1, unrelated to input channel 2. Specifically, if two control channels select the same input channel as the measured value, that channel's measured value can have up to 8 alarm-related settings. Additionally, for input channels that are not selected, the channel should usually be disabled; otherwise, the measurement behavior on that channel may affect the input error flag of the input channel selected by the output channel with the same number.

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

4. The instrument imposes limits on the write range for parameter values with addresses between 0800H and 088FH. If out-of-range data is written, it will still be executed, but the system will restrict its range to avoid system failures caused by writing out-of-range data.

5. AFB.1=0: PID group normal mode; AFB.1=1: Preset 5-group PID auto-switching mode. 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, where groups 1~16 are the PID parameters currently used by channels 1~16. The subsequent 80 PID groups are arranged in order of 5 groups per channel, meaning each channel can preset up to 5 groups of PID parameters to automatically switch based on the current SP value. For example: If SP1 is less than SP17, then P1, I1, and d1 are automatically set to P17, I17, and d17. If SP1 is greater than SP17 but less than SP18, then P1, I1, and d1 are automatically set to P18, I18, and d18. If SP1 is greater than SP18 but less than SP19, then P1, I1, and d1 are automatically set to P19, I19, and d19, and so on.

6. Alarm description

How to set up to drive AL1 and AL2, and the parameters related to alarms are as follows:

HA01~HA96, Default as upper limit absolute value alarm, can be changed to upper deviation alarm by editing configuration

LA01~LA96, Default as lower limit absolute value alarm, can be changed to lower deviation alarm by editing configuration

dHA1~dHA4, Default as upper limit deviation alarm, can be changed to upper absolute value alarm by editing configuration

dLA1~dLA4, Default as lower limit deviation alarm, can be changed to lower absolute value alarm by editing configuration

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

HYS1~4, hysteresis, the hysteresis after the alarm is cleared.

ALAL, Define whether each alarm is output

ALCH, Used when expanding the outbound alarm output module

ALbt, Used when expanding the outbound alarm output module

How to operate AL AL1 AL2 is shown in the table below

ALAL parameter, public alarm parameter,

Bit 0 Abnormal input	Bit 1 HA	Bit 2 LA	Bit 3 dHA	Bit 4 dLA	AL1	AL2	AL
1	0	0	0	0	When an abnormal input alarm is triggered, ON	Always OFF	Any alarm ON
0	1	0	0	0	When an HA alarm is generated, ON	Always OFF	Any alarm ON
1	1	0	0	0	When an abnormal input alarm is triggered, ON	When an HA alarm is generated, ON	Any alarm ON
0	0	1	0	0	When an LA alarm is generated, ON	Always OFF	Any alarm ON
1	0	1	0	0	When an abnormal input alarm is triggered, ON	When an LA alarm is generated, ON	Any alarm ON
0	1	1	0	0	When an HA alarm is generated, ON	When an LA alarm is generated, ON	Any alarm ON
1	1	1	0	0	When an abnormal input alarm is triggered, ON	When an HA alarm is generated, ON	Any alarm ON
0	0	0	1	0	When an dHA alarm is generated, ON	Always OFF	Any alarm ON
…	…	…	…	…	…	…	Any alarm ON
…	…	…	…	…	…	…	Any alarm ON
1	1	1	1	1	When an abnormal input alarm is triggered, ON	When an HA alarm is generated, ON	Any alarm ON

The first 5 bits of NONC correspond to the first 5 bits of ALAL. As long as the corresponding alarm bit in the NONC parameter is set to 1, the alarm and action will be reversed.

If NONC=2 is set to reverse the upper limit alarm and ALAL=2, then AL1 will take action under normal conditions until the upper limit alarm of a certain channel is generated, and then AL1 will disconnect the action.