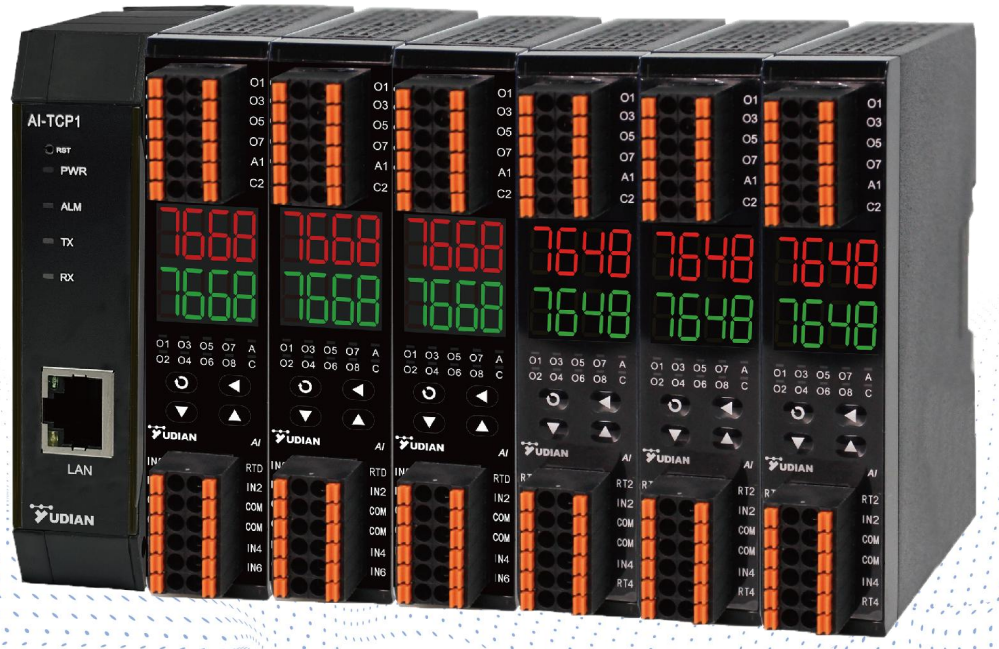
AI-7xx8 Series Multi-Channel Measurement and Control Instrument

User's Manual

(V9.X)



Contents

1 Summary

AI-7xx8 series multi-channel measurement and control instrument can provide 6 channels of various types of thermocouple or two-wire thermal resistance input, as well as four channels of three-wire thermal resistance input; SSR solid-state relay voltage output can be used independently, or used with a computer or a programmable controller PLC. The instrument uses 24VDC or 100~240VAC power supply voltage, and has passed ISO9001 quality certification, with high reliability and meets EMC standards; its power supply and all I/O terminals have passed the 6KV group pulse (EFT) anti-interference test, and can work reliably in a strong interference environment. The new generation technology of Yudian Company is applied to make the multi-channel input achieve the same accuracy and anti-interference ability as the single channel measurement. The main functions of the instrument are as follows:

● support up to 6 programmable measurement input circuits and various input specifications,such as PT100, Cu50, K, S, E, J, B, N, T, WRe5-WRe26 etc., as well as automatic cold junction compensation of thermocouple. After digital correction input , each input circuit has digital filtering, and the filtering intensity can be independently regulated or canceled

● High performance components are used to greatly reduce the temperature drift and mutual interference, so that the accuracy and anti-interference performance of multi-channel measurement can also reach the same level as that of single channel measurement instruments.

● Each circuit can independently set the upper and lower limits or deviation alarm output, and its alarm output position (AL1 or AL2) can be specified by programming. The upper or lower limit alarm signals of different input circuits can be programmed to output from the same alarm channel or from different channels.

● With 12 field parameter setting, users can "customize" the instrument according to their own usage habits.

● It can communicate with computers and support Yudian AIBUS and MODBUS protocols

2 Ordering Code Definition

The hard wares of AI series instrument adopt advanced modules. The AI-7xx8 instrument can be installed with up to 4 modules. The input, output, alarm, communication and other functions can be selected according to the needs. The instrument consists of 6 parts, such as:

AI-7648	D91B	J7	G71	N	L3	S2	–	24VDC
①	②	③	④	⑤	⑥	⑦		⑧

This indicates an instrument:

①Basic function is AI-7648 ;

②Size is D91B dimensions;

③Input is J7 type (supports both thermocouples and RTDs);

⑤ N indicates that no module is installed in this position;

⑥ Two-channel alarm relay output;

⑦ 1 RS485 communication interface;

⑧ 24VDC power supply. The descriptions of each part are as follows:

① Instrument models

AI-7648(Level 0.15 accuracy, 4-channel measurement and control, 8-year free warranty, with 4-channel thermocouple (non-isolated) or 4-channel RTD input capability)

AI-7548 (level 0.2 accuracy, 4-channel measurement and control, 2-year free warranty, with 4-channel thermocouple (non-isolated) or 4-channel RTD input capability)

AI-7348 (level 0.25 accuracy, 4-channel measurement and control, 3-year free warranty, with 4-channel thermocouple (non-isolated) or 4-channel RTD input capability)

AI-7248 (level 0.3 accuracy, 4-channel measurement and control, 2-year free warranty, with 4-channel thermocouple (non-isolated) or 4-channel RTD input capability)

AI-7668 (level 0.15 accuracy, 6-channel measurement and control, 8-year free warranty, with 6-channel thermocouple (non-isolated) or 6-channel 2-wire RTD or 4-channel 3-wire RTD input capability)

AI-7568 (level 0.2 accuracy, 6-channel measurement and control, 5-year free warranty, with 6-channel thermocouple (non-isolated) or 6-channel 2-wire RTD or 4-

channel 3-wire RTD input capability)

AI-7368 (level 0.25 accuracy, 6-channel measurement and control, 3-year free warranty, with 6-channel thermocouple (non-isolated) or 6-channel 2-wire RTD or 4-channel 3-wire RTD input capability)

AI-7268 (level 0.3 accuracy, 6-channel measurement and control, 2-year free warranty, with 6-channel thermocouple (non-isolated) or 6-channel 2-wire RTD or 4-channel 3-wire RTD input capability)

Note: When using three-wire RTD , Cn can not more than 4

② **Indicating Instrument Dimensions**

D71 Rail Mounting Dimensions: D71 width is only 22.5mm, DIN rail mounting mode, dual-row LED display, with button operation, power and communication use plug-in bus terminals, 4-digit digital display panel.

D72 Rail Mounting Dimensions: Single-row 2-digit digital display panel, capable of displaying the instrument communication address.

D91B: Belongs to D91 rail mounting dimensions, dual-row LED display, power and communication use rail bus terminals, can be used to replace D71 dimensions.

D91T: Belongs to D91 rail mounting dimensions, dual-row LED display, power and communication use 5P terminals, generally corresponding to bare board usage.

(Note: D91 dimensions can only be connected to low-voltage circuits. This includes when using relay modules such as L21 and L3, which are also limited to low-voltage connections. To control high-voltage circuits, a 24V-controlled intermediate relay should be connected in series, and the output of the intermediate relay should then be used to control the high-voltage circuit.)

③**Indicates the supported input types (these are fixed input types, not modular).**

J7 denotes compatibility with both thermocouples and RTDs. The 4-channel model can accept inputs from 4 non-isolated thermocouples or 4 RTDs, while the 6-channel model can accept inputs from 6 non-isolated thermocouples, or 6 two-wire RTDs, or 4 three-wire RTDs.

④ **Module available in main output (OUTP)**: For D71/D72 size, modules such as G5, G6, X6, and X72 can be installed.For D91 size, modules such as G7, G71, and X74 can be installed.

⑤ **Module available for auxiliary output (AUX)**: For D71/D72 size, modules such as G5, G6, X6, and X72 can be installed.For D91 size, modules such as G7, G71, and can be installed.

⑥ **Module available in alarm (ALM)**: L21, L3, etc.

⑦ **Module available for communication (COMM)**: S2, etc.

⑧ **Power supply of the instrument**: If it is left blank, the power of the instrument is 100~240VAC. "24VDC"

means the power supply of 24 VDC power.

Note 1: The instrument applies the technology of automatic zero and digital calibration, and is free of maintenance. If the error exceeds certain range, cleaning and drying of the inside parts will improve. If it is not, please send the instrument back to the factory to examine and repair.

Note 2: Please specify the error phenomenon and reason to ensure proper and complete repair if it is sent back for repair.

3 Commonly Used Modules

Modules	Description
N（or left blank）	No module installed.
L21	An output module with a relay of small capacity and small volume for normally open+normally closed(capacity: 30VDC/1A, 250VAC/1A, suitable for alarm use)
L3	Dual channel, large capacity and large size relay. NO relay output module. (Capacity: 30VDC/2A, 250VAC/2A, suitable for alarm).
G5	Dual-channel SSR voltage output module(12V/30mA).
G51	Dual-channel isolated NPN transistor output, capable of externally connecting 5-24VDC to drive solid-state relays or intermediate relays, with a driving current of 100mA per channel.
G6	Three-channel SSR voltage output module(12V/30mA)
G61	Three-channel isolated NPN output module.
G62	Three-channel isolated PNP output module.
G7	Dual isolated NPN transistor output, which can be externally connected to 5-24VDC to drive solid-state relays or intermediate relays, with a driving current of 100mA per channel.
X6	Dual-channel Photoelectrically isolated linear current output modules with isolated power supply (not use the internal isolated power supply), when maximum output voltage greater than 10.5V, non energy-saving.
X61	Two-channel high-precision linear voltage output module (common negative output, 0.2-class output accuracy, using the instrument's internal 12V isolated power supply), supports 0~10V output, low-power energy-saving type.

X72	Two-channel linear current output module with built-in isolated power supply (photoelectric isolation, does not occupy the instrument's internal isolated power supply), maximum output voltage greater than 6V.
X73	Three-channel linear current output module with built-in isolated power supply (photoelectric isolation, does not occupy the instrument's internal isolated power supply), maximum output voltage greater than 6V.
X74	Four-channel linear current output module with built-in isolated power supply (photoelectric isolation, does not occupy the instrument's internal isolated power supply), maximum output voltage greater than 6V, only for D91 dimensions.
S	Photoelectric RS485 communication interface module, use the internal power supply
S2	Photoelectric RS485 communication interface module, use the internal power supply

4 Technical Specification

● **Input specification:**

Thermocouple: K, S, R, E, J, T, B, N, etc;

Thermal resistor: PT100, etc.

● **Instrument Input 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℃）、PT100(-200~+800℃)

● **Measurement accuracy:** level 0.15/ 0.2/ 0.25/ 0.3

Note 1: The allowable error of cold junction compensation at 1 ℃ shall be added when internal cold junction compensation is used by the thermocouple input.

Note 2: The measurement accuracy of B graduation thermocouple cannot reach the calibration accuracy at 60~600 ℃, but it can be at 600~1800 ℃.

● **Temperature drift:** ≤ 0.01%FS/℃ (typical value 60ppm/C)

● **Electromagnetic compatibility (EMC):** ±6KV/5KHz according to IEC61000-4-4 (Electrical Fast Transient); 6KV according to IEC61000-4-5 (Electrical Surge)

● **Isolation withstanding voltage:** Among power, relay contact or signal terminals ≥2300VDC. Among isolated electroweak terminals ≥600V

● **Control period :** 0.48 seconds

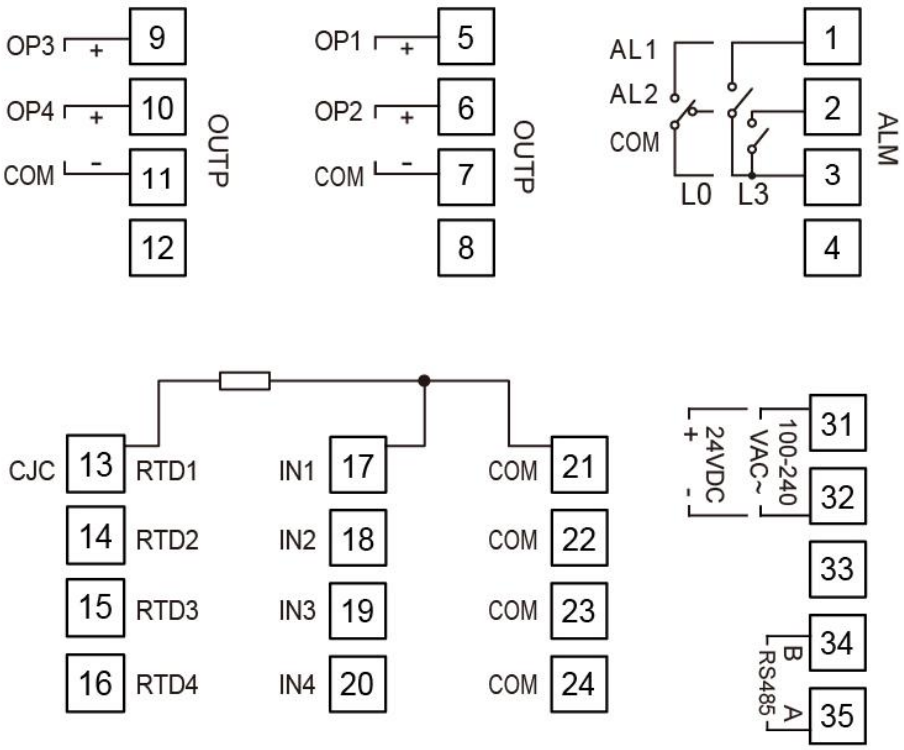
● **Power supply:** 100~240VAC/ 50Hz or 24VDC, +10%, -15%, 5VA

● **Using environment:** temperature -10~+60℃; humidity ≤90%RH

5 Wiring Diagram

Note: If the attached wiring diagram of the instrument is inconsistent with this manual due to technical upgrading or special ordering, the attached wiring diagram shall prevail.

5.1 Wiring for three-wire resistor of AI-7xx8D71J7



① The three wires of a three-wire thermistor are connected to RTDx, INx, and COM respectively. Taking the first circuit as an example, two wires of the same color or with very small resistance values are connected to IN1 and COM, and the remaining wire is connected to RTD1.

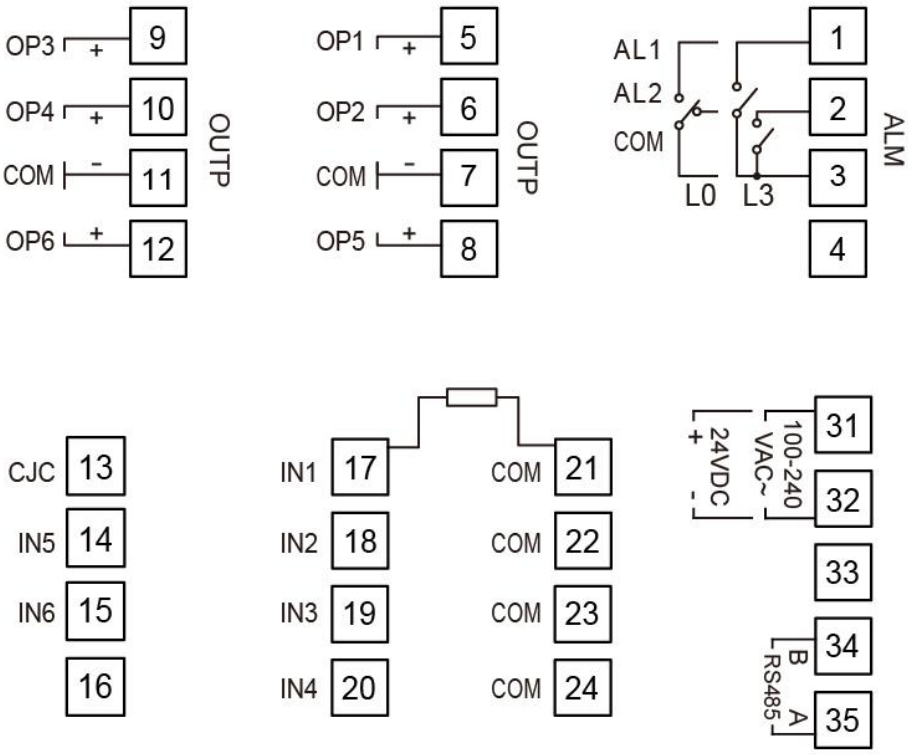
② In the case of installing G5:The main control outputs OP1-OP4 correspond to the positive values of four solid-state relays, with 7 representing the negative values of OP1 and OP2, and 11 representing the negative values of OP3 and OP4.

Note: When installing G51, COM and 24V+ are connected to an external switching power supply. Ensure the positive and negative terminals are not reversed.

③ The alarm output can support up to 2 channels, with the first channel connected to AL1 and COM (terminal 3) and the second channel connected to AL2 and COM (terminal 3).

Note: When using the three-wire thermistor input mode, Cn needs to be set to a number less than or equal to 4.

5.2 Wiring for thermocouple input of AI-7xx8D71J7



① Input thermocouples are positively connected to IN1 to IN6, and negatively connected to COM (terminals 21 to 24).

② Short circuiting CJC and COM (either terminal 21 to 24) can cancel the room temperature compensation of the thermocouple.

③ In the case of installing G5 or G6:The main control outputs OP1 to OP6 correspond to the positive values of six solid-state relays, with 7 indicating the negative values of OP1, OP2, and OP5, and 11 indicating the negative values of OP3, OP4, and OP6.

Note 1: When installing G51, COM and 24V+ are connected to an external switching power supply. Ensure the positive and negative terminals are not reversed.

Note 2: When installing G61 and G62,

the logic corresponds to G6, but there are polarity requirements.

The common terminal of G61 must be connected to the negative,

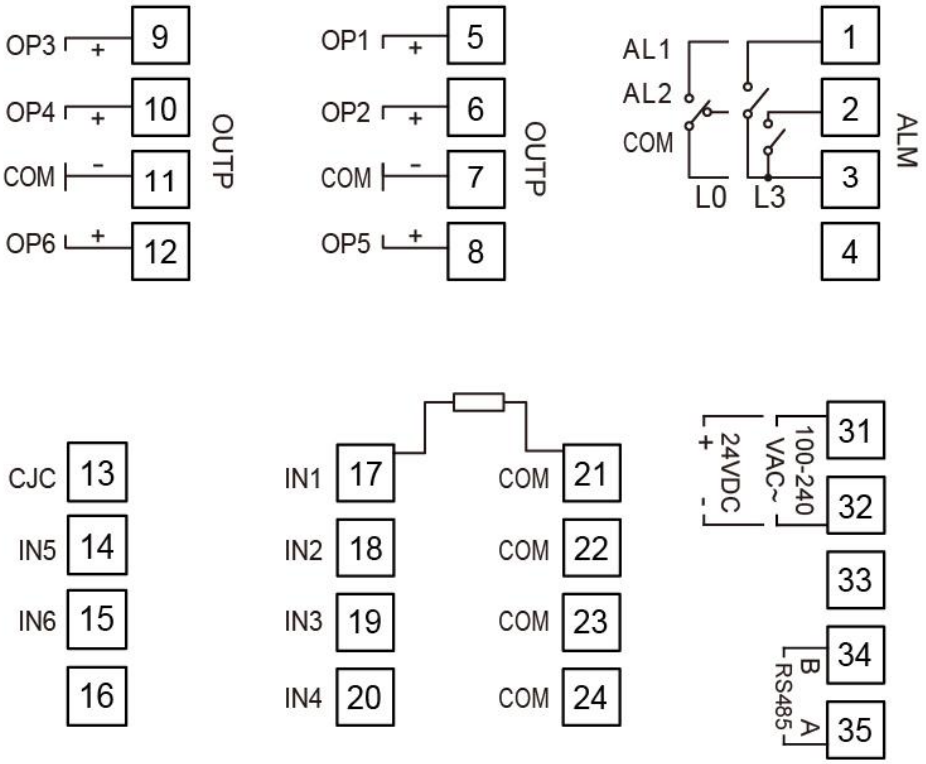
and the common terminal of G62 must be connected to the positive.

④ The alarm output can support up to 2 channels, with the first channel connected to AL1 and COM (terminal 3) and the second channel connected to AL2 and COM (terminal 3).

5.3 Wiring for two-wire resistor of AI-7xx8D71J7

①One end of the input thermal resistor is connected to IN1 to IN6, and the other end is connected to COM (either terminal 21 to 24). Some versions require short circuiting of 13 and 17.

②In the case of installing G5 or G6:The main control outputs OP1 to OP6 correspond



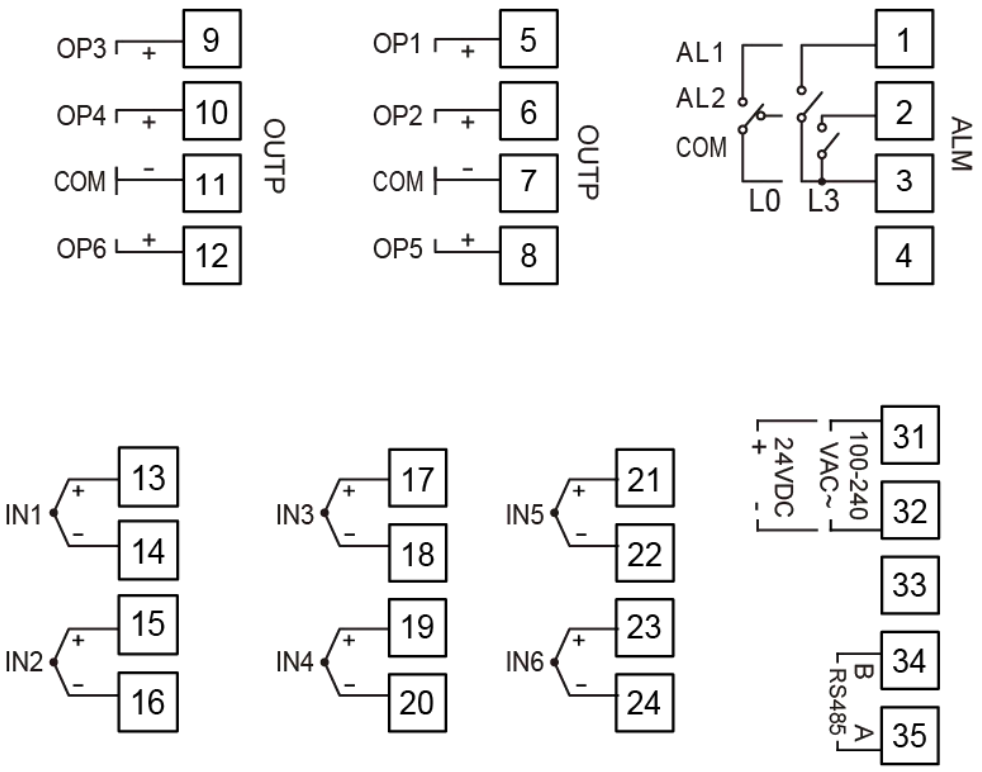
to the positive terminals of 6 solid-state relays, respectively. Terminal 7 is the negative terminal for OP1, OP2, and OP5, and terminal 11 is the negative terminal for OP3, OP4, and OP6.

Note: When installing G51, COM and 24V+ are connected to an external switching power supply. Ensure the positive and negative terminals are not reversed.

Note 2: When installing G61 and G62, the logic corresponds to G6, but there are polarity requirements. The common terminal of G61 must be connected to the negative, and the common terminal of G62 must be connected to the positive.

③The alarm output supports up to 2 channels. The first channel is connected to AL1 and COM (terminal 3), and the second channel is connected to AL2 and COM (terminal 3).

5.4 Wiring diagram of AI-7x68D71J6



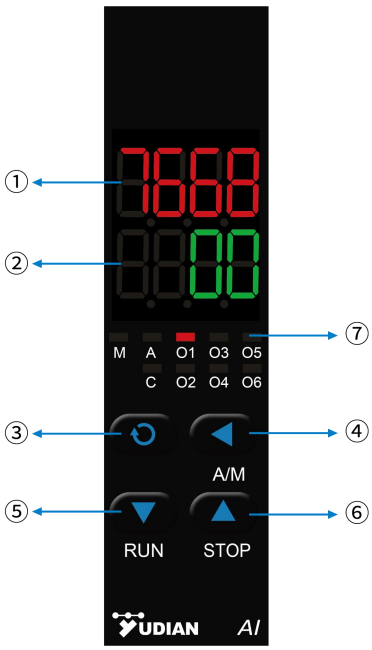
①Six thermocouples are respectively connected from IN1 to IN6. The odd number for positive while the even number for negative.

②In the case of installing G5 or G6:The main control outputs from OP1 to OP6 correspond to the positive of six solid-state relays respectively. 7 for the negative of OP1, OP2 and OP5 while 11 for the negative of OP3, OP4 and OP6.Note: When installing G51, COM and 24V+ are connected to an external switching power supply. Ensure the positive and negative terminals are not reversed.

③The alarm output can support up to two channels, the first is connected to AL1 and COM (terminal 3), and the second is connected to AL2 and COM (terminal 3).

6 Displays and Operations

6.1 D71 Rail mount Panel Description



① Upper display window, displays PV, parameter code, etc.
② Lower display window, displays SV, parameter value, or alarm code.
③ Setup key (manual/automatic switching)
④ Data shift key (set point cursor)
⑤ Data decrease key (and switch to display the previous channel)
⑥ Data increase key (and switch to display the next channel)
⑦ Among the 9 LED indicators, O1, O2, O3, O4, O5 and O6 correspond to 6 outputs respectively; indicator C on means communicating with the upper computer. M corresponds to AL1 alarm output, and A corresponds to AL2 alarm output.

6.2 Operation Description

Switch to display loop: Press ▽ to decrease the loop number, and press △ to increase the loop number. Press ◁ to enter the setting state of the set value.

Setting parameters: When the parameter lock is unlocked, press ↺ and hold for about 2 seconds, then release after the parameter is displayed. Press ↺ again, and the instrument will display each parameter in turn, such as the upper limit alarm value H.AL1 of loop 1, parameter lock Loc, etc. For the instrument configured and locked with the parameter lock, press ↺ to display the parameters (without holding for 2 seconds), and only the parameters that the operator needs to use (field parameters) will appear. The parameter value can be edited by pressing ▽, △, ◁. Press ◁ first and then ↺ to exit the parameter setting, and press ◁ to check the last parameter.

The lower display window displays the loop number: When there is an upper limit or lower limit alarm, the first digit on the left of the lower display window can flash H. or L. When the signal of the loop exceeds the range (such as thermocouple disconnection), the upper display window displays the upper or lower range, and the lower display window flashes.

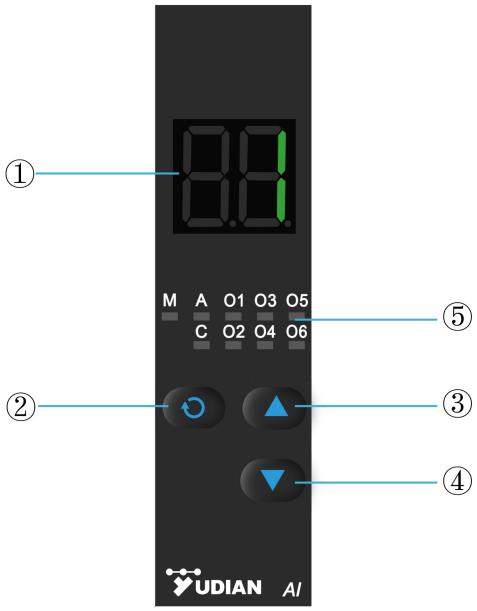
Lead wire resistance compensation during two-wire wiring of thermal resistance: if two-wire wiring is used for resistance signals such as Pt100 or Cu50, an offset value (parameter ScB) needs to be set to offset the lead wire resistance. The offset value can be set automatically through the instrument, and the steps are as follows:

①First, short-circuit both ends of the thermal resistance of the channel to be corrected (the short-circuit point is at the sensor end rather than the instrument end).

②After setting parameter Loc=168, return to the temperature interface and press ◁ and hold for more than 2 seconds until symbol A is displayed in the first digit on the left of the lower display of the instrument. Please cancel the alarm settings, if any, to prevent the alarm from affecting the indication.

③After the A displayed on the instrument disappears automatically, remove the short line at the end of the sensor and set Loc to 0 or 1 to restore the normal status of the instrument. This operation enables the instrument to reverse the measured value and record it into the parameter ScB of the corresponding channel to compensate the measurement error caused by the lead resistance. If the measured signal does not belong to the resistance type, or the short circuit is not connected, this operation will not work. After operation, view the parameter ScB to know the lead resistance, which has been calculated as the value of 0 Ω.

6.3 D72 Panel Description



① Display window: Displays communication address (Addr), etc.

② Setting key

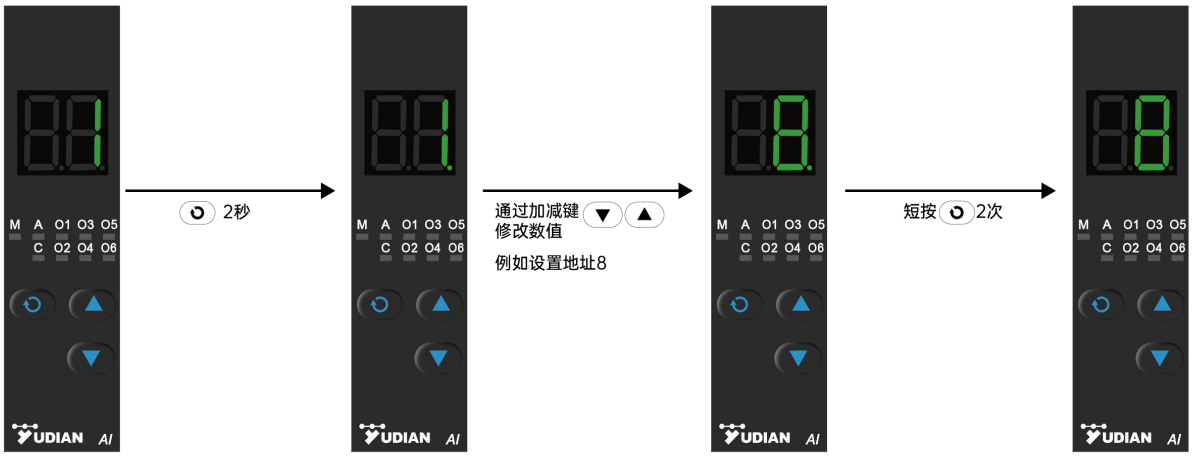
③ Data increase key

④ Data decrease key

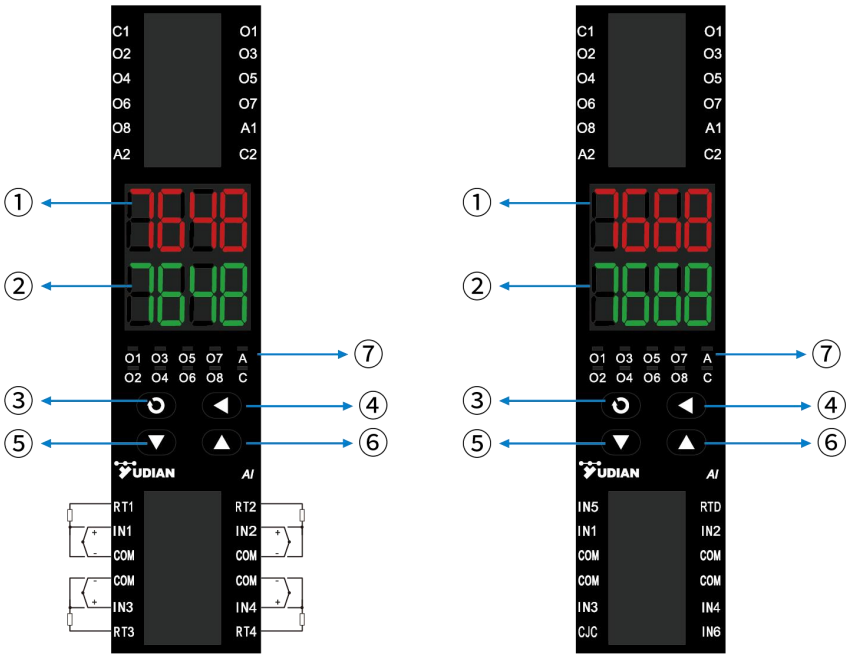
⑤ 9 LED indicators: O1 to O4 represent OP1, OP2, AU1, and AU2, respectively. O5 and O6 are not used in this model. M and A correspond to AL1 and AL2, respectively. The C light indicates active communication with the host computer.

6.4 D72 Operation Instructions

After powering on, the main interface is displayed. Press and hold the setting key for 2 seconds to enter the Addr setting interface. Use the increase and decrease keys , to modify the value. Then, pressthe setting key twice briefly to save and return to the main interface.



6.5 D91 Panel and Wiring Instructions



① Upper display window: Displays measured value (PV), parameter names, etc.
② Lower display window: Displays set value (SV), alarm codes, parameter values, etc.
③ Setting key (also used for manual/automatic cycle display switching)
④ Data shift key (also used for switching to set value display)
⑤ Data decrease key (also used for switching to the previous channel)
⑥ Data increase key (also used for switching to the next channel)
⑦ 10 LED indicators: O1~O6 correspond to 6 output channels, the C light is the communication indicator, O7 corresponds to AL1 output, and A corresponds to AL2 output.

Wiring Instructions:

For 7648, taking the first input channel as an example:
When connecting a thermocouple, IN1 is positive, and COM is negative.
When connecting a 2-wire RTD, IN1 connects to one wire, and COM connects to the other.
When connecting a 3-wire RTD, the two wires with the same color or lower resistance are connected to IN1 and COM, and the remaining wire is connected to RT1 (set AF to 6).
For 7668, taking the first input channel as an example:
When connecting a thermocouple, IN1 is positive, and COM is negative.
When connecting a 2-wire RTD, IN1 connects to one wire, and COM connects to the other.
Main outputs O1~O8, with the common terminal C1. The number of outputs depends on the instrument's channel count. For example, a 4-channel instrument only has O1~O4.
Alarm outputs A1/A2, with the common terminal C2.
When installing active output modules such as G5, G7, X74, or X72, C1 and C2 are the negative terminals, and O1~O8, A1, and A2 are the positive terminals for the corresponding output logic.
When installing NPN output modules such as G71 or G61, the common terminals C1 and C2 should be connected to the negative terminal of the 24V switching power supply. O1~O8, A1, and A2 are connected to the negative terminals of the solid-state relays (or other devices), and the positive terminals of the solid-state relays (or other devices) are connected to the positive terminal of the 24V switching power supply.
When installing relay modules such as L21 or L3, C2 is the common terminal, and A1 and A2 are the output logic points for alarms AL1 and AL2. Note that only low voltage (below 28V) can be used.

7 Parameter Tables

The multi-channel temperature controller defines the input, output, alarm and communication modes of the instrument through parameters which is shown as the following:

Code	Name	Description	Range
Loc Loc	Parameter Lock	When Loc≠808, the instrument only displays and sets 0~12 field parameters (defined by EP1~EP12) and Loc parameter itself. When Loc=808, users can set all parameters. Loc provides operation permissions for various parameters. As follows: Loc = 0: Allowing to display and edit FIELD PARAMETER Loc = 1: Allowing to display but forbidding to edit FIELD PARAMETER Loc=808: Allowing to display and edit all parameters Note: The editing is only for the external display, and the parameter editing by communication will not be affected.	0~9999
Addr Addr	Communication address	To define the communication address, with a valid range 0~80. Instruments on the same communication line are set with different Addr values to distinguish each other. When AIBUS protocol is used, the multi-channel temperature controller has 2~6 circuits, corresponding to 2~6 addresses, which is equivalent to 2~6 single channel instruments on the communication line. For example, if the measuring loop(the single digit of parameter Cn)=6 and Addr=1, then addresses from 1 to 6 will be used by the very instrument. If the measurement loop Cn=3 and Addr=10, then the addresses from 10 to 12 are used by the very instrument. Only one address is used in MODBUS protocol.	0~80

<table>
<tr><td>bAud
bAud</td><td>Baud rate</td><td>The range of baud rate is 4800~19200bit/s(19.2K). When COMM slot is used as communication.For the D72 size, Addr and bAud are set to auto-match by default, and these parameters do not need to be modified:When Addr is set to 1~31, the default baud rate is 9600, and the D72 window displays 1~31.When bAud is set to 33~63, the default baud rate is 19200, the actual communication address is 1~31, and the D72 window displays 1~31.</td><td>0~19.2K BIT/S</td></tr>
<tr><td>InP
InP</td><td>Input specification</td><td>
<table>
<tr><th>InP</th><th>Input spec.</th><th>InP</th></tr>
<tr><td>0</td><td>K</td><td>1</td></tr>
<tr><td>2</td><td>R</td><td>3</td></tr>
<tr><td>4</td><td>E</td><td>5</td></tr>
<tr><td>6</td><td>B</td><td>7</td></tr>
<tr><td>8</td><td>WRe3-WRe25</td><td>9</td></tr>
<tr><td>10</td><td>Extended input specification</td><td>12</td></tr>
<tr><td>19</td><td>Ni120</td><td>20</td></tr>
<tr><td>21</td><td>PT100</td><td>22</td></tr>
</table>
</td><td>0~33</td></tr>
</table>

dPt dPt	Display Resolution	dPt is the decimal position and resolution shared by 6 channels. ①For linear input, dIP=0, 1, 2, 3 corresponds to 0, 0.0, 0.00, and 0.000. ②When thermocouple or thermal resistance input is used, the resolution of temperature display is selected for dIP; dIP=0, and the resolution of temperature display=1℃; dIP=1, temperature display resolution=0.1℃. Note: This setting is only effective for display. The internal temperature measurement resolution is fixed to 0.1 ℃ or 1 linear unit, so it will not affect the communication or transmission output effect. When the resolution of temperature display=0.1 ℃, and the temperature measurement value >1000 ℃, the resolution will automatically change to 1 ℃.	0~3
Cn Cn	Number of channels	The single digit of parameter Cn indicates the number of channels actually used by the instrument. 7*48 can be set as 1~4, 7*68 can be set as 1~6. Unnecessary channels can be closed, which will affect the address used by the AIBUS protocol. If Cn=3 is set, the first three channels will be displayed circularly, and AIBUS communication accounts for three addresses.	1~6
Cno Cno	Start number of channel	Cno is used for the lower display window to indicate the starting number of the channel, for example, the channel number of 7648 instrument is generally 1~4. However, the initial channel number can also be edited when multiple computers are used. For example, when the 1st instrument displays CH1~CH4, if the Cno parameter of the 2nd instrument is changed from 1 to 5, the 2nd instrument can display CH5~CH8.	
Ctl Ctl	Control period	The parameter Ctl can be set between 0.5~5S. SSR (solid state relay) is used as the output actuator. It is generally recommended to set it for 0.5~2s to improve the control accuracy.	0.5~5

HYS HYS	Hysteresis	Hysteresis shared by 6 channels to avoid frequent alarm actions caused by the fluctuation of the measured input value, and to avoid the wrong PID parameters caused by the wrong action of the measured value due to the bit regulation when the instrument is self-tuning AT. This parameter is also called insensitivity zone, dead zone, hysteresis, etc.	0~999.0 ℃
AF AF	Advanced function	AF is used to select advanced function. The value of AF is calculated as below: AF=Ax1+Bx2+Cx4+Dx8 + Ex16+Fx32+Gx64+Hx128 A=0, normal speed cycle display: A=1, fast cycle display. B and C define the input mode: B = C = 0, it is in two-wire RTD or thermocouple input mode; B=1, C=0, it is in 2N+1-wire RTD input mode; B=1, C=1, it is in three-wire RTD input mode. D=0, normal; D=1, the lower limit alarm L.AL becomes upper limit alarm. E=0, spare F=0, spare G=0, spare H=0, AIBUS protocol; H=1, MODBUS protocol	

AF2 AF2	Advanced Function 2	AF2 is used to select the second group of advanced function codes, and its calculation method is as follows: AF2=A X 1+B X 2+C X 4+D X 8+E X 16 A=0, normal use; A=1, change the upper limit alarm H.AL of each loop to the upper limit alarm of deviation. When the deviation (PV-SV)>HAL1~6, the deviation upper limit alarm starts; when the deviation<HAL1~6-HYS, the alarm turns off; If HAL1~6 is set as the maximum, the alarm will be canceled. B=0, normal use; B=1, change the lower limit alarm L.AL of each loop to the lower limit alarm of deviation. When the deviation (PV-SV)<LAL1~6, a negative deviation alarm starts; when the deviation>LAL1~6+HYS, the alarm turns off. If LAL1~6 is set as the minimum, the alarm will be canceled. C=0, reaction (heating); C=1, positive action (cooling). D=0, remain original operating status when power on; D=1, in stop status after power on. E=0, 4~20mA output; E=1, 0~20mA output. (X6 module is required)	
AFC AFC	communication mode	parameter AFC is used to select communication mode, the calculation method is as follows: AFC=Ax1+Dx8； A=0, MODBUS; A=1, AIBUS; D=0, no check; D=1, even check. Note: When the MODBUS protocol is set, it only occupies one address and supports two instructions: 03H (reading parameters and data) and 06H (writing a single parameter). The 03H instruction can read up to 20 words of data at a time	0~12

Nonc nonc	NO/ NC	The parameter nonc is used to define a normally open output as a normally closed output. nonc=Cx4+Dx8 C=0, AL1 is normally open; C=1, AL1 is normally closed. D=0, AL2 is normally open; D=1, AL2 is normally closed.	0~127
At1~At6 At 1- At6	Auto tuning	0, running normally, auto-tuning At is closed. 1, start auto-tuning, and automatically return to 0 after auto-tuning. 5, ON-OFF control. 10, turn off the output. 20，In manual output status	0~20
OP1 ~OP6 OP 1- OP6	Manual output percentage	manual output value	0~100
P1~P6 P 1-P6	Proportional band	To define the proportional band for PID regulation, and its unit is the same as that of PV, rather than the percentage of measuring range. For familiar systems, directly input the correct P, I, D, Ctl without starting the automatic tuning (AT).	0~30000 unit
I 1~I6 I 1- I6	Time of Integral	To define the integral time for PID regulation, in seconds. When I=0, the integral effect is canceled.	0~9999s
d1~d6 d 1-d6	Time of Derivative	To define the differential time for PID regulation, in 0.1 second. When d=0, the differential action is canceled.	0~999.9 s
OPL1~6 OPL 1- OPL6	Output lower limit	Limits the percentage of the minimum value of the OUTP tuning output..	0~100
OPH1~ OPH6 OPH 1- OPH6	Output upper limit	Limits the percentage of the maximum value of the OUTP tuning output.	0~100

Scb1~ Scb6 Scb 1- Scb6	Input Shift Adjustment	Scb is used to shift input to compensate the error caused by transducer, input signal, or auto cold junction compensation of thermocouple. For the input of thermocouple and three-wire PT100, Scb corrects the actual temperature. For example, if Scb=- 10.0, the measured value will be 10.0 ℃ lower than that when Scb=0.0. When the input is a two-wire thermistor, the resistance value is corrected. When InP=19, correct Scb=7.0 to 1 Ω. When InP=20, correct Scb=28.0 to 1 Ω. When InP=21, correct Scb=7.0 to 1 Ω. When InP=22, correct Scb=1.40 to 1 Ω. For the setting method of automatic compensation of lead resistance of two-wire thermal resistor, refer to 6.2 Operation Instructions; During the annual metrological verification, if the calibration error of the instrument that has been used for a period of time in harsh environments exceeds the range, the instrument can be cleaned and dried to solve the accuracy problem. If the accuracy is still not realized, edit the Scb parameters to correct.	-1990~ +9990 unit or 0.1℃
FIL1~ FIL6 FIL 1- FIL6	Digital filter strength	Used to set the strength of digital filtering. 0 means no filtering, 1 means taking median filtering, and 2~40 have both median filtering and integral filtering. The larger the FIL, the more stable the measured values, yet the slower the response. Generally, when the measurement is greatly disturbed, the FIL value can be increased gradually to make the instantaneous runout of the measured value less than 2~5 words. When the instrument is calibrated in the laboratory, the FIL= 0 or 1 can be set to improve the response speed.	0~40
SP1~ SP6 SP 1- SP6	Set value	Respectively represent the set values of 1~6 channels	-999~ +3200℃

H.AL1~ H.AL6 H AL 1- H AL6	High limit alarm	Respectively represents the upper limit alarm value of 1~6 measured channels. Alarm turns on when PV>H.ALx(X represents the measured channel corresponding to 1~6, the same below) Alarm turns off when PV<H.ALx-HYS,	-999~ +3200 ℃
L.AL1~ L.AL6 L AL 1- L AL6	Low limit alarm	Respectively represents the low limit alarm value of 1~6 measured channels. Alarm turns on when PV<L.ALx, Alarm turns off when PV>L.ALx+HYS, by programming parameters AOP1~6, the alarm can control the relay module on ALM, AUX or OUTP. Unused alarms can be set as limit values to avoid alarm.	-999~ +3200℃
AOP1~ AOP6 AOP 1- AOP6	Alarm output allocation	AOP is used to define the output positions of alarms such as H.AL and L.AL, the single digit of AOP indicates the output position of H.AL alarm. Its output range is 0~4. 0~2 indicates that the alarm is not output from any slot. 3 and 4 indicate that the alarm is output by AL1 and AL2 respectively. The ten digits of AOP represent the output position of L.AL alarm, and the numerical meaning is the same as above. For example, if AOP1=43 is set, it means that the upper limit alarm of loop 1 is output by AL1, and the lower limit alarm is output by AL2. Another example: AOP2=34, it means that the upper limit alarm of loop 2 is output by AL2, and the lower limit alarm is output by AL1.	0~77

EP1~EP12 EP 1- EP 12	Field parameter definition	After the instrument is set, the parameters that do not need to be edited frequently can be shielded, leaving only the parameters that need to be edited frequently for the field operators to edit. EP1~EP12 parameters are used to define which parameters can be displayed (i.e. field parameters) when the parameter lock is locked, while other parameters are shielded and cannot be displayed or edited. EP1~EP12 can define 0~12 field parameters. The parameter values are other parameters besides EP parameters, such as H.AL1, L.AL1, etc. When Loc is locked, only the defined parameters or program settings can be displayed, while other parameters cannot be displayed and edited. This function can speed up the edit of parameters, and prevent important parameters from being edited by mistake. The parameters EP1~EP12 can define up to 12 field parameters. If the field parameters are less than 12 (even no field parameter sometimes), the parameters to be used should be defined from EP1 to EP12, and the first parameter not used should be defined as nonE. For example, it is often needed to edit the SP parameters of each channel on site, and the EP parameters can be set as follows: EP1=SP1, EP2=SP2, EP3=SP3, EP4=SP4, EP5=nonE, Loc=0 At this time, if the instrument uses an external display, it can only display and edit 4 parameters from SP1 to SP4, yet the communication will not be affected.	NonE~EP12

8 FAQs

8.1 How to self-tune?

Press and hold for two seconds to enter the parameter list, and then press briefly to find the next parameter. If the parameters are locked, please find the password lock parameter LOC and set it to 808, then press briefly to see all the parameters.

8.2 How to set auto-tuning?

When the measured value PV is room temperature, set the set value SV to about 60% of the common temperature, then call up the *At* parameter, At1~6 correspond to six channels respectively. Set At = 1 to start the self-tuning. After the self-tuning, the At parameter will automatically return to 0.

8.3 How to judge whether the instrument has output?

First, check whether the output indicator light is on (check lights O1, O2, O3, O4, O5, O6 for D71 Dimension instruments). lights not on indicate to check whether the instrument operates normally(At=0 means running), and then check whether the parameters are set correctly; lights on indicates that the output status is normal, and a multimeter can be used to check whether the output terminal signal is normal, if the output signal is normal but the rear SSR does not work, check other faults along the output line. If there is no output signal, it can be judged that the instrument output module is abnormal.

8.4 Common faults

PV=- 208 indicates that no resistance signal is detected when the input specification is Pt100, which is generally a wiring problem. PV=1381 indicates that when the input specification is K-type thermocouple and the instrument detects an open circuit of the input signal, it is necessary to check whether the thermocouple is connected properly.

8.5 How to set alarm parameters?

First, set the alarm parameters to the required values (for example, if 200 degrees is set for the upper limit alarm of the first channel, change the H.AL1 parameter to 200), then enter the internal parameters and find the AOP parameters to define the alarm output slot(for example: If the upper limit alarm of the first channel needs to be output from AL1, set the single digit of AOP1 to 3. For specific definitions, please refer to the AOP parameter introduction in the manual).

9. Display/Alarm Symbols

The basic display status starts after the instrument is powered on, and the SV display window can alternately display symbols to indicate status, shown as the following:

Symbols	Description	Method
CA 1	Start PID initialization and self-tuning after power on	Wait for it to stop flashing automatically, and turn off the setting in advance by changing the At1 parameter to 0. The same applies to other channels.
Ar 1	Automatically corrects the wire resistance	Wait for the automatic correction to end.
H.A 1	An upper limit alarm occurs in the first circuit	PV<H.AL1-HYS, the alarm turns off automatically, or change H.AL1= 3200.0 to turn off the alarm. The same applies to other channels.
L.A 1	An lower limit alarm occurs in the first circuit	PV>L.AL1+HYS, the alarm turns off automatically, or change L.AL1= -999.0 to turn off the alarm. The same applies to other channels.
Er 1	There are errors in the system, such as parameter loss	Need to be returned to the factory for repair

Note: The overrange of the multi-channel instrument is indicated by the maximum or minimum value displayed when PV flashes. At this time, check whether the input parameter specification is correct, whether the input wiring is correct and whether the input signal is normal.