AI Series Multi-channel PID Temperature Controller

User's Manual

(V7.8)

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the video tutorial

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1.Summary

The multi-channel temperature controller uses a variety of optional inputs, such as thermocouples and thermal resistors, and the SSR solid-state relay voltage output. Each channel can have different input specifications, that is, it can be used independently, or it can be used online with a computer or a programmable controller PLC. The instrument can choose 24VDC/AC or 100~240VAC power supply voltage, and has passed ISO9001 quality certification, high reliability and meets EMC standards; its power supply and all I/O terminals have passed the 4KV 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:

- It can support up to 4 programmable measurement input circuits and various input specifications,such as K, S, E, J, B, N, T, WRe5-WRe26, PT100 etc., as well as automatic cold junction compensation of thermocouple and can input linear signal and freely define scale. After digital correction input , each input circuit has digital filtering, and the filtering intensity can be independently adjusted or canceled
- High performance components are used to greatly reduce the temperature drift and mutual interference between the four channels, 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.
- It can support the overall sizes of D5/E5/D7/E7 DIN rail or panel mounted instruments. The rail type without display can be connected to E8 handheld display for display programming.

● Each circuit of the instrument can independently set the upper and lower limits or deviation alarm output functions, 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 settings, users can "customize" the instrument according to their own usage habits.

● It has the advanced function of computer communication and is fully compatible with the communication protocol of commonly used AI-708 artificial intelligence regulator/temperature controller. One AI-7048 can be equivalent to four independent measuring and control instruments in communication.

● The 70482 type in the multi-channel temperature controller series, whose 4-way programming measurement input circuit's weak current signals are isolated from each other, is suitable for the thermocouple whose cathode is connected to the shell.

● AI-7048 is fully compatible with AI-7028 and AI-7038. AI-7028 is a control instrument with two channels of independent measurement. For wiring, only refer to the first two channels of AI-7048.

2.Ordering Code Definition

The AI series instrument hardware adopts advanced modular design. The AI-7028/7048/70482 instrument can be installed with up to 6 modules. The input, output, alarm, communication and other functions can be selected according to the needs. The modules can be purchased together with the instrument or separately, and can be combined freely. The AI-7028/7048/70,482 instrument model consists of 9 parts, such as:

AI-7048	A	J2	J2	G5	L3	G5	S	—	24VDC
①	②	③	④	⑤	⑥	⑦	⑧		⑨

This indicates an instrument: ① The basic function is AI-7048; ② Panel size is Type A (96 × 96mm）； ③ Two two-wire thermistor input circuits; ④ Two two-wire thermistor input circuits; ⑤ 2-way solid-state relay drive voltage output; ⑥ 2-way alarm relay output; ⑦ 2-way solid-state relay drive voltage output; ⑧ 1 RS485 communication interface; ⑨ The instrument power supply is 24VDC. The meanings of each part in the instrument model are as follows:

①Indicates the basic functions of the instrument

AI-7028 (level 0.2 precision 2-way PID temperature controller, AIBUS communication protocol)

AI-7048 (level 0.2 precision 4-way PID temperature controller, AIBUS communication protocol)

AI-70482 (the input is isolated and fixed as thermocouple input, others are the same as AI-7048, suitable for thermocouple input with negative pole connected to shell)

②Indicates the size of the instrument panel

A panel 96*96mm, opening$92^{+0.5}$*$92^{+0.5}$mm

B panel 160*80mm (wide*height), horizontal type, opening $152^{+0.5*}76^{+0.5}$mm

C panel 80*160mm (wide*height), vertical, opening $76^{+0.5*}152^{+0.5}$mm

D5 is only 22.5mm wide. This machine has no display part. It is not a panel mounted meter. It can be installed on DIN rail and can be programmed with an external display

D7 is only 22.5mm wide, DIN rail installation mode, special double row LED display, with key operation, and plug-pull terminal is used for power supply and communication

E panel 48*96mm (wide*height), opening $45^{+0.5*}92^{+0.5}$mm

E5 means I/O modular housing, no display part, non panel mounted meter, can be installed on DIN rail, and external display programming is available

E7 is only 22.5mm wide, DIN rail installation mode, special double row LED display, with key operation

F panel 96*48mm (wide*height), opening $92^{+0.5*}45^{+0.5}$mm

③Indicates the module specification of IN1 and IN2 input installation of instrument M1: J1, J2, J3, J4, J5 and other modules can be installed; N indicates no installation, the same below.

④Indicates the module specification of IN3 and IN4 input installation of instrument M2: J1, J2, J3, J4, J5 and other modules can be installed.

⑤Indicates the module specification of OP1 and OP2 output installation of instrument M3: G5 module can be installed.

⑥Indicates the module specification of alarm (ALM) installation of instrument M4: L0, L3 and other modules can be installed.

⑦Indicates the module specification of OP3 and OP4 output installation of instrument M5: G5 module can be installed.

⑧Indicates the module specification installed for instrument communication (COMM): S, S4 and other modules can be installed.

⑨Indicates the power supply of the instrument: if not written, it means 100~240VAC power supply is used, and 24VDC means 24VDC or AC power supply is used.

Note 1: For sizes D5, D7 and E7, only the input type needs to be selected (only J1 or J2 inputs are available temporarily).The main output is fixed as solid state relay drive voltage output with one RS485 communication. In addition, for sizes D7 and E7, two-way solid state relay drive voltage output alarms are provided by default. The 70482 doesn't have sizes D5 and E7 and only the size D7 has alarm;

Note 2: This instrument is a maintenance-free instrument with automatic zero adjustment and digital calibration technology. In case of out of tolerance during measurement verification, the problem can usually be solved by cleaning and drying the inside of the instrument. If the accuracy cannot be recovered even after drying and cleaning, the instrument should be sent back to the factory as a faulty instrument for maintenance;

Note 3: The instrument shall be guaranteed free of charge during the warranty period. Any instrument that needs to be repaired must specify the fault phenomenon and reason to ensure correct and comprehensive repair.

3.Common Module Model

N (or not written) No module is installed.

J1 2-way thermocouple input module, support mV voltage input as well.

J2 2-way two-wire thermistor input module.

J3 2-way voltage input module, which can support 0~5V, 1~5V and other input specifications.

J4 2-way current input module, which can support 0~20mA, 4~20mA and other input specifications.

J5 2-way two-wire transmitter input module, with 24V feed power inside.

L0 large capacity and large volume relay normally open+normally closed contact switch output module (module capacity: 30VDC/2A, 250VAC/2A, suitable for alarm).

L3 two-way large capacity large volume relay normally open contact switch output module (capacity: 30VDC/2A, 250VAC/2A, suitable for alarm).

G5 two-way solid state relay drive voltage output module.

S photoelectric isolated RS485 communication interface module, which occupies 24V isolated power supply inside the instrument.

S4 photoelectric isolated RS485 communication interface module, with isolated power supply.

S6 supports standard MODBUS-RTU communication protocol and optoelectronic isolated RS485 communication interface module (12V isolated power supply inside the instrument).

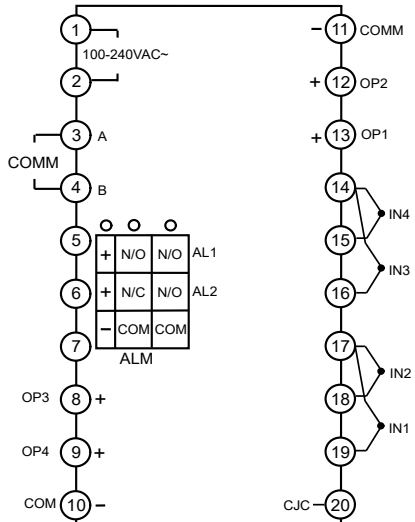
4.Technical Specification

- **Input specification:**
  Thermocouple: K, S, R, E, J, T, B, N, etc; Linear input: 0~20mV, 0~60mV, 0~1V, 1~5V, 4-20ma, etc.
- **Measuring range:**
  K(-50~+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℃)
  Linear input: freely defined by user with SCH and SCL parameter
- **Measurement accuracy:** ± 0.2% FS ± 1 word
  Note 1: When internal cold junction compensation is adopted for thermocouple input, 1 ℃ cold junction compensation allowable error shall be added.
  Note 2:B scale thermocouple can be measured in the range of 60~600 C, but the accuracy can not reach the calibration accuracy. The measurement accuracy can be guaranteed in the range of 600~1800 C.
- **Temperature drift:** < 0.01%FS/C (typical value is 60ppm/C)
- **Electromagnetic compatibility** electrical IEC61,000-4-4 (electrical fast transient pulse group), ± 4KV/5KHz; IEC61,000-4-5 (surge), 4KV
- Isolation voltage withstand, isolation power supply end, relay contact and signal end shall be no less than 2300VDC; ≥ 600VDC between SSR voltage output and thermocouple input
- **Control cycle:** 0.48 seconds/4 circuits
- **Output specification:** SSR drive voltage, 12VDC/20mA per circuit, including short circuit protection function
- **Power supply:** 100~240VAC/50Hz or 24VAC/DC ＋10%, －15%; 5VA
- **Operating environment:** temperature - 10~+60 ℃, humidity ≤ 90% RH

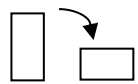
5. Wiring

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.

7028/7038/7048 wiring diagram of multi-channel temperature controller is as follows:

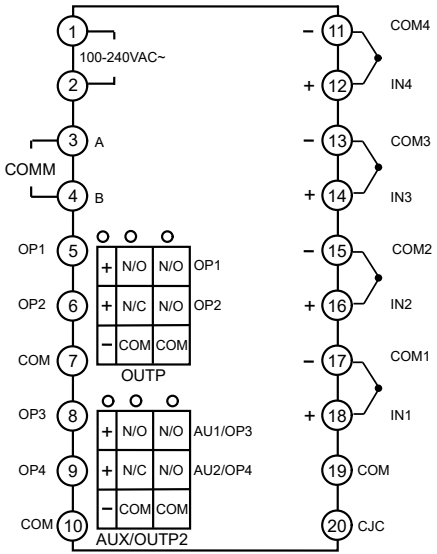


Note: wiring diagram of vertical panels A, C, E, E5, etc.

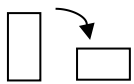


Turn this drawing 90 degrees clockwise to form the wiring diagram of B, F type horizontal panel instrument, and the terminal number remains

The wiring diagram of AI-70482 multi-channel temperature controller is as follows:



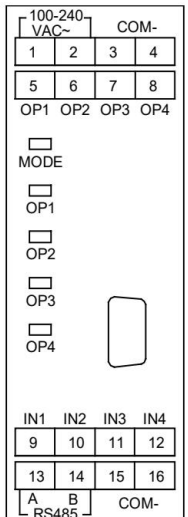
Note: wiring diagram of vertical panels A, C, E, E5, etc.



Turn this drawing 90 degrees clockwise to form the wiring diagram of B, F type horizontal panel instrument, and the terminal number remains unchanged

Layout of D5 indicator light and terminal block is as shown in the figure:

MODE indicator light, indicating communication and alarm status;
OP1~OP4 indicator light, indicating 1~4 circuit output;
Terminals 1~2 are power input, 100~240VAC or 24VAC/DC input
Terminals 9~12 are respectively the positive input end of 1~4 loop thermocouples/input end of two-wire thermal resistance, and terminals 15~16 are the negative input end of thermocouples/input end of two-wire thermal resistance (the two terminals are common terminals, which can be connected at will)
Terminals 5~8 are respectively the positive pole of 1~4 loop SSR voltage output, and terminals 3~4 are the negative pole of SSR voltage output (the two terminals are common terminals, which can be connected at will). The output specification is 12~16VDC, 20mA, with short-circuit current limiting protection function



7048/70482D7 multi-channel temperature controller

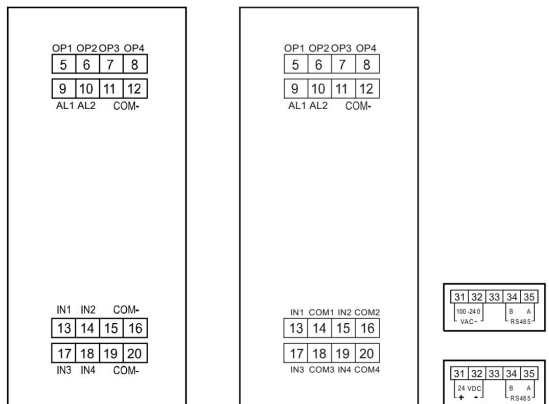
The wiring diagram is arranged as shown:

Power base terminals: 1-2 are power input, 100-240VAC or 24VAC/DC. Terminals 4~5 are RS485 communication ports, 5 is A and 4 is B.

Terminals of the instrument itself: terminals 5~8 are the positive pole of SSR drive voltage output of 1~4 control loops, terminals 9 and 10 are the positive pole of AL1 and AL2 SSR drive voltage alarm output, terminals 11 and 12 are the negative pole, and the output specification is 12~16VDC/20mA, with short-circuit current limiting protection function.

Terminals 13~20 of the 7048D7 are input terminals of 1~4 circuits, of which 13, 14, 17, 18 are positive input terminals, and 15, 16, 19, 20 are negative input terminals.

13+and 14 - of 70482D7 are the input terminals of the first circuit, 15+and 16 - are the input terminals of the second circuit, 17+and 18 - are the input terminals of the third circuit, and 19+and 20 - are the input terminals of the fourth circuit.



7048 70482

E7 multi-channel temperature controller

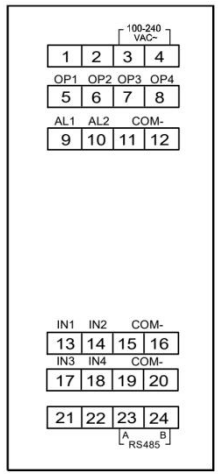
The wiring diagram is arranged as shown:

Terminals 3~4 are power input, 100-240VAC or 24VAC/DC.

Terminals 5~8 are positive pole of SSR drive voltage output of 1~4 control loops, terminals 9 and 10 are positive pole of AL1 and AL2 SSR drive voltage alarm output, terminals 11 and 12 are negative pole, output specification is 12~16VDC/20mA, with short-circuit current limiting protection function.

Terminals 13~20 are 1~4 circuit input terminals, of which 13, 14, 17 and 18 are positive input terminals and 15, 16, 19 and 20 are negative input terminals.

Terminals 23 and 24 are RS485 communication ports, 23 are A and 24 are B.



6. Operating Instructions

The D5/E5 rail mounted type of multi-channel temperature controller can be connected to a special display (E8) with 1394 socket and special cable to program the internal parameters of the instrument.The display is shown as below. The display and key functions are as follows:

① Upper display window, displaying measured value or parameter name

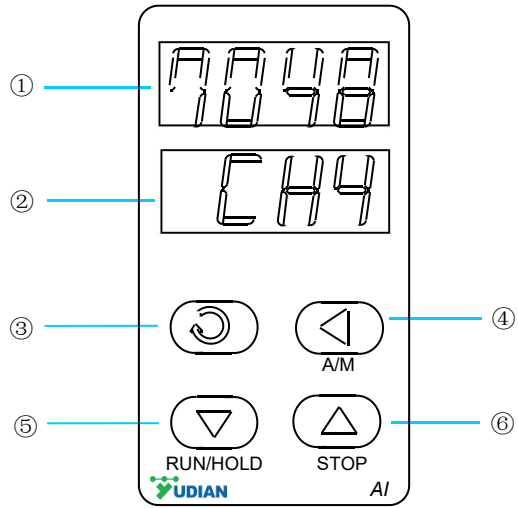
② Lower display window, displaying channel number or parameter value

③ Setting key (manual/automatic cycle display switching)

④ Data shift (also switch display setting of given value)

⑤ Data reduction key (also switch to display the previous channel)

⑥ Data increase key (also switch to display the next channel)



Note: The 1394 socket and connection shown in this instrument are only designed for the interconnection between our products. Do not use them to connect other 1394 devices, otherwise the product may be damaged.

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

2. Setting parameters: When the parameter lock is not locked, press ↺ and hold for about 2 seconds, and release it 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 circuit 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 modified by pressing ▽, △, ◁ . Press ◁ first and then ↺ to exit the parameter setting state, and press ◁ to return to check the last parameter.

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

4. The MODE indicator usually flashes with unequal on/off time when the instrument communicates with the upper computer. Each flash indicates that the two communicate once. At this time, the instrument status can be viewed through the upper computer. If the instrument does not receive the upper computer signal within 6 seconds, it will flash with the equal on/off time, which means:

When the indicator light flashes slowly in a 1.6 second cycle, it indicates that there is no communication but the instrument is working without alarm (it can be regarded as normal);

When the indicator flashes rapidly in a 0.6 second cycle, it indicates that the instrument has no communication, and there are general errors such as alarm;

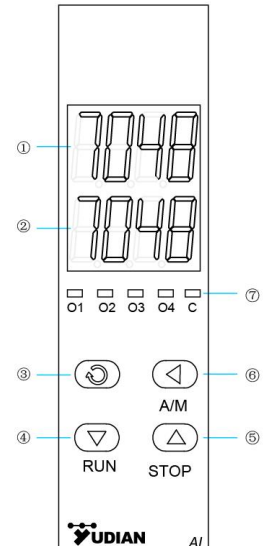
When the indicator flashes rapidly in a 0.3 second cycle, it indicates that there is no communication and there are serious errors such as input overrange (such as open circuit of thermocouple and thermal resistance);

If the indicator light is off, the instrument is dead or damaged; being normally on (more than 8 seconds) indicates that the instrument is powered on but damaged.

5. Lead wire resistance compensation during two-wire wiring of thermal resistance: If the two-wire wiring mode is used for resistance signals such as Pt100 or Cu50, an offset value (parameter Sc) needs to be set to offset the lead resistance value. The instrument can provide an operation to automatically set the offset value. The steps are as follows: (1) First, short-circuit both ends of the thermal resistance of the channel to be corrected (please note that the short-circuit point is at the sensor end rather than the instrument end). (2) Set parameter Loc=808, then press and hold for more than 2 seconds until the symbol A is displayed in the first digit on the right of the lower display of the instrument. If the alarm is set, the alarm can be canceled first to avoid the alarm symbol affecting the indication. (3) When the A displayed by the instrument disappears automatically, remove the short line at the sensor end, set Loc to 0 or 1, and restore the normal measurement state of the instrument. This operation enables the instrument to reverse the measured value and record the Sc parameter of the corresponding channel to compensate the measurement error caused by the lead resistance. If the measurement signal is not of the resistance type, or the line is not shorted, this operation will not work. After operation, check Sc parameter to know the lead resistance, which has been calculated as the value at 0 ℃.

D7/E7 Rail Instrument Panel Description

① The upper display window displays the measured value PV, parameter name, etc
② The lower display window displays the given value SV, alarm code, parameter value, etc
③ Setting key (also manual/automatic cycle display switch)
④ Data reduction key (also switch to display the previous channel)
⑤ Data increase key (also switch to display the next channel)
⑥ Data shift (also switch display setting of given value)
⑦ Five LED indicators, among them, O1, O2, O3 and O4 correspond to four output actions respectively; When the C light is on, it indicates that it is communicating with the upper computer.



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

2. Setting parameters: When the parameter lock is not locked, press ↻ and hold for about 2 seconds, and release it 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 circuit 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 modified by pressing  ,  ,  . Press first and then to exit the parameter setting state, and press to return to check the last parameter.

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

7. Parameters

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

Parm.	Meaning	Description	Rang
H.AL1~4	Alarm value of upper limit absolute value	They respectively represent the upper limit alarm values of 1~4 measurement channels. When the measured value of the corresponding channel is greater than H.ALx (x is 1~4, indicating the corresponding measuring channel, the same below), the upper limit alarm will be generated. After it is generated, the alarm will be released when the measured value of the corresponding channel is less than H.ALx-HYSx.	-999~ +3200℃
L.AL1~4	Alarm value of lower limit absolute value	They respectively represent the lower limit alarm values of 1~4 measurement channels. When the measured value of the corresponding channel is less than L. ALx, the lower limit alarm will be generated. After it is generated, when the measured value of the corresponding channel is greater than L When ALx+HYSx, the alarm can be released. Alarms can control the action of relay modules on ALM, AUX or OUTP, and are programmed by parameters AOP1~4. The unused alarm function can be set to the limit value to avoid its alarm effect.	ditto

At1~4	Auto-tuning	0, the auto-tuning function At is off. 1, start PID and Ctl parameter auto-tuning function, and automatically return to 0 after auto-tuning. 10, turn off the output	0~1,10
P1~4	Proportional band	It is used to define the proportional band for APID and PID adjustment, and its unit is the same as PV value, rather than the percentage of measuring range. For familiar systems, input the known and correct P, I, D, Ctl directly without starting the automatic tuning (AT) function.	10~9999 unit
I1~4	Integration time	The unit of integral time for PID regulation is defined as second. When I=0, the integral effect is canceled.	0~9999s
d1~4	Differential time	The unit that defines the differential time of PID regulation is 0.1 second. When d=0, the differential action is canceled.	0~999.9s
OPH1~4	Output upper limit	Limits the percentage of the maximum value of the OUTP tuning output.	0~100
HYS1~4	Return difference	To avoid frequent alarm actions caused by the fluctuation of the measured input value, and also to avoid the wrong PID parameters caused by the wrong action of the measured value due to the bit adjustment when the instrument is self-tuning the AT. This parameter is also called insensitivity zone, dead zone, hysteresis, etc.	0~999.9 ℃

AOP1~4	Alarm Output Position Definition Parameters	AOP is used to define the output position of H.AL and L.AL alarm functions, which is only supported by E5 instrument. The single digit of parameter AOP indicates the output position of H.AL alarm. The value range is 0~4. 0~2 indicates that the alarm is not output from any port. 3 and 4 respectively indicate that the alarm is output by AL1 and AL2. The ten digits of this parameter 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 circuit 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 circuit 2 is output by AL2, and the lower limit alarm is output by AL1.	0~77

<table>
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<td>INP1~4</td>
<td>Input specifications</td>
<td>INP1~4 defines the input specifications of 1~4 channels respectively.
<table>
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<tr><td>28</td><td>0~20mV voltage input</td><td>29</td><td>0~100mV；0-5V（J3）；
0-20mA（J4）</td></tr>
<tr><td>30</td><td>0~60mV voltage input</td><td>31</td><td>0~1V</td></tr>
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two-wire transmitter (J5)</td><td>33</td><td>1-5V（J3）；4-20mA（J4）</td></tr>
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<td>0~33</td>
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dPt1~4	Decimal point position	DPt1~4 is used to select the decimal point position and resolution of 1~4 channels respectively (1) For linear input, dIP=0, 1, 2, 3 corresponds to 0, 0.0, 0.00 and 0.000 display modes. (2) When thermocouple or thermal resistance input is used, dIP selects the resolution of temperature display, sets dIP=0, and the resolution of temperature display is 1 ℃. DIP=1, temperature display resolution is 0.1 ℃. Note: This setting is only valid for display. The internal temperature measurement resolution is fixed to 0.1 ℃ or 1 linear definition unit, so it does not affect the communication or transmission output effect. When the temperature display resolution is set to 0.1 ℃, the temperature measurement value above 1000 ℃ will automatically change to 1 ℃ resolution.	0~3
SCL1~4	Lower scale limit of input signal	Define the lower scale limit for linear input	-9990~＋30000 linear units
SCH1~4	Upper scale limit of input signal	Define the upper scale limit for linear input	

Scb1~4	Input translation correction	The Scb parameter is usually used for the translation correction of the thermocouple to compensate the error of the sensor or the input signal itself, or to correct the cold junction compensation error of the instrument. The unit of Scb correction is 0.1 ℃. For example, if Scb=- 10.0 is set, the measured value will be 10.0 ℃ lower than that when Scb=0.0. When the input is the wiring mode of two-wire thermal resistor, the correction amount of Scb=Scb × Signal unit. The signal unit is 0.02 Ω for Pt100 input. For example, if 50 signal units are corrected, set Scb=- 5.0; If Pt100 is used, the correction is - 1 Ω. If the lead resistance is 1 Ω, the lead resistance is just offset. For the setting method of lead resistance compensation, refer to 6.5 Operation Instructions. During the annual metrological verification of the instrument, if the error of the instrument used for a period of time in harsh environments exceeds the range, the instrument can be cleaned and dried first, which can generally solve the problem. If the accuracy still cannot be reached, the method of modifying the Scb parameter can be used to correct.	-1990~+9990 definition unit or 0.1 ℃

FIL1~4	Digital filter strength	FIL is used to set the strength of digital filtering. 0 does not have any filtering, 1 only takes median filtering, and 2~40 have both median filtering and integral filtering. The larger the FIL, the more stable the measured value, but 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 should be set to 0 or 1 to improve the response speed.	0~40
SP1~4	Given value	Respectively represent the given values of 1~4 channels	-999~ +3200℃
Cn	Number of measurement channels	The single digit of parameter Cn indicates the number of measurement channels actually used by the instrument. AI-7048 can be set as 1~4. When Cn is set as 2, the lower display window of the instrument will not display the channel number but the measured value of circuit 2. At this time, the instrument is equal to a two-way control instrument.	1~4
Cno	Start number of channel display	Cno is used for the lower display window of the instrument to indicate the starting number of the channel sign. Generally, the instrument channel number is 1~4. However, the initial channel number can also be modified when multiple computers are used. For example, when the first instrument displays CH1~CH4, if the Cno parameter of the second instrument is changed from 1 to 5, the second instrument can display CH5~CH8.	

Ctl	Output cycle	The Ctl parameter value 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
AF	System function selection	AF is used to select some system functions, and its numerical meanings are as follows: AF=A*1+B*2+C*4+D*8＋E*16+F*32 A=0, normal speed cycle display; A=1 fast cycle display. The cycle speed setting only affects the display and does not change the internal scanning speed and alarm response time of the instrument. B=0, for AI-7048 instrument, it should be set as 0. C=0, standby function. D=0, normal use; D=1, change the lower limit alarm L.AL of each circuit of the instrument to the upper limit alarm. E=0, for AI-7048 instrument, it should be set as 0. F=0, using standard communication protocol; F=1, communication protocol with expanded communication address is adopted.	

AF2	System function selection 2	AF is used to select some system functions, and its numerical meanings are as follows: AF2=A X 1+B X 2+C X 4 A=0, normal use; A=1, change the upper limit alarm H.AL of each circuit on the instrument to the upper limit deviation alarm. When the deviation (measured value PV - given value SV) is greater than HAL1-4, the deviation upper limit alarm will be generated. When the deviation is less than HAL1~4-HYS1~4, the alarm will be released. Set HAL1~4 as the maximum, and the alarm function will be canceled. B=0, normal use; B=1, change the lower limit alarm L.AL of each circuit on the instrument into the deviation lower limit alarm. When the deviation (measured value PV - given value SV) is less than LAL1-4, a negative deviation alarm will be generated. When the deviation is greater than LAL1~4-HYS1~4, the alarm will be released. Set HAL1~4 as the minimum, and the alarm function will be canceled. C=0, reaction (corresponding to heating); C=1, positive action (corresponding to refrigeration).	

nonc	Normal on/off selection	Installing one-way alarm relay (AL1) can have normal on+normal off output at the same time, but installing two-way alarm module (AL1+AL2) only has normal-on output, which can be defined as normal on output by nonc parameter. When nonc=0 is set, L3 relays installed in AL1, AL2 and other locations are normal-on output, and when nonc=127 is set, the instrument alarm is normal-off output.	0~127
bAud	Baud rate	When the instrument COMM module interface is used for communication, the bAud parameter defines the communication baud rate, which can range from 1200 to 19200bit/s (19.2K).	0~19.2K BIT/S
Addr	Communication address	It is used to define the communication address of the instrument. And the valid range is 0~80. Instruments on the same communication line shall be set with different Addr values to distinguish each other. The communication protocol adopts AIBUS, and the multi-channel temperature controller has 2~4 circuits, corresponding to 2~4 addresses, which is equivalent to 2~4 one-way instruments on the communication line. For example, if the measuring circuit parameter (the single digit of parameter Cn) is set to 4 and Addr=1, then addresses from 1 to 4 will be used by the instrument, and addresses from 1 to 4 will not be used by other instruments. If the measurement circuit parameter Cn is set to 3 and Addr=10, the addresses from 10 to 12 are used by the instrument.	0~80

Loc	Parameter modification level	When Loc is set to a value other than 808, the instrument is only allowed to display and set 0~12 field parameters (defined by EP1~EP12) and Loc parameter itself. When Loc=808, users can set all parameters. The Loc parameter provides a variety of different parameter operation permissions. As follows: Loc=0, it is allowed to display and modify field parameters. Loc=1, only field parameters can be displayed, but cannot be modified. Loc=808, all parameters can be displayed and set. Note: This setting is only for external display, and it will not be affected if parameters are modified by communication.	0~9999

EP1~12	Field parameter definition	After the instrument is set, the parameters that do not need to be changed frequently can be shielded, leaving only the parameters that need to be changed frequently for the field operators to modify. 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 modified. EP1~EP12 in the parameter table can define 0~12 field parameters for field operators. EP1~EP12 in the parameter table can define 0~12 field parameters for field operators. 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, and other parameters cannot be displayed and modified. This function can speed up the modification of parameters, and prevent important parameters (such as Sn1~6) from being modified by mistake. The parameters EP1~EP12 can define up to 12 field parameters. If the field parameters are less than 12 (sometimes there is no field parameter), 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, an instrument often needs to modify the given 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 modify 4 parameters such as SP1~SP4, but the communication will not be affected.	NonE~ bAud

8. FAQs

8.1 How to enter the parameter list?

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, and then enter the internal parameter list to find the auto-tuning parameter At. At1~4 correspond to four channels respectively. Please change the At parameter to 1 to start auto-tuning and it shall automatically return to 0 after the self-tuning.

8.3 How to judge whether the instrument has output?

First, check whether the instrument output indicator light is on (check lights OP1, OP2, AU1, AU2 for panel mounted instruments, and lightso1~o4 for D7/E7 instruments). If it is not on, check whether the instrument operates normally, and then check whether the instrument parameters are set correctly; if it is not lit, check whether the instrument operates normally, and then check whether the instrument parameters are set correctly; if the output signal is normal but the rear SSR does not work, you need to check other faults along the output line. If there is no output signal, it can be determined that the instrument output module is abnormal.

8.4 Common faults

The instrument PV value display - 208 indicates that no resistance signal is detected when the instrument input specification is Pt100, which is generally a wiring problem. The PV value display of the instrument is 1381, indicating that when the input specification of the instrument 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 to find the AOP parameters to define the alarm signal output port(for example: If the upper limit alarm of the first channel needs to be output from AL1, set the AOP1 single digit to 3. For specific definitions, please refer to the AOP parameter introduction in the manual).