# AI808 Series Intelligent Temperature Controller User Manual



## Features:
⊙ TC / RTD / Analog signal universal input, selected by software menu.
⊙ With display, alarm and adjusting function
⊙ Advanced Fuzzy algorithm & Two Degrees of Freedom PID Arithmetic.
⊙ Optional control output, modularization design.
⊙ Good anti-jamming.
⊙ Up to 50 program stages control.

For your safe, please read the below content carefully before you use the temperature controller!

## ■ Safe Caution

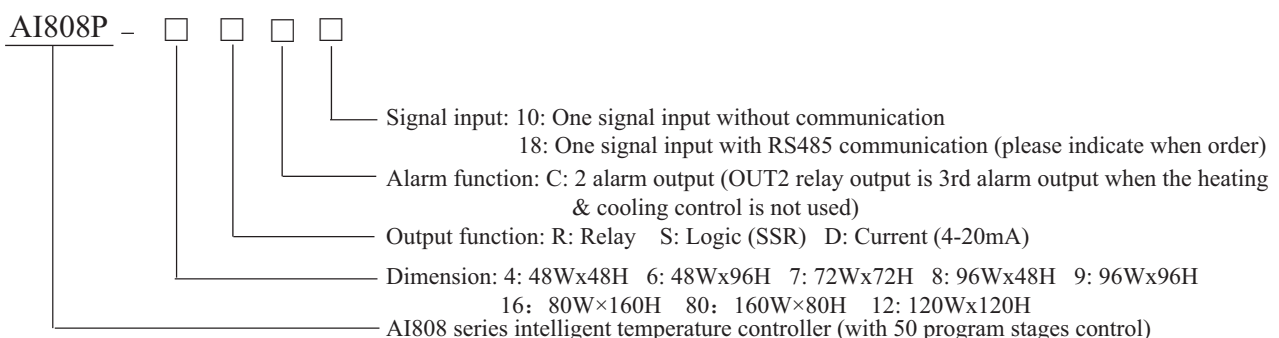| ※ Please read the manual carefully before you use the temperature controller. |
|---|
| ※ Please comply with the below important points. |
| ⚠ Warning     An accident may happen if the operation does not comply with the instruction. |
| ⚠ Notice      An operation that does not comply with the instruction may lead to product damage. |
| ※ The instruction of the symbol in the manual is as below. |
| ⚠ An accident danger may happen in a special condition. |

## ⚠ Warning

1. A safty protection equipment must be installed or please contact with us for the relative information if the product is used under the circumstance such as nuclear control, medical treatment equipment, automobile, train, airplane, aviation and equipment etc.. Otherwise, it may cause serious loss, fire or person injury.
2. A panel must be installed, otherwise it may cause creepage (leakage).
3. Do not touch wire connectors when the power is on, otherwise you may get an electric shock.
4. Do not dismantle or modify the product. If you have to do so, please contact with us first. Otherwise it may cause electric shock and fire.
5. Please check the connection number while you connect the power supply wire or input signal, otherwise it may cause fire.

## ⚠ Caution

1. This product cannot be used outdoors. Otherwise the working life of the product will become shorter, or an electric shock accident may happen.
2. When you connect wire to the power input connectors or signal input connectors, the moment of the No.20 AWG (0.50 mm2) screw tweaked to the connector is 0.74n.m - 0.9n.m. Otherwise the connectors may be damaged or get fire.
3. Please comply with the rated specification. Otherwise it may cause electric shock or fire, and damage the product.
4. Do not use water or oil base cleaner to clean the product. Otherwise it may cause electric shock or fire and damage the product.
5. This product should be avoid working under the circumstance that is flammable, explosive, moist, under sunshine, heat radiation and vibration. Otherwise it may cause explosion.
6. In this unit it must not have dust or deposit, otherwise it may cause fire or mechanical malfunction.
7. Do not use gasoline, chemical solvent to clean the cover of the product because such solvent can damage it. Please use some soft cloth with water or alcohol to clean the plastic cover.

## 1. Model

AI808P – ☐ ☐ ☐ ☐

Signal input: 10: One signal input without communication
             18: One signal input with RS485 communication (please indicate when order)
Alarm function: C: 2 alarm output (OUT2 relay output is 3rd alarm output when the heating & cooling control is not used)
Output function: R: Relay    S: Logic (SSR)   D: Current (4-20mA)
Dimension: 4: 48Wx48H   6: 48Wx96H   7: 72Wx72H   8: 96Wx48H   9: 96Wx96H
            16：80W×160H   80：160W×80H   12: 120Wx120H
AI808 series intelligent temperature controller (with 50 program stages control)

## 2. Model Indication

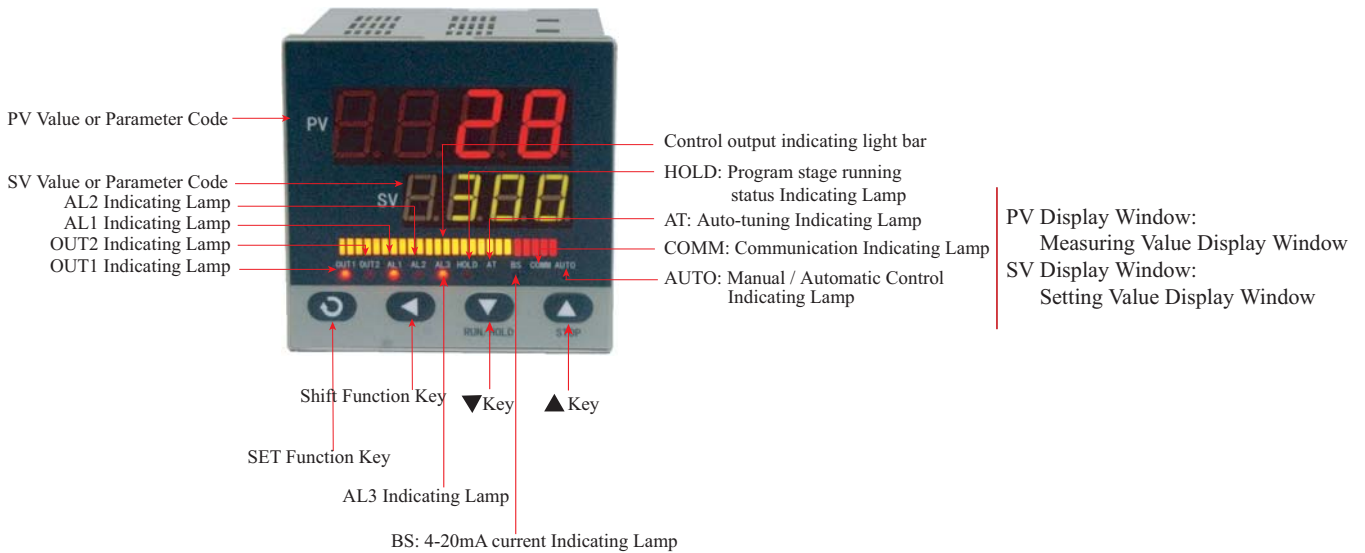| Model | Alarm no. | OUT1 | OUT2 | Communication |
|---|---|---|---|---|
| AI808P-□RC10 | 2 | Relay output | Relay output | No |
| AI808P-□SC10 | 2 | SSR output | Relay output | No |
| AI808P-□DC10 | 2 | 4-20mA current output | Relay output | No |
| AI808P-□RC18 | 2 | Relay output | Relay output | RS485 (Modbus RTU) |
| AI808P-□SC18 | 2 | SSR output | Relay output | RS485 (Modbus RTU) |
| AI808P-□DC18 | 2 | 4-20mA current output | Relay output | RS485 (Modbus RTU) |

## 3. Main Technical Parameters

### 1) Whole controller parameters

| | |
|---|---|
| Power supply | 100-240VAC |
| Total current | ＜30mA（220VAC） |
| Ambient temperature | 0-50℃ |
| Ambient humidity | 45-85%RH |
| Measurement accuracy | 0.3%FS±3digits 25℃ |
| Control mode | ON/OFF control，PID heating control，PID cooling control，PID heating & cooling control |
| Communication function | RS485 communication interface, MODBUS protocol |
| Panel protection level | IP65 |
| Temperature excursion | ≤0.01%FS/℃ |
| Dielectric strength | Between the connectors of power supply to relay output, power supply to signal input, relay output to signal input ≥2000VDC; Between the low voltage signal isolated with each other ≥ 600VDC. |
| OUT1 | 4-20mA current output, load resistance 600Ω max. |
| | Relay output capacity: 3A/230Vac |
| | SSR output capacity: 30mA/24Vdc |
| OUT2 | Relay output capacity: 3A/230Vac. |
| Alarm | Relay output capacity: 1A/230Vac |

### 2) Input signal table

| Signal | Input type | Measuring range | Resolution | Input impedance |
|---|---|---|---|---|
| ᴷ | K type thermocouple | -50～1300℃ | 1℃ | ＞100KΩ |
| ⅃ | J type thermocouple | -50～1200℃ | 1℃ | ＞100KΩ |
| E | E type thermocouple | -50～1000℃ | 1℃ | ＞100KΩ |
| ᴛ | T type thermocouple | -50～400℃ | 1℃ | ＞100KΩ |
| �b | B type thermocouple | 600～1800℃ | 1℃ | ＞100KΩ |
| ʳ | R type thermocouple | -10～1700℃ | 1℃ | ＞100KΩ |
| S | S type thermocouple | -10～1600℃ | 1℃ | ＞100KΩ |
| ᴨ | N type thermocouple | -50～1200℃ | 1℃ | ＞100KΩ |
| ūE∃ | Reserved | | | |
| Pᴛ | PT100 | -199.9～850.0℃ | 0.1℃ | （0.2mA） |
| JPᴛ | JPT100 | -199.9～500.0℃ | 0.1℃ | （0.2mA） |
| cu50 | CU50 | -50.0～150.0℃ | 0.1℃ | （0.2mA） |
| cu00 | CU100 | -50.0～150.0℃ | 0.1℃ | （0.2mA） |
| 0U | Linear voltage | 0～50mV | 0.01%FS | ＞100KΩ |
| 0A | Linear current | 4～20mA | 0.01%FS | ＜110Ω |
| U | Linear voltage | 0～10V | 0.01%FS | ＞100KΩ |
| rᴛ | Linear resistance | 0～400Ω | 0.01%FS | （0.2mA） |

# 4. Panel indication

PV Value or Parameter Code

SV Value or Parameter Code
AL2 Indicating Lamp
AL1 Indicating Lamp
OUT2 Indicating Lamp
OUT1 Indicating Lamp

Shift Function Key

SET Function Key

AL3 Indicating Lamp

BS: 4-20mA current Indicating Lamp

Control output indicating light bar
HOLD: Program stage running status Indicating Lamp
AT: Auto-tuning Indicating Lamp
COMM: Communication Indicating Lamp
AUTO: Manual / Automatic Control Indicating Lamp

▼Key    ▲Key

PV Display Window:
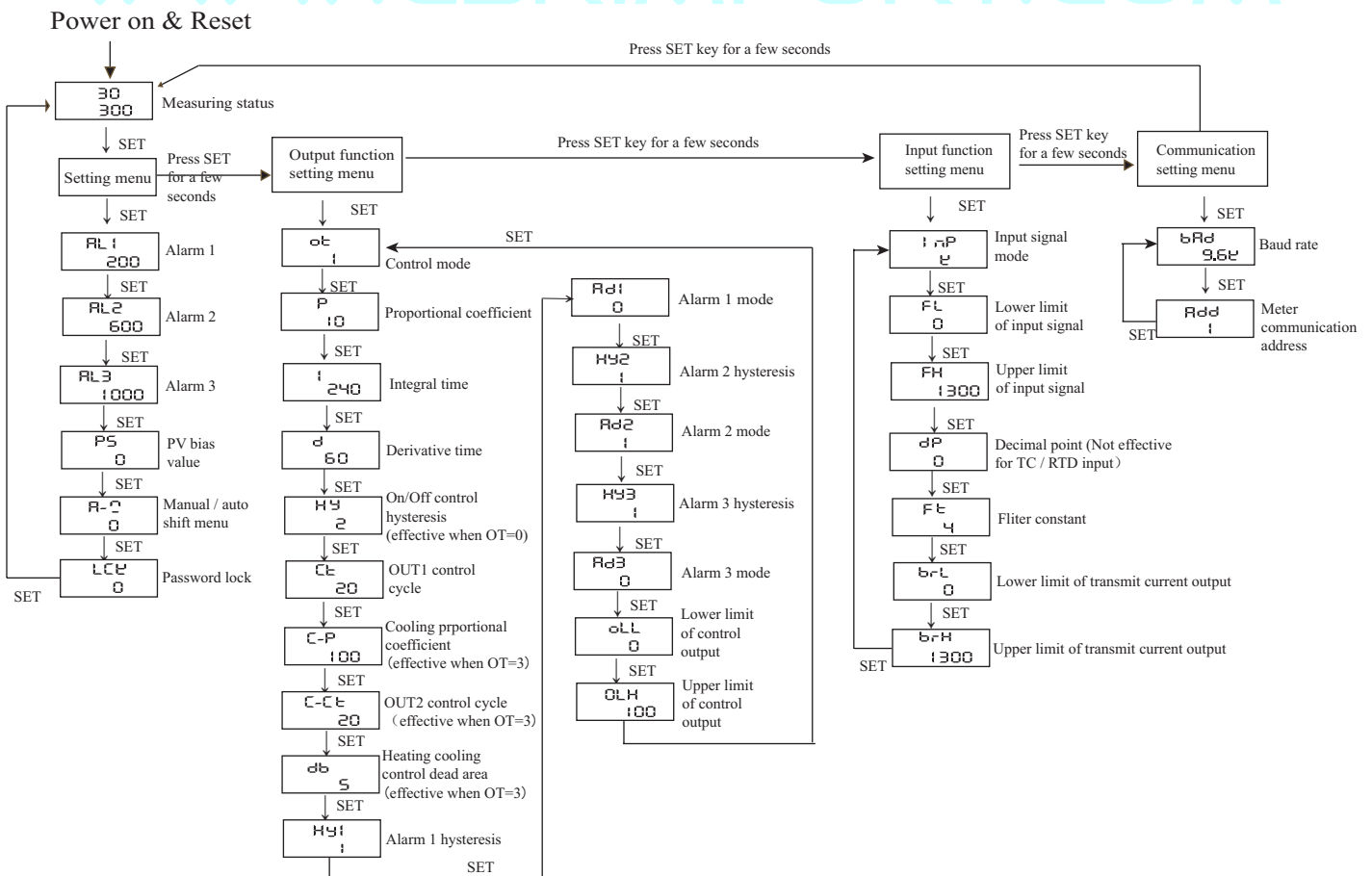    Measuring Value Display Window
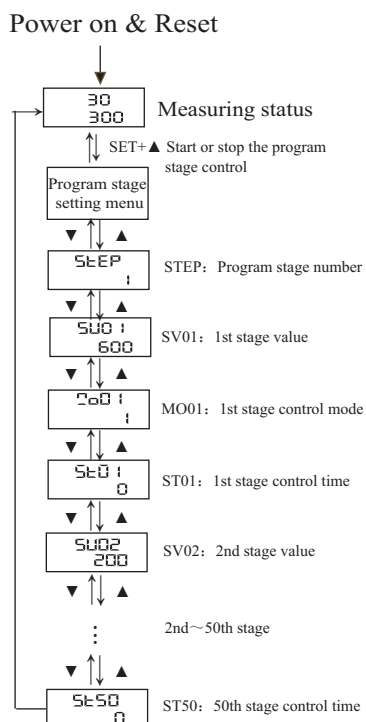SV Display Window:
    Setting Value Display Window

# 5. Panel Key Operation

（1）SET key：In normal display status, press SET key to show setting menu, press SET key for a few seconds to show advanced setting menu.

（2）◄ key：press◄ key to make the parameters to flicker，the parameters can be changed.

（3）▲, ▼ key：to change parameters in setting status.

（4）In advanced setting menu, press SET key for a few seconds to quit the menu and back to normal display status.

（5）In normal display status, press ◄ key for 3 second to start Auto-tuning function，at this moment AT indicating lamp turns on.

# 6. Operation Sequence

Power on & Reset

Press SET key for a few seconds

```
30
300   Measuring status
```
↓ SET

Setting menu — Press SET key for a few seconds → Output function setting menu — Press SET key for a few seconds → Input function setting menu — Press SET key for a few seconds → Communication setting menu

↓ SET

```
AL 1
200    Alarm 1
```
↓ SET
```
AL2
600    Alarm 2
```
↓ SET
```
AL3
1000   Alarm 3
```
↓ SET
```
PS
0      PV bias value
```
↓ SET
```
A-C
0      Manual / auto shift menu
```
↓ SET
```
LCP
0      Password lock
```
SET

Output function setting menu ↓ SET
```
ot
1      Control mode
```
↓ SET
```
P
10     Proportional coefficient
```
↓ SET
```
I
240    Integral time
```
↓ SET
```
d
60     Derivative time
```
↓ SET
```
HY
2      On/Off control hysteresis (effective when OT=0)
```
↓ SET
```
CE
20     OUT1 control cycle
```
↓ SET
```
C-P
100    Cooling prportional coefficient (effective when OT=3)
```
↓ SET
```
C-Ct
20     OUT2 control cycle (effective when OT=3)
```
↓ SET
```
db
5      Heating cooling control dead area (effective when OT=3)
```
↓ SET
```
HY1
1      Alarm 1 hysteresis
```
SET

←SET
```
Ad1
0      Alarm 1 mode
```
↓ SET
```
HY2
1      Alarm 2 hysteresis
```
↓ SET
```
Ad2
1      Alarm 2 mode
```
↓ SET
```
HY3
1      Alarm 3 hysteresis
```
↓ SET
```
Ad3
0      Alarm 3 mode
```
↓ SET
```
oLL
0      Lower limit of control output
```
↓ SET
```
OLH
100    Upper limit of control output
```

Input function setting menu ↓ SET
```
InP
P      Input signal mode
```
↓ SET
```
FL
0      Lower limit of input signal
```
↓ SET
```
FH
1300   Upper limit of input signal
```
↓ SET
```
dP
0      Decimal point (Not effective for TC / RTD input）
```
↓ SET
```
Ft
4      Fliter constant
```
↓ SET
```
brL
0      Lower limit of transmit current output
```
↓ SET
```
brH
1300   Upper limit of transmit current output
```
SET

Communication setting menu ↓ SET
```
bAd
9.6b   Baud rate
```
↓ SET
```
Add
1      Meter communication address
```
SET

# 7. Program stage control setting

Power on & Reset

↓

| 30 |
|:--:|
| 300 |

Measuring status

⇅ SET+▲ Start or stop the program stage control

Program stage setting menu

▼ ⇅ ▲

| StEP |
|:--:|
|  |

STEP：Program stage number

▼ ⇅ ▲

| SU01 |
|:--:|
| 600 |

SV01：1st stage value

▼ ⇅ ▲

| Mo01 |
|:--:|
| 1 |

MO01：1st stage control mode

▼ ⇅ ▲

| St01 |
|:--:|
| 0 |

ST01：1st stage control time

▼ ⇅ ▲

| SU02 |
|:--:|
| 200 |

SV02：2nd stage value

⋮  2nd～50th stage

▼ ⇅ ▲

| StS0 |
|:--:|
| 0 |

ST50：50th stage control time

Program stage control setting method：
1) There are total 50 program stages. For each stage, there are 3 settable parameters: SV, MO, ST.
2) SV value is the object control value of a stage, for example, if SV is 200, the object control value of this stage is 200℃.
3) MO value is the control mode of a stage.
   MO value is -50～-1，it means the current stage will jump to the appointed stage, for example, if it is -45, it means the current stage will jump to stage no.45 directly, after the control of this stage is finished.
   MO value is 0，it means the program stage control function will be stopped automatically when the program turns to this stage.
   MO value is 1，it means when a stage control is running, the condition for jumping to next stage is setting time, when time is up, this stage will jump to the next appointed stage automatically.
   MO value is 2，it means when a stage control is running, the condition for jumping to next stage is setting temperature, when the current temperature changes to the setting value, this stage will jump to the next appointed stage automatically.
4) ST value is running time of a stage, the unit is minute. When MO is set to 1，the stage will run until ST is changed to 0. For example, SV=200，MO=1，ST=10，the current temperature is 30℃，this stage will run for 10 minutes. So the temperature will raise 17℃ per minute in average. If MO=2，there is no time limit for temperature raise in this stage, when temperature reaches 200℃, the stage will jump to next one automatically.
5) In normal display status, press SET key and ▲ key at the same time to show the parameter setting menu of program stage control.
6) In normal display status, press SET key and ▼ key at the same time to run / stop program stage control function. HOLD lamp is on when program stage control is running. HOLD lamp is off when this control stops running.

Example：Here is a control process with below requirement, the relevant setting is on the right side:
1) Temperature raises to 300℃，                      SV01=300，MO01=2；(No time limit)
2) Temperature is keep at 300℃ for 20 minute，        SV02=300，MO02=1，ST02=20；
3) Temperature falls to 150℃，                        SV03=150，MO03=2；
4) Temperature is keep at 150℃ for 60 minute, and then  SV04=150，MO04=1，ST04=60；
5) Program jumps to No.10 stage                       MO05= -10；
6) Temperature falls to 25℃ at No.10 stage            SV10=25，MO10=2；
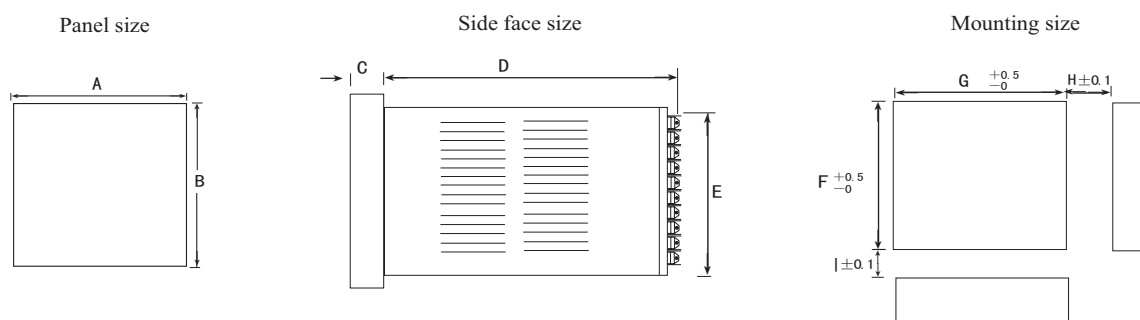7) Program control stops running at No.11 stage.       MO11=0；

# 8. Menu

| Parameter name | Indication | Setting range | Ex-factory setting |
|:--:|:--|:--:|:--:|
| **Setting menu** | | | |
| AL1 | Alarm 1 setting value | FL～FH | 200 |
| AL2 | Alarm 2 setting value | FL～FH | 600 |
| AL3 | Alarm 3 setting value | FL～FH | 100 |
| PS | Measured value amendment | -100～100 | 0 |
| A_M | Manual / auto setting： 0：Manual；1: half-auto （Start Auto-tuning manually） 2: auto （Start Auto-tuning automatically after power on） | 0～2 | 1 |
| LCK | If the units digit (4th digit from left to right) is 1， SV is prohibited to changed；if the tens digit (3rd digit) is 1, menu parameters are prohibited to changed. | 0～9999 | 0 |
| **Output function setting menu** | | | |
| OT | Control mode. 0：ON/OFF control；1：Heating control； 2：Cooling control；3：Heating & cooling control | 0～3 | 1 |
| P | Proportional coefficient (P=0: ON / OFF control) | 0～9999 | 10 |
| I | Integral time | 0～3600 | 240 |
| D | Derivative time | 0～3600 | 60 |
| HY | ON/OFF control hysteresis | 0～1000 | 2 |
| CT | OUT1 control cycle | 0～250 | 20 |
| C_P | Cooling proportional coefficient | 1～200 | 100 |
| C_CT | OUT2 control cycle | 1～250 | 20 |
| DB | Dead area for heating & cooling control | -100～100 | 5 |
| HY1 | Alarm hysteresis 1 | 0～1000 | 1 |
| AD1 | Alarm mode 1 | 0～3 | 0 |
| HY2 | Alarm hysteresis 2 | 0～1000 | 1 |
| AD2 | Alarm mode 2 | 0～3 | 1 |
| HY3 | Alarm hysteresis 3 | 0～1000 | 1 |
| AD3 | Alarm mode 3 | 0～3 | 0 |

| | | | |
|---|---|---|---|
| OLL | Lower limit of control output | 0～99 | 0 |
| OLH | Upper limit of control output | 1～100 | 100 |
| **Input function setting menu** | | | |
| INP | Input signal type | Please refer to input signal table | K |
| FL | Lower display limit of input signal | Please refer to input signal table | 0 |
| FH | Upper display limit of input signal | Please refer to input signal table | 1300 |
| DP | Decimal point setting. Only effective for analog signal input | 0～3 | 0 |
| FT | Filter constant | 1～250 | 4 |
| BRL | Display for 4mA transmit current output | FL～FH | 0 |
| BRH | Display for 20mA transmit current output | FL～FH | 1300 |
| **Communication setting menu** | | | |
| BAD | Baud rate | 4.8K, 9.6K, 19.2K | 9.6K |
| ADD | Meter communication address | 0～250 | 1 |

Alarm function table

| Alarm code | Alarm mode | Alarm output (AL1, AL2 is independent with each other） |
|---|---|---|
| 0 | Direct (High limit) |  AL |
| 1 | Inverse (Low limit) |  AL |
| 2 | High relative to SV |  SV+AL<br>SV |
| 3 | Low relative to SV |  SV-AL  SV |

## 9. Apperance & Mounting Dimension

Panel size          Side face size          Mounting size



| Model | A | B | C | D | E | F | G | H | I |
|---|---|---|---|---|---|---|---|---|---|
| AI808P-4 | 48 | 48 | 6 | 100 | 45 | 46 | 46 | 30 | 30 |
| AI808P-6 | 48 | 96 | 9 | 100 | 89.5 | 91 | 46 | 30 | 30 |
| AI808P-7 | 72 | 72 | 9 | 100 | 67 | 68 | 68 | 30 | 30 |
| AI808P-8 | 96 | 48 | 9 | 100 | 45 | 46 | 91 | 30 | 30 |
| AI808P-9 | 96 | 96 | 9 | 100 | 89.5 | 91 | 91 | 30 | 30 |

Unit：mm

## 10. Connection Drawing



Model：AI808P-6/AI808P-8
Accuracy： 0.3%FS±3digits 25℃
Temperature excursion:≤0.01%FS/℃

Model：AI808P-9
Accuracy： 0.3%FS±3digits 25℃
Temperature excursion:≤0.01%FS/℃
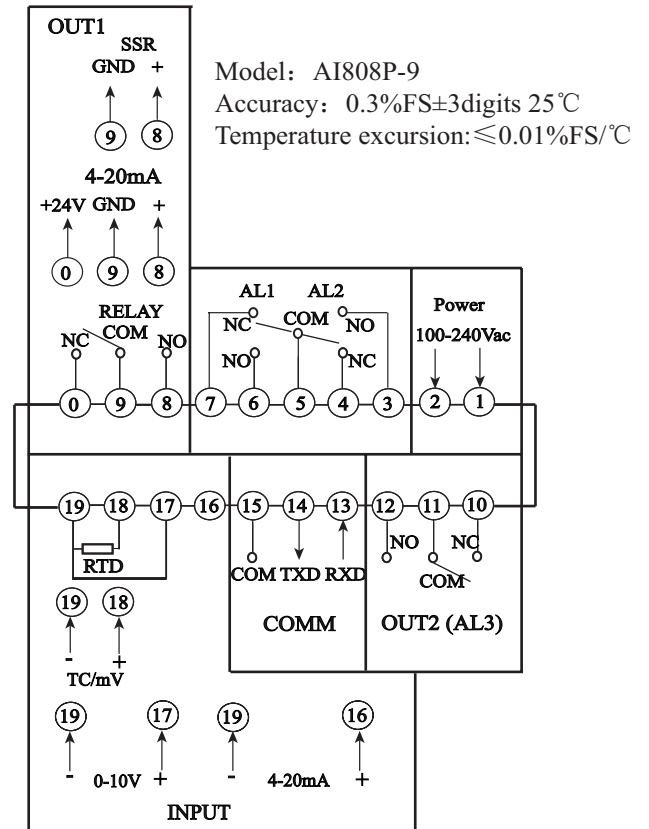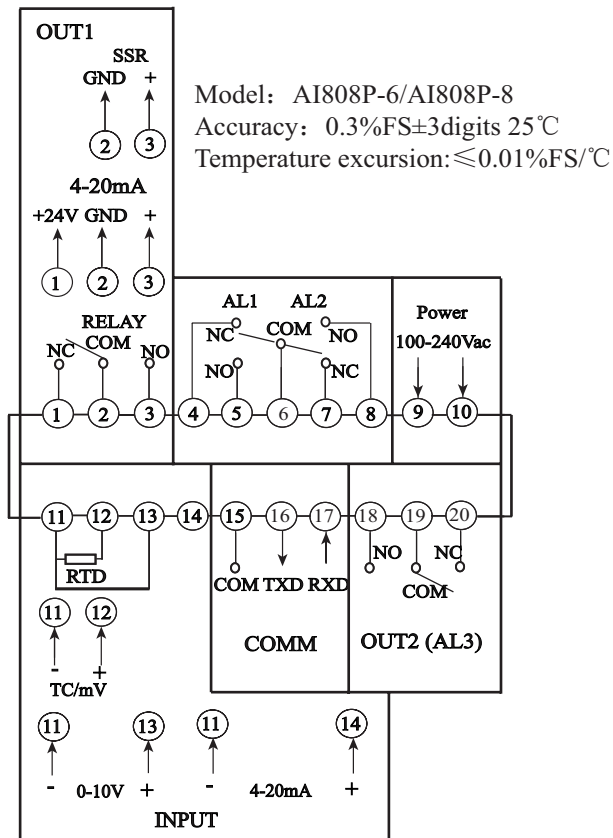
## 11. Simple Problem Shooting

| Display Message | Shooting Method |
|---|---|
| Display HHHH | Input disconnect or over upper limit, please check input signal, FH value and ambient working temperature. |
| Display LLLL | Input disconnect or under lower limit, please check input signal, FL value and ambient working temperature. |

**TOKY®**
DIGITAL CONTROLLERS