Coilliot

Economical PID Temperature Controller For General Use (AiFUZZY-906)

(User Manual)

1.Main features

– The PID controller provides dual output options: Relay and SSR (Solid-State -Relay). Users can configure the desired output type—either Relay or SSR—via the system parameter settings.

– The color LCD display features white PV text for easy readability from a distance. The side-illuminated back-light, combined with the advanced LCD screen, ensures a soft and clear display.

– Equipped with a patented plastic handle and a waterproof button, the device features built-in waterproof sealing rings on both the button and the panel. The entire panel is rated IP65, ensuring reliable protection against water and dust ingress.

– Economically engineered for user-friendly operation, this device is specifically tailored to deliver practical and reliable temperature control.

– Supports standard thermocouple (TC) and resistance temperature detector (RTD) input types, selectable through software parameter settings.

– Delivers a measurement accuracy of ±0.25%. Digital correction and self-calibration technology effectively eliminate errors caused by temperature drift and time drift, ensuring long-term precision and stability.

– Features an advanced "FUZZY + PID" AI control algorithm that effectively prevents overshoot. Includes auto-tuning (AT) and self-adaptation functions for optimal performance and ease of use.

– Supports up to two alarm outputs. When the control output is configured as SSR, the Relay output can be utilized as the second alarm output (AI2), providing enhanced flexibility in alarm management.

– The temperature unit—°C or °F—can be easily selected through software parameter settings to suit user preferences or regional requirements.

– Equipped with a high-efficiency, high-reliability switching power supply that supports a wide global voltage range of AC 100–240V, ensuring stable performance in various environments.

– Designed to meet stringent electromagnetic compatibility (EMC) standards, the device delivers strong anti-jamming performance for reliable operation in harsh industrial environments.

2.Technical Specification

Panel type	G	D	A	E	F
Panel Size (Width * Height)	48*48 mm (1.89*1.89 inch or 1/16 DIN)	72*72 mm (2.83*2.83 inch or 3/16 DIN)	96*96 mm (3.78*3.78 inch or1/4 DIN)	48*96 mm (1.89*3.78 inch or 1/8 DIN)	96*48 mm (3.62*1.77 inch or 1/8 DIN)
Drill Gap (Width * Height)	45*45 mm	68*68 mm	92*92 mm	45*92 mm	92*45 mm
Power supply	AC100~240V 50/60Hz (or DC12~24V needs customization)				
Range	85%~ 110%of the rated power voltage				
Power consumption	Less than 3W				
Display	LCD display (white for PV, green for SV, light orange for indicator)				
Measurement Range (Input)	K: (-50~1300°C / -58~2372°F) E: (0~800°C / 32~1472°F) J: (0~1000°C / 32~1832°F) N: (0~1300°C / 32~2372°F) Pt100: (-200~600°C / -328~1112°F)				
Decimal Point Positioning	0(None), 0.0 (adjustable based on parameters)				
Measurement accuracy	Achieves grade 0.25 accuracy when using thermal resistance (RTD) or thermocouple inputs, with cold-junction compensation provided by copper resistance or a reference freezing point. When cold-junction compensation is handled by the instrument's internal components, thermocouple input accuracy is ±0.25% FS ± 2.0°C.				
Sampling Frequency	80ms; when digital filtering is set to INF=0, response time is 0.5 seconds				
Control Method	ON/OFF control, AI FUZZY algorithm, PV tracking and SV value setting				
Contact output	Relay+SSR Dual type output Relay:5A/250VAC Resistive Load, 5A/30VDC resistive load SSR:12VDC/50mA (Drive external solid state relay)				
Electromagnetic Compatibility	IEC61000-4-4(electrical fast transient burst) at 4KV/5KHz; IEC61000-4-5(surge immunity) at 4KV				
Isolation Voltage	Input/output, power output/control module: ≥2300VDC; signal terminals between phase-to-phase signals ≥600VDC				
Operating Temperature	-10~60°C (14~140°F) (no condensation, no ice formation), humidity: 25~85%RH				
Storage temperature	25~70°C (-13~158°F) (no condensation, no ice formation), humidity: 25~85%RH				

3.Ordering Code Definition

AiFUZZY-906 — ① ② ③ — ④

①

Code	Dimensions (width × height)
G	48×48mm (1/16 DIN)
D	72×72mm (3/16 DIN)
A	96×96mm (1/4 DIN)
E	48×96mm (1/8 DIN)
F	96×48mm(1/8 DIN)

②

Code	OUT (control output)
Q5	Relay+SSR (Dual type output)

③

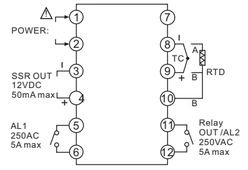
Code	ALM (Alarm)
R1	AL1(Alarm relay output)

④

Code	Power supply
Blank	AC100~240V
D	DC12~24V (Needs customization order from official website)

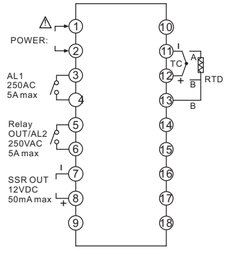
4.Wiring diagram

AiFUZZY-906-G



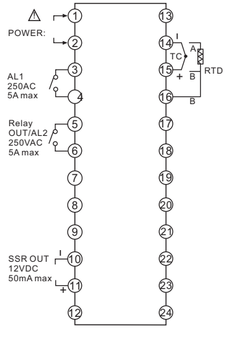
When output mode is set to Relay(oUt = rELY), terminals ⑪ and ⑫ function as control outputs, providing relay contact output.
When output mode is set to SSR (oUt=SSr)is selected, terminals ③ and ④ serve as control outputs, delivering SSR drive voltage. In this mode, terminals ⑪ and ⑫ can be configured as AL2 alarm relay outputs.

AiFUZZY-906-D



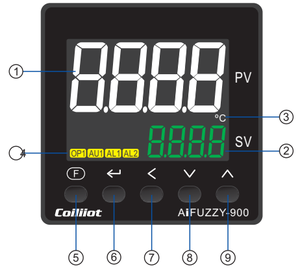
When output mode is set to Relay(oUt = rELY), terminals ⑤ and ⑥ function as control outputs, providing relay contact output.
When output mode is set to SSR (oUt=SSr)is selected, terminals ⑦ and ⑧ serve as control outputs, delivering SSR drive voltage. In this mode, terminals ⑤ and ⑥ can be configured as AL2 alarm relay outputs.

AiFUZZY-906-A,E,F



When output mode is set to Relay(oUt = rELY), terminals ⑤ and ⑥ function as control outputs, providing relay contact output.
When output mode is set to SSR (oUt=SSr)is selected, terminals ⑩ and ⑪ serve as control outputs, delivering SSR drive voltage. In this mode, terminals ⑤ and ⑥ can be configured as AL2 alarm relay outputs.

5.Front Panel Description



① PV first display window
(displays measured values, parameter names, etc.).

② SV second display window
(displays setpoint values, parameter values, etc.).

③ Temperature unit

④ Output indicators:OP1,AL1,AL2 indicators

⑤ Parameter key :Entry / exit parameter settings

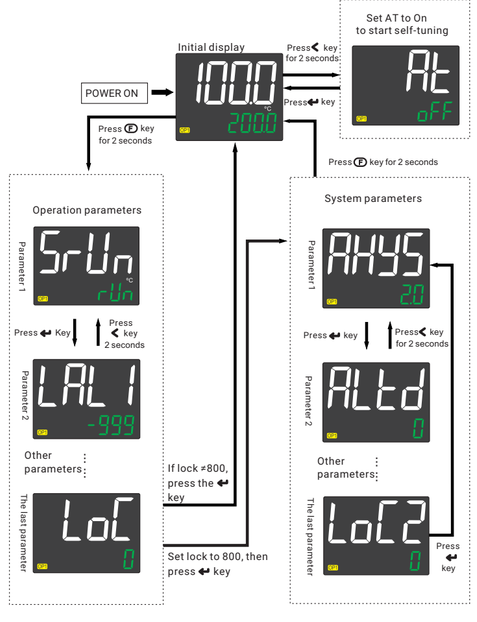
⑥ Return key: confirm and switch to the next parameter

⑦ Data shift key(start auto tuning)

⑧ Data decrease key(also serves as run key)

⑨ Data increase key(also serves as stop key)

6.Display the status and basic operation



System parameter setting

In the initial display:
•Press and hold the F key for about 2 seconds to enter the parameter setting mode.
•If lock is set to 800, press the ↵ key to access the system parameters.
•Use ❮ , ❯, ❮ to directly modify parameter values.
•Press ❯ to decrease and ❮ to increase values. Holding the keys enables faster adjustments.
•To navigate directly to a specific digit for editing, press the ❮ key, then adjust as needed.
•Press the ↵ key to save changes and move to the next parameter.
•To return to the previous parameter, press and hold the ❮ key for over 2 seconds.
•Exit to the basic display state by holding the F key for 2 seconds.

Setting the given value

In the basic display state: Use the ❮ , ❯ , or ❮ keys to modify the given value directly.

Auto-Tuning for Optimal PID Control

To enable optimal PID control parameters using the auto-tuning feature, follow the steps below for precise temperature control:
1. Initiate Auto-Tuning
Press and hold the ❮ key for 2 seconds until the "Rt" parameter appears on the display panel.
2. Activate Auto-Tuning
Change the "Rt" parameter from "OFF" to "ON", then press the ↵ key to confirm.
The instrument will start the auto-tuning process. During this time, "Rt" will flash on the main display.
3. Process Overview
After two ON-OFF oscillation cycles, the instrument will automatically calculate and apply the optimal PID parameters.
4. Canceling Auto-Tuning (if needed)
If you need to stop auto-tuning before it completes, change the "Rt" parameter from "ON" to "OFF", and press the ↵ button to confirm.
5. Tips for Best Results
* Set the target value (SV) to a commonly used or median value before starting auto-tuning.
* For systems with strong insulation (e.g., furnaces), set the target value to the highest temperature typically used.
* Auto-tuning results may vary and often require a stabilization period—usually equal to the tuning duration—for optimal performance.

Important:
Do not operate the controller or interrupt the power supply during the auto-tuning process.

7.Parameter list and function

7.1 Operation parameters

Press F for2 seconds to enter the operation parameter settings

Code	Name	Description	Range
SrUn	Operating Status	Run: The instrument is in normal operating control status. Stop: The instrument is in a stopped control output status, with the SV window flashing.	(Default valuerun)
HAL 1	Alarm_1 max alarm value	"HAL1" refers to the absolute value alarm or deviation value alarm, defined by the "ALtd" parameter. When the value is set to the maximum (3200), this function will be disabled.	-999 to 3200(Factory default values: HAL1 and HAL2 are set to 3200, LAL1 and LAL2 are set to -999)
LAL 1	Alarm_1 min alarm value	"LAL1" refers to the absolute value alarm or deviation value alarm, defined by the "ALtd" parameter. When the value is set to the minimum (-999), this function will be disabled.	
HAL2	Alarm_2 max alarm value	"HAL2" refers to the absolute value alarm or deviation value alarm, defined by the "ALtd" parameter. When the value is set to the maximum (3200), this function will be disabled.	
LAL2	Alarm_2 min alarm value	"LAL2" refers to the absolute value alarm or deviation value alarm, defined by the "ALtd" parameter. When the value is set to the minimum (-999), this function will be disabled.	
Loc	System Parameter Lock	Set Lock to 800, then press the ↵ key to enter the system parameters.	

7.2 System parameter

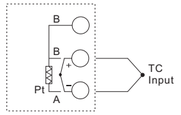
Set Loc = 800, then press the ↵ key to enter the following system parameters

Code	Name	Description	Range
AHYS	Alarm Hysteresis	Also known as alarm hysteresis or dead zone, this feature is used to prevent the alarm relay from frequently activating at the alarm threshold. It introduces a delay between the alarm output turning ON and OFF to ensure stable operation.	0~2000.0 (default value: 2)
ALtd	Alarm mode	ALtd=0: AL1 is the deviation value alarm, and AL2 is the absolute value alarm. ALtd=1: Both AL1 and AL2 are absolute value alarms. ALtd=2: Both AL1 and AL2 are deviation value alarms.	0~2 (default value:1)
CntL	Control mode	onoF: On-off control, suitable for situations that do not require high precision. FPId: Advanced artificial intelligence AiFUZZY (FUZZY+PID) control (Recommended for use).	default value: FPId
orEu	Direct/Reverse Action	onr: Reverse acting. An increase in the measured variable causes a decrease in the output, such as in heating control. ond: Direct acting. An increase in the measured variable causes an increase in the output, such as in cooling control.	default value: onr
P	Proportional band	The proportional band for FPID control is expressed in the same units as the PV value, rather than as a percentage of the range. Generally, optimal P, I, D, and CP values can be obtained through auto-tuning. Alternatively, they can be manually entered if the correct values are already known.	1~3200 default value: 25
I	Integral Time	The integral time for FPID control is measured in seconds. When I=0, the integral action is disabled.	1~9999 default value:200
d	Derivative Time	The derivative time for FPID control is measured in 0.1-second units. When d=0, the derivative action is disabled.	0~3200 (default value: 50.0)
CP	Control cycle	CP reflects the speed at which the instrument operator adjusts the control. The size of the CP affects the control accuracy. For SSR and SCR output control, a shorter control cycle is preferred, typically between 0.5 to 3.0 seconds. For relay switch outputs, a cycle time of 15 to 40 seconds is generally used. When the output relay switches, the CP is limited to 3 seconds. The self-tuning (AT) function will automatically adjust the CP to the appropriate value, optimizing control accuracy and prolonging the mechanical switch life. When the control mode is set to CntL = onoF, the CP acts as the output disconnect or power-on delay time.	0.2~ 300.0 (default value: Relay output is 15.0, SSR output is 2.0)
HYS	Control hysteresis	HYS (Hysteresis) is used in ON-OFF control to prevent the relay from frequently switching on and off. For a reverse acting (heating) system: When PV > SV, the output turns off. When PV < SV - HYS, the output turns on. For a direct acting (cooling) system:When PV < SV, the output turns off. When PV > SV + HYS, the output turns on.	0~ 200.0 (default value 2.0)
oUt (OUT)	Control output	Output Types Relay (rELY): Relay contact signal output SSR(SSr): Solid-state relay (SSR) drive output *Note: When output is set to SSR, the relay output originally used for control can be reassigned as the AL2 alarm output, enabling the use of two independent alarm outputs.*	(Default value: Relay)
Int	Input Signal	Selection of input Types for thermocouples or RTD: K,E,J,N,Pt (Pt100)	default value: K
dP	Decimal point	0 :no decimal. 0.0:one decimal place.	default value: 0.0
Sc	Input correction	SC is used to adjust the input signal to compensate for errors caused by the transducer, input signal, or automatic cold junction compensation of the thermocouple. PV after compensation = PV before compensation + SC. It is generally set to 0. An incorrect setting may result in inaccurate measurements.	-199.9~ +400.0 (default value: 0.0)
InF	PV input filter	The value of InF determines the ability to filter noise from the input signal. - When a large value is set, the measurement input stabilizes, but the response speed slows down. Typically, it can be set between 1 and 3. - If significant interference is present, gradually increasing the InF value can help reduce momentary fluctuations in the measured value, keeping them within 2 to 5 units. - During metrological verification of the instrument, set InF to 0 or 1 to shorten the response time.	0~40 (default value: 2)
dU	Temperature unit	°C：celsius °F：fahenheit	default value: °C
SPL	Min of SV	Minimum value that SV is allowed to be.	-999~ 3200 (default value: SPL is -99, SPH is 999)
SPH	Max of SV	Maximum value that SV is allowed to be.	
Loc2	Password lock2	Parameter Lock Function (LOC2 Setting) LOC2 = 0: Unlocked – No locking function enabled. LOC2 = 1: Locks the AT (Auto-Tuning) parameter – AT cannot be modified. LOC2 = 2: Locks field parameters – Field parameters cannot be modified. LOC2 = 3: Locks SV (Set Value) – SV cannot be adjusted. LOC2 = 4: Fully locked – AT parameter, field parameters, and SV setting cannot be modified.	0~4 (Default value 0)

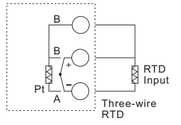
8. Wiring for Common Applications

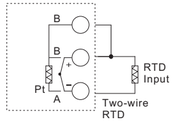
8.1 Wiring of the inputs

Thermocouple



RTD

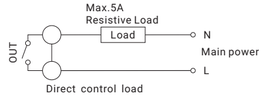


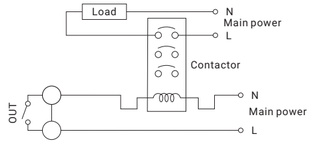


*If there is an input wiring error, sensor damage, input over-range, or a mismatch between the input setting and the selected sensor type, the display will flash a "orAL" warning. Once the issue is resolved, the PV (process value) display will return to normal operation.

8.2 Wiring of the outputs

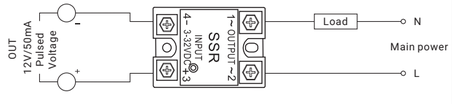
Relay





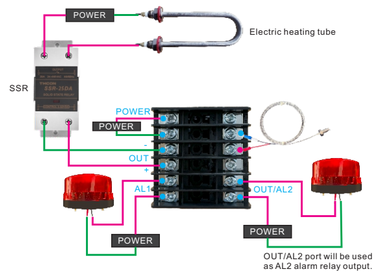
Taking driving contactor to control 220V load as an example.

SSR

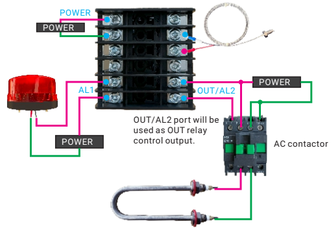


9. Common wiring cases

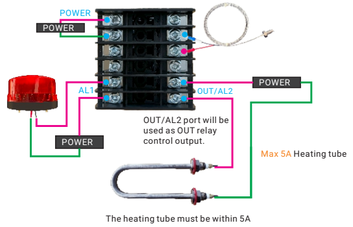
Setting output to SSR enables one SSR drive control output and two independent alarm outputs.



Setting output to Relay enables one relay control output and one alarm output.



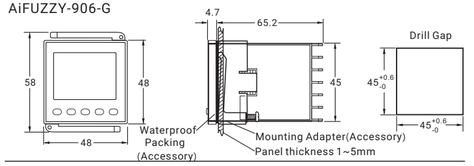
Direct control of the heating tube:



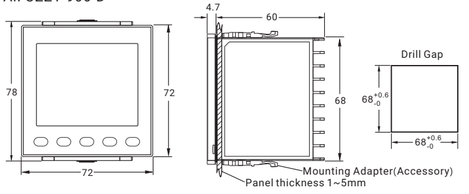
Note:
1. The wiring diagram above uses the 48×48mm (1/16 DIN) panel temperature controller as an example. Terminal numbering may vary for other panel sizes, but the wiring logic remains the same—please refer the respective terminal numbers accordingly.
2. The diagram illustrates input wiring for K, E, J, and N-type thermocouples. For PT100 RTD input, please refer to this user manual accordingly.
3. Different input signal types require corresponding input parameter settings. Refer to the manual for detailed configuration instructions.

10.Dimensions(in mm) and installation instructions

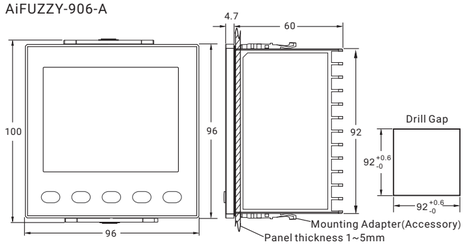
AiFUZZY-906-G



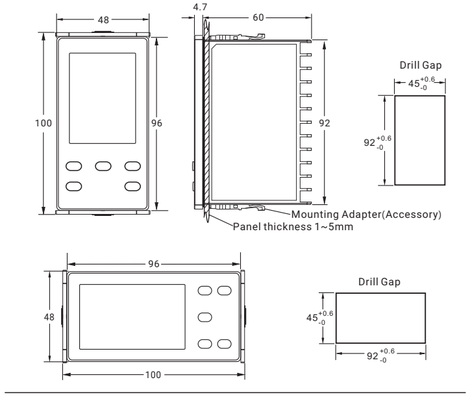
AiFUZZY-906-D



AiFUZZY-906-A



AiFUZZY-906-E ,F



For a more detailed operation manual, please scan this QR code to obtain it!

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