Contact Us

Coiliiot LLC
8 THE GRN STE B,
Dover, DE, 19901
(+1)857-565-5912
info@coiliiot.com
https://coiliiot.com

Economical PID Temperature Controller For General Use AiFUZZY-915/975

Technical Manual

Version number: EN-V9-01

Thank you for choosing Coiliiot products.
To ensure optimal use of this product, please read the following instructions before use.

Table of contents

Page

Table of contents

Page

■Safety Instructions

⚠ Attention

Do not touch the terminals while the power is on, as this may result in minor injuries from electric shock.

Do not allow metal objects, conductors, debris (such as installation cuttings), moisture, or other foreign matter to enter the digital controller, setup tool ports, or the pins on the Setup Tool cable connectors.
Failure to do so may result in electric shock, short circuits, or malfunction of the equipment.

Do not use the product in environments exposed to flammable or explosive gases, as this may lead to injury due to explosion.

Do not disassemble, modify, or repair the product, or touch any internal components.
Failure to follow this may result in electric shock, fire, or equipment failure.

This equipment is an open processing controller. Do not use it in a control cabinet where a fire hazard may exist.
When using more than two open-circuit switches, ensure all switches are turned off before performing maintenance or inspections to keep the product powered off.

If the output relays are used beyond their life expectancy, contact welding or burning may occur.
Always ensure the application conditions are considered, and use the output relays within their rated load and electrical life expectancy.
The life span of the output relays can vary significantly depending on the load and switching conditions.

■1.Main features

1.1AiFUZZY-915Main features

-**Color LCD Display**: Features a color LCD screen with white PV font for easy readability from a distance. The side -illuminated backlight combined with advanced LCD technology delivers a soft and clear display.

-**Sleek Design**: The ultra-thin panel and large LCD screen are housed in a modern industrial aesthetic shell, providing an advanced and sophisticated appearance.

-**Durable Waterproof Buttons**: Equipped with plastic handle waterproof buttons that are sturdy, wear-resistant, and offer a clear, smooth operating feel.

-**Universal Input**: Allows selection of thermocouples, thermistors, analog linear voltage, and current input signals through parameter settings.

-**Versatile Output Modules**: Offers a variety of output module options, including:
Relay contact switch output module
SSR drive voltage output module
SCR non-contact switch output module
One-way/three-way SCR zero-crossing trigger output module
One-way SCR phase-shift trigger output module
Analog linear voltage and current output module

-**High Measurement Accuracy**: Provides a measurement accuracy of 0.25 with enhanced resolution for more precise and stable measurements.

-**Advanced AI Adjustment Algorithm**: Combines fuzzy control and adaptive PID control with self-setting and self-learning functions. It automatically learns and remembers features of the controlled object during adjustment to optimize performance, ensuring control without overshoot or undershoot and achieving excellent results on complex and challenging control objects.

-**Customizable Alarms**: Allows free definition of designated alarm ports and alarm methods, supporting up to four alarm outputs.

-**MIO Auxiliary Input**: Optionally equipped with external switch signal input, enabling dual temperature set value switching or RUN/STOP switching.

-**Dual PID Contro**l: In addition to standard one-way heating or cooling PID control, it supports dual PID dual control outputs for heating and cooling, automatically switching based on the set value.

-**Rate Limiting**: Freely defines rate limiting for temperature rise and drop to ensure controlled and stable temperature changes.

-**Analog Signal Output**: Converts the measured value (PV) or set value (SV) into an analog linear current signal output.

-**Comprehensive Power Supply and Isolation**: When the instrument has multiple sets of inputs and outputs, it provides a comprehensive power supply and optoelectronic isolation solution.

-**Communication Interfaces**: Offers optional RS485 or RS232 communication interfaces supporting the Modbus-RTU protocol, featuring a fast 10ms communication response, unlimited writing cycles, and no concerns about communication write lifespan.

-Wireless Communication: Connects with the Coiliiot series wireless communication module to enable various wireless transparent network transmission methods such as TCP, as well as Internet cloud communication and mobile app integration.

-Self-Healing Power Supply: Utilizes a self-healing circuit design that automatically cuts off power to protect the instrument in case of overvoltage or undervoltage. It automatically restores normal power supply when the voltage returns to normal.

1.2 AiFUZZY975 Main features

-Enhanced Program Control: Builds upon the AiFUZZY915 universal multi-functional temperature controller by adding an 80-segment program control function. Ideal for applications that require automatic set value adjustments based on specific time rules

-80-Segment Programming: Enables the setting of rise and fall slopes for any set value. Includes programmable commands such as jump, run, pause, and stop, allowing modifications to the program during operation for greater flexibility and control.

-Advanced Power Failure Handling: Features a power failure processing mode, measured value startup function, and preparation function. These enhancements ensure efficient and reliable program execution even in the event of power interruptions.

-Multiple PID Parameter Sets: Offers three sets of PID parameters. Through programming, each temperature stage can utilize a different PID set, addressing the need for varied PID parameters to achieve optimal control across different temperature ranges.

-.Simplified Program Setup: The 80-segment program can be configured to create a single temperature curve, with the option to mask unnecessary segments. This simplifies the program setup process, making it more user-friendly.

-Grouping Feature: Allows the division of the 80-segment program into 4 or 8 groups. This facilitates the pre-programming of multiple temperature curves, enabling quick and easy selection of the desired curve during operation.

-Backward Compatibility: Incorporates all functions of the AiFUZZY915. When the program setting function is disabled, the AiFUZZY975 seamlessly operates as a standard AiFUZZY915 temperature controller, ensuring versatility and ease of transition.

■2.Technical Parameter

Type	G - type panel	D - type panel	A - type panel	E - type panel	F - type panel
Panel Size (Width * Height)	48*48 mm 1.89*1.89 in	72*72 mm 2.83*2.83 in	96*96 mm 3.78*3.78 in	48*96 mm 1.89*3.78 in	96*48 mm 3.62*1.77 in
Drill Gap (Width * Height)	45*45 mm 1.77*1.77 in	68*68 mm 2.68*2.68 in	92*92 mm 3.62*3.62 in	45*92 mm 1.77*3.62 in	92*45 mm 3.62*1.77 in
Mounting Type	Built-in panel mounting				
Power supply	AC100~240V 50/60Hz; or DC12~24V				
Voltage Range	85%~ 110%of the rated power voltage				
Power consumption	AC100~240V: 5VA OR DC12~24V: 3.5VA				
Display	LCD display (white for PV, green for SV, light orange for indicator)				
Input	Thermocouple input: K，S，R，E，J，T，B，N，WRe3-WRe25，WRe5-WRe26，etc Thermal resistance input: Cu50, Pt100 Linear current input: 0-20mA, 4-20mA Linear voltage input: 0-5V，1-5V，0-10V，2-10V，0-20V，0-20mV，0-60mV，0-75mV，0-100mV，0-500mV，100-500mV，etc				
Measurement Range	K: (-50~1300°C / -58~2372°F) S: (-50~1700°C / -58~3092°F) R: (-50~1700°C / -58~3092°F) T: (-200~350°C / -328~662°F) E: (0~800°C / 32~1472°F) J: (0~1000°C / 32~1832°F) B: (200~1800°C / 392~3272°F) N: (0~1300°C / 32~2372°F) Cu50: (-50~150°C / -58~302°F) Pt100: (-200~600°C / -328~1112°F) Linear Scale: -9999~32000 (user defined)				
Decimal Point Positioning	0000, 000.0, 00.00, 0.000 (adjustable based on parameters)				
Sampling Accuracy	±0.25%FS				
Sampling Frequency	10 times per second; 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				
Control Range	0.1~300.0 seconds				
Relay Output	5A/250VAC OR 5A/30VDC				
SSR Drive Voltage Output	12VDC 50mA max (used to drive SSR relay)				
SCR Non-contact Output	0.2A (continuous), 2A (20ms pulse, 5s period) 100-240VAC				
SCR Trigger Output	Dual-directional SCR trigger, 5~500A, with 2 single-direction SCR connections or controllable SCR power modules.				
Linear Current/Voltage Output	0-20mA, 4-20mA adjustable (output voltage≥ 10.5V)				

Electromagnetic Compatibility	Electromagnetic compatibility complies with IEC61000-4-4 (electrical fast transient burst) at 6KV/5KHz, IEC61000-4-5 (surge immunity) at 6KV and 10V/m high-frequency electromagnetic field interference. Under these conditions, the instrument does not experience crashes or incorrect I/O operations, and the measurement value fluctuations do not exceed ±5% of the measured range.
Isolation Voltage	Input/output, power output/control module: ≥2300VDC; signal terminals between phase-to-phase signals ≥600VDC
Operating Temperature	-10~55°C (14~131°F) (no condensation, no ice formation), humidity: 25~85%RH
Storage Temperature	25~65°C (-13~149°F) (no condensation, no ice formation), humidity: 25~85%RH

■3.Model definition

① — ② ③ ④ ⑤ ⑥ ⑦ — ⑧

①	②	③	④	⑤	⑥	⑦	⑧
Model	Panel size	MIO Auxiliary input port	OUTP Control output	ALM Alarm output	AUX Control output	COMM Communication Interface	Meter power supply
AiFUZZY915	G	N	N	N	N	N	N
AiFUZZY975	D	I2	R1	R1	R1	S	D
	E	I3	Q1	R2	R2	S2	
	F	I4	W1	R3	R3	S4	
	A	V5	W2	Q1	Q1	V5	
		V12	X2	Q2	Q2	V12	
		V24	X5		W1	V24	
			X8		W2		
			K1		X2		
			K3		X5		
			K5		X8		
			K6		K1		
			Q7		V5		
					V12		
					V24		

① Model

Code	Description
AiFUZZY915	Coiliiot Advanced PID Temperature Controller For Industrial Use
AiFUZZY975	Coiliiot Advanced PID Temperature Controller For Industrial Use (AiFUZZY975 is based on AiFUZZY915, added with an 80-segment program control function)

② Indicates the size of the meter

Code	Description
G	Panel size 48*48mm/1.89*1.89 in (width*height), drill gap 45*45mm/1.77*1.77 in
D	Panel size 72*72 mm/2.83*2.83 in (width*height), drill gap 68*68 mm/2.68*2.68 in
E	Panel size 48*48mm/1.89*1.89 in (width*height), drill gap 45*45mm/1.77*1.77 in
F	Panel size 48*48mm/1.89*1.89 in (width*height), drill gap 45*45mm/1.77*1.77 in
A	Panel size 48*48mm/1.89*1.89 in (width*height), drill gap 45*45mm/1.77*1.77 in

③～⑦Module Code Reference Table

Code	Description
N	None
I2	Switch/frequency signal input, suitable for external contacts or frequency signal input
I3	Analog input 4-20mA/0-20mA

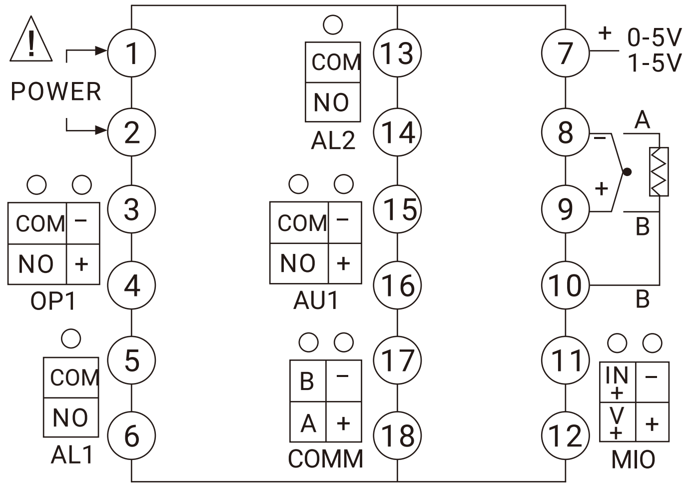
I4	Analog input 4-20mA/0-20mA, with 24VDC power supply output (provides power for external transmitters)
R1	Single channel relay normally open/normally closed contact output module, module capacity: 250VAC/3A,30VDC/3A
R2	Dual channel relay normally open contact output module, module capacity: 250VAC/3A,30VDC/3A
R3	Single channel relay frequently open+normal closed contact switch output module, module capacity: 250VAC/3A, 30VDC/3A
Q1	Single channel SSR drive output module, 12VDC/50mA
Q2	Dual channel SSR drive output module, 12VDC/50mA
W1	Normally open isolated non-contact voltage output module, capacity: 100-240VAC/0.2A
W2	Normally closed isolated non-contact voltage output module, capacity: 100-240VAC/0.2A
X2	0-20mA/4-20mA isolated programmable linear current or voltage output module
X5	0-5V/1-5V isolated programmable linear current or voltage output module
X8	0-10V/2-10V isolated programmable linear current or voltage output module
K1	Single-channel "burn-out-proof" SCR zero-crossing trigger output module. Each channel can trigger a 5–500A bidirectional SCR or two anti-parallel, single-direction SCRs.
K3	Three-channel "burn-out-proof" SCR zero-crossing trigger output module. Each channel can trigger a 5–500A bidirectional SCR or two anti-parallel, single-direction SCRs.
K5	220VAC “burn-out-proof” single-channel SCR phase-shift trigger output module
K6	380VAC “burn-out-proof” single-channel SCR phase-shift trigger output module
Q7	A built-in SSR (solid-state relay) module wired in parallel with the instrument’s internal power supply. It directly outputs the instrument’s input voltage—if the supply is 220V, it outputs 220V; if the supply is 110V, it outputs 110V. Suitable for small loads up to 1.5A at 220V (customization required).
S1	Optical isolation RS485 communication interface module
S2	Optical isolation RS232 communication interface module
S4	Optical isolation with power RS485 communication module
V5	Non-isolated 5V DC voltage output module for external transmitters or other circuits, with a maximum current output of 50mA.
V12	Isolated 12V DC voltage output module for external transmitters or other circuits, with a maximum current output of 50mA.
V24	Isolated 24V DC voltage output module for external transmitters or other circuits, with a maximum current output of 50mA.

⑧ Indicates the power supply power supply

Code	Description
N	100~240VAC power supply
D	12-24VDC power supply

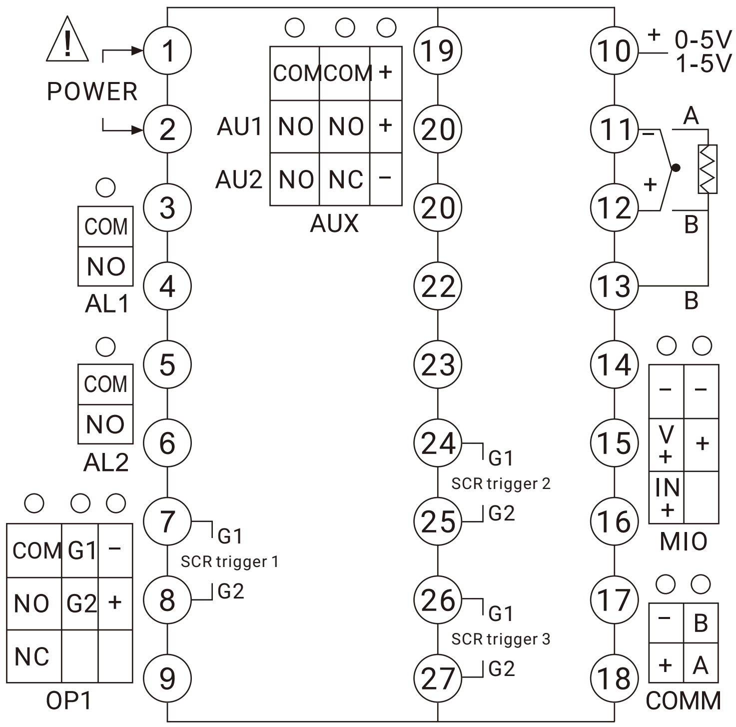
■4.Wiring diagram

G Type panel (48×48mm)



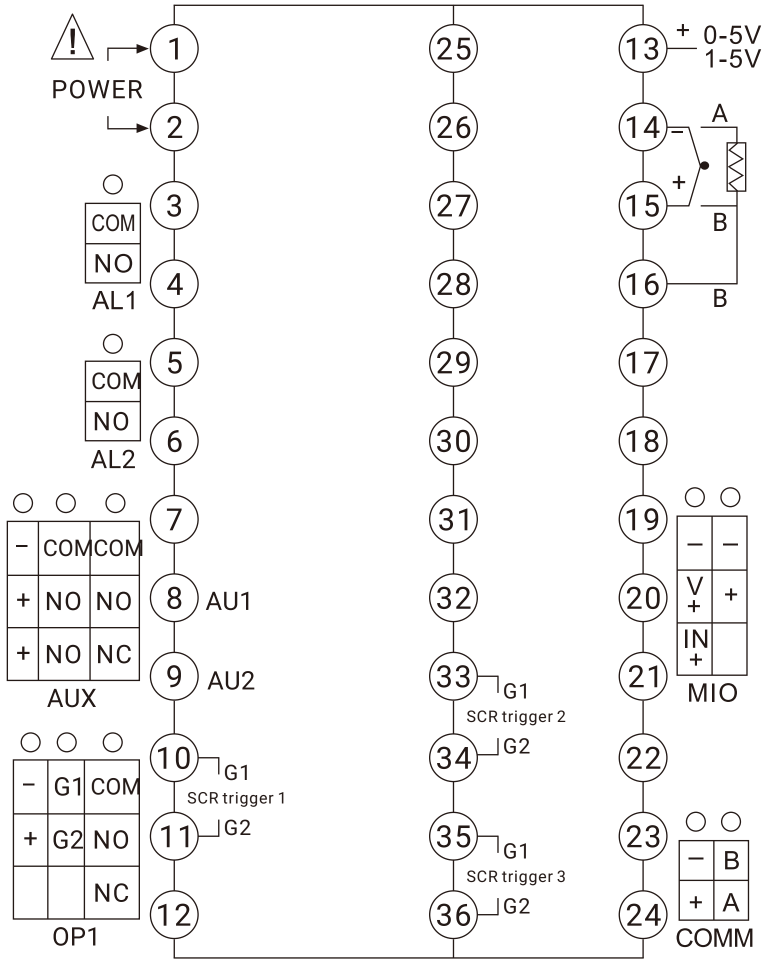
Note:
-For linear voltage ranges below 1V, use terminals 8(-) and 9(+) for input. For 5-10V signals, use terminals 7(+) and 8(-).
-For a 4-20mA linear current input, connect an external 250Ω high-precision resistor to convert it into a 1-5V voltage signal, and then input it through terminals 7(+) and 8(-).
-If using a two-wire 4-20mA transmitter, select the I4 module on the MIO port. Connect the transmitter's signal line to terminal 11 and the transmitter's 24V positive power line to terminal 12.

D Type panel (72×72mm)



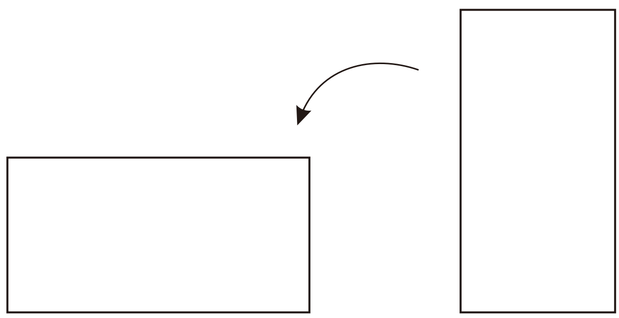
Note:
-For linear voltage ranges below 1V, use terminals 11(-) and 12(+) for input.
- For 0–5V and 1–5V signals, use terminals 10(+) and 11(-).
- For 4–20mA linear current input, connect an external 250Ω high-precision resistor to convert it into a 1–5V voltage signal, then input it through terminals 10(+) and 11(-).
- If using a two-wire 4–20mA transmitter, select the I4 module on the MIO port, then connect the transmitter signal line to terminal 16 and the transmitter's 24V positive supply line to terminal 15.

E,F,A Type panel (48×96mm/96×48mm/96×96mm)

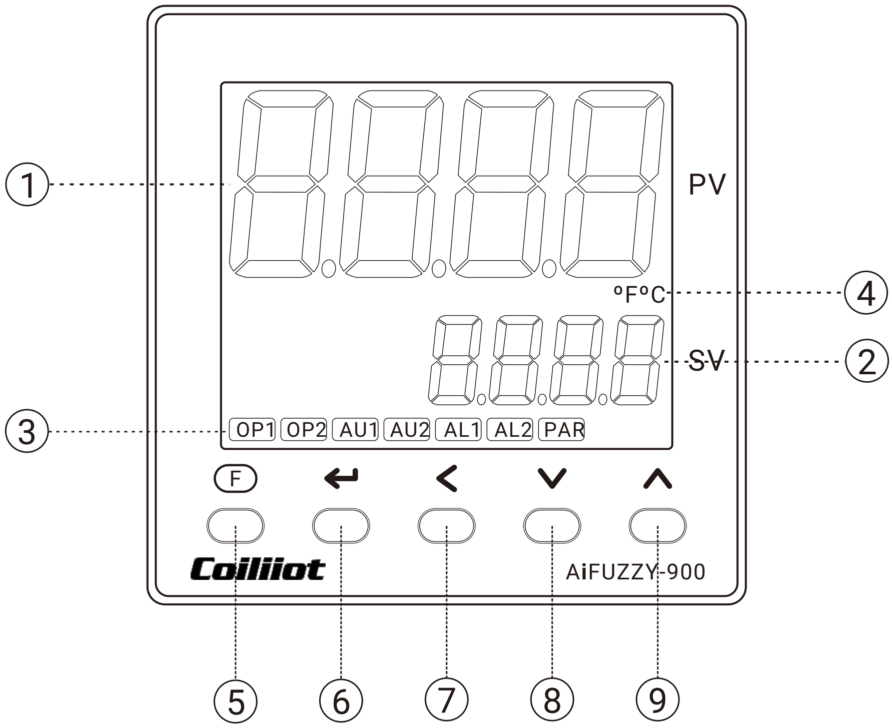


Note1:
- For linear voltage ranges below 1V, use terminals 14(-) and 15(+) for input.
- For 0–5V and 1–5V signals, use terminals 13(+) and 14(-).
- For a 4–20mA linear current input, connect an external 250Ω high-precision resistor to convert the current into a 1–5V voltage signal, then input it through terminals 13(+) and 14(-).
- If using a two-wire 4–20mA transmitter, select the I4 module on the MIO port, then connect the transmitter’s signal line to terminal 21 and the transmitter’s 24V positive supply line to terminal 20.

Note2:
This wiring diagram is oriented for A and E type panels. For F type panels, which are horizontal, rotate the diagram 90° counterclockwise for proper viewing. The terminal numbering remains the same.



■5.Panel description



① PV Primary Display Window (Displays measured values, parameter names, etc.)

② SV Secondary Display Window (Displays set values, parameter values, etc.)

③ Output indicators:OP1,OP2,AL1,AL2,AU1,AU2,PAR indicators.

④ Temperature Display Unit (no display for linear analog signal input).

⑤ Parameter key: Entry / exit parameter settings.

⑥ Return key: confirm and switch to the next parameter.

⑦ Data shift key (Also as manual/automatic switching and program setup key)

⑧ Data decrease key(Also as run key).

⑨ Data increase key(Also as stop key).

■6.Module instructions

AiFUZZY-915 / AiFUZZY-975 Modules Overview

The AiFUZZY-915 / AiFUZZY-975 instruments can be configured with up to five optional function modules. By installing different modules, various output specifications and functional requirements can be met.

Auxiliary Input (MIO):
Functions as an extended input, event input, feed output, or extended output function.
- I4 Module: Internal 24V supply in series, dedicated to 4–20mA two-wire transmitter input.
- I3 Module: Standard 4–20mA input without the internal 24V supply.
- I2 Module: Switch signal event input, enabling external switches to toggle between dual setpoints (SP1/SP2) or RUN/STOP modes.
- V Module: DC voltage output module for external transmitters or other circuits.

Main Output (OUT):
Used for ON-OFF control output, FPID (PID+FUZZY) intelligent control output, or for transmitting measured/set values.
- R Module: Relay contact output
- Q Module: SSR drive voltage output
- W Module: SCR non-contact output
- X Module: Linear current or linear voltage output
- K Module: SCR zero-cross or phase-shift trigger output

Alarm Output (ALM):
Used for alarm output functions.
- Installing an R module (R1) provides an AL1 relay alarm output.
- Installing R2 provides AL1 + AL2 relay alarm outputs.

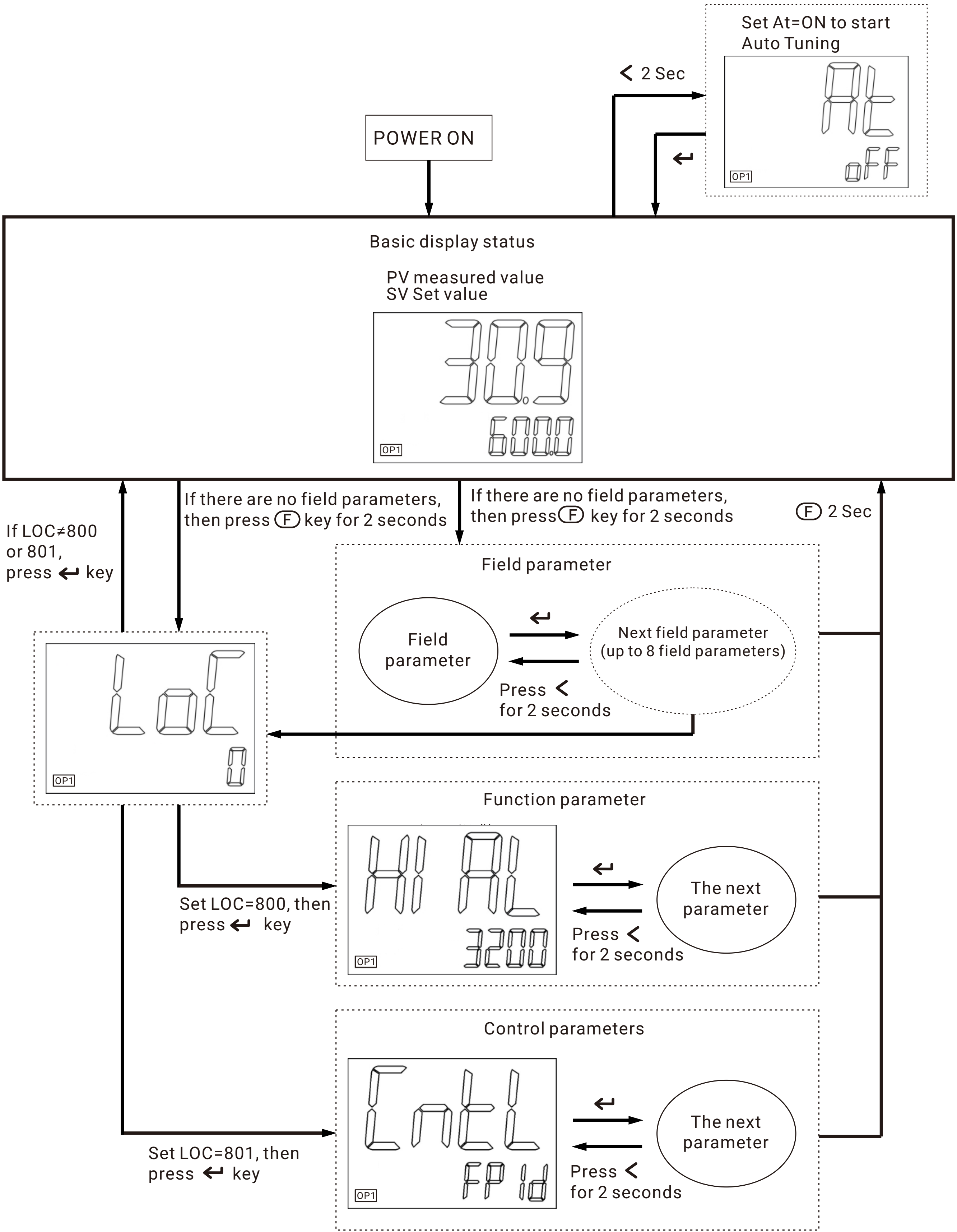
Auxiliary Output (AUX):
Serves as the second output for dual PID heating/cooling control or as an alarm output.
- Compatible with R, Q, X, K (only K1), and V modules.

Communication Interface (COMM):
Used for RS485 or RS232 communication or PV value transmission.
- S Module: Communication module (RS485/RS232)
- V Module: DC voltage output module for external transmitters or other circuits.

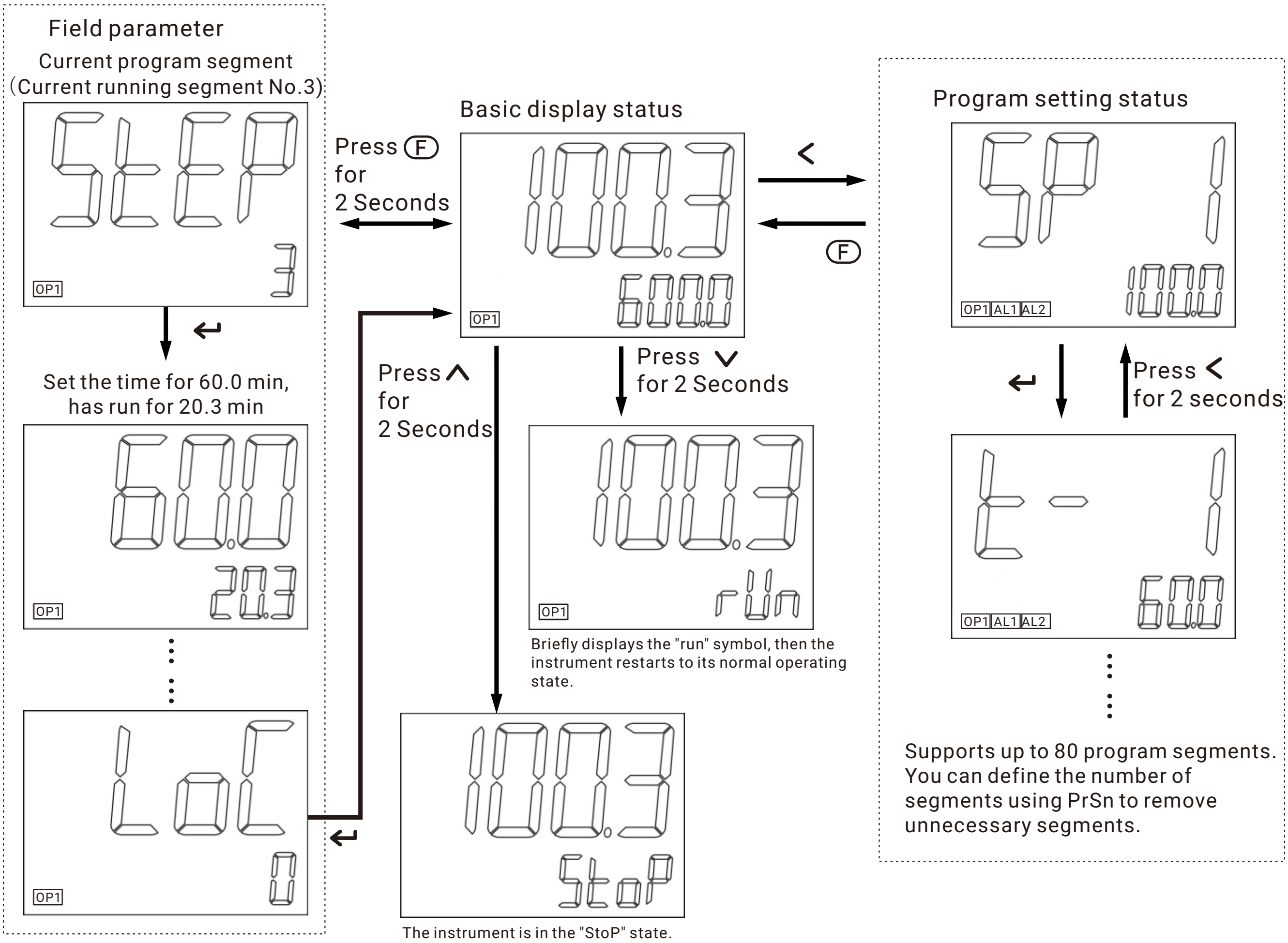
Note: Modules are soldered to the PCB and configured at the factory based on the user’s order specifications. All relevant parameters are set correctly before shipment.

■7.Operation Flow Chart

7.1 display status and basic operation flow chart



7.2 Program Settings flow chart (AiFUZZY-975 only)



■8.Instruction of instrument operation method

8.1 Parameter Setting

In the basic display state:
•Press and hold the Ⓕ key for about 2 seconds to enter the parameter setting mode.
•If LOC=800, press the ↵ key to access the function parameter settings.
•Use the < , ∨ , ∧ , etc., keys 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 Ⓕ key for 2 seconds.

8.2 Set Value Setting

For AiFUZZY915/975 instruments operating in fixed-point control mode (when Prsn=0 for the 975), the following applies:

•If Srun=HOLD, you can directly modify the set value in the basic display state by pressing the <, ∨, ∧ keys.
•If Srun=run, you must first press the < key to enter the set value modification state. After that, you can use the <, ∨, ∧ keys to adjust the set value. Additionally, you can perform quick run/stop operations. Press and hold the ∧ key for two seconds, and the lower display will show "StoP," switching the instrument to the stop state and halting control output.
•In the "StoP" state, pressing and holding the ∨ key for two seconds will briefly display the "run" symbol on the lower display, switching the instrument back to normal operating mode.

8.3 Setting up the program

When the instrument is in program control mode (Prsn ≥ 1) and the SV secondary display window is showing the set value, press the < key once to enter the program setting mode. The first value displayed will be the set value of the current running segment. Pressing the ↵ key shows the next parameter. Each program segment is arranged in the sequence "Set Value – Time – Set Value." Even when the program is running, it can still be modified.

8.4 Run control

To start the control operation, press and hold the ∨ key for about two seconds until the lower display shows the "run" symbol. For AiFUZZY-975 instruments, this will start the program if it is currently stopped.
For 975 instruments with the PSYS parameter's F value = 1, if the instrument is already in a running program state, performing the same operation will put the program into a "HoLd" state, pausing the timer. Performing the run operation again will resume normal operation.

8.5 Stop control

When the SV secondary display window is showing the set value, press and hold the ∧ key for two seconds until the lower display shows the "StoP" symbol. This stops the instrument's control output. For AiFUZZY-975 instruments, this action also stops the program run and resets the program segment parameter (StEP) back to the starting segment.

8.2.5 AT Auto-Tuning:

Press and hold the < key for 2 seconds to display the At parameter (or locate the At parameter in the control parameters). Then press the ∧ key to change the lower display from oFF to on, and press the ↵ key to confirm and begin the auto-tuning process.
Note: If the instrument's rAtE parameter is set and currently limiting the heating rate, the auto-tuning will pause until heating is complete. Afterward, it will start automatically. During auto-tuning, the lower display will flash "At." After two oscillation periods of ON-OFF control, the instrument automatically calculates new PID parameters.
To abort auto-tuning early, press and hold the < key for about 2 seconds to call up the At parameter again, set on back to oFF, and press the ↵ key to confirm. If the instrument is running a program, auto-tuning will pause the program's timing to ensure the set value does not change.
In systems with dual heating/cooling outputs, you must separately tune the PID parameters for each output. When the instrument is controlling from the AUX cooling output and auto-tuning (At) is initiated, the instrument will tune the P2, I2, d2 (cooling) parameters.

Additional Notes:
1. AiFUZZY-915/975 uses an advanced "PID+FUZZY" AI-based PID control algorithm. This "FPID" algorithm prevents overshoot, improves control accuracy, and delivers better results than standard PID. When first using FPID mode, you can initiate auto-tuning to help determine the optimal PID parameters.

2. Parameters obtained from auto-tuning vary with different set values. Before initiating auto-tuning, set the SV (set value) to the most commonly used or mid-range value. For a well-insulated electric furnace, set the SV to the maximum intended operating value. Do not change the SV during auto-tuning. Depending on the system, auto-tuning may take anywhere from a few seconds to several hours.

3. The control hysteresis parameter (HYS) also affects the auto-tuning results. Generally, smaller HYS values yield more accurate tuning results. However, if HYS is too small, minor input fluctuations may trigger unintended positional control actions, potentially leading to incorrect parameters. A recommended HYS value is 2.0.

4. During auto-tuning, do not operate the instrument or power it off prematurely, as this will affect the tuning results. Auto-tuning ends when the "At" symbol stops flashing.

5. Right after auto-tuning completes, the control results may not yet be optimal. Because the system has a learning function, the control effect will improve over time.

■9.Parameter table and functions

9.1 Field parameter

In the basic display state, press and hold (F) key for 2 sec to enter the field parameters.

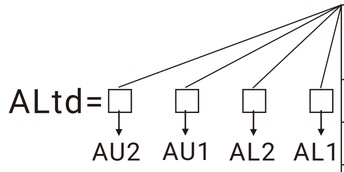
Code	Name	Description	Range
5ŁEP (StEP)	Current Program Segment Number (Applicable to 975 Only)	StEP displays the current program segment number and can also be used to force a jump to a specific segment during program operation. Forced Segment Jump: While the program is running, you can force it to jump to any segment. For example, if the current StEP=3 and you want to jump to segment 8, set StEP=8 and press the ↵ key to confirm. The program will immediately jump to segment 8 and begin execution from there. Setting Range of StEP: The StEP setting range is constrained by the parameters PrGd and PrG. When the instrument stops running (StoP), it will automatically reset StEP to the starting segment. Example 1: If PrGd = 8 and PrG = 2, the program is divided into 8 groups of curves, and the instrument is currently executing the second group. In this case, the StEP setting range is limited to segments 11–20. After the instrument stops running (StoP), it will reset StEP to the starting segment of that group (segment 11). Example 2: If PrGd = 0 and PrG = 0, meaning the program is not divided into groups, then StEP can be set from segment 0 to 80. After the instrument stops running (StoP), it automatically resets StEP to the first segment (segment 1).	1~80 (Default Value 1)
PrG (PrG)	Curve group number (Applicable to 975 only)	PrG displays the current program group (curve group) number in execution. By using PrGd, you can divide the program into multiple groups (curve groups) to meet various process requirements. This allows you to easily and quickly call up different curve sets by adjusting the PrG parameter. PrG Setting Ranges: - If PrGd=0, the program is not divided into groups. PrG cannot be set and is fixed at 0. - If PrGd=4, the program is divided into 4 groups, and PrG can be set from 1 to 4. - If PrGd=8, the program is divided into 8 groups, and PrG can be set from 1 to 8. When the program is divided into groups by PrGd, you can predefine multiple curve sets. By adjusting PrG, you can quickly and conveniently select the desired curve group to execute. Example: If PrGd=4 and PrG=2, the program is divided into 4 groups, and the instrument is executing the second group of curves (segments 21–40). After the instrument stops running (StoP), it automatically resets StEP to the starting segment of the second curve group (segment 21).	0~8 (Default Value 0)
random	Segment Set Time and Elapsed Run Time (Applicable to 975 Only)	The PV display shows the segment's set time, while the SV display shows the elapsed time. For example, if the PV display reads 30.0 and the SV display reads 10.0, it means the currently running segment's total set time is 30.0 units, and 10.0 units of that time have already elapsed.	
PI dn (Pidn)	PID parameter group number (applicable only to 975)	Displays the current PID parameter group number being used. This parameter must be defined through program settings. - 1: Use the first set of PID parameters - 2: Use the second set of PID parameters - 3: Use the third set of PID parameters	0~3 (Default Value 1)

	Custom field parameters	You can use FP1–FP8 to select any parameter from the system or control parameters for on-site operation, allowing up to eight on-site parameters to be added.	
LoC (LoC)	Password lock	Parameter Setting Password Lock: - Set LoC = 800, then press ↵ to enter the following system parameters. - Set LoC = 801, then press ↵ to enter the following control parameters. - If LoC ≠ 800 or 801, pressing ↵ will return the instrument to the basic display state.	0~9999 (Default Value 0)

9.2 Function parameter

In the field parameters,set Loc=800,then press ↵ key to enter the function parameters.

Code	Name	Description	Range
HI AL (HIAL) LoAL	High limit alarm	When the measured value (PV) exceeds HIAL, the instrument triggers a high-limit alarm. The alarm is cleared when PV falls below HIAL – AHYS. If HIAL is set to its maximum value, this alarm function is disabled. Note: Each alarm can be freely assigned to the AL1, AL2, or AUX output ports, or it can be left without any output action. For details, refer to the description of the ALtd alarm output definition parameter.	-999~3200 [-9990~3200] (HI AL Default Value 3200) (LoAL Default Value -999)
HdAL (HdAL)	Deviation high alarm	When PV is less than LoAL, a low-limit alarm is triggered. The alarm is cleared when PV rises above LoAL + AHYS. If LoAL is set to its minimum value, this alarm function is disabled. Note: If needed, HIAL and LoAL can also be configured as deviation alarms (see the SSCo parameter description for details).	(HdAL Ex-factory Value 3200)
LdAL (LdAL)	Deviation low alarm	When the deviation (PV – SV) exceeds HdAL, a high-deviation alarm is triggered. The alarm is cleared when the deviation falls below HdAL – AHYS. If HdAL is set to its maximum value, this alarm function is disabled.	-999~3200 [-9990~3200] (Default Value -999)
(LBA) LbA	Control Loop Open/Short-Circuit Alarm	When the control output switches to otH or otL, the instrument begins monitoring the measured value (PV) at intervals defined by LBA. It checks whether the PV changes by more than 2°C within the specified LBA time. Based on this change, it determines whether there is an abnormality in the control loop. Note on LBA Timing: 1.The time unit for LBA is seconds. 2.Altd defines which alarm port outputs the LBA alarm. 3.The LBA alarm cannot share the same output port with other alarm types; doing so would cause overlapping alarms. Conditions for LBA Alarm: 1. When orEV = onr (Reverse Action) and the instrument's control output continuously remains at otH: If, within the LBA set time, the PV increase is less than 2°C, an LBA alarm is triggered.2. When orEV = ond (Direct Action) and the instrument's control output continuously remains at otH: If, within the LBA set time, the PV decrease is less than 2°C, an LBA alarm is triggered.	0~9999 sec (Default Value 0)
ALtd (Altd)	Alarm output definition	Note on ALtd Parameter Configuration:The ALtd parameter is represented as a four-digit number. Each digit corresponds to a specific output port, allowing you to configure different alarm types for each port: - Thousands digit (the leftmost digit): AU2 port - Hundreds digit: Au1 port - Tens digit: Al2 port - Ones digit: Al1 port; Each digit can be set to a value from 0 to 9, which determines the type of alarm assigned to that port:- 0: No alarm output - 1: HIAL (High-limit alarm) - 2: LoAL (Low-limit alarm) - 3: dHAL (High-deviation alarm) - 4: dLAL (Low-deviation alarm) - 5: HIAL + LoAL outside-range alarm - 6: dHAL + dLAL outside-deviation alarm - 7: HIAL + LoAL inside-range alarm - 8: dHAL + dLAL inside-deviation alarm - 9: LBA (Loop Break Alarm) For example, if ALtd = 3091: - AU2 (thousands digit = 3) -> dHAL (High-deviation alarm) - AU1 (hundreds digit = 0) -> No alarm - AL2 (tens digit = 9) -> LBA (Loop Break Alarm) - AL1 (ones digit = 1) -> HIAL (High-limit alarm) This setting allows each port to provide a specific, distinct type of alarm output as configured.	0~9999 (Default Value 1)

<table>
<tr><td></td><td></td><td>

<table>
<tr><th>value</th><th>Representative alarm function parameters</th></tr>
<tr><td>0</td><td>No alarm output</td></tr>
<tr><td>1</td><td>HIAL(High limit alarm)</td></tr>
<tr><td>2</td><td>LoAL(Low limit alarm)</td></tr>
<tr><td>3</td><td>HdAL(High-deviation alarm)</td></tr>
<tr><td>4</td><td>LdAL(Low-deviation alarm)</td></tr>
<tr><td>5</td><td>HIAL+LoAL(outside-range alarm)</td></tr>
<tr><td>6</td><td>HdAL+LdAL(outside-deviation alarm)</td></tr>
<tr><td>7</td><td>HIAL+LoAL(inside-range alarm)</td></tr>
<tr><td>8</td><td>HdAL+LdAL(inside-deviation alarm)</td></tr>
<tr><td>9</td><td>LBA(Loop Break Alarm)</td></tr>
</table>
Example: If ALtd = 961, then:
- AL1 (ones digit = 1): Outputs HIAL (High-limit alarm)
- AL2 (tens digit = 6): Outputs dHAL + dLAL (High and Low Deviation), achieving an outside-deviation alarm
- AU1 (hundreds digit = 9): Outputs LBA (Loop Break Alarm)
- AU2 (thousands digit = 0, since no digit was specified there): No alarm output</td><td></td></tr>
<tr><td>AHYS
(AHYS)</td><td>Alarm hysteresis</td><td>Also known as alarm hysteresis or deadband, this parameter helps prevent frequent switching of the alarm relay near the threshold point. Once the alarm output turns ON, it will not turn OFF until the measured value crosses the set threshold by the hysteresis amount.</td><td>0~200.0
[0-2000]
(Default Value 2)</td></tr>
<tr><td>Adon
(Adon)</td><td>Alarm ON delay</td><td>The Alarm ON Delay is a setting that determines the delay time (in seconds) before the alarm is activated. If Adon=0, the alarm ON delay function is disabled.</td><td rowspan="2">0~999
(Default Value 0)</td></tr>
<tr><td>AdoF
(AdoF)</td><td>Alarm OFF delay</td><td>The Alarm OFF Delay is a setting that determines the delay time (in seconds) before the alarm is deactivated. If AdoF=0, the alarm OFF delay function is disabled.</td></tr>
<tr><td>Adt
(Adt)</td><td>Alarm delay definition</td><td>The alarm delay function can be configured as follows:
- 0: No alarm delay function.
- 1: Delay applies to AL1 alarm output.
- 2: Delay applies to AL2 alarm output.
- 3: Delay applies to AUX alarm output.
- 4: Reserved for future use.
- 5: Delay applies to both AL1 and AL2 alarm outputs.
- 6: Reserved for future use.
- 7: Delay applies to AL1, AL2, AU1, and AU2 alarm outputs.</td><td>0~7
(default Value 0)</td></tr>
<tr><td>ALL
(ALL)</td><td>Definition of alarm self lock</td><td>When the Alarm Latch Function is enabled, the alarm output remains latched regardless of any changes in the measured value. The alarm will only reset if the device is powered off and back on while the measured value no longer meets the alarm condition.
The settings are as follows:
- 0: No alarm latch function.
- 1: Latch applies to AL1 alarm output.
- 2: Latch applies to AL2 alarm output.
- 3: Latch applies to AUX alarm output.
- 4: Reserved for future use.
- 5: Latch applies to both AL1 and AL2 alarm outputs.
- 6: Reserved for future use.
- 7: Latch applies to AL1, AL2, AU1, and AU2 alarm outputs.</td><td>0~7
(default Value 0)</td></tr>
</table>

<table>
<tr><td>ALE
(ALE)</td><td>Definition of First alarm exemptions</td><td>When the Power-On Alarm Suppression function is enabled, the instrument does not immediately trigger an alarm after powering on, even if the alarm conditions are met. The alarm will only activate if the conditions are met again after first being cleared.
The settings are as follows:
- 0: No power-on alarm suppression function.
- 1: Suppression applies to HIAL alarm.
- 2: Suppression applies to LoAL alarm.
- 3: Suppression applies to HdAL alarm.
- 4: Suppression applies to LdAL alarm.
- 5: Suppression applies to both HIAL and LoAL alarms.
- 6: Suppression applies to both HdAL and LdAL alarms.
- 7: Suppression applies to HIAL, LoAL, HdAL, and LdAL alarms.</td><td>0~7
(Default Value 0)</td></tr>
<tr><td>Int
(Int)</td><td>Input specification Code</td><td>The AiFUZZY-915/975 offers a wide range of input specifications that can be freely configured, as detailed below:
<table>
<tr><th>Int</th><th>Input spec</th><th>Int</th><th>Input spec</th></tr>
<tr><td>0</td><td>K(−50.0~+1300°C)</td><td>18</td><td>J(0~300.00)</td></tr>
<tr><td>1</td><td>S(-50~+1700℃)</td><td>20</td><td>Cu50</td></tr>
<tr><td>2</td><td>R(-50~+1700℃)</td><td rowspan="2">21</td><td rowspan="2">Pt100(−200.0~+600.0°C)</td></tr>
<tr><td>3</td><td>T(-200~+350℃)</td></tr>
<tr><td>4</td><td>E(0~800℃)</td><td rowspan="2">22</td><td rowspan="2">Pt100(-100~+300.00°C)</td></tr>
<tr><td>5</td><td>J(0~1000℃)</td></tr>
<tr><td>6</td><td>B(200~1800℃)</td><td>25</td><td>0~75mV</td></tr>
<tr><td>7</td><td>N(0~1300℃)</td><td>26</td><td>0~80Ω</td></tr>
<tr><td>8</td><td>WRe3-WRe25</td><td>27</td><td>0~400Ω</td></tr>
<tr><td>9</td><td>WRe5-WRe26</td><td>28</td><td>0~20mV</td></tr>
<tr><td rowspan="2">10</td><td rowspan="2">Special custom input specification</td><td>29</td><td>0~100mV</td></tr>
<tr><td>30</td><td>0~60mV</td></tr>
<tr><td rowspan="2">12</td><td rowspan="2">F2 radiation type pyromter</td><td>31</td><td>0~500mV</td></tr>
<tr><td>32</td><td>100~500mV</td></tr>
<tr><td rowspan="2">15</td><td rowspan="2">Spare</td><td>33</td><td>1~5V(4~20mA)</td></tr>
<tr><td>34</td><td>0~5V(0~20mA)</td></tr>
<tr><td rowspan="2">16</td><td rowspan="2">Spare</td><td>35</td><td>0-10V</td></tr>
<tr><td>36</td><td>2-10V</td></tr>
<tr><td>17</td><td>K(0~300.00)</td><td>37</td><td>0-20V</td></tr>
</table></td><td>0~37
(Default Value 0)</td></tr>
<tr><td>dP
(dP)</td><td>Decimal Point Position</td><td>Four display formats are available: 0, 0.0, 0.00, and 0.000.
Note: When using standard thermocouple or RTD (resistance temperature detector) inputs, only 0 and 0.0 formats are supported.</td><td>(Default Value 0)</td></tr>
<tr><td>InL
(InL)</td><td>Input Scale Lower Limit</td><td>Defines the lower scale value for linear input signals. When the instrument is used as a transmitter, it also defines the lower scale value for the output signal.(CntL=Pvtr or Svtr) .</td><td rowspan="2">999~ 3200 [-9990~ 32000] (Default Value 300)</td></tr>
<tr><td>InH
(InH)</td><td>Input Scale HigherLimit</td><td>Defines the upper scale value for linear input signals. When the instrument is used as a transmitter, it also defines the upper scale value for the output signal.(CntL=Pvtr or Svtr) .</td></tr>
</table>

SC (SC)	Input Correction	This parameter applies an offset adjustment to the input signal to compensate for errors in the sensor or the input signal itself. The SC parameter is typically set to 0.Adjustment is not recommended unless necessary, as incorrect settings can introduce additional errors.	-199~400 [-1990~4000] (Default Value 0)
InF (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 0)
dU (dU)	Temperature unit	°C: Celsius. °F: Fahrenheit. Thermocouples and RTDs only	(Default Value ° C)
AdrS (AdrS)	Communication address	If the instrument's COMM port is configured with an S-type RS485 communication interface module, it can be connected to a computer in a multi-device setup. Through the computer, all parameters of the instrument can be read and adjusted. For computers without an RS485 interface, an RS232C/RS485 converter or a USB/RS485 converter can be used. The AdrS parameter defines the communication address of the instrument, with a valid range of 0 to 80. - Each instrument on the same communication line must have a unique AdrS value to ensure proper identification and distinction.	0~100 (Ex-factory Value 1)
bPS (bPS)	Baud rate	The bPS parameter defines the communication baud rate, with a configurable range of 1200 to 19200 bit/s (1.2 to 19.2 Kbps). If the instrument does not require communication functionality, the bPS parameter can be configured to use the AUX port as a transmitter for the PV (Process Variable) measurement value. This enables the instrument to provide one PID control output and one transmission output. The configurations are as follows: - bPS = 3: The AUX port is set to transmit measurement values as a 0~20mA output. - bPS = 4: The AUX port is set to transmit measurement values as a 4~20mA output.	0~19.2K (Default Value 9600)
PArI (PArL)	Communication parity	nonE:No verification. odd:Odd. EVEn: Even	(Default Value nonE)
Comm (COMM)	Communication protocol	FBUS: instrument communication protocol for FTBUS. MBUS: instrument communication protocol for MODBUS.	(Default Value MBUS)
Evt (Evt)	Event input type	When the MIO position is equipped with an I2 switch signal module, the Evt parameter can be configured for the following functionalities: - oFF: Disables the event input function. - ruSt: Run/Stop Control - When the MIO port is set as an I2 switch signal input: - A short press of the switch signal starts the operation control (RUN). - Holding the switch for more than 2 seconds stops the control (STOP). - SP1.2: Setpoint Switching Control - When fixed-point control is enabled (975 parameter PrSn=0): - If the MIO switch signal is disconnected, the set value (SV) is SP1. - If the MIO switch signal is connected, the set value (SV) switches to SP2.	(Default Value oFF)

		- 2PId: Dual PID Control - For single-direction control (not dual heating/cooling control): - If the MIO switch signal is disconnected, the system uses P, I, D, and CP parameters for PID regulation. - If the MIO switch signal is connected, the system switches to using P2, I2, D2, and CP2 parameters for PID regulation.	
SSCo (SSCo)	Advanced System Code	The SSCo parameter is used to select advanced functionalities by calculating a value based on the formula: SSCo=A×1+B×2 +C×4 +D×8+E×16+F×32+G×64+H×128 Configuration Options: A - A=0: HIAL and LoAL are configured as absolute high and low limit alarms. - A=1: HIAL and LoAL are changed to deviation high and low limit alarms, allowing for four deviation alarms. B - B=0: HdAL and LdAL are configured as deviation high and low limit alarms. - B=1: HdAL and LdAL are changed to absolute high and low limit alarms, providing two absolute high and two absolute low alarms. C - C=0: Alarm and hysteresis adjustment are configured as single-sided hysteresis. - C=1: Alarm and hysteresis adjustment are configured as double-sided hysteresis. D, E, F, G - Reserved. Must be set to 0. H - H=0: Precision Control Mode - The internal PID resolution is 10 times the displayed value (e.g., if the temperature is displayed as 1°C, internal PID operates with 0.1°C resolution). - Maximum display value for linear input is 3200 units. - H=1: Wide-Range Display Mode - Use this mode when linear input values exceed 3200 units. Example Calculation: If the requirement is: - HIAL as absolute high limit alarm, - HdAL as absolute high limit alarm, - Alarm hysteresis as double-sided hysteresis, - No specific requirements for other options: The calculation is: SSCo=0x1+1x2+1x4 +0×8+0×16+0×32+0×64++0x128=6 Thus, the SSCo value is 6.	0~255 (Default Value 0)
SPL (SPL)	Min of SV	Minimum value that SV is allowed to be.	-999~3200 [-9990~32000] (Default Value -999~3200)
SPH (SPH)	Max of SV	Maximum value that SV is allowed to be.	
SP1 (Sp1)	Set point 1	For the 915 or 975 model, when the parameter PrSn=0 or 1, and Evt=SP1.2 is set for event input, it can be used to switch to Setpoint 1 (SP1). Under normal conditions, the set value (SV) defaults to SP1.	
SP2 (SP2)	Set point 2	For the 915 or 975 model, when the parameter PrSn=0 or 1, and Evt=SP1.2 is set for event input, it can also be used as Setpoint 2 (SP2). When the MIO port is configured as an I2 switch signal input and the Evt=SP1.2 parameter is set, an external switch can be used to toggle between SP1 and SP2: - When the switch is disconnected, the set value (SV) is SP1. - When the switch is connected, the set value (SV) switches to SP2.	-999~3200 [-9990~32000] (Default Value 0)

Pont (Pont)	Power-On Automatic Operation Mode (Applicable only to the 975 model)	The power-on automatic operation mode determines the instrument's behavior after a power outage and subsequent restoration. The options are: - Cont: - If the instrument was in a stopped state before the power outage, it remains stopped upon power restoration. - Otherwise, the instrument resumes execution from where it stopped. - StoP: - Regardless of the previous state, the instrument enters the stopped state upon power restoration. - run1: - If the instrument was in a stopped state before the power outage, it remains stopped. - Otherwise, it restarts the program from the beginning upon power restoration. - dASt: - After power restoration, the program continues execution if no deviation alarm is present. - If a deviation alarm occurs, the program stops. - HoLd: - If the instrument was running before the power outage, it enters a pause state upon power restoration. - If the instrument was stopped before the power outage, it remains in the stopped state upon power restoration.	(Default Value run1)
PSYS (PSyS)	Program Running mode (applicable only to 975)	The PSYS parameter is used to configure program control functionalities by calculating a value based on the following formula: PSYS = A×1 + B×2 + C×4 + D×8 + E×16 + F×32 1. A (Ready Function): - A=0: The ready function (rdy) is disabled. - A=1: The ready function is enabled. 2. B (Program Mode): - B=0: Ramp Mode: - When a temperature difference exists during program execution, the transition follows a ramp (linear). - Allows for different heating modes or cooling execution. - B=1: Platform Mode (Constant Temperature Mode): - Each program segment defines a setpoint and holding time. - The transition rate between segments can be limited by the rAtE parameter. - Transition to the next segment may be restricted by the rdy (ready function) parameter. - Note: If the program's final segment does not end with a termination command, the constant temperature mode is executed even if B=0, and the program ends automatically when the time is up. 3. C (Time Unit): - C=0: Program time is in minutes. - C=1: Program time is in hours. 4. D (Measurement Value Start): - D=0: Measurement value start function is disabled. - D=1: Measurement value start function is enabled. 5. E (Display Window): - E=0: When used as a program setpoint generator, the upper display window shows the measured value. - E=1: When used as a program setpoint generator, the upper display window shows the program segment number. 6. F (Run Behavior): - F=0: Standard Operation Mode: The program executes normally when running.- F=1: If the RUN operation is triggered during program execution, the program enters the pause (HoLd) state.	(Default Value 0)
PrGd (PrGd)	Program grouping (applicable only to 975)	The PrGd parameter is used to define the program grouping configuration: - PrGd = 0: No forced grouping of the program. - PrGd = 4: The program is divided into 4 groups, each with 20 segments. This allows for up to 4 curves to be programmed: - Curve 1: Program segments 1-20. - Curve 2: Program segments 21-40. - Curve 3: Program segments 41-60. - Curve 4: Program segments 61-80. - PrGd = 8: The program is divided into 8 groups...	0~8 (Default Value 0)
(PrSn) PrSn	No. of Program (applicable only to 975)	When PrGd=0, the program does not use forced grouping. The PrSn parameter defines the number of active program segments, with a range from 0 to 80. This allows unnecessary program segments to be removed, making operation and program setup more convenient for the end user. - When PrSn=0, the 975 operates in constant temperature mode, fully compatible with the operation of the 815 model. - The rAte parameter can be used to limit the heating rate. - When PrSn=1, the instrument operates in single-segment mode, requiring only one setpoint value and one hold time, making it very simple to configure. - When PrSn=2-50, the 975 operates in normal program control mode with the specified number of segments (e.g., setting PrSn=10 means the instrument will have only 10 segments, and the other segments will not be displayed). When PrGd=4 or PrGd=8, the program is forced into grouping, and the PrSn parameter is fixed to 80 and cannot be modified.	0~8 (Default Value 80)

<table>
<tr><td>LoC2
(LoC2)</td><td>Parameter Lock</td><td>Parameter was protected by LoC2 (Parameter LOCK) to prevent setting error. The function was shown as below:
√ : allow to modify data or execute
: not allow to modify data or execute
Run, Stop, Hold. and Program Time & Temp.

Function just for 975 only
<table>
<tr><th>LOC</th><th>Field parameters</th><th>SV</th><th>Program Step Time & Temp</th><th>Shortcut keys for run, stop, or hold</th></tr>
<tr><td>oFF</td><td>√</td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>LCK1</td><td>√</td><td>√</td><td>√</td><td></td></tr>
<tr><td>LCK2</td><td>√</td><td></td><td></td><td>√</td></tr>
<tr><td>LCK3</td><td>√</td><td></td><td></td><td></td></tr>
<tr><td>LCK4</td><td></td><td>√</td><td>√</td><td>√</td></tr>
<tr><td>LCK5</td><td></td><td>√</td><td>√</td><td></td></tr>
<tr><td>LCK6</td><td></td><td></td><td></td><td></td></tr>
</table></td><td>(Default Value oFF)</td></tr>
<tr><td>FP1
~
FP8
(FP1 ~FP8)</td><td>Field parameter definition</td><td>Through Fp1 to FP8, you can select any 8 parameters from the system and control settings to be used as field parameters, which are accessible by on-site operators. If there are fewer than 8 field parameters or if some are not needed, their values can be set to NONE. This allows flexibility in configuring which parameters are available for on-site operation.</td><td>(Default Value nonE)</td></tr>
</table>

9.3 Control parameter

In the field parameters, set Loc=801,Then press the F/↵ key to enter the control parameters.

Code	Name	Description	Range
CntL (CntL)	Control mode	- onoF: Uses ON-OFF control (binary control), which is suitable for applications with low control requirements. - FPId: Uses the advanced PID + FUZZY artificial intelligence control algorithm, which is recommended for more precise and dynamic control applications. - Pvtr: When the instrument is used as a measuring display instrument or digital transmitter, the SV will display the temperature unit. In the case of linear signal input, SV will not display, and the PV value can be used directly as the output value. If the OUT port is equipped with a 4-20mA module, the instrument can function as a transmitter. - Svtr: The SV value is directly used as the output value. When the OUT port is equipped with a 4-20mA module, the instrument can function as a program setpoint generator.	(Default Value FPId)
HYS (HYS)	Control Hysteresis	The ON-OFF hysteresis is used to prevent frequent switching of the relay in ON-OFF control applications. - For reverse action (heating) control: - When the PV (Process Variable) is greater than the SV (Setpoint), the relay is turned off. - When the PV drops below SV - HYS (hysteresis value), the relay is turned back on. - For direct action (cooling) control: - When the PV is less than the SV, the relay is turned off. - When the PV exceeds SV + HYS, the relay is turned back on. This hysteresis function ensures more stable control by preventing the relay from switching on and off too frequently due to small fluctuations in the process variable.	0~200.0 [0-2000] (Default Value 2)

orEu (orEv)	Acting control (Control direction)	onr: Reverse action control (heating control).When the input increases, the output tends to decrease (e.g., heating control).ond: Direct action control (cooling control).When the input increases, the output tends to increase (e.g., cooling control).	(Default Value onr)
dEZo (dEZo)	dead zone	This function is only applicable in heating and cooling dual-channel bidirectional control systems. - The dead zone is centered around the setpoint. - When the setpoint value is positive, it becomes the dead zone (non-action zone), where no control action is taken. - When the setpoint value is negative, it becomes the overshoot zone, where the system may exceed the setpoint temporarily to improve control. - The decimal point position is defined by the dP parameter.	-1999~ 9999 (Default Value 0)
Srun (Srun)	Running Status	- run: The running control state allows the system to operate normally and enables the execution of run or stop operations via the panel buttons. - StoP: The stopped state where the system is not running, but you can still start or stop the operation using the panel buttons. - HoLd: The hold running control state. - For the 915 or 975 models, if PrSn=0, this state is equivalent to the normal running state but prevents the use of panel buttons for starting or stopping the operation. - For the 875 model with PrSn>0 (program control), the instrument maintains control output but pauses the timing. In this state, the SV (setpoint value) is displayed with a flashing "HoLd" on the second display. The running control or stop can be performed through the panel buttons to exit the hold state. Note: You cannot enter the hold state using only the panel operation. The hold state can only be entered by directly modifying this parameter, through programming during program execution, via host communication, or event input.	(Default Value run)
At (At)	Auto tuning	- oFF: The auto-tuning (At) function is disabled. - on: The PID auto-tuning function is activated. After the auto-tuning process is complete, it will automatically return to oFF. - FoFF: The auto-tuning function is disabled, and it is forbidden to start auto-tuning from the panel controls.	(Default Value oFF)
P (P)	Proportional band (No.1 PID parameter)	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 [32000] (Default Value 25)
I (I)	Integral time (No.1 PID parameter)	The integral time for FPID control is measured in seconds. When I=0, the integral action is disabled.	1~9999sec (Default Value 200)
d (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 sec (Default factory Value 50)

CP (CP)	Control cycle (No.1 PID parameter)	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 2, OUT for relay, electrical output, when the Default value is: 15)
P2 (P2)	Proportional band 2 (No.2 PID parameter)	In heating and cooling dual-output systems, the cooling output proportional band for FPID control is defined in the same units as the PV (Process Variable) value, rather than as a percentage of the range.For the 975 model with 3 sets of PID parameters, the proportional band for the second set of PID parameters is used for controlling the cooling output.	1~3200 [32000] (Default Value 25)
I 2 (I2)	Integral Time 2 (No.2 PID parameter)	In a heating and cooling dual-output system, the integral time for the cooling output in FPID control is defined in seconds. When I=0, the integral action is disabled.For the 975 model with 3 sets of PID parameters, the integral time is applied to the second set of PID parameters for controlling the cooling output.	1~9999sec (Default Value 200)
d2 (d2)	Derivative time 2 (No.2 PID parameter)	In a heating and cooling dual-output system, the derivative time for the cooling output in FPID control is defined in 0.1-second units. When d=0, the derivative action is disabled. For the 975 model with 3 sets of PID parameters, the derivative time is applied to the second set of PID parameters for controlling the cooling output.	0~3200 (Default Value 50)
CP2 (CP2)	Control cycle 2 (No.2 PID parameter)	In a heating and cooling dual-output system, the control cycle for the cooling output in FPID control defines the time interval for adjusting the control action. For the 975 model with 3 sets of PID parameters, this control cycle is applied to the second set of PID parameters for controlling the cooling output. - When using SSR (Solid-State Relay), SCR (Silicon-Controlled Rectifier), or current output, the recommended control cycle is typically between 0.5 to 3.0 seconds. - When the output is a relay switch (i.e., oUt or Aut is set to rELY), the actual control period (CP) will be limited to 3 seconds or more. - For relay-based control, the recommended control cycle is generally between 20 to 40 seconds to allow for proper switching and avoid excessive wear on the relay.	0.2~ 300.0 (Default Value 2)
P3 (P3)	Proportional band 3 (No.3 PID parameter)	Applicable to 975 only.	1~3200 [32000] (Default Value 25)

I 3 (I3)	Integral time 3 (No.3 PID parameter)	Applicable to 975 only.	1~9999 sec (Default Value 200)
d3 (d3)	Derivative time 3 (No.3 PID parameter)	Applicable to 975 only.	0~3200 sec (Default Value 50)
CP3 (CP3)	Control cycle 3 (No.3 PID parameter)	Applicable to 975 only.	0.2~ 300.0 (Default Value 2)
oUt (oUt)	OUT primary output type	- Ssr: Output for SSR (Solid-State Relay) drive voltage or SCR (Silicon-Controlled Rectifier) zero-crossing trigger signal. - rELy: Output as a relay contact switch. - 0-20: 0~20mA linear current output (or 0-5V or 0-10V linear voltage output). - 4-20: 4~20mA linear current output (or 1-5V or 2-10V linear voltage output). - PHA: Single-phase SCR phase-shift output. Note: Incorrect settings for the oUt parameter may result in abnormal output operation.	(Factory default values are set according to the purchased model).
AUt (Aut)	AUX auxiliary output type (as a cooling output)	Ssr: Output for SSR (Solid-State Relay) drive voltage or SCR (Silicon-Controlled Rectifier) zero-crossing trigger signal. rELy: Output as a relay contact switch. 0-20: 0~20mA linear current output. 4-20: 4~20mA linear current output.	(Factory default values are set according to the purchased model).
otL (otL)	Min output	The Output Lower Limit (otL) setting functions as the minimum output value for single-direction control when set between 0 to 100%. When set between -1% and -110%, the instrument operates in a dual-output system with heating/cooling control. This enables dual PID control, where: - The main output (oUt) is used for heating. - The auxiliary output (AUX) is used for cooling. In this case: - otL reflects the maximum cooling output limit. - When otL = -100%, there is no restriction on the cooling output. - When otL = -110%, the maximum output range can exceed 100% (e.g., for current outputs like 4-20mA), which may be needed in special cases. - For SSR or relay outputs, the maximum cooling output limit should not exceed 100%. Note: When changing otL from a positive to a negative value, or vice versa, a power cycle (reboot) is required for the changes to take effect.	-110~ +110% (Default Value 0)
otH (otH)	Max output	The Output Upper Limit (otH) restricts the maximum value of the main output (oUt). The range for this setting is 0 to 110%. When using SSR (Solid-State Relay) or relay outputs, the maximum output limit should not exceed 100%. When using current output systems (e.g., 4-20mA), setting 110% allows the maximum output to exceed the nominal range (e.g., beyond 20mA), which can be useful in special cases. Additionally, the otH setting must always be greater than otL (output lower limit).	

		- otH can also be used in conjunction with otEr (output error limit) to implement segmented power limiting. - When the measured value (PV) is less than otEr, the maximum output value (oUt) is limited by otH. - When PV exceeds otEr, the output upper limit is corrected back to 100%.than otL.	0~110% (Default Value 100)
oᴇEr (otEr)	Work range of OPH	The otEr parameter enables segmented power limiting, allowing the system to adjust the output limits based on the measured value (PV). - When PV is less than otEr, the main output (oUt) upper limit is set to otH. - When PV exceeds otEr, the output is no longer limited and is set to 100%. This feature is useful in situations where full power heating is not allowed at low temperatures, such as in drying processes where rapid heating needs to be avoided, or in applications like ovens where moisture must be removed gradually. For example: - If the system is required to limit the heating power to 30% when the temperature is below 150°C, you can set: - otEr = 150.0°C (temperature threshold) - otH = 30% (maximum output power when PV < 150°C) In this case: - When the temperature is below 150°C, the output power is limited to 30%. - When the temperature exceeds 150°C, the output power can go up to 100%.	0-3200℃ /mi-999~ 3200℃ or Linear unitn (Default Value 3200)
rAtE (rAtE)	Heating rate limit	When the rAtE (rate of change) parameter is enabled, it defines a temperature ramp-up rate during program startup. Specifically: - If the measured value (PV) is lower than the setpoint (SV) at the beginning of the program, the system will gradually increase the temperature at the rate defined by rAtE until the setpoint is reached. - While in this ramping state, the PAR indicator light will flash to indicate that the system is limiting the heating rate. - In Slope Mode (rAtE = 0 or defined as a ramp), rAtE applies only to the first program segment. - In Platform Mode (defined by the program), rAtE is applied to all program segments, controlling the ramp-up rate for each segment.	0-3200℃ /min (Default Value 0)

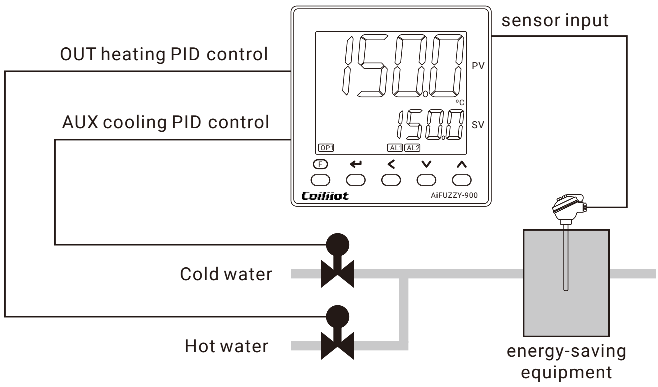
■10.Additional Functions

10.1 Phase Shift Trigger Output (SCR Voltage Regulation Output)

When the OUT is set to PHA, installing a K5/K6 module at the OUT port allows for a single-channel SCR phase shift trigger output. This system can adjust the heating power continuously by controlling the conduction angle of the SCR (either 2 unidirectional anti-parallel SCRs or 1 bidirectional SCR). It also applies nonlinear power correction based on the characteristics of the sine wave, achieving highly ideal control results. The trigger uses self-synchronization technology, allowing the instrument power supply and heater power supply to be different.Additionally, you can install X or X5 modules at the OUT port to output linear current or voltage signals, which can then trigger single-phase or three-phase SCR voltage regulation modules (SCR).This module is currently only suitable for regions with a 50Hz power supply.

10.2 Heating/Cooling Dual PID Dual Control Output

When the setting for otL is a negative value (-1 to -110%), the instrument becomes a bidirectional regulation system, providing heating/cooling dual PID dual output functionality. The main output oUt is used for PID heating control output, while the auxiliary output AUX is used for PID cooling control output, as shown in the diagram below:

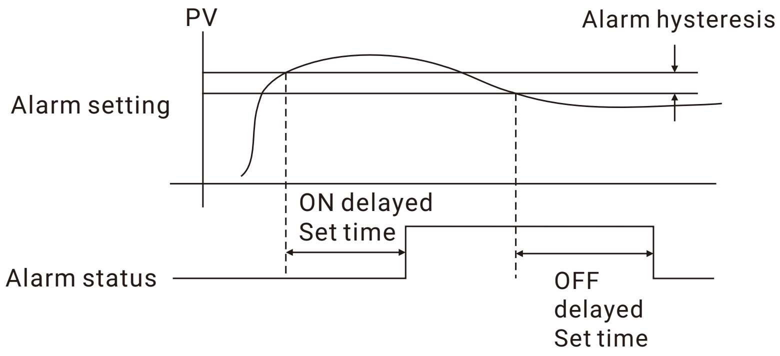


10.3 Temperature Transmitter/Program Setpoint Generator

In addition to functioning as a conventional FPID or ON-OFF control system, the instrument can also output the measured value (PV) or setpoint value (SV) directly from the OUT port. When the output is defined as a current output, the AiFUZZY-915 can be used as a temperature transmitter, and the AiFUZZY-975 can serve as a program setpoint generator. The 4-20mA current output accuracy is 0.3% of the corresponding display value (FS). The relevant parameter settings are as follows:CntL=Pvtr for transmitting the PV value as output.CntL=SVtr for transmitting the SV value as output.oUt, otL, and otH are used to select the output range limits. Typically, a 4-20mA or 0-20mA output is chosen.

10.4 Alarm delay

Chart of alarm delay output:



The alarm ON interval is defined by the ON delay setting. If the condition is below the ON delay, the alarm output will not turn ON. Similarly, the alarm OFF interval is defined by the OFF delay setting. If the condition is below the OFF delay, the alarm output will not turn OFF. During the ON delay, if the alarm switches from ON -> OFF -> ON, the measurement will reset and start counting from the time the alarm was last turned ON. Similarly, during the OFF delay, if the alarm switches from OFF -> ON -> OFF, the measurement will reset and start counting from the time the alarm was last turned OFF.

10.5 Alarm Latching Function

If the alarm latching function is enabled, the alarm output will remain ON regardless of temperature changes when the alarm is triggered.

Alarm Unlocking Method: The alarm will be released after power is cut off (once the controller is powered back on, if the measured value no longer meets the current alarm condition, the alarm will turn off).This function is typically used for over-temperature protection. It can be employed to forcefully shut down the main power supply in the event of over-temperature, and it will remain off until the operator resolves the fault.

10.6 Power-On Alarm Suppression Function

When the instrument is powered on, unnecessary alarms may often be triggered. For example, in electric furnace temperature control (heating control), right after power-on, the actual temperature is much lower than the set point temperature. If the user has set a lower limit alarm or deviation lower limit alarm, the alarm condition may immediately be met upon power-up, even though the control system may not necessarily have any issues. On the other hand, in cooling control (direct action control), power-on may trigger an upper limit alarm or deviation upper limit alarm. To address this, the AiFUZZY-900 series instruments offer a power-on alarm suppression feature. When the orEV parameter is set to onr or ond, the instrument will not immediately trigger the alarm, even if the corresponding alarm conditions are met at power-on. The alarm will only be activated after the condition is cleared, and if the alarm conditions are met again, the alarm will be triggered.

10.7 LBA Control loop break off / shorted Alarm

When the control output reaches otH or otL, the LBA (Loop Break Alarm) monitors changes in the PV (Process Variable) value at each interval, based on the set LBA time. The amount of change is used to determine whether there is an abnormality in the control circuit. The time unit for LBA is in seconds, and it triggers the AL1 alarm.

The alarm conditions are as follows:

When orEV is set to onr (Reverse action):If the instrument’s control output remains at otH and the increase in the measured value (PV) within the LBA set time is less than the threshold for LBA judgment (e.g., 2°C), the alarm is triggered.

When orEV is set to ond (Positive action):If the instrument’s control output remains at otH and the measured value (PV) decreases by less than the LBA judgment range (e.g., 2°C), the alarm is triggered.

10.8 Fine Control

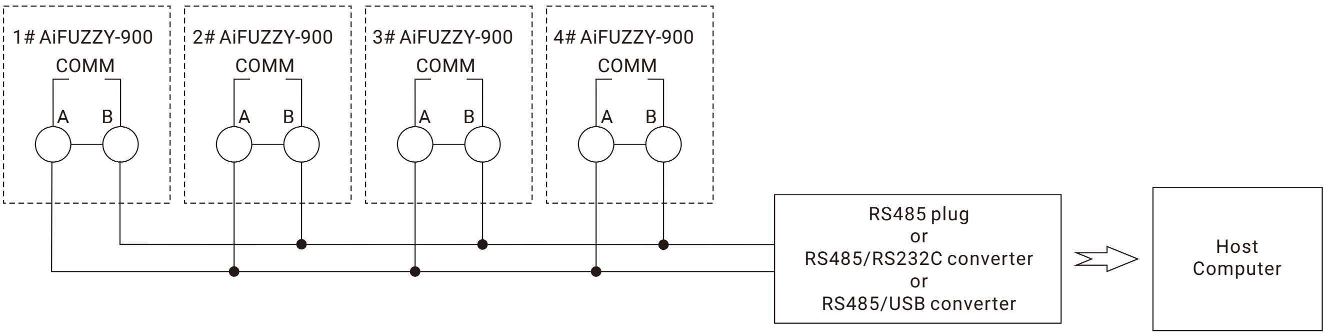
Fine control refers to a PID calculation resolution that is 10 times higher than the display resolution. For example, while the instrument may display a temperature signal with a resolution of 1°C, the internal PID computation and control still operate at a 0.1°C resolution. This allows for a control precision much higher than the display resolution. In previous versions of the AiFUZZY-900 series, fine control mode was only applied to the temperature signal. In the new version, for linear inputs, as long as the displayed value range is below 3000 characters (most industrial applications do not exceed 3000 characters), fine control mode is enabled by default to achieve higher control precision and more stable output. When a display value range exceeds 3000 characters, the setting SSCo.H = 1 can be used to disable fine control mode.

10.9 Communication function

If the instrument's COMM port is configured with an S-type RS485 communication interface module, it can be connected to a computer for multi-device communication. Through the computer, various operations and functions of the instrument can be controlled. For computers without an RS485 interface, an RS232C/RS485 converter or a USB/RS485 converter can be added. Each communication port can directly connect 1 to 60 instruments. With an RS485 repeater, up to 80 instruments can be connected. A single computer can support multiple communication ports. Note that each instrument should be assigned a unique address. When there are many instruments, two or more computers can be used, and these computers can form a local network.

RS232C Communication

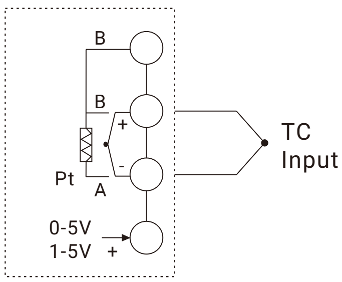
If the instrument's COMM port is configured with an S2-type RS232C communication interface module, it can only support one-to-one communication, as RS232C communication is not capable of multi-device communication.



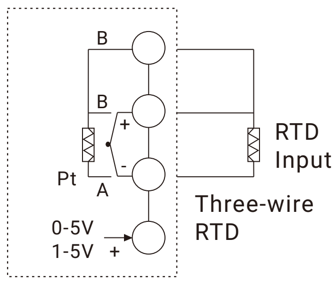
11.Partial application wiring methods

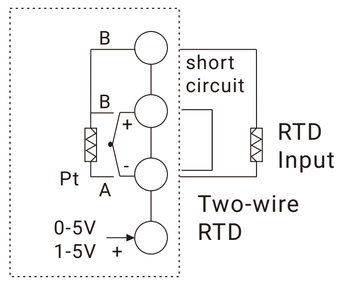
11.1 The wiring method of the input signal

Thermocouple Input

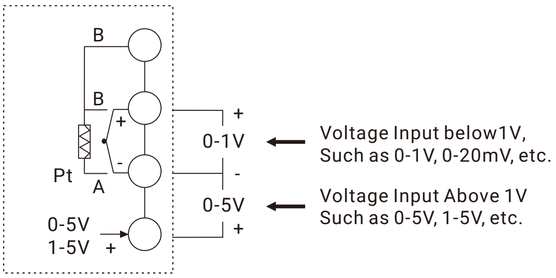


RTDs Input



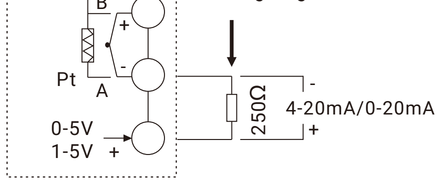


Analog linear voltage input

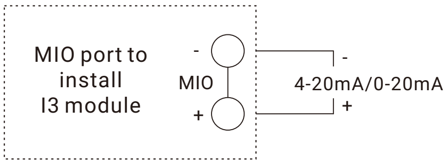


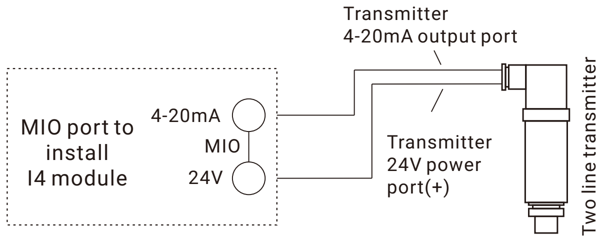
Analog linear current input

4-20mA Linear Current Input, an external 250-ohm resistor can be connected to convert the 4-20mA current signal into a 1-5V voltage signal.

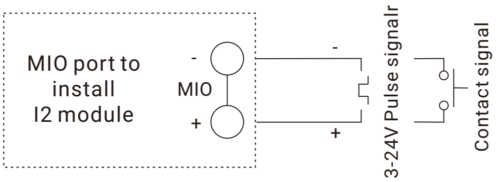


MIO port input linear current



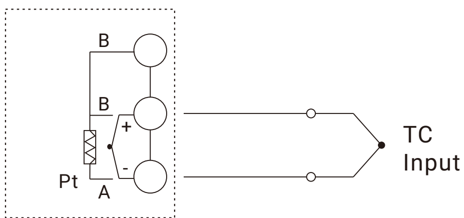


MIO port event input

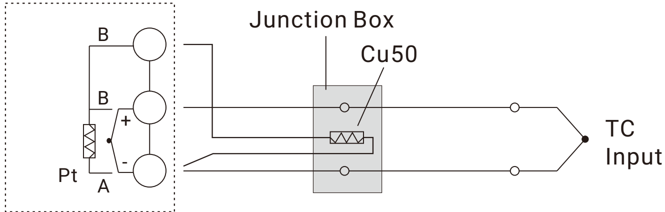


If the I2 module is installed on the MIO port, an external switch can be connected to perform control functions. When the parameter Et=ruSt is set, pressing the button once will execute the "run" operation. If the button is pressed and held for more than 2 seconds, the "stop" operation will be executed.For AiFUZZY-915 (or AiFUZZY-975) instruments with the parameter PrSn=0 and EVt=SP1.2, this can be used to switch between two different setpoints, SP1 and SP2.

Choosing thermocouple cold junction compensation mode based on wire connection



(1)Internal Automatic Compensation Mode
(The compensation wire should be directly connected to the terminal block.)

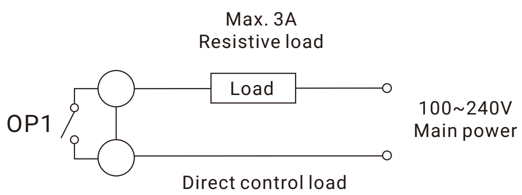


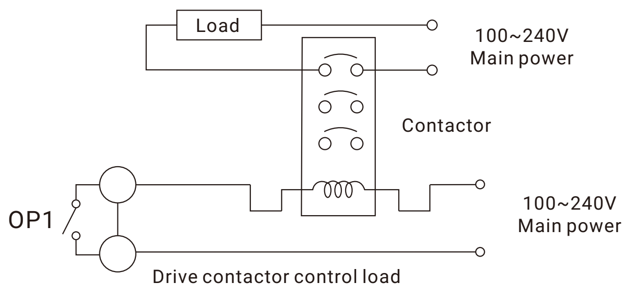
(2)External Copper Resistance Automatic Compensation Mode
(The thermocouple cold junction terminal box should be kept away from heat sources.)

When using a thermocouple as an input signal, according to the principle of thermocouple temperature measurement, it is necessary to compensate for the temperature at the thermocouple's cold junction. The AiFUZZY-900 instrument can automatically compensate for the cold junction temperature based on the temperature near the terminal block at the rear of the instrument. However, due to factors such as measurement element errors, heat generated by the instrument itself, and nearby heat sources, the automatic compensation method may result in a significant deviation, which in the worst case can exceed 2°C.Therefore, for applications requiring high temperature measurement accuracy, an external junction box can be used. In this box, a Cu50 copper resistance (to be purchased separately) and the thermocouple cold junction should be placed together, away from heat sources. This approach ensures that the measurement inconsistency caused by compensation is reduced to less than 0.3°C.

11.2 Main control output wiring method

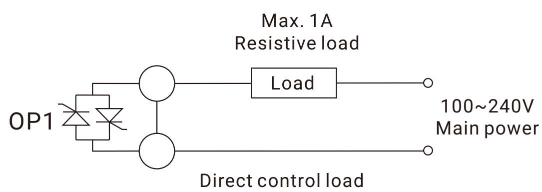
Relay output (OUT port installs R module)

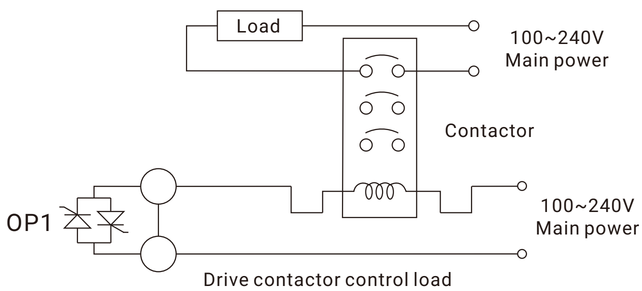




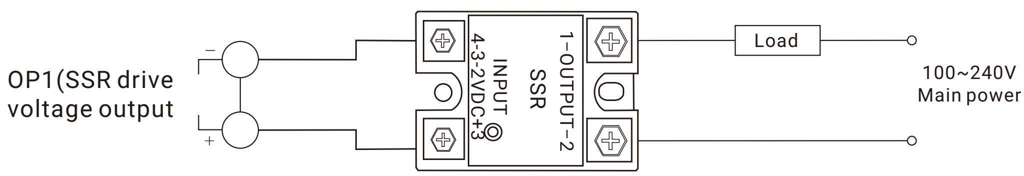
Silicon-Controlled Rectifier (SCR) Solid-State Switch Output (Built-in SSR Output) (W Module Installed at OUT Port)

This new type of solid-state switch module functions like a built-in SSR output and can replace relay contact switches. Compared to relay contact output modules, the W module offers a longer service life and lower interference. It significantly reduces equipment interference from sparks and greatly improves system stability and reliability. It can directly control resistive loads under 1A/240V (e.g., directly controlling a heating element up to 250W). For loads above 1A, it can control larger currents through an AC contactor.The driving element of the solid-state switch is a silicon-controlled rectifier (SCR), so it is only suitable for controlling loads in the 100-240VAC range.

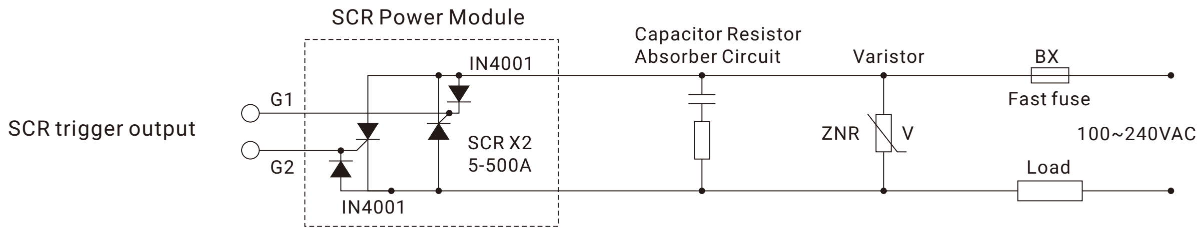


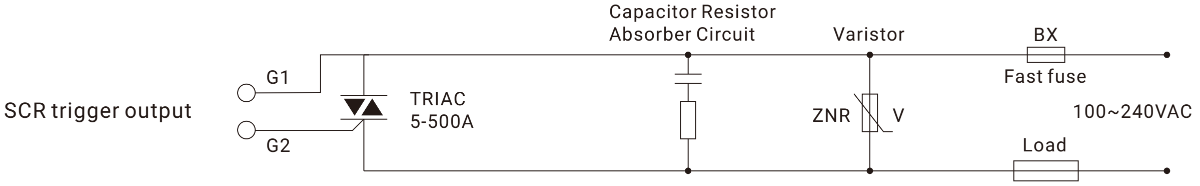


12V SSR drive voltage output(OUT port installed Q module)



Silicon-Controlled Rectifier (SCR) Trigger Output (K1, K5, K6 Modules Installed at OUT Port)

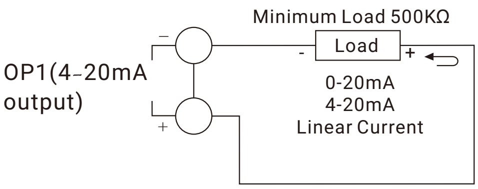


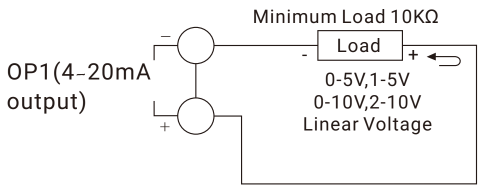


Note 1: Select a varistor based on the load voltage and current size to protect the SCR. If the load is inductive or phase -shift triggering is used, an RC snubber circuit must be added.
Note 2: It is recommended to use an SCR power module, which contains two unidirectional SCRs inside, as shown in the dashed part of the diagram.
Note 3: When using the K5 phase-shift trigger output module, the AC power supply range is reduced to 200-240VAC. When using the K6 phase-shift trigger output module, the AC power supply range is reduced to 340-415VAC, and the power frequency must be 50Hz.
Note 4: When using a three-phase, three-wire electric furnace with time-proportional zero-crossing trigger control, only two bidirectional SCRs are needed for reliable control.

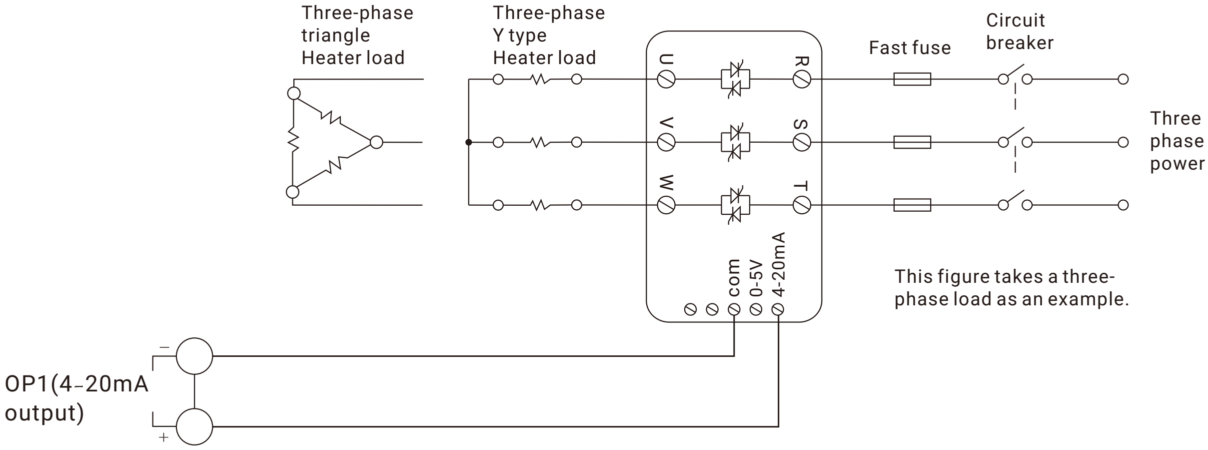
Linear Current and Voltage Output (X, X5, X8 Modules Installed at OUT Port)

Can Drive: SCR power regulators, SCR phase-shift trigger modules, PLCs, inverters, transmitters, valve actuators, and other devices.





The following diagram illustrates the use of a 4-20mA output to trigger an SCR voltage regulation module or SCR power regulator to control a three-phase heater, achieving power adjustment output:



■12.Input Error

When the display window alternates between SV and the "orAL" characters, it indicates an input signal error or out-of-range measurement. Please check whether the Int parameter setting matches the type of input sensor signal being used. If they match, verify that the input sensor wiring is correct. If the wiring is correct, check if there is an issue with the sensor itself, and try replacing it with another sensor.

13.AiFUZZY-975 Programming Instructions

The AiFUZZY-975 program-controlled instrument is designed for applications that require automatic adjustments of setpoints based on specific time schedules. It features an 80-step programming sequence, allowing users to set arbitrary rates for increasing or decreasing setpoints. The instrument includes programmable and operable commands such as jump, run, pause, and stop, and it permits modifications to the program during operation. Additionally, it offers power failure handling modes, measurement-based start functions, and preparation features, making program execution more efficient and comprehensive.

13.1 Functions and Concepts
- **Program Segment**: Segment numbers range from 1 to 80. The current segment (*StEP*) indicates the segment currently being executed.

- **Set Time**: Refers to the total running time set for a program segment, measured in minutes or hours, with valid values ranging from 1 to 999.9.

- **Run Time**: Indicates the elapsed time for the current segment. When the run time reaches the set segment time, the program automatically proceeds to the next segment.

- **Jump:** Program segments can be programmed to automatically jump to any segment, enabling loop control. Jumps can also be executed by modifying the *StEP* value.

- **Run/Hold:**
  - Run: When the program is in the running state, the timer counts, and the setpoint changes according to the prearranged program curve.
  - Hold (Pause): While holding the run state (pausing), the timer stops, and the setpoint remains unchanged. The hold operation can be incorporated within a program segment.
- Stop: Executing the stop operation will halt the program. At this point, the run time is reset to 0, timing stops, and control outputs cease. If a run operation is executed while in the stopped state, the instrument will start running the program from the segment number set in *StEP*. An automatic stop function can be programmed within a segment, simultaneously setting the *StEP* value. Users can also manually execute the stop operation at any time (after which *StEP* is set to 1, though it can be modified by the user). If the program segment number has reached the last segment defined in the *PrSn* parameter, the program will automatically stop.

- **Power Failure/Startup Events:** Refers to the instrument being powered on or experiencing an unexpected power outage during operation. By setting the *Pont* parameter, various handling schemes can be selected.

- Prepare (rdy) Function:
  - Used when starting the run program or after an unexpected power failure/startup when the program needs to continue running. If the measured value differs from the setpoint (if the measurement start function is allowed, the system first handles it using the measurement start function; if effective, the prepare function is not needed. If the conditions for the measurement start function are not met, the prepare function handles it) and the difference exceeds the deviation alarm value (*HdAL* and *LdAL*), the instrument does not immediately trigger a positive (or negative) deviation alarm. Instead, it first adjusts the measured value so that the error is less than the deviation alarm value. At this point, the program timer is paused, and no deviation alarm signal is output until the positive or negative deviation meets the requirements, after which the program restarts. The prepare function is also useful for setting segments with unpredictable heating/cooling times. The prepare function can be enabled or disabled in the *PSYS* parameter. This function ensures the integrity of the entire program curve but may increase the run time due to the preparation period. Both the prepare function and the measurement start function are used to address uncertainties caused by discrepancies between the measured value and the setpoint at program start, achieving efficient, complete, and user-compliant program execution results.

- Measurement Start Function:
  - When starting the run program or after an unexpected power failure/startup while needing to continue running the program, the instrument's actual measured value often differs from the program-calculated setpoint, and this discrepancy is sometimes unexpected and undesirable for the user.

  - Example: Consider a heating segment program where the instrument is set to increase the temperature from 25°C to 625°C over 600 minutes, with a heating rate of 1°C per minute. If the program starts at the beginning of this segment and the measured temperature is exactly 25°C, the program can execute smoothly as planned. However, if the system temperature hasn't yet cooled down upon startup, and the measured temperature is 100°C, the program may not execute as smoothly as intended. The measurement start function allows the instrument to automatically adjust the run time to align the two values. In the above example, if the measured temperature at program start is 100°C, the instrument automatically sets the run time to 75 minutes, allowing the program to start running directly from the 100°C position.

Curve fitting:

Curve fitting is a control technique employed by the AiFUZZY-975 instrument. Because the controlled objects typically exhibit time lag characteristics, the instrument automatically smooths the linear heating, cooling, and maintaining temperature curves at their inflection points. The degree of smoothing is related to the system's lag time t (where t = differentiation time d + control cycle CP). The larger the t, the greater the smoothing, and vice versa. The shorter the lag time of the controlled object (such as thermal inertia), the better the program control effect. By processing program curves using curve fitting, overshooting can be avoided.

Note: The characteristics of curve fitting cause program control to generate a fixed negative deviation during linear heating and a fixed positive deviation during linear cooling. The magnitude of this deviation is proportional to the lag time (t) and the heating (cooling) rate. This is a normal phenomenon.

13.2 Programming and operation (For AiFUZZY-975 only)

13.2.1 Slop Mode(PSYS : B=0)

Parameter Setting:
- PSYS.B = 0: When set to 0, the program arrangement follows a temperature–time–temperature format. This means that each program segment is defined by setting a target temperature, the time to reach the next temperature, and the subsequent target temperature. The units for the temperature setpoint are the same as the measured value (*PV*), and the time can be set in either minutes or hours.

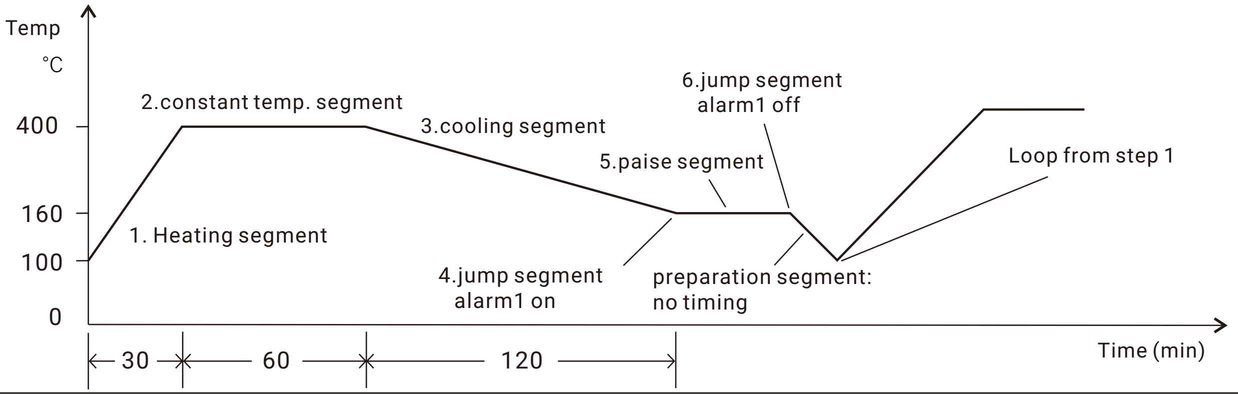
Functionality:
In Slope Mode, if the program runs to the last segment defined by the *PrSn* parameter and the final segment is neither a stop command nor a jump command (time settings in the following sections are editable), the program will automatically end after maintaining the set temperature for the specified duration.

Example Program:
The following is an example of a 5-segment program that includes linear heating, constant temperature, linear cooling, jump loop, preparation, and pause:
1. Segment 1: - Sp1 = 100.0°C (arbitrary value) - t1 = -0.1
   - Description: Specifies the use of PID parameter group 1 (if the current *PIdn* is already 1, this step can be omitted).
2. Segment 2: - Sp2 = 100.0°C - t2 = 30.0 minutes
   - Description: Begins linear heating from 100°C to *SP2* over 30 minutes with a heating slope of 10°C per minute.
3. Segment 3: - Sp3 = 400.0°C - t3 = 60.0 minutes
   - Description: Maintains a constant temperature of 400°C for 60 minutes.
4. Segment 4: - Sp4 = 400.0°C - t4 = 120.0 minutes
   - Description: Cools down to *SP4* over 120 minutes with a cooling slope of 2°C per minute.
5. Segment 5: - Sp5 = 160.0°C - t5 = 0.0 minutes
   - Description: Cools down to 160°C and enters a pause state. To proceed to the next segment, the user must execute the run command.
6. Segment 6: - Sp6 = 160.0°C - t6 = -1.0
   - Description: Jumps back to Segment 1 to start the loop from the beginning.

Operational Details:
In this example, after Segment 5 jumps back to Segment 1, the temperature is set to 160°C while *SP1* is 100°C. Since these temperatures do not match and Segment 5 is a jump segment, the program enters the preparation state. The preparation function first adjusts the temperature to within the deviation alarm limit (e.g., to 105°C if the upper deviation alarm is set to 5°C) before initiating the heating process in Segment 1. This ensures smooth and accurate temperature control as depicted in the accompanying diagram.

Advantages of Temperature–Time Programming:
- Wide Range of Slope Settings: Allows for extensive flexibility in setting heating and cooling slopes.
- Unified Format: Both heating and constant temperature segments use a consistent setup format, making it easier to learn and configure.
- Flexible Curve Configuration: Enables the creation of continuous heating segments with varying slopes to approximate complex heating functions or consecutive constant temperature segments.

Notes:
- Negative Slope Setting (t1 = -0.1): Indicates a specific operational mode or configuration, which may relate to the initial PID settings or other control parameters.
- Preparation and Measurement Start Functions: These functions enhance program execution efficiency and reliability by handling discrepancies between measured values and setpoints, especially after power interruptions or unexpected events.



13.2.2 Platform Mode

Setting the parameter PSYS.B = 1 selects Platform Mode, which is suitable for applications that do not require separate settings for heating and cooling slopes. This mode simplifies programming and allows more efficient use of program segments. In Platform Mode, each program segment follows a temperature–time–temperature format, where each segment defines a set temperature and the duration to maintain that temperature. Additionally, the rAtE parameter can be used between segments to define a heating rate limit. If rAtE is set to 0, it indicates full-speed heating. Since the heating time becomes uncertain and may occupy the holding time, enabling the rdy (Preparation) function ensures accurate holding times.

13.2.3 Setting Program Setpoints and Time

Each program segment includes a setpoint and a time value. The range of setpoint values is limited by SPL and SPH, ranging from -999°C to +3200°C, representing the temperature to be controlled (°C) or a linearly defined unit. The time value not only indicates the running time but also has special control functions. Positive time values represent running time, while negative time values represent jump commands, with the meanings as follows:

- Time Range: -122.0 to 3200
  - tXXX = 0.1 to 3200: Represents running time values.
  - tXXX = 0.0, -0.1 to -122.0: Represents jump commands.

Commands for t:

- 0.0: The instrument enters a hold state at this segment, pausing the program and stopping the timer.
- -121.0: Executes a STOP operation, entering the stopped state.
- -XXX.1: Uses PID parameter group 1.
- -XXX.2: Uses PID parameter group 2.
- -XXX.3: Uses PID parameter group 3.
- -XXX.4: Triggers AL1 action.
- -XXX.5: Releases AL1.
- -XXX.6: Triggers both AL1 and AL2 actions.
- -XXX.7: Releases both AL1 and AL2.
- -XXX.8: Outputs a 0.5-second pulse action on AL1 and continues to the next segment. However, if Alarm 1 is already active—whether triggered by an event output or an alarm—the pulse action is canceled, and Alarm 1 remains active.

Examples:

- t-1 = -0.1: When running Segment 1, it uses PID parameter group 1, and the PIDn parameter is automatically set to 1.
- t-7 = -11.2: When running Segment 7, it jumps to Segment 11 and uses PID parameter group 2, automatically setting PIDn to 2.
- t-5 = -0.4: When running Segment 5, it triggers AL1 action and jumps to Segment 1.
- t-9 = -0.8: When running Segment 9, it outputs a 0.5-second pulse action on AL1 and continues to Segment 10.

Note: Except when executing a run operation or encountering a jump segment during power-on, the program allows a maximum of two consecutive jumps during program execution. If three or more consecutive jumps occur, the program automatically pauses execution (i.e., the instrument inserts a pause operation during the third consecutive jump). An external run operation is required to resume from the paused state. Important: If a jump segment directs the program to itself (e.g., t-6 = -6), the pause state cannot be cleared, rendering the segment ineffective.

13.2.4 Multi-PID Application Case Study

Example Program:

1. Segment 1:
   - Sp1 = Any value (e.g., 100.0°C)
   - t1 = -0.1
   - Description: Specifies the use of PID parameter group 1 (PIDn parameter automatically set to 1).
2. Segment 2:
   - Sp2 = 100°C
   - t2 = 30.0 minutes
   - Description: Begins linear heating from 100°C to SP3 over 30 minutes with a heating rate of 10°C per minute.
3. Segment 3:
   - Sp3 = 400°C
   - t3 = 60.0 minutes
   - Description: Maintains a constant temperature of 400°C for 60 minutes.
4. Segment 4:
   - Sp4 = 400°C
   - t4 = -0.2
   - Description: Specifies the use of PID parameter group 2 (PIDn parameter automatically set to 2).

5. Segment 5:
   - Sp5 = 400°C
   - t5 = 80 minutes
   - Description: Heats from 400°C to 800°C over 80 minutes with a heating rate of 5°C per minute.
6. Segment 6:
   - Sp6 = 800°C
   - t6 = -0.8
   - Description: At 800°C, AL1 outputs a 0.5-second pulse action and continues to the next segment (Segment 7).
7. Segment 7:
   - Sp7 = 800°C
   - t7 = 120.0 minutes
   - Description: Maintains a constant temperature of 800°C for 120 minutes.
8. Segment 8:
   - Sp8 = 800°C
   - t8 = -0.3
   - Description: Continues to the next segment, specifying the use of PID parameter group 3 (PIDn parameter automatically set to 3).
9. Segment 9:
   - Sp9 = 800°C
   - t9 = 60.0 minutes
   - Description: Heats from 800°C to 1220°C over 60 minutes with a heating rate of 7°C per minute.
10. Segment 10:
    - Sp10 = 1220°C
    - t10 = 60 minutes
    - Description: Maintains a constant temperature of 1220°C for 60 minutes.
11. Segment 11:
    - Sp11 = 1220°C
    - t11 = -121.0
    - Description: Executes a STOP operation, halting control outputs and stopping the program. To rerun the program, press the ∨ key for 2 seconds to execute the RUN operation, restarting the loop from the beginning.

Operational Flow:

- Looping Mechanism: After Segment 5 jumps back to Segment 1, the temperature is set to 160°C, while SP1 is 100°C. Since these temperatures do not match and Segment 5 is a jump segment, the program enters the preparation state. The preparation function first adjusts the temperature to within the deviation alarm limit (e.g., to 105°C if the upper deviation alarm is set to 5°C) before initiating the heating process in Segment 1. This ensures smooth and accurate temperature control as depicted in the accompanying diagram.

Advantages of Temperature–Time Programming:

- Wide Range of Slope Settings: Allows extensive flexibility in setting heating and cooling slopes.
- Unified Format: Both heating and constant temperature segments use a consistent setup format, making it easier to learn and configure.
- Flexible Curve Configuration: Enables the creation of continuous heating segments with varying slopes to approximate complex heating functions or consecutive constant temperature segments.

13.2.5 Self-Tuning Program Setup Method

Example: Tuning PID Group 1 with a self-tuning target value of 400°C.

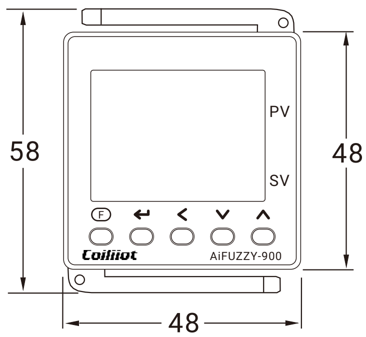
Segment 1:
-Sp1: Any value
-t1: -0.
-Description: Specifies the use of PID parameter group 1 for the next segment. (If tuning PID parameter group 2, set t1 = -0.2; if tuning PID parameter group 3, set t1 = -0.3).

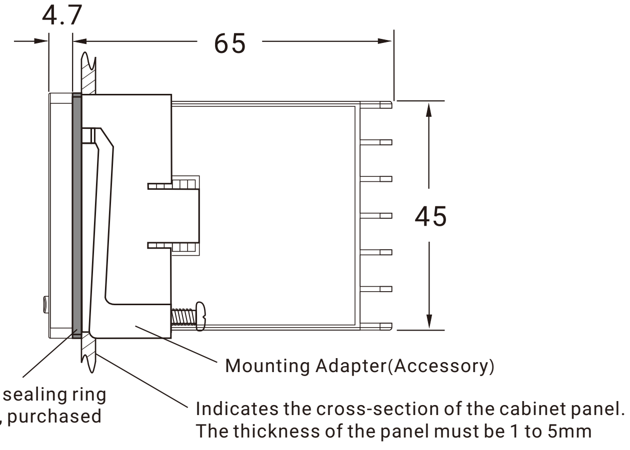
Segment 2:
-Sp2: 400°C
-t2: 100.0 (t2 can be any positive value)
-Description: Sets the self-tuning target value to 400°C.

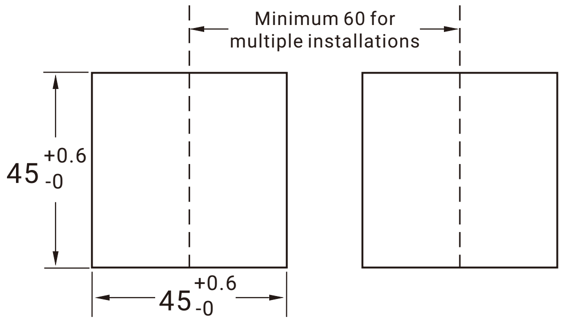
Segment 3:
-Sp3: 400°C
-t3: -1.0
-Description: Jumps back to Segment 1, ensuring the program maintains a constant temperature of 400°C.

■14.Dimensions and installation instructions(mm)

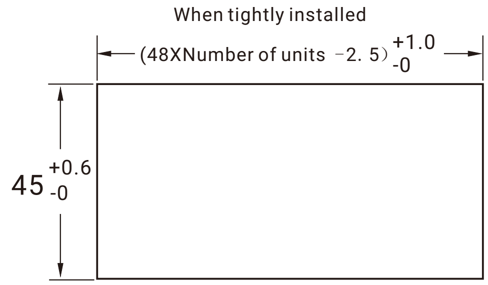
G-types panel



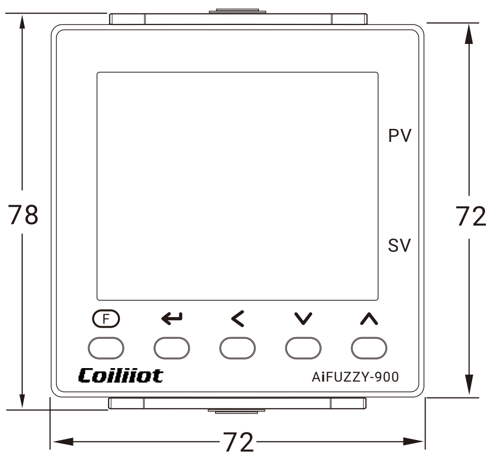


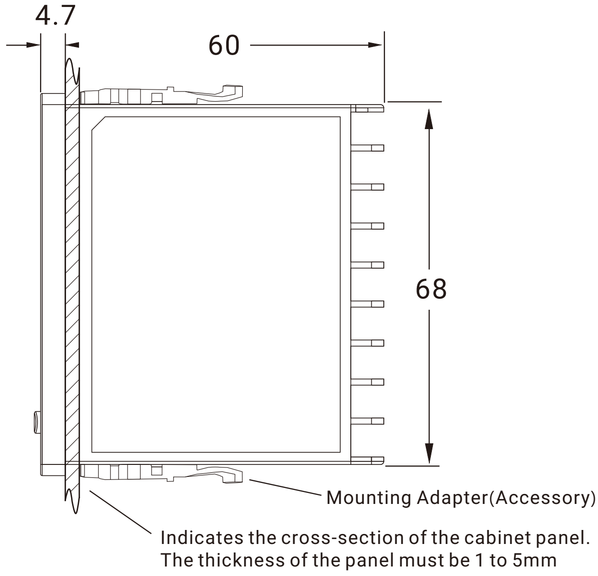


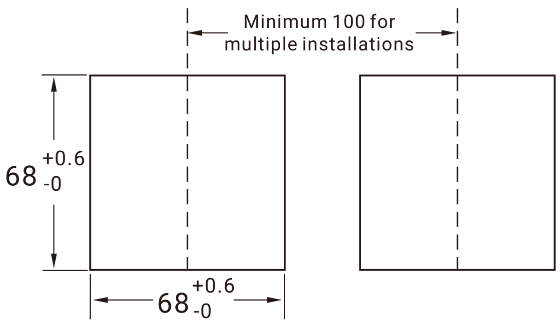
Single Mounting Hole Dimensions



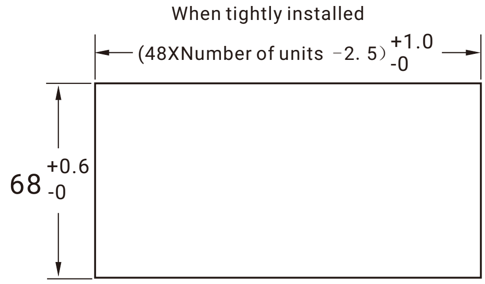
D-types panel



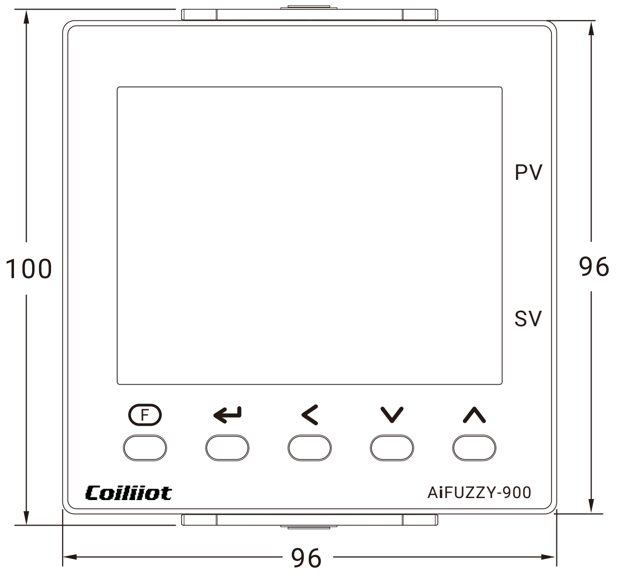


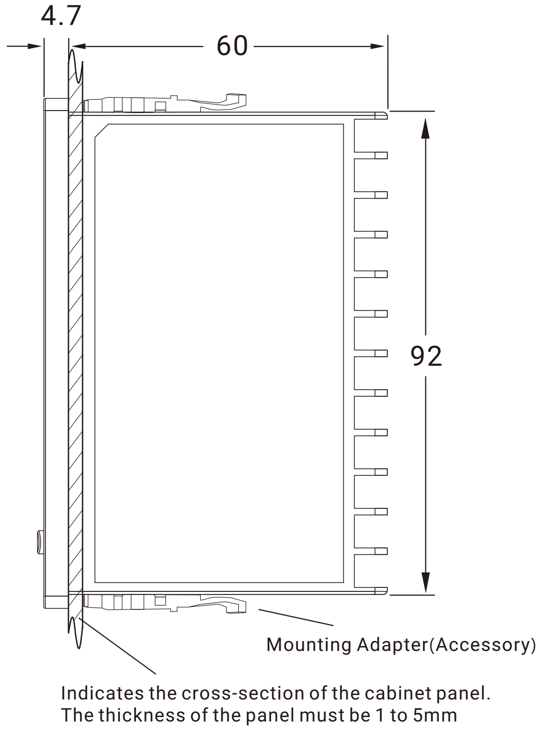


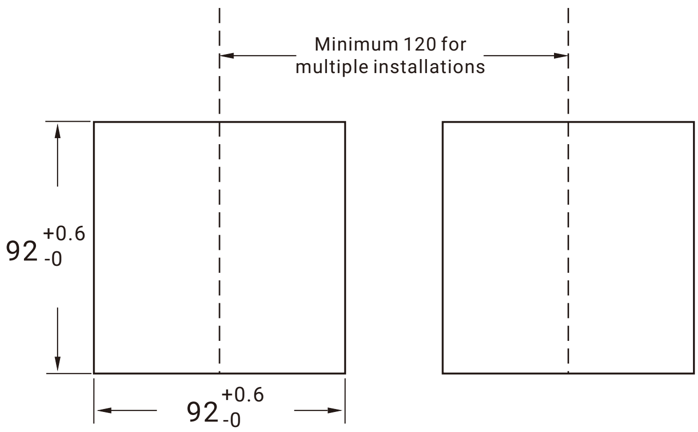
Single Mounting Hole Dimensions



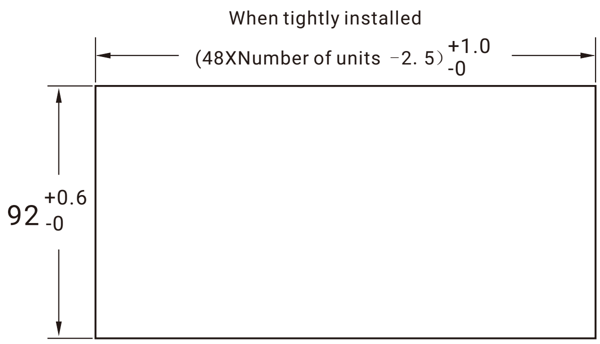
A-types panel



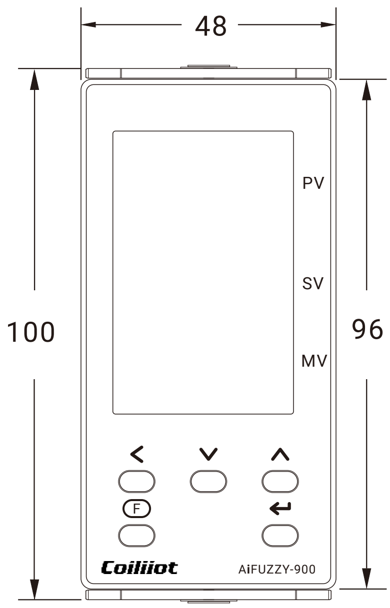


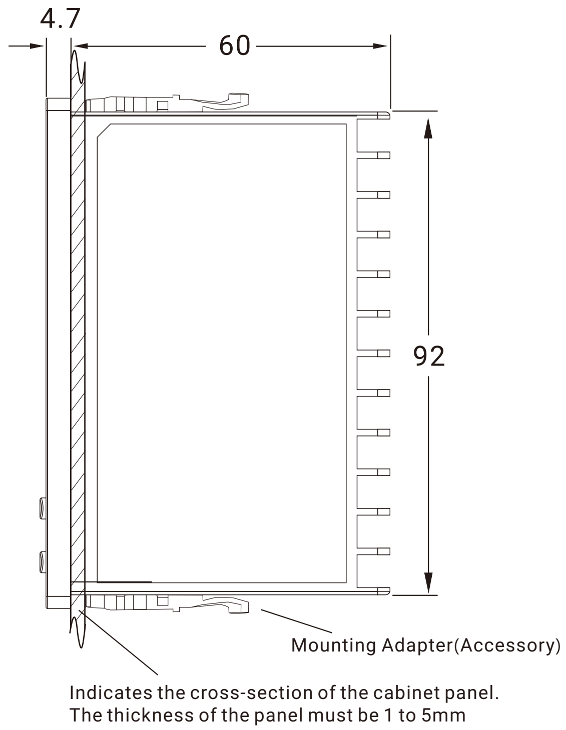


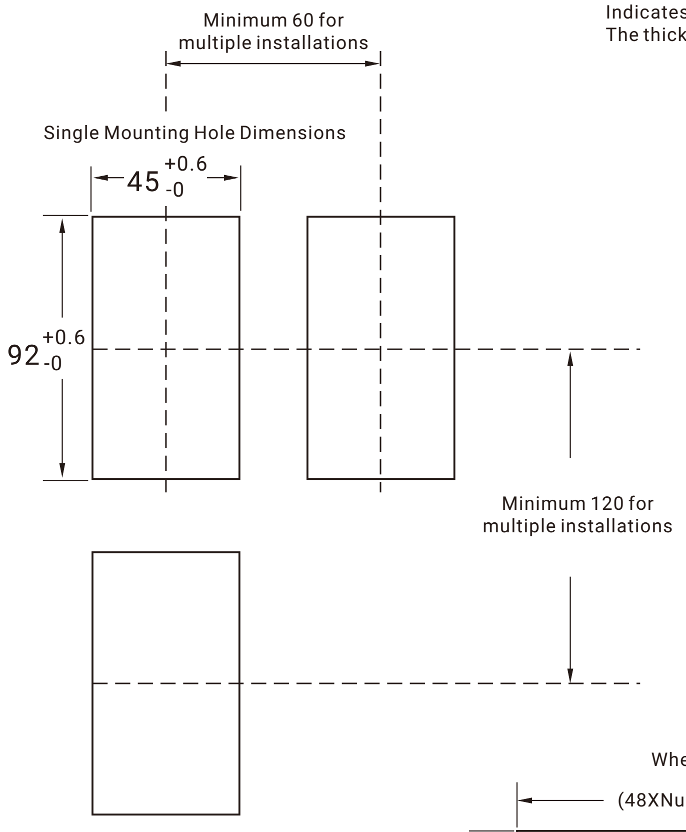
Single Mounting Hole Dimensions

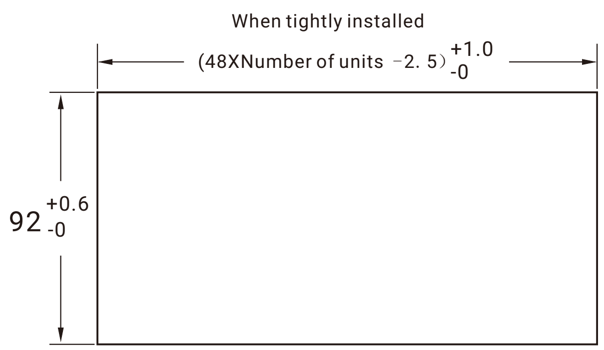


E-types panel

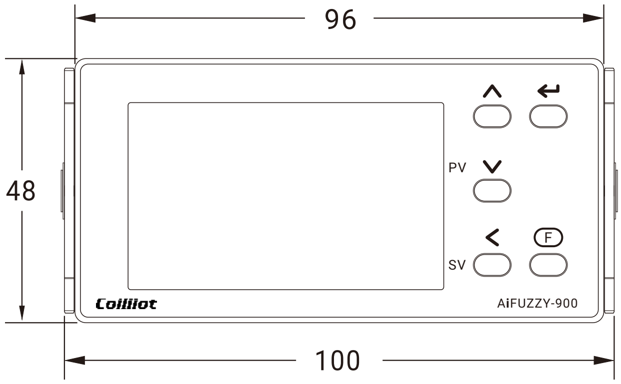


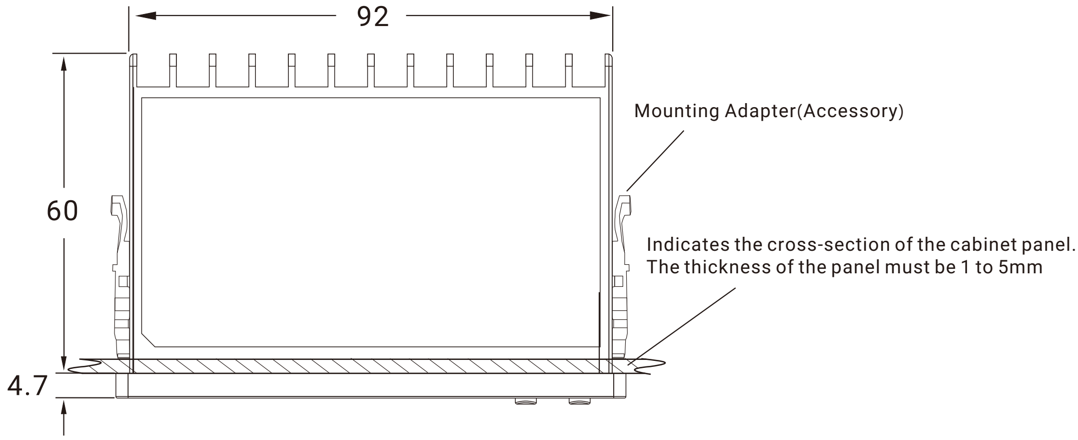






F-types panel





Single Mounting Hole Dimensions