

Autonics

TEMPERATURE CONTROLLER TC4 Series

M A N U A L



Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;

Warning Serious injury may result if instructions are not followed.

Caution Product may be damaged, or injury may result if instructions are not followed.

※The following is an explanation of the symbols used in the operation manual.

Caution:Injury or danger may occur under special conditions.

Warning

- In case of using this unit with machinery (Ex: nuclear power control, medical equipment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.**
It may cause a fire, human injury or damage to property.
- Install the unit on a panel.**
It may cause electric shock.
- Do not connect, inspect or repair this unit when power is on.**
It may cause electric shock.
- Wire properly after checking terminal number.**
It may cause a fire.
- Do not disassemble the case. Please contact us if it is required.**
It may cause electric shock or a fire.

Caution

- This unit shall not be used outdoors.**
It may shorten the life cycle of the product or cause electric shock.
- When connect wire, AWG 20(0.50mm²) should be used and screw bolt on terminal block with 0.74N·m to 0.90N·m strength.**
It may cause a malfunction or fire due to contact failure.
- Please observe the rated specifications.**
It may shorten the life cycle of the product and cause a fire.
- Do not use beyond of the rated switching capacity of relay contact.**
It may cause insulation failure, contact melt, contact failure, relay broken and fire etc.
- In cleaning unit, do not use water or organic solvent. And use dry cloth.**
It may cause electric shock or a fire.
- Do not use this unit in place where there are flammable or explosive gas, humidity, direct ray of the light, radiant heat, vibration and impact etc.**
It may cause a fire or an explosion.
- Do not inflow dust or wire dregs into the unit.**
It may cause a fire or a malfunction.
- Please wire properly after checking the terminal polarity when connecting temperature sensor.**
It may cause a fire or an explosion.
- In order to install the units with reinforced insulation, use the power supply unit which basic insulation level is ensured.**
(TC4SP is basic insulation only.)

Ordering information

T	C	4	S	-	1	4	R	
								Control output
								Indicator - Without control output
								Relay output+SSR drive output ^{*1}
								Power supply
								2 24VAC 50/60Hz, 24-48VDC
								4 100-240VAC 50/60Hz
								Sub output
								N No alarm output
								1 Alarm1 output
								2 Alarm1 + Alarm2 output ^{*2}
								S DIN W48 × H48mm (terminal block type)
								SP DIN W48 × H48mm (11pin plug type) ^{*3}
								Y DIN W72 × H36mm
								M DIN W72 × H72mm
								H DIN W48 × H96mm
								W DIN W96 × H48mm
								L DIN W96 × H96mm
								Size
								4 9999(4 Digit)
								Setting type
								C Set by touch switch
								Item
								T Temperature controller

※1: In case of the AC voltage model, SSR drive output method (standard ON/OFF control, cycle control, phase control) is available to select.

※2: It is unavailable for TC4SP, TC4Y.

※3: Socket for TC4SP (PG-11, PS-11) is sold separately.

※The above specifications are subject to change and some models may be discontinued without notice.

Specifications

Series		TC4S Series	TC4S	TC4SP	TC4Y	TC4M	TC4W	TC4H	TC4L
Power supply	AC power	100-240VAC 50/60Hz							
	AC/DC Power	24VAC 50/60Hz, 24-48VDC							
Allowable voltage range		90 to 110% of rated voltage							
Power consumption	AC power	Max. 5VA (100-240VAC 50/60Hz)							
	AC/DC Power	Max. 5VA (24VAC 50/60Hz), Max. 3W (24-48VDC)							
Display method		7Segment(Red), Other display(Green, Yellow, LED)							
Character size(W×H)		7.0×15.0mm 7.4×15.0mm 9.5×20.0mm 9.5×20.0mm 7.0×14.6mm 11.0×22.0mm							
Input type	RTD	DPt100Q, Cu50Q (Allowable line resistance max.5Ω per a wire)							
	TC	K(CA), J(IC), L(IC)							
Display accuracy ^{*1}	RTD	• At room temperature (23°C±5°C): (PV ±0.5% or ±1°C, select the higher one) ±1digit							
	TC	• Out of room temperature range: (PV ±0.5% or ±2°C, select the higher one) ±1digit							
		※ For TC4SP, add ±1°C by accuracy standard.							
Control output	Relay	250VAC 3A 1a							
	SSR	12VDC ± 2V 20mA Max.							
Alarm output		AL1, AL2 Relay; 250VAC 1A 1a(※TC4SP, TC4Y have AL1 only.)							
Control method		ON/OFF and P, PI, PD, PID control							
Hysteresis		1 to 100°C/°F (0.1 to 50.0°C/°F) variable							
Proportional band(P)		0.1 to 999.9°C/°F							
Integral time(I)		0 to 9999 sec.							
Derivative time(D)		0 to 9999 sec.							
Control period(T)		0.5 to 120.0 sec.							
Manual reset		0.0 to 100.0%							
Sampling period		100ms							
Dielectric strength	AC power	2,000VAC 50/60Hz for 1min.(Between input terminal and power terminal)							
	AC/DC Power	1,000VAC 50/60Hz for 1min.(Between input terminal and power terminal)							
Vibration		0.75mm amplitude at frequency of 5 to 55Hz in each of X, Y, Z directions for 2 hours							
Relay life cycle	Mechanical	OUT: Min. 5,000,000 operations, AL1/2: Min. 5,000,000 operations							
	Electrical	OUT: Min. 200,000 operations (250VAC 3A resistive load), AL1/2: Min. 300,000 operations (250VAC 1A resistive load)							
Insulation resistance		Min. 100MΩ (at 500VDC megger)							
Noise immunity		Square-wave noise by noise simulator (pulse width 1μs) ± 2kV R-phase and S-phase							
Memory retention		Approx. 10 years (When using non-volatile semiconductor memory type)							
Environ -ment	Ambient temp.	-10 to 50°C, Storage: -20 to 60°C							
	Ambient humi.	35 to 85%RH, Storage: 35 to 85%RH							
Insulation type		Double insulation or reinforced insulation (mark:  , Dielectric strength between the measuring input part and the power part: AC power 2kV, AC/DC Power 1kV)							
Approval		  							
Weight ^{*2}		Approx. 141g (approx. 94g)	Approx. 123g (approx. 76g)	Approx. 174g (approx. 85g)	Approx. 204g (approx. 133g)	Approx. 194g (approx. 122g)	Approx. 194g (approx. 122g)	Approx. 254g (approx. 155g)	

※1: Thermocouple L(IC) type, RTD Cu50Q

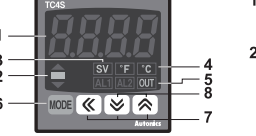
- At room temperature (23°C ± 5°C): (PV ± 0.5% or ± 2°C, select the higher one) ± 1digit
- Out of room temperature range: (PV ± 0.5% or ± 3°C, select the higher one) ± 1digit

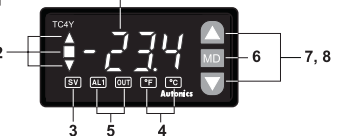
In case of TC4SP Series, ± 1°C will be added.

※2: The weight with packaging and the weight in parentheses is only unit weight.

※Environment resistance is rated at no freezing or condensation.

Parts description

- 

1 Present temperature (PV) display
• RUN mode: Present temperature (PV) display.
• Parameter setting mode: Parameter or parameter setting valuedisplay.
- 

5 Control/alarm output indicator
• OUT: It will turn ON when control output(Main Control Output) is ON.
• In case of CYCLE/PHASE control of SSR drive output, it will turn ON when MV is over 3.0%. (only for AC power type)
• AL1/AL2: It will light up when alarm output Alarm1/Alarm2 are on.
- 2 Deviation indicator, Auto-tuning indicator
It shows current temperature(PV) deviation based on set temperature(SV) by LED.

No.	PV deviation temp.	Deviation display
1	Over 2°C	 indicator ON
2	Below ±2°C	 indicator ON
3	Under -2°C	 indicator ON

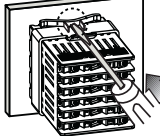
The deviation indicators (, , ) flash by every 1 sec. when operating auto tuning.
- 3 Set temperature(SV) indicator
Press any front key once to check or change current set temperature(SV), the set temperature(SV) indicator is ON and preset set value is flashed.
- 4 Temperature unit(°C/°F) indicator
It shows current temperature unit.
- 6 MODE key
Used when entering into parameter group, returning to RUN mode, moving parameter, and saving setting values.
- 7 Adjustment
Used when entering into set value change mode, digit moving and digit up/down.
- 8 FUNCTION key
Press   keys for 3 sec. to operate function(RUN/STOP, alarm output cancel, auto-tuning) set in inner parameter [di - L].
※Press   keys at the same time in set value operation to move digit.

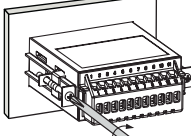
Input sensor and temperature range[i n - t]

Input sensor	Display	Input range (°C)	Input range (°F)
Thermocouple	K(CA)	-50 to 1200	-58 to 2192
	J(IC)	-30 to 500	-22 to 932
	L(IC)	-40 to 800	-40 to 1472
RTD	DPt100Q	-100 to 400	-148 to 752
	dPtE.L	-100.0 to 400.0	-148.0 to 752.0
	Cu50Q	-50 to 200	-58 to 392
		-50.0 to 200.0	-58.0 to 392.0

Installation

- TC4S/SP(48 × 48mm) Series

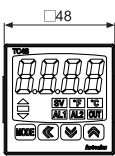

- TC4Y(72 × 36mm) Series


- Other Series

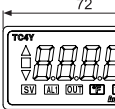

- ※Mount the product on the panel, fasten bracket by pushing with tools as shown above.(In case of TC4Y, fasten bolts for bracket.)

Dimensions

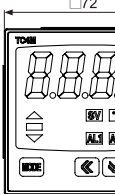
• TC4S Series



• TC4Y Series

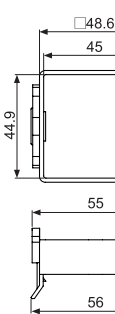


• TC4M Series

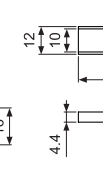


• Bracket

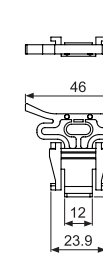
• TC4S/TC4SP Series



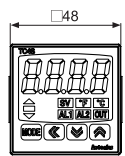
• TC4Y Series



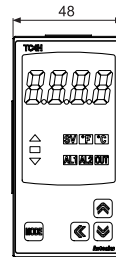
• TC4M, TC4W, TC4H, TC4L Series



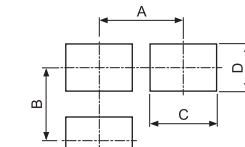
• TC4SP Series



• TC4H Series



• Panel cut-out

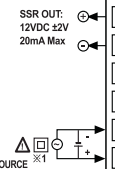


Size	A	B	C	D
Model				
TC4S	Min. 65	Min. 65	45 ^{±0.5}	45 ^{±0.5}
TC4SP	Min. 65	Min. 65	45 ^{±0.5}	45 ^{±0.5}
TC4Y	Min. 91	Min. 40	68 ^{±0.7}	31.5 ^{±0.5}
TC4M	Min. 90	Min. 90	68 ^{±0.7}	68 ^{±0.7}
TC4H	Min. 65	Min. 115	45 ^{±0.5}	92 ^{±0.5}
TC4W	Min. 115	Min. 65	92 ^{±0.5}	45 ^{±0.5}
TC4L	Min. 115	Min. 115	92 ^{±0.5}	92 ^{±0.5}

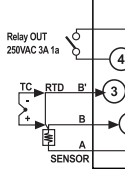
Connections

※TC4 Series has selectable control output; Relay output, and SSR drive output.
AC/DC power type does not have SSRP function.

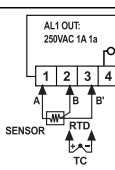
• TC4S Series



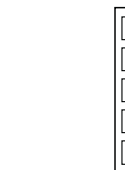
• TC4SP Series



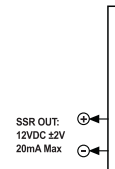
• TC4Y Series



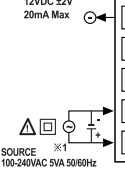
• TC4H, TC4W, TC4L Series



• TC4M Series



• TC4H, TC4W, TC4L Series

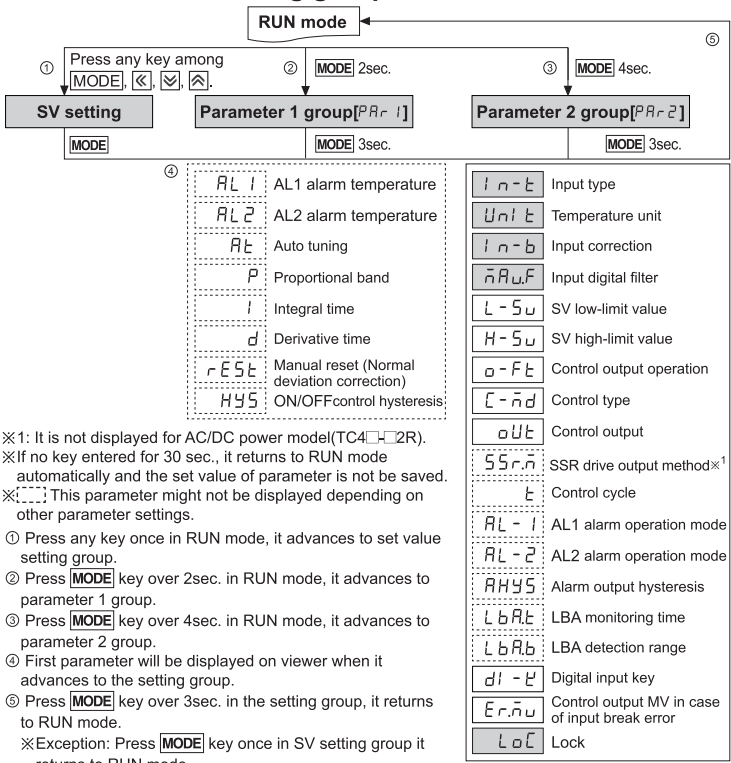


※1: AC power: 100-240VAC 5VA 50/60Hz
AC/DC power: 24VAC 5VA 50/60Hz
24-48VDC 3W

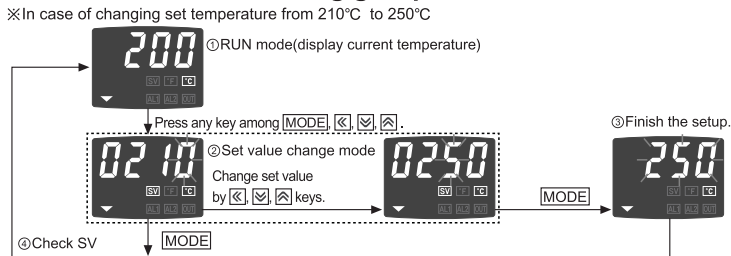
SSR drive output selection function(SSRP function)[5 5 r . n]

- Realizing high accuracy and cost effective temperature control with both current output (4-20mA) and linear output(cycle control and phase control)
- SSRP function is selectable one of standard ON/OFF control, cycle control, phase control by utilizing standard SSR drive output.
- Select one of standard ON/OFF control [5 t n d], cycle control[5 y c l], phase control

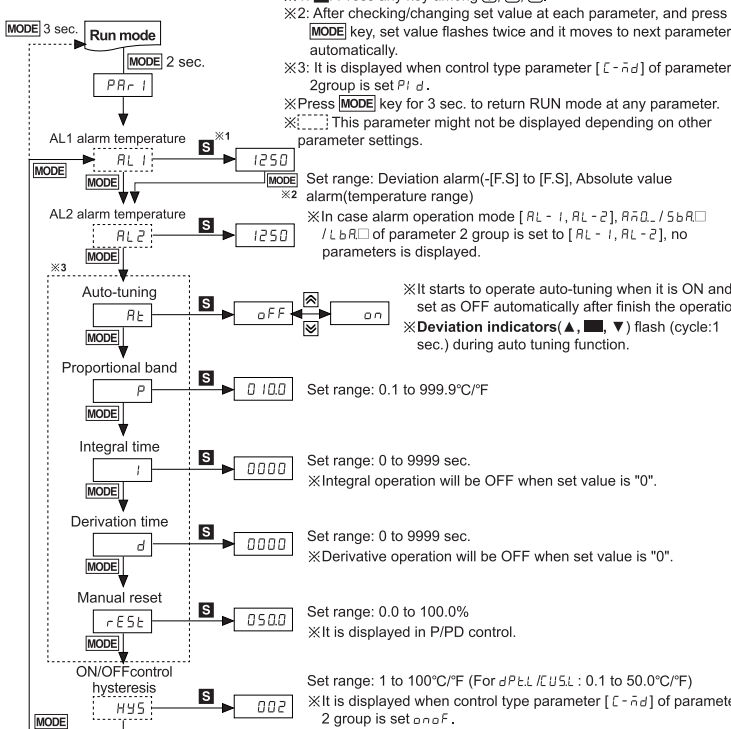
Flow chart for setting group



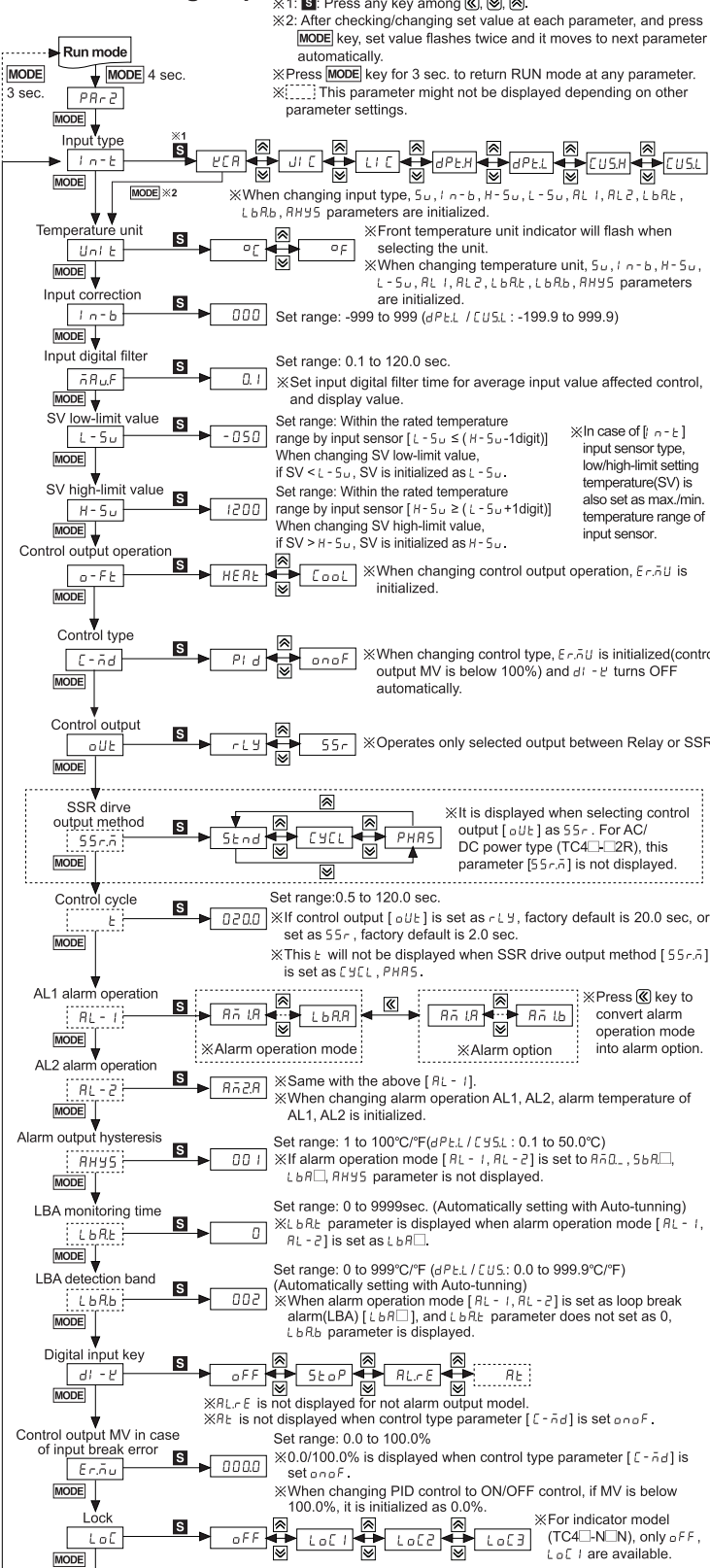
Flow chart for SV setting group



Parameter 1 group



Parameter 2 group



Factory default

SV setting

Parameter	Factory default
—	0

Parameter 1 group

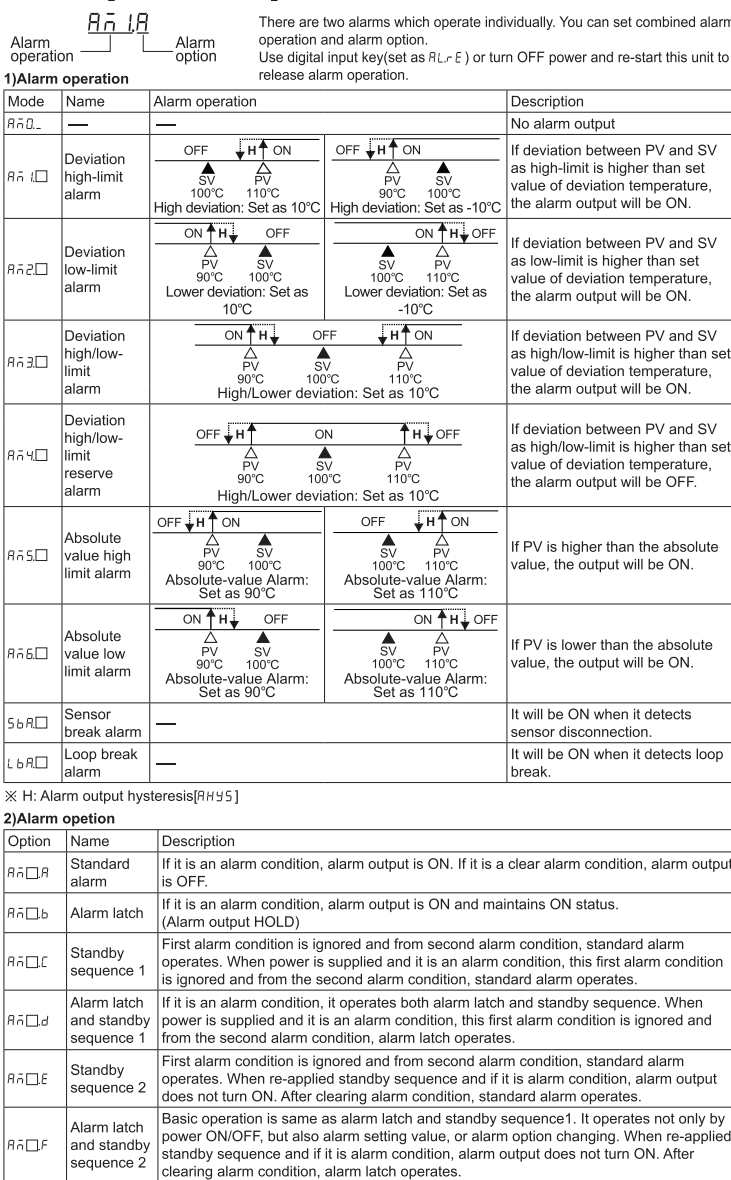
Parameter	Factory default
AL 1	1250
AL 2	
At	oFF
P	0.100
I	0000
d	0000
rESt	0500
HYS	002

Parameter 2 group

Parameter	Factory default	Parameter	Factory default
Input type	εCR	t	0200
Unit	°C	AL - 1	Añ 1A
Input correction	0000		
Input digital filter	000.1	AL - 2	Añ 2A
L-5u	-050	RHYS	000.1
H-5u	1200	LbAt	0000
o-Ft	HEAt	LbAb	002
C-ñd	PI d	dI - ε	StoP
oUt	rLy	Er.nu	0000
SSr.n	Stnd	LoC	oFF

※AC/DC power type has no SSR drive output method [SSr.n] and supports only ON/OFF output when selecting SSr in control output [oUt].

Alarm[AL-1/AL-2]



Input correction[I-n-b]

Controller itself does not have errors but there may be error by external input temperature sensor. This function is for correcting this error.

Ex) If actual temperature is 80°C but controller displays 78°C, set input correction value [I-n-b] as 002° and controller displays 80°C.

※As the result of input correction, if current temperature value (PV) is over each temperature range of input sensor, it displays 'HHHH' or 'LLLL'.

Input digital filter [nRwF]

If current temperature(PV) is fluctuating repeatedly by rapid change of input signal, it reflects to MV and stable control is impossible. Therefore, digital filter function stabilizes current temperature value.

For example, set input digital filter value as 0.4 sec, and it applies digital filter to input values during 0.4 sec and displays this values. Current temperature may be different by actual input value.

Hysteresis [HYS]

• If Hysteresis is too narrow, hunting(oscillation, chattering) could occur due to external noise.

• In case of ON / OFF control mode, even if PV reaches stable status, there still occurs hunting. It could be due to Hysteresis [HYS] SV, load's response characteristics or sensor's location. In order to reduce hunting to a minimum, it is required to take into following factors consideration when designing temp. controlling; proper Hysteresis [HYS], heater's capacity, thermal characteristics, sensor's response and location.

Control output

Heating operation

ON

OFF

Hysteresis (HYS)

Temp.

SV

Manual reset[rESt]

When selecting P/PD control mode, certain temperature difference exists even after PV reaches stable status because heater's rising and falling time is inconsistent due to thermal characteristics of controlled objects, such as heat capacity, heater capacity. This temperature difference is called offset and manual reset [rESt] function is to set/correct offset.

When PV and SV are equal, reset value is 50.0%. After control is stable, PV is lower than SV, reset value is over 50.0% or PV is higher than SV, reset value is below 50.0%.

•Manual reset [rESt] by control result

Set below 50.0 as reset value

Offset

Offset

Set over 50.0 as reset value

SV

Digital input key[di-ε] 3sec. [dI-ε]

Parameter	Operation
OFF	oFF It does not use digital input key function.
RUN/STOP	StoP It is available to pause on control output and auxiliary output (except loop break alarm, sensor break alarm) except control output operates normally as set. Press digital input key for 3sec to re-start the operation.
Clear alarm	RL-ε It is available to clear alarm output by force. (It is only when alarm option is alarm latch, standby sequence.) Clear alarm is able to only for out of alarm operation range. Alarm operates normally right after clear alarm.
Auto tuning	At Auto tuning function, it is same as auto tuning function [At] of parameter 1 group. (You can execute auto tuning from parameter 1group, and finish it by digital input key.) ※ When control type [C-nd] is set as PId, At is displayed. When it is set as onOFF, digital input key [di-ε] is changed as oFF.

Control output MV when input sensor line is broken [Ernu]

The function to set control output MV in case of open error. Users are able to set by ON/OFF setting or MV setting. It executes control output by set MV regardless of ON/OFF or PID control output.

Lock setting[LoC]

A function to prevent changing SV and parameters of each setting group. Parameter setting values are still possible to check while Lock mode is ON.

※ oFF, LoC1 are available only for indicator(TC4□□N□).

Display	Description
oFF	Lock off
LoC1	Lock parameter group 2
LoC2	Lock parameter group 1, 2
LoC3	Lock parameter group 1, 2, SV setting

Error

Display	Description	Troubleshooting
oPEn	Flashes if input sensor is disconnected or sensor is not connected.	Check input sensor state.
HHHH	Flashes if measured sensor input is higher than temperature range.	
LLLL	Flashes if measured sensor input is lower than temperature range.	When input is within the rated temperature range, this display disappears.

Caution for using

- The connection wire of this unit should be separated from the power line and high voltage line in order to prevent from inductive noise.
- For crimp terminal, select following shaped terminal (M3).
- Please install power switch or circuit-breaker in order to cut power supply off.
- Switch or circuit-breaker should be installed near by users for convenient control.
- Do not use this product as Volt-meter or Ampere-meter, this is a temperature controller.
- In case of using RTD sensor, 3 wire type must be used. If you need to extend the line, 3 wires must be used with the same thickness as the line. It might cause of deviation of temperature if the resistance of line is different.
- In case of making power line and input signal line closely, line filter for noise protection should be installed at power line and input signal line should be shielded.
- Keep away from the high frequency instruments.(High frequency welding machine & sewing machine, large capacity SCR controller)
- When supplying measuring input, if 'HHHH' or 'LLLL' is displayed, measuring input may have problem. Turn off the power and check the line.
- Installation environment
 - It shall be used indoor.
 - Altitude Max. 2000m.
 - Pollution Degree 2.
 - Installation Category II.

※It may cause malfunction if above instructions are not followed.

Major product

- Photoelectric sensors
- Fiber optic sensors
- Door sensors
- Door side sensors
- Area sensors
- Proximity sensors
- Pressure sensors
- Rotary encoders
- Connector/sockets
- Switching mode power supplies
- Control switches/Lamps/Buzzers
- I/O Terminal Blocks & Cables
- Stepper motors/drivers/motion controllers
- Graphic/Logic panels
- Field network devices
- Laser marking system(Fiber, CO₂, Nd:YAG)
- Laser welding/soldering system
- Temperature controllers
- Temperature/humidity transducers
- SSR/Power controllers
- Counters
- Timers
- Panel meters
- Tachometer/Pulse(Rate) meters
- Display units
- Sensor controllers

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