

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 machineries (Nuclear power control, medical equipment, vehicle, train, airplane, combustion apparatus, entertainment or safety device etc), it is required to install fail-safe device, or contact us. It may cause fire, human injury or property loss.
- Install the unit on a panel. It may cause an electric shock.
- Do not connect, inspect or repair when power is on. It may cause an electric shock.
- Wire properly after check terminal number. It may cause a fire.
- Do not disassemble the case. Please contact us if it is required. It may cause an electric shock or a fire.

Caution

- This unit shall not be used outdoors. It might shorten the life cycle of the product or give an electric shock.
- When connect wire, no.20AWG(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.
- For crimped terminal, select following shaped terminal.
- Please observe the rated specifications. It might 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 an oil-based detergent and use dry towels. It may cause an 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 check the terminal polarity when connect temperature sensor. It may cause a fire or an explosion.

Ordering information

T	C	4	S	-	1	4	R
Control output	N	Indicator - Without control output					
Power supply	R	Relay output+SSR output					
Sub output	N	No sub output					
	1	Alarm1 output					
	2	(★) Alarm1 output+Alarm2 output					
Size	S	DIN W48×H48mm(Terminal block type)					
	SP	DIN W48×H48mm(Plug type)					
	Y	DIN W72×H36mm					
	M	DIN W72×H72mm					
	H	DIN W48×H96mm					
	W	DIN W96×H48mm					
	L	DIN W96×H96mm					
Digit	4	4Digit					
Setting type	C	Set by touch switch					
Item	T	Temperature controller					

※(★)It is unavailable for TC4SP, TC4Y.

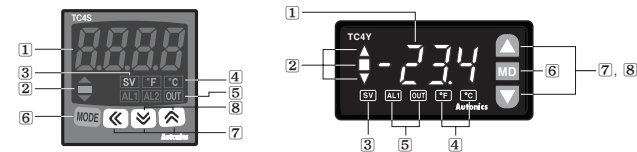
※The above specifications are subject to change without notice.

Specifications

Series	TC4 series						
	TC4S	TC4SP	TC4Y	TC4M	TC4H	TC4W	TC4L
Power supply	100~240VAC 50/60Hz						
Allowable voltage range	90~110% of rated voltage						
Power consumption	Max. 5VA						
Display method	7Segment(Red), Other display(Green, Yellow, Red LED)						
Character size	H	15.0mm	15.0mm	20.0mm	14.6mm	20.0mm	22.0mm
	W	7.0mm	7.4mm	9.5mm	7.0mm	9.5mm	11.0mm
Input type	RTD	DIN Pt100Ω(Allowable line resistance max.5Ω per a wire)					
	TC	K(CA), J(IC)					
Display method	TC, RTD	(★1) (PV ±0.5% or ±1℃ higher one) rdg ±1Digit (★2) ※TC4SP (Plug type) is (PV ±0.5% or ±2℃ higher one) rdg ±1Digit ※Based on normal temperature(23℃ ±5℃)					
Output	Relay	250VAC 3A 1a					
	SSR	12VDC ±2V 20mA Max.					
	Sub	AL1, AL2 relay output : 250VAC 1A 1a(※TC4SP, TC4Y have AL1 only.)					
Control method	ON/OFF and P, PI, PD, PID control						
Hysteresis	1 ~ 100℃ (KCA, JIC, PT1) / 0.1 ~ 50.0℃ (PT2)						
Proportional band	0.1 ~ 999.9℃						
Integral time(I)	9999sec.						
Derivative time(D)	9999sec.						
Control period	0.5 ~ 120.0sec.						
Manual reset	0.0 ~ 100.0%						
Sampling period	100ms						
Dielectric strength	2000VAC 50/60Hz for 1min.(Between input terminal and power terminal)						
Vibration	0.75mm amplitude at frequency of 5~55Hz in each X, Y, Z directions for 2 hours						
Relay	Mechanical	Min. 10,000,000 operations					
life	Malfunction	Min. 100,000 operations (at 250VAC 3A resistive load)					
cycle	Insulation resistance	Min. 100MΩ (at 500VDC)					
Noise	Square shaped 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)						
Ambient temperature	-10 ~ 50℃ (at non-freezing status)						
Storage temperature	-20 ~ 60℃ (at non-freezing status)						
Ambient humidity	35 ~ 85%RH						
Unit weight	Approx. 97g	Approx. 84g	Approx. 127g	Approx. 127g	Approx. 118g	Approx. 118g	Approx. 172g
Approval							

※(★1)(PV ±0.5% or ±2℃ higher one) rdg ±1Digit, in case, out of normal temperature range.
 ※(★2)TC4SP is (PV ±0.5% or ±3℃ higher one) rdg ±1Digit, in case, out of normal temperature range.

Parts description



- Temperature display: It shows current temperature(PV) in RUN mode and parameter and set value for each setting group in parameter change mode.
 - Deviation and Auto-tuning indicator: It shows current temperature(PV) based on set temperature(SV) by LED. Deviation indicators (▲, ■, ▼) are flashed by every 1sec when operating auto-tuning.
 - Set temperature(SV) indicator: Press any front key once to check or change current set temperature(SV), set temperature(SV) indicator is on and preset set value is flashed.
 - Temperature(C/F) indicator: It shows current temperature unit.
 - Control/sub output indicator: -OUT: It will light up when control output(Main Control Output) is on. ※It will light up over 3.0% of operation in CYCLE/PHASE control. -AL1/AL2: It will light up when alarm output AL1/AL2 are on.
 - MODE Key: Used when entering into parameter setting group, returning to RUN mode, moving parameter and saving setting values.
 - Adjustment: Used when entering into set value change mode, Digit moving and Digit Up/down.
 - FUNCTION key: Press ▼+▲keys for 3 sec to operate function(RUN/STOP, alarm output cancel) set in inner parameter [d -V].
- ※Press ▼+▲keys once in set value operation to move digit.

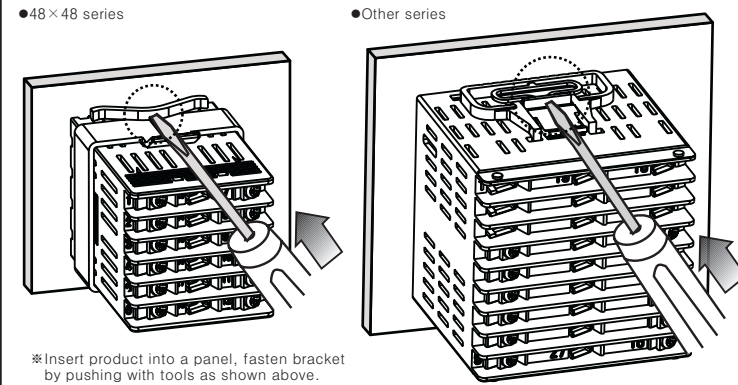
Input sensor and range [1 - 5]

●Select proper input sensor type by user' application.

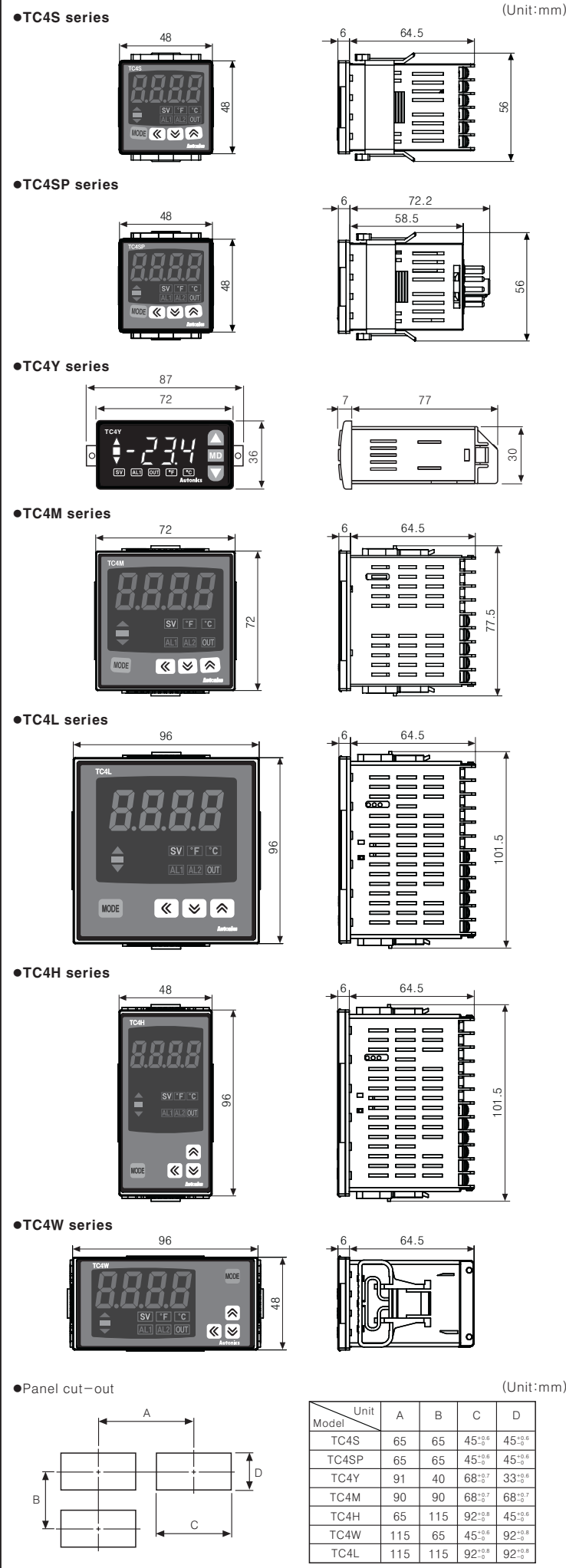
Input sensor	Display	Input range °C	Input range °F	
ThermoCouple	K(CA)	YCR	-50 ~ 1200℃	-58 ~ 2192°F
	J(IC)	JIC	-30 ~ 500℃	-22 ~ 932°F
RTD	DIN Pt 1	PE1	-100 ~ 400℃	-148 ~ 752°F
	rated Pt 2	PE2	-100.0 ~ 400.0℃	-148.0 ~ 752.0°F

●Setting range : YCR / JIC / PE1 / PE2 (Default : YCR)

Product mounting

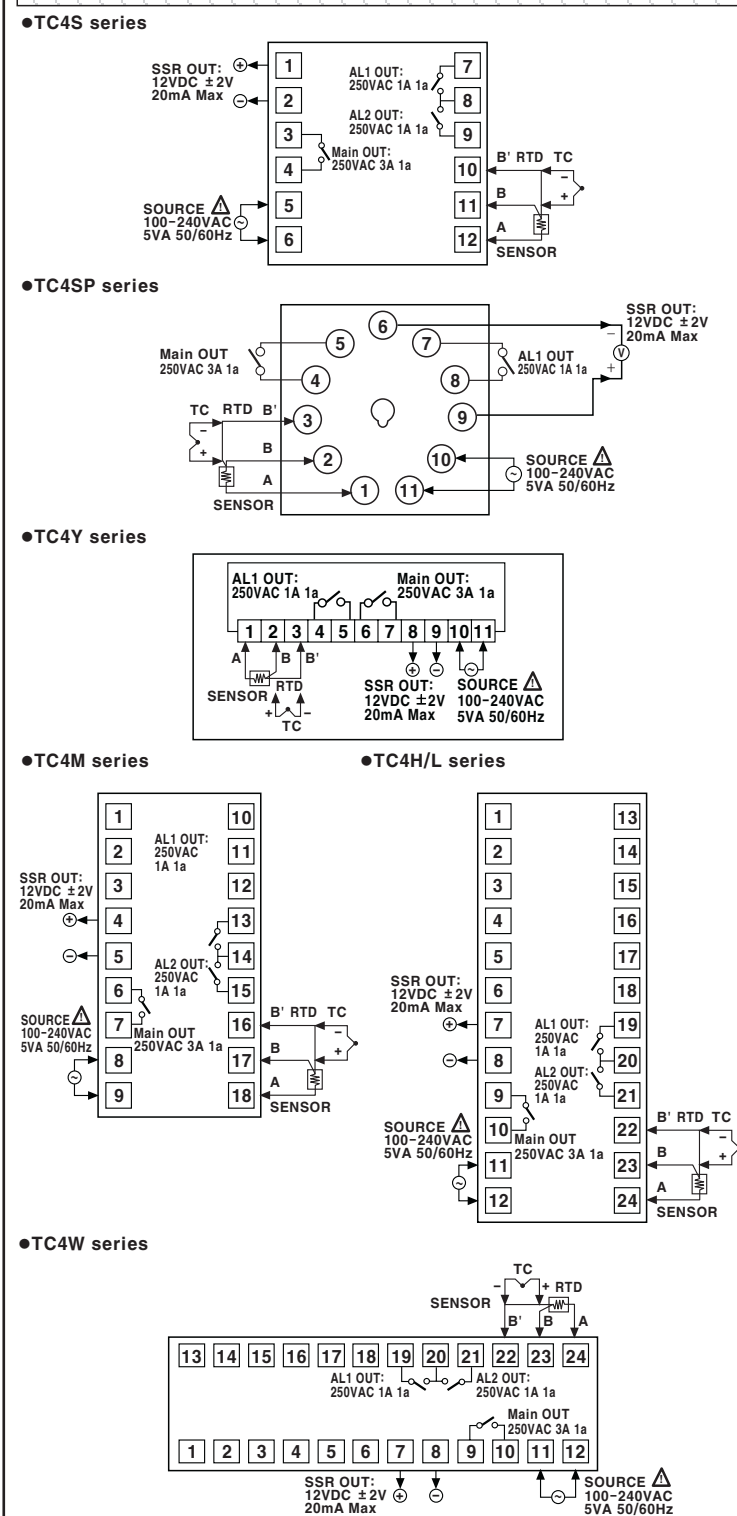


Dimensions

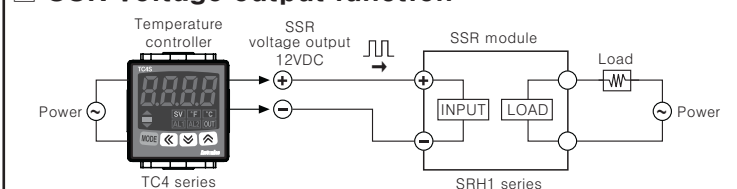


Connections

※TC4 series has both Main Out and SSR Out. You may select the model as your needs.



SSR voltage output function

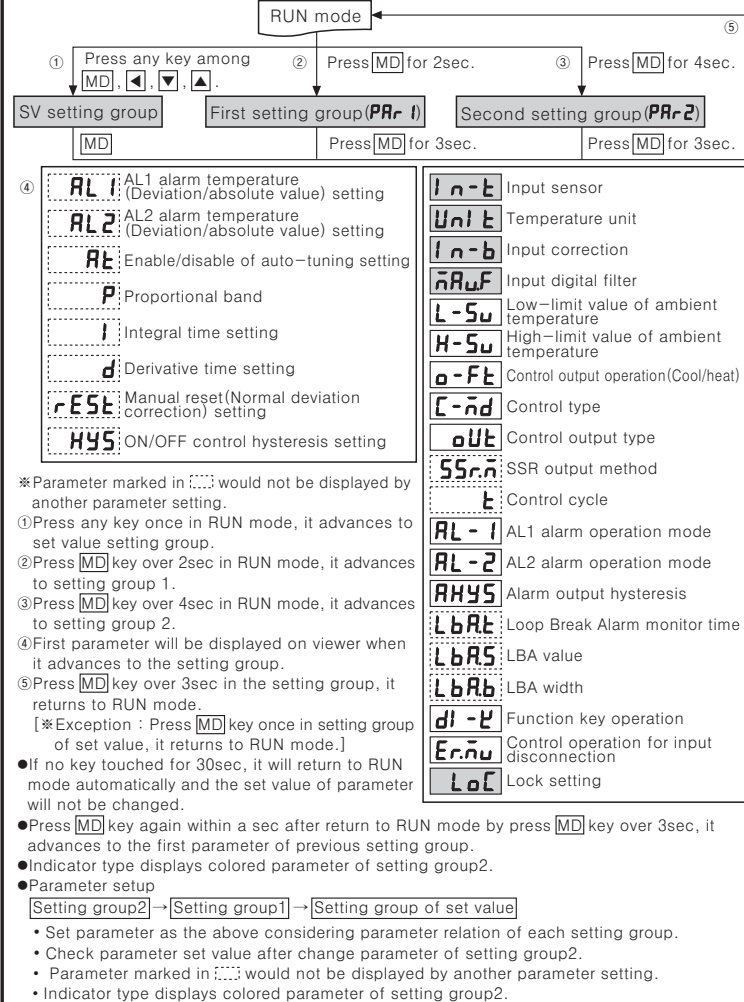


※You can select the functions with parameter settings.

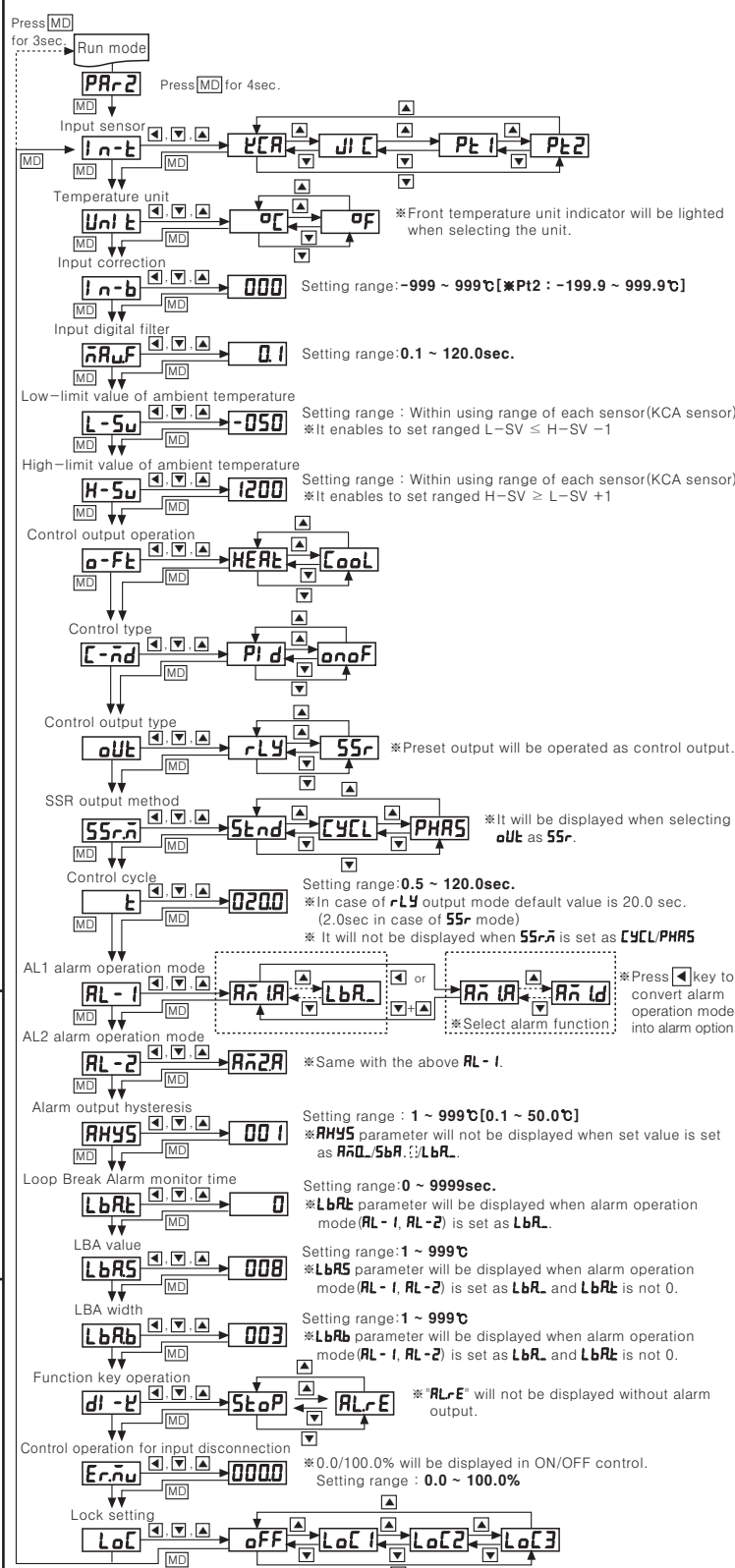
Model	Unit	A	B	C	D
TC4S	65	65	45 [※]	45 [※]	
TC4SP	65	65	45 [※]	45 [※]	
TC4Y	91	40	68 [※]	33 [※]	
TC4M	90	90	68 [※]	68 [※]	
TC4H	65	115	92 [※]	45 [※]	
TC4W	115	65	45 [※]	92 [※]	
TC4L	115	115	92 [※]	92 [※]	

※ You can select phase control mode using RANDOM CROSS SSR module. Linear control mode is still available just as existing 4~20mA DC current output, and you can also reduce the expenses.
 ※ You can select Zero Cross Cycle control mode using Zero Cross SSR module.

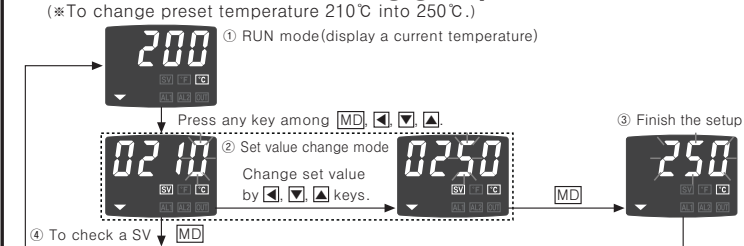
Flow chart for setting group



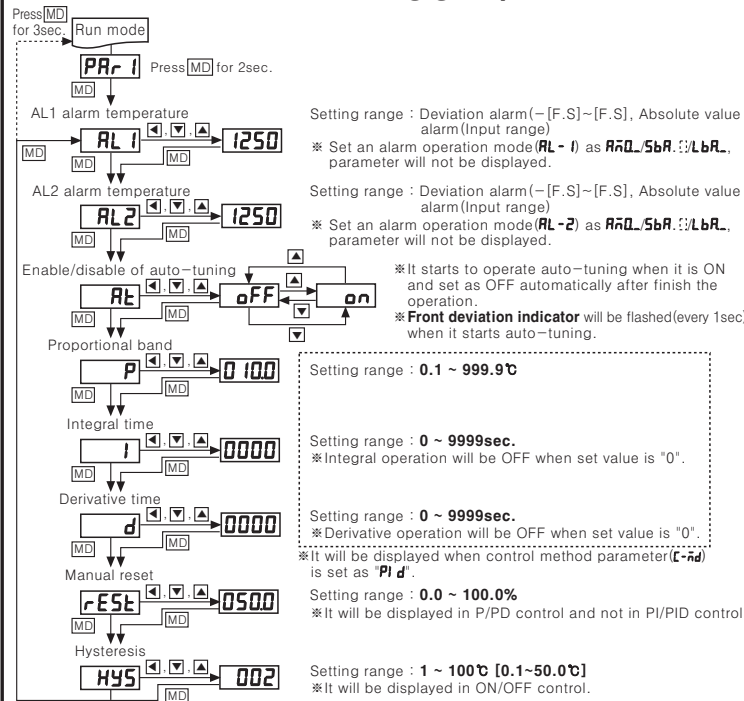
Flow chart for second setting group



Flow chart for SV setting group



Flow chart for first setting group



Factory default

Parameter	Factory default	Parameter	Factory default
AL1	1250	In-t	KCA
AL2	1250	Un-t	°C
ALt	oFF	In-b	0
P	100	nRwF	0.1
I	0	L-Su	-50
d	0	H-Su	1200
rESE	500	o-Ft	HERE
HYS	2	C-nd	PI d
		oUt	rLY
		SSr-n	Stnd
			LoC
			LoC1
			LoC2
			LoC3

Current temperature (PV) deviation display

- It displays current temperature (PV) deviation based on setting temperature (SV).
- Red ▲ indicator will be lighted when PV > SV + 2.0°C.
- Green ■ indicator will be lighted when SV + 2.0°C > PV ≥ SV - 2.0°C.
- Red ▼ indicator will be lighted when PV < SV - 2.0°C.

Auto Tuning [ALt]

- Parameter [ALt] is "on", front deviation indicators (▲, ■, ▼) are flashed (every 1sec) executing auto-tuning and set value will be converted on into off returning to RUN mode when it is finished.
- Set as "oFF" to stop auto-tuning. (※It keeps previous P, I, D set values.)
- Finish auto-tuning when error "oPEn" is occurred during the operation.
- It keeps to operate auto-tuning even though error "HHHH", "LLLL" are occurred and finishes the operation if it satisfies the condition.
- Setting range: oFF / on (Default: oFF)

Hysteresis [HYS]

- Set ON/OFF interval of control output in ON/OFF control.
 - Setting range: 1 ~ 100°C (0.1 ~ 50.0°C for Pt2.)
-

Digital filter [nRwF]

- It stabilizes control by display value stabilization when display value (PV) is fluctuated, disturbed repeatedly, it is hard to control stably.
- Setting range: 0.1 ~ 120.0 (Default: 0.1sec)

Upper/Lower Limit of set temperature [L-Su / H-Su]

- It sets upper/lower Limit range of using temperature within temperature range for each sensor, user can set/change set temperature (SV) within upper-limit (H-Su) ~ lower-limit (L-Su). (※ L-Su ~ H-Su cannot be set.)
- When changing input specification (In-t), upper-limit (H-Su) and lower-limit (L-Su) of using temperature will be initialized as max./min. value of sensor temperature range automatically.

Control type selection [C-nd]

- It is selectable PID, ON/OFF control.
- Setting range: PI d, onof

Control output selection [oUt]

- It is selectable output type between relay and SSR voltage output.
- Setting range: rLY, SSR

SSR output type selection [SSr-n]

- It enables to select for SSR including STANDARD, CYCLE, PHASE output types.
- STANDARD output will be ON when it outputs 100% and OFF for 0% same with relay output. [Stnd]
- CYCLE output is ZERO CROSS type output with improved on/off noise that repeating ON/OFF at the rate of regular output within a cycle. [CYCL]
- PHASE output enables to control continuously by control phase in half cycle of AC. [PHAS] (※ Use SSR for RANDOM CROSS and common power 100~240VAC for the unit and load.)
- Cost benefits are available since it carries out the same function to DC4~20mA current output.

Alarm output operation mode [AL-1 / AL-2]

Mode	Alarm output operation	Description (The initial value of AL1/AL2 is KCA.)
An0	OFF	■ No alarm output.
An1	SV 100°C, PV 110°C	■ Deviation high-limit alarm If deviation between PV and SV is occurring higher than set value of deviation temperature, the output will be ON. The deviation temperature is set in AL1/AL2. (Default of AL1, AL2: 1250)
An2	PV 90°C, SV 100°C	■ Deviation low-limit alarm If deviation between PV and SV is occurring lower than set value of deviation temperature, the output will be ON. The deviation temperature is set in AL1/AL2. (Default of AL1, AL2: 1250)
An3	PV 90°C, SV 100°C	■ Deviation high/low-limit alarm If deviation between PV and SV is occurring higher or lower than set value of deviation temperature, the output will be ON. The deviation temperature is set in AL1/AL2. ※It is ON if AL value 0 (Default of AL1, AL2: 1250)
An4	PV 90°C, SV 100°C	■ Deviation high/low-limit reverse alarm If deviation between PV and SV is occurring higher than set value of deviation temperature, the output will be OFF. The deviation temperature is set in AL1/AL2. ※It is OFF if AL value 0 (Default of AL1, AL2: 0)
An5	PV 90°C, SV 100°C	■ Absolute value high-limit alarm If PV is equal to or higher than the absolute value of alarm temperature, the output will be ON. The absolute temperature is set in AL1/AL2. (Default of AL1, AL2: 1200)
An6	PV 90°C, SV 100°C	■ Absolute value low-limit alarm If PV is equal to or lower than the absolute value of alarm temperature, the output will be ON. The absolute temperature is set in AL1/AL2. (Default of AL1, AL2: -50)
SbAR	It will be ON when it detects sensor disconnection.	■ Sensor Break Alarm
LbAR	It will be ON when it detects loop break.	■ Loop Break Alarm

- Alarm output hysteresis [AHYS]
 - Above alarm output operation mode, "H" is alarm output hysteresis which displays alarm output's on/off interval. User settable.
 - When setting alarm operation (ARt) mode as "An1d", "LbAR", parameter will not be displayed.
 - Setting range KCA, JIC, PT1: 1 ~ 100 (Default: 1) / PT2: 0.1 ~ 50.0

Additional alarm output selection

Display	Operation	Description
AR	General alarm	If it reaches to alarm temperature (deviation), sub output will be ON and OFF when it is out of the range.
b	Latch function	If it reaches to alarm temperature (deviation), sub output will be ON and it keeps ON status. (HOLD alarm output)
f	Standby sequence function	If it reaches to alarm temperature (deviation), sub output will not be ON and it works as general alarm operation from second reach to alarm temperature (deviation).
d	Latch & Standby sequence function	It operates latch and standby sequence mode simultaneously.

Sensor Break Alarm (SBA) [SbAR]

- The function that alarm output will be ON when sensor is not connected or when sensor's disconnection is detected during temperature controlling. You can check whether sensor is connected with buzzers or other units using alarm output contact.
- When setting alarm operation mode parameter (AL-1, AL-2) as "SbAR", it executes sensor break alarm.
- It is selectable between general alarm (SbAR) and latch (SbARb).
- The alarm output will be OFF when alarm output OFF or power OFF and ON again.

Loop Break Alarm (LBA) [LbAR]

- If control deviation is not lowered under LBA detection values within LBA monitoring time at the section that control deviation | SV - PV | is out of LBA detection range during normal operation, it is considered control loop error and alarm output becomes ON.
- It does not detect LBA during auto-tuning and LBA monitoring start will be initialized when entering alarm reset.
- LBA monitoring time setting range [LbARt]: 0~9999 (Default: 0, Unit: sec)
- LBA detecting value setting range [LbARS]: 1~999 [0.1~100.0] (Default: 8, Unit: °C)
- LBA detecting width setting range [LbARb]: 1~999 [0.1~100.0] (Default: 3, Unit: °C)

Function key selection [dl-y]

- Press front keys [▼] + [▲] at the same time for 3 sec to have previously set operation in parameter performed. You can choose between control output stop and alarm output off.
- It enables to stop control output without power off in RUN mode. [StoP]
- It is set as "StoP" if it does not have alarm output.
- Sub outputs will be operated as they are and it might keep "StoP" status after power off, press front keys [▼] + [▲] to off the "StoP".
- Alarm off [ALrE]
- User can off the alarm output during alarm (AL-1, AL-2) output is ON in latch & standby sequence function. (But, if PV is in alarm output range, it is disabled.)

Control output (MV for Error) for sensor input disconnection error (oPEn) [Er-nu]

- It sets control output when sensor input disconnection error is occurred enabling to set as ON/OFF and operation set by user.
- It executes control output by set operations regardless of ON/OFF and PID control operations.
- ON/OFF control setting range: 0.0(OFF)/100.0(ON) / PID control setting range: 0.0~100.0
- Default: 0.0 (Unit: %)

Lock setting [LoC]

- It locks set value and parameter change of the group.
 - It enables to check parameter set value of locked setting group.
- | Display | Description |
|---------|---|
| oFF | Lock off |
| LoC1 | Lock setting group 2 |
| LoC2 | Lock setting group 1, 2 |
| LoC3 | Lock setting group 1, 2, SV setting group |
- Setting range: oFF / LoC1 / LoC2 / LoC3 (Default: oFF)
 ※oFF, LoC1 are available only for indicator (TC4□~N□□).

Error

- Error mark will flash (every 1sec) in PV viewer when error is occurred during the control operation.
- | Display | Description |
|---------|---|
| oPEn | If input sensor is disconnected or sensor is not connected. |
| HHHH | If measured sensor input is higher than temperature range. |
| LLLL | If measured sensor input is lower than temperature range. |
- It will operate normally, if input sensor is connected or returned to normal range under error oPEn / HHHH / LLLL status.

Caution for using

- Installation environment
 - ① It shall be used indoor.
 - ② Altitude Max. 2000m.
 - ③ Pollution Degree 2.
 - ④ Installation Category II.
 - Please install power switch or circuit-breaker in order to cut power supply off.
 - The switch or circuit-breaker should be installed near by users.
 - Do not use this product as Volt-meter or Ampere-meter, this is a temperature controller.
 - Be sure to use compensating wire when extends wire from controller to thermocouple, otherwise the temperature deviation will be occurred at the part where wires are connected to each other.
 - In case of using RTD sensor, 3wire type must be used. If you need to extend the line, 3wires must be used with the same thickness as the line. It might cause the 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)
- ※It may cause malfunction if above instructions are not followed.

Major products

- PROXIMITY SENSOR
- PHOTOELECTRIC SENSOR
- AREA SENSOR
- FIBER OPTIC SENSOR
- DOOR/DOOR SIDE SENSOR
- PRESSURE SENSOR
- ROTARY ENCODER
- SENSOR CONTROLLER
- SWITCHING POWER SUPPLY
- TEMPERATURE CONTROLLER
- TEMPERATURE/HUMIDITY TRANSDUCER
- POWER CONTROLLER
- RECORDER
- TACHOMETER/PULSE (RATE) METER
- PANEL METER
- INDICATOR
- SIGNAL CONVERTER
- COUNTER
- TIMER
- DISPLAY UNIT
- GRAPHIC PANEL
- STEPPING MOTOR & DRIVER & MOTION CONTROLLER

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