

# 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.

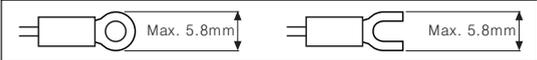
**Caution** Product may be damaged, or injury may result if instructions are not followed.

※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(0.50mm<sup>2</sup>) 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.

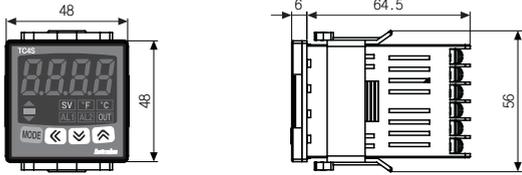
## Ordering information

T	C	4	S	-	1	4	R
Item	Setting type	Digit	Size	Sub output	Power supply	Control output	
	C	4	S	N	4	N	
	T	4	SP	1	4	R	
		4	Y	1	4		
		4	M	1	4		
		4	H	1	4		
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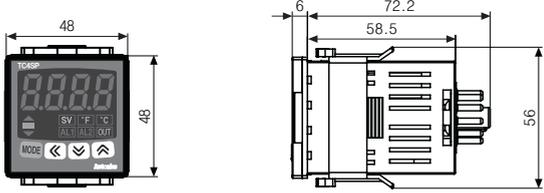
## ■ Dimensions

### ●TC4S series

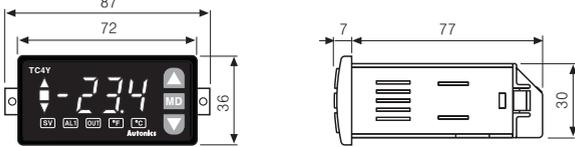
(Unit:mm)



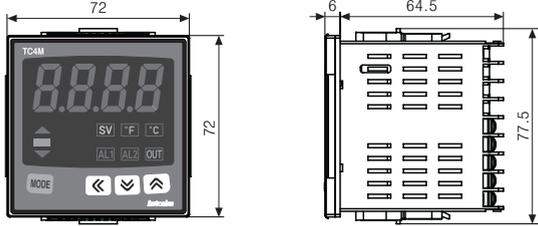
### ●TC4SP series



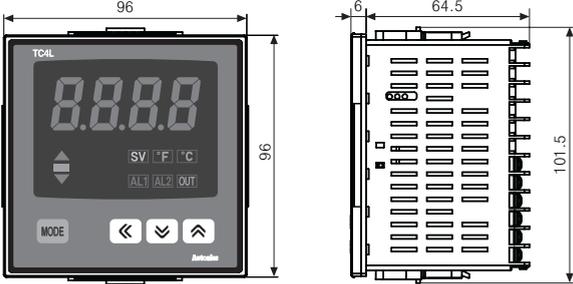
### ●TC4Y series



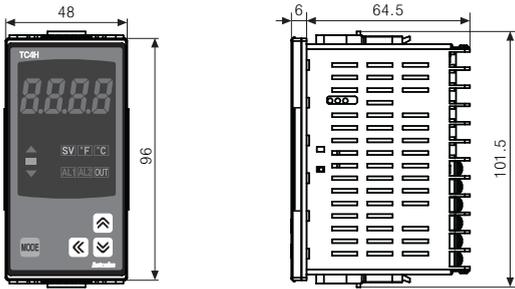
### ●TC4M series



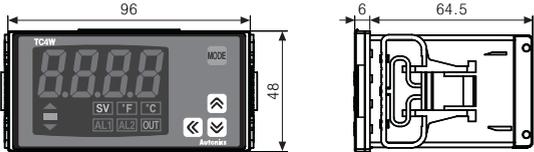
### ●TC4L series



### ●TC4H series

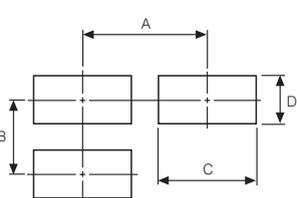


### ●TC4W series



### ●Panel cut-out

(Unit:mm)

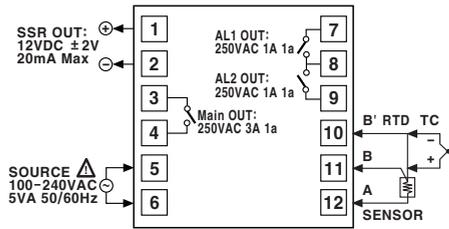


Model	Unit	A	B	C	D
TC4S		65	65	45 <sup>+0.6</sup>	45 <sup>+0.6</sup>
TC4SP		65	65	45 <sup>+0.6</sup>	45 <sup>+0.6</sup>
TC4Y		91	40	68 <sup>+0.7</sup>	33 <sup>+0.6</sup>
TC4M		90	90	68 <sup>+0.7</sup>	68 <sup>+0.7</sup>
TC4H		65	115	92 <sup>+0.8</sup>	45 <sup>+0.6</sup>
TC4W		115	65	45 <sup>+0.6</sup>	92 <sup>+0.8</sup>
TC4L		115	115	92 <sup>+0.8</sup>	92 <sup>+0.8</sup>

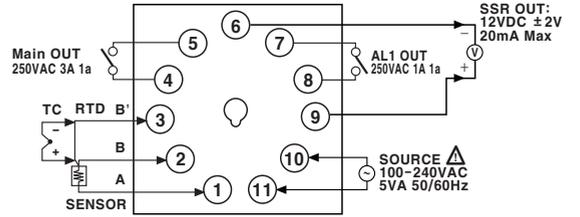
## ■ Connections

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

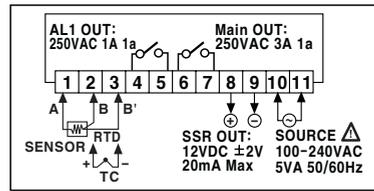
### ●TC4S series



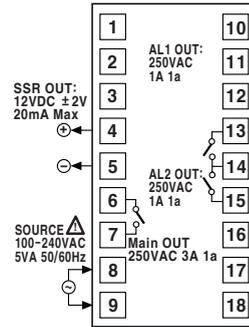
### ●TC4SP series



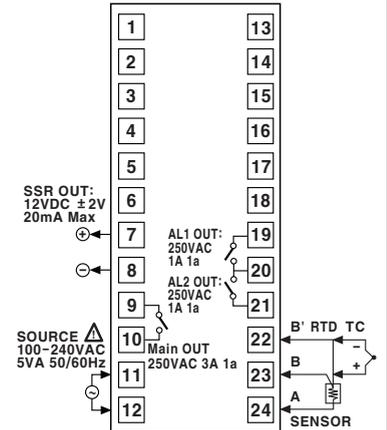
### ●TC4Y series



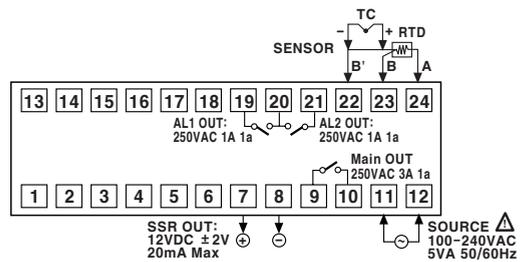
### ●TC4M series



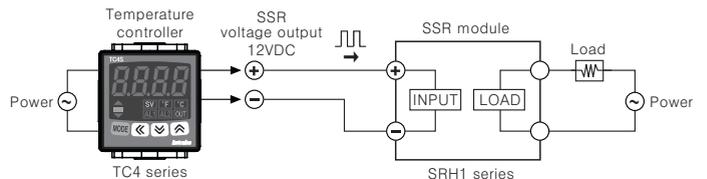
### ●TC4H/L series



### ●TC4W series



## ■ SSR voltage output function

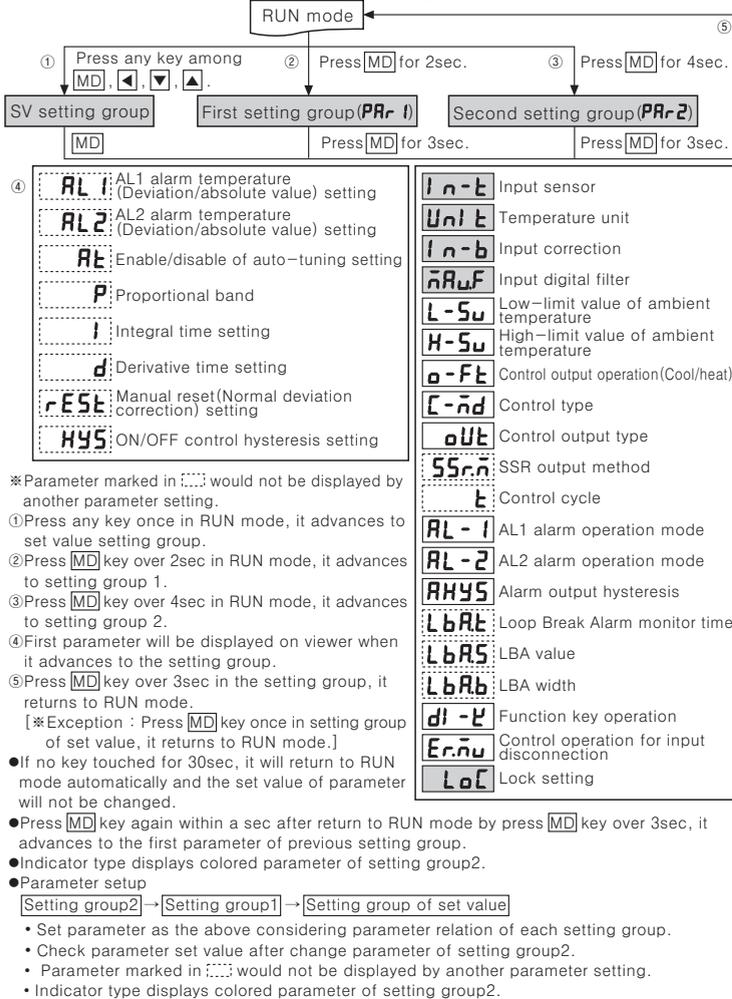


※You can select the functions with parameter settings.

	Load output wave
Phase control mode	
Cycle control mode	
ON/OFF control mode	

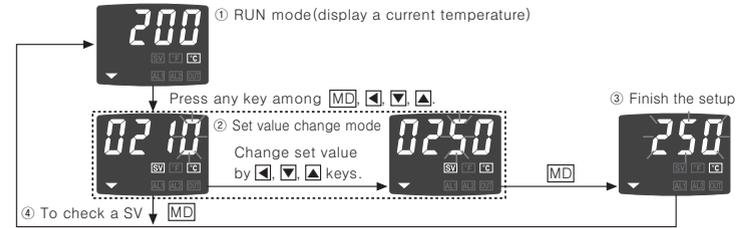
※ You can select phase control mode using RANDOM CROSS SSR module. Linear control mode is still available just as existing 4~20mA DC current output, and you can also reduce the expenses.  
 ※ You can select Zero Cross Cycle control mode using Zero Cross SSR module.

## Flow chart for setting group

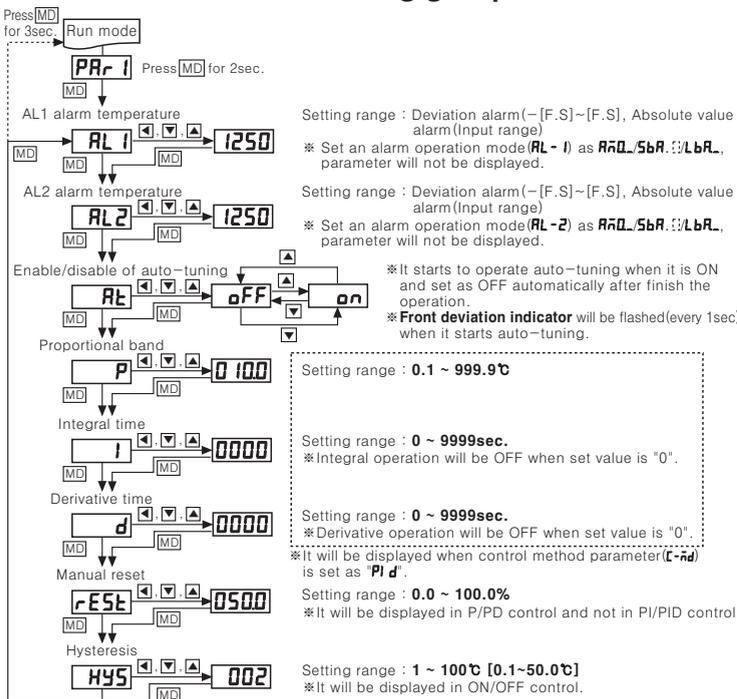


## Flow chart for SV setting group

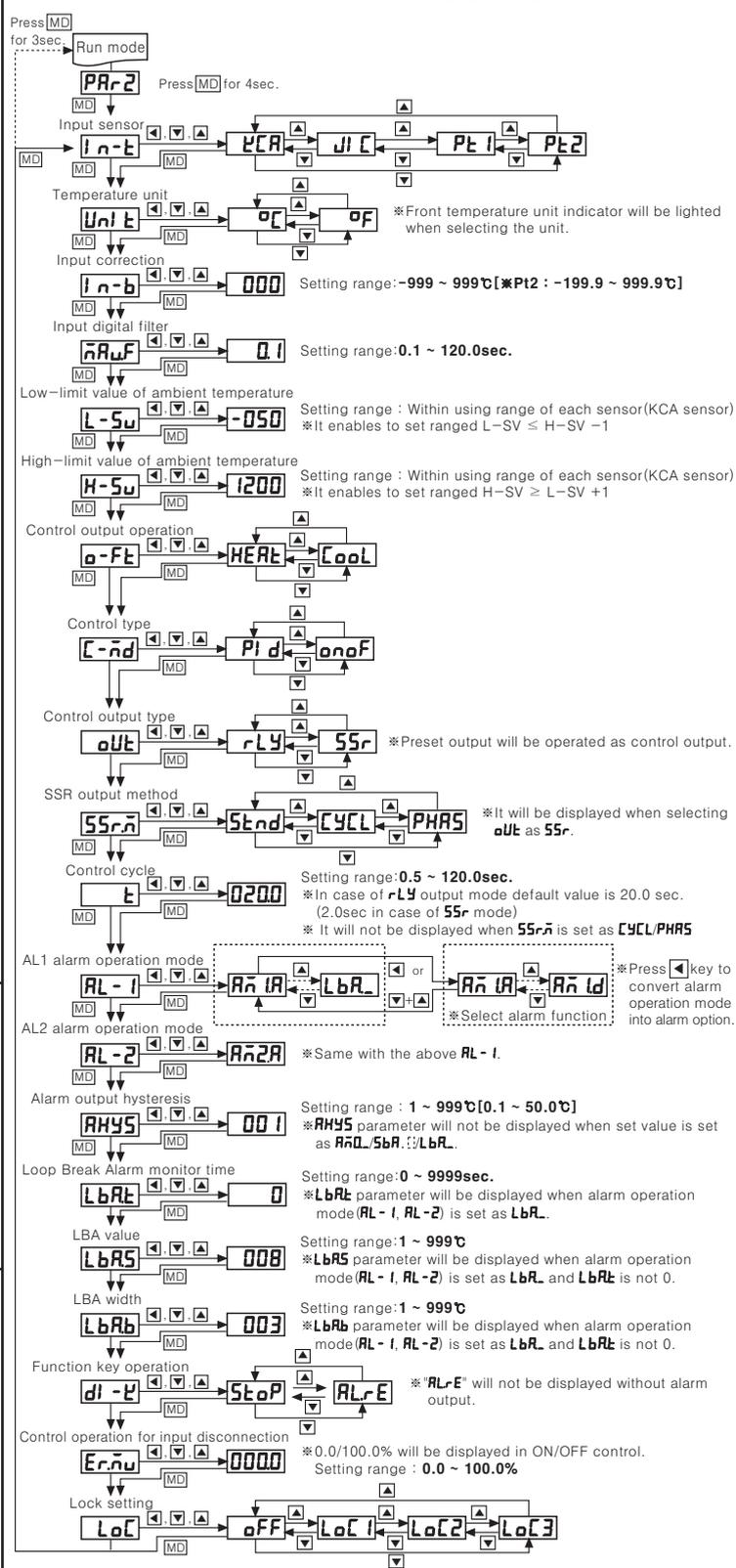
(\*To change preset temperature 210°C into 250°C.)



## Flow chart for first setting group



## Flow chart for second setting group



## Factory default

### First setting group

Parameter	Factory default
<b>AL-1</b> Alarm 1 Set Value	1250
<b>AL-2</b> Alarm 2 Set Value	1250
<b>At</b> Auto Tuning	oFF
<b>P</b> Proportional Bandwidth	100
<b>I</b> Integral time	0
<b>d</b> Derivation time	0
<b>rESet</b> Reset	500
<b>HYS</b> Hysteresis	2

### Second setting group

Parameter	Factory default	Parameter	Factory default
<b>In-t</b> Input type	KCA	<b>t</b> Control Time	200
<b>Unit</b> Unit	°C	<b>AL-1</b> Alarm 1 Type	RnIR
<b>In-b</b> Input Bias	0	<b>AL-2</b> Alarm 2 Type	Rn2R
<b>nARF</b> Input Digital Filter	0.1	<b>AHYS</b> Alarm Hysteresis	1
<b>L-SV</b> SV Low Limit	-50	<b>LbAt</b> Loop Break Alarm Time	0
<b>H-SV</b> SV High Limit	1200	<b>LbAS</b> Loop Break Alarm Set	8
<b>o-Ft</b> Operation Function Type	HEAt	<b>LbAb</b> Loop Break Alarm Band	3
<b>C-nd</b> Control Method	PI d	<b>dl-y</b> Digital Input Key	StOP
<b>oUt</b> Output (Realy or SSR) Type	rLY	<b>Er-nu</b> MV for Error	00
<b>SSr</b> SSR Out Mode	Stnd	<b>LoC</b> Lock	oFF

**Current temperature(PV) deviation display**

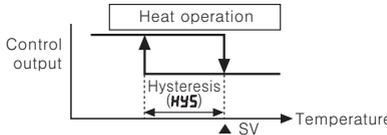
- It displays current temperature(PV) deviation based on setting temperature(SV).
- Red ▲ indicator will be lighted when  $PV > SV + 2.0^{\circ}C$ .
- Green ■ indicator will be lighted when  $SV + 2.0^{\circ}C \geq PV \geq SV - 2.0^{\circ}C$ .
- Red ▼ indicator will be lighted when  $PV < SV - 2.0^{\circ}C$ .

**Auto Tuning[  $\Delta t$  ]**

- Parameter[  $\Delta t$  ] 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[  $\bar{n}RdF$  ]**

- 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(I n-E), 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[  $\bar{c} - \bar{n}d$  ]**

- 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[  $SSr\bar{n}$  ]**

- 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. [Stand]
- 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.)
$R\bar{n}O$	OFF ON	No alarm output.
$R\bar{n}1$	SV PV 100°C 110°C Alarm temperature (Deviation temperature) : Set as 10°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)
$R\bar{n}2$	PV SV 90°C 100°C Alarm temperature (Deviation temperature) : Set as 10°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)
$R\bar{n}3$	ON OFF PV SV 90°C 100°C Alarm temperature (Deviation temperature) : Set as 10°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)
$R\bar{n}4$	OFF ON PV SV 90°C 100°C Alarm temperature (Deviation temperature) : Set as 10°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)
$R\bar{n}5$	OFF ON PV SV 90°C 100°C Alarm temperature (Absolute value) : Set as 90°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)
$R\bar{n}6$	ON OFF PV SV 90°C 100°C Alarm temperature (Absolute value) : Set as 90°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)
$SbR$	It will be ON when it detects sensor disconnection.	Sensor Break Alarm
$LbR$	It will be ON when it detects loop break.	Loop Break Alarm

- Alarm output hysteresis[ $HYS$ ]
- Above alarm output operation mode, "H" is alarm output hysteresis which displays alarm output's on/off interval. User settable.
- When setting alarm operation mode as "AL", "LbR", 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
$\bar{a}R$	General alarm	If it reaches to alarm temperature(deviation), sub output will be ON and OFF when it is out of the range.
$\bar{b}$	Latch function	If it reaches to alarm temperature(deviation), sub output will be ON and it keeps ON status. (HOLD alarm output)
$\bar{c}$	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).
$\bar{d}$	Latch & Standby sequence function	It operates latch and standby sequence mode simultaneously.

**Sensor Break Alarm(SBA)[  $SbR$  ]**

- 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 "SbR", it executes sensor break alarm.
- It is selectable between general alarm(SbAR) and latch(SbAb).
- The alarm output will be OFF when alarm output OFF or power OFF and ON again.

**Loop Break Alarm(LBA)[  $LbR$  ]**

- 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 [LbRE] : 0~9999 (Default : 0, Unit : sec)
- LBA detecting value setting range [LbRS] : 1~999[0.1~100.0] (Default : 8, Unit : °C)
- LBA detecting width setting range [LbRb] : 1~999[0.1~100.0] (Default : 3, Unit : °C)

**Function key selection[  $d/ -E$  ]**

- 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 set and it might keep "StoP" status after power off, press front keys ▼+▲ to off the "StoP".
- Alarm off[AL-E]
- 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) [  $E\bar{n}n$  ]**

- 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□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
    - ①It shall be used indoor.
    - ②Altitude Max. 2000m.
    - ③Pollution Degree 2.
    - ④Installation 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, 3wires 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
- AREA SENSOR
- DOOR/DOOR SIDE SENSOR
- ROTARY ENCODER
- SWITCHING POWER SUPPLY
- TEMPERATURE CONTROLLER
- TEMPERATURE/HUMIDITY TRANSDUCER
- POWER CONTROLLER
- TACHOMETER/PULSE(RATE) METER
- INDICATOR
- TIMER
- STEPPING MOTOR & DRIVER & MOTION CONTROLLER
- PHOTOELECTRIC SENSOR
- FIBER OPTIC SENSOR
- PRESSURE SENSOR
- SENSOR CONTROLLER
- RECORDER
- SIGNAL CONVERTER
- DISPLAY UNIT
- GRAPHIC PANEL

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