Autonics

TEMPERATURE CONTROLLER
TD4 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.

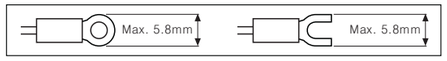
※The following is an explanation of the symbols used in the operation manual.
⚠ caution:Injury or danger may occur under special conditions.

⚠ Warning

1. **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.
2. **Install the unit on a panel.**
   It may cause an electric shock.
3. **Do not connect, inspect or repair when power is on.**
   It may cause an electric shock.
4. **Wire properly after check terminal number.**
   It may cause a fire.
5. **Do not disassemble the case. Please contact us if it is required.**
   It may cause an electric shock or a fire.

⚠ Caution

1. **This unit shall not be used outdoors.**
   It might shorten the life cycle of the product or give an electric shock.
2. **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.
3. **For crimpled terminal, select following shaped terminal.**



4. **Please observe the rated specifications.**
   It might shorten the life cycle of the product and cause a fire.
5. **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.
6. **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.
7. **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.
8. **Do not inflow dust or wire dregs into the unit.**
   It may cause a fire or a malfunction.
9. **Please wire properly after check the terminal polarity when connect temperature sensor.**
   It may cause a fire or an explosion.
10. **In order to install the units with reinforced insulation, use the power supply unit which basic insulation level is ensured.**
    (TD4SP is basic insulation only.)

▣ Ordering information

T D 4 M – 1 4 R

Control output	R	Relay output	TD4SP TD4M
	S	SSR drive output	
	C	Current output	
	R	Relay output + SSR drive output	TD4H TD4L
	C	Current output + SSR drive output	
	※Control output type is different depending on model size.		
Power supply	4	100–240VAC 50/60Hz	
Alarm output	N	No alarm output	
	1	Alarm1 output	
	2	Alarm1 + Alarm2 output	
Size	SP	DIN W48×H48mm(8 pin plug type)(※1)	
	M	DIN W72×H72mm	
	H	DIN W48×H96mm	
	L	DIN W96×H96mm	
Digit	4	9999(4 Digit Type)	
Setting type	D	Set by digital switch	
Item	T	Temperature controller	

※ **1**: 8 Pin Socket(PG-08, PS-08): Sold separately

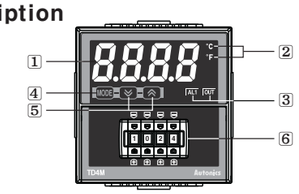
※The above specifications are subject to change without notice.

▣ Specifications

Series		TD4 series			
		TD4SP	TD4M	TD4H	TD4L
Power supply		100–240VAC 50/60Hz			
Allowable voltage range		90 ~ 110% of rated voltage			
Power consumption		Max. 5VA			
Display method		7 Segment(Red), Other display part(Green, Yellow, Red LED)			
Character size		H15mm×W7mm	H18mm×W9mm	H15mm×W7mm	H22mm×W11mm
Input type	RTD	DIN Pt100Ω(Allowable line resistance max.5Ω per a wire)			
	TC	K(CA), J(IC)			
Display accuracy	RTD	(※1) (PV ± 0.5% or ±1℃ higher one) rdg ± 1Digit (※2) ※TD4SP(Plug type) is (PV ±0.5% or ± 2℃ higher one) rdg ± 1Digit ☞Based on normal temperature(23℃ ± 5℃)			
	TC				
Control output	Relay	250VAC 3A 1c	250VAC 3A 1a	Relay(250VAC 3A 1a) + SSR(24VDC ± 3V 20mA Max.)	
	SSR	24VDC ± 3V 20mA Max.			
	Current	DC4–20mA (Load resistance Max. 600Ω)			
Alarm output		——	AL1 Relay: 250VAC 1A 1a	AL1, AL2 Relay : 250VAC 1A 1a	
Control method		ON/OFF and P, PI, PD, PID control			
Hysteresis		1 ~ 100℃/℉			
Proportional band(P)		0.1 ~ 999.9℃/℉			
Integral time(I)		9999 sec.			
Derivative time(D)		9999 sec.			
Control period(T)		0.5 ~ 120.0 sec.			
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 life cycle	Control output	Mechanical: Min. 10,000,000 operations, Electrical: Min. 100,000 operations			
	Alarm output	Mechanical: Min. 5,000,000 operations, Electrical: Min. 100,000 operations			
Insulation resistance		Min. 100MΩ(500VDC megger)			
Noise immunity		Square-wave noise by noise simulator(pulse width 1㎲)±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			
Insulation type(※3)		⊡			
Approval		CE cULus			
Unit weight		Approx. 76g	Approx. 126g	Approx. 131g	Approx. 193g

※ **1**: (PV ±0.5% or ±2℃ higher one) rdg ±1Digit, in case, out of normal temperature range.
※ **2**: TD4SP is (PV ±0.5% or ±3℃ higher one) rdg ±1Digit, in case, out of normal temperature range.
※ **3**: "⊡" Mark indicates that equipment protected throughout by double insulation or reinforced insulation.

▣ Parts description



1 Temperature display
It shows current temperature(PV) in RUN mode and parameter and set value for each setting group in parameter change mode.
2 Temperature unit indicator(℃/℉)
–It shows current temperature unit.
–Temperature unit(℃ or ℉) display lamp will be flickering during AT function.
3 Control/sub output indicator
–OUT : It will be ON when control output is ON.
※In case of current output type, it will be OFF when output level is under 2%, and ON when output level is over 3%.
–AL□ : It will light up when AL□ output is on.
4 MODE Key : Used when entering into parameter setting group, returning to RUN mode, moving parameter and saving setting values.
5 Adjustment : Used when entering into set value change mode, Digit moving and Digit Up/down. Press ▽+△key at the same time to perform setting functions in Function Key setting mode(*dI -Y*) and to make Digit movement.
6 Digital Switch : Used to set SV to control

▣ Input sensor and range[*In-t*]

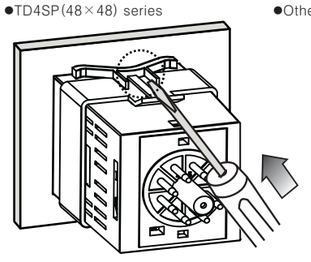
●Select proper input sensor type by user' application.

Input sensor			Display	Input range (℃)	Input range (℉)
ThermoCouple	K(CA)		*KCA*	-50 ~ 1200	-58 ~ 2192
	J(IC)		*JIC*	-30 ~ 500	-22 ~ 932
RTD	DIN rated	DPt 100Ω	*Pt*	-100 ~ 400	-148 ~ 752

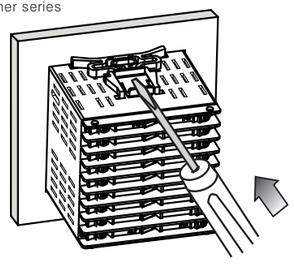
●Setting range : [*KCA* / *JIC* / *Pt*] (Default : [*KCA*])

▣ Product mounting

●TD4SP(48×48) series



●Other series

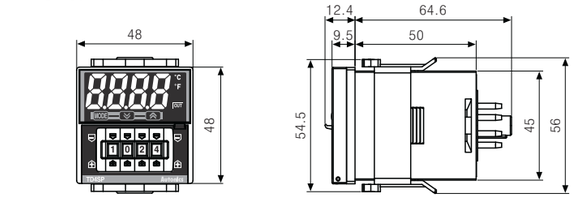


※Insert product into a panel, fasten bracket by pushing with tools as shown above.

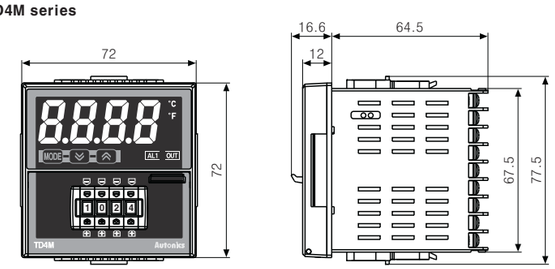
▣ Dimensions

(Unit:mm)

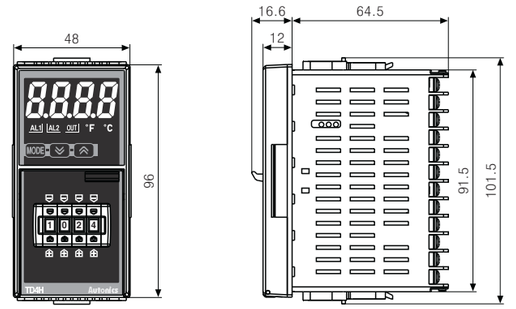
●TD4SP series



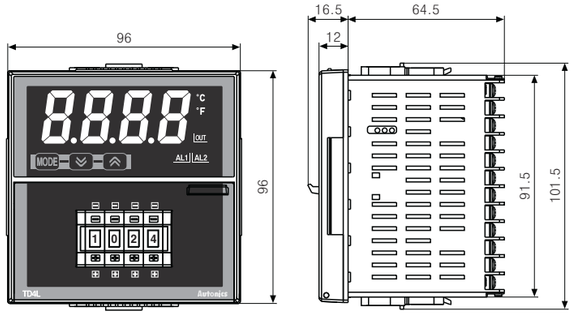
●TD4M series



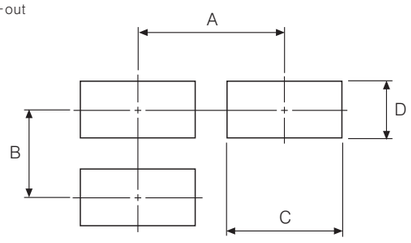
●TD4H series



●TD4L series



●Panel cut-out

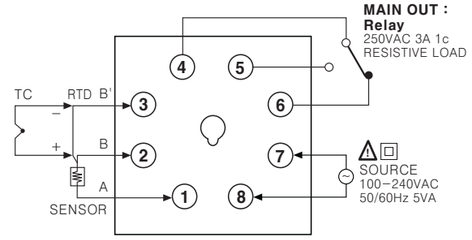


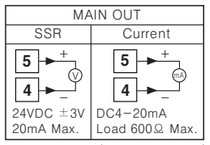
(Unit:mm)

Model \ Unit	A	B	C	D
TD4SP	65	65	$45^{+0.6}_{-0}$	$45^{+0.6}_{-0}$
TD4M	90	90	$68^{+0.7}_{-0}$	$68^{+0.7}_{-0}$
TD4H	65	115	$45^{+0.6}_{-0}$	$92^{+0.8}_{-0}$
TD4L	115	115	$92^{+0.8}_{-0}$	$92^{+0.8}_{-0}$

▣ Connections

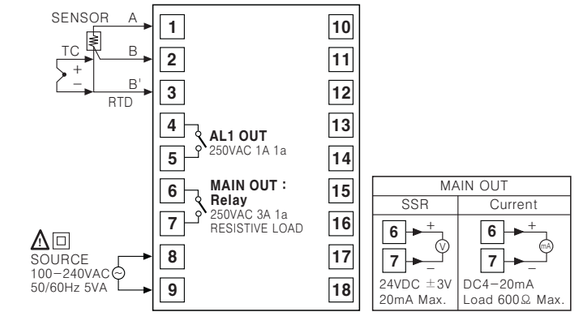
●**TD4SP-N4□ model (No alarm output model)**



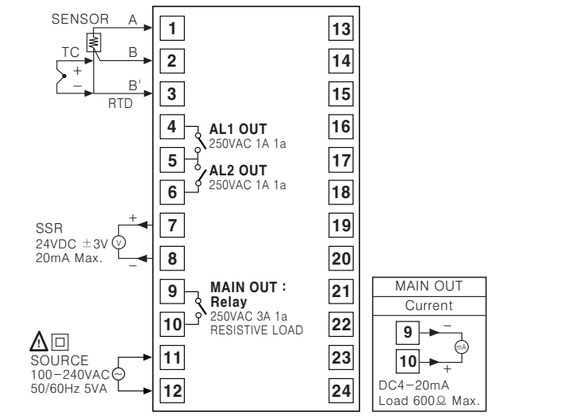


※8 Pin Socket(PG-08, PS-08)
: Sold separately

●**TD4M series**



●**TD4H/TD4L series**



▣ Factory default

●**First setting group**

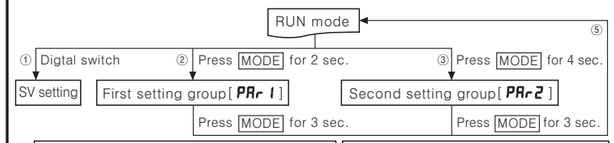
Parameter		Factory default
AL1	AL1 alarm temperature	1250
AL2	AL2 alarm temperature	
AT	Auto Tuning ON/OFF	*oFF*
P	Proportional Band	100
I	Integral time	0
d	Derivative time	
rESt	Manual reset	500
HYS	Hysteresis	2

●**Second setting group**

Parameter		Factory default	Parameter		Factory default
In-t	Input sensor	*KCA*	*AL-1*	AL1 alarm operation mode	*An1A*
Unit	Temperature Unit	*°C*			
In-b	Input correction	0	*AL-2*	AL2 alarm operation mode	*An2A*
nAuF	Input Digital Filter	0.1	*AHYS*	Alarm output Hysteresis	1
L-SU	SV low-limit value	-50	*LbAt*	LBA monitoring time	0
H-SU	SV high-limit value	1200	*LbAS*	LBA value	8
o-Ft	Control output operation	*HEAt*	*LbAb*	LBA detection range	3
C-Ad	Control type	*PId*	*dI -Y*	Function key operation	*StoP*
oUt	Control output type(※1)	*rLY*	*ErAU*	Control output MV for input break error or setting error	0.0
t	Control Time	20.0			
		20	*LoC*	Lock setting	*oFF*

※**1**: Available with only TD4H/TD4L model.
※Default for [*t*] ☞ Relay contact output : 20.0 sec. / SSR output : 2.0 sec.

▣ Flow chart for setting group



④

AL 1	AL1 alarm temperature (Deviation/absolute value) setting
AL2	AL2 alarm temperature (Deviation/absolute value) setting
At	Auto tuning ON/OFF
P	Proportional band
I	Integral time setting
d	Derivative time setting
rESt	Manual reset(Normal deviation correction) setting
HYS	Hysteresis setting

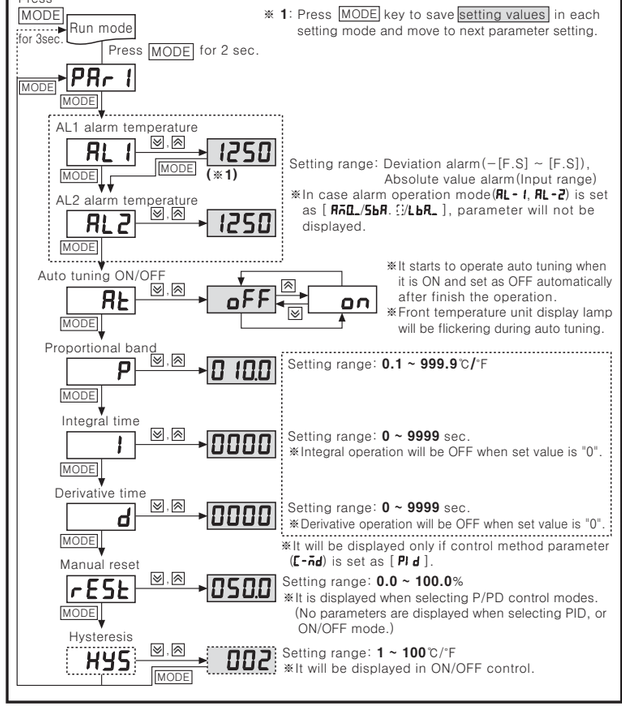
In-t	Input sensor
Unit	Temperature unit
In-b	Input correction
inAuF	Input digital filter
L-Su	SV low-limit value
H-Su	SV high-limit value
o-Ft	Control output operation (Cool/heat)
C-nd	Control type
oUt	(※)Control output selection (Available with only TD4H/L model)
t	(※)Control cycle setting when selecting PID control type
AL-1	(※)AL1 alarm operation mode
AL-2	(※)AL2 alarm operation mode
AHYS	Alarm output hysteresis
LbAt	LBA monitoring time
LbAS	LBA value
LbAb	LBA detection range
dI-E	Function key operation
Er.nu	Control output MV in case of input break error or setting error
LoC	Lock setting

① Digital switch could set SV value in any mode.
②Press MODE key over 2 sec in RUN mode, it advances to setting group 1.
③Press MODE key over 4 sec in RUN mode, it advances to setting group 2.
④First parameter will be displayed on viewer when it advances to the setting group.
⑤Press MODE key over 3 sec in the setting group, it returns to RUN mode.

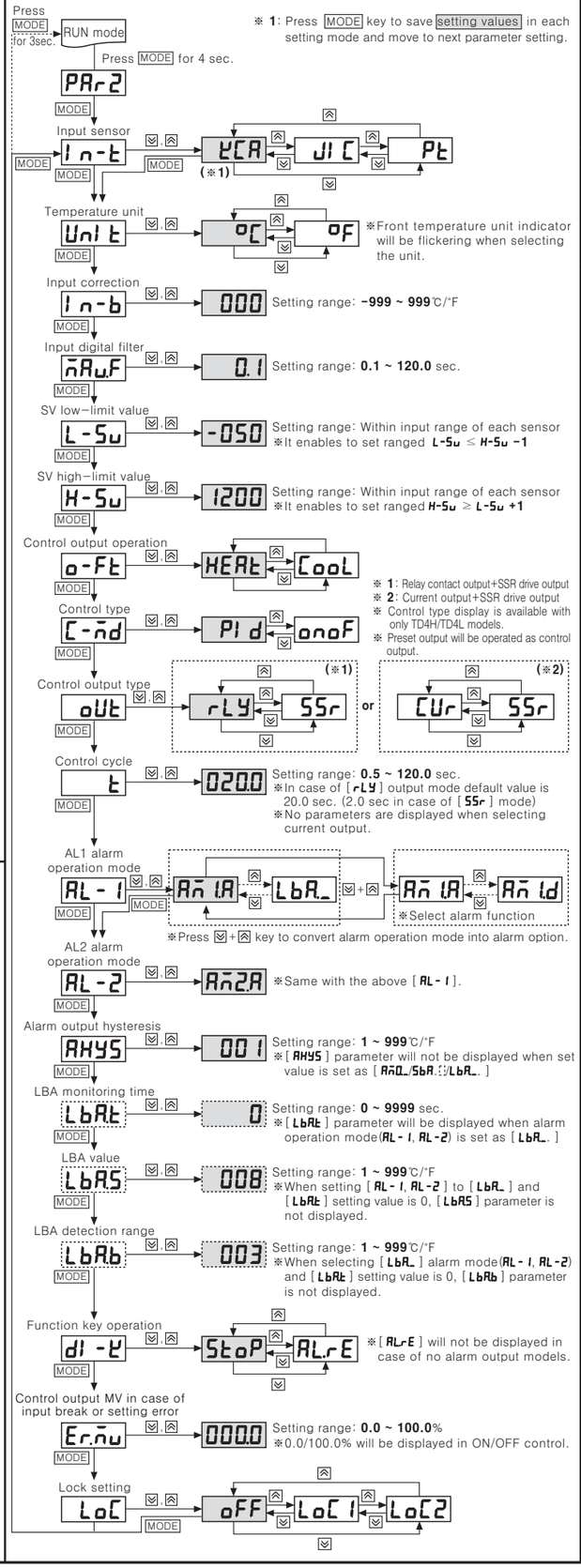
- If no key touched for 30 sec, it will return to RUN mode automatically and the set value of parameter will not be changed.
- Press MODE key again within a sec after return to RUN mode by press MODE key over 3 sec, it advances to the first parameter of previous setting group.
- Parameter setup

  Setting group 2 → Setting group 1
  - Set parameter as the above considering parameter relation of each setting group.
  - Check parameter set value after change parameter of setting group 2.
  - Setting group description above is for 24R models.
  - ⬚: The part shown in dotted line is displayed depending on setting in setting group 2.
- (※) is displayed depending on the model type.

▣ Flow chart for first setting group



▣ Flow chart for second setting group

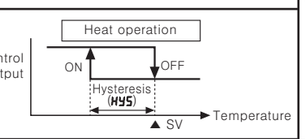


▣ Auto tuning[At]

- When setting [At] parameter to [on], front temperature unit display(℃ or ℉) lamp will be flickering during Auto tuning. After completing auto tuning, temperature unit display lamp returns to normal operation and [At] parameter automatically becomes [oFF].
- Set as [oFF] to stop auto tuning. ※It keeps previous P, I, D set values.
- If SV is changed during auto tuning mode, auto tuning is stopped.
- PID time constants figured out thru auto tuning function can be changed.
- If control type is [onoF] mode, no parameters are displayed.
- Finish auto tuning when error(oPEn) occurs during the operation.
  ※In case of [oPEn] error, auto tuning is not applicable.
- Setting range: [oFF / on] (Default: [oFF])

▣ Hysteresis[HYS]

- In case of selecting ON/OFF control mode, it is required to set hysteresis.
- Related parameters are displayed only if selecting ON/OFF control mode.
- Setting range: 1 ~ 100(Default: 2, Unit: ℃/℉)



▣ Digital filter[inAuF]

- A function to filter input signals for more stable PV display in order to provide stable control output. If noise occurs on input signals or PV value keeps changing, it gets difficult to perform high accuracy control.
- Setting range: 0.1 ~ 120.0(Default: 0.1 sec.)

▣ SV High / Low Limit Setting[L-Su / H-Su]

- A function to set high / low limit for SV(※ [L-Su > H-Su] cannot be set.)
- Users can set / change SV within the range of [H-Su]~[L-Su].
- When changing input sensors(In-t), [H-Su] and [L-Su] are automatically reset to Max / Min. of input sensor temperature range.

▣ Control type selection[C-nd]

- It is selectable PID, ON/OFF control. - Setting range: [PId, onoF]

▣ Control output selection[oUt] (※Available with only TD4H/L model)

- In case of Relay output type models, both Relay output and SSR drive output are available.
- In case of current output type models, both current output(4~20mA) and SSR drive output are available.
- Setting range: [rLY / 5Sr], [CUr / 5Sr]

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

Mode	Alarm output operation	Description(The initial value of AL1/AL2 is KCA.)
AnO_	———	■No alarm output.
An⬚	OFF H ON (△ SV 100℃ PV 110℃) Alarm temperature (Deviation temperature) : Set as 10℃. OFF H ON (△ PV 90℃ SV 100℃) Alarm temperature (Deviation temperature) : Set as -10℃.	■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⬚	ON H OFF (△ PV 90℃ SV 100℃) Alarm temperature (Deviation temperature) : Set as 10℃. ON H OFF (△ SV 100℃ PV 110℃) Alarm temperature (Deviation temperature) : Set as -10℃.	■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⬚	ON H OFF H ON (△ PV 90℃ SV 100℃ PV 110℃) Alarm temperature (Deviation temperature) : Set as 10℃.	■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⬚	OFF H ON H OFF (△ PV 90℃ SV 100℃ PV 110℃) Alarm temperature (Deviation temperature) : Set as 10℃.	■Deviation high/low-limit reverse alarm If deviation between PV and SV is occurring higher or lower 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⬚	OFF H ON (△ 90℃ SV 100℃) Alarm temperature (Absolute value) : Set as 90℃. OFF H ON (△ SV 100℃ PV 110℃) Alarm temperature (Absolute value) : Set as 110℃.	■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⬚	ON H OFF (△ PV 90℃ SV 100℃) Alarm temperature (Absolute value) : Set as 90℃. ON H OFF (△ SV 100℃ PV 110℃) Alarm temperature (Absolute value) : Set as 110℃.	■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)
5bA⬚	It will be ON when it detects sensor disconnection.	■Sensor Break Alarm
LbA_	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.
- If selecting [AnO_], [5bA⬚], [LbA_] modes, no parameters are displayed.
- Setting range KCA, JIC, PT: 1 ~ 100 (Default: 1)

▣ Additional alarm output selection

Display	Operation	Description
⬚A	General alarm	When PV reaches alarm temp.(deviation), Aux output will be ON.
⬚b	Latch	When PV reaches alarm temp.(deviation), Aux output will be ON and retained.
⬚C	Standby	When PV reaches alarm temp.(deviation) for the second time, Aux output will be ON. (No output will be on for initial operation.)
⬚d	Latch & Standby	Latch and Standby mode applied together.

▣ Sensor Break Alarm(SBA)[5bA⬚]

- 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 [5bA.⬚], it executes sensor break alarm.
- It is selectable between general alarm(5bAA) and latch(5bAb).
- The alarm output will be OFF when alarm output OFF or power OFF and ON again.

▣ Loop Break Alarm(LBA)[LbA⬚]

- If control deviation is not lowered under LBA detection values within LBA monitoring time at the section that control deviation I SV-PV I 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 [LbAt]: 0 ~ 9999 (Default: 0, Unit: sec.)
- LBA detecting value setting range [LbAS]: 1 ~ 999 (Default: 8, Unit: ℃/F)
- LBA detecting width setting range [LbAb]: 1 ~ 999 (Default: 3, Unit: ℃/F)

▣ FUNCTION KEY Selection Function[dI-E]

Press front key (▽+△) for 3 sec at the same time to perform RUN/STOP function [5toP] and Alarm output OFF function [ALrE].
(In case of no alarm output model, it is fixed to [5toP].)

- RUN/STOP function [5toP] is to make control output stop in RUN mode by force.
  - Auxiliary output is normally provided regardless of RUN/STOP function
  - In case power is off while [5toP] mode, [5toP] mode will be kept after Power is supplied again.
  - Press FUNC key (▽+△key) for 3 sec to return to RUN mode.
- Alarm output OFF function [ALrE] is to make alarm(AL-1, AL-2) output off by force.
  ☞(Applicable to only to Latch [AA⬚b] and Latch / Standby [AA⬚d] mode)
  (Available only if PV is out of alarm output setting range)

▣ Control output MV[Er.nu] for sensor break[oPEn] and setting error[Er.5u] modes

- A function to set control output MV when sensor breaks / setting errors occur.
- It executes control output by set MV regardless of ON/OFF or PID control output.
- ON/OFF control setting range : [00](OFF) / [100.0](ON)
  PID control setting range : [0.0] ~ [100.0]
- Default: [0.0] (Unit: %)

▣ 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.

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

- Setting range: [oFF / LoC1 / LoC2] (Default: [oFF])

▣ Error

- Error mark will flash(every 1 sec.) in PV viewer when error occurs during the control operation.

Display	Description
Er.5u	Setting error (When SV is out of SV range)
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.

- As soon as error causing factors get solved (by connecting input sensors / by making sensor input within the rated range), error mark [oPEn / HHHH / LLLL] will be disappeared and returning to normal operation mode.

▣ Caution for using

1. Installation environment
   ①It shall be used indoor. ②Altitude Max. 2000m.
   ③Pollution Degree 2. ④Installation Category Ⅱ.
2. Please install power switch or circuit-breaker in order to cut power supply off.
3. The switch or circuit-breaker should be installed near by users.
4. Do not use this product as Volt-meter or Ampere-meter, this is a temperature controller.
5. 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.
6. 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.
7. 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.
8. 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 sensors
- Photoelectric sensors
- Area sensors
- Fiber optic sensors
- Door/Door side sensors
- Pressure sensors
- Counters
- Timers
- Rotary encoders
- Display units
- Power controllers
- Sensor controllers
- Panel meters
- Graphic/Logic panels
- Temperature controllers
- Tachometer/Pulse(Rate) meters
- Temperature/Humidity transducers
- Switching power supplies
- Stepping motors/drivers/motion controllers
- Field network devices
- Laser marking system(CO_2, Nd:YAG)
- Laser welding/soldering system

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