Autonics

DUAL INDICATOR TEMPERATURE CONTROLLER

TCN4H-24RR

M A N U A L

CE c(UL)us

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

⚠ Caution

1. **This unit shall not be used outdoors.**
   It may shorten the life cycle of the product or cause electric shock.
2. **When connect wire, AWG20(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. **Please observe the rated specifications.**
   It may shorten the life cycle of the product and cause a fire.
4. **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.
5. **In cleaning unit, do not use water or organic solvent. And use dry cloth.**
   It may cause electric shock or a fire.
6. **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.
7. **Do not inflow dust or wire dregs into the unit.**
   It may cause a fire or a malfunction.
8. **Please wire properly after checking the terminal polarity when connecting temperature sensor.**
   It may cause a fire or an explosion.
9. **In order to install the units with reinforced insulation, use the power supply unit which basic insulation level is ensured.**

■ Parts description
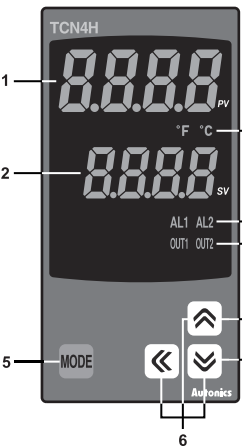
1. **Present temperature (PV) display (Red)**
   1) RUN mode: Present temperature (PV) display
   2) Parameter setting mode: Parameter display
2. **Set temperature (SV) display (Green)**
   1) RUN mode: Set temperature (SV) display
   2) Parameter setting mode: Parameter setting value display
   ※ During Auto-tuning, [At] is displayed in turns for 1 sec.
3. **Alarm output display lamp**
   1) AL1/AL2: It turns ON when the alarm1/2 output is ON.
4. **Control output display lamp**
   OUT1/OUT2: It turns ON when the control output1/2 is ON.
5. **MODE key**
   Used when entering into parameter setting group, returning to RUN mode, moving parameter, and saving setting values.
6. **Adjustment**
   Used when entering into set value change mode, digit moving and digit up/down.
7. **Digital input key**
   Press ⌄ + ⌃ keys for 3 sec. to operate the set function (RUN/STOP, alarm output reset, auto tuning) in digital input key [dI-t].
8. **Temperature unit (°C/°F) indicator**
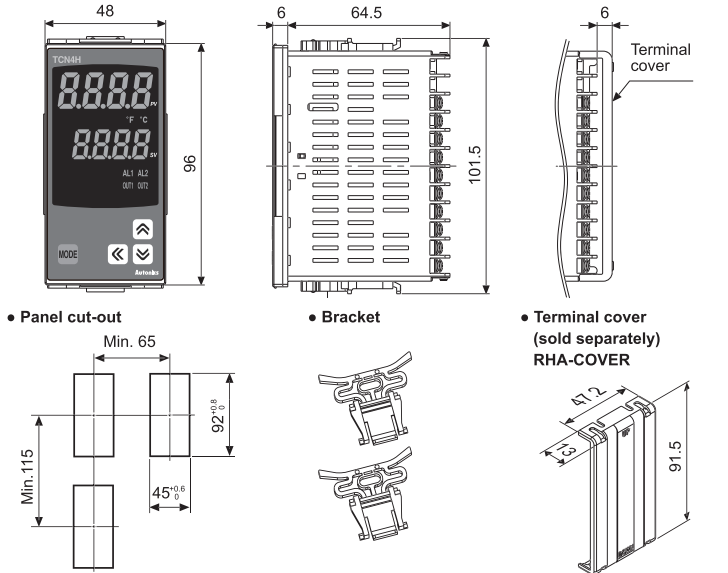   It shows current temperature unit.

※The above specifications are subject to change without notice.
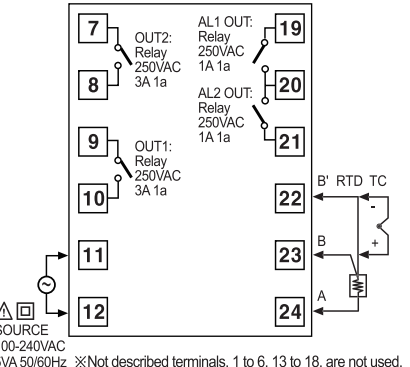
■ Specification

Model		TCN4H-24RR
Power supply		100-240VAC 50/60Hz
Allowable voltage range		90 to 110% of rated voltage
Power consumption		Max. 5VA
Display method		7 Segment LED(PV: red, SV: green)
Character size		PV: W7.0×H14.6mm, SV: W6.0×H12.0mm
Input type	RTD	DPt100Ω, Cu50Ω(Allowable line resistance max.5Ω per a wire)
	TC	K(CA), J(IC), L(IC), T(CC), R(PR), S(PR)
Display accuracy[※1]	RTD	At room temperature(23℃ ± 5℃): (PV ± 0.5% or ±1℃, select the higher one) ± 1 digit
	TC	Out of room temperature range: (PV± 0.5% or ±2℃, select the higher one)± 1digit
Control output		OUT1, OUT2 Relay: 250VAC 3A 1a
Alarm output		AL1, AL2 Relay: 250VAC 1A 1a
Control type		ON/OFF control, P, PI, PD, PID control
Hysteresis		1 to 100℃/0.1 to 50.0℃
Proportional band(P)		0.1 to 999.9℃
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		2000VAC 50/60Hz for 1min.(Between input terminal and power terminal)
Vibration		0.75mm amplitude at frequency of 5 to 55Hz (for 1 min.) in each of X, Y, Z directions for 2 hours
Relay life cycle	Mechanical	OUT1/2: Over 5,000,000 operations, AL1/2: Over 5,000,000 operations
	Electrical	OUT1/2: Over 200,000 operations(250VAC 3A resistive load), AL1/2: Over 300,000 operations(250VAC 1A resistive load)
Insulation resistance		Min. 100MΩ(at 500VDC megger)
Noise strength		Square-wave noise by noise simulator(pulse width 1μs) ±2KV R-phase and S-phase
Memory retention		Approx. 10 years (non-volatile semiconductor memory type)
Environ -ment	Ambient temperature	-10 to 50℃ , storage: -20 to 60℃
	Ambient humidity	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 : 2kV)
Weight[※2]		Approx. 191g(Approx. 121g)

※1: ▣ At room temperature(23℃±5℃)
  - Below 200℃ of thermocouple R, S is (PV ±0.5% or ±3℃, select the higher one) ±1 digit
  - Over 200℃ of thermocouple R, S is (PV ±0.5% or ±2℃, select the higher one) ±1 digit
  - Thermocouple L (IC), RTD Cu50Ω is (PV ±0.5% or ±2℃, select the higher one) ±1 digit
  ▣ Out of room temperature range
  - Below 200℃ of thermocouple R, S is (PV ±1.0% or ±6℃, select the higher one) ±1 digit
  - Over 200℃ of thermocouple R, S is (PV ±0.5% or ±5℃, select the higher one) ±1 digit
  - RTD Cu50Ω is (PV ±0.5% or ±3℃, select the higher one) ±1 digit
※2: The weight is with packaging and the weight in parentheses is only unit weight.
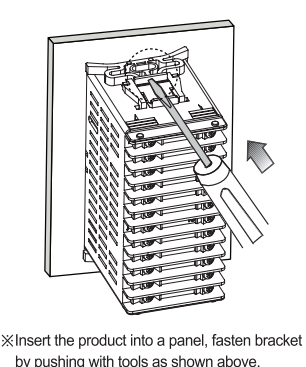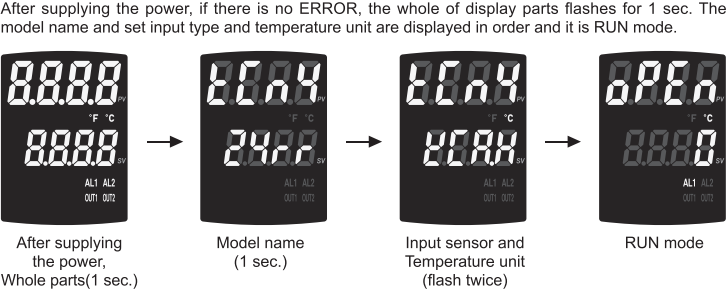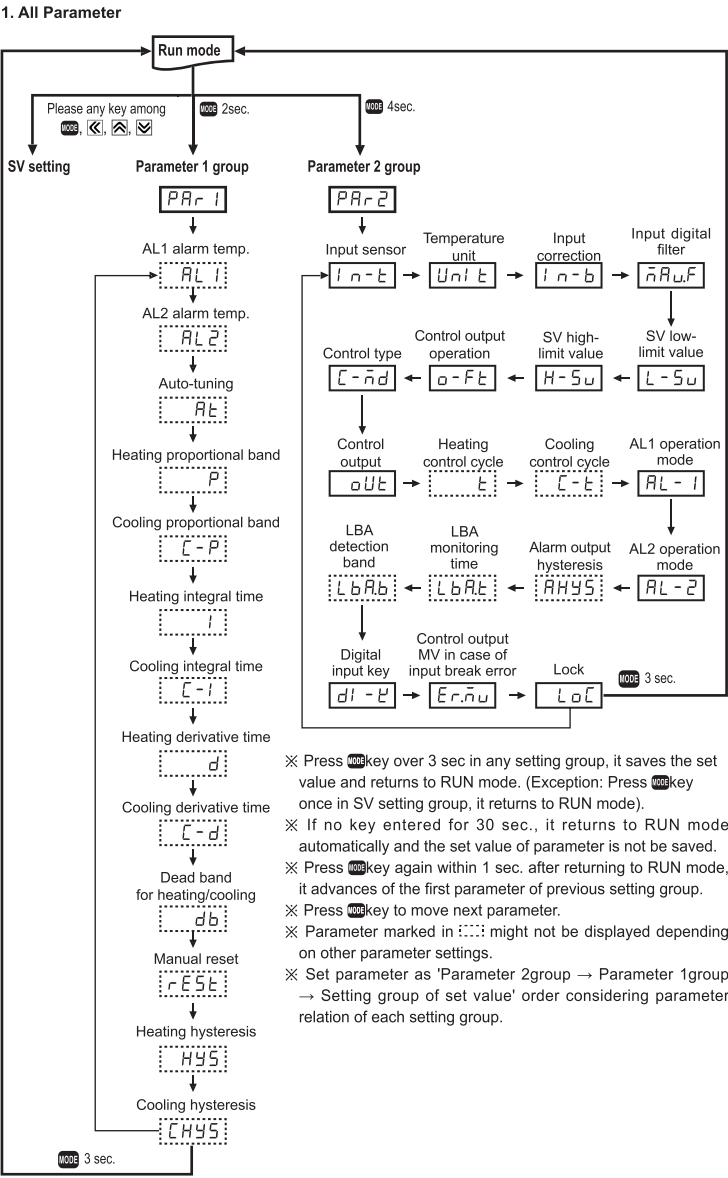※Environment resistance is rated at no freezing or condensation.

■ Dimensions

[unit: mm]

● Panel cut-out

● Bracket

● Terminal cover (sold separately) RHA-COVER

■ Connections

7	OUT2: Relay 250VAC 3A 1a	AL1 OUT: Relay 250VAC 1A 1a	19
8		AL2 OUT: Relay 250VAC 1A 1a	20
9	OUT1: Relay 250VAC 3A 1a		21
10			22	B' RTD TC
11			23
12			24

SOURCE 100-240VAC 5VA 50/60Hz ※Not described terminals 1 to 6, 13 to 18, are not used.

■ Installation

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

■ Input sensor and temperature range

Input sensor		Display	Input range(℃)	Input range(℉)
Thermocouple	K(CA)	ʰCAH	-50 to 1200	-58 to 2192
		ʰCAL	-50.0 to 999.9	-58.0 to 999.9
	J(IC)	JICH	-30 to 800	-22 to 1472
		JICL	-30.0 to 800.0	-22.0 to 999.9
	L(IC)	LICH	-40 to 800	-40 to 1472
		LICL	-40.0 to 800.0	-40 to 999.9
	T(CC)	ECCH	-50 to 400	-58 to 752
		ECCL	-50.0 to 400.0	-58.0 to 752.0
	R(PR)	rPr	0 to 1700	32 to 3092
	S(PR)	SPr	0 to 1700	32 to 3092
RTD	DPt100Ω	dPtH	-100 to 400	-148 to 752
		dPtL	-100.0 to 400.0	-148.0 to 752.0
	Cu50Ω	CUSH	-50 to 200	-58 to 392
		CUSL	-50.0 to 200.0	-58.0 to 392.0

■ Display parts for power ON

After supplying the power, if there is no ERROR, the whole of display parts flashes for 1 sec. The model name and set input type and temperature unit are displayed in order and it is RUN mode.

After supplying the power, Whole parts(1 sec.) → Model name (1 sec.) → Input sensor and Temperature unit (flash twice) → RUN mode

■ Flow chart for parameters

1. All Parameter

※ Press MODE key over 3 sec in any setting group, it saves the set value and returns to RUN mode. (Exception: Press MODE key once in SV setting group, it returns to RUN mode).
※ If no key entered for 30 sec., it returns to RUN mode automatically and the set value of parameter is not be saved.
※ Press MODE key again within 1 sec. after returning to RUN mode, it advances of the first parameter of previous setting group.
※ Press MODE key to move next parameter.
※ Parameter marked in ⌐⌐⌐ might not be displayed depending on other parameter settings.
※ Set parameter as 'Parameter 2group → Parameter 1group → Setting group of set value' order considering parameter relation of each setting group.

2.Parameter 2 group

MODE key: Moves parameter and saves the set, ≪ key: Moves digit, ⌄ or ⌃ key: Changes the set

Parameter	Display	Description
Input sensor	In-t	Set range: Refer to 'Input sensor and temperature range'. ※If changing input sensor, Su, In-b, H-Su, L-Su, AL1, AL2, LbAt, LbAb, AHYS parameter values are initialized.
Temperature unit	Unit	℃ ↔ ℉ ※If changing temperature unit, Su, In-b, H-Su, L-Su, AL1, AL2, LbAt, LbAb, AHYS parameter values are initialized.
Input correction	In-b	·ʰCAH, JICH, LICH, ECCH, rPr, SrP, dPtH, CUSH:-999 to 999℃/℉ ·ʰCAL, JICL, LICL, ECCL, dPtL, CUSL: -199.9 to 999.9℃/℉
Input digital filter	ñAuF	Set range: 0.1 to 120.0 sec.
SV low-limit value	L-Su	Set range: Within the rated temperature range by input sensor[L-Su≤ (H-Su−1 digit)] ※When changing SV low-limit value, if SV < L-Su, SV is initialized as L-Su.
SV high-limit value	H-Su	Set range: Within the rated temperature range by input sensor[H-Su≥ (L-Su+1 digit)] ※When changing SV high-limit value, if SV > H-Su, SV is initialized as H-Su.
Control output operation	o-Ft	H-C ↔ HEAt ↔ CooL ※When changing control output operation, ErñU is initialized.
Control type	C-ñd	· PId ↔ onoF: General control(Heating [HEAt] or Cooling [CooL]) · PP ↔ Pon ↔ onP ↔ onon: Heating/Cooling [H-C] ※When changing control type, ErñU, dI-t are initialized as oFF.
Control output	oUt	rLY
Heating control cycle	t	Set range: 0.5 to 120.0 sec.
Cooling control cycle	C-t	※When setting control type [C-ñd] as onoF or onon, these parameters are not displayed.
AL1 operation mode	AL-1	
AL2 operation mode	AL-2	For more details refer to ■ Functions 9. Alarm. ※Black: Flashes, Gray: Fixed ※When changing AL1, AL2 alarm operation mode, AL1, AL2 alarm temperature value are initialized.
Alarm output hysteresis	AHYS	Set range: Refer to ■ Functions 7. Alarm output hysteresis. ※It is not displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as AñA□, 5bA□, LbA□.
LBA monitoring time	LbAt	Set range: 0 to 9999 sec., When '0' is set, loop break alarm function is OFF. When '0' is set, loop break alarm function is OFF. ※It is displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as LbA□.
LBA detection band	LbAb	Set range: 0 to 999(0.0 to 999.9)℃/℉, ※It is displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as LbA□ and LbAt is not '0'.
Digital input key	dI-t	StoP ↔ ALrE ↔ At ↔ oFF Press ⌄ + ⌃ keys for 3 sec. and it executes the set function. For more information, refer to ■ Functions 8. Digital input key. ※When control type [C-ñd] is onoF,onon, At is not displayed.
Control output MV in case of input break error	ErñU	Set range: · General control(Heating [HEAt] or Cooling [CooL]): 0.0 to 100.0% ※When control type [C-ñd] is set as onoF, only 0.0, 100.0 are displayed. · Heating/Cooling [H-C]: -100.0(cooling) to 100.0%(heating) ※When control type [C-ñd] is set as onon, -100.0(cooling), 0.0.0(OFF), 100.0(heating) are displayed.
Lock	LoC	oFF ↔ LoC1 ↔ LoC2 ↔ LoC3 · LoC1: Locks parameter 2 group LoC2: Locks parameter 1, 2 group LoC3: Locks parameter 1, 2 group and SV setting group ※Parameter setting values are enable to check while Lock is set.

3. Parameter 1 group

MODE key: Moves parameter and saves the set, ≪ key: Moves digit, ⌄ or ⌃ key: Changes the set

Parameter	Display	Description
AL1 alarm temp.	AL1	Set range: Absolute value alarm(temperature range), Deviation alarm(-F.S. to F.S.) ※When AL1, AL2 operation mode [AL-1, AL-2] of parameter 2 group is set as AñA□,/5bA□,/LbA□, this parameter is not displayed.
AL2 alarm temp.	AL2	
Auto-tuning	At	oFF ↔ on When executing Auto-tuning, "SV value" ↔ At are displayed in turn by 1 sec. at the SV display part. ※When control type [C-ñd] is set as onoF, onon, this parameter is not displayed in case of opening input sensor.
Heating proportional band	P	Set range: 0.1 to 999.9℃/℉ ※When control type [C-ñd] is set as onoF, this parameter is not displayed.
Cooling proportional band	C-P	
Heating integral time	I	Set range: 0 to 9999 sec. When setting as '0', integral operation is OFF. ※When control type [C-ñd] is set as onoF, onon, this parameter is not displayed.
Cooling integral time	C-P	
Heating derivative time	d	Set range: 0 to 9999 sec. When setting as '0', derivative operation is OFF. ※When control type [C-ñd] is set as onoF, onon, this parameter is not displayed.
Cooling derivative time	C-d	
Dead band for heating/cooling	db	Set range: · ʰCAH, JICH, LICH, ECCH, rPr, SrP, dPtH, CUSH:-999 to 999℃/℉ · ʰCAL, JICL, LICL, ECCL, dPtL, CUSL: -199.9 to 999.9℃/℉ ※When control output operation [o-Ft] is set as H-C, this parameter is displayed.
Manual reset	rESt	Set range: 0.0 to 100.0% ※In case of P control, PD control of heating or cooling control, this parameter is displayed.
Heating hysteresis	HYS	Set range: · ʰCAH, JICH, LICH, ECCH, rPr, SrP, dPtH, CUSH: 1 to 100℃/℉
Cooling hysteresis	CHYS	· ʰCAL, JICL, LICL, ECCL, dPtL, CUSL: 0.1 to 50.0℃/℉ ※When control type [C-ñd] is set as PId, PP, this parameter is not displayed.

■ SV setting

You can set the temperature to control with MODE, ◀, ∨, ∧ keys.
Set range is within SV low-limit value [L-Su] to SV high-limit value [H-Su].
Ex) In case of changing set temperature from 210ºC to 250ºC

① [210 / 210] ② [210 / 210] ③ [210 / 250] ④ [210 / 250]
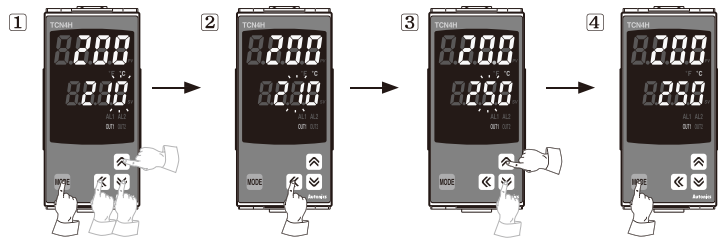
| ① Press any key among MODE, ◀, ∨, ∧ key in RUN mode, the right digit at SV display flashes and it enters to SV setting group. | ② Press ◀ key to move the desired digit. ($10^0 \rightarrow 10^1 \rightarrow 10^2 \rightarrow 10^3 \rightarrow 10^0$) | ③ Press ∨ or ∧ key to move the desired number (1 → 5). | ④ Press MODE key to save the value and it controls with this set value. (Even though there is no key input for over 3 sec., it saves automatically.) |

■ Functions

1. Auto-tuning [At]
Auto-tuning measures the control subject's thermal characteristics and thermal response rate, and then determines the necessary PID time constant in PID control.
When executing Auto-tuning, "SV value" ↔ At are displayed in turn by 1 sec. at the SV display part.
If error [oPEn] occurs during auto tuning, it stops this operation automatically.
To stop auto tuning, change the set as [oFF].(It maintains P, I, D values of before auto-tuning.)

2. Hysteresis [HYS / CHYS]
In case of ON/OFF control, set between ON and OFF intervals as hysteresis. In case of heating for general control, HYS is activated and in case of cooling for general control, CHYS is activated.
For heating/cooling control, both HYS, CHYS are activated.
If hysteresis is too small, it may cause control output hunting (takeoff, chattering) by external noise, etc.

Heating / Cooling hysteresis diagrams.
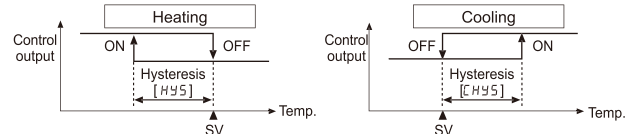
3. Control output operation [o-Ft]
1) Heating control [HEAt]: The output will be provided in order to supply power to the load (heater) if PV is falls below SV.
2) Cooling control [CooL]: The output will be provided in order to supply power to the load (cooler) if PV rises above SV.
3) Heating/Cooling [H-C]: Heating and cooling with a single temperature controller when it is difficult to control subject temperature with only heating or cooling.
Heating and cooling control mode controls the object using different PID time constants for each heating and cooling. It is also possible to set heating and cooling control in both PID control or ON/OFF control mode. OUT1 control output is fixed as heating control and OUT2 control output is fixed as cooling control.
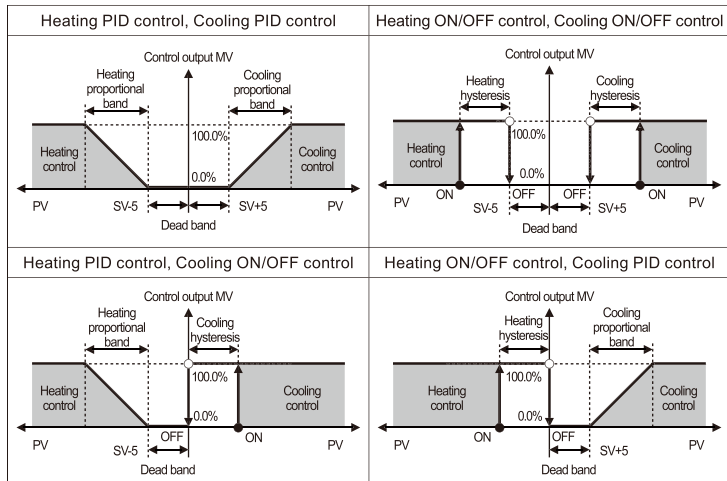
4. Control type [C-nd]
Temperature is controled by the desired control type.

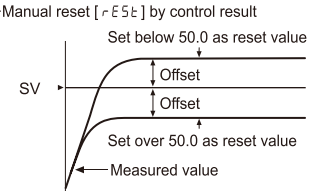| Setting		Description	
		Heating	Cooling
General control	PId	PID control	
	onoF	ON/OFF control	
Heating/cooling control	P.P	PID control	PID control
	P.on	PID control	ON/OFF control
	on.P	ON/OFF control	PID control
	on.on	ON/OFF control	ON/OFF control

5. Dead band/Overlap band [db]
In heating/cooling control, it is able to designate the band between heating control and cooling control based on SV. When setting as '+' value, Dead band is formed based on SV and any controls are not executed within the set band. Therefore, MVs of heating and cooling are 0.0% within the dead band.
When setting as '-' value, Overlap band is formed based on SV and MVs of heating and cooling are applied within the set band and it executes control.
When not using Dead band/Overlap band, set db as '0'.
In case of PID - ON/OFF control or ON/OFF - PID control, Dead band is formed only at PID control.

1) Using Dead band(example of db as 10℃/℉)

Heating PID control, Cooling PID control / Heating ON/OFF control, Cooling ON/OFF control
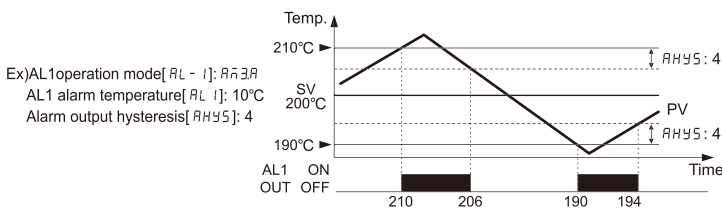Heating PID control, Cooling ON/OFF control / Heating ON/OFF control, Cooling PID control

6. 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 / Measured value
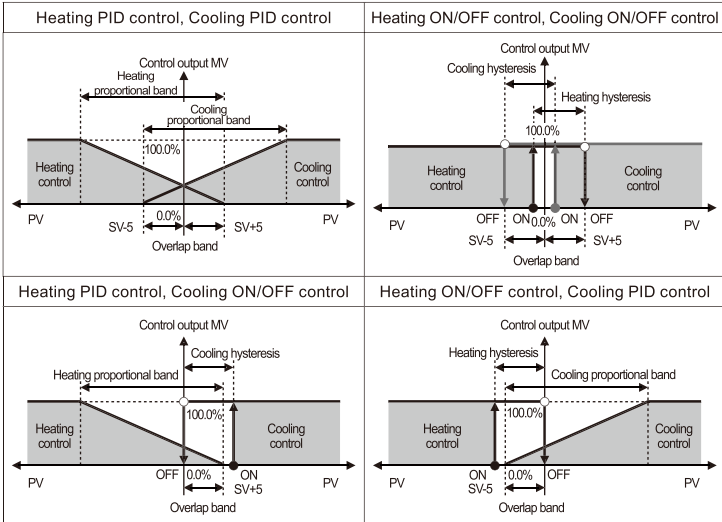
7. Alarm output hysteresis [AHYS]
It displays alarm output(AL1 OUT, AL2 OUT)ON and OFF interval and hysteresis is applied to both AL1 OUT and AL2 OUT.
· PCAH, JI CH, LI CH, tCCH, rPr, SPr, dPtH, CUSH: 1 to 100
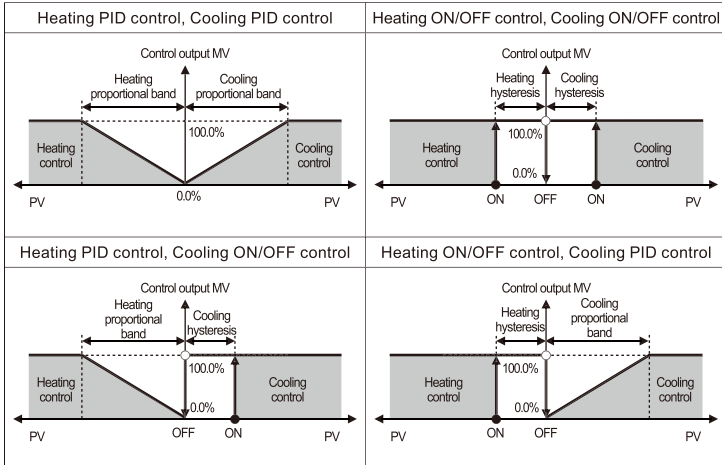· PCAL, JI CL, LI CL, tCCL, dPtL, CUSL: 0.1 to 50.0

Ex)AL1operation mode[AL-1]: AA3A
AL1 alarm temperature[AL1]: 10℃
Alarm output hysteresis[AHYS]: 4

Temp graph: 210℃ / SV 200℃ / 190℃, AL1 ON OUT OFF, values 210 206 190 194, Time

8. Digital input key(∧+∨ 3 sec.) [dI-P]

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 output	AL.rE	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 1group. (You can execute auto tuning from parameter 1group, and finish it by digital input key.) ※When control type [C-nd] is set as PId, P.P, P.on, on.P, At is displayed. When control type is set as on.oF, on.on, digital input key [dI-P] is changed as oFF.

RUN STOP RUN STOP RUN / Digital input key (t: Over 3 sec.)

2) Using Overlap band (example of db as -10℃/℉)
Heating PID control, Cooling PID control / Heating ON/OFF control, Cooling ON/OFF control
Heating PID control, Cooling ON/OFF control / Heating ON/OFF control, Cooling PID control

3) Not using Dead band/Overlap band(example of db as 0℃/℉)
Heating PID control, Cooling PID control / Heating ON/OFF control, Cooling ON/OFF control
Heating PID control, Cooling ON/OFF control / Heating ON/OFF control, Cooling PID control

9. Alarm

An1A — Alarm operation / Alarm option

There are two alarms which operate individually.
You can set combined alarm operation and alarm option.
Use digital input key(set as AL.rE) or turn OFF power and re-start this unit to release alarm operation.

1)Alarm operation

Mode	Name	Alarm operation	Description
AA0			No alarm output
AA1	Deviation high-limit alarm	Alarm (Deviation)temperature: 10℃ / -10℃ OFF H ON SV 100℃ PV 110℃ / PV 90℃ SV 100℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
AA2	Deviation low-limit alarm	Alarm (Deviation)temperature: 10℃ / -10℃ ON H OFF PV 90℃ SV 100℃ / SV 100℃ PV 110℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AA3	Deviation high/low-limit alarm	Alarm (Deviation)temperature: 10℃ ON H OFF H ON PV 90℃ SV 100℃ PV 110℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AA4	Deviation high/low-limit reverse alarm	Alarm (Deviation)temperature: 10℃ OFF H ON H OFF PV 90℃ SV 100℃ PV 110℃	If PV is equal to or higher than the absolute value of alarm temperature, the output will be ON.
AA5	Absolute value high limit alarm	Alarm (Absolute)temperature: 90℃ / 110℃ OFF H ON PV 90℃ SV 100℃ / SV 100℃ PV 110℃	If PV is equal to or higher than the absolute value of alarm temperature, the output will be ON.
AA6	Absolute value low limit alarm	Alarm (Absolute)temperature: 90℃ / 110℃ ON H OFF PV 90℃ SV 100℃ / SV 100℃ PV 110℃	If PV is equal to or lower than the absolute value of alarm temperature, the output will be ON.
SbAL	Sensor break alarm	—	It will be ON when it detects sensor disconnection.
LbAL	Loop break alarm	—	It will be ON when it detects loop break.

※H: Alarm output hysteresis[AHYS]

2)Alarm option

| Mode	Name	Description
AAA	Standard operation	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AAb	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)
AAC	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, standard alarm operates.
AAd	Alarm latch and standby sequence 1	If it is an alarm condition, it operates both alarm latch and standby sequence. When power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates.
AAE	Standby sequence 2	First alarm condition is ignored and from second alarm condition, standard alarm operates. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, standard alarm operates.
AAF	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence1. It operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

※Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Power ON
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON, changing set temperature, alarm temperature (AL1, AL2) or alarm operation (AL-1, AL-2), switching STOP mode to RUN mode.

3)Sensor break alarm
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 the sensor is connected with buzzer or other units using alarm output contact. It is selectable between standard alarm [SbAA] or alarm latch [SbA.b].

4)Loop break alarm(LBA)
It checks control loop and outputs alarm by temperature change of the subject. For heating control(cooling control), when control output MV is 100%(0% for cooling control) and PV is not increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], or when control output MV is 0%(100% for cooling control) and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], alarm output turns ON.

Loop break alarm timing diagram.
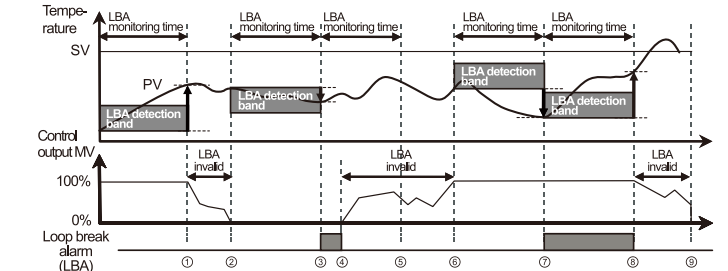
Start control to ①	When control output MV is 100%, PV is increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t].
① to ②	The status of changing control output MV (LBA monitoring time is reset.)
② to ③	When control output MV is 0% and PV is not decreased below than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], loop break alarm (LBA) turns ON after LBA monitoring time.
③ to ④	Control output MV is 0% and loop break alarm (LBA) turns and maintains ON.
④ to ⑤	The status of changing control output MV (LBA monitoring time is reset.)
⑥ to ⑦	When control output MV is 100% and PV is not increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], loop break alarm (LBA) turns OFF after LBA monitoring time.
⑦ to ⑧	When control output MV is 100% and PV is increased over than LBA detection band [LbA.b] during LBA monitoring time [LbA.t], loop break alarm (LBA) turns OFF after LBA monitoring time.
⑧ to ⑨	The status of changing control output MV (LBA monitoring time is reset.)

※When executing auto-tuning, LBA detection band [LbA.b] and LBA monitoring time are automatically set based on auto tuning value. When alarm operation mode [AL-1, AL-2] is set as loop break alarm(LBA) [LbAL], LBA detection band [LbA.b] and LBA monitoring time [LbA.t] parameter is displayed.

10. Input correction [In-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 80ºC but controller displays 78ºC, set input correction value [In-b] as '002' and controller displays 80ºC.
※As the result of input correction, if current temperature value (PV) is over each temperature range ofinput sensor, it displays HHHH or LLLL .

11. Input digital filter [nAuF]
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.

12. 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.	When input is within the rated temperature range, this display disappears.
LLLL	Flashes if mesured sensor input is lower than temperature range.	

■ Factory default

	Parameter		Factory default
SV	SV value	-	0
Parameter 1 group	AL1 alarm temperature	AL1	1250
	AL2 alarm temperature	AL2	1250
	Auto-tuning	At	oFF
	Heating proportional band	P	0100
	Cooling proportional band	C-P	0100
	Heating integral time	I	0000
	Cooling integral time	C-I	0000
	Heating derivative time	d	0000
	Cooling derivative time	C-d	0000
	Dead band for heating/cooling	db	0000
	Manual reset	rESt	0500
	Heating hysteresis	HYS	002
	Cooling hysteresis	CHYS	002
Parameter 2 group	Input sensor	In-t	PCAH
	Temperature unit	Unit	ºC
	Input correction	In-b	0000
	Input digital filter	nAuF	0001
	SV low-limit value	L-Su	-050
	SV high-limit value	H-Su	1200
	Control output operation	o-Ft	H-C
	Control type	C-nd	P.P
	Control output	oUt	rLY
	Heating control cycle	t	0200
	Cooling control cycle	C-t	0200
	AL1 operation mode	AL-1	An1A
	AL2 operation mode	AL-2	An2A
	Alarm output hysteresis	AHYS	001
	LBA monitoring time	LbAt	0000
	LBA detection band	LbAb	0002
	Digital input key	dI-P	StoP
	Control output MV in case of input break error	ErAu	0000
	Lock	LoC	oFF

■ Caution for using
1. The connection wire of this unit should be separated from the power line and high voltage line in order to prevent from inductive noise.
2. For crimp terminal, select following shaped terminal (M3).
   Max. 5.8mm / Max. 5.8mm
3. Please install power switch or circuit-breaker in order to cut power supply off.
4. Install power switch or circuit-breaker to supply or cut off the power.
   Switch or circuit-breaker should be installed near by users for convenient control.
5. Do not use this product as Volt-meter or Ampere-meter, this is a temperature controller.
6. 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 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 & sewingmachine, large capacity SCR controller)
9. When supplying measuring input, if HHHH or LLLL is displayed, measuring input may have problem. Turn off the power and check the line.
10. Installation environment
    ①It shall be used indoor. ②Altitude Max. 2000m
    ③Pollution Degree 2 ④Installation Category II
※ It may cause malfunction if above instructions are not followed.

■ Major product
- Proximity sensors
- Area sensors
- Display units
- Rotary encoders
- Power controllers
- Photoelectric sensors
- Door/Door side sensors
- 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(CO₂, Nd:YAG)
- Laser welding/soldering system
- Counters
- Timers
- Panel meters
- Pressure sensors
- Fiber optic sensors
- Sensor controllers