Autonics

DUAL INDICATOR TEMPERATURE CONTROLLER

TCN4 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 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, AWG 20(0.50mm²) should be used and screw bolt on terminal block with 0.74N.m to 0.90N·m strength.**
   It may cause a malfunction or fire due to contact failure.
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.**

▣ Ordering information

T CN 4 S - 2 4 R - P

Wiring method	**No-mark**	Bolt wiring method
	P	Connector plug connection method※1
Control output	**R**	Relay contact + SSR drive output※2
Power supply	**2**	24VAC 50/60Hz, 24-48VDC
	4	100-240VAC 50/60Hz
Sub output	**2**	Alarm1 + Alarm2 output
Size	**S**	DIN W48 X H48mm
	M	DIN W72 X H72mm
	H	DIN W48 X H96mm
	L	DIN W96 X H96mm
Digit	**4**	9999 (4 digit)
Setting type	**CN**	Dual display type, set by touch switch
Item	**T**	Temperature controller

※**1:** Only for TCN4S model.
※**2:** In case of the AC voltage model, SSR drive output method (standard ON/OFF control, cycle control, phase control) is available to select.

※The above specifications are subject to change without notice.

▣ Specification

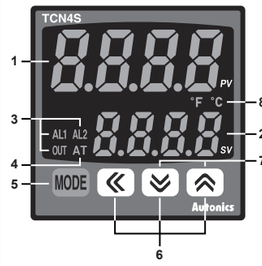
Series		TCN4S	TCN4M	TCN4H	TCN4L
Power supply	AC Power	100-240VAC 50/60Hz			
	AC/DC Power	24VAC 50/60Hz, 24-48VDC			
Allowable voltage range		90 to 110% of rated voltage			
Power consumption	AC Power	Max. 5VA(100-240VAC 50/60Hz)			
	AC/DC Power	Max. 5V(24VAC 50/60Hz), Max. 3W(24-48VDC)			
Display method		7 Segment (PV: red, SV: green), other display part(green, red) LED method			
Character size	PV(WXH)	7.0 X 15.0mm	9.5 X 20.0mm	7.0 X 14.6mm	11.0 X 22.0mm
	SV(WXH)	5.0 X 9.5mm	7.5 X 15.0mm	6.0 X 12.0mm	7.0 X 14.0mm
Input type	RTD	DIN Pt100Ω, 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(23ºC ± 5ºC): (PV ± 0.5% or ±1ºC, select the higher one) ± 1 digit Out of room temperature range: (PV± 0.5% or ±2ºC, select the higher one)± 1digit For TCN4S-□-P, add ±1℃ by accuracy standard.			
	TC				
Control output	Relay	250VAC 3A 1a			
	SSR	12VDC±2V 20mA Max.			
Alarm output		AL1, AL2 Relay: 250VAC 1A 1a			
Control method		ON/OFF control, P, PI, PD, PID control			
Hysteresis		1 to 100ºC/ºF (0.1 to 50.0ºC/ºF)			
Proportional band(P)		0.1 to 999.9ºC/ºF			
Integral time(I)		0 to 9999 sec.			
Derivative time(D)		0 to 9999 sec.			
Control period(T)		0.5 to 120.0 sec.			
Manual reset		0.0 to 100.0%			
Sampling period		100ms			
Dielectric strength	AC power	2000VAC 50/60Hz 1min.(Between input terminal and power terminal)			
	AC/DC power	1000VAC 50/60Hz 1min.(Between input terminal and power terminal)			
Vibration		0.75mm amplitude at frequency of 5 to 55Hz in each X, Y, Z directions for 2 hours			
Relay life cycle	Mechanical	OUT: Over 5,000,000 times, AL1/2: Over 5,000,000 times			
	Electrical	OUT: Over 200,000 times(250VAC 3A resistive load) AL1/2: Over 300,000 times(250VAC 1A resistive load)			
Insulation resistance		Min. 100MΩ(at 500VDC megger)			
Noise		Square-wave noise by noise simulator(pulse width 1μs) ±2KV R-phase and S-phase			
Memory retention		Approx. 10 years (When using non-volatile semiconductor memory type)			
Environment	Ambient temp.	-10 to 50ºC, Storage: -20 to 60ºC			
	Ambient humi.	35 to 85%RH, Storage: 35 to 85%RH			
Insulation type		Double insulation or reinforced insulation (Mark: ⊡, Dielectric strength between the measuring input part and the power part : AC Power 2kV, AC/DC Power 1kV)			
Approval		CE cULus (except, AC/DC voltage type and TCN4S-□-P)			
Weight※2		Approx. 147g (approx. 100g)	Approx. 203g (approx. 133g)	Approx. 194g (approx. 124g)	Approx. 275g (approx. 179g)

※1: ◎ At room temperature(23ºC±5ºC)
- Below 200ºC of thermocouple R(PR), S(PR) is (PV ±0.5% or ±3ºC, select the higher one) ±1 digit
- Over 200ºC of thermocouple R(PR), S(PR) is (PV ±0.5% or ±2ºC, select the higher one) ±1 digit
- Termocouple L (IC), RTD Cu50Ω is (PV ±0.5% or ±2ºC, select the higher one) ±1 digit

◎ Out of room temperature range
- Below 200ºC of thermocouple R(PR), S(PR) is (PV ±1.0% or ±6ºC, select the higher one) ±1 digit
- Over 200ºC of thermocouple R(PR), S(PR) is (PV ±0.5% or ±5ºC, select the higher one) ±1 digit
- Thermocouple L(IC), RTD Cu50Ω is (PV ±0.5% or ±3ºC, select the higher one) ±1 digit

For TCN4S-□-P, add ±1℃ by accuracy standard.
※2: The weight in parentheses is only unit weight.
※ Environment resistance is rated at no freezing or condensation.

▣ 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
3. **Control/Alarm output display indicator**
   1) OUT: It turns ON when the control output is ON. During SSR drive output type in CYCLE/ PHASE control, this indicator turns ON when MV is over 3.0%.
   2) AL1/AL2: It turns ON when the alarm output is ON.
4. **Auto tuning indicator**
   AT indicator flashes by every 1 sec during operating auto tuning.
5. **MODE key**
   Used when entering into parameter groups, 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 (℃/℉) indicator**
   It shows current temperature unit.

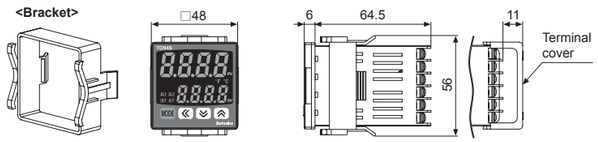
▣ Input sensor and temperature range

Input sensor		Display	Temperature range(ºC)	Temperature range(ºF)
Thermocouple	K(CA)	K CA H	-50 to 1200	-58 to 2192
		K CA L	-50.0 to 999.9	-58.0 to 999.9
	J(IC)	J I C H	-30 to 800	-22 to 1472
		J I C L	-30.0 to 800.0	-22.0 to 999.9
	L(IC)	L I C H	-40 to 800	-40 to 1472
		L I C L	-40.0 to 800.0	-40 to 999.9
	T(CC)	T C C H	-50 to 400	-58 to 752
		T C C L	-50.0 to 400.0	-58.0 to 752.0
	R(PR)	r P r	0 to 1700	32 to 3092
	S(PR)	S P r	0 to 1700	32 to 3092
RTD	DPt100Ω	d Pt H	-100 to 400	-148 to 752
		d Pt L	-100.0 to 400.0	-148.0 to 752.0
	Cu50Ω	C U S H	-50 to 200	-58 to 392
		C U S L	-50.0 to 200.0	-58.0 to 392.0

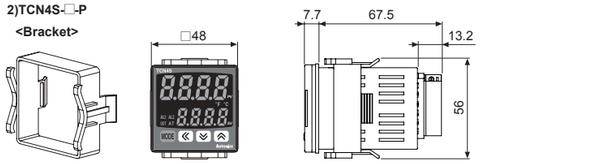
▣ Dimensions

(Unit: mm)

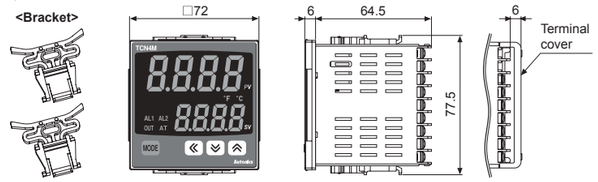
1)TCN4S



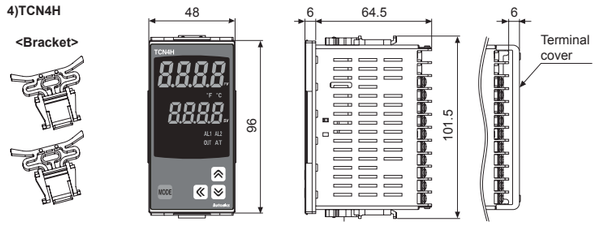
2)TCN4S-□-P



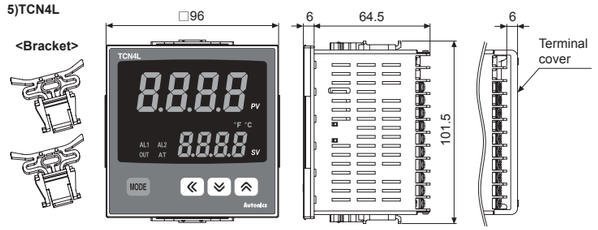
3)TCN4M



4)TCN4H

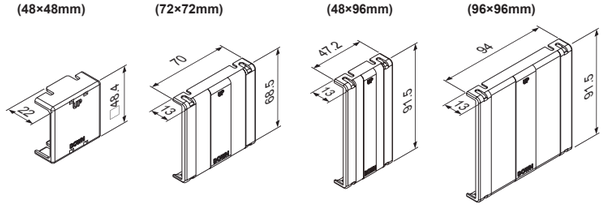


5)TCN4L

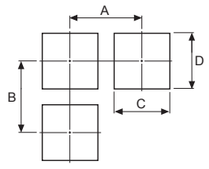


6)Terminal cover(sold separately)

- **RSA-COVER (48×48mm)**
- **RMA-COVER (72×72mm)**
- **RHA-COVER (48×96mm)**
- **RLA-COVER (96×96mm)**



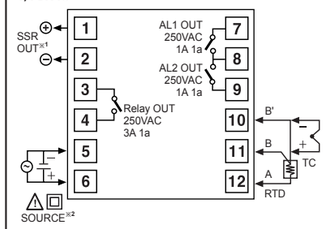
7)Panel cut-out



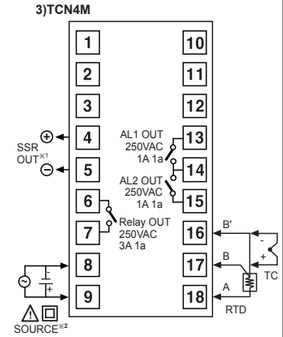
Size / Model	A	B	C	D
TCN4S	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TCN4M	Min. 90	Min. 90	$68^{+0.7}_{0}$	$68^{+0.7}_{0}$
TCN4H	Min. 65	Min. 115	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$
TCN4L	Min. 115	Min.115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

▣ Connections

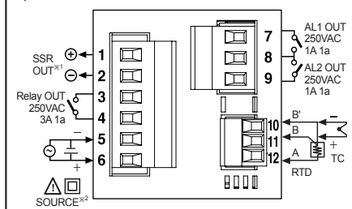
1)TCN4S



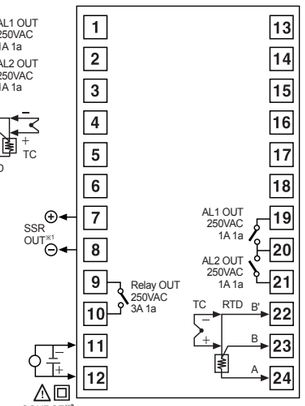
3)TCN4M



2)TCN4S-□-P



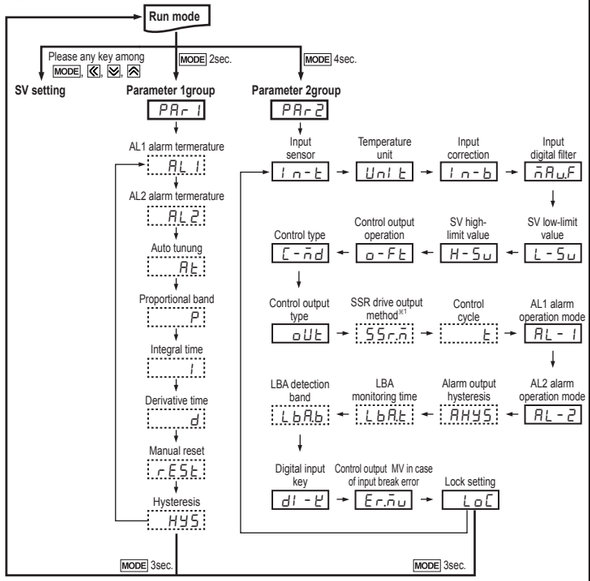
4)TCN4H/L



※1: 12VDC±2V 20mA Max.
※2:AC voltage type: 100-240VAC 5VA 50/60Hz
AC/DC voltage type: 24VAC 5VA 50/60Hz
24-48VDC 3W

▣ Flow chart for setting group

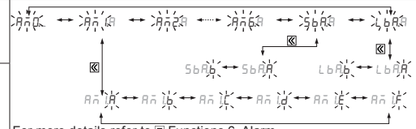
1. All Parameter



※ Press MODE key over 3 sec in any parameter 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 parameter group.
※ Press MODE key to move next parameter.
※ Parameter marked in ⋯ might not be displayed depending on other parameter settings.
※ Set parameter as 'Parameter 2 group → Parameter 1 group → Setting group of set value' order considering parameter relation of each setting group.
※1: It is not displayed for AC/DC power model (TCN4□-22R).

2. Parameter 2group

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, SV, In-b, H-Su, L-Su, AL1, AL2, LbAt, LbAb, AHYS parameter values are initialized.
Temperature unit	Unit	°C ↔ °F ※ If changing temperature unit, SV, In-b, H-Su, L-Su, AL1, AL2, LbAt, LbAb, AHYS parameter values are initialized.
Input correction	In-b	Set range ● tCAL, JIC, LIC, tCCH, rPr, SrP, dPtH, CUSH:-999 to 999℃/℉ ● tCAL, JIC, LIC, tCCL, dPtL, CUSL: -199.9 to 999.9℃/℉
Input digital filter	nAvF	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-1digit)] ※When changing SV lower limit value, if SV < L-Su, SV is initialized as L-Su. ※In case of changing input sensor type[In-t], it changes automatically as min. value of the changed input sensor.
SV high-limit value	H-Su	Set range: Within the rated temperature range by input sensor[H-Su≥(L-Su+1digit)] ※When changing SV higher limit value, if SV > H-Su, SV is initialized as H-Su. ※In case of changing input sensor type [In-t], it changes automatically as max. value of the changed input sensor.
Control output operation	o-Ft	HEAt ↔ CooL ※When changing control output operation, Ervu is initialized.
Control type	C-Ad	PId ↔ onoF ※When changing control type, Ervu is initialized (control output MV is below 100%) and dI-t turns OFF automatically.
Control output type	oUt	rLY ↔ SSr
SSR drive output method	SSrv	Stnd ↔ CYCL ↔ PHAS ※ It is displayed when selecting control output [oUt] as [SSr]. It is not displayed for AC/DC power model (TCN4□-22R).
Control cycle	t	Set range: 0.5 to120.0 sec. ※ In case of Relay drive output [rLY] of control output [oUt], it is set as 20.0 sec. In case of SSR drive output [SSr] of that, it is set as 2.0 sec. ※t is not displayed when SSR drive output [SSrv] method is set as CYCL, PHAS.
AL1 alarm operation mode	AL-1	
AL2 alarm operation mode	AL-2	For more details refer to ▣ Functions 6. 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 4. Alarm output hysteresis. ※ AHYS is not displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as [AnO.., SbA□, LbA□].
LBA monitoring time	LbAt	Set range: 0 to 9999 sec. ※ '0' is set, loop break alarm function is OFF. ※ LbAt is displayed when AL1, AL2 alarm operation mode [AL-1, AL-2] is set as LbA□.
LBA monitoring range	LbAb	Set range: 0 to 999(0.0 to 999.9)℃/°F, '0' is set, loop break alarm function is OFF. ※ LbAb 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-P	StoP ↔ ALrE ↔ At ↔ oFF Press ▽+△ keys for 3 sec. and it executes the set function. For more information, refer to ▣ Functions 5. Digital input key. ※ When control type [C-Ad] is onoF, At is not displayed.
Control output MV in case of input break error	Ervu	Set range 0.0 to 100.0% ※ Only 0.0, 100% are displayed when control type [C-Ad] is set as onoF. ※ When changing PID control to ON/OFF control, if MV is below 100.0%, it is initialized as 0.0%.
Lock setting	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 ※ Parameter setting values are still possible to check while Lock mode is ON.

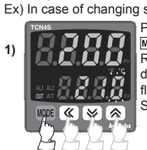
MODE key: Moves parameter and saves the set, ◁ key: Moves digit, ▽ or △ key: Changes the set

3. Parameter 1 group

Parameter	Display	Description
AL1 alarm temp.	AL1	Set range: Deviation alarm(-F.S to F.S), Absolute value alarm(temperature range) In case alarm operation mode [AL-1, AL-2] of Parameter 2 group AnO_ / SbA□ / LbA□, no parameters is displayed.
AL2 alarm temp.	AL2	
Auto tuning	At	oFF ↔ on Front AT indicator flashes during auto tuning operation.
Proportional band	P	Set range: 0.1 to 999.9℃/°F
Integral time	I	Set range: 0 to 9999 sec. Integral operation is OFF when set value is "0".
Derivative time	d	Set range: 0 to 9999 sec. Derivative operation is OFF when set value is "0".
Manual reset	rESt	Set range: 0.0 to 100.0%/ It is displayed in P/PD control.
Hysteresis	HYS	Set range ● tCAH, JIC, LIC, tCCH, rPr, SrP, dPtH, CUSH: 1 to 100℃/°F ● tCAL, JIC, LIC, tCCL, dPtL, CUSL: 0.1 to 50.0℃/°F ※ It is displayed when control type [C-Ad] of parameter 2 group is set onoF.

4. SV setting

You can set the temperature to control with MODE, ◁, ▽, △ keys.
Set range is within SV lower limit value [L-Su] to SV higher limit value [H-Su].
Ex) In case of changing set temperature from 210ºC to 250ºC

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.)

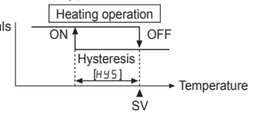
▣ Functions

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. (When control type[C-Ad] is set as PId, it is displayed.) Application of the PID time constant realizes fast response and high precision temperature control.
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]

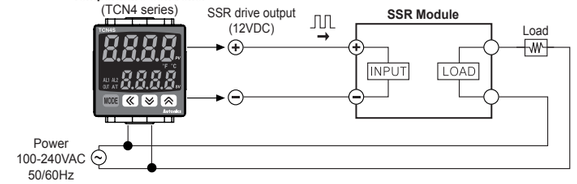
In case of ON/OFF control, set between ON and OFF intervals as hysteresis. (When control type [C-Ad] is set as onoF, it is displayed.) If hysteresis is too small, it may cause control output hunting (takeoff, chattering) by external noise, etc.



3. SSR drive output selection(SSRP function) [SSrv]

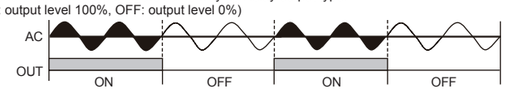
- Realizing high accuracy and cost effective temperature control with both current output (4-20mA) and linear output(cycle control and phase control)
- SSRP function is selectable one of standard ON/OFF control, cycle control, phase control by utilizing standard SSR drive voltage output.
- Select one of standard ON/OFF control [Stnd], cycle control[CYCL] , phase control[PHAS] at SSR drive output method SSrv of parameter 2 group. For cycle control, connect zero cross turn-on SSR (random turn-on SSR is also available). For phase control, connect random turn-on SSR.

Temperature controller (TCN4 series)

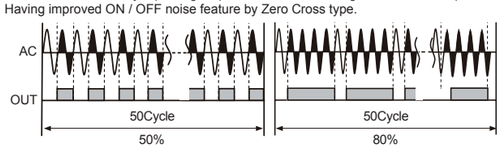


※ When selecting phase or cycle control mode, **the power supply for load and temperature controller must be the same.**
※ In case of selecting PID control type and phase [PHAS] / cycle [PHAS] control output modes, control cycle [t] is not allowed to set.
※ For AC/DC power model (TCN□-22R), this parameter is not displayed and it is available only standard control by relay or SSR.

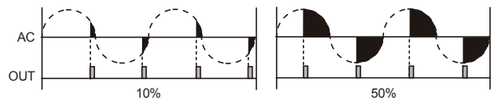
1)Standard ON/OFF control mode [Stnd]
A mode to control the load in the same way as Relay output type.
(ON: output level 100%, OFF: output level 0%)



2)Cycle control mode [CYCL]
A mode to control the load by repeating output ON / OFF according to the rate of output within setting cycle. Having improved ON / OFF noise feature by Zero Cross type.



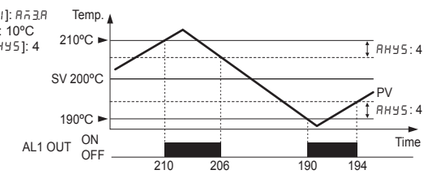
3)Phase control mode [PHAS]
A mode to control the load by controlling the phase within AC half cycle. Serial control is available. RANDOM Turn-on type SSR must be used for this mode.



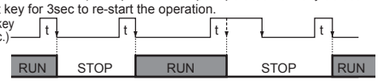
4. Alarm output hysteresis [AHYS]

It displays alarm output ON and OFF interval and hysteresis is applied to both AL1 OUT and AL2 OUT.
- tCAH, JIC, LIC, tCCH, rPr, SPr, dPtH, CUSH: 1 to 100
- tCAL, JIC, LIC, tCCL, dPtL, CUSL: 0.1 to 50.0

Ex)AL1 alarm operation[AL-1]: AnJF
AL1 alarm operation[AL1]: 10ºC
Alarm output hysteresis[AHYS]: 4



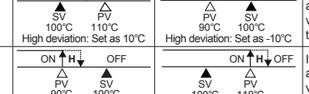
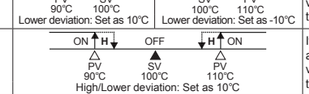
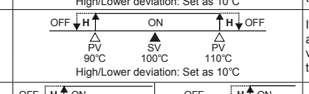
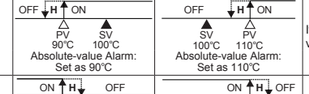
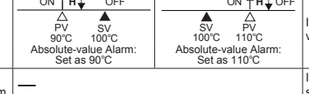
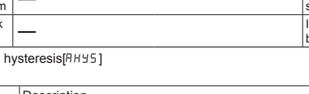
5. Digital input key (▽+△ 3sec.) [dI-P]

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 function	ALrE	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 tunning	At	Auto tuning function, it is same as auto tuning function [At] of parameter 1 group. (You can execute auto tuning from parameter 1group, and finish it by digital input key.) ※ When control type [C-Ad] is set as PId, At is displayed. When it is set as onoF, digital input key [dI-t] is changed as oFF.

6. Alarm

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

1)Alarm operation

Mode	Name	Alarm operation	Description
AnO_	—	—	No alarm output
An 1□	Deviation high-limit alarm		If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
An2□	Deviation low-limit alarm		If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
An3□	Deviation high/low-limit alarm		If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
An4□	Deviation high/low-limit reserve alarm		If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
An5□	Absolute value high limit alarm		If PV is higher than the absolute value, the output will be ON.
An6□	Absolute value low limit alarm		If PV is lower than the absolute value, the output will be ON.
SbA□	Sensor break alarm	—	It will be ON when it detects sensor disconnection.
LbA□	Loop break alarm	—	It will be ON when it detects loop break.

※ H: Alarm output hysteresis[AHYS]

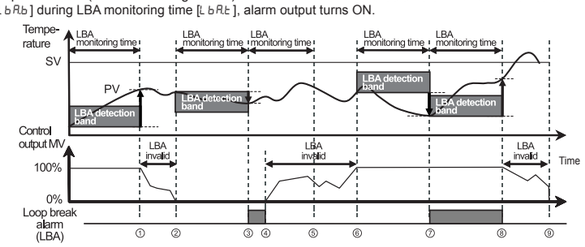
2)Alarm opetion

Option	Name	Description
An□A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
An□b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)
An□C	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.
An□d	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.
An□E	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.
An□F	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 [SbAb].

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 [LbAb] during LBA monitoring time [LbAt], or when control output MV is 0%(100% for cooling control) and PV is not decreased below than LBA detection band [LbAb] during LBA monitoring time [LbAt], alarm output turns ON.

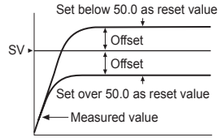


Start control to ①	When control output MV is 100%, PV is increased over than LBA detection band [LbAb] during LBA monitoring time [LbAt].
① to ②	The status of changing control output MV (LBA monitoring time is reset.)
② to ③	When control output MV is 0% and PV is not decreased below than LBA detection band [LbAb] during LBA monitoring time [LbAt], 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 ⑥	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 [LbAb] during LBA monitoring time [LbAt], loop break alarm (LBA) turns ON after LBA monitoring time.
⑦ to ⑧	When control output MV is 100% and PV is increased over than LBA detection band [LbAb] during LBA monitoring time [LbAt], 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[LbAb] 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) [LbA□], LBA detection band [LbAb] and LBA monitoring time [LbAt] parameter is displayed.

7. Manual reset[rESt]

·Manual reset [rESt] by control result



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%.

8. 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 of input sensor, it displays 'HHHH' or 'LLLL'.

9. Input digital filter[AnvF]

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.

10. 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

1. SV setting

Parameter	Default
—	0

2. Parameter 1 group

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
AL1	1250	At	oFF	I	0000	rESt	050.0
AL2	1250	P	0100	d	0000	HYS	002

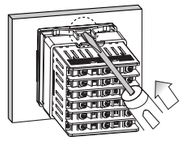
3. Parameter 2 group

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
In-t	tCAH	H-Su	1200	t	020.0	LbAb	0002
Unit	°C	o-Ft	HEAt	AL-1	AnJ.A	dI-P	StoP
In-b	0000	C-Ad	PId	LA-2	AnJ2A	Ervu	000.0
nAvF	000.1	oUt	rLY	AHYS	001	LoC	oFF
L-Su	-050	SSrv	Stnd	LbAt	0000		

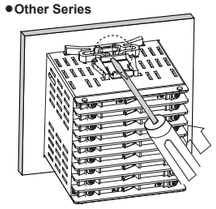
※ The AC/DC voltage models do not have SSR drive output method[SSrv]. In case of control output [oUt], if set as SSr, it supports only ON/OFF output.

▣ Installation

● **TCN4S(48X48mm) Series**



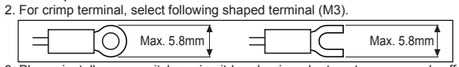
● **Other Series**



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

▣ 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).



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 & sewing machine, 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

- Photoelectric sensors
- Fiber optic sensors
- Door sensors
- Door side sensors
- Area sensors
- Proximity sensors
- Pressure sensors
- Rotary encoders
- Connector/Sockets
- Switching mode power supplies
- Control switches/Lamps/Buzzers
- I/O Terminal Blocks & Cables
- Stepper motors/drivers/motion controllers
- Graphic/Logic panels
- Field network devices
- Laser marking system(Fiber, CO_2, Nd:YAG)
- Laser welding/soldering system
- Temperature controllers
- Temperature/Humidity transducers
- SSR/Power controllers
- Counters
- Timers
- Panel meters
- Tachometer/Pulse(Rate) meters
- Display units
- Sensor controllers

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EP-KE-03-0350B