Autonics

TEMPERATURE CONTROLLER **TC4 Series**

INSTRUCTION MANUAL





Thank you for choosing our Autonics product. Please read the following safety considerations before use.

■ Safety Considerations

×Please observe all safety considerations for safe and proper product operation to avoid hazards.

Safety considerations are categorized as follows.

Marning Failure to follow these instructions may result in serious injury or death.

Caution Failure to follow these instructions may result in personal injury or product damage.

The symbols used on the product and instruction manual represent the following

▲ symbol represents caution due to special circumstances in which hazards may occur.

∧ Warning

- 1. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment, ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster prevention devices, etc.) Failure to follow this instruction may result in fire, personal injury, or economic loss.
- 2. Install on a device panel to use.

 Failure to follow this instruction may result in electric shock or fire
- 3. Do not connect, repair, or inspect the unit while connected to a power source. Failure to follow this instruction may result in electric shock or fire.

 4. Check 'Connections' before wiring.
- Failure to follow this instruction may result in fire.
- Do not disassemble or modify the unit.
 Failure to follow this instruction may result in electric shock or fire.

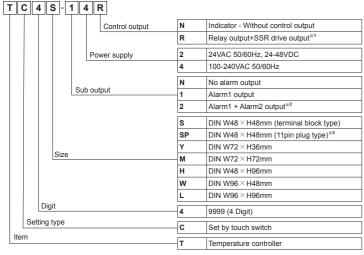
▲ Caution

- When connecting the power input and relay output, use AWG 20(0.50mm²) cable or over and tighter the terminal screw with a tightening torque of 0.74~0.90N·m.
- When connecting the sensor input and communication cable without dedicated cable, use AWG 28~16 cable and tighten the terminal screw with a tightening torque of 0.74~0.90N·m. Failure to follow this instruction may result in fire or malfunction due to contact failure
- Use the unit within the rated specifications.
 Failure to follow this instruction may result in fire or product damage 3. Use dry cloth to clean the unit, and do not use water or organic solvent.
- Failure to follow this instruction may result in electric shock or fire.

 4. Do not use the unit in the place where flammable/explosive/cor
- sive gas, humidity, direct sunlight radiant heat, vibration, impact, or salinity may be present.
 Failure to follow this instruction may result in fire or explosion.

 5. Keep metal chip, dust, and wire residue from flowing into the unit.
- Failure to follow this instruction may result in fire or product damage

Ordering Information



- X1: In case of the AC voltage model, SSR drive output method (standard ON/OFF control, cycle control, phase control) is available to select.
- X2: It is unavailable for TC4SP, TC4Y.X3: Sockets for TC4SP (PG-11, PS-11(N)) are sold separately.
- XThe above specifications are subject to change and some models may be discontinued
- Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

Specifications

Series		TC4 Series			I			I = - ··
		TC4S	TC4SP	TC4Y	TC4M	TC4W	TC4H	TC4L
	AC power		C∼ 50/60H					
	AC/DC Power							
Allowable	voltage range							
Power	AC power		100-240VAC					
consumptio	n AC/DC Power			0Hz), Max. 3				
Display m	ethod	7Segment	(Red), Other	r display (Gr				
Character	size (W×H)	7.0×15.0m	m	7.4×15.0mm	9.5×20.0n	nm 9.5×20.0m	m 7.0×14.6n	nm 11.0×22.0
Input	RTD	DPt100Ω,	Cu50Ω (Allo	wable line re	sistance n	nax.5Ω per a	wire)	
type	TC	K (CA), J (IC), L (IC)					
Dianlass	RTD					or ±1°C, sel		
Display accuracy*1						or ±2°C, sele	ct the highe	r one) ±1di
accuracy	TC		4SP, add ±1°	°C by accura	cy standai	d.		
Control	Relay	250VAC~	3A 1a					
output	SSR	12VDC== ±	£ 2V 20mA N	lax.				
Alarm out	put	AL1, AL2 F	Relay: 250VA	C~ 1A 1a (XTC4SP,	TC4Y have A	AL1 only.)	
Control me	ethod	ON/OFF at	nd P, PI, PD,	PID control				
Hysteresis	5	1 to100°C/	°F (0.1 to 50	.0°C/°F) varia	able			
Proportion	nal band (P)	0.1 to 999.	9°C/°F					
Integral tin	ne (I)	0 to 9999 s	sec.					
Derivative	time (D)	0 to 9999 sec.						
Control pe	riod (T)	0.5 to 120.0 sec.						
Manual re	set	0.0 to 100.	0%					
Sampling	period	100ms						
Dielectric	AC power	2,000VAC	50/60Hz for	1min. (between	een input t	erminal and	power termi	nal)
strength	AC/DC Power	1.000VAC	50/60Hz for	1min. (between	een input t	erminal and	power termi	nal)
Vibration		0.75mm ar	mplitude at fr	equency of	5 to 55Hz i	n each X, Y,	Z direction t	or 2 hours
	Mechanical					000,000 opera		
Relay						sistive load),		
life cycle	Electrical					esistive load		
Insulation	resistance		Ω (at 500VD				,	
Noise imm	nunity	Square-wave noise by noise simulator (pulse width 1µs) ± 2KV R-phase and S-phase						
Memory re	etention					miconductor		
Environ	Ambient temp.						, ,,,	-,
	Ambient humi.				RH.			
						rk: 🔲, Diele	ctric strengt	n hetween t
Insulation	type					ower 2kV, A		
Approval		(E c Sulling		ia ale powel	part. AC	JOWEI ZRV, A	OIDO FOWE	: :KV)
				Annroy 174a	Annroy 20	4g Approx. 194	In Annroy 10	4n Annroy S
Weight ^{×2}			(approx. 76q)					

- At room temperature (23°C ±5°C): (PV ±0.5% or ±2°C, select the higher one) ±1digit Out of room temperature range: (PV ±0.5% or ±3°C, select the higher one) ±1digit In case of TC4SP Series, ±1°C will be added.
- X2: The weight includes packaging. The weight in parentheses is for unit only Environment resistance is rated at no freezing or condensation

Unit Description





- 1. Present temperature (PV) display
- RUN mode: Present temperature (PV) display. · Parameter setting mode: Parameter or
- 2. Deviation indicator, Auto-tuning indicator It shows current temperature (PV) deviation based on set temperature (SV) by LED

Duoc	a on our tomporatare	(01)0) LLD.
No.	PV deviation temp.	Deviation display
1	Over 2°C	▲ indicator ON
2	Below ±2°C	indicator ON
3	Under -2°C	▼ indicator ON
Tho	doviation indicators (A V flach by

every 1 sec, when operating auto tuning.

- 3. Set temperature (SV) indicator Press any front key once to check or change current set temperature (SV), the set erature (SV) indicator is ON and preset set
- value is flashed. 4. Temperature unit (°C/°F) indicator

5. Control/alarm output indicator

- OUT: It will turn ON when control output (Main Control Output) is ON.
- ※In case of CYCLE/PHASE control of SSR drive output, it will turn ON when MV is over 3.0%. (only for AC power type)
- AL1/AL2: It will light up when alarm output Alarm1/ Alarm2 are on.

6. MODE key

to RUN mode, moving parameter, and saving setting values.

Used when entering into set value change mode, digit moving and digit up/down.

8. FUNCTION key

Press → keys for 3 sec. to operate function (RUN/ STOP, alarm output cancel, auto-tunning) set in inner

■ Input Sensor and Temperature Range [n-t]

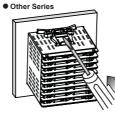
		•	.	-
Input sensor		Display	Temperature range (°C)	Temperature range (°F)
	K (CA)	FEB	-50 to 1200	-58 to 2192
Thermocouple	J (IC)	JI E	-30 to 500	-22 to 932
	L (IC)	LIE	-40 to 800	-40 to 1472
	DPt1000	dPE.H	-100 to 400	-148 to 752
RTD	DPITOUL	dPt.L	-100.0 to 400.0	-148.0 to 752.0
RID	Cu50Ω	СИБН	-50 to 200	-58 to 392
		E U S.L	-50.0 to 200.0	-58.0 to 392.0

Installation

● TC4S/SP (48 × 48mm) Series ● TC4Y (72 × 36mm) Series

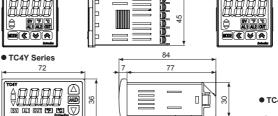






*Mount the product on the panel, fasten bracket by pushing with tools as shown above.

Dimensions TC4S Series TC4SP Series 72.2 58.5



 TC4M Series _72

Bracket

• TC4S/TC4SP Series

Connections

SSR OUT: ⊕◀ 1

TC4S Series

TC4Y Series

• TC4M Series

⊙◀

SV F C ALI ALE OUT

(()



• TC4Y Series

15



• TC4M, TC4W, TC4H, TC4L Series

12

23.9

TC4SP Series

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▶(1) (11)**←**

(10)◀

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23

▶②

• TC4H, TC4W, TC4L Series

2

3

4

5

6

7 AL1 OUT: 250VAC 1A 1a AL2 OUT:

X:1: AC power: 100-240VAC 5VA 50/60Hz

AC/DC power: 24VAC 5VA 50/60Hz

⊙**4** 8

XTC4 Series has selectable control output; Relay output, and SSR drive output

AC/DC power type does not have SSRP function.

9

SOURCE **
100-240VAC 5
24VAC 5VA 5
24-48VDC 3W

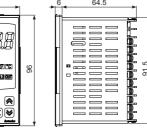
11

12

AL1 OUT: 250VAC 1A 1a

AL2 OUT: 250VAC 1A 1a

8 4 5 6 7 8 9 10 11

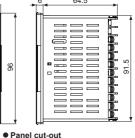


Size

TC4SP

TC4Y

TC4M



Min. 65 Min. 65 45*06

Min. 65 Min. 65 45*%

TC4H Min. 65 Min. 115 45*08 92*08

TC4L Min. 115 Min. 115 92*08 92*08

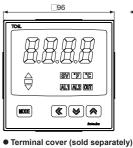
TC4W Min. 115 Min. 65 92*08

Min. 91 Min. 40 68% 31.5%

Min. 90 Min. 90 68^{-0.7} 68^{-0.7}

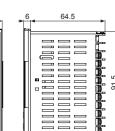
45*0.6

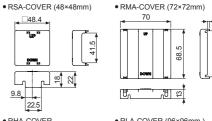
45*0.6



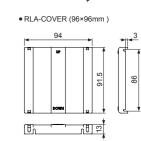
• TC4W Series

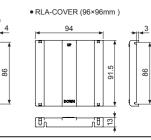
TC4I Series









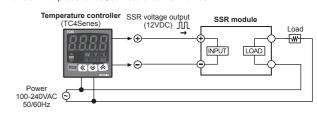


TH = ■ SSR Drive Output Selection Function (SSRP Function)[55-ñ]

- standard SSR drive output. Realizing high accuracy and cost effective temperature control as linear output(cycle control and
- Select one of standard ON/OFF control [5End], cycle control [EBEL], phase control [PHR5] at [55c.5]

• SSRP function is selectable one of standard ON/OFF control, cycle control, phase control by utilizing

parameter of Parameter group 2. For cycle control, connect zero cross turn-on SSR or rando turn-on SSR, For phase control, connect random turn-on SSR,



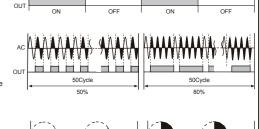
When selecting cycle or phase control mode, the power supply for a load and a temperature controller must be the same

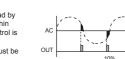
*In case of selecting cycle [LYEL] or phase [PHR5] control mode for PID control, control cycle [E] is not allowed to set

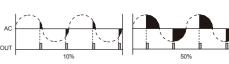
※For AC/DC power model (TC4□-□2R), this parameter [55r.ñ] is not displayed and it is available only standard control by relay or SSR

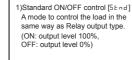
Having improved ON / OFF noise

3)Phase control [PHR5] A mode to control the load by controlling the phase within AC half cycle. Serial control is Random turn-on SSR must be used for this mode

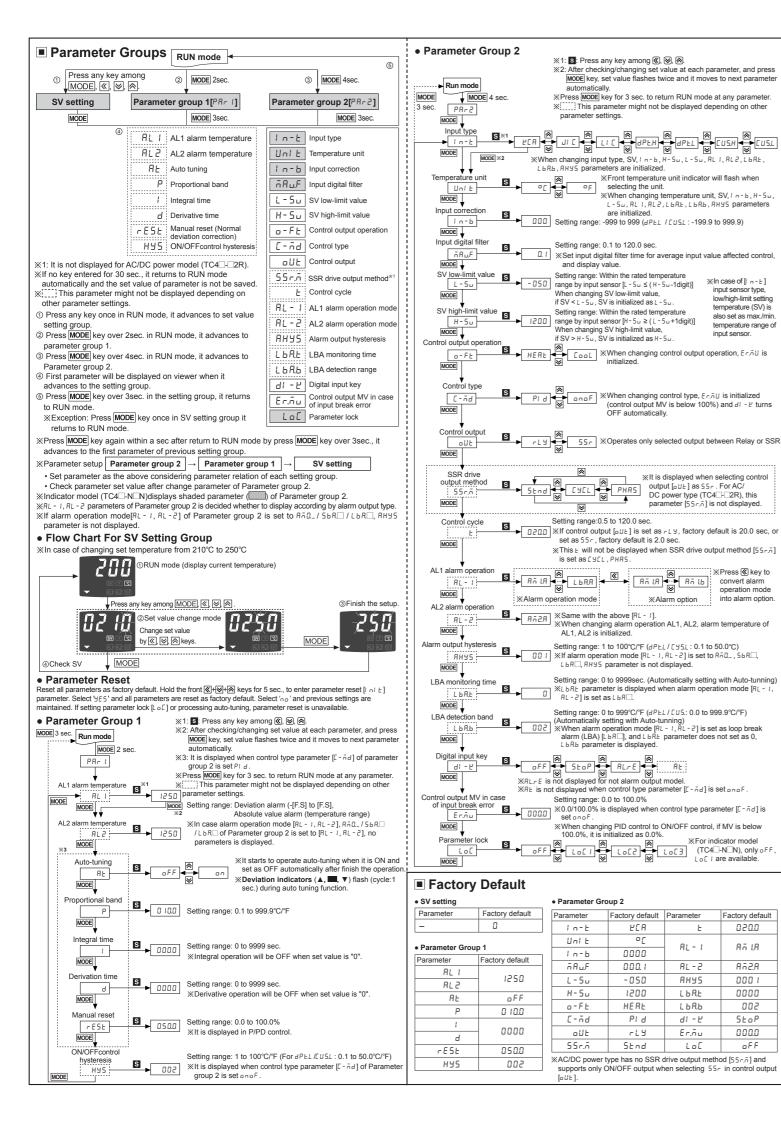








2)Cycle control [EYEL] A mode to control the load by repeating output ON / OFF according to the rate of output within setting cycle. feature by Zero Cross type.



■ Alarm [AL - 1/AL - 2] 1)Alarm operation

Set both alarm operation and alarm option by combining. Each alarm operates individually in two alarm output models When the current temperature is out of alarm range, alarm clears automatically. If alarm option is alarm latch or alarm latch and standby sequence 1/2, press digital input key(☑+♠ 3 sec. digital input key[d1 - t2] of Parameter group 2 set as ALLE), or turn OFF the power and turn ON to clear alarm.

Mode	Name	Alarm operation		Description
AñO	-	_		No alarm output
Rñ l□	Deviation high-limit alarm	OFF H ON SV PV 100°C 110°C High deviation: Set as 10°C	OFF H ON A PV 90°C 100°C High deviation: Set as -10°C	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
Añ2.□	Deviation low-limit alarm	ON H OFF A SV 90°C 100°C Lower deviation: Set as 10°C	ON H OFF SV PV 100°C 110°C Lower deviation: Set as -10°C	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
Rñ3.□	Deviation high/low- limit alarm	ON H OF DV SV 90°C 100 High/Lower devia	V PV	If deviation between PV and SV as high/low-limit is higher than svalue of deviation temperature, the alarm output will be ON.
Aŭ√□	Deviation high/low- limit reserve alarm	OFF H OI A PV SI 90°C 100 High/Lower devia	V PV	If deviation between PV and SV as high/low-limit is higher than value of deviation temperature, the alarm output will be OFF.
A ā 5.□	Absolute value high limit alarm	OFF H ON PV SV 90°C 100°C Absolute-value Alarm: Set as 90°C	OFF H ON SV PV 100°C 110°C Absolute-value Alarm: Set as 110°C	If PV is higher than the absolute value, the output will be ON.
A ñ 6.□	Absolute value low limit alarm	ON H OFF A SV 90°C 100°C Absolute-value Alarm: Set as 90°C	ON H OFF SV PV 100°C 110°C Absolute-value Alarm: Set as 110°C	If PV is lower than the absolute value, the output will be ON.
56R□	Sensor break alarm	_		It will be ON when it detects sensor disconnection.
LЬЯ□	Loop break alarm	_		It will be ON when it detects loo break.

2)Alarm opetion Option Name Standard If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output R⊼□A is OFF. If it is an alarm condition, alarm output is ON and maintains ON status Яй□ь Alarm latch (Alarm output HOLD) 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. Aŭ □E Alarm latch If it is an alarm condition, it operates both alarm latch and standby sequence. When Bā□d and standby power is supplied and it is an alarm condition, this first alarm condition is ignored and from the second alarm condition, alarm latch operates. 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 Rā□E sequence 2 does not turn ON. After clearing alarm condition, standard alarm 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 [RL 1, RL 2] or alarm operation [RL - 1, RL - 2], switching STOP mode

clearing alarm condition, alarm latch operates.

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-ap standby sequence and if it is alarm condition, alarm output does not turn ON. After

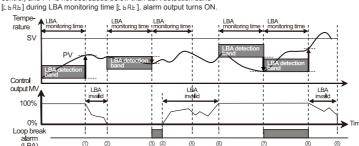
3)Sensor break alarm

sequence 2

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 nits using alarm output contact. It is selectable between standard alarm [56RR] or alarm latch [56Rb].

4)I oon break alarm (I BA)

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 [L bRb] during LBA monitoring time [L bRb], or when control output MV is 0% (100% for cooling control) and PV is not decreased below than LBA detection band



(LD, 1)	
Start control to ①	When control output MV is 100%, PV is increased over than LBA detection band [L bRb] during LBA monitoring time [L bRb].
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 [L bAb] during LBA monitoring time [L bAb], 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 [Ł bRb] during LBA monitoring time [Ł bRt], loop break alarm (LBA) turns ON after LBA monitoring time.
⑦ to ®	When control output MV is 100% and PV is increased over than LBA detection band [L bRb] during LBA monitoring time [L bRb], 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[L ЬЯЬ] and LBA monitoring time are automatically set ba on auto tuning value. When alarm operation mode [RL - 1, RL - 2] is set as loop break alarm (LBA)[LbR...]. LBA detection band [L b R b] and LBA monitoring time [L b R b] parameter is displayed

Input Correction [n-b]

Controller itself does not have errors but there may be error by external input temperature sensor. This function is for correcting this error

E.g.) If actual temperature is 80°C but controller displays 78°C, set input correction value [n - b] as '002' and controller displays 80°C.

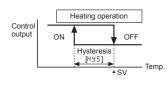
жAs the result of input correction, if current temperature value (PV) is over each temperature range of input sensor, it displays 'нннн' or 'tltl'.

■ Input Digital Filter [丙月山月]

If current temperature (PV) is fluctuating repeatedly by rapid change of input signal, it refl ects 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.

■ Hysteresis [H95]

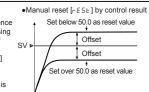
- If Hysteresis is too narrow, hunting (oscillation chattering) could occur due to external noise.
- In case of ON / OFF control mode, even if PV reaches stable status, there still occurs hunting. It could be due to Hysteresis [H95] SV, load's response characteristics or sensor's location. In order to reduce hunting to a minimum, it is required to take into following factors consideration when designing temp. controlling; proper Hysteresis [HYS], heater's capacity, thermal characteristics, sensor's response and location.



■ Manual Reset [r E 5 b]

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 [-E5b] 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%.



■ Digital Input Key (🔝 + 🔊 3sec.) [d/ -년]

Parameter		Operation				
OFF	oFF	It does not use digital input key function.				
RUN/STOP	StoP	Pauses control output. Auxiliary output (except loop break alarm, sensor break alarm) except Control output operates as setting. Hold the digital input keys for 3 sec. to restart. Digital input key (t: over 3 sec.)				
Clear alarm	ALFE	Clears alarm output by force. (only when alarm option is alarm latch, or alarm latch and standby sequence 1/2.) This function is applied when present value is out of alarm operation range but alarm output is ON. Alarm operates normally right after clearing alarm.				
Auto-tuning	ЯĿ	Starts/Stops auto-tuning. This function is same as auto-tuning[RE] of parameter group (You can start auto-tuning [RE] of parameter group 1 and stop it by digital input key.) **XThis parameter RE appears only when control method [[ād] Parameter group 2 is set as PId. When control method [[ād] Parameter group 2 is set as anaF, this parameter is changed as aFF.				

■ Control Output MV When Input Sensor Line Is Broken [E r.ō u]

The function to set control output MV in case of open error. Users are able to set by ON/OFF setting or MV setting. It executes control output by set MV regardless of ON/OFF or PID control output.

■ Parameter Lock [Lo[]

A function to prevent changing SV and parameters of each setting group. Parameter setting values are still possible to check when parameter lock is set. X ₀FF, L ₀ [≀ are available only for indicator (TC4□-N□

Display	Description
oFF	Unlock
Lo[1	Lock parameter group 2
Lo[2	Lock parameter group 1, 2
Lo[3	Lock parameter group 1, 2, SV setting

■ Error

Display	Description	Troubleshooting
oPEn	Flashes if input sensor is disconnected or sensor is not connected.	Check input sensor state.
нннн	Flashes if measured sensor input is higher than temperature range.	When input is within the rated temperature
LLLL	Flashes if measured sensor input is lower than temperature range.	range, this display disappears.

Cautions during Use

- . Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
- . Check the polarity of the terminals before wiring the temperature sensor.
- For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length. For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire
- Keep away from high voltage lines or power lines to prevent inductive noise. In case installing power line and input signal line closely, use line filter or varistor at power line and shielded
- Do not use near the equipment which generates strong magnetic force or high frequency noise
- Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting the power
 Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller.
- When changing the input sensor, turn off the power first before changing.
- After changing the input sensor, modify the value of the corresponding parameter.

 24VAC, 24-48VDC power supply should be insulated and limited voltage/current or Class 2, SELV power
- supply device.
- . Make a required space around the unit for radiation of heat.
- For accurate temperature measurement, warm up the unit over 20 min after turning on the power.
- 9. Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.
- 10. Do not wire to terminals which are not used.

 11. This unit may be used in the following environments
- ①Indoors (in the environment condition rated in 'Specifications') ③Pollution degree 2

②Altitude max 2 000m

Autonics Corporation

■ Major Products

Photoelectric Sensors ■ Temperature Controllers
iber Optic Sensors ■ Temperature/Humidity Transducers
loor Sensors ■ SSRs/Power Controllers

oor Sensors oor Side Sensors rea Sensors

■ Counters
■ Timers

■ Imers
■ Panel Meters
■ Tachometer/Pulse (Rate) Meters
■ Display Units
■ Sensor Controllers

ontrol Switches/Lamps/Duzzers

D Terminal Blocks & Cables

tepper Motors/Drivers/Motion Controlle

raphic/Logic Panels

eld Network Devices

aser Marking System (Fiber, Co₂, Nd: YAG) aser Welding/Cutting System

■ HEADQUARTERS:
18, Bansong-ro 513beon-gil, Haeundae-gu, Busan, South Korea, 48002
TEL: 82-51-519-3232
■ E-mail: sales@autonics.com

DRW170775AA

Autonics

DUAL INDICATOR TEMPERATURE CONTROLLER

TCN4 SERIES

INSTRUCTION MANUAL

CE CAL'US







Thank you for choosing our Autonics product. Please read the following safety considerations before use.

■ Safety Considerations

**Please observe all safety considerations for safe and proper product operation to avoid hazards.

*Safety considerations are categorized as follows.

⚠Warning Failure to follow these instructions may result in serious injury or death

▲Caution Failure to follow these instructions may result in personal injury or product damage. *The symbols used on the product and instruction manual represent the following

▲ symbol represents caution due to special circumstances in which hazards may occur.

⚠ Warning

- 1. Fail-safe device must be installed when using the unit with machinery that may cause serious injury or substantial economic loss. (e.g. nuclear power control, medical equipment ships, vehicles, railways, aircraft, combustion apparatus, safety equipment, crime/disaster
- Failure to follow this instruction may result in fire, personal injury, or economic loss. 2. Install on a device panel to use.
- Failure to follow this instruction may result in electric shock or fire.

 3. Do not connect, repair, or inspect the unit while connected to a power source.
- Failure to follow this instruction may result in electric shock or fire.

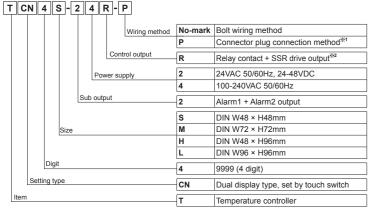
 4. Check 'Connections' before wiring.
- Failure to follow this instruction may result in fire
- 5. Do not disassemble or modify the unit. Failure to follow this instruction may result in electric shock or fire.

▲ Caution

- 1. When connecting the power input and relay output, use AWG 20(0.50mm²) cable or over and tighten the terminal screw with a tightening torque of 0.74~0.90N·m.
 When connecting the sensor input and communication cable without dedicated cable, use AWG 28~16 cable and tighten the terminal screw with a tightening torque of 0.74~0.90N·m. Failure to follow this instruction may result in fire or malfunction due to contact failure.
- 2. Use the unit within the rated specifications.
- Failure to follow this instruction may result in fire or product damage. 3. Use dry cloth to clean the unit, and do not use water or organic solvent.
- Failure to follow this instruction may result in electric shock or fire.

 4. Do not use the unit in the place where flammable/explosive/corrosive gas, humidity, direct
- sunlight, radiant heat, vibration, impact, or salinity may be present. Failure to follow this instruction may result in fire or explosion
- 5. Keep metal chip, dust, and wire residue from flowing into the unit. Failure to follow this instruction may result in fire or product damage.

Ordering Information



- *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 and some models may be discontinued
- %Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).

Specification

Series		TCN4S	TCN4M	TCN4H	TCN4L		
Power	AC Power	100-240VAC~	50/60Hz				
supply	AC/DC Power	24VAC~ 50/60	Hz, 24-48VDC=				
Allowab	le voltage range	90 to 110% of r	ated voltage				
Power	AC Power	Max. 5VA(100-	240VAC 50/60Hz)				
consumpt	ion AC/DC Power	Max. 5V(24VAC	C 50/60Hz), Max. 3	W(24-48VDC)			
Display	method	7 segment (PV:	red, SV: green), o	ther display part(gr	reen, red) LED method		
Charact	ter PV(W×H)	7.0×15.0mm	9.5×20.0mm	7.0×14.6mm	11.0×22.0mm		
size	SV(W×H)	5.0×9.5mm	7.5×15.0mm	6.0×12.0mm	7.0×14.0mm		
Input	RTD	DIN Pt100Ω, C	u50Ω (Allowable lir	ne resistance max.	5Ω per a wire)		
type	TC	K(CA), J(IC), L	(IC), T(CC), R(PR),	S(PR)			
Display	RTD				elect the higher one) ± 1 dig		
accurac *1	TC TC		nperature range: (PV P, add ±1°C by acci		lect the higher one)± 1digi		
Control	Relay	250VAC∼ 3A 1	la				
output	SSR	12VDC=±2V 2	0mA Max.				
Alarm o	utput	AL1, AL2 Relay	/: 250VAC∼ 1A 1a				
Control	method	ON/OFF control, P, PI, PD, PID control					
Hystere	sis	1 to 100°C/°F (0.1 to 50.0°C/°F)					
Proporti	ional band(P)	0.1 to 999.9°C/°F					
Integral	time(I)	0 to 9999 sec.					
Derivati	ve time(D)	0 to 9999 sec.					
Control	period(T)	0.5 to 120.0 sec.					
Manual	reset	0.0 to 100.0%					
Samplin	ng period	100ms					
Dielectr	ic AC power	2000VAC 50/60	OHz 1min.(between	input terminal and	power terminal)		
strength	AC/DC power	1000VAC 50/60	OHz 1min.(between	input terminal and	power terminal)		
Vibratio	n	0.75mm amplitu	ide at frequency of 5	5 to 55Hz in each X	, Y, Z direction for 2 hours		
Relay lif	Mechanical	OUT: Over 5,00	00,000 times, AL1/	2: Over 5,000,000	times		
cycle	Electrical		OUT: Over 200,000 times(250VAC 3A resistive load) AL1/2: Over 300,000 times(250VAC 1A resistive load)				
Insulation	on 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)					
Environ	Ambient temp.	-10 to 50°C, Storage: -20 to 60°C					
-ment	Ambient humi.	35 to 85%RH, \$	Storage: 35 to 85%	RH			
Inquilat:		Double insulation	on or reinforced insu	lation (mark: 🔲, die	lectric strength between		
Insulatio	лі іуре	the measuring in	nput part and the po	wer part : AC powe	r 2kV, AC/DC power 1kV)		
Approva	al	(€ ;%\ ′⊔s					
Weight **2		Approx. 147g	Approx. 203q	Approx. 194q	Approx. 275q		

- At room temperature(23°C±5°C)
- Bellow 200°C of thermocouple R(PR), S(PR) is (PV ±0.5% or ±3°C, select the higher one) ±1 digit Over 200°C of thermocouple R(PR), S(PR) is (PV ±0.5% or ±2°C, select the higher one) ±1 digit Termocouple L (IC), RTD Cu50Ω is (PV ±0.5% or ±2°C, select the higher one) ±1 digit
- Out of room temperature range
- Out of room emperature range Below 200°C of thermocouple R(PR), S(PR) is (PV ±1.0% or ±6°C, select the higher one) ±1 digit Over 200°C of thermocouple R(PR), S(PR) is (PV ±0.5% or ±5°C, select the higher one) ±1 digit Thermocouple L(IC), RTD Cu50Ω is (PV ±0.5% or ±3°C, select the higher one) ±1 digit
- For TCN4S--P, add ±1°C by accuracy standard.
- *2: The weight includes packaging. The weight in parentheses is for unit only.* Environment resistance is rated at no freezing or condensation.

Unit Description



- 1. Present temperature (PV) display (Red)
- RUN mode: Present temperature (PV) display
 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
- . Control/Alarm output display indicator 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.
- . Auto tuning indicator AT indicator flashes by every 1 sec during operating

5. MODE key

Used when entering into parameter groups, returning to RUN mode, moving parameter, and saving

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

Press ☑ + ☒ keys for 3 sec. to operate the set function in digital in (RUN/STOP, alarm output reset, auto tuning) in digital input key [dl - E].

8. Temperature unit (°C/°F) indicator

Input Sensor and Temperature Range

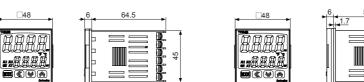
Input sensor		Display	Temperature range(°C)	Temperature range(°F)
	K(CA)	PERH.	-50 to 1200	-58 to 2192
	K(CA)	LE UT	-50.0 to 999.9	-58.0 to 999.9
	J(IC)	JI C.H	-30 to 800	-22 to 1472
	J(IC)	JI C.L	-30.0 to 800.0	-22.0 to 999.9
Thermoseunie	1 (10)	LI C.H	-40 to 800	-40 to 1472
Thermocouple	L(IC)	LI C.L	-40.0 to 800.0	-40 to 999.9
	T(CC)	F E E H	-50 to 400	-58 to 752
	1(00)	FEET	-50.0 to 400.0	-58.0 to 752.0
	R(PR)	rPr	0 to 1700	32 to 3092
	S(PR)	5Pr	0 to 1700	32 to 3092
	DPt100Ω	dPt.H	-100 to 400	-148 to 752
RTD	DF(100Ω	dPt.L	-100.0 to 400.0	-148.0 to 752.0
KID	Cu500	C U S.H	-50 to 200	-58 to 392
	Cu3012	CU5.L	-50.0 to 200.0	-58.0 to 392.0

• TCN4S Series

Bracket

TCN4S Series

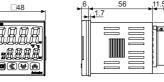
Dimensions (unit: mm)

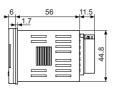


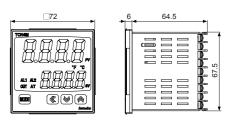
• TCN4M. TCN4H. TCN4L Series

● TCN4S-□-P

TCN4L Series

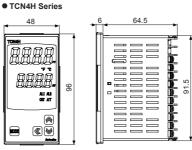


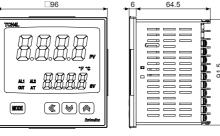


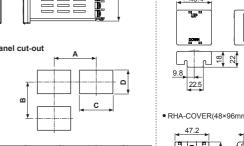


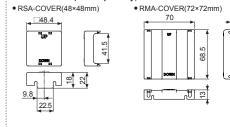
Terminal cover(sold separately)

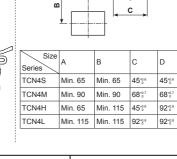
• TCN4M Series

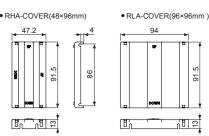


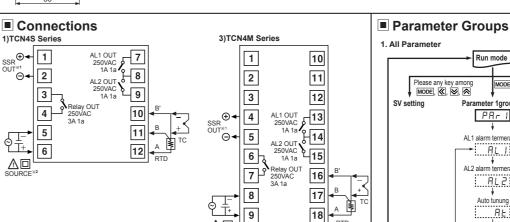




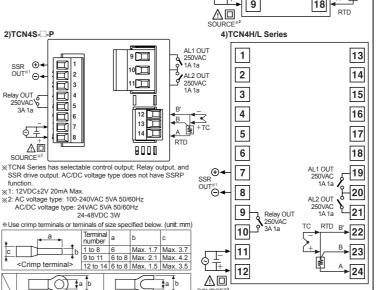


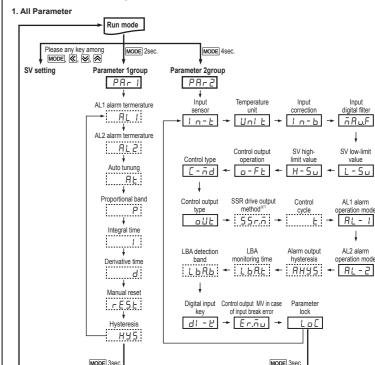




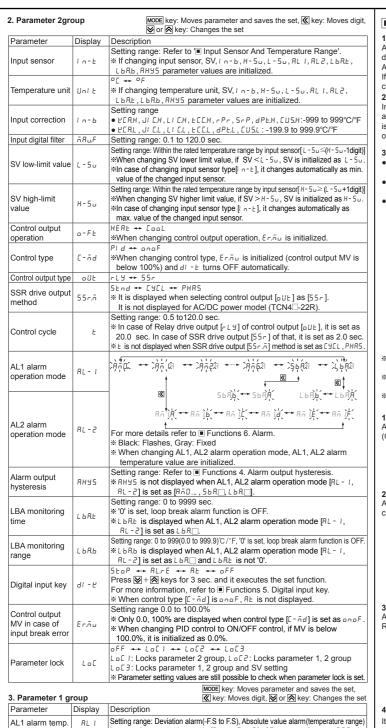


23.9





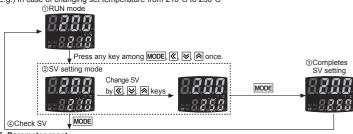
- (Exception: Press MODE key once in SV setting group, it returns to RUN mode).
- If no key entered for 30 sec., it returns to RUN mode automatically and the set value of parameter is not be saved.
- ** Press MODE key again within 1 sec. after returning to RUN mode, it advances of the first parameter of previous parameter group.
- * 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).



		to it moved alga, to it is not contained also con
Parameter	Display	Description
AL1 alarm temp.	AL I	Setting 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 Ana./
AL2 alarm temp.	AL 2	568_/L68_, no parameters is displayed.
Auto tuning	RĿ	□FF ↔ □□ Front AT indicator flashes during auto tuning operation.
Proportional band	Р	Setting range: 0.1 to 999.9°C/°F
Integral time	1	Setting range: 0 to 9999 sec. Integral operation is OFF when set value is "0".
Derivative time	д	Setting range: 0 to 9999 sec. Derivative operation is OFF when set value is "0".
Manual reset	rESt	Setting range: 0.0 to 100.0%/ It is displayed in P/PD control.
Hysteresis	нч5	Setting range • ECERH, JI EH, LEECH, rPr , SrP , $JPEH$, $LUSH$: 1 to $100^{\circ}C/^{\circ}F$ • ECERL, JI LL, LL EL, LEELL, $JPEL$, $LUSL$: 0.1 to $50.0^{\circ}C/^{\circ}F$ * It is displayed when control type $[C-\bar{n}d]$ of parameter 2 group is set $JUSL$.

4. SV setting

You can set the temperature to control with Mooe, (€, №, A keys. Setting range is within SV lower limit value [L - 5 \(\omega\)] to SV higher limit value [H - 5 \(\omega\)]. E.g.) In case of changing set temperature from 210°C to 250°C



5. Parameter reset

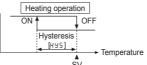
Reset all parameters as factory default. Hold the front <a>Keys for 5 sec., to enter parameter reset [I n] E] parameter. Select "JE5" and all parameters are reset as factory default. Select 'no ' and previous settings are maintained. If setting parameter lock [L o C] or processing auto-tuning, parameter reset is

Functions

I. 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[[-nd] is set as PId, it is displayed.) Application of the PID time constant realizes fast response and high precision temperature control. If error [aPEn] occurs during auto tuning, it stops this operation automatically. To stop auto tuning, change the set as [aFF]. (It maintains P, I, D values of before auto tuning.)

2. Hysteresis [H95] In case of ON/OFF control, set between ON and OFF intervals as hysteresis. (When control type [$[- \bar{n} d]$ is set as $a \cap a F$, 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) [55c.51

- SSRP function is selectable one of standard ON/OFF control, cycle control, phase control by utilizing standard SSR drive output.
- Realizing high accuracy and cost effective temperature control as linear output(cycle control and
- Select one of standard ON/OFF control [5½ nd], cycle control [5½ [2], phase control [PHR5] at [55 nd] parameter of parameter 2 group. For cycle control, connect zero cross turn-on SSR or rando turn-on SSR. For phase control, connect random turn-on SSR.

Temperature controlle (TCN4 series) SSR drive output SSR Module (12VDC) 8886 INPUT LOAD 8888 **(()** 100-240VAC 🗢 50/60Hz

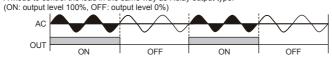
When selecting phase or cycle control mode, the power supply for load and temperature

** In case of selecting PID control type and phase [PHR5] / cycle [PHR5] control output modes, control cycle [£] 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.

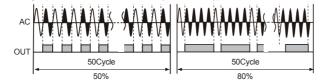
1)Standard ON/OFF control mode [5 knd]

A mode to control the load in the same way as Relay output type.



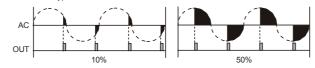
2)Cycle control mode [EYEL]

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



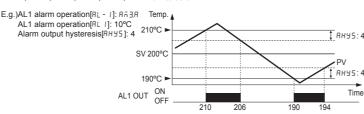
3)Phase control mode [PHR5]

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 [AH95]

It displays alarm output ON and OFF interval and hysteresis is applied to both AL1 OUT and AL2 OUT. , JI EH, LI EH, EEEH, rPr, 5Pr, dPEH, EUSH: 1 to 100 PERL. JI C.L. LI C.L. ECC.L. dPE.L. CUS.L: 0.1 to 50.0



5. Digital input key (🗹+🐼 3sec.) [d/ - 년]

Parameter		Operation				
OFF	oFF	It does not use digital input key function.				
RUN/STOP	StoP	Pauses control output. Auxiliary output (except loop break alarm, sensor break alarm) except Control output operates as setting. Hold the digital input keys for 3 sec. to restart. It				
Clear alarm	AL.r E	Clears alarm output by force. (only when alarm option is alarm latch, or alarm latch and standby sequence 1/2.) This function is applied when present value is out of alarm operation range but alarm output is ON. Alarm operates normally right after clearing alarm.				
Auto-tuning	RE	Starts/Stops auto-tuning. This function is same as auto-tuning[$\Re E$] of parameter 1 group. (You can start auto-tuning [$\Re E$] of parameter 1 group and stop it by digital input key.) \divideontimes This parameter $\Re E$ appears only when control method [$E - \widehat{n} d$] parameter 2 group is set as $\Re E$ M . When control method [$E - \widehat{n} d$] parameter 2 group is set as $\Re E$.				



1)Alarm operation



Set both alarm operation and alarm option by combining Set born alarin operation and alarin opinion by combining. Alarm outputs are two and each one operates individually. When the current temperature is out of alarm range, alarm clears automatically, if alarm option is alarm latch or alarm latch and standby sequence 1/2, press digital input key(딸+)의 3 sec., digital input kev[d] - E] of parameter 2 group set as AL, E), or turn OFF the power and turn ON to clear alarm

Mode	Name	Alarm operation		Description No alarm output		
RÃO		_				
Aŭ (□	Deviation high-limit alarm OFF H ON SV PV 100°C 110°C High deviation: Set as 10°C		OFF H ON A PV SV 90°C 100°C High deviation: Set as -10°C	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.		
A ¥ 5.□	Deviation low-limit alarm Over 100°C Lower deviation: Set as 10°C		ON ↑H → OFF SV PV 100°C 110°C Lower deviation: Set as -10°C	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.		
A ĕ 3.□	Deviation high/low- limit alarm	90°C 100	V PV	If deviation between PV and SV as high/low-limit is higher than so value of deviation temperature, the alarm output will be ON.		
ฅลัฯ□	Deviation high/low- limit reserve alarm	△ A PV S' 90°C 100	V PV	If deviation between PV and SV as high/low-limit is higher than sel value of deviation temperature, the alarm output will be OFF.		
A ē 5.□	Absolute value high limit alarm	OFF H ON PV SV 90°C 100°C Absolute-value Alarm: Set as 90°C	OFF H ON SV PV 100°C 110°C Absolute-value Alarm: Set as 110°C	If PV is higher than the absolute value, the output will be ON.		
A ē 6.□	Absolute value low limit alarm	ON TH OFF A PV SV 90°C 100°C Absolute-value Alarm: Set as 90°C	ON H OFF SV PV 100°C 110°C Absolute-value Alarm: Set as 110°C	If PV is lower than the absolute value, the output will be ON.		
56R.□	Sensor break alarm	_		It will be ON when it detects sensor disconnection.		
L b R.	Loop break alarm	_		It will be ON when it detects loop break.		

H: Alarm output hysteresis[AH95]

2)Alarm opetion

Name	Description
Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)
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.
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.
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.
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.
	Standard alarm Alarm latch Standby sequence 1 Alarm latch and standby sequence 1 Standby sequence 2 Alarm latch and standby

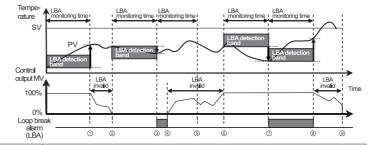
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2. Power ON changing set temperature, alarm temperature (RL 1, RL 2) or alarm operation (RL - 1, RL - 2), switching STOP mode to RUN mode.

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 [56RR] or alarm latch [5bRb].

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 [L b Ab] during LBA monitoring time [L b Ab], or when contro output MV is 0%(100% for cooling control) and PV is not decreased below than LBA detection band IL bRb1 during LBA monitoring time IL bRb1, alarm output turns ON.



Start control to ①	When control output MV is 100%, PV is increased over than LBA detection band [$LbRb$] during LBA monitoring time [$LbRb$].
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 [L bRb] during LBA monitoring time [L bRb], 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 [L b Rb.] during LBA monitoring time [L b Rb.], loop break alarm (LBA) turns ON after LBA monitoring time.
⑦ to ®	When control output MV is 100% and PV is increased over than LBA detection band [L b Rb] during LBA monitoring time [L b Rb] 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[L b Rb] 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) L bR], LBA detection band [L bRb] and LBA monitoring time [L bRb] parameter is displayed.

7. Manual reset[rE5b]

·Manual reset [- E5 L] 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, neater capacity. This temperature difference is called offse and manual reset. In E.5 E.1 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

Set below 50.0 as reset value Offset Offset Set over 50.0 as reset value

is higher than SV, reset value is below 50.0%. 8. Input correction[! n-b]

Controller itself does not have errors but there may be error by external input temperature sensor. This function is for correcting this error. E.g.) If actual temperature is 80°C but controller displays 78°C, set input correction value [i n-b] as

'002' and controller displays 80°C. * 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[nRuF] 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.

IU. EIIUI		
Display	Description	Troubleshooting
oPEn	Flashes if input sensor is disconnected or sensor is not connected.	Check input sensor state.
нннн		When input is within the rated temperature range, this display
LLLL	E. 1. 76	disappears.

Factory Default

1. SV settina

Parameter	Default
_	0

2. Parameter 1 group

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
RL I	1250	RĿ	oFF	1	0000	rESt	050.0
RL2	1250	Р	0.01	Ь	0000	H95	002

3. Parameter 2 group

Parameter	Default	Parameter	Default	Parameter	Default	Parameter	Default
In-E	LC UH	H-5u	1500	Ł	0.050	L b R.b	0002
Uni E	٥٢	o-Ft	HERL	AL-I	ANT.A	41 - F.	StoP
In-b	0000	[-ñd	PId	LA-5	R.5.AR	Er.ñu	0.00.0
ñRuF	000.1	oUt	rLY	RHYS	001	LoC	oFF
L-5u	-050	55r.ñ	Stad	LBRE	0000		

* The AC/DC voltage models do not have SSR drive output method[55r.ñ]. In case of control output I o U E 1, if set as 55 r., it supports only ON/OFF output.

Installation

TCN4S(48×48mm) Series



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

Cautions during Use

- Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
 Check the polarity of the terminals before wiring the temperature sensor.

For RTD temperature sensor, wire it as 3-wire type, using cables in same thickness and length. For thermocouple (CT) temperature sensor, use the designated compensation wire for extending wire . Keep away from high voltage lines or power lines to prevent inductive noise.

In case installing power line and input signal line closely, use line filter or varistor at power line and shielded wire at input signal line.

Do not use near the equipment which generates strong magnetic force or high frequency noise. 4. Install a power switch or circuit breaker in the easily accessible place for supplying or disconnecting

5. Do not use the unit for other purpose (e.g. voltmeter, ammeter), but temperature controller

6. When changing the input sensor, turn off the power first before changing.

After changing the input sensor, modify the value of the corresponding parameter.
7. 24VAC, 24-48VDC power supply should be insulated and limited voltage/current or Class 2, SELV

power supply device.

. Make a required space around the unit for radiation of heat.

For accurate temperature measurement, warm up the unit over 20 min after turning on the power. Make sure that power supply voltage reaches to the rated voltage within 2 sec after supplying power.

11. This unit may be used in the following environments

①Indoors (in the environment condition rated in 'Specifications') ②Altitude max. 2,000m ③Pollution degree 2

@Installation category II

■ Major Products

■ Photoelectric Sensors ■ Temperature Controllers
■ Fiber Optic Sensors ■ Temperature/Humidity Transducers
■ Door Sensors ■ Temperature/Humidity Transducers
■ Door Sensors ■ SR8/Power Controllers
■ Counters ■ Counters
■ Proximity Sensors ■ Timers
■ Pressure Sensors ■ Tachometer/Pulse (Rate) Meters
■ Connector/Sockets ■ Sensor Controllers
■ 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, Co₂, Nd: YAG)
■ Laser Welding/Cutting System

Autonics Corporation http://www.auto

HEADQUARTERS

18, Bansong-ro 513beon-gil, Haeundae-gu, Busan, South Korea, 48002

DRW170776AA