DUAL INDICATOR TEMPERATURE CONTROLLER

TS4 SERIES

INSTRUCTION MANUAL

Thank you for choosing our 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 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.
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, humidit ，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

T S 4 M - 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	**M**	DIN W48 × H48mm
	C	DIN W72 × H72mm
	H	DIN W48 × H96mm
	B	DIN W96 × H96mm
Digit	**4**	9999 (4 digit)
Setting type	**S**	Dual display type, set by touch switch
Item	**T**	Temperature controller

※**1:** Only for TS4M 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 without notice.**

※**Be sure to follow cautions written in the instruction manual and the technical descriptions (catalog, homepage).**

▣ Specificatio

Series		TS4M	TS4C	TS4H	TS4B
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(W×H)	7.0×15.0mm	9.5×20.0mm	7.0×14.6mm	11.0×22.0mm
	SV(W×H)	5.0×9.5mm	7.5×15.0mm	6.0×12.0mm	7.0×14.0mm
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 TS4M-□-P, add ±1ºC 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 direction 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			
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

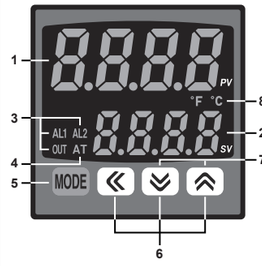
◎Out of room temperature range
- Below 200ºC of thermocouple R(PR), S(PR) is (PV ±1.0% or ±6ºC, select the higher one) ±1 digit
- Over 200ºC of thermocouple R(PR), S(PR) is (PV ±0.5% or ±5ºC, select the higher one) ±1 digit
- Thermocouple L(IC), RTD Cu50Ω is (PV ±0.5% or ±3ºC, select the higher one)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

For TS4M-□-P, add ±1ºC 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)**
   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.

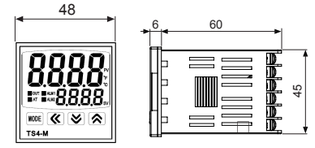
▣ Input Sensor and Temperature Range

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.IC.H	-30 to 800	-22 to 1472
		J.IC.L	-30.0 to 800.0	-22.0 to 999.9
	L(IC)	L.IC.H	-40 to 800	-40 to 1472
		L.IC.L	-40.0 to 800.0	-40 to 999.9
	T(CC)	T.CC.H	-50 to 400	-58 to 752
		T.CC.L	-50.0 to 400.0	-58.0 to 752.0
	R(PR)	R.PR	0 to 1700	32 to 3092
	S(PR)	S.PR	0 to 1700	32 to 3092
RTD	DPt100Ω	dPt.H	-100 to 400	-148 to 752
		dPt.L	-100.0 to 400.0	-148.0 to 752.0
	Cu50Ω	CU5.H	-50 to 200	-58 to 392
		CU5.L	-50.0 to 200.0	-58.0 to 392.0

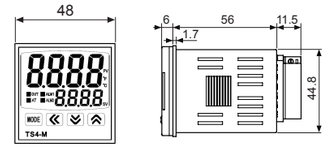
▣ Dimensions

(unit: mm)

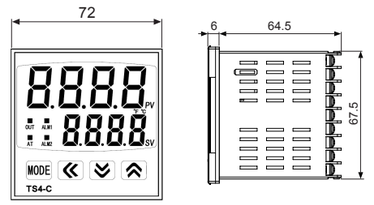
● **TS4M Series**



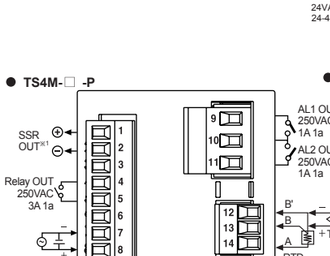
● **TS4M -□-P**



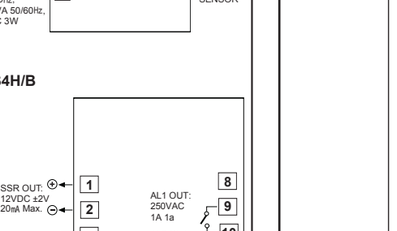
● **TS4C Series**



● **TS4H Series**

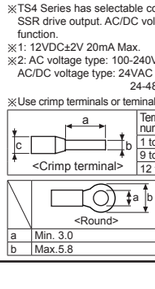


● **TS4B Series**

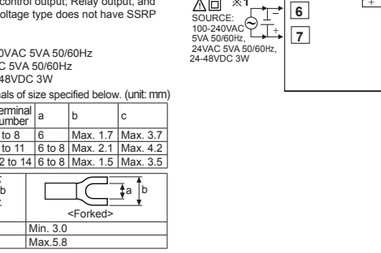


● **Bracket**

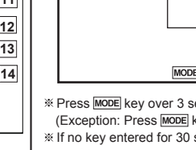
● **TS4M Series**



● **TS4C, TS4H, TS4B Series**



● **Panel cut-out**



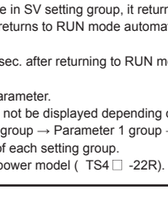
Size / Series	A	B	C	D
TS4M	Min. 65	Min. 65	$45^{+0.6}_{0}$	$45^{+0.6}_{0}$
TS4C	Min. 90	Min. 90	$68^{+0.7}_{0}$	$68^{+0.7}_{0}$
TS4H	Min. 65	Min. 115	$45^{+0.6}_{0}$	$92^{+0.8}_{0}$
TS4B	Min. 115	Min. 115	$92^{+0.8}_{0}$	$92^{+0.8}_{0}$

● **Terminal cover(sold separately)**

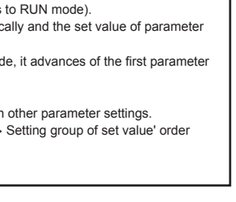
● RSA-COVER(48×48mm)

● RMA-COVER(72×72mm)

● RHA-COVER(48×96mm)

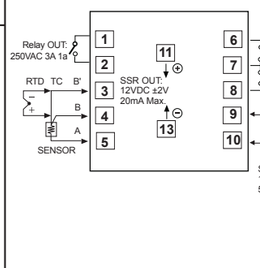


● RLA-COVER(96×96mm)

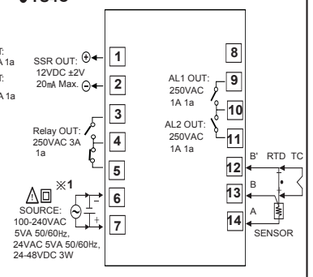


▣ Connections

● **TS4M**

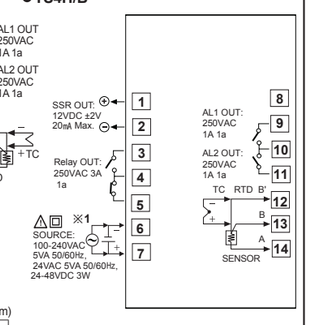


● **TS4C**



● **TS4M-□ -P**

● **TS4H/B**



※TS4 Series has selectable control output; Relay output, and SSR drive output. AC/DC voltage type does not have SSRP function.

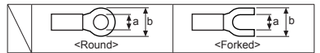
※1: 12VDC±2V 20mA Max.

※2: AC voltage type: 100-240VAC 5VA 50/60Hz
AC/DC voltage type: 24VAC 5VA 50/60Hz
24-48VDC 3W

※Use crimp terminals or teminals of size specified below. (unit: mm)

<Crimp terminal>

Terminal number	a	b	c
1 to 8	6	Max. 1.7	Max. 3.7
9 to 11	6 to 8	Max. 2.1	Max. 4.2
12 to 14	6 to 8	Max. 1.5	Max. 3.5

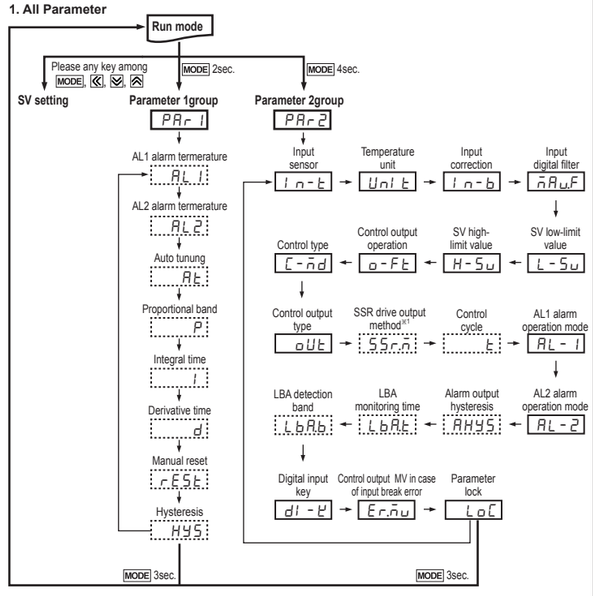


<Round> <Forked>

	<Round>	<Forked>
a	Min. 3.0	Min. 3.0
b	Max.5.8	Max.5.8

▣ Parameter Groups

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.

※ PressMODE 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.

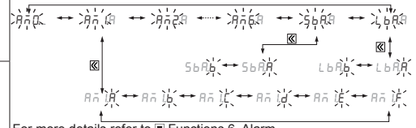
※ Parameter marked in ⋯ might not be displayed depending on other parameter settings.

※ 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 (TS4□ -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	Setting range: Refer to '■ Input Sensor And Temperature Range'. ※ If changing input sensor, SV, in-b, H-Su, L-Su, AL 1, AL2, LbAt, LbAb, AHYS parameter values are initialized.
Temperature unit	Unit	°C ↔ °F ※ If changing temperature unit, SV, in-b, H-Su, L-Su, AL 1, AL2, LbAt, LbAb, AHYS parameter values are initialized.
Input correction	in-b	Setting range ● tCAH, tCAL, t1CH, t1CL, t2CH, t2CL, dPt1, dPt2, CUSH, CUSL: -999 to 999°C/°F ● tCA1, tCA2, t1C1, t1C2, t2C1, t2C2, dPt1, dPt2, CUS1, CUS2: -199.9 to 999.9°C/°F
Input digital filter	inAwF	Setting range: 0.1 to 120.0 sec.
SV low-limit value	L-Su	Setting 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	Setting 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, Ero is initialized.
Control type	C-Ad	PId ↔ onoF ※When changing control type, Ero is initialized (control output MV is below 100%) and di-t turns OFF automatically.
Control output type	oUt	rLY ↔ SSr
SSR drive output method	SSro	Stnd ↔ CYCL ↔ PHAS ※ It is displayed when selecting control output [oUt] as [SSr]. It is not displayed for AC/DC power model (TS4 □-22R).
Control cycle	t	Setting 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 [SSro] method is set as CYCL, PHAS.
AL1 alarm operation mode	AL-1	 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.
AL2 alarm operation mode	AL-2	
Alarm output hysteresis	AHYS	Setting 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 [AAO_, SbA□, LbA□].
LBA monitoring time	LbAt	Setting 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	Setting range: 0 to 999(0.0 to 999.9)°C/°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-t	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	Ero	Setting 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%.
Parameter lock	LoC	oFF ↔ LoC1 ↔ LoC2 ↔ LoC3 LoC1: Locks parameter 2 group, LoC2: Locks parameter 1, 2 group LoC3: Locks parameter 1, 2 group and SV setting ※ Parameter setting values are still possible to check when parameter lock is set.

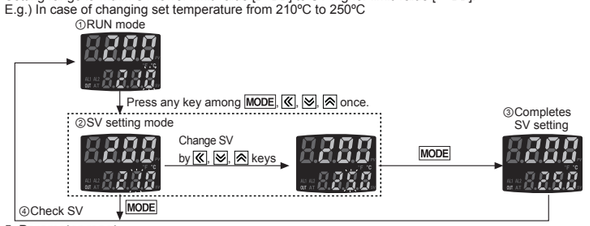
3. Parameter 1 group

MODE key: Moves parameter and saves the set, ≪ key: Moves digit, ∨ or ∧ key: Changes the set

Parameter	Display	Description
AL1 alarm temp.	AL1	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 AAO_/ 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	Setting range: 0.1 to 999.9°C/°F
Integral time	I	Setting range: 0 to 9999 sec. Integral operation is OFF when set value is "0".
Derivative time	d	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	HYS	Setting range ● tCAH, tC1H, t1CH, t2CH, rPr, SrP, dPtH, CUSH: 1 to 100°C/°F ● tCAL, tC1L, t1CL, t2CL, dPtL, CUSL: 0.1 to 50.0°C/°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.
Setting range is within SV lower limit value [L-Su] to SV higher limit value [H-Su].
E.g.) In case of changing set temperature from 210ºC to 250ºC



5. Parameter reset

Reset all parameters as factory default. Hold the front ≪+∨+∧ keys for 5 sec., to enter parameter reset [rnit] parameter. Select 'YES' and all parameters are reset as factory default. Select 'no' and previous settings are maintained. If setting parameter lock [LoC] or processing auto-tuning, parameter reset is unavailable.

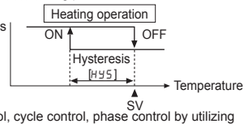
■ Functions

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.)

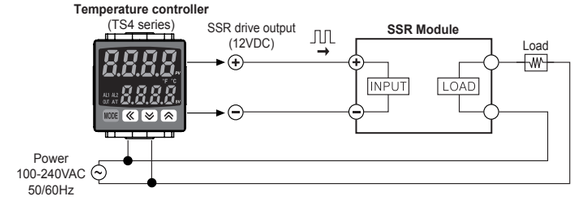
2. Hysteresis [HYS]

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) [SSro]

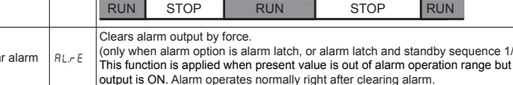
- SSRP function is selectable one of standard ON/OFF control, cycle control, phase control by utilizing standard SSR drive output.
- Realizing high accuracy and cost effective temperature control as linear output(cycle control and phase control).
- Select one of standard ON/OFF control [Stnd], cycle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



※ 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 (TS □-22R), this parameter is not displayed and it is available only standard control by relay or SSR.

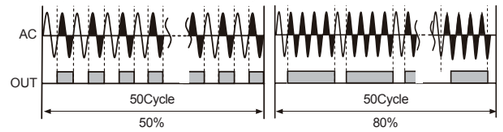
1)Standard ON/OFF control mode [Stnd]

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



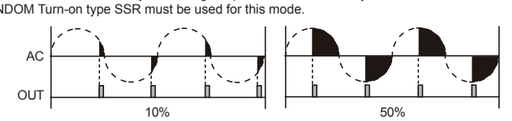
2)Cycle control mode [CYCL]

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]

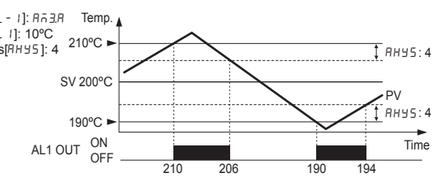
A mode to control the load by controlling the phase within AC half cycle. Serial control is available. RANDOM Turn-on type SSR must be used for this mode.



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, tC1H, t1CH, t2CH, rPr, SPr, dPtH, CUSH: 1 to 100
- tCAL, tC1L, t1CL, t2CL, dPtL, CUSL: 0.1 to 50.0

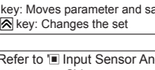
E.g.)AL1 alarm operation[AL-1]: AA3A
AL1 alarm operation[AL 1]: 10ºC
Alarm output hysteresis[AHYS]: 4



5. Digital input key (∨+∧ 3sec.) [di-t]

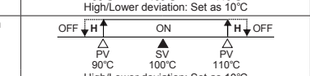
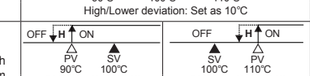
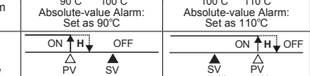
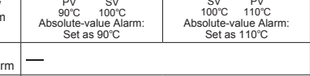
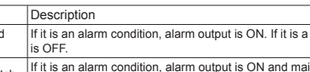
Parameter		Operation
OFF	oFF	It does not use digital input key function.
RUN/STOP	StoP	Pauses control output. Auxiliary output (except loop break alarm, sensor break alarm) except Control output operates as setting. Hold the digital input keys for 3 sec. to restart. Digital input key (t: over 3 sec.)
Clear alarm	ALrE	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	At	Starts/Stops auto-tuning. This function is same as auto-tuning[At] of parameter 1 group. (You can start auto-tuning [At] of parameter 1 group and stop it by digital input key.) ※This parameter At appears only when control method [C-Ad] parameter 2 group is set as PId. When control method [C-Ad] parameter 2 group is set as onoF, this parameter is changed as oFF.

6. Alarm



Set both alarm operation and alarm option 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[∨+∧ 3 sec., digital input key[di-t] of parameter 2 group set as ALrE), or turn OFF the power and turn ON to clear alarm.

1)Alarm operation

Mode	Name	Alarm operation	Description
AAO_	—	—	No alarm output
AA 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.
AA2□	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.
AA3□	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.
AA4□	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.
AA5□	Absolute value high limit alarm		If PV is higher than the absolute value, the output will be ON.
AA6□	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
AA□A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AA□b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)
AA□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.
AA□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.
AA□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.
AA□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.

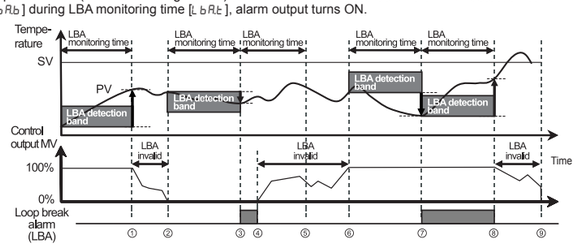
※ Condition of re-applied standby sequence for standby sequence 1, alarm latch and standby sequence 1: Power ON
Condition of re-applied standby sequence for standby sequence 2, alarm latch and standby sequence 2: Power ON, changing set temperature, alarm temperature (AL 1, AL2) or alarm operation (AL-1,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

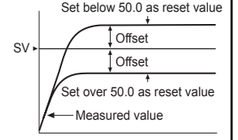


Start control to ①	When control output MV is 100%, PV is increased over than LBA detection band [LbAb] during LBA monitoring time [LbAt].
① to ②	The status of changing control output MV (LBA monitoring time is reset.)
② to ③	When control output MV is 0% and PV is not decreased below than LBA detection 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.
E.g.) 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 filte [AAwF]

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
AL 1	1250	At	oFF	I	0000	rESt	050.0
AL2	1250	P	0100	d	0000	HYS	002

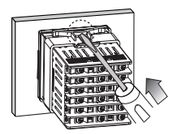
3. Parameter 2 group

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	AA1A	di-t	StoP
in-b	0000	C-Ad	PId	LA-2	AA2A	Ero	000.0
AAwF	000.1	oUt	rLY	AHYS	001	LoC	oFF
L-Su	-050	SSro	Stnd	LbAt	0000		

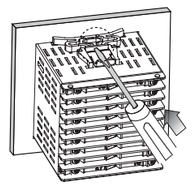
※ The AC/DC voltage models do not have SSR drive output method[SSro]. In case of control output [oUt], if set as SSr, it supports only ON/OFF output.

■ Installation

●TS4M(48×48mm) Series



●Other Series



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

■ Cautions during Use

1. Follow instructions in 'Cautions during Use'. Otherwise, It may cause unexpected accidents.
2. 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.
3. 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 the power.
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.
8. 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') ②Altitude max. 2,000m
    ③Pollution degree 2 ④Installation category II

■ Major Products

■ Photoelectric Sensors ■ Temperature Controllers
■ Fiber Optic Sensors ■ Temperature/Humidity Transducers
■ Door Sensors ■ SSRs/Power Controllers
■ Door Side Sensors ■ Counters
■ Area Sensors ■ Timers
■ Proximity Sensors ■ Panel Meters
■ Pressure Sensors ■ Tachometer/Pulse (Rate) Meters
■ Rotary Encoders ■ Display Units
■ 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, CO_2, Nd: YAG)
■ Laser Welding/Cutting System