Autonics

TEMPERATURE CONTROLLER
TD4 SERIES

M A N U A L

Thank you very much for selecting Autonics products.
For your safety, please read the following before using.

▣ Caution for your safety

※Please keep these instructions and review them before using this unit.

※Please observe the cautions that follow;

⚠ Warning Serious injury may result if instructions are not followed.

⚠ Caution Product may be damaged, or injury may result if instructions are not followed.

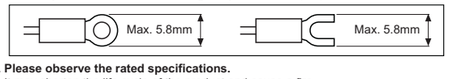
※The following is an explanation of the symbols used in the operation manual.
⚠ caution: Injury or danger may occur under special conditions.

⚠ Warning

1. **In case of using this unit with machinery (Ex: nuclear power control, medical equipment, ship, vehicle, train, airplane, combustion apparatus, safety device, crime/disaster prevention equipment, etc) which may cause damages to human life or property, it is required to install fail-safe device.**
   It may cause a fire, human injury or damage to property.
2. **Install the unit on a panel.**
   It may cause electric shock.
3. **Do not connect, inspect or repair this unit when power is on.**
   It may cause electric shock.
4. **Wire properly after checking terminal number.**
   It may cause a fire.
5. **Do not disassemble the case. Please contact us if it is required.**
   It may cause electric shock or a fire.

⚠ Caution

1. **This unit shall not be used outdoors.**
   It may shorten the life cycle of the product or cause electric shock.
2. **When connect wire, AWG 20(0.50mm²) should be used and screw bolt on terminal block with 0.74N·m to 0.90N·m strength.**
   It may cause a malfunction or fire due to contact failure.
3. **For crimp terminal, select following shaped terminal(M3).**



4. **Please observe the rated specifications.**
   It may shorten the life cycle of the product and cause a fire.
5. **Do not use beyond of the rated switching capacity of relay contact.**
   It may cause insulation failure, contact melt, contact failure, relay broken and fire etc.
6. **In cleaning unit, do not use water or organic solvent. And use dry cloth.**
   It may cause electric shock or a fire.
7. **Do not use this unit in place where there are flammable or explosive gas, humidity, direct ray of the light, radiant heat, vibration and impact etc.**
   It may cause a fire or an explosion.
8. **Do not inflow dust or wire dregs into the unit.**
   It may cause a fire or a malfunction.
9. **Please wire properly after checking the terminal polarity when connecting temperature sensor.**
   It may cause a fire or an explosion.
10. **In order to install the units with reinforced insulation, use the power supply unit which over basic insulation level is ensured.**(TD4SP is basic insulation only.)

▣ Ordering information

T D 4 M – 1 4 R

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

※1: Control output type is different by model size.
※2: Socket for TD4SP (PG-08, PS-08) is sold separately.

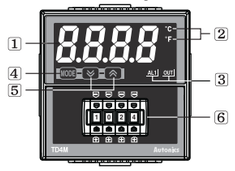
※The above specifications are subject to change without notice.

▣ Specifications

Series		TD4SP	TD4M	TD4H	TD4L
Power supply		100-240VAC 50/60Hz			
Allowable voltage range		90 to 110% of rated voltage			
Power consumption		Max. 5VA			
Display method		7Segment(Red), Other display(Green, Yellow, Red LED)			
Character size		H15mm×W7mm	H18mm×W9mm	H15mm×W7mm	H22mm×W11mm
Input type	RTD	DPt100Ω (Allowable line resistance max.5Ω per a wire)			
	TC	K(CA), J(IC)			
Display accuracy	RTD	(PV ± 0.5% or ± 1℃ higher one) rdg ± 1Digit※1 ※TD4SP(Plug type) is (PV ± 0.5% or ± 2℃ higher one) rdg ± 1Digit※2 - Based on room temperature(23℃ ± 5℃)			
	TC				
Control output	Relay	250VAC 3A 1c	250VAC 3A 1a	Relay(250VAC 3A 1a) + SSR(24VDC ±3V 20mA Max.)	
	SSR	24VDC ±3V 20mA Max.			
	Current	DC4-20mA (Load resistance Max. 600Ω)			
Alarm output		—	AL1 Relay: 250VAC 1A 1a	AL1, AL2 Relay : 250VAC 1A 1a	
Control method		ON/OFF and P, PI, PD, PID control			
Hysteresis		1 to 100℃/℉			
Proportional band(P)		0.1 to 999.9℃/℉			
Integral time(I)		9,999 sec.			
Derivative time(D)		9,999 sec.			
Control period(T)		0.5 to 120.0 sec.			
Manual reset		0.0 to 100.0%			
Sampling period		100ms			
Dielectric strength		2,000VAC 50/60Hz for 1min.(Between input terminal and power terminal)			
Vibration		0.75mm amplitude at frequency of 5 to 55Hz in each X, Y, Z directions for 2 hours			
Relay life cycle	Control output	Mechanical: Min. 10,000,000 operations, Electrical: Min. 100,000 operations			
	Alarm output	Mechanical: Min. 5,000,000 operations, Electrical: Min. 100,000 operations			
Insulation resistance		Min. 100MΩ (at 500VDC megger)			
Noise immunity		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 temperature	-10 to 50℃, Storage: -20 to 60℃			
	Ambient humidity	35 to 85%RH, Storage: 35 to 85%RH			
Insulation type※3		▣			
Approval		CE cULus			
Unit weight		Approx. 76g	Approx. 126g	Approx. 131g	Approx. 193g

※1: In case of out of room temperature range: (PV ± 0.5% or ± 2℃ higher one)rdg ± 1 Digit
※2: In case of out of room temperature range for TD4SP: (PV ± 0.5% or ± 3℃ higher one)rdg ± 1 Digit
※3: "▣" Mark indicates that equipment protected throughout by double insulation or reinforced insulation.
※Environment resistance is rated at no freezing or condensation.

▣ Parts description



1 Temperature display
It shows current temperature(PV) in RUN mode and parameter and set value for each setting group in parameter change mode.

2 Temperature unit indicator(℃/℉): It shows current temperature unit.

2 Auto-tuning indicator
Temperature unit indicator (℃ or ℉) is flashing by every 1 sec during auto tuning operation.
Set [oFF] to stop auto tuning operation, it maintains previous P, I, D setting values.
If error [Er-Su, oPEn] occurs during operation, auto tuning stops.
※Auto tuning operates continuously if error [HHHH], [LLLL] occurs. If it is satisfied with the condition, it finishes auto tuning normally.

3 Control/sub output indicator
-OUT: It will light up when control output(Main Control Output) is on.
※For current output type, if MV is below 2%, it turns OFF. If MV is over 3%, it turns ON.
-AL1/AL2: It will light up when alarm output AL1/AL2 is on.

4 MODE Key: Used when entering into parameter setting group, returning to RUN mode, moving parameter and saving setting values.

5 Adjustment: Used when entering into set value change mode, Digit moving and Digit Up/down.
Press ▽+△ keys at the same time to move digit, to execute, or release the set function in digital input key setting (**dI -U**).

6 Digital Switch: Set the setting temperature (SV) to be controlled.

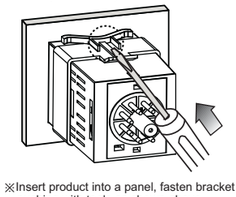
▣ Input sensor and temperature range[In-t]

Input sensor		Display	Temperature range(℃)	Temperature range(℉)
Thermo Couple	K(CA)	K CA	-50 to 1200	-58 to 2192
	J(IC)	J IC	-30 to 500	-22 to 932
Platinum resistance thermometer (RTD)	DPt100Ω	Pt	-100 to 400	-148 to 752

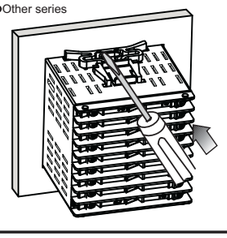
Factory default : [K CA]

▣ Installation

●TD4SP(48 X 48mm) series



●Other series

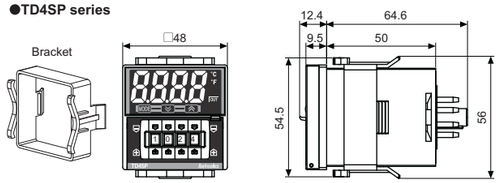


※Insert product into a panel, fasten bracket by pushing with tools as shown above.

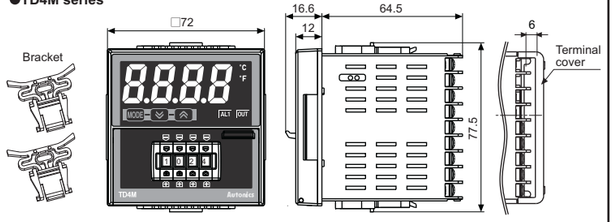
▣ Dimensions

(Unit:mm)

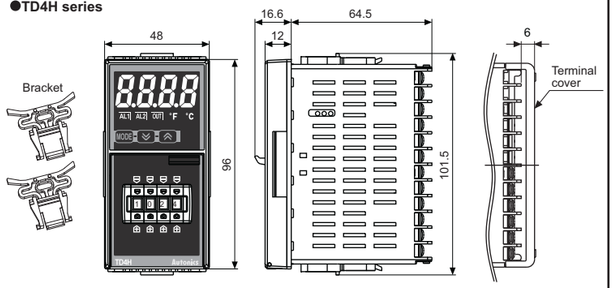
●TD4SP series



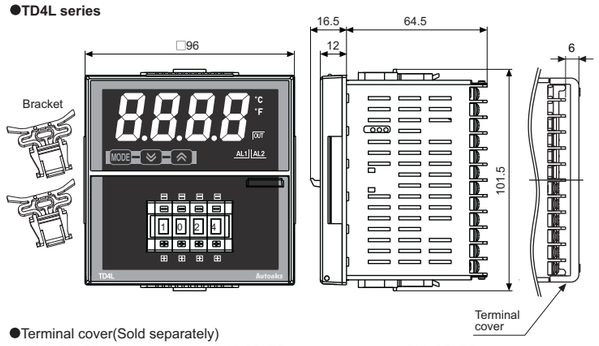
●TD4M series



●TD4H series

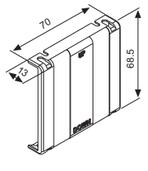


●TD4L series

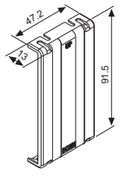


●Terminal cover(Sold separately)

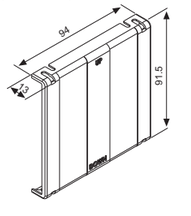
· RMA-COVER (72 X 72mm)



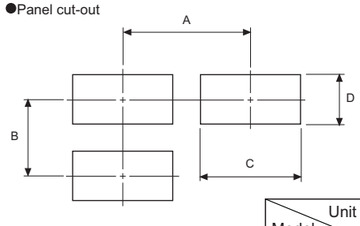
· RHA-COVER (48 X 96mm, 96 X 48mm)



· RLA-COVER (96 X 96mm)



●Panel cut-out

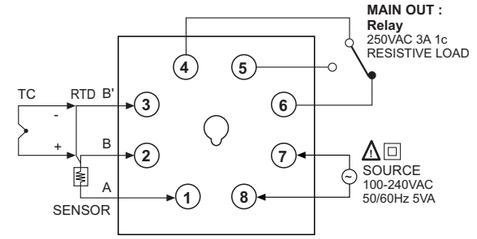


(Unit:mm)

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

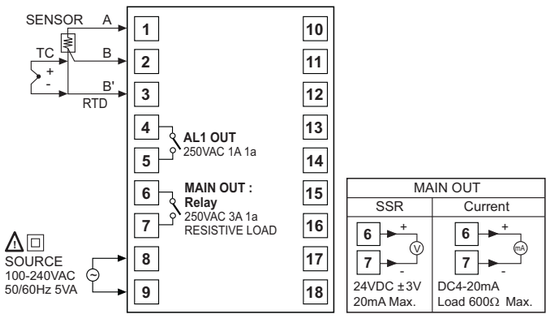
▣ Connections

●**TD4SP-N4□**(Indicator model)



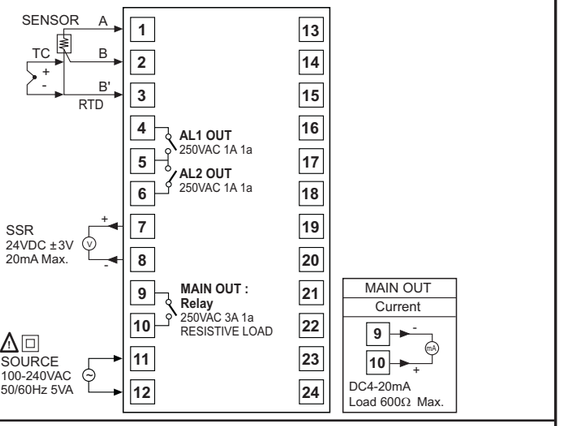
MAIN OUT	
SSR	Current
24VDC ±3V 20mA Max.	DC4-20mA Load 600Ω Max.

●**TD4M series**



MAIN OUT	
SSR	Current
24VDC ±3V 20mA Max.	DC4-20mA Load 600Ω Max.

●**TD4H/TD4L series**



MAIN OUT
Current
DC4-20mA Load 600Ω Max.

▣ Factory default

●**First setting group**

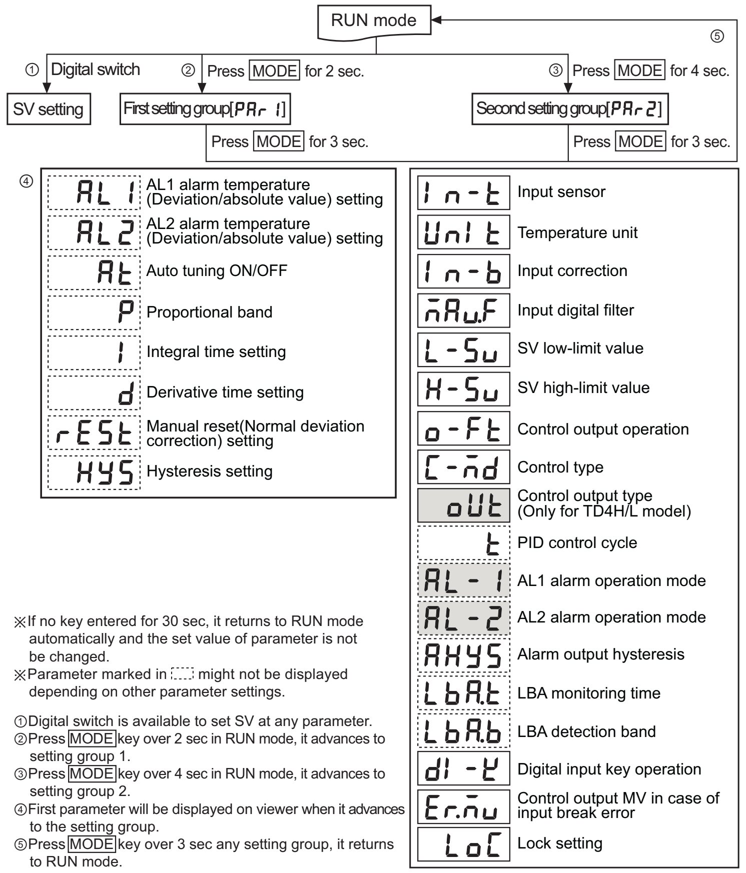
Parameter	Factory default
AL1	1250
AL2	
At	oFF
P	0100
I	0000
d	
rESt	0500
HYS	002

●**Second setting group**

Parameter	Factory default	Parameter	Factory default
In-t	K CA	AL-1	AM 1A
Unit	°C	AL-2	AM2A
In-b	000	AHYS	001
AMuF	000.1	LbAt	0000
L-Su	-50	LbAb	002
H-Su	1200	dI -U	StoP
o-Ft	HEAt	ErAu	0000
C-Ad	PId	LoC	oFF
oUt※1	rLY		
t※2	0200		
	0020		

※1: It is only for TD4H/TD4L.
※2: If control output [oUt] is set as [rLY], factory default of [t] is 20.0 sec, or set as [SSr], factory default is 2.0 sec. It does not display for current output mode [CUr].

■ Flow chart for setting group



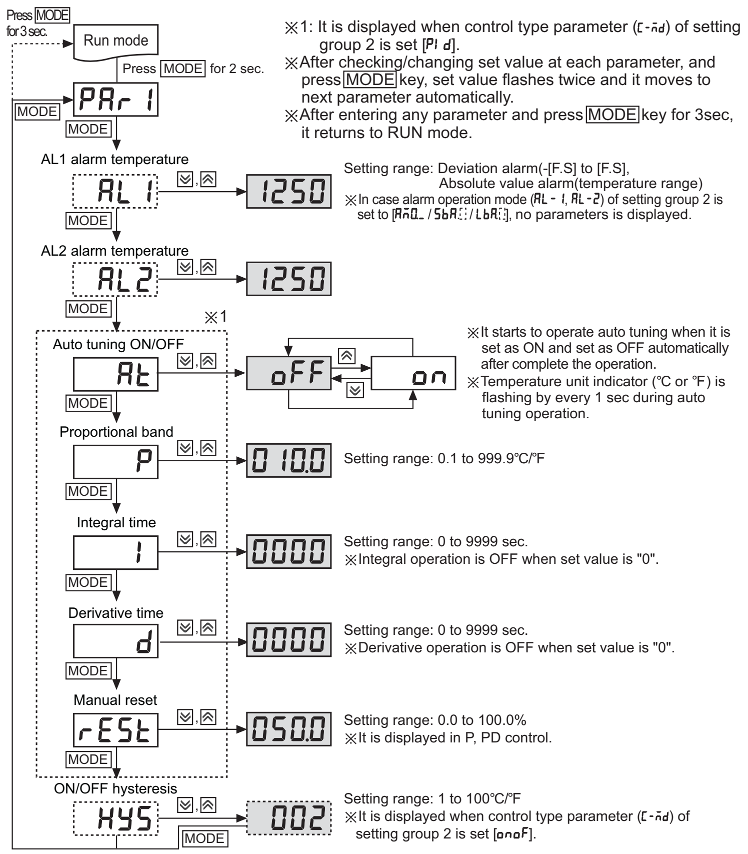
※If no key entered for 30 sec, it returns to RUN mode automatically and the set value of parameter is not be changed.
※Parameter marked in ⬚ might not be displayed depending on other parameter settings.

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

※Press MODE key again within 1 sec after return to RUN mode by press MODE key over 3 sec, it advances to the first parameter of previous setting group.
※Parameter setup
Setting group2 → Setting group1
• Set parameter as the above considering parameter relation of each setting group.
• Check parameter set value after change parameter of setting group2.
• Above description for setting group is based on for TD4H/L-24R model.
※Shaded parameters of setting group 2 may not be displayed depending on TD4 model.
※Alarm operation mode (AL-1, AL-2) of setting group2 is decided whether to display according by alarm output type.
※If alarm operation mode (AL-1, AL-2) of setting group2 is set to [AM0_/SbA.⬚/LbA⬚], [AHYS] parameter is not displayed.

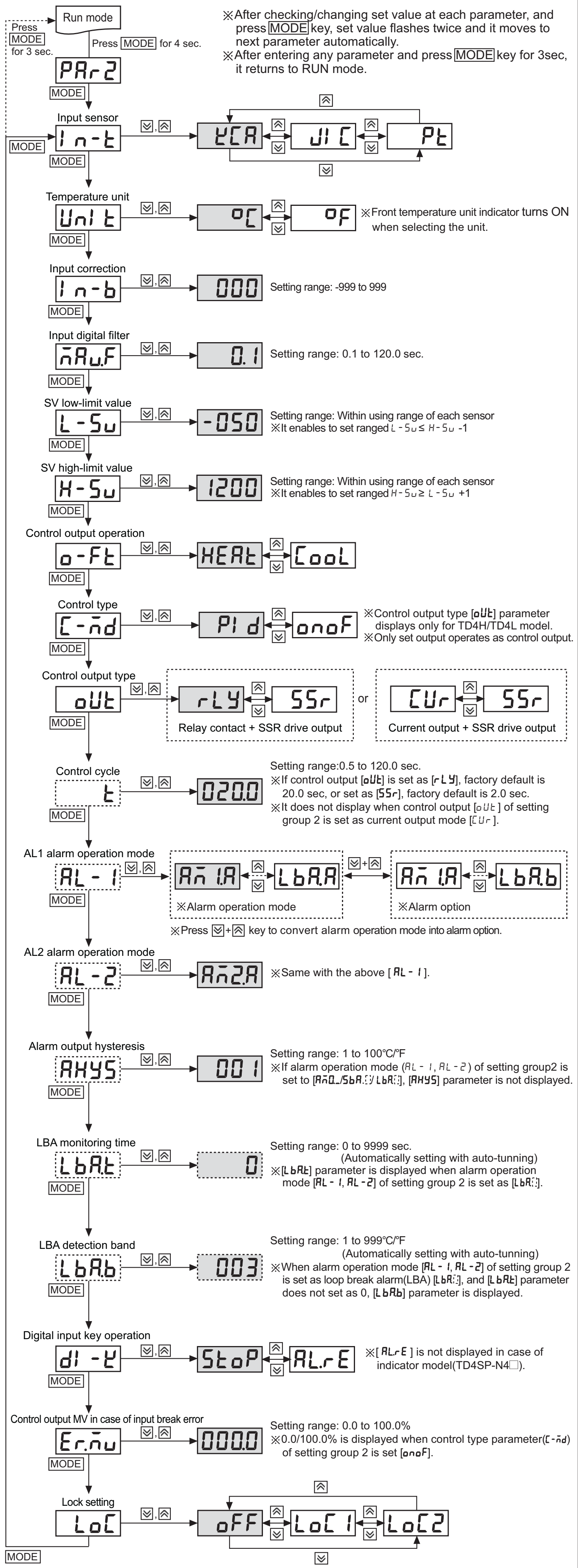
■ Flow chart for first setting group

※1: It is displayed when control type parameter (C-Md) of setting group 2 is set [PId].
※After checking/changing set value at each parameter, and press MODE key, set value flashes twice and it moves to next parameter automatically.
※After entering any parameter and press MODE key for 3sec, it returns to RUN mode.

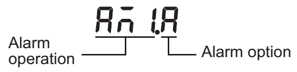


■ Flow chart for second setting group

※After checking/changing set value at each parameter, and press MODE key, set value flashes twice and it moves to next parameter automatically.
※After entering any parameter and press MODE key for 3sec, it returns to RUN mode.



■ Alarm[AL-1/AL-2]



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

●**Alarm operation**

Operation	Name	Alarm operation	Description
AM0._	-	-	No alarm output
AM1.□	Deviation high-limit alarm	OFF H ON, SV 100℃, PV 110℃, Alarm (Deviation) temperature: 10℃ / OFF H ON, PV 90℃, SV 100℃, Alarm (Deviation) temperature: -10℃	If deviation between PV and SV as high-limit is higher than set value of deviation temperature, the alarm output will be ON.
AM2.□	Deviation low-limit alarm	ON H OFF, PV 100℃, SV 110℃, Alarm (Deviation) temperature: 10℃ / ON H OFF, SV 90℃, PV 100℃, Alarm (Deviation) temperature: -10℃	If deviation between PV and SV as low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AM3.□	Deviation high/low limit alarm	ON H OFF H ON, PV 90℃, SV 100℃, PV 110℃, Alarm (Deviation) temperature: 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be ON.
AM4.□	Deviation high/low-limit reverse alarm	OFF H ON H OFF, PV 90℃, SV 100℃, PV 110℃, Alarm (Deviation) temperature: 10℃	If deviation between PV and SV as high/low-limit is higher than set value of deviation temperature, the alarm output will be OFF.
AM5.□	Absolute value high limit alarm	OFF H ON, PV 90℃, SV 100℃, Alarm temperature (Absolute): 90℃ / OFF H ON, SV 100℃, PV 110℃, Alarm temperature (Absolute): 110℃	If PV is equal to or higher than the absolute value of alarm temperature, the output will be ON.
AM6.□	Absolute value low limit alarm	ON H OFF, PV 90℃, SV 100℃, Alarm temperature (Absolute): 90℃ / ON H OFF, SV 100℃, PV 110℃, Alarm temperature (Absolute): 110℃	If PV is equal to or lower than the absolute value of alarm temperature, 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]
It displays alarm output ON and OFF interval and hysteresis is applied to both AL1 OUT and AL2 OUT.

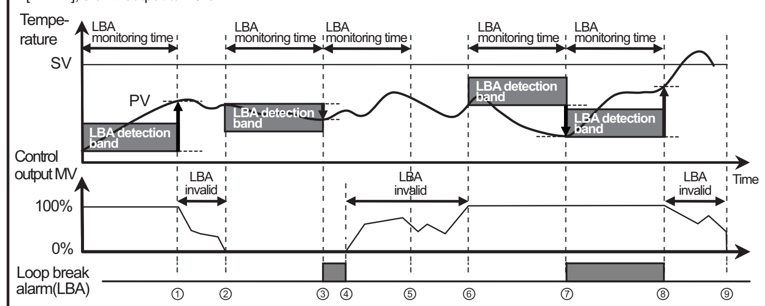
●**Alarm option**

Option	Name	Description
AM□.A	Standard alarm	If it is an alarm condition, alarm output is ON. If it is a clear alarm condition, alarm output is OFF.
AM□.b	Alarm latch	If it is an alarm condition, alarm output is ON and maintains ON status. (Alarm output HOLD)
AM□.C	Standby sequence 1	First alarm condition is ignored and from second alarm condition, standard alarm operates.
AM□.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.
AM□.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.
AM□.F	Alarm latch and standby sequence 2	Basic operation is same as alarm latch and standby sequence1. It operates not only by power ON/OFF, but also alarm setting value, or alarm option changing. When re-applied standby sequence and if it is alarm condition, alarm output does not turn ON. After clearing alarm condition, alarm latch operates.

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

●**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 [SbA.A] or alarm latch [SbA.b].

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



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

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

■ Input correction[In-b]

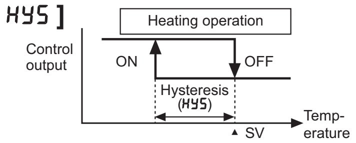
Controller itself does not have errors but there may be error by external input temperature sensor. This function is for correcting this error.
Ex) If actual temperature is 80℃ but controller displays 78℃, set input correction value [In-b] as '002' and controller displays 80℃.
※As the result of input correction, if current temperature value (PV) is over each temperature range of input sensor, it displays 'HHHH' or 'LLLL'.

■ Digital filter[MAvF]

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.

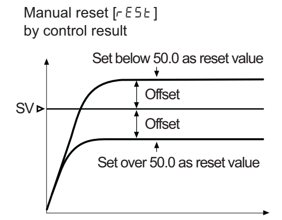
■ ON/OFF control hysteresis[HYS]

In case of ON/OFF control, set between ON and OFF intervals as hysteresis.
If hysteresis is too small, it may cause control output hunting (takeoff, chattering) by external noise, etc.



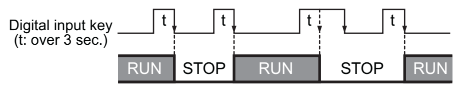
■ Manual reset[rESt]

When selecting P/PD control mode, certain temperature difference exists even after PV reaches stable status because heater's rising and falling time in 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%.



■ Digital input key(▽+△ 3sec.) function[dI-K]

●**RUN/STOP function[StoP]**



●**Clear alarm output function[ALrE]**
It is available to clear alarm output by force. (It is only when alarm option is alarm latch, standby sequence.)
Clear alarm is able to only for out of alarm operation range. Alarm operates normally right after clear alarm.

■ Control output MV for open error[Er.Mv]

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 mode.

■ Lock setting[LoC]

A function to prevent changing SV and parameters of each setting group.
Parameter setting values are still possible to check while Lock mode is ON.

Display	Description
oFF	Lock off
LoC1	Lock setting group 2
LoC2	Lock setting group 1, 2
LoC3	Lock setting group 1, 2, SV setting group

※[oFF], [LoC1] are available only for indicator(TD4SP-N4□).

■ Error

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

Display	Description
ErSv	Set value error (out of setting range)
oPEn	If input sensor is disconnected or sensor is not connected.
HHHH	If measured sensor input is higher than temperature range.
LLLL	If measured sensor input is lower than temperature range.

As soon as error causing factors get solved, error mark will be disappeared and returning to normal operation mode.

■ Caution for using

1. Please install power switch or circuit-breaker in order to cut power supply off.
2. Install power switch or circuit-breaker to supply or cut off the power.
3. Switch or circuit-breaker should be installed near by users for convenient control.
4. Do not use this product as Volt-meter or Ampere-meter, this is a temperature controller.
5. In case of using RTD sensor, 3 wire type must be used. If you need to extend the line, 3 wires must be used with the same thickness as the line. It might cause the deviation of temperature if the resistance of line is different.
6. In case of making power line and input signal line closely, line filter for noise protection should be installed at power line and input signal line should be shielded.
7. Keep away from the high frequency instruments.(High frequency welding machine & sewing machine, large capacity SCR controller)
8. Installation environment
①It shall be used indoor. ②Altitude Max. 2000m.
③Pollution Degree 2. ④Installation CategoryII.
※It may cause malfunction if above instructions are not followed.

■ Major products

- ■ Proximity sensors
- ■ Area sensors
- ■ Door/Door side sensors
- ■ Counters
- ■ Rotary encoders
- ■ Power controllers
- ■ Panel meters
- ■ Temperature controllers
- ■ Switching power supplies
- ■ Temperature/Humidity transducers
- ■ Tachometer/Pulse(Rate) meters
- ■ Stepping motors/drivers/motion controllers
- ■ Laser marking system(CO₂, Nd:YAG)
- ■ Laser welding/soldering system
- ■ Photoelectric sensors
- ■ Fiber optic sensors
- ■ Pressure sensors
- ■ Timers
- ■ Display units
- ■ Sensor controllers
- ■ Graphic/Logic panels
- ■ Field network devices

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