### TTM-04SPSeries Plug-in Digital Temperature Controller Operation Manual Second Edition: July 2008

\*Thank you for purchasing our TTM-04SP Series. Please thoroughly read this manual.

\*For detailed specifications and usage, consult your dealer or our sales.

#### Cautions

For safety purpose, following symbols are used in this manual.

The case that a user may receive fatal damage, electric shock, or severe burn injury when the product is incorrectly used.

? Caution

Wiring: Do not use empty terminals for irrelevant purposes. Operation: Do not use a sharp-pointed tool for operating keys.

**!** Warning

\*Verify correct wiring before turning on electricity since incorrect wiring may cause an equipment failure \*Modification of this equipment may cause malfunctioning or a fire.

Do not add modification on this equipment. · Hand over this operation manual to a person who actually operates the product.

 Do not reprint or duplicate this manual without permission. · Content of this manual may be subject to modification without prior notice.

#### Verification of the product

1) Verification of the model

Refer the model name printed in the packing box to the order sheet.

2) Verification of accessories:

Mounting devices (See the section, How to Mount the Panel.) Operation manual (this document) --- 1 copy 3) Model table:

 $TTM-04SP-\Box-AB$ Symbol Output 1 R Relay contact

P Voltage to drive SSR Model Thermocouple (K, J, R, T, N, S, B) Resistance temperature Detector (Pt100,JPt100) Dimension 48 × 48 mm

Symbol Standard specifications Event output 1 relay contact output B | Event output 2 relay contact output × Event output2 can be used as control output2. When control output1 is the heating control, control output2 is fixed as the cooling control

and When control output1 is the cooling control

control output2 is fixed as the heating control.

### **Specifications**

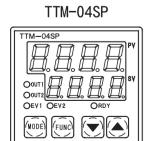
Power supply voltage	100 to 240VAC, 50/60Hz		
Power consumption	10 VA or less		
Memory element	EEPROM		
Input	Thermocouple/resistance-temperature detector(switchable in the parameter setting from front key)		
Control output	Relay contact/voltage to drive SSR		
Control method	Two types of PID, ON/OFF		
Range of use temperature and humidity 0 to 50 °C, 20 to 90%RH (dew condensation not allowed)  Range of storage temperature and humidity -25 to 70 °C, 5 to 95%RH (freezing and dew condensation not allowed)  Weight 200g or less			
		Installation environment	· Absence of corrosive gas, dust, oil, etc.
			· As far away as possible from electric noises and little effect from magnetic field
	· As little influence as possible from mechanical vibrations or impacts		
	·No reception of direct sunlight		
Installation	Installation category II		

#### **Before Performing Control**

- · This product employs nonvolatile memory; Setting is saved even after power-off.
- This product allows switchover of input types.
- For use, match the input type selection with the product input setting.
- · This product allows PID control (time proportional control) and ON/OFF control.
- Characteristics of each control are as follows.
- Make selection based on understanding of such characteristics. \*In self-tuning, PID constant is automatically determined and written in when control starts or SV changes.

	PID control	ON/OFF control
Advantage	Better result is obtained than those from ON/OFF control.	Longer life of relay contact is typically expected due to turn-on at lower temperature than setting and turn-off at higher (case of heating control).
Drawback	Shorter life of relay contact is resulted due to frequent turn-on and -off of output.	Quality of control value is lower than that of PID control.

#### PARTS INDICATION



PV	Process value, charactor for setting mode display.
SV	Settiug value, input value for setting mode display.
OUT1	Lights ON when output 1 turn ON
OUT2	Lights ON when output 2 turn ON
EV1	Lights ON when Event output 1 turn ON
EV2	Lights ON when Event output 2 turn ON
RDY	Lights ON under Ready
MODE KEY	For change of display
FUNC KEY	For action of function setting
<b>▲▼</b> KEY	Up down key for change of setting value. Holding the up down keys are the value at a rapid rate.



< SET 2: Control set >

. Control content setting screen

call-out screen

SEL Control setting mode

10. SV limiter upper limit setting screen

\_ 5L H PV Setting value upper limit setting screen

1200 5V (Within the setting range listed in Table 1)

MODE kev

MODE key

11. SV limiter lower limit setting screen

Setting value lower limit setting screen

☐ 5V (Within the setting range listed in Table 1)

ПыРV To be used to set

MODE key

12. Control mode setting

ี่ เปก 5V control mode.

SV 「リュ Control execution Control stop (operating amount limiter lower in Manual control

MODE key

2 : ON/OFF

↓ MODE key

√MODE key

MODE key

14. Forward/reverse operation switchover screen

Control output operation can be

5v 0: Reverse operation (heating)

15. Output 1 control amount (%

Displays the present operating amount of output 1. Also sets the operating amount during manual control.

Display range: 0.0 to 100.0%

Setting range:operating amount limit lower limit to upper limit

 $\square$  **5V** switched between the following.

1 : Forward operation (cooling)

Ent PV Control method can be selected from the

113 5v following or switched over thereamong.

: No control requir

1 : PID 2 : ON/OFF

3 : Event output

13. Control type selection screen

PID selection (See explanation 3.) Output 1 control selection

Setting mode

< SET 1: initial set >

5EL Initial setting mode

□□ 5v (See Table 1.)

3. PV compensation gain setting screen

4. PV compensation zero setting screen

 $P_{U}$  In case of deviation in measurements.

☐ 5V set a compensation value (addition).

↓ MODE key

MODE key

MODE key

Nonexistent

DD Existent

MODE key

7. FUNC key setting screen (See explanation 2.)

No setting

MODE key

8. Key lock setting screen

Lock OFF

**LDC** PV Keylock setting to prevent improper operation

□ 5V can be selected from the following.

FUPV The FUNC key function can be

 $\square$  **5** $\nu$  selected from the following.

Dedicated for timer

Dedicated for digit shift

Dedicated for RUN/READY

Dedicated for auto-tuning

Lock all (no setting possible)

Lock of operating mode

☐ PV Adjustment of differential time

□ **5V** 0 to 3600 (sec)

22. Output 1 proportional frequency setting screen

\_ \_ \_ \_ PV Adjustment of proportional

☐ 20 5V frequency time 1 to 120 (sec)

23. ARW setting screen (See explanation 4.)

\_ 月 アピ PV Adjustment of ARW(%)

100.0 5v 0.0 to 100.0 (%) (-10.0 to 110.0 (%))

MODE key To item 24

MODE key

MODE key

\*PID constant is not displayed when self-tuning is selected.

5. Input filter setting screen

Par PV (Rifler effect is actualized on software through primary delay calculation on measurement value (PV).

6. Decimal point position setting screen

Thermocouple/resistance temperature detector model

\_ アュロ PV In case of deviation in measurements, set a compensation value(multiplication).

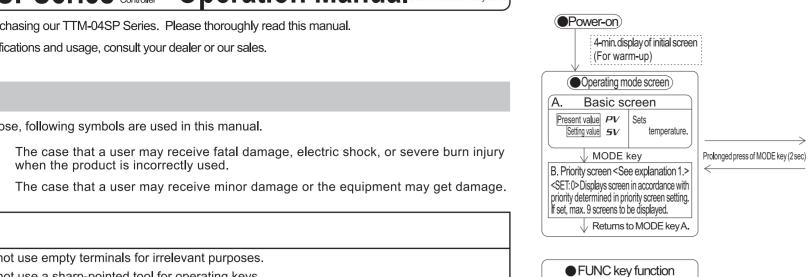
call-out screen

2. Input type setting screen \*The selection to

Selects input type. by pressing the MODE key.

1. Initial setting screen

MODE key



Executes operation selected

in the setting mode 7.

<See explanation 2.>

Explanation 1. Priority screen/priority screen setting Each of all screens in the setting mode can be assigned by using this function to the operating mode with a higher priority depending on customer requirement Select a target screen in the priority screen setting. Example: Switches display at each pressing of MODE key, i.e., [Basic screen]—[Output 1 operating amount display]—[Event output 1 upper limit setting].

[	Explanation 2. FUNC key function
	Assigns the FUNC key in the setting mode as a dedicated key for the following operation.  1: Dedicated key for digit shift
	Shifts a setting digit during setting value change.  2: Dedicated key for RUN/READY Switches the FUNC key function each time when pressing it
	control stop (READY) ← control execution (RUN). (READY lamp lights up during control stop.)  3. Dedicated key for auto-tuning
	Starts auto-tuning when pressing the FUNC key.  (Switches the FUNC key function between start and reset each time when pressing it.)
	Dedicated key for the timer     To use the FUNC key to start/reset the timer.

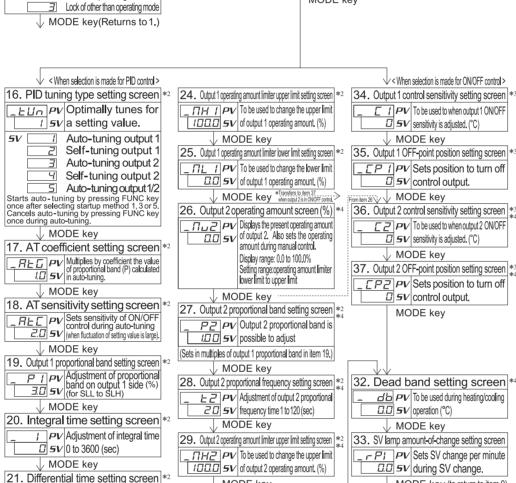
Explanation 3. PID selection Characteristics of types A and B Type A Basic PID Type B PID to suppress overshoot

> Explanation 4. ARW function ARW (Anti-reset windup) is effective for a control target with which overshoot due to excessive integration of PID control operation is to be controlled. Smaller the value, higher the effect; note, however, 0 value cancels the integration operation.

Table 1. Input selection table/setting range Unit of °C							
Symbol* *		Lower limit to upper limit	At 0.0 setting				
00	K thermocouple	-200 to 1372	-199.9 to 990.0				
01	J thermocouple	-200 to 850	-199.9 to 850.0				
02	Rthermocouple	- 0 to 1700	_				
03	T thermocouple	-200  to  400	- 199.9 to 400.0				
04	N thermocouple	- 200 to 1300	-199.9 to 990.0				
05	S thermocouple	— 0 to 1700	_				
06	B thermocouple	- 0 to 1800	_				
10	Pt100	- 199 to 500	-199.9 to 500.0				
11	JPt100	- 199 to 500	- 199.9 to 500.0				

Other functions Timer mode Blind mode

Loader communication



■ Mounting

MODE key 37. Output 2 OFF-point position setting screen \*3 \_ EP2 PV Sets position to turn off □ 5V control output. MODE key 28. Output 2 proportional frequency setting screen | \*2 | 32. Dead band setting screen | \* PV Adjustment of output 2 proportional PV To be used during heating/cooling 29. Output 2 operating amount limiter upper limit setting screen  $|*|_{*4}^{*2}$  | 33. SV lamp amount-of-change setting screen FPI PV Sets SV change per minute □□□ **5V** during SV change. MODE key MODE key (to return to item 9) 30. Output 2 operating amount limiter lower limit setting screen **アレ** To be used to change the lower limit \* 2 Not displayed in ON/OFF control. □□ 5V of output 2 operating amount. (%) In the case of Manual reset, OUT1 is not displayed MODE key in ON/OFF control. 3 Not displayed in PID control. 1. Manual reset setting screen \* \* 4 When output2 in selection of control type setting is set Change the setting value either 0 or 3, it will not be shown. 7.0 5V when displacing proportional band. MODE key

 $\overline{\beta}$  **5V** for event output among items below. 5V 2: MODBUS (ASCII) □□ 5V for event output among items below. PV event function PV event function Timer unused 56. Communication parameter setting screen Event output / MODE key 63. Timer function setting screen range 5 : Absolute value upper/lower limit Stop bit length function range i : Absolute value upper/lower limit 1-bit 2-bit Parity check function Auto-start (ON delay) Additional functions Additional functions n N/A Manual start (ON delay) Event start (ON delay) Odd number 1 : Hold (power supply reset) : Hold (power supply reset) E Even number 2 : With standby sequence 3 : Hold + standby sequence 2 : With standby sequence 3 : Hold + standby sequence Auto start (OFF delay) Manual start (OFF delay) Data Iso. 7-Di. 8-bit Event start (OFF delay) MODE key MODE key SV start (OFF delay) 40. EV 1 upper limit setting screen \*5 V 2 upper limit setting screen \*9 MODE key BCC check function 1H PV Displayed when selecting upper E 2 H PV Displayed when selecting upper \* Timer unit switchover screen  $\Box$  **5** $\nu$  limit. Input setting value. [7] 51/ limit. Input setting value. Existent 41. EV 1 lower limit setting screen \*5 MODE key 49. EV 2 lower limit setting screen \*9\*10 Hour/minute \_ E 2 L PV Displayed when selecting lower \*12 57. Communication speed setting screen E 1L PV Displayed when selecting lower 5V limit. Input setting value. Minute/second ☐ 5V limit. Input setting value. MODE kev MODE key 65. Timer SV start permission width setting screen \*1 42. EV 1 sensitivity setting screen 50. EV 2 sensitivity setting screen \*9 5V 2400 bps E I PV Sets when sensitivity setting is EZE PV Sets when sensitivity setting is detector input model
Setting range: 0 to 999 or 0.0 to 999.9 4800 bps ☐ 5V required for EV 1. (°C) ☐ 5V required for EV 2. (°C) 9600 bps MODE key MODE key rent/voltage input mode 19200 bps 43. EV 1 delay timer setting screen Setting range: 0 to 9999, 2 delay timer setting screen \*1 MODE key E IE PV Sets when delay timer setting E2E PV Sets when delay timer setting Communication address setting screen 5V is required for EV 1. (sec) MODE key ☐ 5V is required for EV 2. (sec) RローPV Setting range: 1 to 99 stations Timer time setting screen MODE key MODE key 44 EV 1 abnormal function setting screen Setting range: 0:00 to 99:59: Hour/minute or 2 abnormal function setting screen □.□□ 5v 0:00 to 59:59: Minute/second E 16 PV Sets when occurrence of abnormalities PV Sets when occurrence of abnormalities Response delay time setting screen  $\square\square$  **5V** in the table below is used for EV 1.  $\overline{\mathcal{I}}$  **5V** in the table below is used for EV 2. MODE key RHH PV Setting range: 0 to 250 ms Timer remaining time monitor setting screen Type Type Monitor for remaining time Timer starts when pressing FUNC key once on this screen.  $\downarrow$  MODE key : PV abnormality (such as sensor disconnection 1 : PV abnormality (such as sensor disconnection) 3O. Communication mode switchover setting screen Operation Operation MODE key (to return to item 61  $\bigcap_{a\in A} PV$ 0 : Only at occurrence, or N/A 0 : Only at occurrence, or N/A \*14 Not displayed when "timer unused" 1 : Hold (power supply reset) 1 : Hold (power supply reset) Communication R possible \*15 Not displayed when "SV start" is selected. ¬ H Communication RW possible MODE key MODE key MODE key (to return to item 54) / 1 polarity setting screen 53. EV 2 polarity setting screer PV Sets "open" or "close" of contact Sets "open" or "close" of contact  $\Box | \mathbf{5} \mathbf{v} |$  during event output ON. **5 v** during event output ON. Normal open Normal open Normal close Normal close MODE key(to return to item 38) MODE key(to return to item 46) \*9 Not displayed when event 2 is not assigned \*5 Not displayed when measurement (PV) event output 1 function is not used. Not displayed when measurement (PV) event output \*10 Not displayed when measurement (PV) event output function is not used for upper limit alarm. 2 function is not used. Not displayed when measurement (PV) event output 1 function is not used for lower limit alarm 2 function is not used for upper limit alarm. 1 function/special event output is not used. 2 function is not used for lower limit alarm. \*13 Not displayed when measurement (PV) event output 2 function/special event output is not used. Transfer to blind setting mode 1. Power on Initial screen display (for 4 sec) 2. Operating mode screen 3. Pressing MODE key-SEL for 10 sec ±1 - In blind mode, "Pu5u" is displayed in below of each character (in SV display section). "Pu 5u " displays PV/SV. (Blinking display 4. Pressing FUNC key "Pu" Blinds SV side. Pressing MODE key "5" " Blinds PV side.

< SET 7: Timer set >

MODE kev

< SET 6: Communication set >

SEL EV 2 setting mode SEL Communication setting call-out screen Communication setting mode call-out screen Call-out screen

< SET 3: Event output 1 set > < SET 4: Event output 2 set >

ca**ll-**out screen

47. EV 2 function setting screen \*9 55. Communication protocol setting screen

MODE key

F P P Selects and switches standard functions

38. EV 1 setting screen

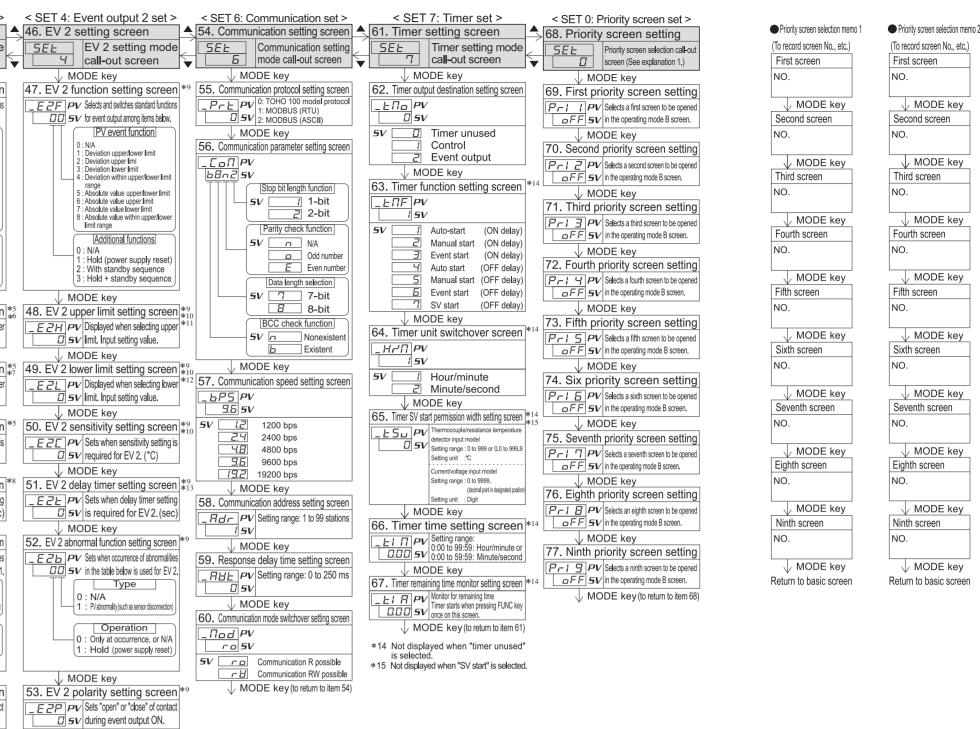
MODE key

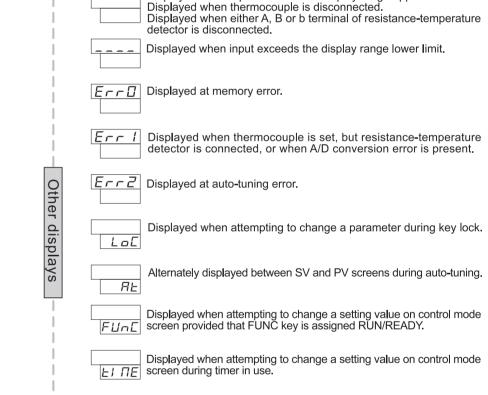
39. EV 1 function setting screen

\_ E !F PV Selects and switches standard functions

5EL EV 1 setting mode

∃ call-out screen 😈

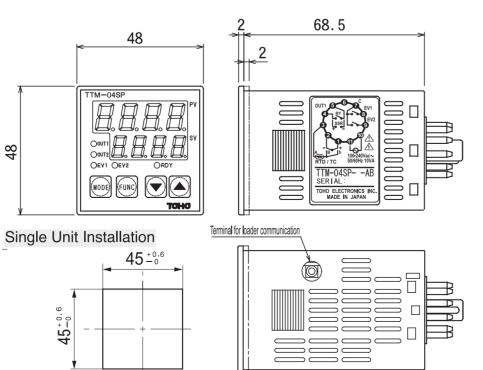




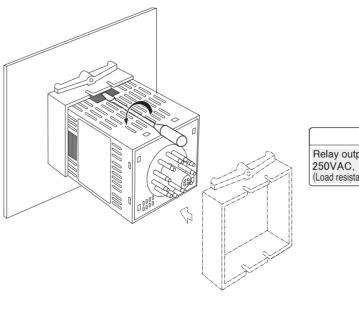
——— Displayed when input exceeds the display range upper limit.

#### **INSTALLATION AND WIRING**

# **Outer Dimensions and Panel Cutout**



Wiring



For removal.insert a flathead screwdriver in between body and attachment pawl,

land rotate the screwdriver to float the pawl.

Relay output SSR drive voltage -- 5 250VAC, 3A 12V DC output INPUT 3 A 3 2 B

5. Pressing MODE key

6. To display "1" to "7" using △▽ key.

(Some items may not be displayed depending on model.)

SEL7 \*2

① b RTD

5EŁ 1 ★2

To prevent an electric shock, do not touch terminals while energized.

★2 - In blind mode, "an" "aFF" is displayed

- To change each character in blind mode,

press FUNC key (same as normal mode).

EV1 Relay output

EV2

Relay output

250VAC, 1A (Load resistance)

(NO POLARITY)

XEvent output2 can be used

POWER ON

100 to 240VAC 50/60Hz 10VA

AC100~240V 50/60Hz 10VA

as control output2.

250VAC, 1A (Load resistance

Unit: mm

- To end of blind mode, turn off the power.

" an " displays.

" oFF " blinds.

in below of each character (in SV display section).

For prevention of electric shock, please do wiring connection only after turning power off and don't touch the terminal part under power on.

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