和文の説明は裏面にあります。

TTM-000 SERIES USER'S MANUAL
DIN.DIGITAL TEMPERATURE CONTROLLER

Thank you for purchasing model **TTM-000 SERIES** Digital Temperature Controller.
Please go through this Instruction Manual carefully and use the unit in proper manner.

NOTICE/WARNING BEFORE OPERATION USE

- When having the purchased controller at hand, please be sure that its unit is a correct model (See the following "Model Configuration") .
- The following symbol marks ⚠ provide to prevent incident or damage. Kindly refer to the details of the WARNING/CAUTION when using for the first time.
- Another copy of the user's manual "Advanced Version" is provided at customer's request.

⚠ **WARNING**	Due to mishandling, serious dangers may occur to the operator such as death, electrocution and a skin burn.
⚠ **CAUTION**	Owing to mishandling, it may cause some damage to the unit or the operator getting slight injury.

⚠ CAUTION

- For prevention of its malfunction, do not push the front key with sharp points.
- Spare terminal must not be used for other purposes.

⚠ WARNING

- Make sure the correct wiring connection before turning on electricity. Mis-wiring may cause malfunction of the unit and fire.
- Never modify the unit to prevent damage or incident such as malfunction and fire etc.

・Please put this user's manual aside for your reference, when operating the unit.
・Copy or reprint of this manual, wholly or partially, is not allowed.
・The contents of this manual may change without notice in future.

INSTALLATION CONDITIONS

・Indoor use
・Altitude up to 2000m
・Pollution Degree 2

ACCESSORY & CONFIGURATION

1) Please be sure that the unit enclosed in packing carton is a right model before using.
2) Kindly check the following accessory being contained in that carton box.
   - Installation Attachment (For installation, please see "INSTALLATION AND WIRING" on the back.)
   - This user's manual : 1 copy
3) Model Configuration

TTM-□□□-□-□-A□□□

MODEL	Front Dimensions
002	24×48 mm
004	48×48 mm
005	96×48 mm
006	48×96 mm
007	72×72 mm
009	96×96 mm

CODE	Grade
	Normal Grade (Sampling time: 500mS)
S	"S" Grade (Sampling time: 250mS & Ramp function) Not available in TTM-002

CODE	Input Type
	Thermocouple (K, J, R, T, N, S, B) R.T.D. (Pt100, JPt100)
2	0–5V, 1–5V, 4–20mA

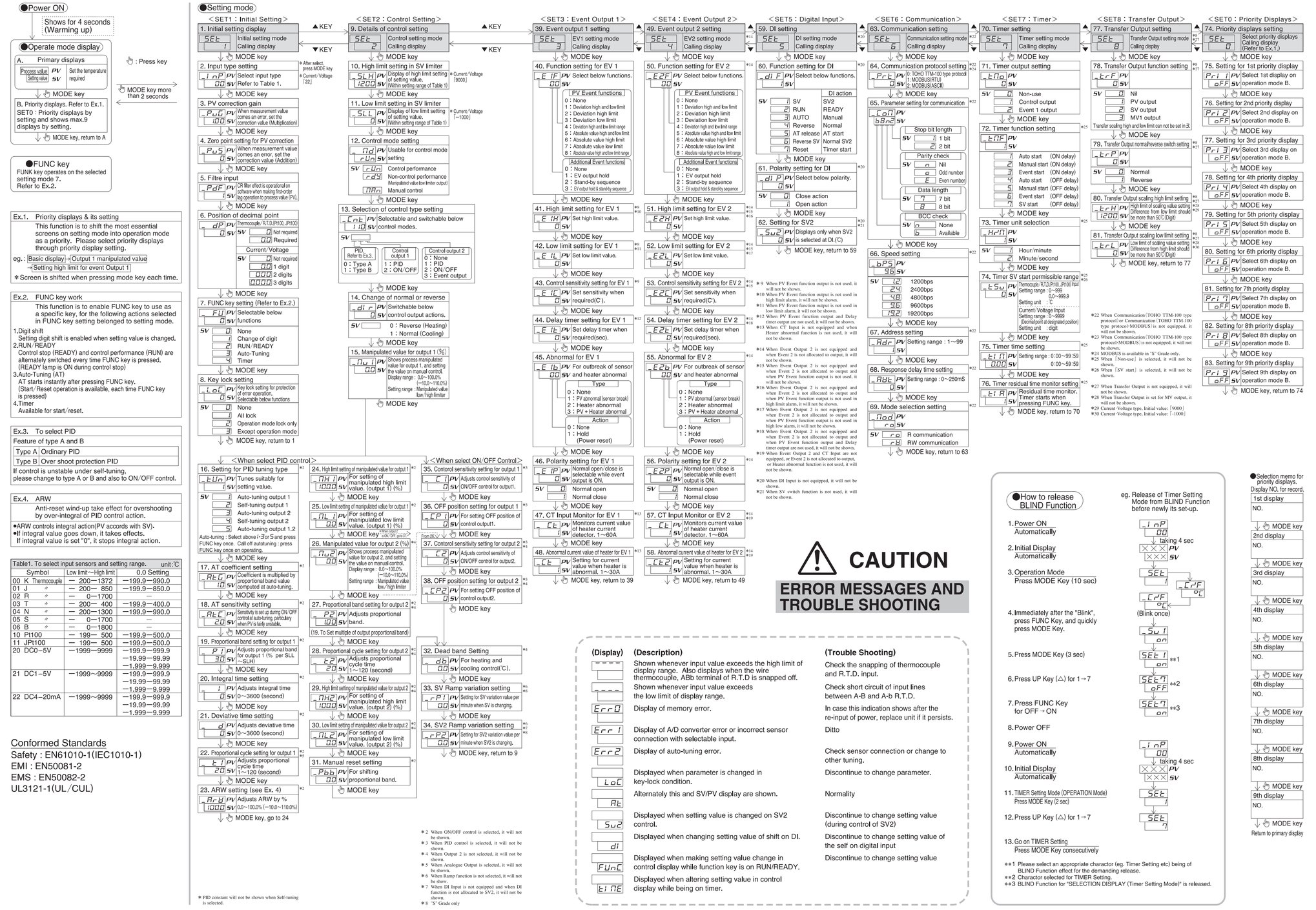
CODE	Output 1
R	Relay contact
P	SSR drive voltage
I	Current 4–20 mA DC

CODE	Option		
B	Output 2 Relay contact		B or P selectable
P	Output 2 SSR drive voltage		
R	EV 2 Relay contact	Not optional for TTM-002/004. When DI is selected for TTM-005, 006, 007 or 009, this option is not available.	
D	CT input	When DI is selected for TTM-002/004, this option is not usable. When **I** output (4–20mA) is selected, this option is not provided.	
E	DI (Digital input)	When CT is selected for TTM-002/004, this option cannot be obtained. When EV 2 is selected for TTM-005, 006, 007 or 009, this option cannot be chosen.	
M	Communication	RS-485 (TOHO TTM-100 type protocol) Available when Normal Grade is selected.	
X		RS-485 (TOHO TTM-100 type protocol·MODBUS) Available when "S" Grade is selected.	
H	Transfer Output	0-10mVDC	Only one can be selected from H, K, J, F, G, I.
K		0-1VDC	
J		0-5VDC	Not selectable when Normal Grade is selected.
F		1-5VDC	
G		0-10VDC	Not available in TTM-004S /X04S/007S.
I		4-20mADC	

1) A (EV1) provided in the standard specifications.
2) Without output 2, EV2 is not available. Output 2 is equally used as EV2, but both not activated simultaneously.
3) Transfer Output (H, K, J, F, G, I) , TOHO TTM-100 type protocol·MODBUS (X) can be selected in "S" Grade only.
4) Option of "M" & "X" can not be selected at the same time.
5) Ramp function can be used when "S" Grade is selected.

OPERATION FLOW AND SETTING MENU

There are menus not displayed by the selected options and models.



Ex.1. Priority displays & its setting
This function is to shift the most essential screens on setting mode into operation mode as a priority. Please select priority displays through priority display setting.
eg. : Basic display → Output 1 manipulated value → Setting high limit for event Output 1
∗Screen is shifted when pressing mode key each time.

Ex.2. FUNC key work
This function is to enable FUNC key to use as a specific key, for the following actions selected in FUNC key setting belonged to setting mode.
1.Digit shift
Setting digit shift is enabled when setting value is changed.
2.RUN/READY
Control stop (READY) and control performance (RUN) are alternately switched every time FUNC key is pressed. (READY lamp is ON during control stop)
3.Auto-Tuning (AT)
AT starts instantly after pressing FUNC key.
(Start/Reset operation is available, each time FUNC key is pressed)
4.Timer
Available for start/reset.

Ex.3. To select PID

Feature of type A and B	
Type A	Ordinary PID
Type B	Over shoot protection PID

If control is unstable under self-tuning, please change to type A or B and also to ON/OFF control.

Ex.4. ARW
Anti-reset wind-up take effect for overshooting by over-intergal of PID control action.
●ARW controls integral action(PV accords with SV).
●If integral value goes down, it takes effects.
If integral value is set "0", it stops integral action.

Table1. To select input sensors and setting range. unit : °C

Symbol		Low limit~High limit	0.0 Setting
00	K Thermocouple	−200~1372	−199.9~990.0
01	J 〃	−200~850	−199.9~850.0
02	R 〃	0~1700	—
03	T 〃	−200~400	−199.9~400.0
04	N 〃	−200~1300	−199.9~990.0
05	S 〃	0~1700	—
06	B 〃	0~1800	—
10	Pt100	−199~500	−199.9~500.0
11	JPt100	−199~500	−199.9~500.0
20	DC0~5V	−1999~9999	−199.9~999.9 −199.99~99.99 −1.999~9.999
21	DC1~5V	−1999~9999	−199.9~999.9 −199.99~99.99 −1.999~9.999
22	DC4~20mA	−1999~9999	−199.9~999.9 −199.99~99.99 −1.999~9.999

Conformed Standards
Safety : EN61010-1(IEC1010-1)
EMI : EN50081-2
EMS : EN50082-2
UL3121-1(UL/CUL)

∗ PID constant will not be shown when Self-tuning is selected.

∗2 When ON/OFF control is selected, it will not be shown.
∗3 When PID control is selected, it will not be shown.
∗4 When Output 2 is not selected, it will not be shown.
∗5 When Analogue Output is selected, it will not be shown.
∗6 When Ramp function is not selected, it will not be shown.
∗7 When DI Input is not equipped and when DI function is not allocated to SV2, it will not be shown.
∗8 "S" Grade only

∗9 When PV Event function output is not used, it will not be shown.
∗10 When PV Event function output is not used in high limit alarm, it will not be shown.
∗11 When PV Event function output is not used in low limit alarm, it will not be shown.
∗12 When PV Event function output and Delay timer output are not used, it will not be shown.
∗13 When CT Input is not equipped and when Heater abnormal function is not used, it will not be shown.
∗14 When Event Output 2 is not equipped and when Event 2 is not allocated to output, it will not be shown.
∗15 When Event Output 2 is not equipped and when Event 2 is not allocated to output and when PV Event function output is not used, it will not be shown.
∗16 When Event Output 2 is not equipped and when Event 2 is not allocated to output and when PV Event function output is not used in high limit alarm, it will not be shown.
∗17 When Event Output 2 is not equipped and when Event 2 is not allocated to output and when PV Event function output is not used in low limit alarm, it will not be shown.
∗18 When Event Output 2 is not equipped and when Event 2 is not allocated to output and when PV Event function output and Delay timer output are not used, it will not be shown.
∗19 When Event Output 2 and CT Input are not equipped, or Event 2 is not allocated to output, or Heater abnormal function is not used, it will not be shown.
∗20 When DI Input is not equipped, it will not be shown.
∗21 When SV switch function is not used, it will not be shown.

∗22 When Communication (TOHO TTM-100 type protocol) or Communication (TOHO TTM-100 type protocol·MODBUS) is not equipped, it will not be shown.
∗23 When Communication (TOHO TTM-100 type protocol·MODBUS) is not equipped, it will not be shown.
∗24 MODBUS is available in "S" Grade only.
∗25 When 「Non-use」 is selected, it will not be shown.
∗26 When 「SV start」 is selected, it will not be shown.
∗27 When Transfer Output is not equipped, it will not be shown.
∗28 When Transfer Output is set for MV output, it will not be shown.
∗29 Current·Voltage type, Initial value: 「9000」
∗30 Current·Voltage type, Initial value: 「−1000」

●Selection memo for priority displays.
Display NO. for record.
1st display NO.
2nd display NO.
3rd display NO.
4th display NO.
5th display NO.
6th display NO.
7th display NO.
8th display NO.
9th display NO.
Return to primary display

●How to release BLIND Function

1. Power ON Automatically
2. Initial Display Automatically
3. Operation Mode Press MODE Key (10 sec)
4. Immediately after the "Blink", press FUNC Key, and quickly press MODE Key.
5. Press MODE Key (3 sec) ∗∗1
6. Press UP Key (△) for 1→7 ∗∗2
7. Press FUNC Key for OFF→ON ∗∗3
8. Power OFF
9. Power ON Automatically
10. Initial Display Automatically
11. TIMER Setting Mode (OPERATION Mode) Press MODE Key (2 sec)
12. Press UP Key (△) for 1→7
13. Go on TIMER Setting Press MODE Key consecutively

eg. Release of Timer Setting Mode from BLIND Function before newly its set-up.
(Blink once)

∗∗1 Please select an appropriate charactor (eg. Timer Setting etc) being of BLIND Function effect for the demanding release.
∗∗2 Charactor selected for TIMER Setting.
∗∗3 BLIND Function for "SELECTION DISPLAY (Timer Setting Mode)" is released.

⚠ CAUTION
ERROR MESSAGES AND TROUBLE SHOOTING

(Display)	(Description)	(Trouble Shooting)
-oooo	Shown whenever input value exceeds the high limit of display range. Also displays when the wire thermocouple, ABb terminal of R.T.D is snapped off.	Check the snapping of thermocouple and R.T.D. input.
-ooo	Shown whenever input value exceeds the low limit of display range.	Check short circuit of input lines between A-B and A-b R.T.D.
Err0	Display of memory error.	In case this indication shows after the re-input of power, replace unit if it persists.
Err1	Display of A/D converter error or incorrect sensor connection with selectable input.	Ditto
Err2	Display of auto-tuning error.	Check sensor connection or change to other tuning.
LoC	Displayed when parameter is changed in key-lock condition.	Discontinue to change parameter.
At	Alternately this and SV/PV display are shown.	Normality
Su2	Displayed when setting value is changed on SV2 control.	Discontinue to change setting value (during control of SV2)
di	Displayed when changing setting value of shift on DI.	Discontinue to change setting value of the self on digital input
FUnC	Displayed when making setting value change in control display while function key is on RUN/READY.	Discontinue to change setting value
tIME	Displayed when altering setting value in control display while being on timer.	

SPECIFICATIONS

Power Supply Voltage	100 to 240V AC, 50/60Hz
Power Consumption	Below 10 VA
Memory Element	EEPROM
Input of Sensor	Thermocouple, R.T.D./0–5V, 1–5V, 4–20mA (Changeable by front key)
Control Output	Relay contact, SSR drive voltage, Current
Control Method	Two kinds of PID, ON/OFF
Operation Environment	0 to 50℃, 20 to 90%RH (Avoid making dew)
Storage Environment	−25 to 70℃, 5 to 95%RH (Avoid making dew)

Weight	TTM-002/004 Less than 180g, TTM-005/006 Less than 300g, TTM-007 Less than 250g, TTM-009 Less than 380g.
Location of the Unit Setting ⚠ **CAUTION**	Keep away from the followings. ・Gas of corrosion, dust and oily smoke. ・The electric noise of generator. ・The influence of electromagnetic field. ・Mechanical vibration and shock. ・The direct sunlight.
Installation condition	Installation category Ⅱ

CAUTION BEFORE CONTROL

- Setting program is stored after power OFF, as non-volatile memory is equipped with TTM-000 SERIES controllers for setting storage.
- Either thermocouple or R.T.D. (Pt 100/JPt 100) is selectable input type, but Current/Voltage input needs to be selected individually. For suitable application, please select most appropriate input type and adjust input setup.
- PID or ON/OFF control is selective for the optimal performance and each detail of features is specified in the table on the right side.

	PID Control	ON/OFF Control
Merit	Better control result is achieved as opposed to that of ON/OFF control.	Life span of relay is generally longer, as it is ON when temperature is below SV and it is OFF when temperature is over SV (For heating control) .
Demerit	Life span of relay is shorter, as output exists frequently with relay contact .	Control value is worse in comparison with that of PID control.

※ PID constants are automatically reckoned up to write in, when control begins or SV is altered on self-tuning.

※See also "PARTS INDICATION" & "INSTALLATION AND WIRING" on the reverse.

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