TTM-004W

TOHO

DIGITAL TEMPERATURE CONTROLLER

TTM-000W

TTM-004W

OUT1
OUT2
AL1 AL2 COM RDY DI

MODE FUNC ▼ ▲

TOHO

PV
SV

Most Superior Controller with Advanced Multiple Functions!
Low Price, Easy Operation & Selectable Input!!

TTM-002W

TTM-005W
OUT 1 2
AL1 AL2 COM RDY DI
MODE FUNC ▼ ▲

TTM-004W
OUT1
OUT2
AL1 AL2 COM RDY DI
MODE FUNC ▼ ▲
TOHO

TTM-006W
PV
SV
OUT1 AL1
OUT2 AL2
COM RDY DI
MODE FUNC ▼ ▲
TOHO

TTM-007W
PV
SV
OUT1
OUT2
AL1 AL2 COM RDY DI
MODE FUNC ▼ ▲
TOHO

TTM-009W
PV
SV
OUT1 OUT2 AL1 AL2 COM RDY DI
MODE FUNC ▼ ▲
TOHO

| TTM-002W | TTM-004W | TTM-005W | TTM-006W | TTM-007W | TTM-009W |

TOHO ELECTRONICS INC.

DIGITAL TEMPERATURE CONTROLLER

TTM-000W SERIES

Upgraded Digital Temperature Controller with Various Functions, Easy-to-Use & Multiple Inputs

■ FEATURES

● **Self-Tuning PID (Heating / Cooling)**
The most appropriate PID constant is automatically computed for the controlled objects. PID constant is computed by performing the tuning, or when the hunting occurs.

● **Blind Function**
From the various existing parameters, only the required parameters can be indicated or set.

● **Simplified Timer Function**
ON/OFF setting control is available after some certain interval. Function of ON/OFF alarm output is independently usable.

● **Priority Display**
Demanding parameter screens are monitored and set up under operational mode screen. (max. 9 points)

● **Multiple Inputs**
Thermocouple / R.T.D. (Pt100 & JPt100) are selectable by front key.

● **External Standard**
Conforms to "UL", "cUL" and "CE" markings (except TTM-002W) and compliant to "IP66"equivalent.
The 6 substances restricted by the RoHS directives are not used.

● **Compact Size**
Compactly made with the depth of only 77mm (002W is 95mm).

● **Manual Control (Balanceless & Bumpless)**
Manual output function is applicable for versatile applications of instrumentation systems.

● **Sampling Cycle:** 250mS

● **Communication Function (RS-485: TOHO Protocol / MODBUS)**
The communication distance is extended up to 500 m, and max. of 31 units of controllers can be connected to a single computer at a time. Centralized supervision is available for collectiion of the whole data and alterration of setting values at remote location.

● **Digital PV Filter**
A filtering is possible with a software for abrupt alteration of input value.

● **PID with Overshoot Control Function**
A PID control is available to control the overshoot which occurs when the control is just starting.
Further, in order to improve the controllability, PID algorithm of TTM-200 series had been introduced.

● **DI Function**
The following functions are switchable:
① SV / SV2
② RUN / READY
③ AUTO (RUN) / Manual
④ Normal / Reverse Action
⑤ AT (Auto-Tuning) Start
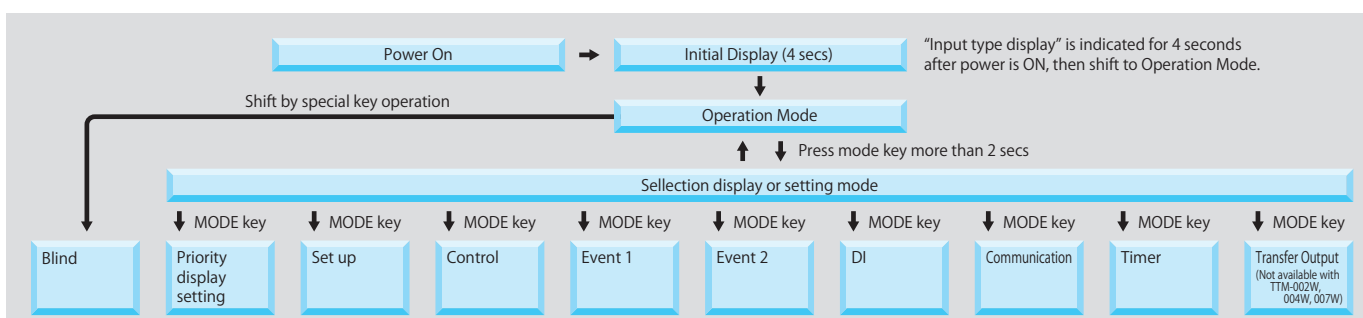⑥ Normal (SV2) / Reverse Action (SV)
⑦ TIMER Start / Reset

● **Others**
① CT Input (w/ Input Monitor)
② Shift setting of OFF position during the ON / OFF control (for both Output 1 & 2).
③ Heating / Cooling Control (w/ PID Control Function on Cooling Side).
④ Ramp Function

■ FRONT PANEL

TTM-004W
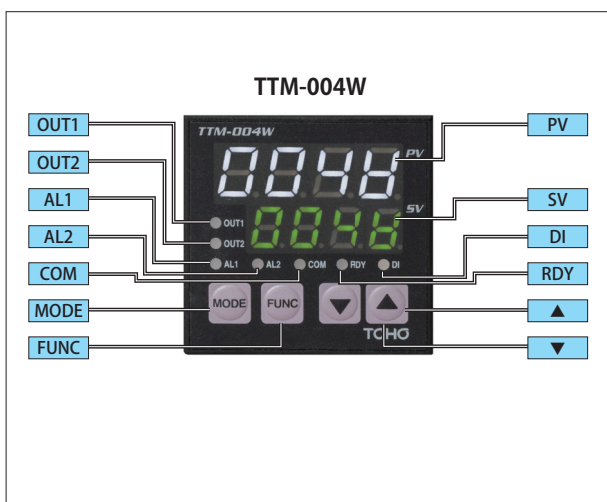
AL1	Output monitor for contact output 1
AL2	Output monitor for contact output 2
OUT1	Output monitor for output 1
OUT2	Output monitor for output 2
RDY	Light up in "READY" condition
COM	Light up when the communication function (option) is working (It blinks during the communication)
MODE	Mode key for shifting display
DI	Light up when DI (option) is functioning
FUNC	This key executes the set functions. ① Digit shifting key (digit being selected will blink) ② AT key ③ RUN / READY key ④ TIMER Start / Reset
PV	Indication of measured value & character display (Alarm, PID, etc.)
SV	Indication of set value, manipulation volume, timer remaining time
▲ ▼	Up / Down key for alteration of the set values - Press continuously for 1 sec. to 10 sec. : 1 digit / 100ms. 10 sec. to 20 sec. : 10 digits / 100ms. over 20 sec. : 100 digits / 100ms.

■ OPERATION FLOW

Power On → Initial Display (4 secs)

"Input type display" is indicated for 4 seconds after power is ON, then shift to Operation Mode.

Shift by special key operation

Operation Mode

↑ ↓ Press mode key more than 2 secs

Sellection display or setting mode

↓ MODE key	↓ MODE key	↓ MODE key	↓ MODE key	↓ MODE key	↓ MODE key	↓ MODE key	↓ MODE key	↓ MODE key
Blind	Priority display setting	Set up	Control	Event 1	Event 2	DI	Communication	Timer	Transfer Output (Not available with TTM-002W, 004W, 007W)

■ STANDARD SPECIFICATIONS

Input Type	Thermocouple	K, J, T, R, N, S, B (Input Resistance: 1M Ω)		Thermocouple / R.T.D. Input, Current / Voltage Input are switchable with the front key.
	R.T.D.	Pt100, JPt100 (provided that the external resistance is below 10 Ω (per wire) and 3 wires have all the same resistance)		
	Current / Voltage	4 - 20mADC (Input Resistance 250 Ω), 0 - 5 VDC / 1 - 5 VDC (Input Resistance above 500k Ω) (Measured Current Appx. 2mA)		
Indication	PV Character	4-digits White 10mm height (7.6mm height for TTM-002W, 14mm height for TTM-006W / 009W)		
	SV Set Value	4-digist Green 8mm height (5.25mm height for TTM-002W)		
	Various Function	LED: Red (AL1, AL2, OUT1, OUT2, RDY), LED: Green (COM, DI), COM for TTM-002W is at 1st decimal digit of display.		
Control Method	PID Auto-Tuning Self-Tuning	Proportional band (P1)	0.1 to 200.0% of the setting limiter span	
		Proportional band (P2) at Output 2 side.	0.10 to 10.00 times (magnification over the proportional band P1)	
		Integral Time (I)	0 to 3600 sec. (Integral Control Action becomes OFF at 0).	
		Derivative Time (D)	0 to 3600 sec. (Derivative Action becomes OFF at 0).	
		Proportional Cycle (T1, T2)	1 to 120 sec.	
		Dead Band (DB)	Temp. Input	-100.0 to +100.0 or -100 to +100(℃)
			Analogue Input	-1000 to 1000 (digit) (Decimal point is at designated place)
	ON / OFF	Control Sensitivity (C1, C2)	Temp. Input	0 to 999 or 0.0 to 999.9(℃)
			Analogue Input	0 to 9999 (digit) (Decimal point is at designated place)
	OFF point of Output 1 & 2	Position Setting	Temp. Input	-199 to 999 or -199.9 to 999.9(℃)
			Analogue Input	-1999 to 9999 (digit) (Decimal point is at designated place)
Control Output	Relay Contact	250VAC, 3A (Resistance Load) 1a contact (On heating / cooling operation, output 2 is 250VAC, 2.4A (Load Resistance) 1a contact)		
	SSR Drive Voltage	0 to 12VDC (Load Resistance: 600 Ω or more)		
	Current	4 to 20mADC (Load Resistance: Below 600 Ω)		
Sampling Time		0.25 sec. (Output change cycle is also the same)		
Setting and Indication Accuracy	Thermocouple	± (0.3% + 1-digit) of input value or ± 2℃, whichever is bigger (Ambient Temp.: 23℃± 10℃) However -99 to 0℃: ± 3℃ -210 to -100℃: ± 4℃ Thermocouple B under 400℃ is not regulated.		
	R.T.D.	± (0.3% + 1-digit) of input value or ± 0.9℃, whichever is bigger (Ambient Temp.: 23℃± 10℃)		
	Current (4-20mA), Voltage (0 - 5VDC, 1 - 5VDC)	± (0.3% + 1-digit) of setting value limiter span (Ambient Temp.: 23℃± 10℃)		
Memory Element		EEPROM		
Input Voltage		100 - 240VAC (-15%, +10%) or 24V AC/DC (± 10%) 50/60Hz ✽ For transfer output models, 24V AC/DC is not selectable.		
Weight		TTM-002W / 004W: below 180gms., TTM-005W / 006W: below 300gms., TTM-007W: below 250gms., TTM-009W: below 380gms.		
Power Consumption		10VA (264VAC), 6VA (24VAC), 4W (24VDC)		
Accessories		Instruction Manual & mounting attachment (TTM-002W, 004W), metal mounting bracket (TTM-005W, 006W, 007W, 009W)		
Suitable Operating Environment		0 to 50℃, 20 to 90% RH (no condensation)		
Suitable Storage Environment		-25℃ to 70℃, 5 to 95% RH (no icing and condensation)		
Functions	Manipulated Variable Limiter (ML1, MH1, ML2, MH2)	0.0 (-10.0) to 100.0 (110.0)% Values indicated in ( ) are for current / voltage models.		
	Set Limiter (SLL, SLH)	See "Input & Scale Range Table".		
	Selectable Control Mode(CNT)	Auto-Tuning PID Type A (Normal / Reverse Action), Auto-Tuning PID Type B (Normal / Reverse Action), Self-Tuning PID (Normal / Reverse Action), ON / OFF (Normal / Reverse Action)		
	PV Correction 0-point Setting (PVS)	Thermocouple / R.T.D.: -199 to 999 or -199.9 to 999.9 (℃) Current / Voltage (Decimal point at designated position): -1999 to 9999 (digit)		
	PV Correction Gain Setting	0.50 to 2.00 (times)		
	Input Filter	0.0 to 99.9 (sec.)		
	Manual Reset (PBB)	0.0 to 100.0%, -100.0 to +100.0 (heating / cooling) of proportional band.		
	Timer Operation Mode (TMM)	0 min. 00 sec. to 59 min. 59 sec. 0 hr. 00 min. to 99 hrs. 59 min. Accuracy: ± (1.5%+0.5 sec.) of the set time.		
	Decimal Point Shift (DP)	Indication after the decimal point Yes / No		
	Manual Control	Manual control is possible (Balanceless / Bumpless)		
	RUN / READY	RUN / READY is switchable		
	Blind Function	A non-indication is possible for any unnecessary parameter screen.		
	Auto-Tuning (AT) Coefficient	A coefficient can be set to the proportional band which is computed by the Auto-Tuning.		
	FUNC Key	Selectable from "Digit Shift", "AT", "RUN / READY", "Timer Start / Reset".		
	Priority Display	Selected parameter screen can be displayed in the operation mode (9-points)		
	Lock Function (LOC)	4-modes (OFF, ALL, Operation Mode Lock, Lock except Operation Mode)		
	Self-Checking Function	EEPROM Data Check (Err0), A/D Converter Operation Check (Err1), Auto-Tuning Check (Err2), Built-In Watchdog Timer		
	Ramp Function	Operation: When the SV is changed, it sets the SV changes per minute. The setting can be done individually for SV & SV2 respectively. *SV2 is available when option DI is selected. Setting Range: 0.0 to 999.9 The ramp function is disabled by 0.0 setting. Setting Unit: 0.1℃ /min. (thermocouple / R.T.D. input model) 0.1-digit/min. of SV setting unit (analogue input model)		
External Standard	6 substances as restricted by the RoHS Directives are not used.	Lead: Below 1,000 ppm Mercury: Below 1,000 ppm Cadmium: Below 100 ppm Hexad Chrome: Below 1,000 ppm Polybrominated Biphenyl (PBB): Below 1,000 ppm Polybrominated Diphenyl Ethers (PBDE): Below 1,000 ppm		
	UL/cUL/CE Markings (except TTM-002W)			

■ ADDITIONAL FUNCTIONS (Option)

Contact Output 1 (AL 1)
Contact Output 2 (AL2 or OUT2)
	Function: PV event contact output (8 modes), Special functions (3 modes), additonal functions (3 modes)
	Setting Range: Thermocouple / R.T.D: -199.9 to 999.9 or -1999 to 3276 (℃)
	          Current / Voltage (decimal point at designated position): 0 to 9999 (digit)
	Sensitivity: Thermocouple / R.T.D: 0.0 to 999.9 or 0 to 999 (℃)
	          Current / Voltage (decimal point at designated position): 0 to 9999 (digit)
	Rating: 250VAC 2.4A (resistance load) 1a contact When OUT2 is selected at contact output 2, the cooling side output of the heating / cooling control will be generated.
	          Contact polarity is selectable (normal open / normal close).
	          When OUT2 is SSR, the output voltage shall be 0 to 12VDC (load resistance: above 600 Ω)

DI	Function: SV / SV2 switchable (OFF: SV2), Auto / Manual switchable (OFF: Manual), RUN / READY switchable (OFF: READY), Normal / Reverse action switchable (OFF: Normal), Normal action (SV2) / Reverse action (SV2) switchable (OFF: Normal SV2), Timer Start / Reset (OFF: counting) Input Specifications: Min. input time: 500mS, OFF voltage: 6VDC max., ON current: 6mA max., permissible resistance value between terminals: ON = 333 Ω max., OFF = 500k Ω min.
CT Input	Setting Range: 1 to 30A AC, Accuracy: ±5% (setting resolution 1A)of FS, Detection of wire malfunction: when the ON time of OUT1 is above 300mS. Welding detection: when the OFF time of OUT1 is above 300mS.
Heating & Cooling	Refer to "Use of Control Output"

Communication	(1) Communication Standard : RS-485 conformable
	(2) Communication Method : Protocol: TOHO protocol / MODBUS
	                           Multi-drop system (1:31 stations)
	                           Direction of Information: Semi-duplex
	                           Synchronous method: Asynchronous
	                           Transfer code: TOHO protocol ASCII (BCC is excluded)
	                                         MODBUS RTU / ASCII
	                           Interface: Two-wire system
	                           Communication speed: 1200 / 2400 / 4800 / 9600 / 19200 BPS
	                           Character: Start bit 1 bit fixed
	                                       Stop bit 1/2 bit
	                                     Data length - TOHO Protocol 7/8 bit
	                                                    - MODBUS RTU 8 bit
	                                                 - MODBUS ASCII 7 bit
	                                     Parity None / odd no. / even no.
	                                     BCC check - TOHO Protocol No / Yes
	                                                  (The error check will be done by CRC for MODBUS RTU, LRC for MODBUS ASCII)
	                                   Address - TOHO Protocol 1 to 99
	                                                    - MODBUS RTU and ASCII 1 to 247
	                           Response delay time: 0 to 250mS
	(3) Isolation: Isolated from power circuit and CPU circuit.

Transfer Output	FUNCTION: PV (Measured Value) Output, SV (Set Value) Output, MV (OUT1 Manipulated Variable) Output
	            Output Accuracy FS ± 0.3% (ambient temp. 23 ± 10℃)
	            0 to 10mV DC, 0 to 1V, 0 to 5V, 1 to 5V, 0 to 10V, 4 to 20mA Normal / Reverse switchable

■ INPUT and SCALE RANGE
(Thermocouples & R.T.D. are switchable freely)

Thermocouple		Set Range		Display Range	
		No decimal point	w/ decimal point	No decimal point	w/ decimal point
K	℃	-200 to 1372	-199.9 to 990.0	-210 to 1382	-199.9 to 999.9
J	℃	-200 to 850	-199.9 to 850.0	-210 to 860	-199.9 to 860.0
R	℃	0 to 1700	———	-10 to 1710	———
T	℃	-200 to 400	-199.9 to 400.0	-210 to 410	-199.9 to 410.0
N	℃	-200 to 1300	-199.9 to 990.0	-210 to 1310	-199.9 to 999.9
S	℃	0 to 1700	———	-10 to 1710	———
B	℃	0 to 1800	———	-20 to 1820	———

R.T.D.		Set Range		Display Range	
		No decimal point	w/ decimal point	No decimal point	w/ decimal point
Pt100 (JIS/IEC)	℃	-199 to 500	-199.9 to 500.0	-199 to 530	-199.9 to 520.0
JPt100 (JIS)	℃	-199 to 500	-199.9 to 500.0	-199 to 510	-199.9 to 520.0

Current / Voltage		Set Range		Display Range
		No decimal point	w/ decimal point	
0 to 5V	V	-1999 to 9999	-199.9 to 999.0 -19.99 to 99.99 -1.999 to 9.999	Appx. -2% of SV low limit setting (SLL) to appx. +12% of SV high limit setting (SLH) within the set range.
1 to 5V	V	-1999 to 9999	-199.9 to 999.0 -19.99 to 99.99 -1.999 to 9.999	Appx. -12% of SV low limit setting (SLL) to appx. +12% of SV high limit setting (SLH) within the set range.
4 to 20mA	mA	-1999 to 9999	-199.9 to 999.0 -19.99 to 99.99 -1.999 to 9.999	Appx. -12% of SV low limit setting (SLL) to appx. +12% of SV high limit setting (SLH) within the set range.

■ CONTACT OUPUT MODE

Kinds of Specialized Functions

0	None
1	PV Abnormal Contact Output
2	Heater Abnormal Contact Output
3	PV Abnormal Contact Output + Heater Abnormal Contact Output

0.1 only when there is no CT input.

Additional Functions

0	None
1	Contact Output Hold
2	Standby Sequence
3	Contact Output Hold + Standby Sequence

0.1 only the kinds of specialized functions are 0.

Kinds of PV Event Function

| 0	None
1	Deviation Upper / Lower Limit Contact Output
2	Deviation Upper Limit Contact Output
3	Deviation Lower Limit Contact Output
4	Deviation Upper / Lower Limit Range Contact Output
5	Absolute Value Upper / Lower Limit Contact Output
6	Absolute Value Upper Limit Contact Output
7	Absolute Value Lower Limit Contact Output
8	Absolute Value Upper / Lower Limit Range Contact Output

■ WIRING

TTM-002W when makig DI with open collector output, terminal #11 is "+ (plus)".
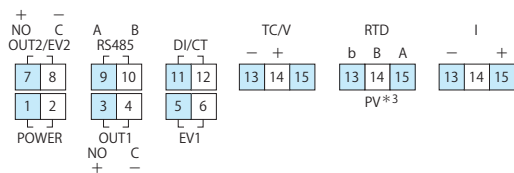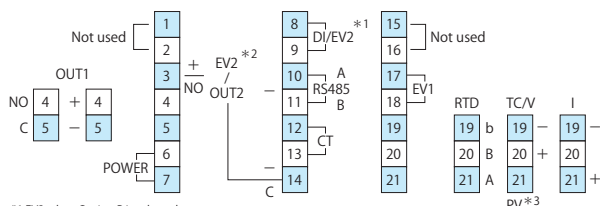

TTM-004W when makig DI with open collector output, terminal #9 is "+ (plus)".
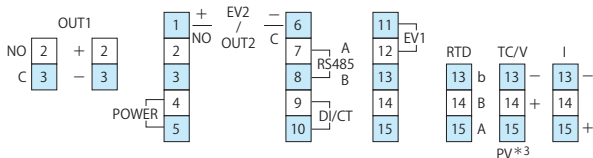
TTM-005W/006W/009W when makig DI with open collector output, terminal #11 is "+ (plus)".
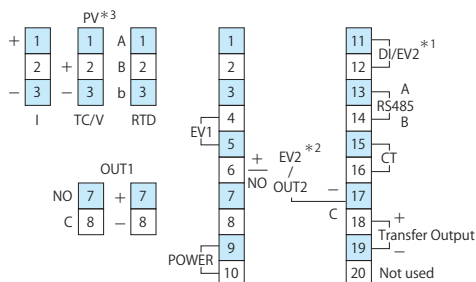
TTM-007W when makig DI with open collector output, terminal #8 is "+ (plus)".

*1 EV2 when Option R is selected
*2 EV2 when Options B or P is selected
*3 RTD: Resistance Temperature Detector Input
    TC: Thermocouple Input
    V: Voltage Input
    I: Current Input

■ TERMINALS

Communication	Connect correctly the terminal of T/R (A) and T/R (B). (Use converter for connection other than RS-485)
Relay Output	C: Common, NO: Normal Open
SSR Drive Output	Connect directly to + & - input of SSR
EV1, 2	The polarity of normal open & normal close is switchable.
CT	Connect designated current transformer (heater abnormal contact output detector) directly.
R.T.D. Input	Connect carefully to terminals A, B, b.
Thermocouple Input	Watch for the polarity + & - when making connection.

*When OUT2 is "P", connect directly to INPUT + & - at SSR side.
*Watch for the polarity of transfer output + & - when making connection.

■ TIMER OPERATION MODE

Start Mode

1	Auto-Start	:(ON Delay)
2	Manual Start	:(ON Delay)
3	Event Star	:(ON Delay)
4	Auto-Start	:(OFF Delay)
5	Manual Start	:(OFF Delay)
6	Event Start	:(OFF Delay)
7	SV Start	:(OFF Delay)

OFF Delay: After the time's up, either the control stops or the event output becomes OFF.
ON Delay: After the time's up, either the control starts or the event output becomes ON.
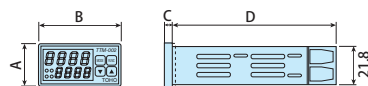*Output is selectable either main control output or event output

■ TIMER OUTPUT SETTING

1	Timer Disuse
2	Control Output
3	Event 1 Output

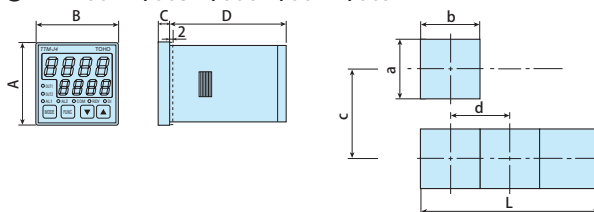## ■ DIMENSIONS

● **TTM-002W**   ＊ European terminal AWG less than 18 (Upper side)
                                              AWG less than 16 (Lower side)

● **TTM-004W/005W/006W/007W/009W**

● **External Dimension & Panel Cutout Dimension**

| Model	a	b	c	d	A	B	C	D	L
TTM-002W	$22.2^{+0.3}_{-0}$	$45^{+0.6}_{-0}$	60	48	24	48	3.5	96.5	$(B \times N\text{-}2.5)^{+0.6}_{-0}$
TTM-004W	$45^{+0.6}_{-0}$	$45^{+0.6}_{-0}$	60	48	48	48	6	77	$(B \times N\text{-}3)^{+0.6}_{-0}$
TTM-005W	$92^{+0.6}_{-0}$	$45^{+0.6}_{-0}$	120	48	96	48	6.5	76.5	$(B \times N\text{-}3)^{+1}_{-0}$
TTM-006W	$45^{+0.6}_{-0}$	$92^{+0.6}_{-0}$	48	120	48	96	6.5	76.5	$(A \times N\text{-}3)^{+1}_{-0}$
TTM-007W	$68^{+0.6}_{-0}$	$68^{+0.6}_{-0}$	90	72	72	72	8.5	77	$(B \times N\text{-}3)^{+1}_{-0}$
TTM-009W	$92^{+0.6}_{-0}$	$92^{+0.6}_{-0}$	120	96	96	96	9	77	$(B \times N\text{-}3)^{+1}_{-0}$

※ When attaching several units, kindly refer to "L" column in the above table.
※ When the crimped terminal will be used to attach several units, make sure the terminals will not touch each other.
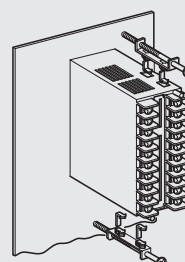※ TTM-006W cannot be connected in crosswise direction. The "L" column above applies to vertical attachment dimensions.

■ PANEL INSTALLATION
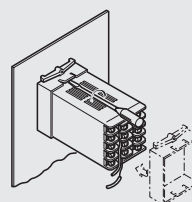
● TTM-002W, 004W   ● TTM-005W
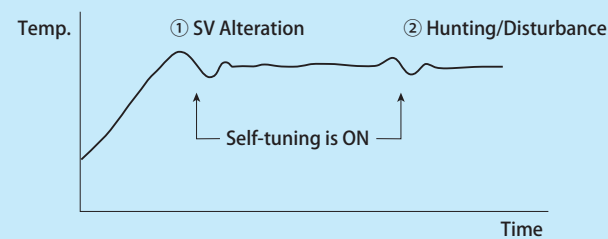   ● TTM-006W
                          ● TTM-007W
                          ● TTM-009W

In the case of wiring a unit with options, and when connecting the wires to the center terminals, please connect wires directly to the terminal as much as possible.
If crimped terminals are used, make sure they don't touch other terminals.

■ FUNCTIONAL DESCRIPTION

● Self-Tuning PID

Temp.

① SV Alteration   ② Hunting/Disturbance

Self-tuning is ON

Time

● Blind Function

● Mode Display Blind Setting

A		B		C		I		J	
Su / on	(MODE) →	APN / on	(MODE) →	Nu1 / on	(MODE) →	AL2L / on	..... (MODE) →	AL2H / on	(MODE) → A

● Parameter Display Blind Setting

1		2		3		35		36	
_P / on	(MODE) →	_I / on	(MODE) →	_d / on	(MODE) →	_Nod / on	..... (MODE) →	_LoC / on	(MODE) → 1

The screen of your choice can be made not to appear (blinded) by the key operation. However, please note that when the SV setting value screen is blinded, the SV will not show, only the Measured Value (PV) will be shown during the normal indication.

● Timer Function

1. In the case of Bread Oven
● Place the dough in to the oven, and press the start key of the timer.
● While the set time of the timer is in effect, the temperature will be controlled by the heaters, etc.
● When the timer count ends, the control will stop automatically.
 (The function is used to stop the control when the timer count ends)

Start Key

Timer Action   Setting Time   Time-up

Control Output
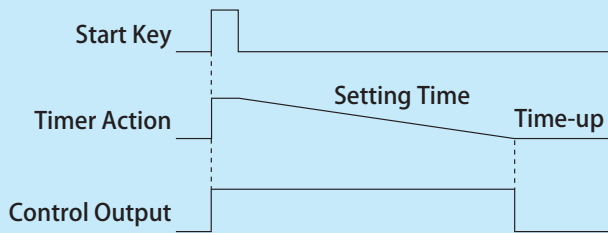
2. In case the control needs to start after the peripheral equipment are readied for the packaging machines and industrial machines
● The timer starts to count the moment the power is turned ON.
● While the set time of the timer is in effect, the control output is put on hold.
● When the timer count ends, the control starts automatically.
  (The function is used to start the control when the timer count ends)
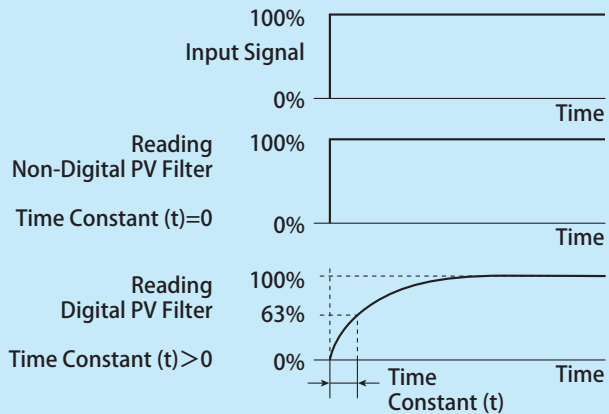

Power

Timer Action   Setting Time   Time-up

Control Output
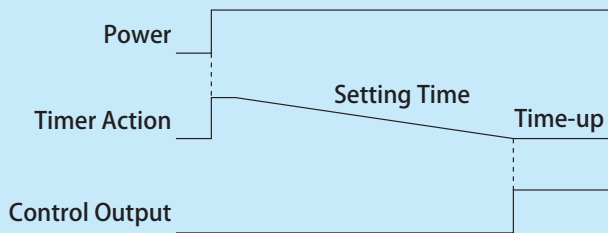
● Communication Function

● Example of connection with the Personal Computer
  By the connection as shown below, centralized monitoring would be possible with the use of PC.

Host computer

RS-232C
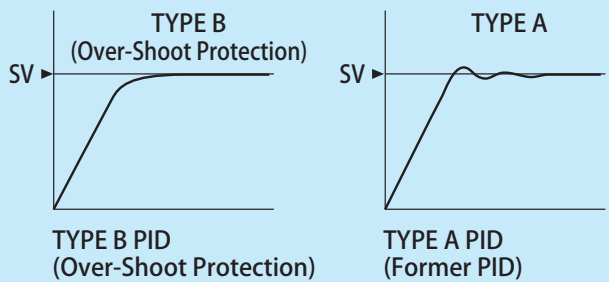
Transduce

RS-485

TTM-000
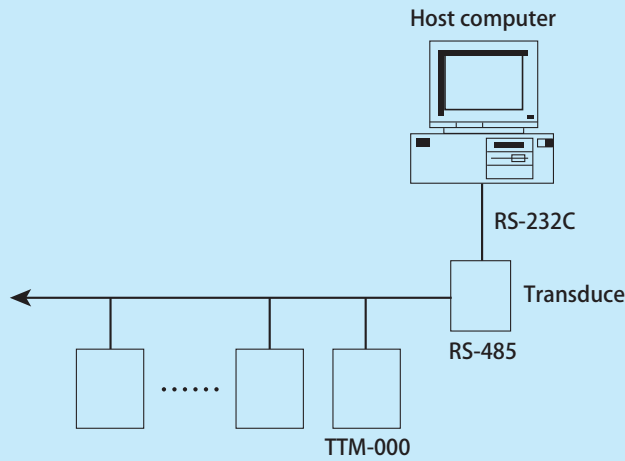
● Digital PV Filter

This is a function to realize the CR Filter Effect with software by means of primary delay operation on the measured value (PV). The Filter Effect can be set by time constant (t). (The time constant refers to a time the PV value reaches to appx. 63% when the input changes in a step-wise)

Input Signal   100%   0%   Time

Reading Non-Digital PV Filter   Time Constant (t)=0   100%   0%   Time

Reading Digital PV Filter   Time Constant (t)>0   100%   63%   0%   Time Constant (t)   Time

Use of Digital PV Filter
1) Removal of High-Frequency Noise: The effect of the noise is lessened when the electrical noise is added during the input process.
2) The response can be delayed in the event of abrupt input change.

● PID with Overshoot Suppressive Function

TYPE B (Over-Shoot Protection)   SV

TYPE A   SV

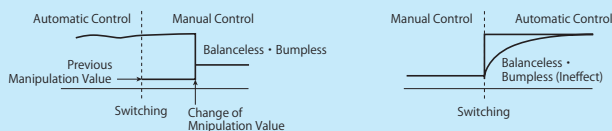TYPE B PID (Over-Shoot Protection)

TYPE A PID (Former PID)

● AUTO (RUN) / MANUAL CONTROL

The AUTO & Manual Control can be switched with the front key, DI or by the communication. Manual operation is a function which enables the setting / generation of output of the control output (manipulated variable) at will regardless of the deviation condition.

The system can be operated manually when there is a need to make a validation of the final control element such as valves or heaters during the sytem test run, or when normal control cannot be done due to faulty sensors.

When switching over the AUTO / Manual reciprocally, sudden changes in the control output is suppressed. Furthermore, the Balanceless / Bumpless functions are available to hold the damages to peripheral devices due to sudden changes or harmful effect to the control system so the control can be done at ease.

Automatic Control | Manual Control
Previous Manipulation Value
Balanceless • Bumpless
Switching | Change of Mnipulation Value

Manual Control | Automatic Control
Balanceless • Bumpless (Ineffect)
Switching

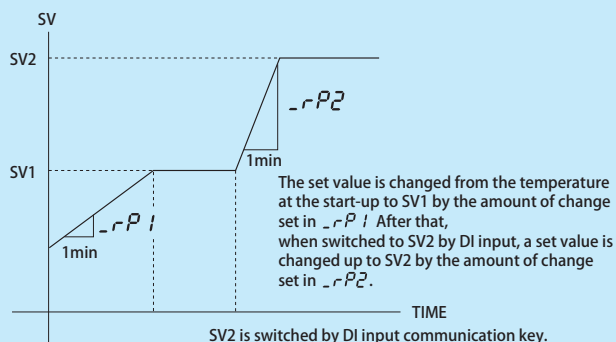BALANCELESS • BUMPLESS

● Ramp Function

When SV (Set Value) is changed, this function provides a slope to its changes.
The actual action is performed in such a way that dummy SV is gradually changed towards the new set value, and the control is performed over the dummy set value.
A variation of SV per minute is set.
When the characteristics of the item to be controlled does not allow a sudden change of the control result, or when the change rate (slope) of the control result is important, the ramp function becomes very effective.
However, since this funcion changes only the SV, if great effect is expected on PV (measured value), expected result may not be obtained.
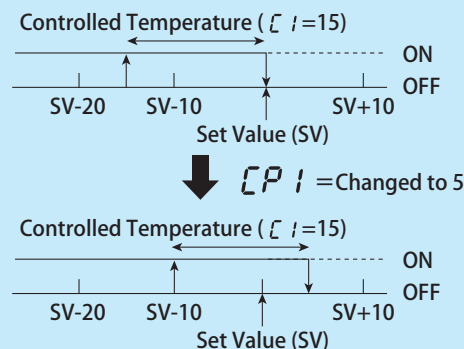
SV
SV2
_rP2
1min
SV1
_rP1
1min

The set value is changed from the temperature at the start-up to SV1 by the amount of change set in _rP1 After that,
when switched to SV2 by DI input, a set value is changed up to SV2 by the amount of change set in _rP2.

TIME
SV2 is switched by DI input communication key.

Start-up
* When the SV2 option is selected, the above is possible to operate.
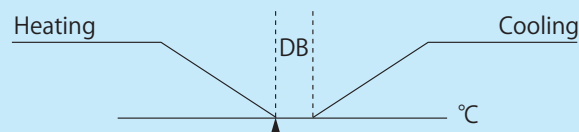
● OFF-Point Position Shifting of ON / OFF Control

When the OFF-Point Position Shifting value is set to 0, the OFF-Point is at the set value position.

Controlled Temperature (C1 =15)
ON
OFF
SV-20   SV-10   SV+10
Set Value (SV)

↓ CP1 =Changed to 5

Controlled Temperature (C1 =15)
ON
OFF
SV-20   SV-10   SV+10
Set Value (SV)

Above diagram shows the case the OFF-Point Position Shifting is set at (+5).
The actual set value does not have changes with above, but as ON / OFF position, it moved to upper side by (+5). When position is moved to minus side, the OFF-Point moves in opposite direction to above diagram.

● Heating / Cooling (Low Cost Type)

Heating   Cooling
DB
℃

■ ORDERING INFORMATION (Model Configuration)

TTM-☐☐☐W-☐-☐-A ☐☐☐☐☐☐

Model | Input | Output 1 | Option

Model		002W	24 × 48mm
		004W	48 × 48mm
		005W	96 × 48mm
		006W	48 × 96mm
		007W	72 × 72mm
		009W	96 × 96mm
Input			Thermocouple (K, J, R, T, N, S, B), R.T.D. (Pt100, JPt100)
		2	0 to 5V, 1 to 5V, 4 to 20mA
Output 1		R	Relay Contact
		P	SSR Drive Voltage
		I	Current 4 to 20mA DC

Option		B	Out2 / EV2 Contact Output Relay		Select one
		P	Out2 / EV2 SSR Drive Voltage Output		
		R	EV2	Contact Output Relay Not selectable with 002W / 004W. Not selectable when "DI" is selected. Not selectable when Out2 is not selected.	
		D	CT Input	Not selectable when "I" of Output 1 is selected. Not selectable with 002W / 004W when DI is selected.	
		E	DI	Not selectable when option "R" is selected. Not selectable with 002W / 004W when "CT" is selected.	
		X	Communication	RS-485 (TOHO Protocol / MODBUS)	
		H		0 to 10mV DC	
		K		0 to 1VDC	
		J	Transfer Output	0 to 5VDC	A multiple choise is not possible. Not selectable with 002W / 004W / 007W.
		F		1 to 5VDC	
		G		0 to 10VDC	
		I		4 to 20mA DC	
		-24	Power Source AC / DC 24V (Blank if 100 to 240VAC) Not selectable when Transfer Output is selected.		

TTM-002W

TTM-004W

TTM-005W

TTM-006W

TTM-007W

TTM-009W

● **Size**
TTM-002W   24 × 48mm
TTM-004W   48 × 48mm
TTM-005W   96 × 48mm
TTM-006W   48 × 96mm
TTM-007W   72 × 72mm
TTM-009W   96 × 96mm