

TOHO TTM-002 DIGITAL TEMPERATURE CONTROLLER

LOW-COST, EASY-TO-USE 1/32 DIN CONTROLLER WITH MULTIPLE FUNCTIONS



- **Self-Tuning PID**

Most appropriate PID constants are automatically set for optimum control. PID constant is calculated when making alteration to setting value, or it is corrected when disturbance/hunting etc. occurs

- **Blind Function**

The parameter screen can be masked from display

- **Simplified Timer**

ON/OFF setting control is available after set interval.

Function of ON/OFF alarm output can be used independently

- **Priority Display**

Preferred parameter screens are monitored and set up under operational mode screen. (max. 9 screens)

- **Multiple Inputs**

Thermocouple/RTD (Pt 100 & JPt 100) are selectable by front key

- **Agency Approvals**

UL, cUL and CE approved

- **Safety Classification**

IP66 NEMA 4X

- **Compact Size**

24 x 48 mm with a depth of only 77mm

- **Manual Control (Balanceless & Bumpless)**

Manual control function is useful in various applications

- **Sampling Time**

500mS

- **Digital PV Filter**

Smoothens rapid changes in input

- **PID Over-Shoot Protection**

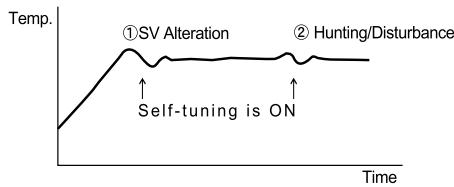
Inhibits PID Over-Shoot

- **Others**

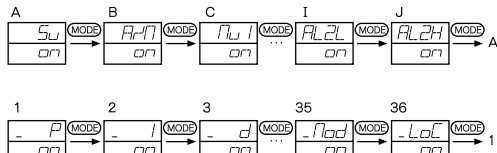
Shift setting of OFF position during ON/OFF control, for both output 1 & 2

Advanced Features

Self-Tuning PID (Standard)



Blind Function (Standard)

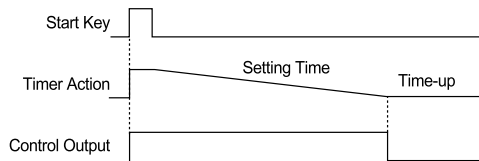


The mode screen or the parameter screen whichever you demand can be displayed by merely pressing a key, at the request. When the SV screen is erased, the set value is normally not indicated but the measured value(PV) is only shown.

Timer Function (Standard)

1. Bread Oven Machine

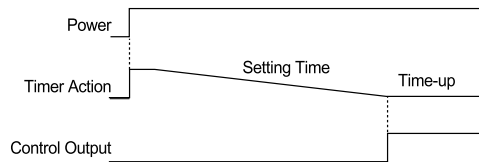
- Put dough into oven and press the timer start key.
- While setting timer, temperature in oven is controlled by heater.
- After timer counts up, control of oven is stopped automatically. (This example is for control stop after the timer counts up.)



2. Package Machine and Industry Machinery

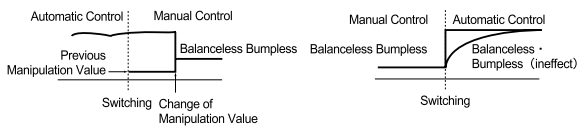
(In case of start of control after the relative equipments are prepared)

- When power is "ON", the timer starts to count.
- While setting timer, control output is stopped.
- After the timer counts up, control is started automatically. (For control start after the timer counts up.)



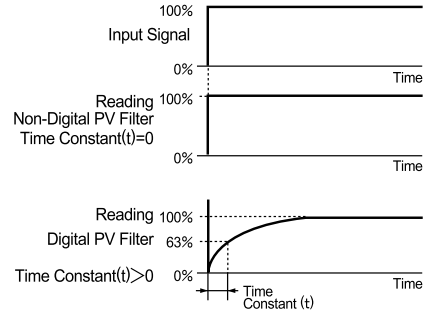
Automatic/Manual Control (Standard)

Automatic/Manual control can be switched by front key for DI or communication. when checking the manipulation action for valve and heater during a system test run, or when normal control is not operational due to sensor failure, the system can be operated manually in this mode.



Digital PV Filter (Standard)

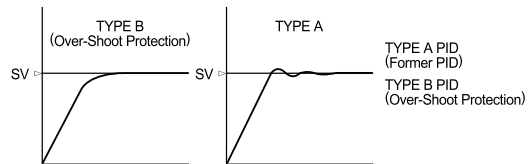
This is a function to realize a CR filter effect on software by means of primary delay arithmetic on the measured value(PV). The filter effect can be set by time constant(t). (The time constant is a period to reach 63% of PV value, when the input changes stepwise.)



Digital PV filter with the following uses

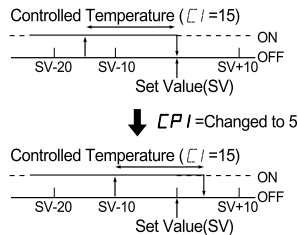
- 1) To eliminate high frequency noise : When electric noise is added to the input, the adverse effect is reduced.
- 2) When input changes abruptly, the response delay is possibly made.

Over-Shoot Protection PID (Standard)



Sifting OFF Position in ON-OFF Control (Standard)

When the shift value is set to 0(zero), the OFF position is the set value position.



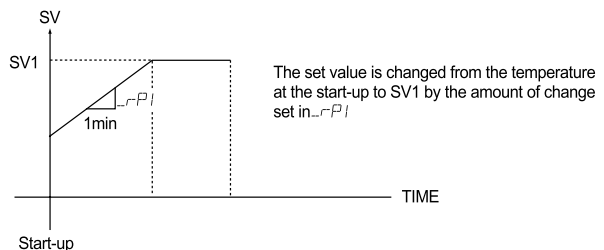
When the OFF position setting is shifted by +5, ON/OFF position shifts that of +5 minutes upper than the original position, though the set value is not changed. When the OFF position setting is shifted toward the minus direction, the OFF position shifts in the reverse direction.

Ramp

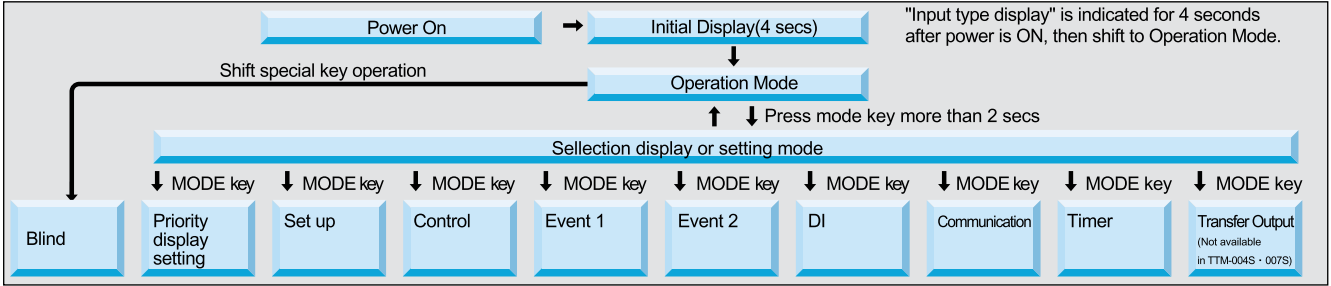
When SV(set value) is changed, this function slopes the curve. The actual action is performed in such a manner that dummy SV is gradually changed toward the new set value, and the control is performed to the dummy set value.

Set the change of SV per minute to use the ramp function. When the characteristic of the item to be controlled does not permit a sudden change of the manipulated variable, or when the change rate (slope) of the variable is important, the ramp function is very effective.

If it is desire to have great influence on PV(measurements), the result of expectation might not be obtained because only SV is changed.



Operation Flow



Input and range

(Thermocouple & R. T. D. switchable by key)

Thermocouple		Setting Range		Display Range	
		Non-decimal point	Decimal point	Non-decimal point	Decimal point
K	°C	-200~1372	-199.9~990.0	-210~1382	-199.9~999.9
J	°C	-200~850	-199.9~850.0	-210~860	-199.9~860.0
R	°C	0~1700	—	-10~1710	—
T	°C	-200~400	-199.9~400.0	-210~410	-199.9~410.0
N	°C	-200~1300	-199.9~990.0	-210~1310	-199.9~999.9
S	°C	0~1700	—	-10~1710	—
B	°C	0~1800	—	-20~1820	—

R. T. D.		Setting Range		Display Range	
		Non-decimal point	Decimal point	Non-decimal point	Decimal point
Pt100(JIS/IEC)	°C	-199~500	-199.9~500.0	-199~520	-199.9~530.0
JPt100(JIS)	°C	-199~500	-199.9~500.0	-199~530	-199.9~520.0

Current Voltage		Setting Range		Display Range
		Non-decimal point	Decimal point	
0-5V	V	-1999~9999	-199.9~999.9 -19.99~99.99 -1.999~9.999	Approx. -2% of SV low limiter setting(SLL) ~ Approx. +12% of SV high limiter setting (SLH), within the setting range.
1-5V	V	-1999~9999	-199.9~999.9 -19.99~99.99 -1.999~9.999	Approx. -12% of SV low limiter setting(SLL) ~ Approx. +12% of SV high limiter setting (SLH), within the setting range.
4-20mA	mA	-1999~9999	-199.9~999.9 -19.99~99.99 -1.999~9.999	Approx. -12% of SV low limiter setting(SLL) ~ Approx. +12% of SV high limiter setting (SLH), within the setting range.

Event Contact Output Mode(Alarm)

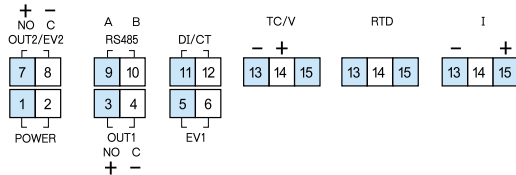
Abnormal PV/heater code

0	None
1	Abnormal PV contact output
2	Abnormal heater contact output
3	Abnormal PV contact output + abnormal heater control output

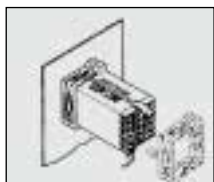
Only 0 or 1 available

Wiring

TTM-002 when making DI with open collector output, terminal# 11 needs to be "+"(plus)".



Panel Installation



Timer Operation Mode

Start Mode

1	Auto start : ON delay
2	Manual start : ON delay
3	Event start : ON delay
4	Auto start : OFF delay
5	Manual start : OFF delay
6	Event start : OFF delay
7	SV start : OFF delay

ON delay : Control start or event output is ON, after time-up

OFF delay : Control stop or event output is OFF, after time-up

* Output is selectable, either main control output or event output.

Timer Drive Setting

0	Non-use timer function
1	Control output
2	Event 1 output

PV Event Code(Alarm)

0	None
1	Deviation high and low limit
2	Deviation high limit
3	Deviation low limit
4	Deviation high and low range
5	Absolute value high and low limit
6	Absolute value high limit
7	Absolute value low limit
8	Absolute value high and low range

Additional Functions

0	None
1	Holding
2	Awaiting sequence
3	Holding + awaiting sequence

When special function is 0, only code 0 or 1 selectable.

Terminals

Relay Output	C ; Common. NO ; Normal open
SSR Drive Output	Connect directly to + & - input of SSR
EV 1	Changeable normal open & normal close
R. T. D. Input	Connect to A, B and b
Thermocouple Input	Connect to polarity(+, -)

※ When OUT 2 is "P", connect directly + & - on input of SSR side.

※ Make sure the polarity(+, -) for Transfer Output, when you wire.

Dimensions

Model	a	b	c	d	A	B	C	D	L
TTM-002	22.2 ^{+0.3}	45 ^{+0.5}	60	48	24	48	3.5	96.5	(BxN-2.5) ^{+0.5}

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

TOHO TTM-002, CONTINUED

SPECIFICATIONS

GENERAL SPECIFICATIONS

INPUT SWITCHABLE	Thermocouple K, J, T, R, N, S, B (JIS1602~1995) RTD, Pt100, JPt100 (Load resistance: 10ohms or less)
SAMPLING TIME	0.5 sec (Output change cycle is also same)
MEMORY ELEMENT	EEPROM
VOLTAGE SOURCE	100V AC to 240V AC (50/60Hz)
WEIGHT	<180g
POWER CONSUMPTION	Less than 10VAC (240VAC)
OPERATING CONDITION	0 to 50°C, 20 to 90%RH (under non-condensation)
STORAGE CONDITION	-25 to 70°C, 5 to 95%RH (under non-condensation)

INDICATION

PV (CHARACTER)	4 digits, 7 segments, Green, 7.6mm high
SV (SETTING VALUE)	4 digits, 7 segments, Red, 5.25mm high
FUNCTION INDICATION	LED: Red (AL1, OUT1, or RDY) and Green (DI)

CONTROL METHOD

PID AUTO-TUNING, PID SELF-TUNING	Proportional band (P1): 0.1 to 200.0% of setting limiter span Reset time (Integral) (I): 1 to 3600 sec (0 : OFF) Rate time (Deviation) (D): 1 to 3600 sec (0 : OFF) Cycle time (T1): 1 to 120 sec Dead band (DB): -100.0 to +100.0 or -100 to +100 (°C)
ON/OFF	Control sensitivity (C1): 0 to 999 or 0.0 to 999.9 (°C)
OFF POINT OF OUTPUT 1	Position of setting: -199 to 999 or -199.9 to 999.9 (°C)

SETTING AND INDICATION ACCURACY

THERMOCOUPLE	+/- (0.3% + 1 digit) of process value or +/- 2°C, either of bigger numerical values is taken. (Ambient temperature: 23°C +/- 10°C) -100 to 0°C: +/- 3°C -200 to 100°C: +/- 4°C Thermocouple B under 400°C is not regulated
RTD	+/- (0.3% + 1 digit) of process value or +/- 0.9°C, larger of the two. (Ambient temperature: 23°C +/- 10°C) Ambient temperature 0 to 50°C: +/- (0.5% + 1 digit) or 1.5°C, larger of the two values is taken

CONTROL OUTPUT

RELAY CONTACT	250V AC, 3A (Load resistance) 1a contact
SSR DRIVE VOLTAGE	0 to 12V DC (Load resistance: 600ohms or more)

FUNCTIONS

MANIPULATED VARIABLE LIMITER (ML1, MH1)	0.0 to 100.0%
SELECTABLE CONTROL MODE (CNT)	Auto-Tuning PID Type A / B, Normal / Reverse, Auto-Tuning PID / ON/OFF
PV CORRECTION 0 POINT SETTING (PVS)	-199 to 999 or -199.9 to 999.9 (°C)
PV CORRECTION GAIN SETTING	0.50 to 2.00 (times)
INPUT FILTER	0 to 99 (sec)
MANUAL RESET (PBB)	0.0 to 100.0%, -100.0 to 100.0 of proportional band
TIMER OPERATION MODE (TMM)	0.00 minute to 59.59 minutes, 0.00 hour to 99.59 hours. Accuracy: +/- (1.5% + 0.5 sec) of setting time
DECIMAL POINT SHIFT (DP)	Decimal point display available (up to 999.9)
MANUAL CONTROL	Auto/Manual control can be switched by key
RUN/READY	Run and Ready can be switched by key
BLIND FUNCTION	No indication available for non-required display
AUTO-TUNING COEFFICIENT (AT)	After AT, the computed new PID values are set
FUNC KEY	"Digit Shift" "AT" "RUN/READY" "Timer Start/Reset"
PRIORITY DISPLAY	Arbitrary parameter screens are shifted to indication of operation mode by key. (max: 9 screens)
LOCK FUNCTION (LOC)	4 modes (OFF, ALL, Operation Lock, Lock except Operation Mode)
WATCH-DOG FUNCTION	Data checked by EEPROM (Err0), A/D converter check (Err1), and Auto-Tuning check (Err2), Built-in watch dog timer.
EVENT OUTPUT 1 (AL1)	Function: PV contact output (8 modes), Special contact output (3 modes), additional functions (3 modes) Setting Range: -199.9 to 999.9 or -1999 to 9999 (°C) Sensitivity: 0.0 to 999.9 or 0 to 9999 (°C) Rating: 250V AC 2.4A (Load resistance) 1a contact Contact polarity: Selectable either normally open or normally closed

TOHO TTM-002 ORDERING INFORMATION

T T M - 0 0 2 - A - A

To create an ordering code fill in the boxes above with the appropriate number and/or letter from the corresponding box below.

Box A: Output 1

- R = Relay contact
- P = SSR drive voltage 12 VDC