TOHO

DIGITAL PROGRAM CONTROLLER

TTM-300 SERIES

JSA ISO 9001:1994 登録番号 JSAQ 097

JAB QS Accreditation 認定番号R001

TOHO ELECTRONICS INC.

DIGITAL PROGRAM CONTROLLER

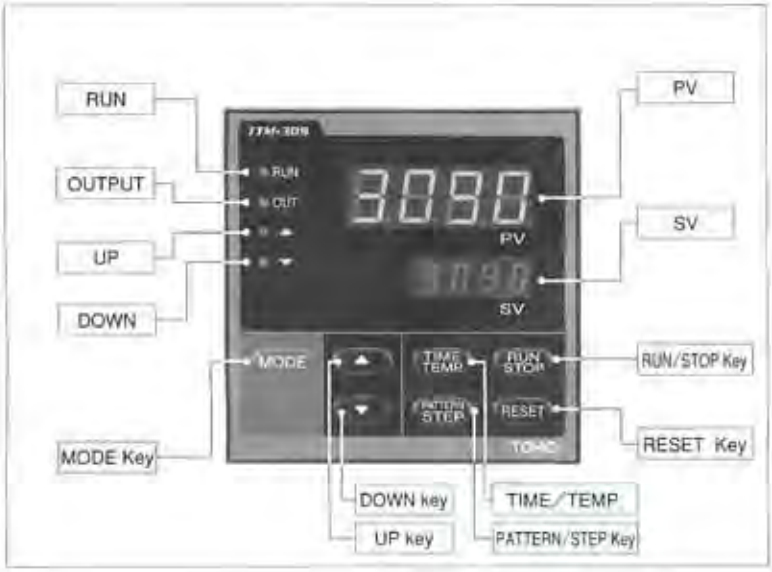
TTM-300 SERIES

This program controller with fuzzy logic function can program up to "patterns × steps = 64". The blind function realizes unique operability.

Features

- **Built-in fuzzy logic function.**
  The fuzzy logic has been applied to stepped temperature setting operation which is apt to be unsteady, realizing nearly ideal sloping temperature control. (See "Explanation of function" for further information.)
- **Blind function.**
  It is possible to exclude various parameters from display as desired. By advantage of this function, only necessary parameters for actual operation can be displayed and set, making operation of a program controller easier.
- **Communication function of DIN 1/16 size.**
  Communication distance can be extended up to 500 meters, and up to 31 units can be connected. Thus, one host computer can perform centralized monitoring of collection of all data, change of set values, and so on at a remote location.
- **Diversified contact outputs.**
  Various types of contact outputs are available by means of independent two-point contact output. Various output patterns such as temperature, end signal, and time signal can be set.
- **Easy to read 4-digit display.**
  Since the PV value display (green, 4 digits) and SV value display (red, 4 digits) are independent, the state of operation can be checked at a glance.

Panel



RUN	Operation: Lighting Stop: Not lighting Temporary stop: Flickering	PATTERN STEP	Pattern/Step key Used to switch over operation mode or pattern/step check mode.
OUTPUT	ON: Lighting OFF: Not lighting		
UP	Increasing the setting: Lighting	RESET	Reset key Used to switch over operation mode and reset mode.
DOWN	Decreasing the setting: Lighting		
MODE Key	Used to change the screen, etc. in each mode.	PV	Indication of process value
TIME TEMP	Used to switch over time or temp. on the display.	SV	Indication of set value
RUN STOP	Run/ Stop key Used to switch over reset mode and operation mode.	▲ ▼	Up/Down key • Setting and change of SV value • Setting and change of contact output value • Change of selection of functions

Standard Specifications

Input	Thermocouple	K, J, T, R, N, B Input resistance: 1MΩ or more, Influence of external resistance: approx. 0.2 μv/Ω	
	R.T.D.	Pt100, JPt100 (Load resistance: 5Ω or less)	
Indication	PV (Process value)	4 digits, 7 segments, LED, Green 10mm high, 15mm high (TTM-309)	
	SV (Setting value)	4 digits, 7 segments, LED, Red, green 8mm high	
	Functions	LED: Red(RUN · OUTPUT), LED: Green(UP · DOWN)	
Control Method	PID PID Fuzzy (Auto-tuning)	Proportional band(P)	0.1 to 200.0%.
		Reset time (Integral) (I)	0 to 3600 sec (0: OFF)
		Rate time (Deviation) (D)	0 to 3600 sec (0: OFF)
		Cycle time(T)	1 to 120 sec
	ON／OFF	Control sensitivity(C)	0 to 999.9 or 0 to 999
Control Output	Relay contact	250 VAC, 3A(Load resistance) 1c contact	
	SSR drive voltage	0 to 12 VDC (Load resistance: 600Ω or more)	
	Voltage	1 to 5 V, 0 to 10 VDC (Load resistance: 1KΩ or more)	
	Current	4 to 20 mA/DC (Load resistance: 600Ω or less)	
Sampling Time		0.5 sec (Output change period is the same.)	
Setting and Indication Accuracy	Thermocouple	±(0.3% + 1 digit) of setting value or ±3°C (6°F), whichever is the greater. (B thermocouple: 399°C (750°F) or more.)	
	R.T.D	±(0.3% + 1 digit) of setting value or ±0.9°C (1.8°F), whichever is the greater.	
Memory Element		FRAM	
Souce Voltage		85 to 264 VAC (Free power source), 24V ±10% AC/DC (Made to order)	
Weight		TTM-304 Less than 170g, TTM-305 Less than 230g, TTM-309 Less than 300g.	
Power Consumption		TTM-304 Less than 11VA (264 VAC) / Less than 7VA (24 VAC) / Less than 5W (24 VDC) TTM-305 Lass than 12VA (264 VAC) / Lass than 8VA (24 VAC) / Lass than 5W (24 VDC) TTM-309 Less than 12VA (264 VAC) / Less than 8VA (24 VAC) / Less than 5W (24 VDC)	
Accessories		Instruction manual, attachment for installation and unit seal. (Fittings for installation, except TTM-304)	
Operating Condition		0 to 55°C, 35 to 85% RH (No condensation)	
Storage Condition		–20 to 65°C, 35 to 85%RH (No condensation)	
Functions	Manipulated variable limiter (MLL, MLH)	–10.0 to 110% (Relay, SSR drive voltage output: 0.0 to 100.0%)	
	Switching of control mode (CNT)	PID fuzzy↔PID↔ON/OFF. Normal↔Reverse (In case of heat/cool, it is fixed)	
	PV correction (PVS)	–1999.9 to 999.9 or –199 to 999(°C or °F)	
	Blind function	It is possible not to display any screen as desired by operation of key.	
	PV/ SV Start	Be able to change in PV/ SV start and setting time of PV/ SV start.	
	Shift of decimal point (DP)	Be able change of display of under decimal position without thermocouple input.	
	Input switchable	Be able to change in thermocouple and in R.T.D., not to change to R.T.D. from T/C and it reverse.	
	Key lock (LOC)	4 modes (No lock: all parameters, temperature and time parameter, setting modes of pattern No. and parameter each pattern.)	
	Watch dog function	Data checked by FRAM (Err0), A/D converter check (Err1), and autotuning Check (Err2). Built-in watch dog timer	
	Programmed operation	Number of steps × Number of patterns = 64 max. (Can be programmed up to number of steps and patterns.)	
	Setting of step time	0 to 99 hrs 59 mens (Step time can be set in increment of 1 min.)	

Optional Function

	Specifications
Event Output 1 (EV1) Event Output 2 (EV2)	Function: PV contact output (8 modes), Time signal (4 modes), End signal Setting range: –199.9 to 999.9 or –1999 to 9999 for PV contact mode ＊Time/End signal mode: 0 to 99 hrs 59 mins Sensitivity: PV contact mode 0 to 999.9 or 0 to 999 Rating: 250 VAC, 0.5A (Resistance load) or 125 VAC, 1A (Resistance load) Contact 1a
RUN Input ＊1	When input is OFF: RUN, When input is ON: STOP Voltage when OFF: 32 VDC max. Current when ON: 6mA max.
Communication ＊2	Conforms to RS-485: Multi-drop 2-line, 1: 31 addressee stations max. Communication parameter: Check BBC/or not, 7 bit or 8 bit data, No parity/an uneven number/an even number, start bit1, stop bit 1/2 Communication speed: 1200/2400/4800/9600 bps Communication address: 1 to 99 Response delay time: 0 to 250 msec Local: Changeble

Either ＊1 or ＊2 can be selected.

Input and These Ranges

(Range for input of thermocouple, R.T.D., current, and voltage are adjustable in the arranges given below.)

Thermocouple		Setting range		Display range	
		None decimal point	Decimal point	None decimal point	Decimal point
K (JIS/IEC)	°C	0~1300	0.0~999.9	-40~1372	-40.0~999.9
	°F	0~2500	—	-40~2501	—
J (JIS/IEC)	°C	0~ 800	0.0~800.0	-31~ 850	-31.0~850.0
	°F	0~1450	0.0~999.9	-24~1563	-24.0~999.9
T (JIS/IEC)	°C	-200~ 400	-199.9~400.0	-231~ 407	-199.9~407.0
	°F	-330~ 750	-199.9~750.0	-385~ 765	-199.9~765.0

Thermocouple		Setting range		Display range	
		None decimal point	Decimal point	None decimal point	Decimal point
R (JIS/IEC)	°C	0~1700	—	0~1755	—
	°F	32~3100	—	32~3192	—
N (JIS/IEC)	°C	0~1300	0.0~999.9	0~1335	0.0~999.9
	°F	32~2372	—	32~2435	—
B (JIS/IEC)	°C	0~1800	—	-20~1820	—
	°F	32~3270	—	-4~3300	—

R.T.D.		Setting range		Display range	
		None decimal point	Decimal point	None decimal point	Decimal point
Pt 100 (JIS/IEC)	°C	-199~500	-199.9~500.0	-199~539	-199.9~539.1
	°F	-199~950	-199.9~950.0	-199~999	-199.9~999.9
JPt 100 (JIS)	°C	-199~500	-199.9~500.0	-199~529	-199.9~529.0
	°F	-199~950	-199.9~950.0	-199~984	-199.9~984.4

Event Output Mode

Kind of PV contact output

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 function

0	None
1	Holding
2	Awaiting sequenee
3	Awaiting sequence
4	Holding and awaiting sequence
5	Holding and abnormal Process value(PV)
6	Awaiting sequence and abnormal Process value(PV)
7	Holding and awaiting sequence plus abnormal Process value(PV)

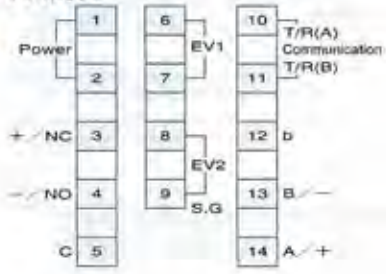
When PV contact output function mode is 0, only selectable 0, 1, 2, and 4.
Unusual contact output mode is 4, only selectable 0.

Time signal output

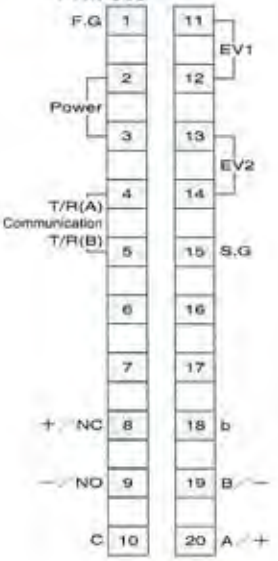
1	ON-delay/OFF-delay after start of stepping	Set for each step.
2	ON-delay/OFF-delay after start of stepping	Common to all steps.
3	ON time after start of stepping	Set for each step.
4	ON time after start of stepping	Common to all steps.
5	ON in wait zome	
6	ON time after reaching wait zome	Set for each step.
7	ON time after reaching wait zome	Common to all steps.

Terminals

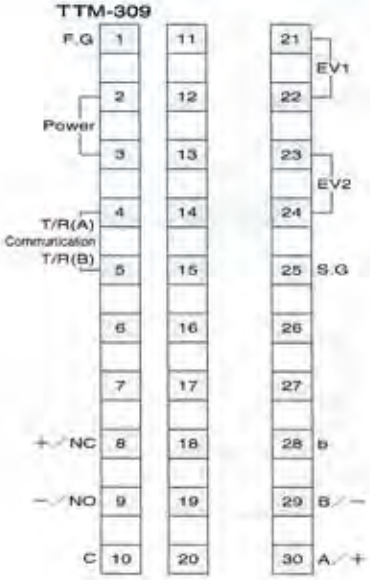
TTM-304



TTM-305



TTM-309

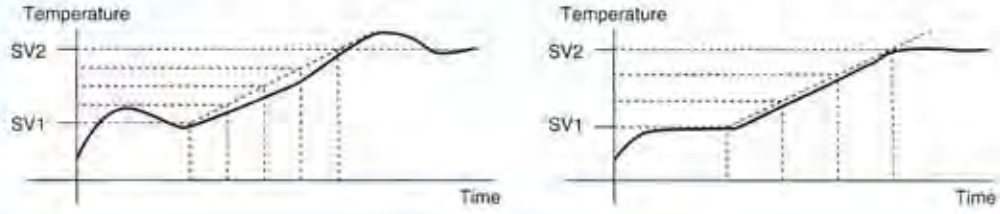


F.G	Connect to ground	EV1, 2	Output at normally open contact
RUN	No polarity	R.T.D. Input	Connect the terminals A, B, and b.
Communication	Connect T/R(A) and T/R(B) terminals correctly. (Be necessary for transducer except RS-485.)	Thermocouple, Input	Connect to polarity (+, -).
		Power	Power connect
SG	Use as a signal for communication.	NC	See relay output
Relay output	C: Common NO: Normal open NC: Normal close	NO	See relay output
SSR drive	Connect to + and - of INPUT on SSR side directly.	C	See relay output

■FUNCTION

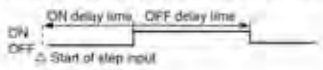
●Fuzzy PID

To reduce overshoot and undershoot and to shorten preparing time, fuzzy has been applied.
As a result and together with PID operation, control closer to the set pattern is achieved while correcting MV (the manipulated variable).
The effect of fuzzy operation on MV can be adjusted by "fuzzy (FUZ)" of the parameters. (Approx. ±20 to ±70% of MV)

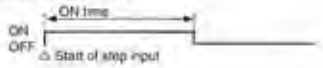


●Time signal and action

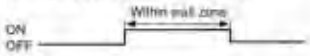
Time signal 1 and 2
(Setting of ON/OFF delay after starting step input)



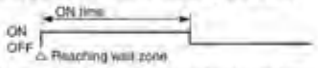
Time signal 3 and 4
(Setting of ON time)



Time signal 5
(ON during the period within wait zone)

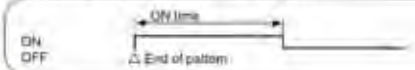


Time signal 6 and 7
(Setting of ON time after reaching wait zone)



ON/OFF time, ON/OFF delay time can be set for each step.
TO set the same time for each step is also possible.

●End signal and action



●Setting of pattern step

The pattern steps can be set up to 64 steps expressed in product of numbers of patterns and steps.

For example, 64 patterns×1 step,
8 patterns×8 steps,
14 patterns×4 steps, etc,

●Blind function

●Example of indication of pattern when setting parameters.

The blind function can be applied to all unlocked parameters.

The screens of the blind function is not indicated after the setting. (The blinding can be released.) The function is usable to protect the parameters from being changed by the operator.

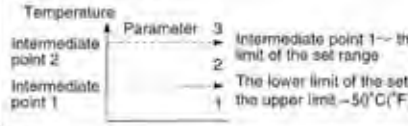
●Wait action

When the process value (PV) does not reach the wait zone (or overshoots beyond the wait zone) after elapse of the measuring time in the process of transition from certain step to the next step, the next step is not started. However, transition to the next step occurs after the wait time elapses.

Example of operation

●Auto-tuning

The PID parameters are classified into three groups depending on the set temperature range. Accordingly, the auto-tuning is performed three times to determine the three parameters. It is possible to set each point individually and also to set three points con-tinuously by one operation.



●Actions when applying power (after recovery from power failure)

RESET START or CONTINUOUS START can be selected by the key on the front panel.

RESET START : Started up in the RESET mode and the operation is started by the key on the front panel or signal input.

CONTINUOUS START :

●"Deviation ≦ ±10℃(18℉)" : The operation is started at the state of the program operation when power is shut off.

●"Deviation ≧ ±10℃(18℉)" : The same as in the RESET mode.

●PV start and SV start

SV start : Operation is started at the specified measured value (SV) toward the set value (SV) of step 1 in the set time of the step.

PV start : Operation is started at the ramp (up or down) step which includes the process value (PV) at the time of start of program operation. The set value (SV) at the RUN start = the process value (PV).
When two steps are applicable, the step of smaller step number is applied.

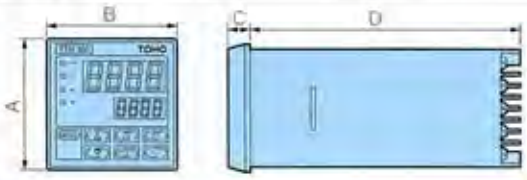
■Ordering Information

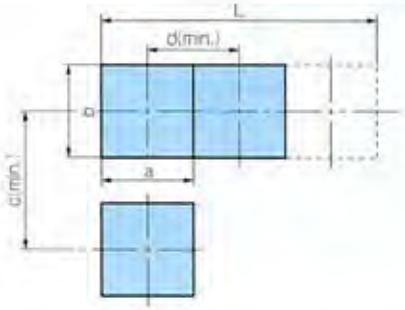
TTM–3 [Model] – [Input] – [Output] – [Options] – [Power]

Model	04	48×48mm	
	05	96×48mm	
	09	96×96mm	
Input	0	Thermocouple (K, J, T, R, N, B)	Selectable by key on front panel
	1	Resistance thermometer (Pt100, JPt100)	Selectable by key on front panel
Output	N	None	
	R	Relay contact	
	P	SSR drive voltage 12 VDC	
	F	Voltage 1 to 5 VDC	
	G	Voltage 0 to 10 VDC	
	I	Current 4 to 20 mA DC	
Options-6 digits When selecting options, see "Optional function". There are some options which cannot be selected at the same time.	A	EV1 Event output relay	
	B	EV2 Event output relay	
	E	RUN signal input	
	M	Communication RS-485	
Power		85 to 264 VAC	
	24	24 VAC/DC (Special factory option)	

Referring to the specifications, please order according to this table.

■Dimensions





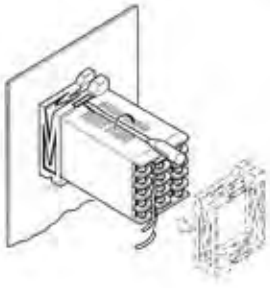
Dimensions

Type	A	B	C	D	a	b	c	d
TTM-304	48	48	8	100	$45^{+0.6}_{-0}$	$45^{+0.6}_{-0}$	60	48
TTM-305	96	48	11	80	$45^{+0.6}_{-0}$	$92^{+0.8}_{-0}$	120	48
TTM-309	96	96	11	80	$92^{+0.8}_{-0}$	$92^{+0.8}_{-0}$	120	96

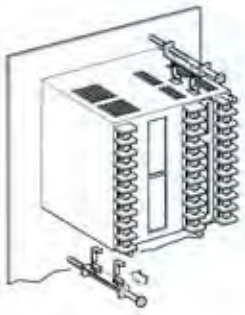
※In case of installing multiple units, L = (dxN-3)$^{+1}_{0}$
When you use compressed lead wire on installing multiple units, please be careful sufficiently not to touch the other lead wire.

■Installing Panel

●TTM-304
In case of TTM-304 with option, fasten lead wire as it is at connecting to center it. Please be careful sufficiently not to touch the other lead wire.



●TTM-305, 309
Please put mounting nut in square hole of case as direction to an arrow mark, then fasten it by driver. To fasten too tightly change case shape, be so careful.



●Specifications are subject to change without notice.
Note: The color printed in this catalog may be different from actual color.

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