TOHO

TTM-339

TTM-339

PROGRAM CONTROLLER

TTM-339

TOHO ELECTRONICS INC.

PROGRAM CONTROLLER TTM-339

COMPACT SIZE PROGRAM CONTROLLER WITH HIGH FUNCTIONALITY AND HIGH PERFORMANCE

● **Program Controller Specifications**

A liquid crystal display program controller with maximum of 15 patterns and 99 steps.

● **Full Multiple Inputs**

The multiple inputs of Thermocouple (13 types)・RTD (2 types)・Voltage (5 types)・Current (1 type) input

● **Utilizes a liquid crystal display**

① The indication range has been extended to 5 digits
② Realized the various indication with 7 segments
③ Adopted LED for the back light

● **Backup and Initialization for the Setting Value.**

● **Compact Size**

A compact sized body with depth of only 65mm. In addition, the protrusion of the front panel is only 2mm when TTM-339 is mounted.

● **Loader communication function**

It is best for the set up work of a complicated parameter peculiar to the program controller.
・Cable : Option (sold separately)
・Software : Option (free) ··· it can be downloaded from our website
(Under development).

● **Blind function**

The system can be configured so that only the selected parameters are displayed from the set of parameters.

● **Manual control**

A manual output function enables application of various instrumentation systems.

● **Communication function
(RS485: TOHO exclusive protocol / MODBUS)**

The cable can be extended up to the length of 500m, and can connect up to 31 units simultaneously. With one host computer, a centralized control such as "The collection of all data" and "Change of respective setting value" are possible from a distance place.

Front Panel
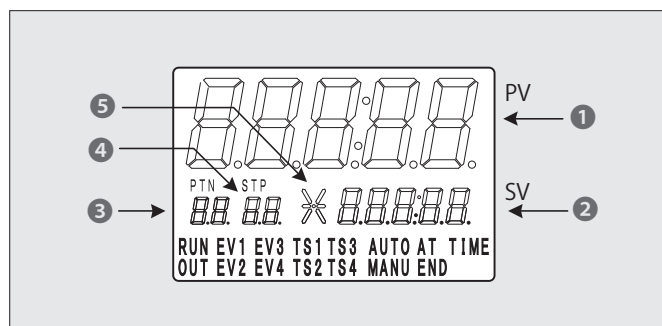
Lamp character	Explanation
PTN	Lights while the Pattern is displayed
STP	Lights while the Step is displayed
RUN	Lights while the Program is in operation
OUT	Lights while the Heating Output is turned ON
EV1	Lights while EV1 is turned ON
EV2	Lights while EV2 is turned ON
EV3	Lights while EV3 is turned ON
EV4	Lights while EV4 is turned ON
TS1	Lights while Time Signal 1 is turned ON
TS2	Lights while Time Signal 2 is turned ON
TS3	Lights while Time Signal 3 is turned ON
TS4	Lights while Time Signal 4 is turned ON
AUTO	Lights while the Auto is in operation
MANU	Lights while the Manual is in operation
AT	Lights in Auto-Tuning
END	Lights while the output is turned ON in using End Signal
TIME	Lights while Time is set.

NO	Segment	Explanation
❶	PV (5 digits)	Displays PV, etc.
❷	SV (5 digits)	Displays SV, etc. 0-fixed during pause. While the timer is in operation, 「TIME」is displayed.
❸	Pattern (Lower case 2-digits Left)	Displays a pattern number currently selected.
❹	Step digits (Lower case 2-digits Right)	Pause: Displays a step number of the pattern currently selected. In operation: Displays a step number which is performing now
❺	Operation condition (Lower case Center 6-SEG)	Displays a program operation condition

Name of key switch	Explanation
❶ Run/Hold key	Used for Run/Stop and Pause, etc.
❷ Indication switch key	Used to change the indication, etc.
❸ Digit move key	Moves setting digits leftward during the setting
❹ Auto/Manual key	Switches AUTO/MANU
❺ Reset key	Used for the screen reverse travel, etc.
❻ Selection key	Used for the selection of the setting items
❼ ▽ key	Used for decreasing the values, etc.
❽ △ key	Used for increasing the values, etc.

Standard Specifications

Input type (Multiple inputs)	Thermocouple	K, J, T, E, R, S, B, N, U, L, WRe5-26, PR40-20, PLⅡ		
	RTD	Pt100, JPt100 (External resistance10Ω or less per cable, three cables must have the same resistance)		
	Current/Voltage	4 to 20mADC (Input resistance 250Ω), 0 to 1VDC, 0 to 5VDC, 1 to 5VDC, 0 to 10VDC, 0 to 10mVDC (Input resistance 1MΩ or more)		
Indication (LCD indication)	PV (Process Value) indication	LCD indication (with LED back light, emission colors are Red, Green and Orange), 5 digits, character height 20mm		
	SV (Setting Value) indication	LCD indication (with LED back light, emission color is Red), 5 digits, character height 8mm		
	Status indication part	LCD indication (with LED back light, emission color is Red), 1 digit, indication height 8mm		
	Pattern indication part	LCD indication (with LED back light, emission color is Green), 2 digits, character height 6mm		
	Step indication Part	LCD indication (with LED back light, emission color is Green), 2 digits, character height 6mm		
	Each function indication	LCD indication Red (RUN, OUT, EV1, EV2, EV3, EV4, TS1, TS2, TS3, TS4, TIME, AUTO, MANU, AT, END) Green (PTN, STP)		
Control	PID (With auto-tuning)	Proportional band (P1, P2, P3)	0.1 to 200.0% of set limiter span (Low/Medium/High temperature)	
		Integration time (I1, I2, I3)	0 to 3600 sec (0: OFF) (Low/Medium/High temperature)	
		Differentiation time (D1, D2, D3)	0 to 3600 sec (0: OFF) (Low/Medium/High temperature)	
		Proportion cycle (T1, T2)	0.1 to 120.0 sec	
	Dead band (DB)	Temperature input	−999.9 to 999.9 or −999～999（℃）	
		Analog input	−9999 to 9999 (digit) (The decimal point position is the specified position.)	
	ON/OFF	Sensitivity (C1,C2)	Temperature input	0.0 to 999.9, 0 to 999（℃）
			Analog input	0 to 9999 (digit) (The decimal point position is the specified position.)
		OFF point position selection setting	SV unit setting High/ Medium/Low	
		OFF point position	Temperature input	−999.9 to 999.9, −999 to 999（℃）
			Analog input	−9999 to 9999 (digit) (The decimal point position is the specified position.)
	Setting of normal motion/ reverse motion	Reverse motion (heating)		
		Normal motion (cooling)		
Control output	Relay contact output (OUT 1 only)	250VAC 3A (Resistance load), 1a contact, minimum load 5V, 100mA		
	SSR drive voltage (OUT 1, OUT 2 selectable)	0 to 12VDC (Load resistance 600Ω or more), output voltage accuracy ±1V (23℃±10℃), leak current 21μA or less (when output is turned OFF)		
	Current (OUT 2 only)	4 to 20mADC (Load resistance 600Ω or less), output accuracy FS±0.3% (23℃±10℃), leak current 21μA or less (when output is turned OFF)		
Auxiliary output	Open collector (6 points)	26.4VDC 100mA (MAX)		
		Output name TS1 to 4, TIME, EV4		
	Relay contact (4 points)	250VAC 1A (Resistance load) 1a contact		
		Output name EV1 to 3, END		
	Setting range (Upper and Lower limit)	Temperature input	−1999.9 to 2999.9, −1999 to 2999（℃）	
			However, thermocouples R, S, B, WRe5-26 and PR40-20 are −1999 to 9999（℃）	
		Analog input	−19999 to 29999 (digit)	
	Sensitivity setting	Temperature input	0.0 to 999.9, 0 to 999（℃）	
		Analog input	0 to 9999 (digit)	
	Polarity setting	Normal open, Normal close		
Sampling cycle		0.2 sec		
Measurement accuracy	Thermocouple	K, J, T, E, R , B, N, S	Either ±(0.3% +1 digit) of process value or ±2℃ , whichever is bigger (23℃±10℃). However, ±3℃ between −100 to 0℃ , ±4℃ between −200 to −100℃ There is no accuracy specified below 400℃ for B-Thermocouple.	
		U, L	Either ±(0.3% +1 digit) of process value or ±4℃, whichever is bigger. However, ±6℃ for less than 0℃.	
		WRe5-26	Either ±(0.6% +1 digit) of process value or ±4℃, whichever is bigger.	
		PR40-20	±9.4℃±1 digit. There is no accuracy specified below 800℃	
		PLⅡ	Either ±(0.3% +1 digit) of process value or ±2℃, whichever is bigger.	
	RTD	Pt100, JPt100	Either ±(0.3% +1 digit) of process value or ±0.9℃, whichever is bigger (23℃±10℃).	
	Current・Voltage	0 to 1VDC, 0to 5VDC, 1 to 5VDC, 0 to10VDC, 4 to20mADC	±0.3% of FS±1 digit (23℃±10℃)	
		0 to 10mVDC	±0.5% of FS±1 digit (23℃±10℃)	
Memory element		EEPROM		
Input power supply		100 to 240VAC 50/60Hz (Permissible voltage range is 85 to 110%)		
Weight		300g or less		
Power consumption		10VA or less		
Accessories		Instruction manual, metal attachment		
Standard range of ambient temperature humidity (Compensating range such as accuracy)		23℃±10℃ , 45 to 75% RH		
Usable range of ambient temperature humidity		0 to 50℃ , 20 to 90% RH (No condensation)		
Storage range of ambient temperature humidity		−20 to 70℃ (No freezing and condensation), 5 to 95% RH (No condensation)		
Function	Program specifications	Pattern numbers	1 to 15	
		Step numbers	1 to 99 (Maximum value changes depending on selected pattern numbers)	
		Wait function setting (1 to 4 common)	Wait zone setting	Temperature input	0.0 to 999.9, 0 to 999（℃）
				Analog input	0 to 9999（digit）
			Wait time setting	0 to 99 hrs 59 min
		End signal ON time	0 to 99 hrs 59 min	
		Time signal function setting (1 to 4 common)	ON delay timer	0 to 99 hrs 59 min
			OFF delay timer	0 to 99 hrs 59 min
		PID setting	Memory points 3points (Low/Medium/High temperature)	
		PID range setting	Low temperature (PID No1): [Minimum value of setting temperature range (SLL)] to [Intermediate point 1 (PM1)]	
			Medium temperature (PID No2): [Intermediate point1 (PM1)] to [Intermediate point2 (PM2)]	
			High temperature (PID No3): [Intermediate point2 (PM2)] to [Maximum value of setting temperature range (SLH)]	
		Intermediate point setting	Intermediate point1 setting= [Minimum value of setting temperature range] to [Maximum value of setting temperature range-5.0℃]	
			Intermediate point2 setting＝[Setting value of intermediate point1] to [Maximum value of setting temperature range]	
		PV start/SV start selection	PV start/SV start switchable	
			Start temperature setting when SV start	Temperature input	SLL to SLH（℃）
				Analog input	SLL to SLH (digit)

Standard Specifications

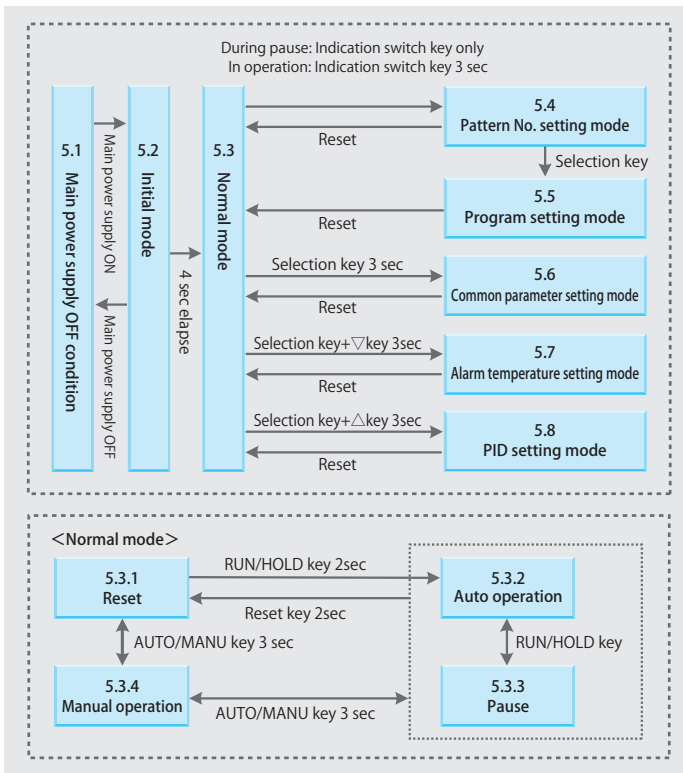|					
Function	Program specifications		Output in operation/End signal output selectable and configurable		
		External drive signal selection	Internal operation, external operation		
		Temperature range setting for power failure recovery	Temperature input	0.0 to 2999.9, 0 to 2999（℃）	
			Analog input	0 to 2999 (digit)	
	Timer specifications	Setting unit	1 min		
		Setting time	0 to 99 hrs 59 min		
		Setting accuracy	±(0.5% +0.5 sec) of setting time		
	Manipulated variable	Manipulated variable function selection (MLF)	None, Manipulated variable limiter, manipulated variable current limiter		
		Manipulated variable limiter	Upper limit (MLH1 to MLH4)	MLL1 to 100.0 (%) , MLL2 to 100.0 (%)	
				MLL3 to 100.0 (%) , MLL4 to 100.0 (%)	
			Lower limit (MLL1 to MLL4)	0.0 to MLL1 (%) , 0.0 to MLL2 (%)	
				0.0 to MLL3 (%) , 0.0 to MLL4 (%)	
		Manipulated variable change limiter rise	Percentage of rise for manipulated variable	0.0 to 549.9 (%) (0.0% : function OFF)	
			Rise time of manipulated variable	0 to 3600 (sec) (0: function is none)	
	Setting limiter (SLL), (SLH)	Upper limit (SLH)	Temperature input	(SLL+5.0) to SV setting range upper limit, (SLL+5) to SV setting range upper limit（℃）	
			Analog input	(SLL+50) to SV setting range upper limit (digit)	
		Lower limit (SLL)	Temperature input	SV setting range lower limit to (SLH-5.0), SV setting range lower limit to (SLH-5)（℃）	
			Analog input	SV setting range lower limit to (SLH-50) (digit)	
	Scaling setting (Analog input only)	Upper limit (FSH1)	FSL1 to 29999 (digit)		
		Lower limit (FSL1)	−19999 to FSH1 (digit)		
	Control type (CNT)	PID control, ON/OFF control			
	PV correction gain setting (PVG)	0.500 to 2.000 (times)			
	PV correction zero setting (PVS)	Temperature input	−999.9 to 999.9, −999 to 999（℃）		
		Analog input	−9999 to 9999 (digit)		
	PV filter setting (PDF1)	0.0 to 99.9 (sec)			
	Special PV filter setting (PDFS)	0.0 to 99.9 (sec)			
	Anti reset windup	0.0 to 110.0（%）(Function OFF by 110.0% setting)			
	Manual reset	0.0 to 100.0（%）(−100.0 to 100.0（%）if there is auxiliary control)			
	Main control loop abnormal	PV variation setting	Temperature input	0.0 to 999.9, 0 to 999（℃）	
			Analog input	0 to 9999 (digit) (The decimal point position is the specified position.)	
		Time setting	0 to 3600 (sec)		
	Decimal point position setting (DP)	Temperature input	1℃ , 0.1℃		
		Analog input	1/digit, 0.1/digit,0.01/digit, 0.001/digit, 0.0001/digit		
	Lock function (LOC)	Normal screen, pattern No. setting mode, alarm temperature setting mode, PID setting mode, common parameter setting mode (SET1 to 12), setting temperature (all steps at one time), wait function setting (all steps at one time), time signal 1 to 4 function setting (all steps at one time), manipulated variable limiter function setting (all steps at one time), setting time (all steps at one time), end signal ON time			

Option specifications

DI input	Number of input point	7 points
	Input specification	No voltage contact
	Function	Run/Reset, Hold, Step advance, pattern selection
	Minimum input time	200 mS
	When ON current	Maximum 6 mADC
	When OFF voltage	Maximum 6 VDC

CT input	Number of input point	1 point
	Measurement current range	0.0 to 50.0 A
	Setting current range	0.0 to 30.0 A
	Setting resolution	0.1 A
	Setting accuracy	±5% of full span (1.0 A or less is outside accuracy)
	Current limit setting	Memory points 20 points

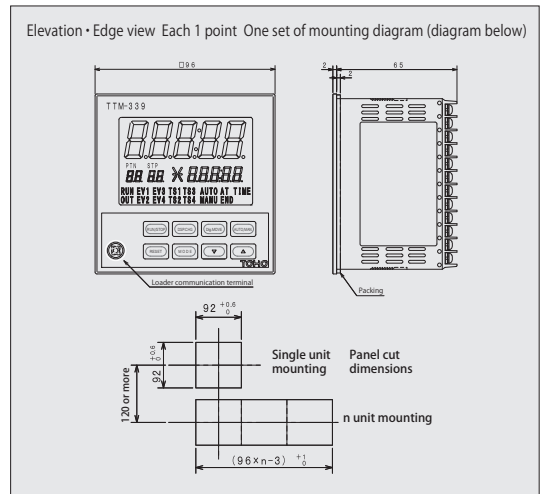|		Communication	Loader communication
Commu-nication	Communication standard	RS-485 (1:10) Normal communication, Communication between the main unit and the sub-units. (The main unit-sub unit communication under development)	TTL（1:1）
	Communication terminal	RS-485 exclusive terminal	Loader communication exclusive terminal
	Protocol	TOHO protocol, MODBUS protocol (RTU mode), MODBUS protocol (ASCII mode)	TOHO protocol
	Direction of information	Half duplex	Half duplex
	Synchronous system	Asynchronous	Asynchronous
	Transmission code	ASCII	ASCII
	Interface	RS-485 (two lines)	TTL level
	Communication speed	2400/4800/9600/19200/38400 bps	2400/4800/9600/19200/38400 bps
	Communication distance	500 m	
	Response delay time	0 to 250 mS	0 to 250 mS
	Communication switch setting	Write protect, write enable	
	Character	Start bit: 1 bit fixed	Start bit: 1 bit fixed
		Stop bit: 1/2 bit	Stop bit: 1/2 bit
		Data length: 7/8 bit	Data length: 7/8 bit
		MODBUS: ASCII⋯7 bit fixed	
		MODBUS: RTU⋯8 bit fixed	
		Parity: None/Odd number/Even number	Parity: None/Odd number/Even number
		BCC check: No/Yes	BCC check: No/Yes
		Address: TOHO 1 to 99 (stations) MODBUS 1 to 247 (stations)	Address: 1 to 99 stations

Operation flow

During pause: Indication switch key only
In operation: Indication switch key 3 sec

5.1 Main power supply OFF condition

Main power supply ON → Main power supply OFF

5.2 Initial mode

4 sec elapse

5.3 Normal mode

Reset ← → **5.4** Pattern No. setting mode

Selection key

Reset ← → **5.5** Program setting mode

Selection key 3 sec / Reset ← → **5.6** Common parameter setting mode

Selection key+▽key 3sec / Reset ← → **5.7** Alarm temperature setting mode

Selection key+△key 3sec / Reset ← → **5.8** PID setting mode

＜Normal mode＞

5.3.1 Reset ← RUN/HOLD key 2sec — Reset key 2sec → **5.3.2** Auto operation

AUTO/MANU key 3 sec ↕ — ↕ RUN/HOLD key

5.3.4 Manual operation ← AUTO/MANU key 3 sec → **5.3.3** Pause

Input and scale range

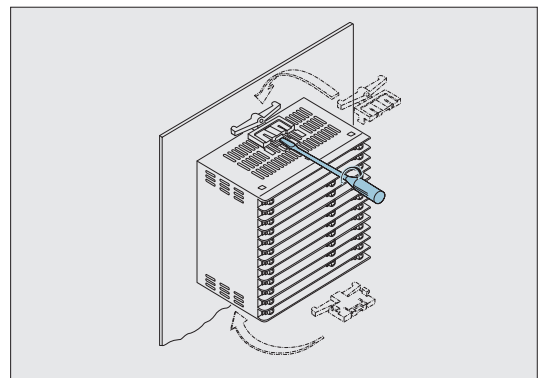| Input type			Measurement/Setting Range	Indication resolution
Thermo-couple	K	℃	−200.0 to +1372.0	1℃ /0.1℃
	J	℃	−200.0 to +1200.0	
	T	℃	−200.0 to +400.0	
	E	℃	−200.0 to +1000.0	
	R	℃	−50 to +1768	1℃
	S	℃	−50 to +1768	
	B	℃	0 to 1800	
	N	℃	−200.0 to +1300.0	1℃ / 0.1℃
	U	℃	−200.0 to +400.0	
	L	℃	−200.0 to +900.0	
	PR40-20	℃	0 to 1880	1℃
	WRe5-26	℃	0 to 2300	
	PL II	℃	0.0 to 1390.0	
RTD	Pt100	℃	−200.0 to +850.0	1℃ / 0.1℃
	JPt100	℃	−200.0 to +510.0	
Voltage	0 to 1VDC		−19999 to +29999 Indication width is 20000 or less	A decimal point position can be changed at random.
	0 to 5VDC			
	1 to 5VDC			
	0 to 10VDC			
	0 to 10mVDC			
Current	4 to 20mADC			

Terminal connection diagram

Power	1	
	2	
Not used	3	
OUT1 Relay/SSR drive voltage output	−	4
	+	5
OUT2 SSR drive/4 to 20mADC output	−	6
	+	7
Not used	8	
Relay contact output	EV1	9
	EV2	10
	EV3	11
	COM	12

X	A	Communication (RS-485)
25	B	
26	Pattern1	DI input
27	Pattern2	
28	Pattern3	
29	Pattern4	
30	RUN/RDY	
31	Operation switching	
32	Step advance	
33	COM	
34	END	Relay contact output
Y	COM	

13	+	EV4	Open collector output
14	+	TS1	
15	+	TS2	
16	+	TS3	
17	+	TS4	
18	+	TIME	
19	−	COM	
20			CT input
21			
22			Sensor input (See diagram below)
23			
24			

22	b	22		22	+
23	B	23	−	23	−
24	A	24	+	24	
RTD		TC/10mV		Current/Voltage	

Panel Cut & Dimensions

Elevation・Edge view Each 1 point One set of mounting diagram (diagram below)

TTM-339

PTN STP

RUN EV1 EV3 TS1 TS3 AUTO AT TIME
OUT EV2 EV4 TS2 TS4 MANU END

Loader communication terminal

Packing

Single unit mounting / Panel cut dimensions

n unit mounting

(96×n−3)

Panel installation

Contact output

Event function 1 (4 points)

Function		Additional function	
0	None	0	None
1	Deviation upper and lower limit	1	Hold
2	Deviation upper limit	2	Wait
3	Deviation lower limit	3	Hold + Wait
4	Deviation range		
5	Absolute value upper and lower limit		
6	Absolute value upper limit		
7	Absolute value lower limit		
8	Absolute value range		

Event function (Loop Abnormal)

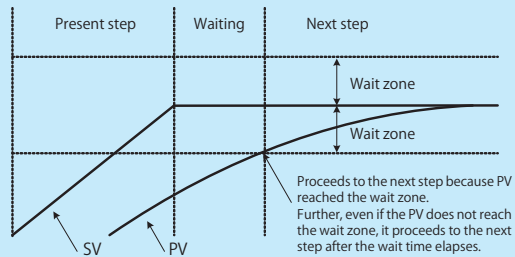| Function	
0	None
1	Exist
Additional function	
0	None
1	Hold

● Wait function

It is a function to wait for the time course of the next step when PV doesn't reach the wait zone after the transition from the present step to the next step.
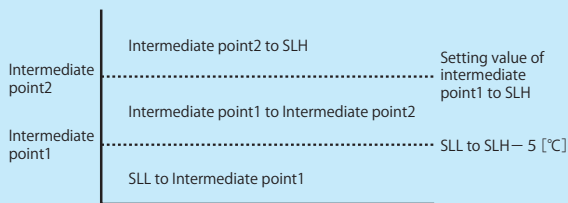Waits until the maximum wait time.
The different wait conditions can be set by selecting the wait functions 1 to 4.
When it is set to "0", the wait continues until PV exceeds SV.

Present step | Waiting | Next step

Wait zone

Wait zone

Proceeds to the next step because PV reached the wait zone.
Further, even if the PV does not reach the wait zone, it proceeds to the next step after the wait time elapses.

SV   PV

● Auto-tuning function

The auto-tuning starts at each point of Low/Medium/High temperature. The temperature, to which the auto-tuning is performed, is set on the respective start screen and the auto-tuning is started by pressing the RUN/HOLD key. AT-1 (～3)/PV is alternately indicated on the PV display digits during the auto-tuning.
The auto-tuning is stopped by pressing the RUN/HOLD key again.

Intermediate point2 to SLH

Intermediate point2

Setting value of intermediate point1 to SLH

Intermediate point1 to Intermediate point2

Intermediate point1

SLL to SLH－ 5 [℃]

SLL to Intermediate point1

● PV start/SV start

PV start The operation starts at the ramp step of the rising slope which includes the measurement temperature. In addition, the operation starts from the elapsed time, assuming that the time has elapsed until the start point. The start point is calculated from 0℃ /0 digit. The operation is started by the elapsed time 0 minutes if below 0℃ /0 digit.

SV start The program operation starts according to the PV start temperature setting.
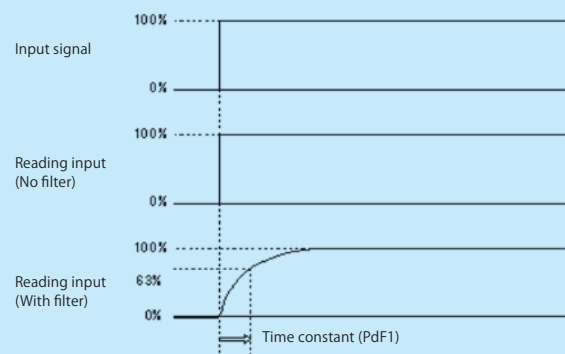
● Digital PV filter

It is a function to realize the CR filter effect on the software by performing primary delay operation to PV of input 1. The effect of the filter can be set by the time constant. (Time constant is the time it takes for the PV value to reach up to about 63% when the input changes in step pattern.)
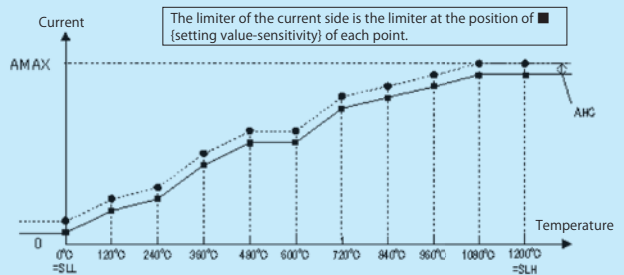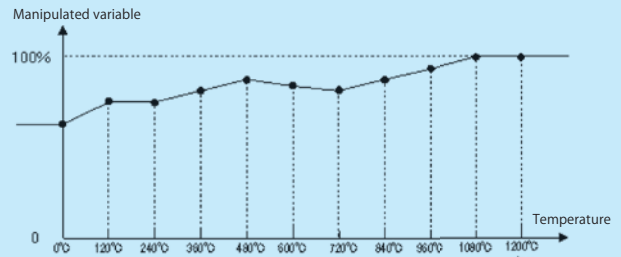※CR filter⋯Primary delay filter
The use of Digital PV filter：
①Removal of high frequency noise⋯The noise effect is minimized when the electrical noise is added to input.
②A response can be delayed against the sudden change of the input.

Input signal

100%

0%

Reading input (No filter)

100%

0%

Reading input (With filter)

100%
63%
0%

Time constant (PdF1)

● Manipulated variable current limiter

This function divides SLL to SLH into 10 segments and performs the manipulated variable limit and current value limit at respective points. The limit of manipulated variable is performed by calculation result in the manipulated limiter points 1 to 11. In the current limiter points 1 to 11, if the measurement current value exceeds the (setting value-current limiter sensitivity) of respective points, the manipulated variable at the current value limiter point is computed from the measured current value and the present manipulated variable, and the manipulated variable limit is performed from the computed manipulated variable. This manipulated variable changes every time the current value is measured. And, the final manipulated variable performs the limit by the smaller one of the two above.


Manipulated variable

100%

0
0℃ =SLL 120℃ 240℃ 360℃ 480℃ 600℃ 720℃ 840℃ 960℃ 1080℃ 1200℃ =SLH

Temperature

The limiter of the current side is the limiter at the position of ■ {setting value-sensitivity} of each point.

Current

AMAX

AHC

0
0℃ =SLL 120℃ 240℃ 360℃ 480℃ 600℃ 720℃ 840℃ 960℃ 1080℃ 1200℃ =SLH

Temperature

・Calculated by the manipulated variable and the current value of SLL in case the input is below the table range
・Calculated by the manipulated variable and the current value of SLH in case the input is over the table range

e.g.) When the various settings and PV are as follows.
PV＝120℃, manipulated variable limiter point 2＝75.0%, current value limiter point 2＝75A, present manipulated variable＝60 %, AMAX＝200A (equivalent to 0 to 5.0A), AHC＝10A
〈When measurement current value＝100A〉
The manipulated variable of the current value limiter point 2 (75A)-the current limiter sensitivity (10A) is calculated by the interaction between 0 to the present manipulated variable (60.0%)＝0 to measurement current value (100A). The manipulated variable is 45.0 % according to the calculation.

Current

100A

0A
0%   60.0%

Manipulated variable

Current

100A

(75A-10A =) 65 A

0A
0%   45.0% 60.0%

Manipulated variable
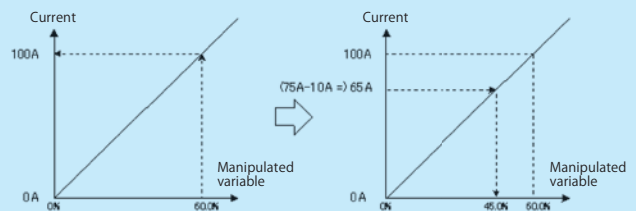
● Pattern/Step setting
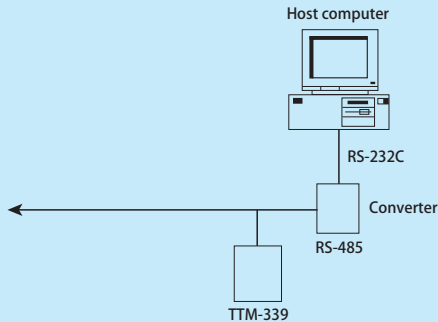
The following fixed step numbers are set by the pattern numbers about step numbers.

Pattern number	Step number
When 1 is selected	99 steps
When 2 is selected	49 steps
When 3 is selected	33 steps
When 4 is selected	24 steps
When 5 is selected	19 steps
When 6 is selected	16 steps
When 7 is selected	14 steps
When 8 is selected	12 steps

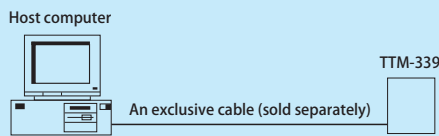| Pattern number	Step number
When 9 is selected	11 steps
When 10 is selected	9 steps
When 11 is selected	9 steps
When 12 is selected	8 steps
When 13 is selected	7 steps
When 14 is selected	7 steps
When 15 is selected	6 steps

● Communication function (inclusive of Loader Communication)

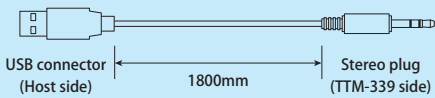### A connection example with the personal computer

Centralized supervision with the personal computer would be possible with the connection like the chart below.

Host computer

RS-232C

Converter

RS-485

TTM-339

Loader communication

Host computer

TTM-339

An exclusive cable (sold separately)

※Loader cable specification
[Appearance and structure]

USB connector
(Host side)

1800mm

Stereo plug
(TTM-339 side)

[Standard and performance]

USB I/F standard	USB Specification 2.0 Compliant
DTE (Personal computer side) speed	Up to 38400bps
Connector specification	Personal computer side: USB
	Temperature Controller side: φ 2.5mm Stereo plug

[Model]
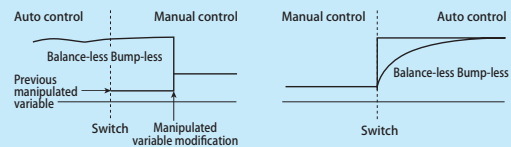TTM-LOADER

● Power failure function

In the event of power failure during which the unit had been in operation, the setting of the unit can be restored back to the time right before the power failure but on the following condition. However, if the PV at the time of recovery is outside the range of PV±Power Failure Recovery Temperature, operation will be in stop condition when it recovers. The alarm condition of Event function will be also restored back to the time right before the power failure.
1) When step 1 is in timer operation condition (SV=SLL) → Restores up to the point when the power failure occurred
2) During the ramp of SV increase or in soak → Restores with PV start Restores with the operation-end "END" when there is no SV.
3) During the ramp of SV decrease or while in soak after decrease → PV＞Restores with PV start in the decreasing step in case of the decreasing point. PV≦Restores with the operation-end "END" in case of the decreasing point
4) While in End → Restores to END
5) Restores with pause when the power failure occurred during pause while in conditions mentioned in 1) to 3)
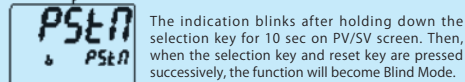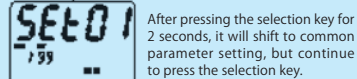6) When in manual operation → Restores with stop condition.
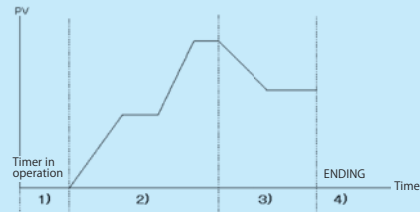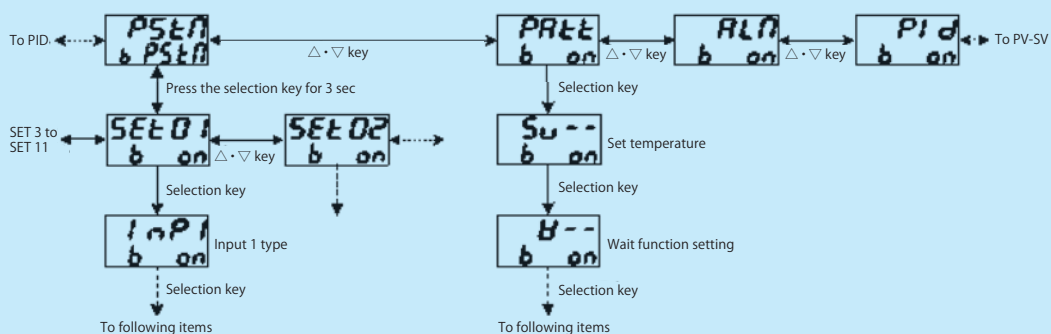
● Auto operation (AUTO)/Manual operation (MANU)

The auto control and the manual control can be switched with the front key. Manual operation is a function in which the control output (manipulated variable) can be set and output the power manually regardless of the deviation condition. The system can be operated manually when performing operation check of the control-end (valve, heater, etc.) during the system trial run, or when normal control cannot be done due to sensor trouble, etc. Further, the switching can be done at ease as it is equipped with Balance-less Bump-less function which suppresses the sudden change of control output when switching the automatic control and manual control reciprocally and also prevents damage on the peripheral equipment as a result of sudden change and adverse effect to a control system.

● Blind function

Press the selection key

After pressing the selection key for 2 seconds, it will shift to common parameter setting, but continue to press the selection key.

The indication blinks after holding down the selection key for 10 sec on PV/SV screen. Then, when the selection key and reset key are pressed successively, the function will become Blind Mode.

① The indication blinks after holding down the selection key for 10 sec on PV/SV screen. Then, when the selection key and reset key are pressed successively, the function will become Blind Mode.
② In the BLIND MODE, either "ON" or "OFF" will be displayed on under each characters (SV display portion). "ON" is "Display", "OFF" is "None-Display" (Blind). However, as for the PV/SV screen, the elapsed time screen and the manipulated variable screen, the setting shall be all at one time.
③ To change characters in BLIND MODE, press the indication switch key.
④ To end the Blind Setting Mode, either put off the power or press selection key for 10 seconds over the PV/SV screen.

To PID

Press the selection key for 3 sec

SET 3 to SET 11

Selection key

Selection key

To following items

Set temperature

Selection key

Wait function setting

Selection key

To following items

Input 1 type

△・▽ key

To PV-SV

● Time signal output

When each steps start, and after the ON delay timer is lapsed, the time signal output 1 to 4 are turned ON. Next, the output is turned OFF after the OFF delay timer is lapsed. The corresponding TS1 to TS4 lamps light when each time signal output is turned ON.

The function selections 0 to 5 of TS1 to TS4 are selected at each step, the above mentioned operation is performed by setting value in case of 1 to 4, the function is none when 0 is selected, the time signal output is always turned ON in the selection step when 5 is selected.

The output is returned till the returned point when the time is returned by △・▽ key after the time course, and then the count is started from that point. (It's from the halfway.)

e.g.) After 3 minutes from the time the OFF delay ends, the output is turned ON and the OFF delay is counted for 2 minutes when the elapsed time is reversed 5 minutes back by ▽key.
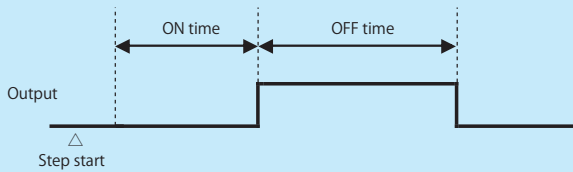
● OFF point position movement of ON/OFF control

When the OFF point position movement is set to 0, the OFF point is the set value position.
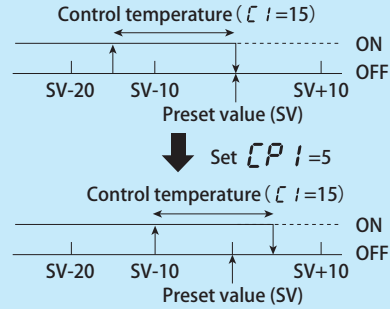
This is when off point position movement is set up with (+5).
In the actual specification, there is no description change as above, but move above equal to (+5) as a position of ON/OFF.
When moved to negative side, the OFF point moves to opposite side to description above.

● Signal output during operation/End signal output function

Signal output during operation
The relay output as the "signal output during operation" is always turned ON while in operation.

End signal output
The output as the End signal output is turned ON/OFF by the following flow when the program operation ends. The output is turned ON till 5.3.1 reset condition when the End signal ON time is set beyond the maximum of setting range (「-----」 indication). The End lamp also lights.
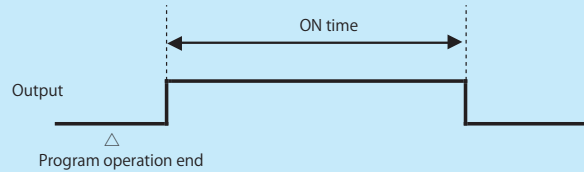
Model Selection Chart

TTM-339-□□-□□□□□□
① ②   ③
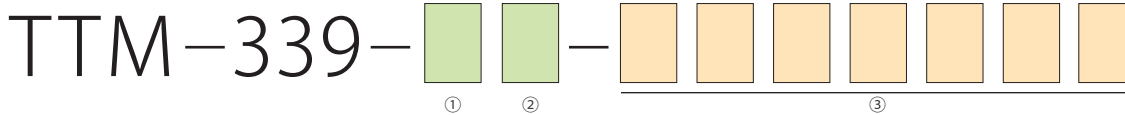
	Input	Thermocouple (K, J, T, E, R, S, B, N, U, L, WRe5-26, PR40-20, PLⅡ)		Multiple inputs, Switchable by key	
		R.T.D. (Pt100, JPt100)			
		Current (4 to 20 mADC)			
		Voltage (0 to 1 VDC, 0 to 5 VDC, 1 to 5 VDC, 0 to 10 VDC, 0 to 10 mVDC)			
①	**Output1**	R	Relay contact	R or P selectable	
		P	SSR drive voltage		
②	**Output2**	P	SSR drive voltage	P or I selectable	
		I	Current 4 to 20 mADC		
③	**Option**	A	Relay contact (EV1 to EV3) "EV3" is none when relay contact is selected for output1		
		B	Relay contact END signal output		
		C	Open collector TS1 to 4, TIME, EV4 "EV4" is none when relay contact is selected for output1		
		D	CT input		
		E	DI input		
		M	Communication (RS485)		
		T	Front face (English version)		