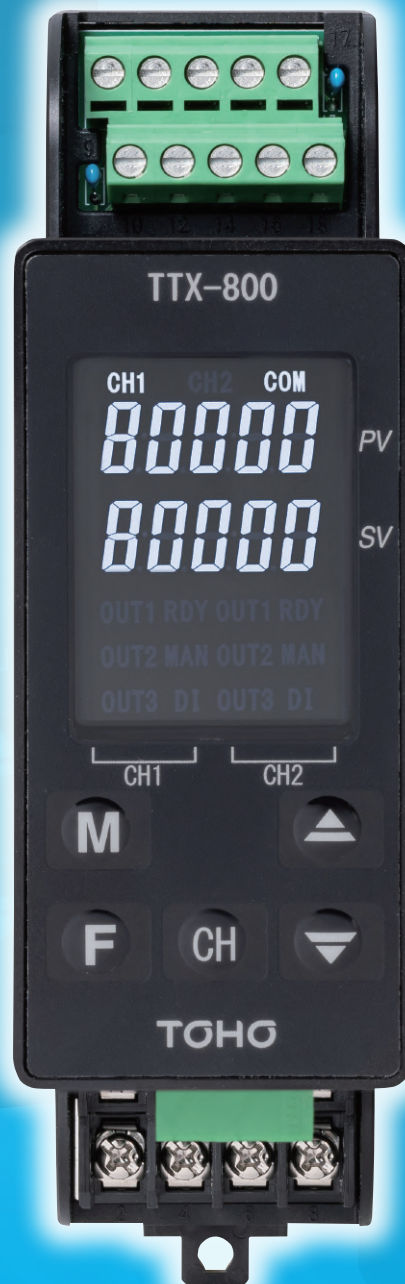


# TTX-800

## DIGITAL CONTROLLER



TTX-800



# DIGITAL CONTROLLER TTX-800

## 2ch Module-type Controller

This product is a DIN rail mounting type two-channel controller with white-colored LED for better visibility.

The built-in display and key switch allow the user to set each parameter directly on the unit.

Connecting the main unit with connector allows the user to connect the power source and RS-485 communication without the transition wiring of the terminal board. (Number of connections is up to 10 units)

It can also be used as a converter.

## Features

### ●New PID algorithm for better controllability

- ①Time needed for the control to stabilize itself from its start is reduced
- ②Equipped with jumpless control that controls the overshoot after the disturbance
- ③Two types of PID control are available

### ●Universal Input

Input specifications of thermocouple (13 types), RTD (2 types), voltage (4 types), and current (1 type) are realized in one model. (Change the setting by the parameter)

### ●Various Control Types

- ①2 Inputs Individual Control
- ②1 Input Heating and Cooling Control
- ③2 Input Heating and Cooling Control
- ④Cascade Control
- ⑤Remote Control
- ⑥Position Ratio Control
- ⑦Temperature and Humidity Control

### ●Sampling Cycle

High speed of 100ms

### ●LCD is used for the display

- ①Wider display area with a five-digit display
- ②LED is used for the back-light

### ●Optional Functions

Event Input (2 points)

### ●Blind Function

Only necessary parameters can be selected for display and setting.

### ●Simple Timer Function

"Start or stop the control after the lapse of a specific time" can be done in just one unit. Individual use of timer (turning the event ON or OFF) is also possible.

### ●Digital PV Filter

Filter made of software can be applied against the sudden change in the input value.

### ●Manual Control

The manual output function allows the application of various instrumentation systems.

### ●Communication Function (RS485: MODBUS)

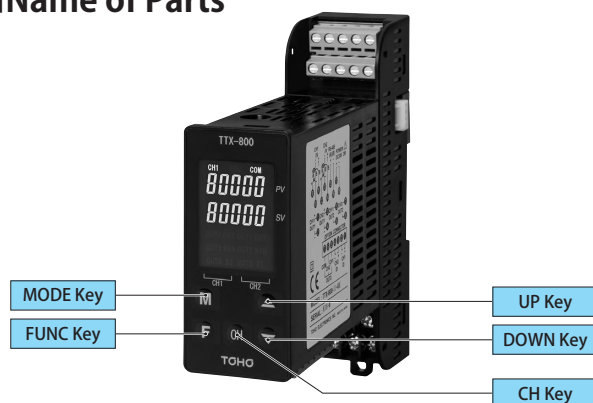
The distance can be extended up to 500m with a simultaneous connection of up to 31 units.

Centralized monitoring can be performed remotely by just one host computer with "gathering of all data" and "changing of settings".

### ●Loop Abnormality

Abnormality of the control loop can be detected by monitoring measuring value and MV.

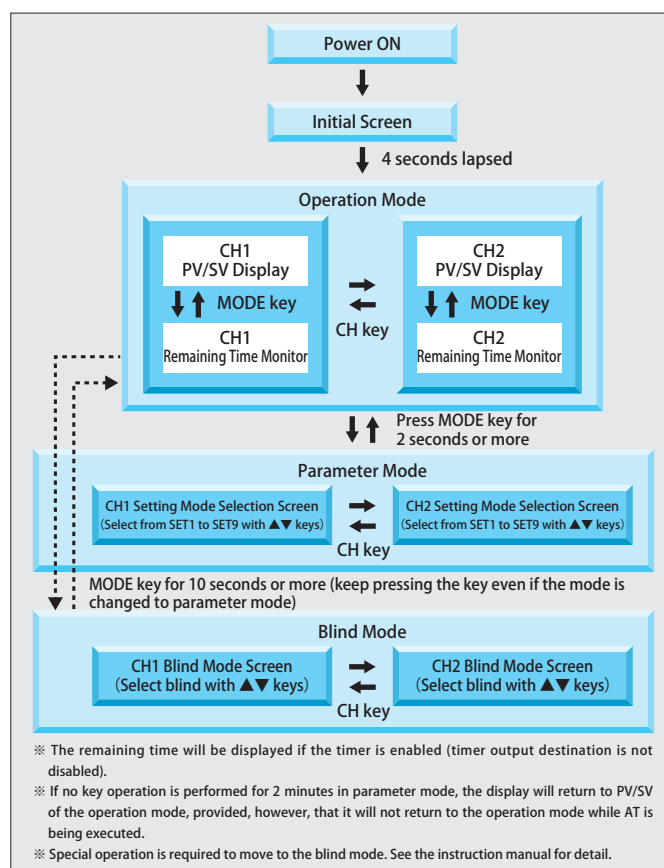
## Name of Parts



## Key Operations

MODE	<b>MODE Key</b> ●To be used to switch the screen. (It memorizes configured parameters)
FUNC	<b>FUNC Key</b> ●Executes functions that are being set. ①Digit Shift (Selected digit blinks): Enabled in all modes ②RUN/READY: Enabled only at operation mode. Function switches if pressed ③Start/Stop AT: Enabled only at operation mode. Function switches if pressed ④Timer Start/Reset: Enabled only at operation mode. Function switches if pressed ⑤Reset Alarm
▼	<b>DOWN Key</b> ●Decreases the setting value.
▲	<b>UP key</b> ●Increases the setting value.
CH	<b>CH key</b> ●Switches the channel of display or setting. It switches between CH1 and CH2 each time the key is pressed.

## Operation Flow



## Standard Specifications

Input Type	Thermocouple	K, J, T, E, R, S, B, N, U, L, WRe5-26, PR40-20, PL II		Thermocouple/Resistance Temperature Detector Input and Current/Voltage Input are to be selected at parameter settings	
	RTD	Pt100, JPt100 (External Resistance 10Ω or less (per wire) Resistance of 3 lines must be the same)			
	Current and Voltage	4 to 20mA DC (Input Resistance 250Ω), 0-1V DC, 0-5V DC, 1-5V DC, 0-10V DC (Input Resistance 1MΩ or higher)			
Display	PV and Character Display	5-digit 7-segment White-color Display Character Height: 6mm			
	SV Setting Display	5-digit 7-segment White-color Display Character Height: 6mm			
	Various Displays	LED White-color (CH1, CH2, COM, OUT1, OUT2, OUT3, RDY, MAN, DI)			
Control	PID (With Auto Tuning) (With Self Tuning)	Proportional Band (P1)	0.1 to 200.0% of setting limiter span		
		Output 2 Proportional Band (P2)	0.10 to 10.00 times (Against the main control proportional band)		
		Integral Time (I)	0 to 3600 seconds (Integral time is turned OFF if "0")		
		Differential Time (D)	0 to 3600 seconds (Derivative time is turned OFF if "0")		
		Proportional Cycle (T1, T2)	1 to 120 seconds		
		Dead Band (DB)	Temperature Input	-100.0 to 100.0 or -100.0 to 100.0 (°C)	
	ON/OFF	Control Sensitivity (C1, C2)	Analog Input	-1000 to 1000 (digit)	
			Temperature Input	0 to 999 or 0.0 to 999.9 (°C)	
	Output 1・2 OFF Point	Position Setting	Analog Input	0 to 9999 (digit)	
			Temperature Input	-199 to 999 or -199.9 to 999.9	
Control Output	Output 1	Relay Contact	250V AC 3A (Resistance Load) 1a Contact Point Minimum Load 5V DC 10mA		
		Voltage Output for SSR Drive	0 to 12V DC ±10% (Load resistance 600Ω or higher)		
		Current	4 to 20mA DC (Load Resistance 600Ω or less)		
	Output 2	Relay Contact	250V AC 1A (Resistance Load) 1a Contact Point Minimum Load 5V DC 10mA		
	Output 3	Open Collector	28V DC 100mA		
Sampling Cycle		100mS			
Setting and Indication Accuracy (Ambient Temperature 23°C±10°C )	Thermocouple	K, J, T, E, R, S, B, N	±(0.3%±1 digit) or ±2°C of input value, whichever is larger Provided that -100 to 0°C is ±3°C and -200 to -100°C is ±4°C No accuracy stipulation below 400°C in B-thermocouple		
		U, L	±(0.3%±1 digit) or ±4°C of input value, whichever is larger Less than 0°C is ±6°C		
		WRe5-26	±(0.6%±1 digit) or ±4°C of input value, whichever is larger		
		PR40-20	±9.4°C±1 digit No accuracy stipulation less than 800°C		
	RTD	PL II	±(0.3%±1 digit) or ±2°C of input value, whichever is larger		
		Pt100, JPt100	±(0.3%±1 digit) or ±0.9°C of input value, whichever is larger		
Current/Voltage		4 to 20mA DC, 0 to 1V DC, 0 to 5V DC, 1 to 5V DC, 0 to 10V DC	±0.3%±1digit of FS		
Storage Element		EEPROM			
Input Power Supply		24V DC±10%			
Weight		240g or less			
Power Consumption		3W or less			
Accessories		Operation Manual			
Range of Standard Ambient Temperature and Humidity (Compensation range such as accuracy)		23±10°C, 45 to 75%RH			
Range of Usage Ambient Temperature and Humidity		0 to 50°C, 20 to 90% RH (without condensation)			
Range of Storage Ambient Temperature and Humidity		-20 to 70°C, 5 to 95% RH (without freezing and condensation)			
Function	MV Limiter (ML1, MH1, ML2, MH2)	Maximum Limit (MLH1, MLH2)	ML1 to 100.0% (110.0%) ( ) is for OUT1 when AO Output model. ML2 to 100.0%		
		Minimum Limit (MLL1, MLL2)	0.0% (-10.0%) to MH1 ( ) is for OUT1 when AO Output model. 0.0% to MH2		
	Setting Limiter (SLL, SLH)	Maximum Limit (SLH)	(SLL+5°C ) to SV Maximum Setting Range or (SLL+5.0°C ) to SV Maximum Setting Range (SLL+50digit) to SV Maximum Setting Range Provided that if PV≠0, (SLL+50digit) - 29999		
		Minimum Limit (SLL)	SV Minimum Setting Range to (SLH-5°C ) or SV Minimum Setting Range to (SLH-5.0°C ) SV Minimum Setting Range to (SLH-50digit) Provided that if PV≠0, -19999 to (SLH-50digit)		
	Control Mode (MD)	Stop Control, Run Control, Manual Control			
	Control Type (CNT)	PID Type	typeA (Normal PID Control)		Activate/deactivate the auto tuning with FUNC key.
			typeB (Overshoot Control Function)		
		Setting of Direct and Reverse Action	Reverse Action		
			Direct Action		
	Setting of Tuning Type	Auto Tuning (Main Control)			
		Auto Tuning (Subcontrol)			
		Auto Tuning (Main/Subcontrol)			
	Setting of PV Correction Zero Point (PVS)	-9999 to 9999°C			
	Setting of PV Correction Gain (PVG)	0.500 to 2.000 (times)			
	Input Filter (PDF)	0.0 to 99.9 (second)			
	Anti-Reset Windup	0.0 to 100.0% (-10.0 to 100.0%) ( ) is for OUT1 when AO Output model.			
	Manual Reset (PBB)	0.0 to 100.0% (-100.0 to 100.0%) ( ) is for main/sub-control			
	Setting of the Loop Abnormal Time	Setting of the Loop Abnormal Time of Main Control	0 to 9999 (sec)		
		Setting of the Loop Abnormal Time of Subcontrol	0 to 9999 (sec)		
	Timer Operation Mode (TMF)	0 minute 00 second to 99 minutes 59 seconds 0 hour 00 minute to 99 hours 59 minutes. Function: Auto Start, Manual Start, Event Start, SV Start			
	Shifting of Decimal Point (DP)	Display of Digit After a Decimal Point Yes/No			
	Manual Control	It allows the user to control manually (balanceless and bumpless)			
	RUN/READY	It allows the user to switch between RUN and READY			
	Auto Tuning Coefficient (ATG)	0.1 to 10.0 (times)			
	Auto Tuning Sensitivity (ATC)	Temperature Input	0.0 to 999.9 or 0 to 999 (°C )		
		Analog Input	0 to 9999 (digit)		
	Function Key	Select the function key from "Digit Shift", "RUN/READY", "AT", "Timer Start/Reset", and "Alarm Reset"			
	Lock Function (LOC)	Four modes (OFF, Lock All, Lock Operation Mode, and Lock except Operation Mode)			
	Self-diagnosis Function	EEPROM Data Check (Err0), A/D Converter Action Check (Err1), Auto Tuning Check (Err2), Built-in Watch Dock Timer			
	Valve Function	Motor Stroke Time	1 to 999 (second)		
		Motor Drive Dead Band	0.0 to 100.0 (second)		
	Initial Setting Mode	To be selected from "Setting of Device Type" and "Setting of Backup"			
External Standard	The following 6 substances, which are regulated by RoHS command, are not used:	Lead: 1,000ppm or less Mercury: 1,000ppm or less Cadmium: 100ppm or less Hexavalent Chromium: 1,000ppm or less Polybrominated Biphenyl (PBB): 1,000ppm or less Polybrominated Diphenyl Ethers (PBDE): 1,000ppm or less			

## Option Specifications

Auxiliary Output (Max. 2 points) (Common)	Relay Contact	250V AC 1A (Resistance Load) 1a Contact Point Minimum Applicable Load 5V DC 10mA	
	Open Collector	28V DC 100mA ※ Common	
	Setting Range (Maximum and minimum limits)	Temperature Input	-1999 to 2999 or -1999.9 to 2999.9
		Analog Input	-19999 to 29999 (digit)
	Sensitivity	Temperature Input	0 to 999 or 0.0 to 999.9
		Analog Input	0 to 9999 (digit)
	Delay Timer	0 to 9999 (sec)	
DI Input (Max. 2 points)	Function	Switching of SV/SV2, switching of RUN/READY, switching of auto/manual, switching of reverse action/direct action, switching of stop AT/start AT, switching of reverse action • SV/direct action • SV2, switching of timer reset/timer start, alarm reset, interlock	
	Input Specifications	Nonvoltage contact point	
	Minimum Input Time	200ms	
	Current during ON	Approx. 10mA DC	
	Voltage during OFF	Approx. 5V DC	
	Allowable Resistance Between Terminals	If ON: 1kΩ or less If OFF: 4kΩ or more	
Communication	Communication Standard	RS-485 (1:31)	
	Communication Terminal	Connector	
	Protocol	MODBUS (RTU)/MODBUS(ASCII)	
	Direction of Information	Half-Duplex	
	Synchronization System	Start-Stop Synchronization	
	Transmission Code	ASCII	
	Interface	Transmission Two Wires	
	Communication Speed	2400 • 4800 • 9600 • 19200 • 38400bps	
	Communication Distance	500m (value may vary depending on the usage environment )	
	Response Delay Time	0 to 250ms	
	Character	Start Bit: 1 bit fixed	
		Stop Bit: 1/2 bit	
		Data Length: 7/8 bit	
		Parity: None/Odd/Even	
Transmission Output	Function Settings	PV (Measurement Value) output, SV (Setting Value) output, MV1 (Main Manipulated Variable) output, MV2 (Submanipulated Variable) output. Direct and reverse actions are switchable	
		Setting of the Maximum Limit of Scaling	Temperature Input Scaling Minimum Limit to 2999 (°C ) or Scaling Minimum Limit to 2999.9 (°C ) Analog Input Scaling Minimum Limit to 29999 (digit)
		Setting of the Minimum Limit of Scaling	Temperature Input -1999 (°C ) to Scaling Maximum Limit or -1999.9 (°C ) to Scaling Maximum Limit Analog Input -19999 (digit) to Scaling Maximum Limit

## Input and Scale Range

Thermocouple		Measuring/Setting	Indication resolution
K	°C	-200.0 to 1372.0	1°C /0.1°C
J	°C	-200.0 to 1200.0	1°C /0.1°C
T	°C	-200.0 to 400.0	1°C /0.1°C
E	°C	-200.0 to 1000.0	1°C /0.1°C
R	°C	-50 to 1768	1°C
S	°C	-50 to 1768	1°C
B	°C	0 to 1800	1°C
N	°C	-200.0 to 1300.0	1°C /0.1°C
U	°C	-200.0 to 400.0	1°C /0.1°C
L	°C	-200.0 to 900.0	1°C /0.1°C
WRe5-26	°C	0 to 2300	1°C
PR40-20	°C	0 to 1880	1°C
PL II	°C	0.0 to 1390.0	1°C /0.1°C

Resistance		Measuring/Setting Range	Indication resolution
Pt100 (JIS/IEC)	°C	-200.0 to 530.0	1°C /0.1°C
JPt100 (JIS)	°C	-200.0 to 510.0	1°C /0.1°C

Current and Voltage		Measuring/Setting Range	Indication resolution
0 to 1V DC	-19999 to 29999 Display range is 20000 or less		Position of decimal point can be changed freely
0 to 5V DC			
1 to 5V DC			
0 to 10V DC			
4 to 20mA DC			

## Timer Operation Mode

### Start Mode

1	Auto Start	: ON Delay
2	Manual Start	: ON Delay
3	OUT1 Event 1 Start	: ON Delay
4	OUT2 Event 1 Start	: ON Delay
5	OUT3 Event 1 Start	: ON Delay
6	Auto Start	: OFF Delay
7	Manual Start	: OFF Delay
8	OUT1 Event 1 Start	: OFF Delay
9	OUT2 Event 1 Start	: OFF Delay
10	OUT3 Event 1 Start	: OFF Delay
11	SV Start	: OFF Delay

Auto Start : Timer start by turning the power ON

Manual start: Timer start by the front key

Event start : Timer start by the occurrence of event

SV Start : Timer start from the time when the value has crossed setting value + SV start setting value after the power ON (for OFF delay only)

OFF Delay : Stops the control or turns the event output OFF when the time is up

ON Delay : Stops the control or turns the event output ON when the time is up

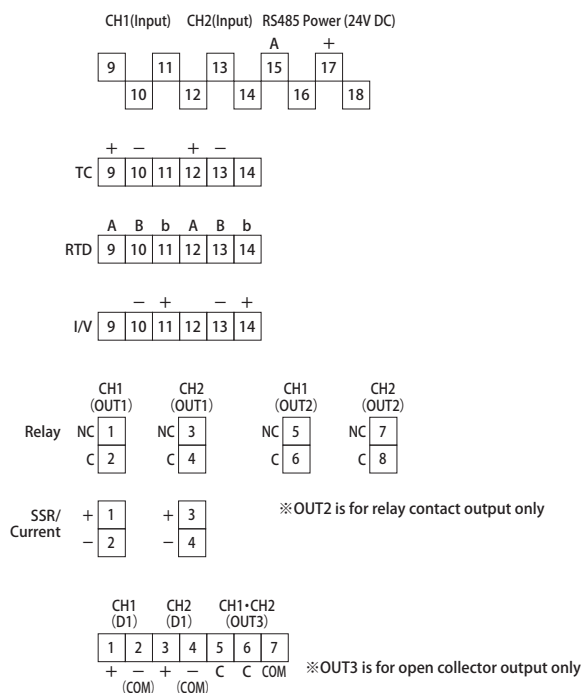
※ Output destination can be set to Control Output and Event Output

## Setting of Timer Connection Destination

0	Timer OFF
1	Control
2	Event 1 Output



## Terminal Layout



## Contact Point Output Mode

### Event Function 1

Function	
0	OFF
1	Maximum and Minimum Deviation
2	Maximum Deviation
3	Minimum Deviation
4	Deviation Range
5	Maximum and Minimum Absolute Value
6	Maximum Absolute Value
7	Minimum Absolute Value
8	Absolute Value Range
Additional Function	
0	OFF
1	Hold
2	Standby
3	Delay
4	Hold+Standby
5	Hold+Delay
6	Standby+Delay
7	Hold+Standby+Delay
Control Mode Interlock	
0	All modes
1	RUN/MAN mode only
2	RUN mode only

### Event Output Setting 1(Event Function 1)

Function	
0	Event Output turns OFF when an Event occurs
1	Event Output turns ON when an Event occurs

### Event Output Setting 2(PV Abnormality)

Function	
0	Event Output turns OFF when an Event occurs
1	Event Output turns ON when an Event occurs

### Event Output Setting 3(AT Abnormality)

Function	
0	Event Output turns OFF when an Event occurs
1	Event Output turns ON when an Event occurs

### Event Output Setting 4(Loop Abnormality)

Function	
0	Event Output turns OFF when an Event occurs
1	Event Output turns ON when an Event occurs

### Event Output Setting 5(Timer Output)

Function	
0	Event Output turns OFF when an Event occurs
1	Event Output turns ON when an Event occurs

### Event Output Setting 6(Interlock)

Function	
0	Event Output turns OFF when an Event occurs
1	Event Output turns ON when an Event occurs

## Explanation for Terminals

Communication	Properly connect terminals of T/R (A) and T/R (B) (Use the converter except for RS-485)
Relay Output	C: Common, NO: Normal Open
Voltage Output for SSR Drive	Connect directly to INPUT + and - of SSR (Solid State Relay) side
EV1, 2	Polarity is switchable between normal open and normal close
RTD	Make sure to properly connect terminals A, B, and b
Thermocouple	Make sure that the polarity (positive and negative) is correct during the connection
Power Supply	Make sure that the polarity (positive and negative) is correct during the connection

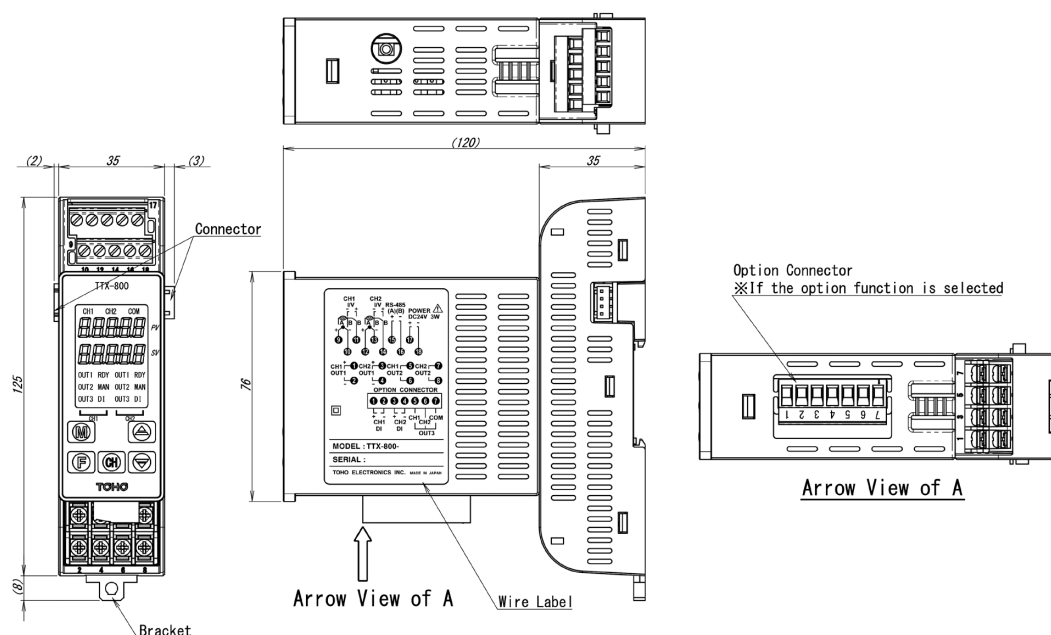
## Dimensions

### Assignment of Output Function

(○: Can be assigned, ×: Cannot be assigned)

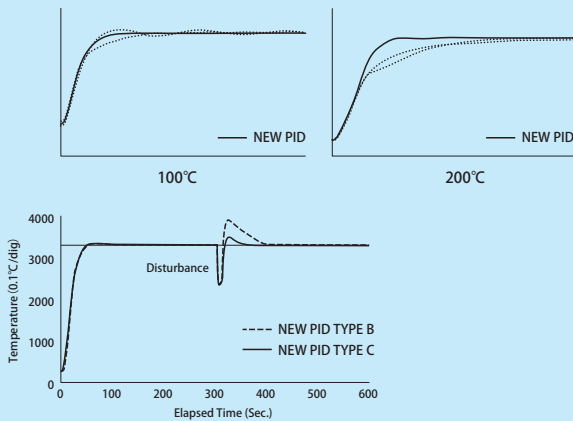
Output Type	Control					
	OUT 1		OUT2		OUT3	
	CH1	CH2	CH1	CH2	CH1	CH2
Main Output (Heating)	○	○	○	○	○	○
Sub-output (Cooling)	○	○	○	○	○	○
Event Output	○	○	○	○	○	○
Transmission Output *	○	○	×	×	×	×
Ratio Conversion Output *	○	○	×	×	×	×

※can be set only for the analog output model (model "I")



## Function Description

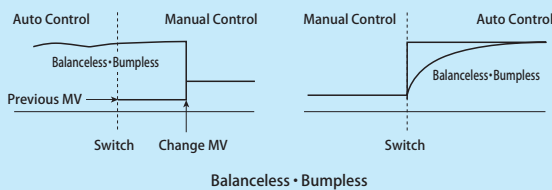
### ●PID Control by the New Algorithm (Compared with our products)



### ●Auto (RUN)/Manual Function

Auto control and manual control can be switched by the front key, ID, or communication. Manual action is a function that allows the user to freely set and output the control output (MV) regardless of the condition of deviation. Manual system operation is available for the validation of final control element (e.g. valve heater), or in case normal control is not possible due to sensor trouble.

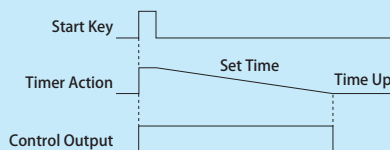
Safe operation is assured by the balanceless and bumpless functions, which prevent sudden change in the control output upon switching the control between auto and manual and to prevent damage to peripherals and bad effects to the control system by such sudden change.



### ●Timer Function

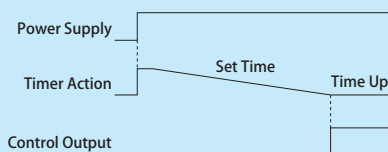
#### 1. In the Case of a Baking Oven

- Place the bread dough inside the oven and press the start key of the timer.
  - While the timer is counting, the temperature will be controlled by the heater.
  - Control automatically stops if the timer count ends.
- (This will be used if the control is to be stopped at the end of the timer count)



#### 2. In the case of packaging machine and industrial machinery and if the control is to be started when peripherals are ready for operation.

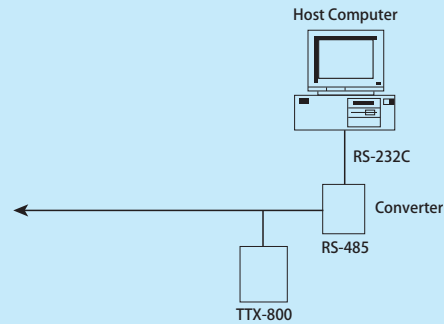
- Timer starts when the power is turned ON.
  - Control output is stopped while the timer is running.
  - Control automatically starts if the timer count ends.
- (This will be used if the control is to be started at the end of the timer count)



### ●Communication Function

#### ●Sample connection with PC

Centralized management by PC can be done with the connection shown in the figure below.

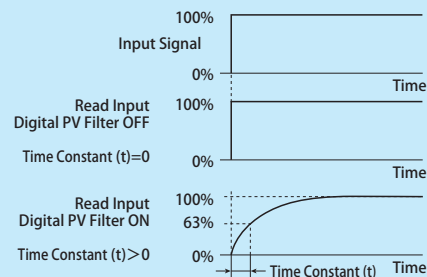


### ●Digital PV Filter

A function to programmatically realize CR filtering effect by performing a primary delay operation for the PV of the input.

Filter effect will be set through time constant (t).

(Time constant is the time spent before PV to reach up to approximately 60% when the input has changed in a step-by-step manner)

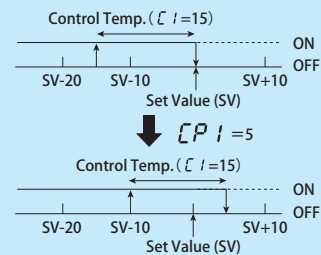


Purpose of the Digital PV Filter

- 1) Elimination of high-frequency noise ... The effect of electrical noise that was applied to the input can be minimized.
- 2) Can delay the response against a sudden change in the input.

### ●Shifting of the OFF Point of ON/OFF Control

If the shifting of the OFF point is set to 0, the OFF point will be placed at the setting position.

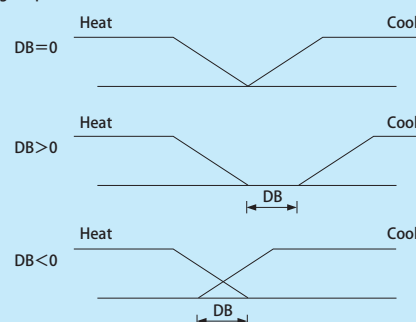


If the shifting of OFF point is set to (+5). While the actual setting value remains the same with the value shown above, the position of ON/OFF goes up for (+5). When moved toward the negative side, the OFF point will be shifted to the direction that is opposite to the one shown in the figure above.

### ●Heating and Cooling

Heating and cooling can be controlled by assigning main and sub-outputs to two output points.

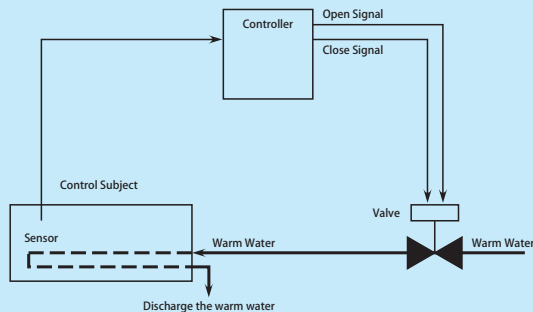
The DB (dead band) setting allows the user to set the margin between the heating output and cooling output.



## ●Position Proportional Control

### ■Position Proportional Control

- It outputs open/close signal to the valve with MV (acquired by PID control) through the valve motor stroke time, change the valve angle, adjust the flow rate, and control the temperature of the subject. Control is possible without the feedback resistance.
- Valve Motor Stroke Time is the time that takes for the fully-closed valve to fully open.

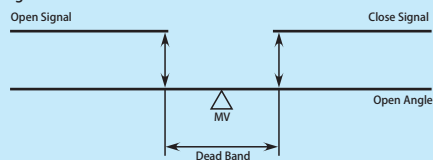


### • Valve Motor Drive Dead Band

The position proportional control operates the output of the open/close signal to match the MV of the controller with an open angle of valve.

To prolong the service life of the valve, frequent opening and closing must be minimized.

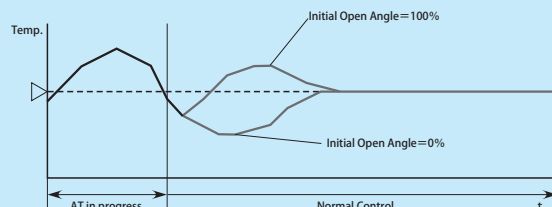
Frequent switching of open and close signals is reduced by placing a dead band at the switching point of the output of open and close signals to stop the output of both open and close signals in the area.



### • Initial Open Angle After the End of AT

MV right after the end of auto tuning can be set to control the undershoot.

Ex.) Response after AT



## ●Setting of PV Difference/Addition

### [Function]

- It displays the value in which the measure of the other CH is subtracted/added from the standard input (measuring value of CH with subtraction/addition display is specified).
- The location of decimal point will be based on the standard input side.
- The measuring value for the computation of difference / addition will be the value after PV correction.
- If subtraction, "Standard Input - Measuring Value of Other CH", if addition, "Standard Input + Measuring Value of Other CH".
- If the standard input side is DC input and if the computation result exceeds "Setting of Maximum and Minimum Difference/Addition Display", the display will be over/under scale. (In the case of TC/PT input, the measuring range of the standard input side will be the standard)
- If either the standard input or the measuring value of other CH is abnormal, the display of standard input side will be over/under scale.

## ●Setting of PV X-Y2 Point Correction

### [Function]

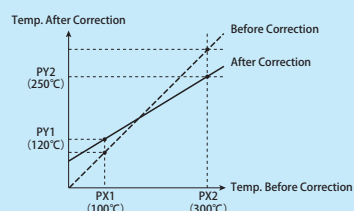
PV can be corrected by setting two input values within the input range.

### [Sample Setting]

• To set PV from 100 °C to 120 °C and from 300 °C to 250 °C : Before Correction: PX1=100(°C), PX2=300(°C)

After Correction: PY1=120(°C), PY2=250(°C)

Correction can be made as shown below by doing the above setting.



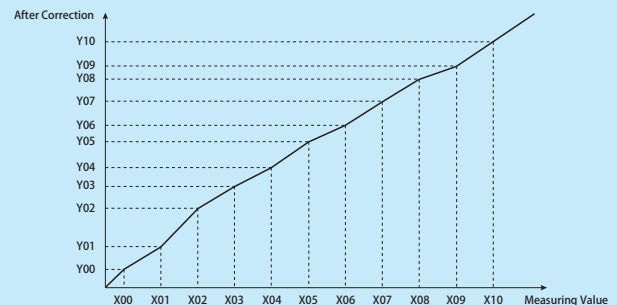
## ●Setting of PV X-Y Multi-point Correction

### [Function]

PV can be corrected by setting up to 11 input values within the input range.

### [Remark]

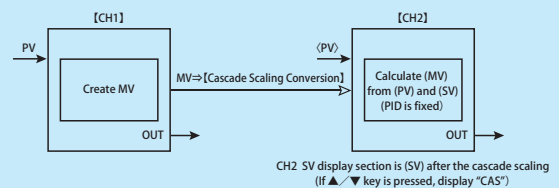
- Set as: X00 < X01X ... < X09 < X10
- If the above condition is not met, correction hereafter will be invalid.
- (Example) X00 = 0 X01 = 10 X02 = 20 X03 = 15 X04 = 30
- With the setting above, the correction from X00 to X02 will be valid.
- Correction from X03 onward (from X03 to X10) will be invalid.



## ●Cascade Control

### [Function]

- This function can be set only at CH2.
- A function that converts the MV value calculated on CH1 side at the setting of the cascade scaling and uses it as the SV of CH2.
- The SV of CH2 cannot be changed while cascade control is active.
- If ▼ / ▲ key is pressed at the normal screen, it display "CAS" at the SV display section.
- CH2 performs PID control while cascade control is active.



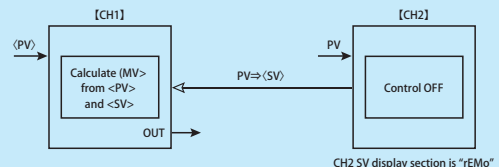
## ●Remote Control

### [Function]

- This function can be set only at CH2.
- A function to use PV, which is measured at CH2, as SV of CH1.
- The SV value will be given a limit by the maximum (minimum) setting of the SV limiter.
- The SV of CH1 cannot be changed while the remote control is active.

If ▼ / ▲ key is pressed at the normal screen, it display "REMO" at SV display section.

- Control of CH1 will be stopped if PV of CH2 becomes over (under) scale.

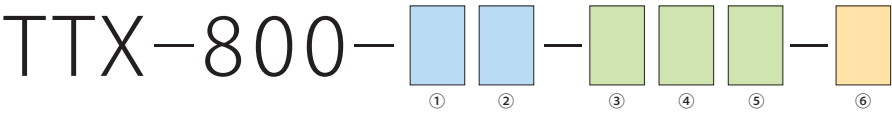


## ●Ratio Conversion Output


### [Function]

- It is a function to convert the ratio of DC input value and output it as AO 4 to 20mA.
- It is valid only if OUT1 is the AO model.
- To output the ratio conversion, please set the transmission output function setting to "4: Ratio Conversion Output".
- Computation formula for each output shall be the following:
  - Positive Pitch Characteristic-AO (%) = [Ratio] \* "Measured Value (%)" + [Bias]
  - Negative Pitch Characteristic-AO (%) = [Ratio] \* "Measured Value (%)" + [Bias] + 100%
- [Sample Setting]
  - If the measuring value is 1V (20.0%) when Input Type: 0 to 5V, Ratio: 1.50 (-1.50), and Bias: 10.0:
    - Positive Pitch Characteristic  $1.50 \times 20.0 (\%) + 10.0 (\%) = 40 (\%)$  AO=10.4mA
    - Negative Pitch Characteristic  $-1.50 \times 20.0 (\%) + 10.0 (\%) + 100.0 (\%) = 80 (\%)$  AO=16.8mA

■List of Models for Selection




Symbol	Item	Description	
①	OUT1 (ch1)	R	Relay Contact
		P	Voltage Output for SSR Drive
		I	Current 4 to 20mA
②	OUT1 (ch2)	R	Relay Contact
		P	Voltage Output for SSR Drive
		I	Current 4 to 20mA
③	OUT2 (ch1,ch2)		OFF
		A	Relay Contact
④	OUT3 (ch1,ch2)		OFF
		B	Open Collector
⑤	DI (ch1,ch2)		OFF
		E	Contact Point Input
⑥	Selection of Parameter Initial Settings		2 Input Individual Control Specifications
		1	1 Input Heating and Cooling Control Output Specifications
		2	2 Input Heating and Cooling Control Output Specifications
		3	Cascade Control Specifications
		4	Remote Control Specifications
		5	Position Proportional Control Specifications
		6	Temperature and Humidity Control Specificaitons
		7	Channel Difference Input Specifications
		8	Channel Addition Input Specifications
		9	1 Input 2 Outputs Specifications
		10	Transmission Output Specifications
		11	1ch Alarm Specifications
		12	2ch Alarm Specifications
		13	1ch Converter Specifications
		14	2ch Converter Specifications
		15	1ch Ratio Converter
		16	2ch Ratio Converter



**Warning**

This product is designed to control temperature and other physical volume of general purpose industrial facilities.  
(Do not use this product for the control that may greatly affect the human life)



**Caution**

- Please read the operation manual carefully for proper and safe usage of the product.
- In case the trouble of this product may cause damage or loss to system or property, take necessary safety measure to prevent the accident before using this product.



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