

CONOTEC

CONOTEC CO., LTD.

DIGITAL TEMPERATURE CONTROLLER



ISO 9001:2008

Instruction Manual



- PID Temperature Controller
- Two Relay Outputs
- Two outputs usable as Current/SSR (Cycle Control / Phase Control / On-Off Control)
- Hardware select function allows the user to choose Alarm Output / Transmission Output / Control Output
- Supports various sensor inputs such as RTD, Thermocouple, N-type voltage (mV, Volt), and current (4~20mA)
- Supports RS485 Communication (MODBUS-RTU)

- A user manual for this product is posted on the company website.

- Please download the technical document and communications manual on the company website

01 Safety precautions

Please read the safety precautions carefully for correct operation of the product.

- ✖ The specifications and dimensions specified in this instruction manual may be changed without any notice for performance enhancement.

⚠ Warning

1. This product was not made as a safe device. Therefore, this product should be attached with dual safety devices if it is used for the control purposes (e.g. a device vulnerable to accident and property damage, etc.).
2. Do not wire, inspect or service this product while the power is being supplied.
3. You must attach this product to a panel. Otherwise, it may cause an electric shock.
4. When connecting the power, you must check the terminal number.
5. Do not ever disassemble, process, modify or repair this product.

⚠ Caution

1. Please make yourself familiar with all the operation instructions, safety precautions and warnings before using this product. Comply with related specifications and capacity requirements
2. Do not wire or install this product to any unit with high inductive load (e.g. motor, solenoid, etc.).
3. Use a shielded cable with a proper length when extending a sensor.
4. Do not use any part that generates an arc when used in the same power or directly switched in close proximity.
5. Keep the power cable away from a high-voltage cable and do not install this product in any place that is full of water, oil and dust.
6. Do not install this product in any place that is exposed to direct sunlight or rain.
7. Do not install this product in any place that is subject to strong magnetic power, noise, vibration or shock.

8. Keep this product away from any place that generates strong alkaline or acid substances. Use a separate pipe.
9. Do not sprinkle water onto this product for cleaning when installing it in the kitchen.
10. Do not install this product in any place where the temperature/humidity ratings are exceeded
11. The sensor cable should not be cut or cracked..
12. Keep the sensor cable away from a signal cable, a power cable or a load cable. Use a separate pipe.
13. Keep in mind that the follow-up service will not be available if this product has been arbitrarily disassembled and modified
14. ⚠ symbol on the terminal wiring diagram indicates a safety statement that alerts a warning or caution.
15. Do not use this product near any device generating strong high-frequency noise (e.g. high-frequency welding machine, high-frequency sewing machine, high-frequency radio, large-capacity SCR controller, etc.).
16. Using this product in any method other than those specified by the manufacturer may lead an injury or a property damage
17. The product is not a toy. Keep it away from children.
18. The product should be installed only by an expert or a qualified person.
19. The company will not be liable for any damage caused by the violation of the above warnings and cautions or by a consumer's fault

⚠ Danger

Caution: Risk of electric shock

- Electric shock - Do not touch the AC terminal while the current is flowing. It may cause an electric shock.
- You must disconnect the input power when servicing it.

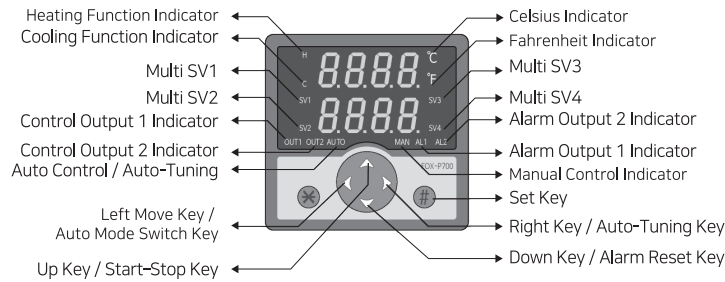
02 Model Types

Input Power	100~240 VAC 50/60Hz		Display Accuracy	± 1% rdg ±1digit		
Display	7-segment 0.51Inch 4Digit 2Line					
Display Accuracy	OUT1 : Control output or transmission (relay, SSR voltage, phase control, cycle control) - Current: Load resistance within 500Ω, SSR : 11VDC ±2V under 20mA					
	OUT2 : Current Output and Transmission / SSR Output (Normal, Cycle, Phase Control) - Current: Load resistance within 500Ω, SSR : 11VDC ±2V under 20mA					
	AL1 or OUT3 : 1c 250 VAC 2A relay					
	AL2 or OUT4 : 1a 250 VAC 2A relay					
Sensor Input	Type	Model	Range	Type	Model	Range
	RTD	DPT100Ω	-199.9 ~ 400.0℃	Thermistor	NTC10K(Low)	-55.0 ~ 99.9℃
		JPT100Ω	-199.9 ~ 400.0℃		NTC10K(High)	-20.0 ~ 250.0℃
	TC	K	-50 ~ 1200℃	Voltage	mV	0.0 ~ 100.0mV
		N	-50 ~ 1200℃		0~5V	0.00 ~ 5.00V
		T	-50 ~ 400℃		1~5V	1.00 ~ 5.00V
		J	-50 ~ 1200℃		0~10V	0.00 ~ 10.00V
		E	-50 ~ 1000℃	0~20mA	0.00 ~ 20.00mA	
				4~20mA	4.00 ~ 20.00mA	
Comm.	RS485, MODBUS RTU, Data 8 bit, Parity None, Stop bit 1					
Operating Environment	0~55℃, 35~80%Rh(Avoid condensation or corrosive gases)					
Power Consumption	Operating Voltage: 90~110%					
Whether to use a relay for each output function	Category	Selectable Hardware	Selectable Output Type			
	Control Output 1 (Heater Control)	OUT1, OUT2	SSR ON/OFF, SSR General PID, SSR Cycle PID, SSR Phase PID, Current PID			
		OUT3, OUT4	Relay ON/OFF, Relay PID			
	Control Output 2 (Cooler Control)	OUT1, OUT2	SSR ON/OFF, SSR General PID, SSR Cycle PID, SSR Phase PID, Current PID			
		OUT3, OUT4	Relay ON/OFF, Relay PID			
	Alarm Output 1	OUT3, OUT4	High-temp alarm, Low-temp alarm, High & Low-temp alarm, Sensor error, Loop error (output relay)			
	Alarm Output 2	OUT3, OUT4	High-temp alarm, Low-temp alarm, High & Low-temp alarm, Sensor error, Loop error (output relay)			
	Transmission Output 1	OUT1, OUT2	Current temperature transmission, Set temperature transmission, Control output transmission			
Selectable whether to use SSR	Transmission Output 2	OUT1, OUT2	Current temperature transmission, Set temperature transmission, Control output transmission			
Digital Input	Input 1, 2, 3			Start/Stop, Alarm Reset, Auto/Manual Switching, Auto-tuning, Multi SV		
Data Retention	Approx. 10 years (Non-volatile semiconductor memory)					

⚠ Caution

* When using cycle PID control or phase PID control with an SSR, you must use an SSR that supports Non-Zero-Crossing and has a response time within 1 ms.

03 Components



Special Function Indicators

OUT1, OUT2 (Control Output Indicators)
In PID control mode, the indicator blinks according to the magnitude of the control output. AUTO (Auto Control / Auto Tuning Indicator)
It remains steadily ON in Auto Control mode. During Auto Tuning, the indicator blinks. SV1,SV2,SV3,SV4(Multi SV)
The selected set temperature is indicated according to the external digital input key.

Set Value Initialization ✖ + # Press and hold the SET key for 3 seconds to reset all settings.

Auto/Manual Switch Key ⏻ Press during operation to switch between Auto and Manual mode.

AUTO Auto Indicator MAN Manual Indicator

Start/Stop Switch Key ⏻ Press during operation to switch between Start and Stop modes.
Stop Mode Indicator **Stop**

Alarm Reset Key ⏻ When an alarm occurs, press this key on the operation screen to clear the alarm output.

Auto Tuning Key ⏻ Press this key on the operation screen to start or stop auto tuning.

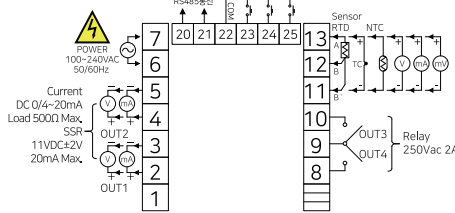
⚠ **Caution** : Functions such as the Auto/Manual Switch Key, Start/Stop Switch Key, Alarm Reset Key, and Auto Tuning Key can also be operated via external digital input. However, if configured for external input, these functions will not respond to key presses on the controller.

04 Terminal wiring diagram

[CNT-P700]

Switch Usage According to Digital Switch Function Settings

When Set to Start/Stop Function	Select Switch Use	
When Set to Alarm Reset Function	Push Switch Use	
When Set to Auto/Manual Mode Switching	Select Switch Use	
When Set to Auto Tuning Function	Push Switch Use	
When Set to Multi-SV Function	Select Switch Use	



⚠ Warning :

* Always turn off the power before performing any wiring or replacement work. The relay contact rating is 250 VAC, 2A max. Exceeding the rated load may result in contact welding, connection failure, or relay damage.

⚠ Caution:

* When using cycle PID control or phase PID control with SSR, be sure to use an SSR that supports non-zero crossing and has a response time of 1 ms or less.

⚠ Caution:

* Since many menus are initialized when changing the sensor, please be sure to recheck the setting values of all menus one by one.

05 Logo displayed at power-on

P700 ← Model Name
8.10 ← Program Version

⚠ Caution:

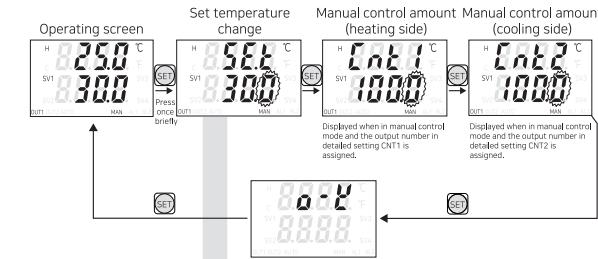
If the logo keeps appearing repeatedly even when power is supplied, there may be a problem with the input power.
If there is no issue with the power supply, please contact the manufacturer.

⚠ Warning :

Unstable power supply can cause damage to the internal memory.

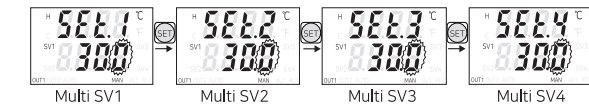
06 Setting process

Change set temperature and manual control amount



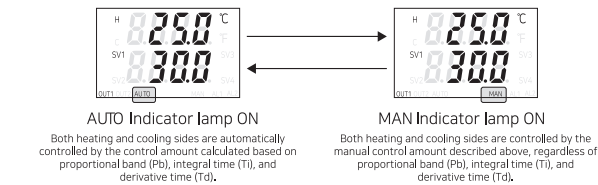
⚠ Note:

* If the external digital input is set to the Multi-SV function, the set temperature will be displayed as shown below.



* If the Multi-SV function is not selected, only the SV1 setting will be displayed, as in the top set temperature change screen.

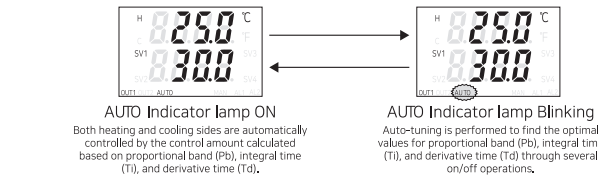
Automatic Control / Manual Control Switching



⚠ Caution:

* When the external digital input function is set to automatic/manual control, operation via the front panel keys is disabled.

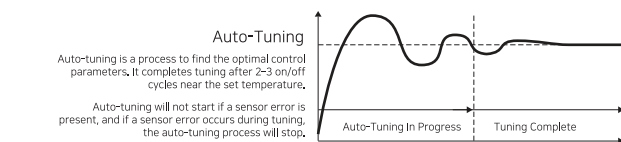
Auto-Tuning Start / Stop



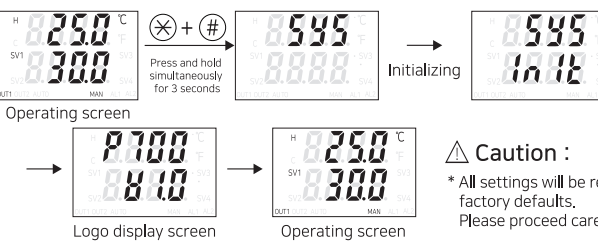
⚠ Caution:

* When the external digital input function is set to auto-tuning start/stop, operation via the front panel keys is disabled.

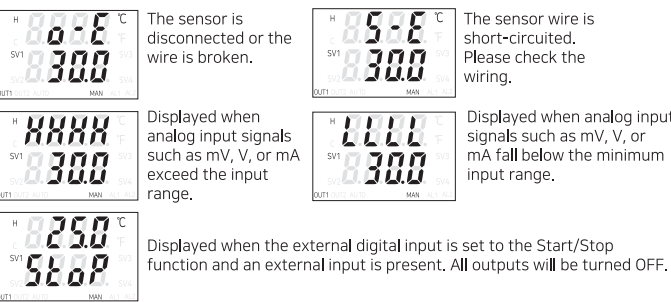
* Some menu items cannot be changed during auto-tuning, and the character **Auto** is temporarily displayed to indicate that tuning is in progress.



Parameter Reset



Error Display



Press and hold the **SET** key for over 5 seconds on the operating screen to enter detailed settings mode, and after adjusting all settings, press and hold the **SET** key for over 3 seconds to save and return; use **SET** to enter menus, **◀▶** to navigate menus, **◀▶** to move between digits, and gray-shaded menus appear depending on selected functions.

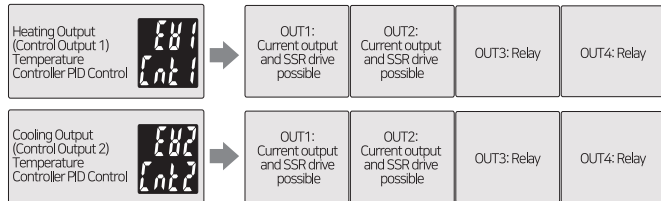
E81 [nt1] Heating Side (Control Output 1) Settings		E82 [nt2] Cooling Side (Control Output 2) Settings		E83 [ALn1] Alarm Output 1 Settings		E84 [ALn2] Alarm Output 2 Settings		E87 [SYS] System Settings	
Output Hardware Selection OUT1: Current or SSR Output OUT2: Current or SSR Output OUT3: Relay OUT4: Relay None		Output Hardware Selection OUT1: Current or SSR Output OUT2: Current or SSR Output OUT3: Relay OUT4: Relay None		Alarm Output 1 Hardware Selection OUT1: None OUT2: Relay OUT3: Relay OUT4: Relay		Alarm Output 2 Hardware Selection OUT1: None OUT2: Relay OUT3: Relay OUT4: Relay		Input and Sensor Type Settings DPT1: German Standard PT100 DPT2: Japanese Standard PT100 Type K Thermocouple Type N Thermocouple Type T Thermocouple Type J Thermocouple Type E Thermocouple NTC 10K (Low Range) NTC 10K (High Range) 0-100 mV Input 0-5V Input 1-5V Input 0-10V Input 0-20mV Input 4-20mV Input	
Control Method Selection SSR ON/OFF Control (Available with OUT1, OUT2) SSR ON/OFF PID Control (Available with OUT1, OUT2) SSR Cycle PID Control (Available with OUT1, OUT2) SSR Phase PID Control (Available with OUT1, OUT2) Current PID Control (Available with OUT1, OUT2) Relay ON/OFF Control (Available with OUT3, OUT4) Relay ON/OFF PID Control (Available with OUT3, OUT4)		Control Method Selection SSR ON/OFF Control (Available with OUT1, OUT2) SSR ON/OFF PID Control (Available with OUT1, OUT2) SSR Cycle PID Control (Available with OUT1, OUT2) SSR Phase PID Control (Available with OUT1, OUT2) Current PID Control (Available with OUT1, OUT2) Relay ON/OFF Control (Available with OUT3, OUT4) Relay ON/OFF PID Control (Available with OUT3, OUT4)		Alarm Output 1 Type Selection ALH: High Limit Alarm ALL: Low Limit Alarm ALHL: High/Low Limit Alarm SEnS: Sensor Error FALE: Loop Error (Output Error)		Alarm Output 2 Type Selection ALH: High Limit Alarm ALL: Low Limit Alarm ALHL: High/Low Limit Alarm SEnS: Sensor Error FALE: Loop Error (Output Error)		Digital Input 3 Function Setting Not used Start/Stop Function Alarm Reset Function Auto-Tuning Function Auto/Manual Function	
ON/OFF Deviation Setting Displayed only when control method is set to SSrnf dIF 1.0		ON/OFF Deviation Setting Displayed only when control method is set to SSrnf dIF 1.0		Alarm Output 1 Hold Function Selection Use Hold None AXHd YES		Alarm Output 2 Hold Function Selection Use Hold None AXHd YES		Digital Input 1 Input Type NormalOpen NormalClose 1LP1 no	
Output Delay Time Setting Displayed only when control method is set to SSrnf dLE 0		Output Delay Time Setting Displayed only when control method is set to SSrnf dLE 0		Alarm Output 1 Initial Alarm Pass Selection Use Pass None PRSS YES		Alarm Output 2 Initial Alarm Pass Selection Use Pass None PRSS YES		Digital Input 2 Input Type NormalOpen NormalClose 1LP2 no	
PID Control Cycle Setting Displayed only when control method is set to SSnPdrLPd CPL 2.0		PID Control Cycle Setting Displayed only when control method is set to SSnPdrLPd CPL 2.0		Alarm Output 1 High Limit Alarm Temperature Setting Displayed only when alarm type is set to ALLALHL HPr 4000		Alarm Output 2 High Limit Alarm Temperature Setting Displayed only when alarm type is set to ALLALHL HPr 4000		Digital Input 3 Input Type NormalOpen NormalClose 1LP3 no	
PID Proportional Band (Pb) Setting Displayed only when control method is set to SSnPdrLPd Pb 100		PID Proportional Band (Pb) Setting Displayed only when control method is set to SSnPdrLPd Pb 100		Alarm Output 1 Low Limit Alarm Temperature Setting Displayed only when alarm type is set to ALLALHL LPr 1999		Alarm Output 2 Low Limit Alarm Temperature Setting Displayed only when alarm type is set to ALLALHL LPr 1999		Temperature Unit Unit: °C Unit: °F	
PID Integral Time (Ti) Setting Displayed only when control method is set to SSnPdrLPd ti 0		PID Integral Time (Ti) Setting Displayed only when control method is set to SSnPdrLPd ti 0		Alarm Output 1 Alarm Release Deviation Temperature Setting Displayed only when alarm type is set to ALHL ALM ALL RdF 0.1		Alarm Output 2 Alarm Release Deviation Temperature Setting Displayed only when alarm type is set to ALHL ALM ALL RdF 0.1		Analog Scale Function Use Analog Scale Function Use	
PID Derivative Time (Td) Setting Displayed only when control method is set to SSnPdrLPd td 0		PID Derivative Time (Td) Setting Displayed only when control method is set to SSnPdrLPd td 0		Alarm Output 1 Output Direction Setting NormalClose Output NormalOpen Output noanL no		Alarm Output 2 Output Direction Setting NormalClose Output NormalOpen Output noanL no		Analog Signal Input Upper Limit RIuH 4000	
Steady-State Offset Compensation Displayed only when control method is set to SSnPdrLPd rSt 0.0		Steady-State Offset Compensation Displayed only when control method is set to SSnPdrLPd rSt 0.0		Current Output 1 Settings Current Output 1 Hardware Selection OUT1: None OUT2: Current Output OUT3: Current Output		Current Output 2 Settings Current Output 2 Hardware Selection OUT1: None OUT2: Current Output OUT3: Current Output		Analog Signal Input Lower Limit RIuL 0.0	
ON/OFF Deviation Setting Displayed only when control method is set to RPd AXH 2.00		ON/OFF Deviation Setting Displayed only when control method is set to RPd AXH 2.00		Current Output 1 Type Selection Current Temperature Set Temperature Control Output ALrS PWT		Current Output 2 Type Selection Current Temperature Set Temperature Control Output ALrS PWT		Analog Signal Scale Upper Limit XSCU 4000	
Minimum Power Output Setting Displayed only when control method is set to RPd ALp 4.0		Minimum Power Output Setting Displayed only when control method is set to RPd ALp 4.0		Current Output 1 Temperature at 20mA t20 1000		Current Output 2 Temperature at 20mA t20 1000		Analog Signal Scale Lower Limit LSCU 0.0	

Character Indicator Table

0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

07 Control Output Description (Heating Output, Cooling Output)

This product's outputs are designed so that the hardware can be selected by function. You can select the control outputs from OUT1, OUT2, OUT3, or OUT4.



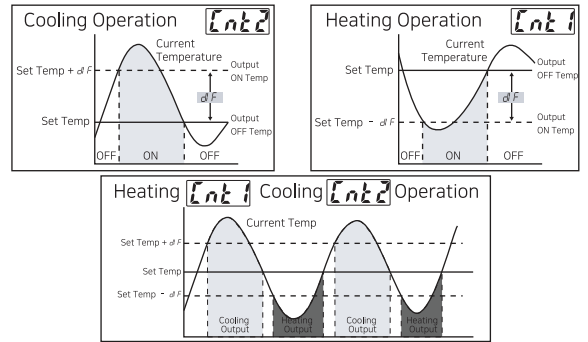
On-Off Control

For on/off control, when the heating output and cooling output hardware are selected as OUT1 and OUT2, on/off control using an SSR is possible. When selected as OUT3 and OUT4, on/off control using a relay is possible.

In the control method selection menu **[CSEL]**, when OUT1 and OUT2 are selected, it should be set to **SSrnf**, and when OUT3 and OUT4 are selected, it should be set to **rLnF**.

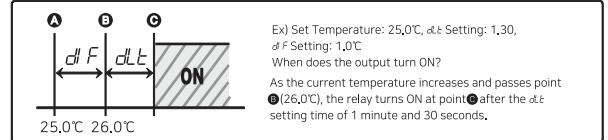
1 dIF On/Off Differential Temperature Setting

If the relay output repeatedly switches ON/OFF too frequently, the output contacts can wear out quickly, or hunting (oscillation, chattering) may occur due to external noise. To prevent this, a fixed interval is set between ON and OFF output operations to protect the device's contacts and related components.



2 dLE Output Delay Time Setting

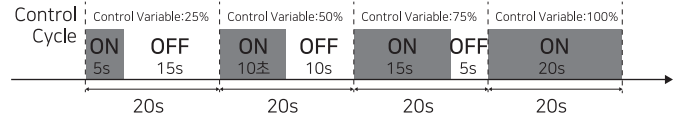
Used when the controlled device frequently repeats ON/OFF operations causing problems (e.g., refrigeration units, compressors) Protective function for machinery during momentary power outages or power restoration



Caution: When using SSR for on/off control, a Zero-Crossing SSR must be used to reduce noise generation.

On/Off PID Control

On/Off PID control is similar to standard on/off control, but it adjusts the ON and OFF durations within a control cycle based on the control variable, enabling PID-like control.



For on/off PID control, when the heating and cooling output hardware is selected as OUT1 and OUT2, PID control using an SSR is possible. When selected as OUT3 and OUT4, PID control using a relay is possible.

In the control method selection menu **[CSEL]**, when OUT1 and OUT2 are selected, it should be set to **SSrnf**, and when OUT3 and OUT4 are selected, it should be set to **rLnF**.

When using a relay for PID control, the minimum ON/OFF time varies depending on the control period (CPT).
- If the CPT is less than 5 seconds: 0.3 seconds
- If the CPT is less than 10 seconds: 0.5 seconds
- If the CPT is 10 seconds or more: 1 second
When using an SSR for PID control, the minimum ON/OFF time is always 0.05 seconds.

Caution:

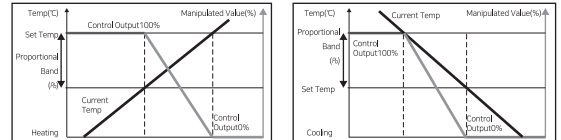
When using a relay for PID control, if the control cycle is too short, frequent ON/OFF operations may reduce the relay contact lifespan. When using an SSR for on/off PID control, a Zero-Crossing SSR must be used to reduce noise generation.

3 CPL Control Cycle Setting

When performing PID control using relay or SSR output, the output turns ON for a certain time and OFF for a certain time repeatedly within the set time cycle. This set time cycle is called the control cycle.

4 Pb Proportional Bandwidth

When the current temperature falls within the proportional band, the P control output changes.



5 ti Integral Time

Integral time refers to the time it takes for the integral action alone to achieve the same manipulated value as the proportional action. With proportional action alone, the target temperature is not reached and a temperature deviation occurs. The integral action integrates the magnitude of the deviation and adds it to the manipulated value, helping the current temperature reach the target temperature.

- * If the integral time is too short: regular oscillations may occur.
- * If the integral time is too long: it is difficult to reach the target temperature or it takes a long time.
- * If the integral time is zero, the integral action does not occur.

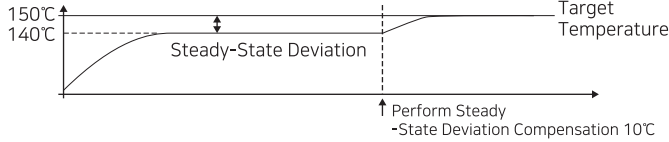
6 **td** Derivative Time

Derivative time refers to the time it takes for the derivative action alone to achieve the same manipulated value as the proportional action when the deviation changes at a constant rate. The derivative action monitors deviations caused by sudden disturbances, and when the difference from the previous deviation is large, it increases the manipulated value significantly to respond quickly to the disturbance.

- * If the derivative time is too short: the response to disturbances will be slow.
- * If the derivative time is too long: regular oscillations may occur.
- * If the derivative time is zero, the derivative action does not occur.

7 **rSt** Steady-State Error Compensation

This is applied when only proportional (P) control is used. With proportional control alone, the system cannot reach the target temperature and results in a steady-state error. This menu allows you to compensate for the deviation.

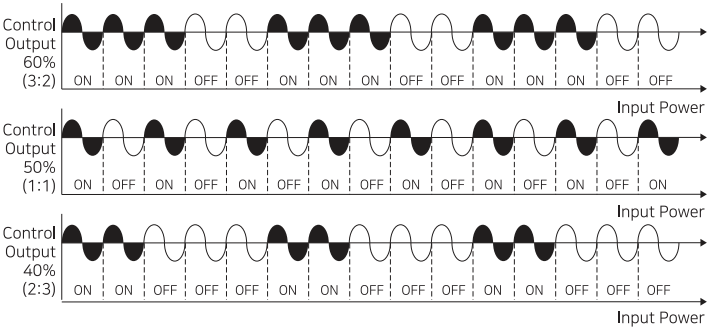


SSR Cycle PID Control

SSR Cycle PID control uses a Non-Zero-Crossing type SSR and adjusts the number of ON/OFF operations per AC power cycle based on the control output. Compared to phase control, Zero-Cross AC power control reduces switching noise, and since the control cycle is not fixed but varies at an optimal ratio, more precise control is possible.

For cycle PID control using SSR, both Non-Zero-Crossing and Zero-Crossing types of SSR can be used, as long as the response time is within 1 ms.

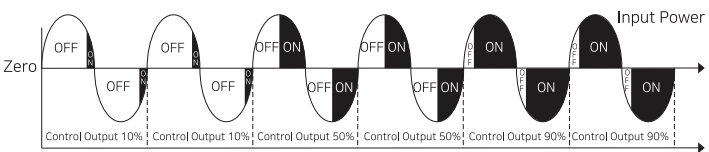
⚠ Caution : Since the zero-cross point of the load power must be detected within the device, when using a Non-Zero-Crossing type SSR, the device operating power and the load must share a common power source.



SSR Phase PID Control

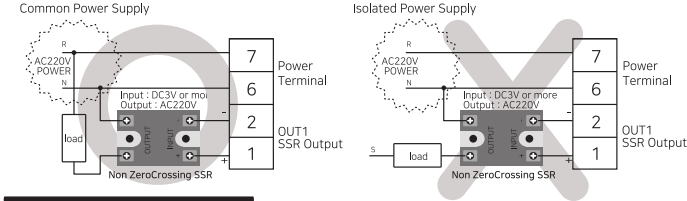
SSR Phase PID control uses a Non-Zero-Crossing type SSR, and based on the control output, it adjusts the phase within a half cycle of the AC power to continuously control the power supplied to the load. In general, a power controller can be used for phase control, but it tends to be expensive and bulky. Instead, a low-cost SSR can be used efficiently. For phase control, the heating and cooling output hardware must be selected as OUT1 and OUT2.

In the control method selection menu **[LSEL]** **[PPd]** must be selected.



⚠ Caution : When using SSR for phase PID control, an SSR that supports Non-Zero-Crossing must be used (response time within 1 ms).

⚠ Caution : Since the device must detect the zero-cross point of the load power internally, the device operating power and the load must share a common power source.

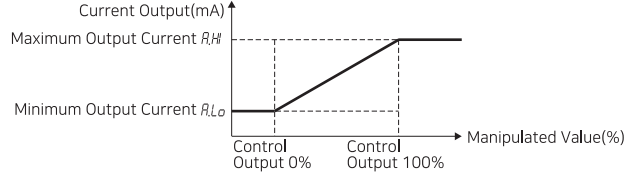


Current PID Control

Current PID control efficiently stabilizes the current temperature at the target temperature by adjusting the 4–20 mA current output according to the control output. The output current is controlled as a continuous analog output. For current PID control, the heating and cooling output hardware must be selected as OUT1 and OUT2.

In the control method selection menu **[LSEL]** **[RPd]** must be selected.

⚠ Caution : When using current output, the load resistance must be 500 ohms or less.



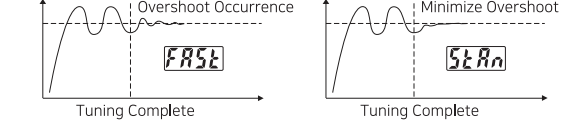
8 **RHi** Current Output Maximum Value Setting

This is the current output value when the manipulated value is 100% during current PID control. Example: If A.HI = 15.0 mA, the current output at 100% manipulated value is 15.0 mA. **[RLo]** Current Output Minimum Value Setting

This is the current output value when the manipulated value is 0% during current PID control. Example: If A.LO = 5.0 mA, the current output at 0% manipulated value is 5.0 mA.

PID Operation Type

9 **PI dt** PID Operation Type Setting

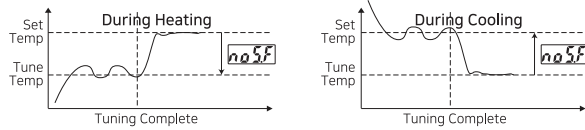


In FAST mode, the system reaches the target temperature more quickly, even if slight overshoot occurs. In STANDARD mode, the system minimizes overshoot while reaching the target temperature.

PID Tuning Temperature Setting

10 **noSt** No-Overshoot Tuning Deviation Temperature Setting

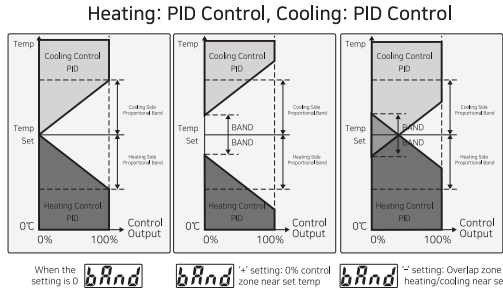
During auto-tuning, this setting allows tuning to be performed at a temperature below the set temperature by the value of the no-over-shoot tuning deviation, so that the current temperature does not exceed the set temperature. After tuning is complete, the temperature then rises to the set value (This does not apply when both heating and cooling are used simultaneously.)



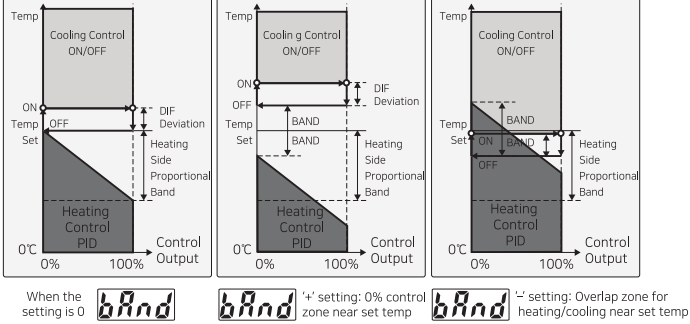
PID Tuning Temperature Setting

11 **bRnd** Band Function Setting

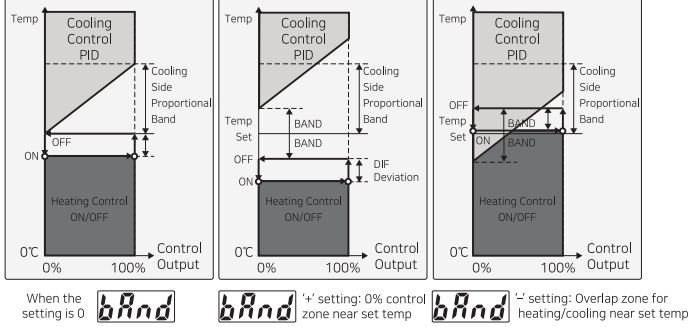
When both heating and cooling outputs are used, a control region between heating and cooling can be defined. If the setting value is 0, the band function is not applied. When set to a positive (+) value, a neutral zone is created where both heating and cooling control outputs become 0%. When set to a negative (-) value, an overlapping zone is created where both heating and cooling controls can be active simultaneously.



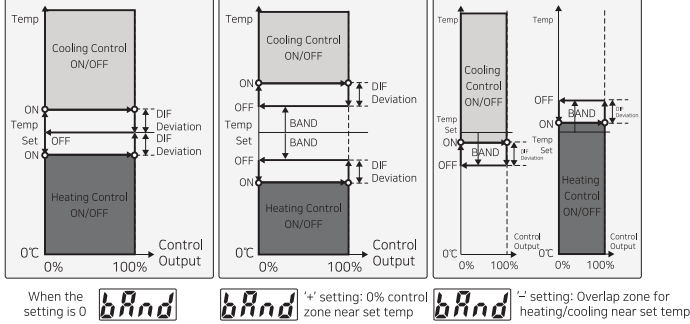
Heating: PID Control, Cooling: ON/OFF Control



Heating: ON/OFF Control, Cooling: PID Control

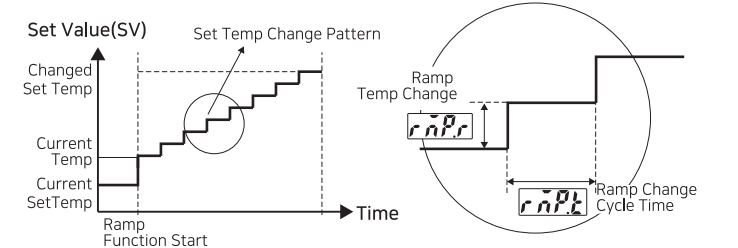


Heating: ON/OFF Control, Cooling: ON/OFF Control



Ramp Function

The ramp function is used to prevent sudden temperature changes when the set value (SV) is changed. It is mainly used in applications where such changes could cause issues with the controlled object.



12 **rnPrr** Ramp Temperature Change

This is the temperature value added or subtracted from the set temperature at each ramp interval when the ramp function starts.

Ex) Ramp Change Temp = 5°C, Current Set Temp = 10°C, Target Set Temp = 50°C, Ramp Interval Time = 1 minute

⇒ The set Temp increases by 5°C every 1 minute, and when it reaches 50°C, the ramp function stops.

13 **rnpLr** Ramp Change Time

This menu is used to change the set Temp by the ramp change Temp at the specified interval after the ramp function starts. If the setting is 0, the ramp function will not operate.

08 Alarm Output Description (Alarm Output 1, Alarm Output 2)

The outputs of this product are selected by hardware according to their function. Alarm outputs can be selected from OUT3 or OUT4.



High Limit Alarm

14 This can be used when menu **[ALYP]** is set to **[ALH]**

An alarm is triggered when the current temperature exceeds the set high limit alarm Temp. After the alarm occurs, the temperature must drop by the **RdF** setting value for the alarm to be cleared.

The high limit alarm Temp is set in menu **[HPr]**

Low Limit Alarm

15 This can be used when menu **[ALYP]** is set to **[ALL]**

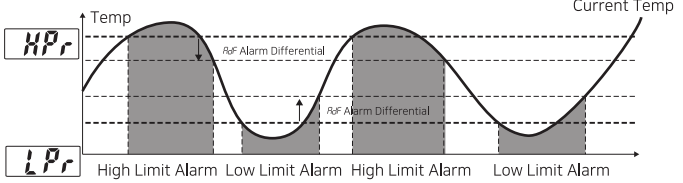
An alarm is triggered when the current temperature falls below the set low limit alarm Temp. After the alarm occurs, the temperature must rise by the **RdF** setting value for the alarm to be cleared.

The Low limit alarm Temp is set in menu **[LPrr]**

High/Low Limit Alarm

16 This can be used when menu **[ALYP]** is set to **[ALHL]**

An alarm is triggered when the current Temp exceeds the set high limit alarm Temp, or falls below the set low limit alarm Temp. Both high and low limit alarms can be used simultaneously.



Sensor Error Alarm

- [o-E]** The sensor is disconnected or the wiring is broken.
- [S-E]** The sensor wires are short-circuited. Please check the wiring.
- [I-E]** For thermocouple sensors, if the cold junction compensation sensor malfunctions, this alarm will be displayed. Please contact the manufacturer for service.
- [XXXX]** When analog signals such as mV, V, or mA exceed the input range, this alarm is displayed.
- [LLLL]** When analog signals such as mV, V, or mA fall below the input range with too small a signal, this alarm is displayed.

Loop Break Alarm

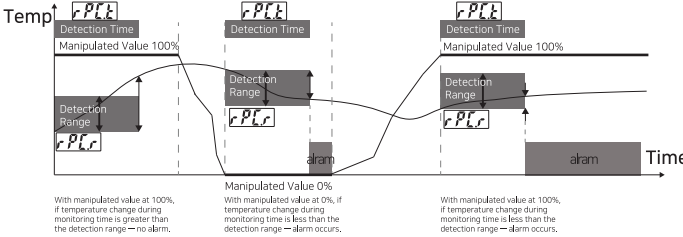
When the manipulated value is 0% or 100% for heating or cooling devices, temperature changes are expected. However, if there is a problem with the output device, temperature may not change, which should be considered a fault.

17 **rPCLr** Loop Error Detection Temperature

This sets the temperature range that must change within the detection time once the loop error detection function starts. Ex) Loop error detection time: 5 minutes, Loop error detection temperature: 2°C ⇒ If the manipulated value is 0% or 100% and there is no temperature change of 2°C or more within 5 minutes, an alarm will be triggered.

18 **rPCLt** Loop Error Detection Time

This sets the detection time for loop error detection. If, when the manipulated value is 0% or 100%, the temp does not change by the set detection temperature within this time, an alarm is triggered. If the setting is 0, the loop error detection function is disabled.



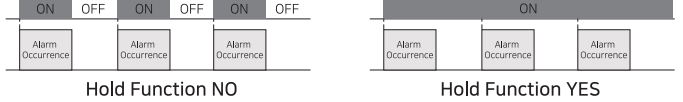
Alarm Hold Function

19 Use **[ALYd]**

Set to **[no]** After alarm occurs and alarm is cleared, the corresponding alarm output turns OFF.

Set to **[YES]** After alarm occurs and alarm is cleared, the corresponding alarm output remains ON.

⇒ Power must be reapplied to clear the alarm, and when the external digital input is set as alarm reset function, the alarm can be cleared by operating that input.

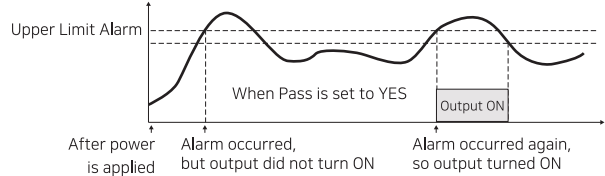


Alarm Pass Function

20 Use **PASS**

Set to **no** Even when the initial alarm occurs after power is applied, the corresponding alarm output turns ON.

Set to **YES** Even when the initial alarm occurs after power is applied, the corresponding alarm output does NOT turn ON.



Output Direction Setting

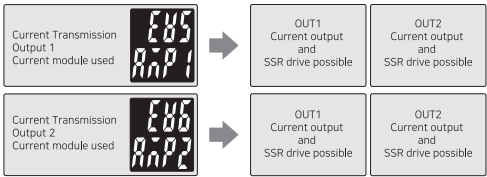
21 Use **nonL**

Set to **no** Normal: OFF, Output: ON when alarm occurs.

Set to **YES** Normal: ON, Output: OFF when alarm occurs.

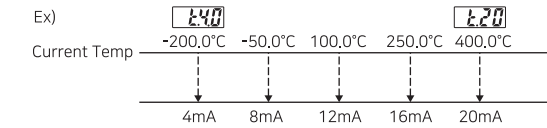
09 Current Transmission Description (Transmission Output 1, 2)

The output of this product is configured by selecting hardware according to each function. Alarm output can be selected from OUT1 or OUT2.



Current Temp Transmission

22 Use **Rt-rS** Set to **PhL** Current Temp can be transmitted as current.



Set Temp Transmission

23 Use **Rt-rS** Set to **ShL** Set Temp can be transmitted as current.

When the ramp function is in use, the changing Set Temp is transmitted.

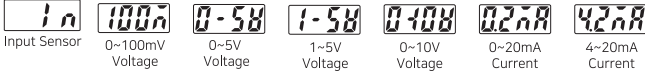
Control Output Transmission

24 Use **Rt-rS** Set to **CnL** Control output can be transmitted.

10 Analog Scale Function

The Analog Scale Function expands or reduces the analog signal input value to display it within the specified maximum and minimum values.

Use **SCALE** Can be used when selected as.



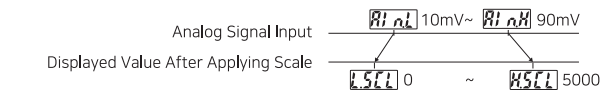
25 Use **SCALE** Set to **YES** Analog scale function can be used.

26 **R1 nH** This is the menu for setting the maximum value of the analog signal.

27 **R1 nL** This is the menu for setting the maximum value of the analog signal.

28 **H5CL** is the value that is expanded or compressed when the analog signal input is **R1 nH**

29 **L5CL** is the value that is expanded or compressed when the analog signal input is **R1 nL**



30 **dot** This menu sets the decimal point position of the displayed value after expanding or compressing the analog input signal using the scale function.

11 Digital Input Description

You can control the general functions of the controller by connecting an external switch.

⚠ Caution:

Although general functions can also be used via the controller's keys, when a function is set to external input, it cannot be operated using the controller keys.

Terminal Wiring Method

Switch Usage According to Digital Switch Function Settings

When Set to Start/Stop Function	Select Switch Use	
When Set to Alarm Reset Function	Push Switch Use	
When Set to Auto/Manual Mode Switching	Select Switch Use	
When Set to Auto Tuning Function	Push Switch Use	
When Set to Multi-SV Function	Select Switch Use	

Select switch is a form where the signal is continuously maintained when the user turns on the switch, and Push switch is a form where the signal is not maintained after the user presses and releases the switch.

31 **di G1 di G2 di G3** Sets the function of the external switch.

no NO: This switch is not used.

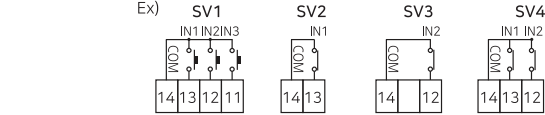
stop Start/Stop function: When Stop is selected, all outputs turn OFF and "STOP" is displayed.

ELR Alarm reset function: When the alarm output is ON, pressing the switch turns the alarm output OFF.

Auto Auto-tuning function: Auto-tuning is the process of finding suitable control parameters for automatic control. Operating the switch toggles between tuning start and stop.

ALnR Auto/Manual mode switching function: Auto mode automatically calculates the control output for precise control. Manual mode allows the user to set the control output directly.

nULRnULb Multi-SV function: Allows setting of up to four stages of set temperature, from Set Temp 1 to Set Temp 4.



If there is no external input signal, the device operates based on the SV1 setting value.

32 **1tP1 1tP2 1tP3** Sets the input type of the external switch.

When set to **nL** : Normally ON, turns OFF when the switch is pressed.

When set to **no** : Normally OFF, turns ON when the switch is pressed.

12 Input Sensor and Others

33 **In** This menu is for selecting the input sensor.

34 **Cor** This menu is for calibrating the displayed value from the input sensor when there is a discrepancy compared to another precise instrument.

Ex) Measured temperature: 20°C, Temperature by precise instrument: 22°C
⇒ If a **Cor** correction value of 2°C is entered, the current temperature will be displayed as 22°C.

35 **Unit** This menu changes the display unit based on the input sensor. It is only available when the input sensor is set to a temperature sensor, and you can choose between Celsius and Fahrenheit.

13 Communication Description

- * RS485 MODBUS RTU protocol is built-in.
- * Asynchronous 2-wire half-duplex communication method / Communication distance: within 1.2 km
- * Communication speed: 1200 / 2400 / 4800 / 9600 / 19200 Bps
- * Start bit: 1 bit, Stop bit: 1 bit, Parity bit: None, Data bit: 8 bits

[Func 0x02 : Read Discrete Inputs]

Simple information such as controller status can be received in bit format.

NO	Address	Description	Range	Unit	Output Value
100001	0000	Sensor Open Error	0/1		
100002	0001	Sensor Short Error	0/1		
100003	0002	Cold Junction Compensation Sensor Error	0/1		
100004	0003	Auto Tuning	0 : Not Tuning / 1 : Tuning		
100005	0004	Heating Side ON/OFF Output	0 : OFFX / 1 : ON		
100006	0005	Cooling Side ON/OFF Output	0 : OFFX / 1 : ON		
100007	0006	Alarm Output 1	0 : OFFX / 1 : ON		
100008	0007	Alarm Output 2	0 : OFFX / 1 : ON		
100009	0008	Temp Unit Celsius	0 : Not Celsius / 1 : Celsius		
100010	0009	Temp Unit Fahrenheit	0 : Not Fahrenheit / 1 : Fahrenheit		
100011	000A	Start/Stop	0 : Stop / 1 : Start		
100012	000B	Alarm Release Input	0 : No Input / 1 : Release Input		
100013	000C	Auto Mode	0 : Not Auto / 1 : Auto Mode		
100014	000D	Manual Mode	0 : Not Manual / 1 : Manual Mode		
100015	000E	Multi SV1	0 : Not Active / 1 : SV1 Status		
100016	000F	Multi SV2	0 : Not Active / 1 : SV2 Status		
100017	0010	Multi SV3	0 : Not Active / 1 : SV3 Status		
100018	0011	Multi SV4	0 : Not Active / 1 : SV4 Status		
100019	0012	Heating Control Use/Not Use	0 : Not Used / 1 : Used		
100020	0013	Cooling Control Use/Not Use	0 : Not Used / 1 : Used		
100021	0014	Alarm Output 1 Use/Not Use	0 : Not Used / 1 : Used		
100022	0015	Alarm Output 2 Use/Not Use	0 : Not Used / 1 : Used		
100023	0016	Transmission Output1 Use/Not Use	0 : Not Used / 1 : Used		
100024	0017	Transmission Output2 Use/Not Use	0 : Not Used / 1 : Used		
100025	0018	Analog Scale	100006 100005 00:0000 01:0000		
100026	0019	Decimal Point Display Position	00019 00018 10:0000 11:0000		

[Func 0x04 : Read Inputs Registers]

Simple information such as current Temp, sensor status, and output status can be received.

NO	Address	Description	Range	Unit	Output Value
300001	0000	Current Temp	Sensor error : ~5000	°C	

NO	Address	Description	Range	Unit	Output Value
300002	0001	Sensor Input Type	0 DPT100	1 JPT100	Temperature sensor
			2 TC,K	3 TC,N	
			4 TC,T	5 TC,J	
			6 TC,E		Voltage
			7 NTC Low	8 NTC High	
			9 0~100mV	10 0~5V	
			11 1~5mV	12 0~10V	Current
			13 0~20mA	14 4~20mA	
300003	0002	Current Setting Temperature	If operating in ramp function: ramp temperature is used		
300004	0003	Heating Control Amount	0.0 ~ 100.0	%	
300005	0004	Cooling Control Amount	0.0 ~ 100.0	%	
300006	0005	System Status Bit(100016~100001)	Func 002 : Read Discrete Inputs		
300007	0006	System Status Bit(100026~100017)	Func 0x02 : Read Discrete Inputs		
300008	0007	Model Name	0x5037 ('P', '7')		
300009	0008	Model Name	0x3030 ('0', '0')		
300010	0009	Model Name	0x0000		

300006(0005) System status bit	15bit 14bit 13bit 12bit 11bit 10bit 9bit 8bit 7bit 6bit 5bit 4bit 3bit 2bit 1bit 0bit
300007(0006) System status bit	15bit 14bit 13bit 12bit 11bit 10bit 9bit 8bit 7bit 6bit 5bit 4bit 3bit 2bit 1bit 0bit

[Func 0x03 : Read Hoding Registers]

You can read the Regulator Settings menu.

[Func 0x06 : Write Single Registers]

You can change one item at a time from the regulator setting menu.

[Func 0x10 : Write Multiple Registers]

You can change several items in the Adjuster Settings menu.

NO	Address	Description	Range	Unit	Output Value
400001	0000	Sensor Information	Func 0x04: Read Inputs Registers		0 : DPT100
400002	0001	PID Operation Type	0 : Standard operation, 1: High-speed operation		0 : Standard operation
400003	0002	NO Output Deviation Setting	0.0 ~ 30.0°C	°C	0.0°C
400004	0003	Multi SV1	According to input sensor DPT100, PT100: -199.9~400.0°C KJ: -50~400°C / T: -50~1000°C NTC low: -55.0~99.9°C / NTC high: -20.0~250.0°C mV: 0.0~100.0mV / 0~5V: 0.00~500V 1~5V: 1.00~500V / 0~10V: 0.00~100.0V 0~20mV: 0.00~20.00mV / 4~20mV: 4.00~20.00mV		0
400005	0004	Multi SV2			
400006	0005	Multi SV3			
400007	0006	Multi SV4			
400008	0007	Heating Flow Rate Control Amount	Heating flow mode control amount	%	0
400009	0008	Cooling Flow Rate Control Amount	Cooling flow mode control amount	%	0
400010	0009	Heating Control Output Number	OUT1 / OUT2 / OUT3 / OUT4		OUT1
400011	000A	Cooling Control Output Number	OUT1 / OUT2 / OUT3 / OUT4		OUT2
400012	000B	Alarm Output 1 Number	OUT3 / OUT4		OUT3
400013	000C	Alarm Output 2 Number	OUT3 / OUT4		OUT4
400014	000D	Power Transmission 1 Output Number	OUT1 / OUT2		NO
400015	000E	Power Transmission 2 Output Number	OUT1 / OUT2		NO
400016	000F	Heating Control Type	0: SSR off control / 1: SSR on-off PID control / 2: SSR cycle PID control / 3: SSR phase PID control / 4: Electric PID control / 5: Relay on-off control / 6: Relay on-off PID control		1: SSR on-off PID control
400017	0010	Cooling Control Type			0: SSR off control
400018	0011	Heating Temperature Deviation	0.1~20.0		1.0
400019	0012	Cooling Temperature Deviation	0.1~20.0		1.0
400020	0013	Heating Output Delay Time	0~1999	sec	0
400021	0014	Cooling Output Delay Time	0~1999	sec	0
400022	0015	Heating Control Cycle	0~120	sec	20
400023	0016	Cooling Control Cycle	0~120	sec	20
400024	0017	Heating Dead Band	0~30.0	°C	10.0
400025	0018	Cooling Dead Band	0~30.0	°C	10.0
400026	0019	Heating Integral Time	0~9999	sec	0
400027	001A	Cooling Integral Time	0~9999	sec	0
400028	001B	Heating Derivative Time	0~9999	sec	0
400029	001C	Cooling Derivative Time	0~9999	sec	0
400030	001D	Heating Normal State Offset Correction	-30.0~30.0	°C	0
400031	001E	Cooling Normal State Offset Correction	-30.0~30.0	°C	0
400032	001F	Heating Current Output Upper Limit	0~20.0	mA	20.0
400033	0020	Cooling Current Output Upper Limit	0~20.0	mA	20.0
400034	0021	Heating Current Output Lower Limit	0~20.0	mA	4
400035	0022	Cooling Current Output Lower Limit	0~20.0	mA	4
400036	0023	Alarm Output 1 Alarm Time	0: Upper limit alarm output / 1: Lower limit alarm output / 2: Upper & Lower limit alarm output / 3: Sensor error output / 4: Loop error output		Upper limit alarm
400037	0024	Alarm Output 2 Alarm Time			Lower limit alarm
400038	0025	Alarm Output 1 Alarm Hold	0: Not held, 1: Held (in use)		0: Not held
400039	0026	Alarm Output 2 Alarm Hold	0: Not held, 1: Held (in use)		0: Not held
400040	0027	Alarm Output 1 Initial Compass	0: Suppress, 1: Initial Alarm Suppress		0: No Pass
400041	0028	Alarm Output 2 Initial Compass	0: Suppress, 1: Initial Alarm Suppress		0: No Pass
400042	0029	Alarm Output 1 Upper Alarm Info	400004 Refer to Multi SV	°C	Multi SV Max Value
400043	002A	Alarm Output 2 Upper Alarm Info	400004 Refer to Multi SV	°C	Multi SV Max Value
400044	002B	Alarm Output 1 Lower Alarm Info	400004 Refer to Multi SV	°C	Multi SV Max Value
400045	002C	Alarm Output 2 Lower Alarm Info	400004 Refer to Multi SV	°C	Multi SV Max Value
400046	002D	Alarm Output 1 Hysteresis	0.1 ~ 20.0	°C	0.1
400047	002E	Alarm Output 2 Hysteresis	0.1 ~ 20.0	°C	0.1
400048	002F	Alarm Output 1 Output Direction	0 : Normal Open, 1 : NormalClose	°C	1 : NormalOpen
400049	0030	Alarm Output 2 Output Direction	0 : Normal Open, 1 : NormalClose	°C	1 : NormalOpen
400050	0031	Transmission Output 1 Transmission Type	0: Current Temp, 1: Set Temp, 2: Control Amount		0: Current Temp
400051	0032	Transmission Output 2 Transmission Type			1: Set Temp
400052	0033	Transmission Output 1 20mA Data	400004 Refer to Multi SV	°C	Multi SV Max Value
400053	0034	Transmission Output 2 20mA Data	400004 Refer to Multi SV	°C	Multi SV Max Value
400054	0035	Transmission Output 1 4mA Data	400004 Refer to Multi SV	°C	Multi SV Min Value
400055	0036	Transmission Output 2 4mA Data	400004 Refer to Multi SV	°C	Multi SV Min Value
400056	0037	RS485 Communication Address	1 ~ 99		1
400057	0038	RS485 Communication Address	1200/2400/4800/9600/19200		9600
400058	0039	Sensor Input Compensation	-20.0 ~ 20.0		0.0
400059	003A	Digital Input 1 Function	0: Not Used, 1: Start/Stop, 3: Alarm Reset, 4: Auto/Manual, 5: Auto Tuning, 6: Multi SV A		1: Start/Stop
400060	003B	Digital Input 2 Function	0: Not Used, 1: Start/Stop, 3: Alarm Reset, 4: Auto/Manual, 5: Auto Tuning, 6: Multi SV A		2: Alarm Reset
400061	003C	Digital Input 3 Function	0: Not Used, 1: Start/Stop, 3: Alarm Reset, 4: Auto/Manual, 5: Auto Tuning		4: Auto Tuning
400062	003D	Digital Input 1 Input Type	0 : Normal Open		1 : NormalOpen
400063	003E	Digital Input 2 Input Type	1 : Normal Close		
400064	003F	Digital Input 3 Input Type			
400065	0040	Temperature Display Unit	0: No Unit, 1: Celsius, 2: Fahrenheit		1: Celsius
400066	0041	Use Analog Scale	0: Not Used, 1: Used		0: Not Used
400067	0042	Analog Input Upper Limit	400002 Multi SV Reference		Multi SV Maximum Value
400068	0043	Analog Input Lower Limit	400002 Multi SV Reference		Multi SV Minimum Value
400069	0044	Analog Scale Upper Limit	-1999 ~ 9999		2000
400070	0045	Analog Scale Lower Limit	-1999 ~ 9999		400
400071	0046	Analog Scale Decimal Point Position	0 : 0000, 1 : 000.0, 2 : 00.00, 3 : 0.000		0 : 0000
400072	0047	Band Setting	-20.0 ~ 20.0	°C	0
400073	0048	Lamp Value	0 ~ 20.0		0
400074	0049	Lamp Time	0 ~ 5999	sec	0
400075	004A	Loop Break Check Value	0 ~ 20.0	°C	0
400076	004B	Loop Break Detection Time	0 ~ 1000	sec	0

14 Diemension and panel hole sizes

(Unit : mm / error : ±0.5)

