Digital Temperature Controller

monoOne®-120

OPERATION MANUAL

Please read this manual before attempting to operate the unit.

「monoOne」

monoone is the only one digital temperature controller carved out of our experience based on the accumulated skills and technologies at our shop floor.

Contents

1 Safety Precautions

The symbols on the right indicates the prohibited items and required operations that must be observed to prevent physical injury and/or damage to or destruction of the product.

🚫	Prohibited item
❗	Required operation

⚠️ ELECTRIC SHOCK

Warning — **If the cautions corresponding to this indication are not observed, death, electric shock, burns, or other physical injury may occur.**

🚫	▸ Do not touch anything inside the unit while the power is applied. ▸ Never operate the unit with wet hands. ▸ Do not push anything through the openings in the case while power is applied to the unit.
❗	▸ Turn off the power before attempting to make any connections. ▸ Make sure that the unit is correctly grounded. ▸ The unit does have any means of guarding against ground faults caused by short circuits. Install a ground-fault circuit breaker or other protective device on the power input side.

⚠️ FIRE

Warning — **If the cautions corresponding to this indication are not observed, death, electric shock, burns, or other physical injury may occur.**

🚫	▸ Never modify or disassemble the unit. Otherwise, a malfunction may occur, possibly causing a fire.
❗	▸ Before powering on a measuring instrument, check that all the connections have been made correctly. If the connections are incorrect, a malfunction may occur, possibly causing an accident.

⚠️ **Caution** — **If the cautions corresponding to this indication are not observed, injury to the user and/or damage to the unit may occur.**

■Notes on safety measures

❗	▸ While the utmost care is applied during the manufacturing of the unit, specific measures for dealing with abnormal ambient temperatures must be applied to prevent a malfunction. ▸ Temporary malfunctions caused by noise can be eliminated by turning the power off and then turning it back on. Should such a fault occur repeatedly, however, consider permanent measures to prevent noise.

■Notes on making connections

➲ For details, see Section 3-2, "Connections."

🚫	▸ Do not attach or detach a connection while the unit is powered on.
	▸ Do not connect the input power to the output terminals or sensor input terminals.
	▸ Route the wiring for the thermocouple input away from the power and load lines. Do not bundle them together.
❗	▸ Turn off the power before attempting to make any connections.
	▸ Confirm that all the connections are correct before turning on the power.
	▸ Install a ground fault circuit breaker for the power input.
	▸ The unit is designed for use with single-phase power only. It cannot be used with three-phase power.
	▸ Only a resistor (heater) can be connected as a load to the output terminals.
	▸ The load on the resistor (heater) must not exceed 15 A.
	▸ The cables for the power and load lines must be rated for the voltage and power.
	▸ Use the specified compensating conductor wires or thermocouple elemental wires to make a connection between a thermocouple and the unit.
	▸ Use shielded wires near any equipment that may generate noise.
	▸ Use crimp contacts for M3.5 screws.
	* M3 screws for the upper terminal block.
	▸ Securely tighten the fixing screw of each terminal.

■Notes on installation location

❗	Install the unit in a location that satisfies the following conditions.
	▸ Indoor location where the ambient temperature is between 0 and 40℃; away from direct sunlight or sources of heat such as electric furnaces; where the temperature change is small, ideally where the temperature is as near to room temperature as possible; and with good ventilation.
	▸ Location where the ambient humidity ranges from 35 to 85％ RH; where low humidity and high humidity are not experienced (no condensation).
	▸ Location where there is no sulfide gas, corrosive gas, or cutting fluid mist.
	▸ Location where there is no dust or oily fumes, and which is not likely to suffer smoke or salt damage.
	▸ Location that is not splashed with water, oil, or chemical agents.
	▸ Location with minimal mechanical vibration or shock.
	▸ Location where the effect of electrical noise is minimal.
	* Do not select a location close to electrical circuitry or where there is a risk of inductive interference.
	▸ Location where the effect of electromagnetic fields is minimal.

■Notes on installation

➲ For details, see Section 2-2, "Mounting."

❗	Before attempting to install the unit, be careful to discharge all static electricity. Static electricity stored in your clothes or on your body may damage the unit. **Wall mounting** ▸ Mount the unit on a fire-resistant wall that is not subject to vibration, using the built-in mounting brackets. ▸ DIN rail is available for installing the unit on the wall. (Optional) ➲ For details, see Section 2-2, "Mounting." ▸ To ensure efficient cooling, position the unit away from other equipment or components. **Table-top use** ▸ Remove built-in mounting brackets and apply rubber bumper feet (supplied accessories) to four (4) corners of the bottom. Select a flat surface for the unit. ▸ Angle adjustable stand is available. (Optional) ➲ For details, see Section 2-2, "Mounting."

■Operations after power-on

❗	▸ Before using the unit, you must choose the overheat prevention selection (AS1) and overheat prevention setting (AH1) according to how you will be using the unit. Even when you choose to use the initial settings, you must nevertheless check the overheat prevention setting. ➲ For details, see Section 4-4, "Overheat Prevention Setting." ▸ The measurement sensor of the unit has been so designed as to use7 types of thermocouples and platinum resistance temperature detector (Pt100Ω). Parameter-setting is required depending upon measurement the sensor you will use. ➲ For details, see Section 5, "Setting Parameters."

■Disposal method

	This product corresponds to industrial waste.
	Please perform the disposal method according to the rule of each local government.

■Other notes

	‣ Do not block the cooling vents of the unit.
	‣ Do not use the unit outdoors.
	‣ Do not allow water to splash onto the unit.
	‣ Do not apply excessive force to the touch panel or puncture it with a sharp-pointed object such as the tip of ballpoint pen or a metal rod. Otherwise, it may malfunction or fail.
	‣ The operating voltage of the unit must be between 90 V and 240 V.
	‣ When you are not using the unit, turn off the power for safety.

2 Installation Location and Mounting

2-1 Installation Location

Install the unit in a location that satisfies the following conditions.

- Indoor location where the ambient temperature is between 0 and 40℃; away from direct sunlight or sources of heat such as electric furnaces; where the temperature change is small, ideally where the temperature is as near to room temperature as possible; and with good ventilation.

- Location where the ambient humidity ranges from 35 to 85％ RH; where low temperatures and high humidity are not experienced (no condensation)

- Location where there is no sulfide gas, corrosive gas, or cutting fluid mist

- Location where there is no dust or oily fumes, and which is not likely to suffer smoke or salt damage

- Location that is not splashed with water, oil, or chemical agents

- Location with minimal mechanical vibration or shock

- Location where the effect of electrical noise is minimal

  * Do not select a location close to electrical circuitry or where there is a risk of inductive interference.

- Location where the effect of the electromagnetic fields is minimal

2-2 Mounting

The unit can be mounted either on a table or wall.

⚠ Before attempting to install the unit, make sure to discharge all static electricity. Static electricity stored in your clothes or on your body may damage the unit.

■Wall mounting

Mount the unit using the built-in mounting brackets.

⚠
‣ Mount the unit on a fire-resistant wall that is not subject to vibration.
‣ To ensure efficient cooling, position the unit away from other equipment or components.

10cm or more

5cm or more ↔ ↔ 5cm or more

10cm or more
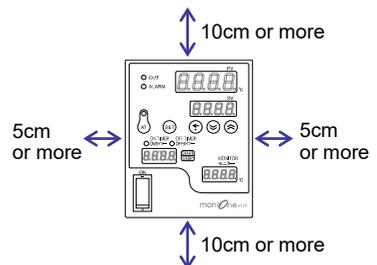
■Table-top use

Apply rubber bumper feet (supplied accessories) to four (4) corners of the bottom when using the unit on the table.
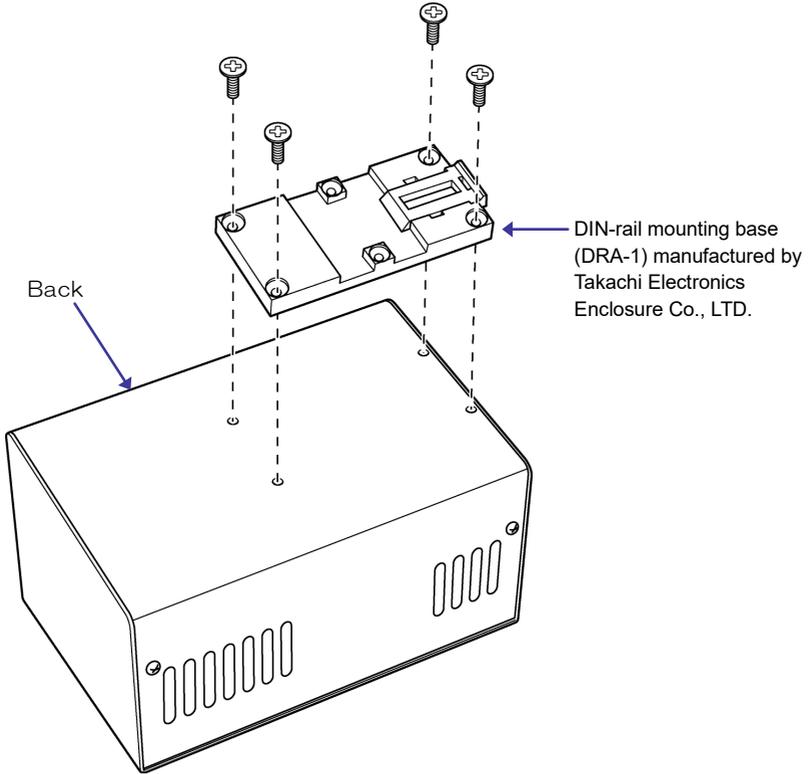
⚠ Always select a flat surface for the unit.

■DIN-rail mounting

Please inquire about "DIN-rail mounting base" (optional) available when you need to mount the unit on DIN rail (35mm).

Easy to attach and to detach MONONE-120 from DIN-rail mounting base by pulling a lever below.

DIN-rail mounting base (DRA-1) manufactured by Takachi Electronics Enclosure Co., LTD.
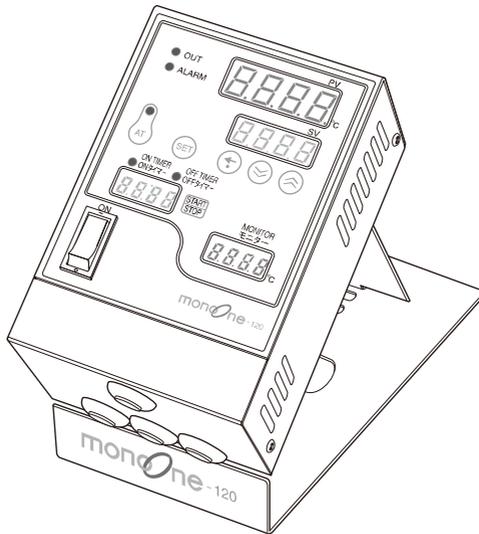
Back

⚠ **Notes on installation**

Make sure if there is space enough to pull a lever to detach monoone-120 when mounting monoone-120 on DIN-rail mounting base.

DIN-rail mounting base.

monoone-120

DIN rail

Lever
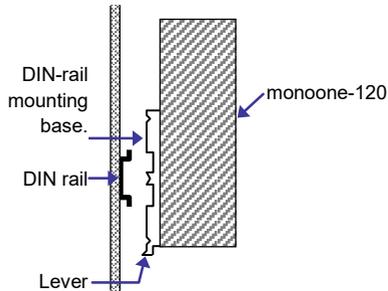
■Stand mounting

Please inquire about "Angle adjustable stand" (optional) for using MONONE-120 on a tabletop.

Angle adjustable stand

Back
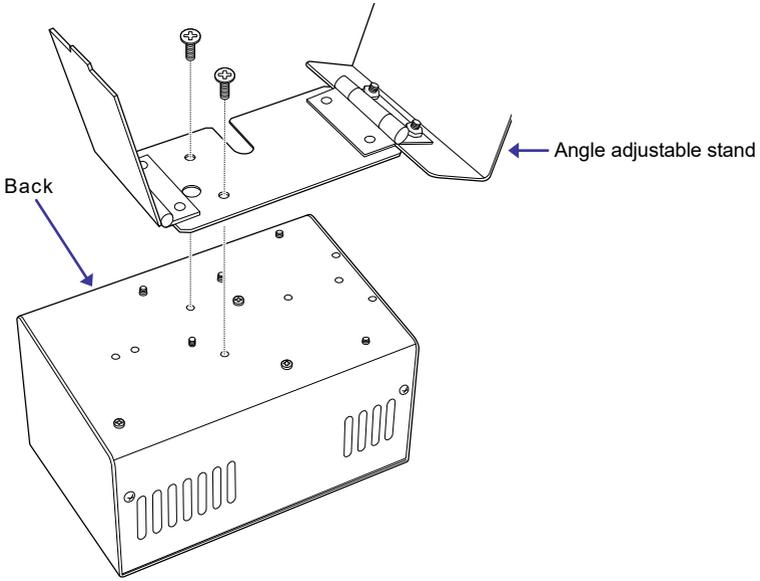
3 Components and Connections

3-1 Name and Description of Components

■Body

Mounting brackets

Terminal block cover fixing screws
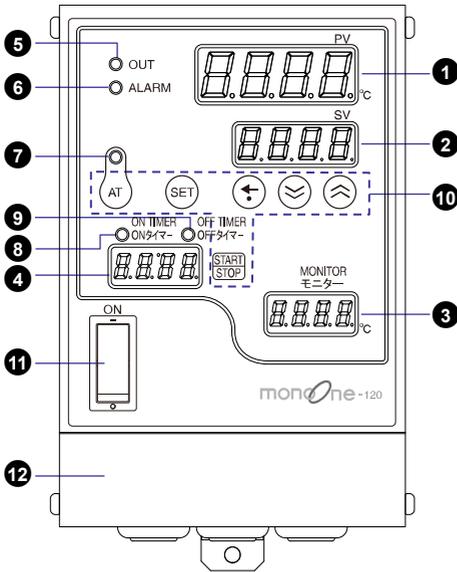
■Terminal block

＜Main terminal block＞

＜The upper terminal block＞

E ① ② ③ ④ ⑤ ⑥ ⑦

⑧ ⑨ ⑩ ⑪ ⑫

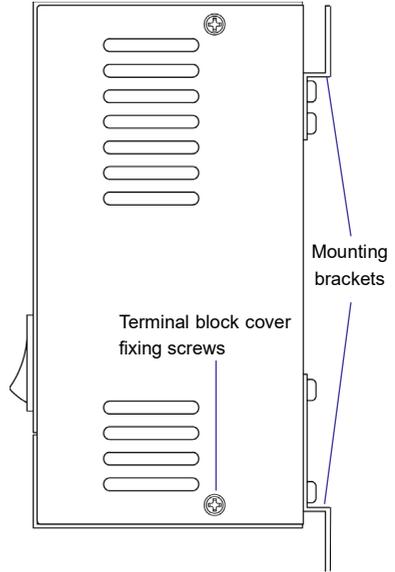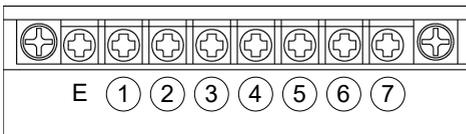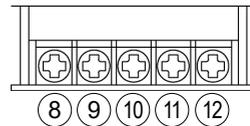| No	Component	Description
❶	PV display	• Normally indicates the measured temperature (red LED). • Press and hold (↕) to display the electric current flowing through the unit. • Under abnormal conditions, indicates an error. • When a parameter is changed, displays the character.
❷	SV display	• Normally indicates the set temperature (green LED). • When a parameter is changed, the set character blinks. • Press and hold (↕) to display the output of control cycle.
❸	Monitor display	The measured temperature will be displayed in red LED when temperature monitor function is activated by changing parameters.
❹	Timer display	A set time will be displayed in green LED when timer function is activated by changing parameters. * Timer function is usable only if Timer Function (Optional) is purchased.
❺	OUT lamp	This orange lamp lights while the heater output is on.
❻	ALARM lamp	Under abnormal conditions, this red lamp lights.
❼	AT lamp	This green lamp lights during auto-tuning.
❽	ON Timer lamp	• Orange lamp lights while ON Timer is selected. • Orange lamp blinks while ON Timer is counting down.
❾	OFF Timer lamp	• Orange lamp lights when OFF Timer is selected. • Orange lamp blinks while OFF Timer is counting down.
❿	Operation keys (AT)	This key is pressed to start or stop auto-tuning.
	(SET)	• This key is pressed to change a setting or select a mode. • This key is pressed to change a parameter or to switch to the next parameter.
	(↕) (Shift key)	• Press this shift key to change decimal point position of a set value. * The output of control cycle and the electric current flowing through the unit are displayed.
	(˅) (˄)	This key is pressed to increase or reduce a setting.
	START STOP	• Press this key when either to start or to end Timer Function. • Press this key just for a second to pause while Timer Function is working. • Press this key longer to reset while Timer Function is working. • The above operations are not possible when Timer Function is not selected.
⓫	Power switch	This switch is used to turn the power on or off.
⓬	Terminal block cover	Terminal block cover. Removing this cover reveals the terminal block.

3-2 Connections

■Necessary parts

- Crimp contacts for М3.5 screws *M3 screws for the upper terminal block.

- Thermocouples or platinum resistance temperature detector (Pt100Ω).

- Compensating conductor wires for connections between a thermocouple and the unit. Use only the specified type of compensating conductor wires or thermocouple elemental wires.

  * Use shielded wires near equipment that generates noise.

- Wires used for power lines and load lines. Use wires rated for the voltage and power of the power and load lines.
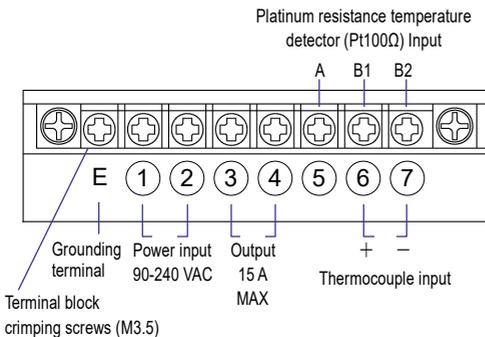
> ⚠
> ▸ Turn off the power before attempting to make any connections.
> ▸ Confirm that all connections are correct before turning on the power.
> ▸ The unit can be used only with single-phase power. It cannot be used with three-phase power.
> ▸ Do not attempt to make or break any connections while the power is turned on.
> ▸ Route the wiring for the measurement sensor input away from the power and load lines. Do not bundle them together.

■Making a connection

① Turn off the power.

② Remove the two terminal block cover fixing screws and then remove the terminal block cover.

> ⊙ The location of the terminal block cover and terminal block cover fixing screws are shown in Section 3-1, "Components."

③ Removing the cover reveals the terminal block, allowing you to make a connection.
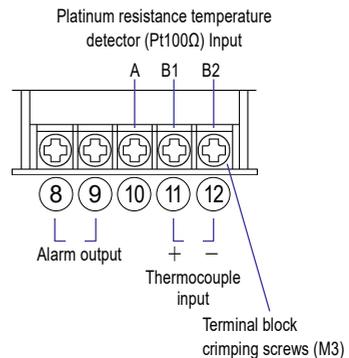
＜Main terminal block＞

Platinum resistance temperature detector (Pt100Ω) Input
A   B1   B2

E ① ② ③ ④ ⑤ ⑥ ⑦

Grounding terminal
Power input 90-240 VAC
Output 15 A MAX
＋ －
Thermocouple input

Terminal block crimping screws (M3.5)

＜The upper terminal block＞

Platinum resistance temperature detector (Pt100Ω) Input
A   B1   B2

⑧ ⑨ ⑩ ⑪ ⑫

Alarm output
＋ －
Thermocouple input

Terminal block crimping screws (M3)

■Type and temperature range of measurement sensors

Item	Classification	Said mark PV said	Display range (input range) Resolution 0.1	Resolution 1	Unit
1	K（CA）	*H.*	−199.9 ～ 999.9	−199 ～ 1372	℃
			−199.9 ～ 999.9	−326 ～ 2502	°F
2	Pt100	*Pt*	−199.9 ～ 650.0	−199 ～ 650	℃
			−199.9 ～ 999.9	−326 ～ 1202	°F
3	J（IC）	*J*	−50.0 ～ 999.9	−50 ～ 1100	℃
			−58.0 ～ 999.9	−58 ～ 2012	°F
4	T（CC）	*t*	−199.9 ～ 400.0	−199 ～ 400	℃
			−199.9 ～ 752.0	−326 ～ 752	°F
5	E（CRC）	*E*	−199.9 ～ 750.0	−199 ～ 750	℃
			−199.9 ～ 999.9	−326 ～ 1382	°F
6	R（13%PR）	*r*	—	0 ～ 1760	℃
				32 ～ 3200	°F
7	S（10%PR）	*S*	—	0 ～ 1760	℃
				32 ～ 3200	°F
8	B（30%PR）	*b*	—	0 ～ 1800	℃
				32 ～ 3272	°F

■Indicating accuracy

* No measurement errors of input element included.

Classification		Indicating accuracy
Thermocouple	K, J, T, E	(±0.3% or ±2℃ of indication value, whichever is greater) ±1digit max
	R, S	(±0.3% or ±3℃ of indication value, whichever is greater) ±1digit max
	B	±5％ ±1digit max in the display range of 0 to 400℃
Platinum resistance temperature detector (Pt100Ω)		(±0.3% or ±2℃ of indication value, whichever is greater) ±1digit max

■Features of Thermocouple

| Type	Strength	Weakness
K	• Excellent linearity of the thermal electromotive force. • Excellent oxidation resistance.	• Not suitable for a reducing atmosphere. • The thermal electromotive force changes greatly within a short period of time when used in the 350 - 550℃ range as it is short range ordering.
J	• Inexpensive. • Usable in a reducing atmosphere.	• Positive electrode (iron) is apt to get rusty. • Variations in characteristics are large.
T	• Excellent linearity of the thermal electromotive force. • Variations in quality are small. • Usable in a reducing atmosphere.	• Positive electrode (copper) gets easily oxidized. • Excellent thermal conductivity.
E	• Excellent thermal electromotive force. • Compared with J type, excellent corrosion resistance and oxidation resistance. • Both positive electrode and negative electrode are non-magnetic. • Thermal conductivity is small.	• Not suitable for a reducing Atmosphere. • Excellent electrical resistance.
R, S	• Superior precision and less deterioration and less variation in quality. • Excellent oxidation resistance and chemical resistance.	• Sensitivity is low. • Fragile to a reducing atmosphere. • Fragile to a reducing atmosphere and metal vapor. • Expensive.
B	• Suited to measure more than 1000℃. • Compensating lead wire is not required as the thermal electromotive force is negligible at ambient temperatures. • Excellent oxidation resistance and chemical resistance. • Life expectancy is 10 to 20 times longer, compared with R type even in a reducing atmosphere.	• Not suited to measure less than 600℃ as the thermal electromotive force is small. • Sensitivity is low. • Linearity of the thermal electromotive force is poor. • Expensive.

4 Setup

4-1 Starting Operation

① Set the power switch to ON.
   → The PV display and SV display indicate "8888", which blinks for approximately two seconds. Then, the PV display indicates the current temperature, while the SV display indicates the setting. Control starts.
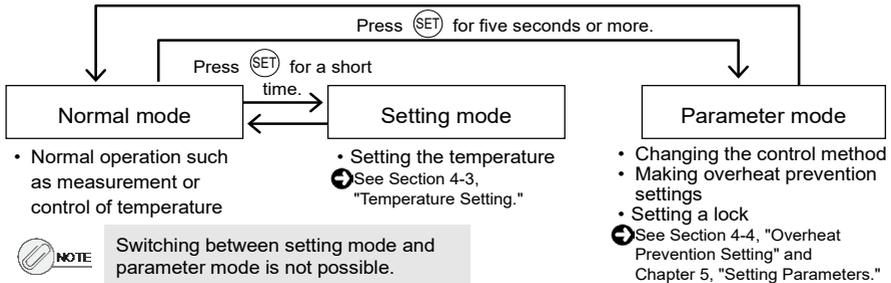
NOTE Parameter setting is required according to the type of sensor to be used for measurement. Parameter is set for K type as a default.
   ➲ Please refer to 5 Setting Parameters for details.
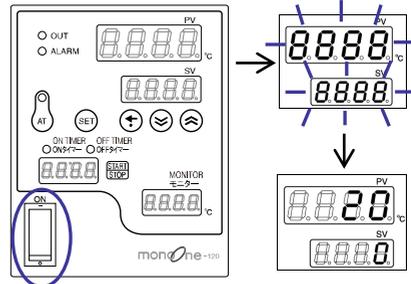
4-2 Modes

The unit has three modes, which are switched according to how you are using the unit.

Press (SET) for five seconds or more.

Press (SET) for a short time.

| Normal mode | Setting mode | Parameter mode |

- **Normal mode**
  - Normal operation such as measurement or control of temperature

  NOTE Switching between setting mode and parameter mode is not possible.

- **Setting mode**
  - Setting the temperature
    ➲ See Section 4-3, "Temperature Setting."

- **Parameter mode**
  - Changing the control method
  - Making overheat prevention settings
  - Setting a lock
    ➲ See Section 4-4, "Overheat Prevention Setting" and Chapter 5, "Setting Parameters."

4-3 Temperature Setting

Switch from normal mode to setting mode and then set the temperature.
The following steps describe how to set the temperature to 40°C.

① Press (SET).
   → The mode is switched to setting mode and the SV display blinks.
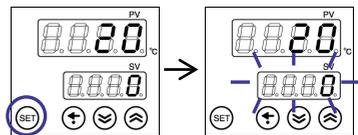
② Set the temperature with (⌄) and (⌃) and then press (SET).
   → The set temperature is recorded.

NOTE The latest setting is recorded immediately after (SET) is pressed or one minute after (⌄) or (⌃) is released.

NOTE After a minute elapses without any key being pressed, the mode automatically returns to normal mode.

4-4 Overheat Prevention Setting

The unit uses SSR for temperature control, so has the function for preventing heater overheating caused by a failure of an internal output module or the like.

This function uses an internal relay to turn off the output if the set temperature is exceeded.
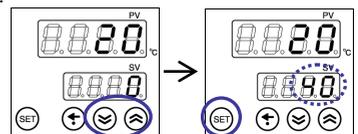

⚠ ▸ Before using the unit, you must choose the overheat prevention selection (AS1) and overheat prevention setting (AH1), according to the use conditions.
Even when you are using the unit while leaving the initial settings as is, you must check the overheat prevention setting.

▸ If this function operates due to a temperature rise even when the heater output (OUT) is turned off, the output module is likely to have failed. In this case, the unit requires repair. Contact your sales office.
However, this may be caused by a general overshoot (the temperature depends on the system). In this case, increase the AH1 setting (overheat prevention setting).

■Methods of overheat prevention setting

Make this setting using one of the following methods.

- Setting based on a deviation (SV + AH1)
  Make the setting such that the function operates when the temperature reaches a level that is equal to or higher than the set temperature (SV) plus the overheat prevention setting (AH1).

- Setting based on an absolute value (AH1)
  Make the settings such that the function operates when the temperature reaches a level that is equal to or higher than the overheat prevention setting (AH1).

■Procedure for overheat prevention setting

The following steps describe how to set the deviation to 60℃.

① Press (SET) for five seconds or more.

> NOTE Press and continue to hold (SET), even after the SV display starts blinking.

→ The mode is switched to parameter mode.
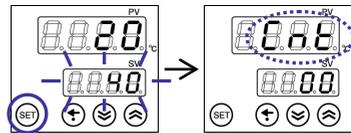
② Press (SET) to change to the overheat prevention selection (AS1).
Confirm if SV display indicates a deviation of 00.
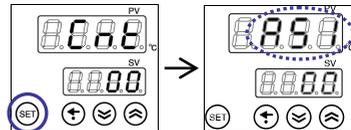
> NOTE The initial value of AS1 is a deviation of 00. To set an absolute value, change AS1 to 01 with (⌄)and(⌃).

③ Press (SET) to switch to the overheat prevention setting (AH1).
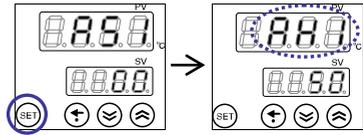
④ Change the setting with (∨)and(∧) then press (SET).

→ The setting is saved.

NOTE The latest setting is recorded immediately after (SET) is pressed or one minute after (∨) or (∧) is released.

NOTE Once one minute has elapsed without any key being pressed, the mode automatically returns to normal mode.

5 Setting Parameters

5-1 Setting Parameters

To set parameters, switch from normal mode to parameter mode.

> NOTE Once a parameter is set, the setting remains saved even after power-off.
> It does not have to be set every time.

The procedure below is an example of how to switch to E type of thermocouple.

⊃ For details on the displayed characters, see Section 5-3, "Description of Characters and Initial Settings."

① Press (SET) for five seconds or more.

> NOTE Press and continue to hold (SET) , even after the SV display starts blinking.

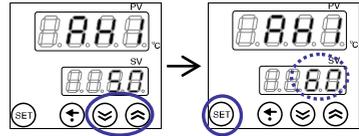→ The mode is switched to parameter mode.
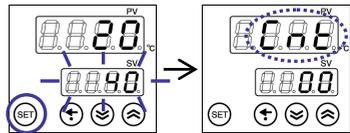
② Press (SET) to select a parameter.
In this example, the measurement sensor input (in1) is selected.
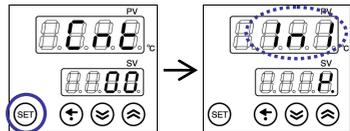
③ Press (≽)／(≼) to indicate E, and then press (SET).
→ The setting is saved.
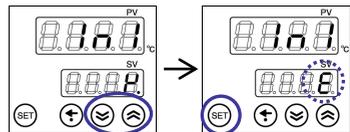
> NOTE Select the thermocouple from those to be shown in the following order by pressing (≽)／(≼).
>
> $$\rightarrow \mathcal{H}. \rightarrow P\,t \rightarrow J \rightarrow t \rightarrow E \rightarrow r \rightarrow S \rightarrow b$$
>
> | | | | | | | | |
> |------|------|------|------|------|------|------|------|
> | K | Pt | J | T | E | R | S | B |

> NOTE After a minute has elapsed without any key being pressed, the mode automatically returns to normal mode.

5-2 Operation Flow in Parameter Mode

⊙ For *1 to *4, see "■Parameter settings and control methods" on the next page.
*5 : Please refer to "■Type and temperature range of measurement sensors" on page 11.

PV	Cnt	Control method
SV	00=PID control *1 01=ON/OFF control *2	

↓ ON／OFF   ↓ PID

PV	dFS	Sensitivity	PV	Pb	Proportional band
SV	0〜99.9 *1		SV	0.1〜999.9（℃）	

PV	SLH	Setting upper limit	PV	It	Integral time
SV	*5		SV	0〜999（sec）	

PV	SLL	Setting lower limit	PV	dt	derivative time
SV	*5		SV	0〜999（sec）	

PV	PuS	PV compensation	PV	Pt	Proportional cycle
SV	−50.0〜50.0（℃）		SV	1〜10（sec）	

PV	$In1$	Measurement sensor input
SV	K→Pt→J→T→E→R→S→B	

PV	$dP1$	Measurement scaling（Minimum unit selection）
SV	0.1／1	

PV	$AS1$	Overheat prevention selection
SV	oFF 00= Deviation（SV+AH1） *3 01= Absolute value（AH1） *4	

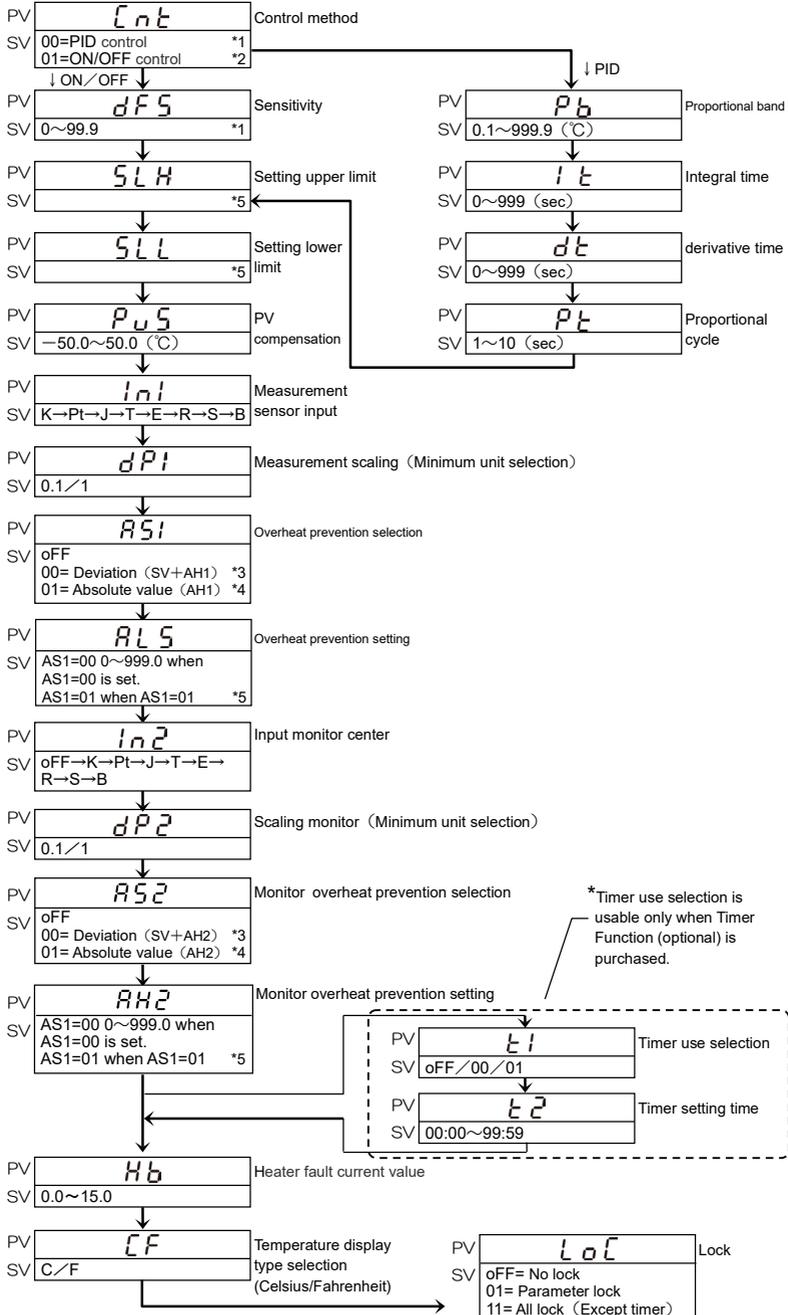|		
PV	$AL1$	Overheat prevention setting
SV	AS1=00 0〜999.0 when AS1=00 is set. AS1=01 when AS1=01 *5	

PV	$In2$	Input monitor center
SV	oFF→K→Pt→J→T→E→ R→S→B	

PV	$dP2$	Scaling monitor（Minimum unit selection）
SV	0.1／1	

PV	$AS2$	Monitor overheat prevention selection
SV	oFF 00= Deviation（SV+AH2） *3 01= Absolute value（AH2） *4	

PV	$AH2$	Monitor overheat prevention setting
SV	AS1=00 0〜999.0 when AS1=00 is set. AS1=01 when AS1=01 *5	

*Timer use selection is usable only when Timer Function (optional) is purchased.

PV	$t1$	Timer use selection
SV	oFF／00／01	

PV	$t2$	Timer setting time
SV	00:00〜99:59	

PV	Hb	Heater fault current value
SV	0.0〜15.0	

PV	CF	Temperature display type selection (Celsius/Fahrenheit)
SV	C／F	

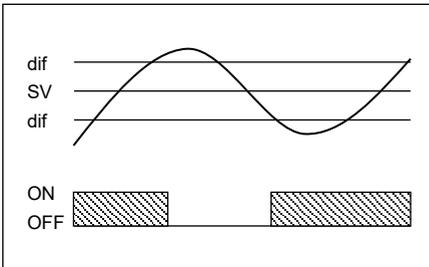|		
PV	LoC	Lock
SV	oFF= No lock 01= Parameter lock 11= All lock（Except timer）	

■Parameter settings and control methods

The following control methods correspond to *1 to *4 in Section 5-2, "Operation Flow in Parameter Mode" on the previous page.

*1: PID control   (Cnt=00)

ON/OFF is repeated near the setting to prevent overshoot.
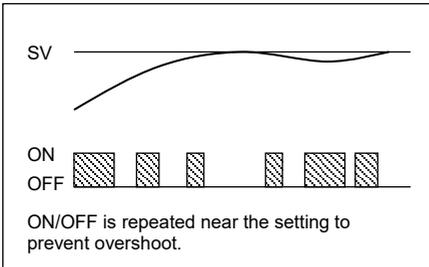
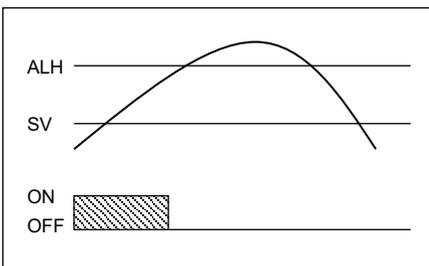*2: ON/OFF control   (Cnt=01)

NOTE   "dif" is an abbreviation for "differential", and indicates the differential between the operating temperature and the recovery temperature.
For example, when the output is off at 90°C and the output is on at 85°C, the differential is 5°C.

*3: Overheat prevention setting   (AS1,AS2=00)
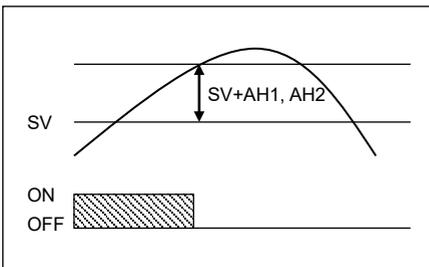
*4: Overheat prevention setting   (AS1,AS2=01)

5-3 Description of Characters and Initial Settings

* The initial settings are factory-set values.

Symbol	Item	Setting range	Initial setting	Resolution (smallest unit)	Description
Cnt	Control method	00/01	01	—	Switching between control methods • 00: PID control • 01: ON/OFF control
dFS	Sensitivity	0.1～99.9	2.0	0.1℃	Constant for ON/OFF control (Cnt=01)
Pb	Proportional band	0.1～999.9	10.0	0.1℃	Valid only when the PID setting Constants for PID control (Cnt=00)
It	Integral time	0～999	0	1 sec	
dt	Derivative time	0～999	0	1 sec	
Pt	Proportional cycle	1～10	2	1 sec	
SLH	Setting upper limit	(*1)	300	0.1℃	Upper limit on the setting range
SLL	Setting lower limit	(*1)	0	0.1℃	Lower limit on the setting range
PuS	PV compensation	−50.0～50.0	0.0	0.1℃	Compensation value for measured temperature
InI	Measurement sensor input	K, Pt, J, T, E, R, S, B	K	—	Switching of the sensor measurement
dPI	Measurement scaling	0.1/1	1	0.1℃	Minimum unit selection (*2)
ASI	Overheat prevention selection	OFF/00/01	00	—	Selection of a deviation or absolute value (alarm) • OFF • 00 : Deviation • 01 : Absolute value
AHI	Overheat prevention setting	AS1=00 0～999.0 when AS1=00 is set. AS1=01 when AS1=01 (*1)	50	0.1℃	Set temperature of overheat prevention
$In2$	Input monitor center	K, Pt, J, T, E, R, S, B, OFF	OFF	—	Switching the monitor sensor OFF= Display OFF
$dP2$	Scaling monitor	0.1/1	1	0.1℃	Minimum unit selection (*2)
$AS2$	Monitor overheat prevention selection	OFF/00/01	OFF		Selection of a deviation or absolute value • OFF • 00 : Deviation • 01 : Absolute value
$AH2$	Monitor overheat prevention setting	AS2=00 0～999.0 when AS1=00 is set. AS2=01 when AS2=01 (*1)	50	0.1℃	Temperature set to prevent excessive temperature rise.
Hb	Heater fault current value	0.0～15.0	0.0	0.1A	• 0.0A : no abnormality will be detected • 15.0A : abnormality will be detected
CF	Temperature display type selection (Celsius/Fahrenheit)	C/F	C	—	• C: Celsius (℃) • F: Fahrenheit (°F) (*5)
LoC (*4)	Lock	OFF/01/11	OFF	—	Lock selection • OFF : Unlock • 01 : Parameter lock • 11 : All locks（Except timer）

Symbol	Item	Setting range	Initial setting	Resolution (smallest unit)	Description
$t1$	Timer use selection	OFF/00/01	OFF	—	• OFF • 00 : OFF timer • 01 : ON timer　　　　(*3)
$t2$	Timer setting time	00:00～99:59	00:00	One minute	Timer is displayed on the display screen

(*1)　Please refer to the temperature ranges shown in "Type and temperature range of measurement sensors" on page 11.

(*2)　Settable units will differ, depending upon measurement scaling.

Measurement scaling	Settable unit
0.1	0.1℃
1	1℃

∗ In case that set values are changed from 0.1℃ to 1℃, figures after the decimal point will be rounded down.

(*3)　Timer use selection is usable only when Timer Function (optional) is purchased.

(*4)　"Lock" means locking keys.

> **NOTE**
>
> **Setting of SV**
>
> The setting for SV is 0. SV can be set to a value between SLL and SLH (0 to 999), but, if there is a contradiction between SV, SLL, and SLH, then the settings are automatically changed as shown below.
>
> ① **When SLL ≥ SLH → SLH = SLL + 1**
> Example) When SSL is set to 100 and SLH is set to 90, SLH is automatically set to 101.
>
> ② **When SV > SLH → SV = SLH**
> Example) When SV is set to 110 and SLH is set to 90, SV is automatically set to 90.
>
> ③ **When SV < SLL → SV = SLL**
> Example) When SV is set to 110 and SLL is set to 120, SV is automatically set to 120.

> **NOTE**
>
> Resolution is the minimum unit below which measurement is generally impossible.

(*5)　If you select "C", the temperature will be displayed and controlled in Celsius and if you select "F", the temperature will be displayed and controlled in Fahrenheit.
When storing this parameter, the Celsius/Fahrenheit of the set temperature and temperature-related parameters are converted and stored.
The conversion formula is as follows:
- Sv, SLH, SLL, AH1 (when AS1 is 01), AH2 (when AS2 is 01)
  Celsius → Fahrenheit: (new set value) = (old set value) * 1.8 + 32 (rounded to two decimal places)
  Fahrenheit → Celsius: (new set value) = (old set value) - 32) /1.8 (rounded to two decimal places)
- dFS, Pb, PvS, AH1 (when AS1 is 00), AH2 (when AS2 is 00)
  Celsius → Fahrenheit: (new set value) = (old set value) * 1.8 (rounded to two decimal places)
  Fahrenheit → Celsius: (new set value) = (old set value) /1.8 (rounded to two decimal places)

If the parameter value exceeds the set range as a result of switching between Celsius and Fahrenheit, the value is changed to the upper limit if it exceeds the upper limit or to the lower limit if it is below the lower limit.

6 Other functions

6-1 Starting Auto-Tuning

The unit incorporates an auto-tuning function for PID.

When auto-tuning is started, the PID constant is automatically calculated, enabling the PID control best suited to the use condition.

> ⚠
> ‣ Auto-tuning is not required for the same system (the conditions).
> ‣ Once auto-tuning is done, the PID constant is internally memorized, thereby enabling the PID control to automatically start whenever used.
> ‣ Before starting auto-tuning, make sure that the connections have been made correctly and that temperature control can actually be applied.
> ‣ Auto-tuning is required whenever resistive load (electrical heater) and set temperature are changed, and also whenever the operating environment is significantly changed.

■Before starting auto-tuning

By setting parameter, control method will be switched to PID control. Set control method (Cnt) to [00].

> 📝 NOTE Note When LoC (Lock) is set to All locks, (AT) has been disabled meaning that auto-turning will not start.

■Starting auto-tuning

Set the temperature and then start auto-tuning. The example below shows a case of temperature set at 40℃.

① Press (SET).
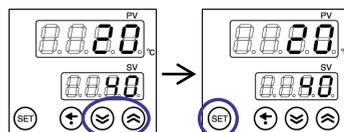→ The mode is switched to setting mode and the SV display blinks.
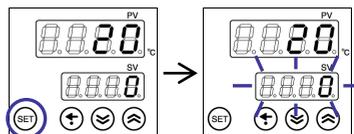
② Set the temperature with (⌄)and(⌃) and then press (SET).
→ The set temperature is saved.

> 📝 NOTE The latest setting is recorded immediately after (SET) is pressed or one minute after (⌄) or (⌃) is released.

③ Press (AT).

→ The AT lamp (green) lights and the proportional band (Pb), integral time (It), and derivative time (Dt) are automatically calculated.

> **NOTE** To interrupt auto-tuning, press (AT) again. The AT lamp (green) goes out and auto-tuning is interrupted.

When auto-tuning is completed, the AT lamp (green) lights out. The calculated constant is recorded and PID control is automatically started.

＜Example＞
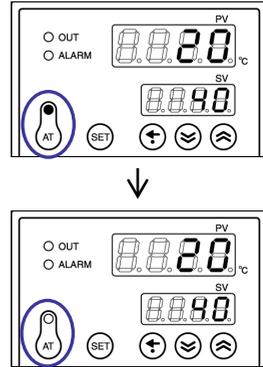
Integral time (It)	Derivative time (Dt)	Operation
0	—	PD operation
—	0	PI operation
0	0	(SV-PV)/Pb + 0% operation

> **NOTE**
> ‣ The initial settings for the integral time (It) and derivative time (Dt) are 0.
> ‣ The initial setting for the proportional band (Pb) is 10.

■**Action taken upon timeout**

During auto-tuning, an ON/OFF operation is performed three times an hour. When the PID value cannot be calculated for more than 60 minutes, a timeout occurs.
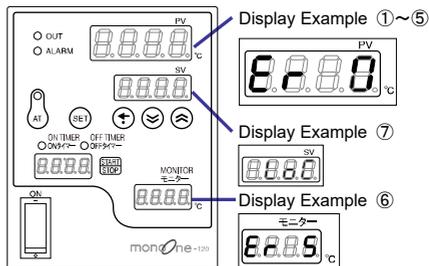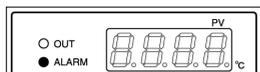
In this case, start auto-tuning again.

7 Error Indication and Recovery Methods

7-1 Error Display and Cause

Errors from ① to ⑤ will be shown on PV display while error ⑥ on monitor display. Alarm lamp (red) lights for errors except "Warning during locking".

Display Example ①〜⑤

Display Example ⑦

Display Example ⑥

	Error	Indication	Cause		Control output	Alarm output
①	Internal memory failure	*Er 0*	• Values retained from non-volatile memory exceed the predetermined range when the power is turned on. • The unit is being affected by noise.		OFF	ON
②	PV sensor burnout	*Er 1*	• Sensor input falls outside the measurement range. • A wire breakage has occurred in the sensor.		OFF	ON
③	Overheat prevention detection	*Er 2* and the measured temperature are indicated alternately.	Absolute value	Measured temperature ≥ Overheat prevention set temperature	OFF	ON
			Deviation	Measured temperature ≥ Overheat prevention set temperature + Set temperature.		
④	Heater failure	*Er 3* This will not be shown when Alarm output is off,	• Heater disconnection occurs. • Short-circuit occurs in SSR (Solid State Relays).		OFF	(*2)
⑤	Monitor overheat prevention detection	*Er 4* and the PV display temperature are indicated alternately.	Absolute value	Monitor temperature ≥ Overheat prevention set temperature.	OFF	ON
			Deviation	Monitor temperature ≥ Overheat prevention set temperature + Set.		
⑥	Sensors monitor burnout	*Er 5*	• Sensor input falls outside the measurement range. • Sensor is disconnected.		ON (*1)	ON
⑦	Warning during locking	*LoC*	• LoC=01 : When parameter mode is set. • LoC=11 : Any key except Timer Function key is pressed.		ON (*1)	OFF

NOTE In case errors from [Er 0] to [Er 4] occur simultaneously, only the smallest error number will be displayed.

(*1) A priority is given to the conditions of "control output is off" or "alarm output is on" resulting from other errors.

(*2) Regarding "heat alarm"
- The electric current flowing in the heater (CT) is detected when control output is 100%, and heater alarm turns on when the CT is not exceeds heater fault current value (parameter:Hb, Unit:A).
- The electric current flowing in the heater (CT) is detected when control output is 0%, and heater alarm turns on when the CT is equal to or higher than heater fault current value (parameter:Hb, Unit:A).
- Heater alarm holds the previous mode and alarm judgment is not performed when control output is greater than 100% and less than 0%. (In case PID control is selected).
- Exceptional cases

  Setting Parameters { • If Hb is set at 0.0A, heater alarm is constantly off.
  • If Hb is set at 15.0A, heater alarm is constantly on.

NOTE For an overheat prevention detection error, the absolute value warning and deviation warning depend on the setting made for the overheat prevention selection (AS1).

➲ For details, see Section 4-4, "Overheat Prevention Setting."

7-2 Recovery Methods

In case errors are observed except locking, remove the cause and turn the power off and then back on again to recover from them.

■In the case of ① Memory failure

Turn the power off and then back on again (no key operations are available for recovery). When an error is caused by noise, this operation enables recovery from an error. When this operation cannot recover from an error or if an error subsequently occurs frequently, the unit requires repair. Contact your sales office.

■② PV sensor burnout
③ Overheat prevention detection
④ Heater failure
⑤ Monitor overheat prevention detection
⑥ Sensors monitor burnout

The cases, in which the following action is required.

Remove the cause and turn the power off and then back on again to recover from errors.
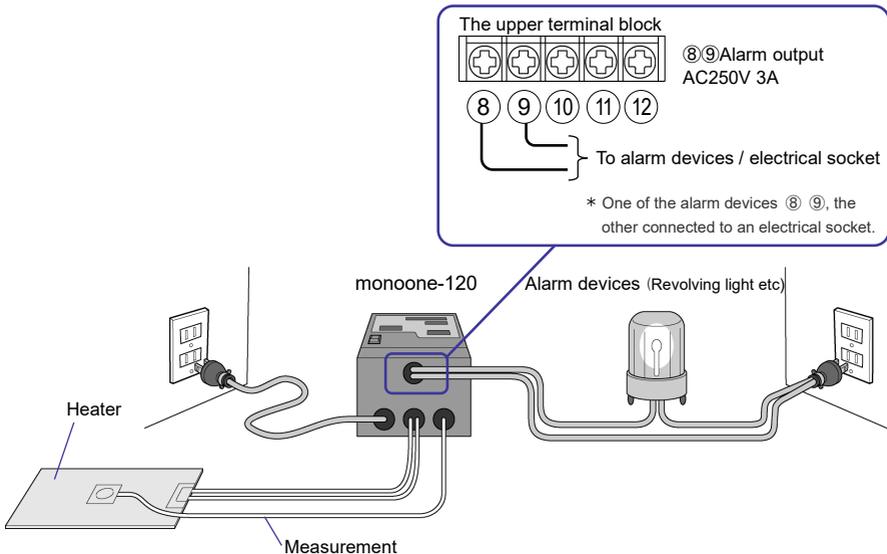
> **NOTE** During recover from burnout or overheat prevention detection, the parameter settings are not changed.

■In the case of ⑦ Warning during locking

Release the pressed key.

■Alarming function when errors occur

This product can be connected to external alarm devices such as signal rotating light lamp with buzzer siren.

The upper terminal block

⑧⑨Alarm output AC250V 3A

8 9 10 11 12

To alarm devices / electrical socket

＊ One of the alarm devices ⑧ ⑨, the other connected to an electrical socket.

monoone-120   Alarm devices（Revolving light etc）
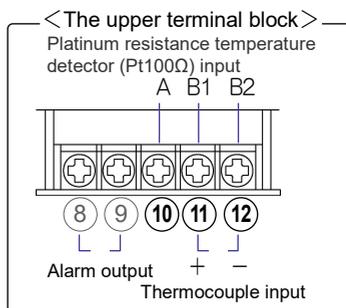
Heater

Measurement

8 Advanced function

8-1 Temperature monitor function

This product is designed not only to control temperature but also to measure temperature. Attach temperature monitor to the upper terminal block for measuring temperature. The measured temperature is shown on the monitor display. And the overheat prevention can be set if needed.

■Making a connection

① Turn off the power.

② Remove the two terminal block cover fixing screws and then remove the terminal block cover.

　➲ The location of the terminal block cover and terminal block cover fixing screws are shown in Section 3-1, "Components."

③ Removing the cover reveals on the upper the terminal block, allowing you to make a connection.

＜The upper terminal block＞

Platinum resistance temperature detector (Pt100Ω) input

A　B1　B2

8　9　10　11　12

Alarm output

＋　－

Thermocouple input

■Parameter setting procedure

① Press (SET) for five seconds or more.

> **NOTE** Press and continue to hold (SET), even after the SV display starts blinking.

→ The mode is switched to parameter mode.

② Press (SET) to change to monitor sensor input (in2). Press (⌄)／(⌃) and select the thermocouple desired. Select K type here.
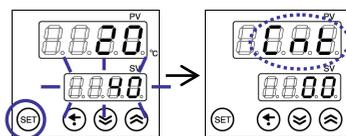
③ Press (SET) to change to　monitor scaling (dP2).

Press (⌄)／(⌃) to change to 0.1 from 1 and then press (SET).

> **NOTE** In case that set values are changed from 0.1℃ to 1℃, figures after decimal point will be rounded down. Select 0.1 to show figures after decimal point. And, select 1 not to show them.

→ Temperature monitor function is now activated, so that the measured temperature will be shown on monitor display.
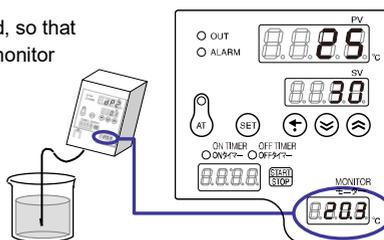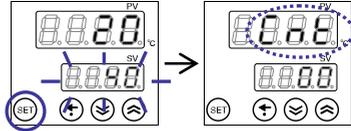
■Overheat Prevention Setting for Monitor

The following steps describe how to set the deviation to 60℃.

① Press (SET) for five seconds or more.

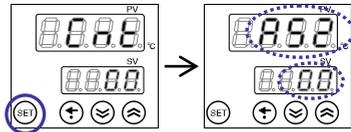> **NOTE** Press and continue to hold (SET) , even after the SV display starts blinking.

→ The mode is switched to parameter mode.

② Press (SET) to change to the monitor overheat prevention selection (AS2).
Press ⊗／⊗ till 00 is shown on the SV display.

> **NOTE** Initial setting of AS2 is OFF.
> Press ⊗／⊗ to change to 01 value setting if needed.

③ Press (SET) to change to the monitor overheat prevention setting (AH2).
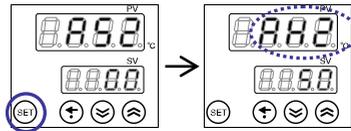
④ Change the setting with ⊗ and ⊗ ,then press (SET).

→ The setting is saved.

> **NOTE** The latest setting is recorded immediately after (SET) is pressed or one minute after ⊗ or ⊗ is released.
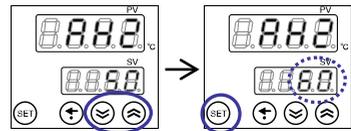
> **NOTE** After a minute not press, the mode automatically returns to normal mode.

＜Monitor display＞

Normal monitor use

＜When Overheat Prevention Setting for Monitor is activated＞
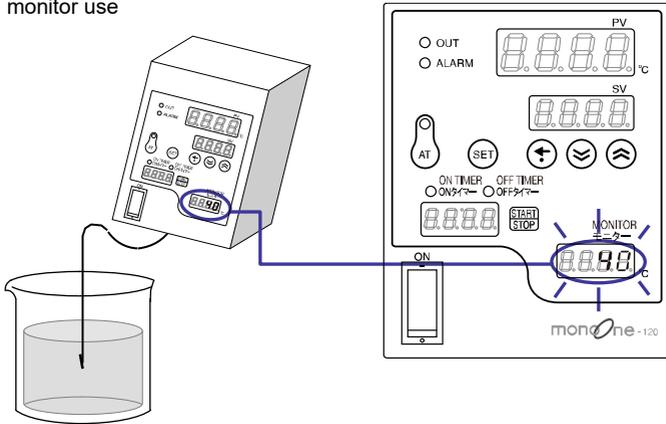
Er 4 is shown on PV display and then the power flow to the heater is cut off when the temperature exceeds a level that is equal to or higher than the overheat prevention setting (AH2).

Er 4 is alternately shown with the measured value on PV display.
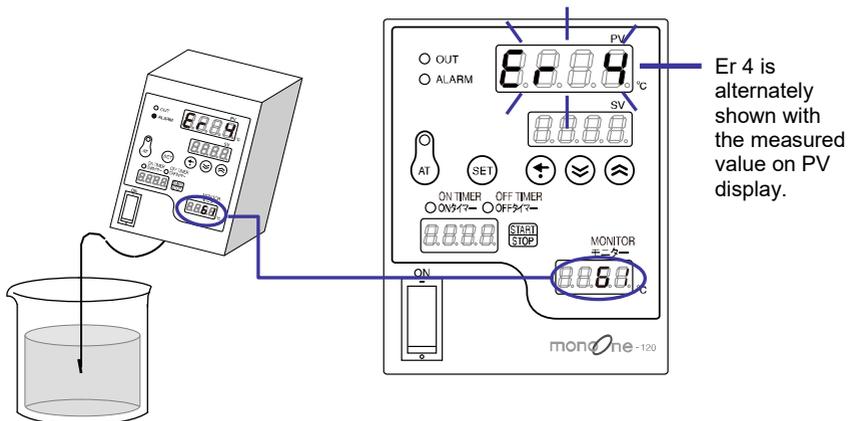
8-2 Timer function（Optional）

Timer is a function to turn power on and off after the preset time elapses.

- ON Timer: To switch from off to on whenever the preset time elapses.
- OFF Timer: To switch from on to off whenever the preset time elapses.

> **NOTE** Timer use selection is usable only if Timer Function (optional) is purchased.

■Set the timer

① Press (SET) for five seconds or more.

> **NOTE** Press and continue to hold (SET), even after the SV display starts blinking.

→ The mode is switched to parameter mode.
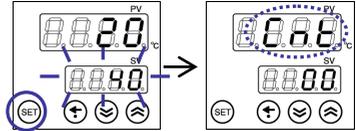
② Press (SET) to change to the timer use selection (t1).

③ Press ⊗／⊗ to select the desired operation, and then press (SET).
Select 01 for ON Timer in this case.

> **NOTE** Select 00 for OFF Timer.

→ Timer setting (t2) is shown on PV display.
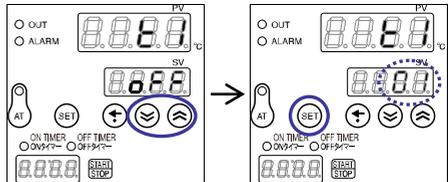
④ Press ⊗／⊗ to set the desired time (hours and Minutes).

> 🖉 NOTE
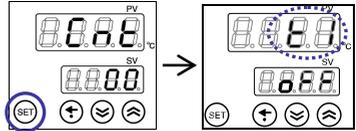> ‣ Enter time from the last digit. Press ⊕ to change digits.
> ‣ The maximum time that can be entered is 99:59.

To set time to 10 hours 15 minutes (10:15) in this case.
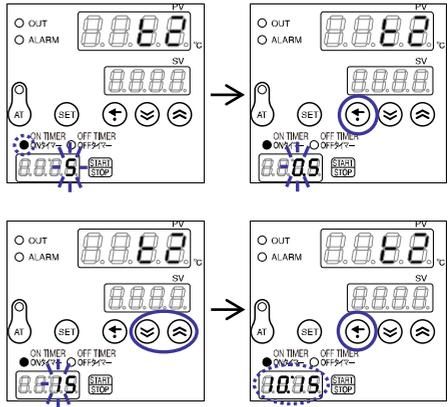
⑤ Press (SET) for five seconds or more.
→ Timer is set, and the unit goes in standby mode.
The mode is switched to normal mode from parameter mode.
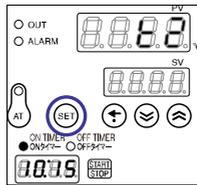
■Timer is started

Below is the procedure to follow after setting timer (the unit in standby mode).

> 🖉 NOTE
> Timer will not start if parameter mode is set, so switch the mode to normal mode before pressing START STOP.

Press START STOP.
→ Countdown starts
Timer lamp blinks

> 🖉 NOTE
> A stop and reset of the timer
> ‣ Stop：Press START STOP briefly.
> ‣ Reset：Press and hold START STOP.

Countdown is complete, it will display "END"
Output is switched to ON from OFF, and then normal control starts.

> 🖉 NOTE
> In ④ of Set Timer above, in case OFF timer (00) is selected, output is switched to OFF from ON, then deactivating Timer function.

Time is shown in seconds when the remaining time is less than one minute.

Countdown completion

9 Specifications

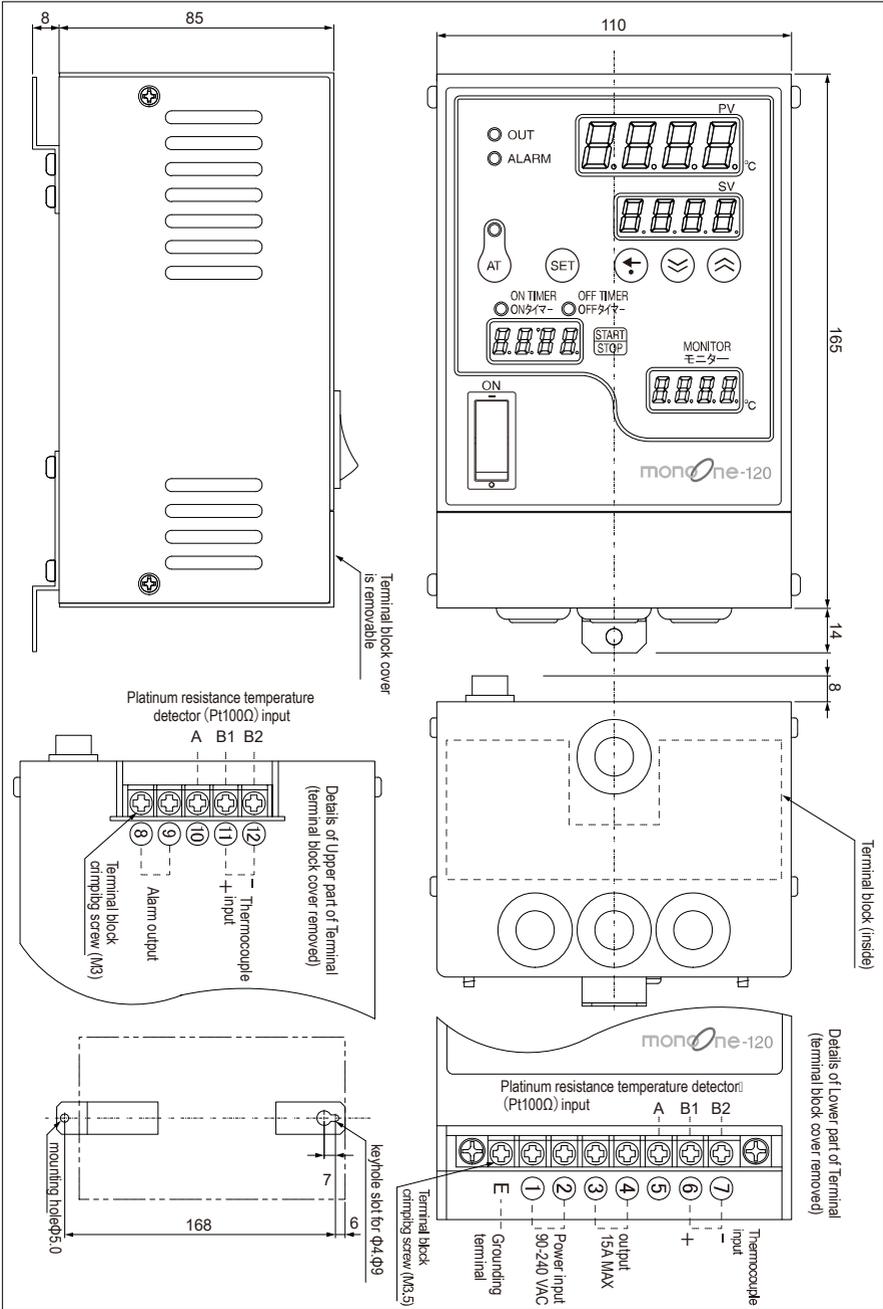|	
Input	• Thermocouple（K, J, T, E, R, S, B）<External resistor : 100 Ω or less> • Platinum resistance temperature detector（Pt100Ω）
Supply voltage	90 to 240 VAC (single phase)　　50/60 Hz
Output type	SSR (non-contact) voltage output (The output voltage depends on the power voltage.)
Output rating	15 A or less　　　* A small amount of leakage current flows because of the SSR output. If the current is 0.1 A or less, contact us.
Auxiliary output	AC250V 3A
Control method	1. PID time division proportion (heating) with auto-tuning 2. ON/OFF control (heating)
Control constant	Proportional band 　　: 1 to 999.9 (°C)/proportional cycle: 1 to 10 (sec) Integral time 　　　　: 0 to 999 (sec)/Sensitivity: 0 to 99.9 (°C) Derivative time 　　　: 0 to 999 (sec)/PV compensation: -50.0 to 50.0 (°C)
Display unit	Display range Setting range ⟩ Please refer to Type and temperature range of measurement sensors on Page 11. Measured temperature ：7-segment red LED with a character height of 14.3 mm Set temperature 　　　: 7-segment green LED with a character height of 10.2 mm Monitor display 　　　: 7-segment red LED with a character height of 8.0 mm Timer display 　　　　: 7-segment green LED with a character height of 8.0 mm OUT lamp 　　　　　　: Lights when heater output is on. (Orange LED) ALARM lamp 　　　　 : Lights upon an alarm. (Red LED) AT lamp 　　　　　　 : Lights during auto-tuning. (Green LED) ON timer 　　　　　　: Lights up when you select ON timer. (Orange LED) OFF timer 　　　　　 : Lights up when you select OFF timer. (Orange LED)
Indicating precision	Please refer to Type and temperature range of measurement sensors on Page 11. * No measurement errors of thermocouples included.
Sampling period	0.5 sec
Storage for settings	EEPROM
Short-circuit protection	Built-in 20 A fuse (not replaceable by user)
Other functions	Error indication/burnout/overheat prevention setting/locking function Heater burnout alarm /Timer function/Temperature monitor function
Power consumption	10 VA or less
Allowable ambient conditions	Temperature 　　: 0 to 40°C Humidity 　　　　: 35 to 85% RH (no condensation)
Withstand voltage	1800 VAC for one second (both power supply and output unit)
Noise resistance	1200 V or more with a pulse width of 50 ns and 1 μs
Dimensions/weight	165 (H) × 110 (W) × 85 (D) mm　　* Excluding projections and brackets Approx. 1.3 kg
Installation	Wall hanging * When using on a table, attach rubber feet (optional)

8   85   110

PV

○ OUT
○ ALARM

°C

SV

AT   SET   ←   ⌄   ⌃

ON TIMER   OFF TIMER
○ ONタイマー   ○ OFFタイマー

START
STOP

MONITOR
モニター

°C

ON

mono*one*-120

165

14

8

Terminal block cover
is removable

Platinum resistance temperature
detector（Pt100Ω）input

A   B1   B2

Details of Upper part of Terminal
(terminal block cover removed)

⑧   ⑨   ⑩   ⑪   ⑫

Terminal block
crimp/big screw (M3)

Alarm output

Thermocouple

－ ＋ input

Terminal block (inside)

mounting hole φ5.0

168   6

7

keyhole slot for Φ4.Φ9

Terminal block
crimp/big screw (M3.5)

mono*one*-120

Details of Lower part of Terminal
(terminal block cover removed)

Platinum resistance temperature detector
（Pt100Ω）input

A   B1   B2

E   ①   ②   ③   ④   ⑤   ⑥   ⑦

Grounding
terminal

Power input
90-240 VAC

output
15A MAX

Thermocouple
－ ＋ input

For prevention of electric shock, do not touch any of the charged circuits or parts when
powered on. Please securely tighten screws of each terminal.

ELECTRIC
SHOCK

10 FAQs

FAQ1. What are the recommended installations of MONONE-120?

A1. You can mount our product on a fire-resistant wall that is not subject to vibration, using either the built-in mounting brackets or DIN rail (optional). Or, you can use our product on the table either "after applying rubber bumper feet (supplied accessories) to four (4) corners of the bottom" or "angle adjustable stand" (optional).

FAQ2. Can we use MONONE-120 immediately after it is purchased?

A2. Power cable and thermocouples are not included at the time of purchase.
Please inquire us if you need them.

FAQ3. Can you give us any safety precautions to ensure safe usage of MONOONE-120 as we plan to control more than one heater with one unit of MONOONE-120?

A3. As long as you observe the maximum amperage of 15, it is safe to control more than one heater with one (1) unit of MONOONE-120. However, in case that sensor is disconnected, there is a risk that all heaters you are using will go out of control.

FAQ4. Can we get to see the current temperature and the set temperature at the same time?

A4. Yes, you can see both of them at the same time and can control the temperature.

FAQ5. Can we get MONOONE-120 repaired? If so, whom should we contact?

A5. Our engineers are always ready to attend to your technical problems. So, please inquire us about any problems you may encounter.

FAQ6. Can we purchase measurement sensors from your company?

A6. Yes, we handle all kinds of measurement sensors for your use. Please inform us of types of sensors you need.

FAQ7. Can we purchase and install Timer Function even after MONOONE-120 has been purchased?

A7. Yes, Timer Function can be purchased and installed after you have purchased MONOONE-120. Our engineers are always ready.
Please inquire us about Timer Function.

FAQ8. How can we measure the temperature of the object to be heated? And, how can we get to simultaneously see the temperature of heating systems and the object to be heated?

A8. If you connect sensor to the upper terminal block, you can use it as thermometer, thereby controlling temperature of heater while measuring the temperature of the object to be heated. As the measured temperature is shown on monitor display, you can check both temperature of heater and temperature of the object to be heated at the same time. The overheat prevention can be set if needed.

➲ Please refer to 8-1 Temperature monitor function for details.

11 Troubleshooting

Status	Cause	Action
Temperature error is large	A type of sensor chosen to measure does not correspond to parameter setting done for the unit.	Check to see which sensor is used, and then reset the unit to match with the sensor. Follow the instruction of parameter setting procedure. ➲ Please refer to 5-1 Setting Parameters.
	Sensor is not properly connected.	Check where sensor has been set and see if sensor has been set with the correct polarity. ➲ Please refer to 3-2 Connections.
	The unit has been affected by noise because the lead of sensor is wired together with power cable.	To avoid noise, do not run the sensor wires in the same conduit with power cable or use shielded compensating lead wires.
	(In case PID control is selected) (AT) is not pressed (In case auto-tuning is selected)	After entering the set temperature, be sure to press (AT) (auto-tuning key). Once (AT) is pressed, the calculated constant is internally memorized, so that no auto-tuning is required. However, in case that either the set-temperature or heater is changed, activate auto-tuning again by pressing (AT) key.
Temperature rises above the set-temperature (overshoot).	ON/OFF control is selected. * Initial setting is ON/OFF control.	Switch to PID control and press (AT) (auto-tuning key). Parameter mode. allows you to change the initial setting. ➲ Please refer to 6-1 Starting Auto-Tuning for details.
	PID constant is not properly calculated.	• Press (AT) (auto-tuning key). • Set PID constant manually.
Temperature does not rise.	Heater is either disconnected or worn out.	Make sure if nothing is wrong with heater.
	Heater capacity is not sufficient.	Check if heater capacity is sufficient.
	Overheat prevention system of peripheral equipment is being activated.	Increases the set temperature of overheat prevention system for peripheral equipment higher than the set temperature of the unit.
No key operations are working.	Keys are locked.	Unlock keys after switching to parameter mode. ➲ Please refer to 5-2 Operation Flow in Parameter Mode for details.

Status	Cause	Action
Heater failure (Er 3) is not displayed and alarm does not go off	HB is set at 0.0(A). * HB is initially set at 0.0(A).	Seta relevant value for Hb from parameter mode. Er 3 will be displayed and connected alarm turn off when the electric current of heater is setting value of Hb or less. Er 3 will not displayed and alarm output turn off when Hb is set at the initial value:0.0. ⊃ Please refer to 7-1 Error Display and Cause.
Alarm turns off and Er 3 is displayed when heater is not disconnected and short-circuit does not occurs in SSR.	HB value of parameter is set higher than the electric current of heater.	Set a value for Hb that is equal to or less than the electric current of heater from parameter mode. The electric current of heater will be shown on PV display if press and hold ⊕.
Timer function is not usable.	Timer function is not selected.	Switch to timer function from parameter mode. ⊃ Please refer to 8-2 Timer Function (Optional) for details. * Timer Function (Optional) can be purchased. Please do not hesitate to contact our engineers for details.
Monitor function is not usable.	Monitor function is not on. * Monitor function is initially set off.	Switch to monitor function from parameter mode. ⊃ Please refer to 8-1 Temperature monitor Function for details.
A temperature measurement error shown on monitor display is large.	A type of sensor selected for measurement does not correspond to the settings done for the unit.	Confirm what type of sensor has been selected and then reset the unit to match with the type of sensor. Parameter mode allows you to change the setting. ⊃ Please refer to 5-1 Setting Parameters for details.
	Measurement sensor is not properly connected.	Check where sensor has been set and see if sensor has been set with correct polarity. Or be sure to confirm the polarity every time when sensor is set. ⊃ Please refer to 3-2 Connections
Error indications cannot be cleared.	What causes an error has not been removed yet.	Remove what causes an error. ⊃ Please refer to 7-2 Recovery Methods for details. In case that overheat prevention (Er 2) is shown, increase the value of AH1 in parameter mode higher than or equal to the set temperature (measurement temperature), thereby removing the error indication. (Note: in case an absolute value of AS1=01 is selected.)

Warranty

We highly appreciate that you have purchased our product.
This warranty has been prepared to promise free repairs to our customers in accordance with the provisions set forth below.
For details, please read our provisions below.

◆Date of Purchase	Date Month Year
◆Name of Customer	
◆Address	Postal Code Street City State (or Prefecture or County), Country Phone No.

■Warranty Period: Good for 5 years from the date of purchase.

Product	Digital Temperature Controller monoOne-120
Lot No.	
Sales agent	

* Contact and request either our sales agent nearby or our company for necessary repairs upon the presentation of this warranty in case any malfunctions occur during 5 years warranty period of our product from the date of original purchase.

THREE HIGH
CO.,LTD. SINCE 1990

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【Provisions of our warranty】

Our warranty shall apply only to the original purchaser of our product in case that malfunctions occur during the use of our product under the normal conditions.

Warranty period is limited to 5 years from the date of original purchase.

The warranty does not cover the following cases even during the said period of warranty.

■Malfunctions or damages resulting from intentional or negligent acts such as failures to use the product properly.

■Malfunctions or damages resulting from mishandling (falls, impacts by foreign objects, etc.) of our product while transporting or moving it after purchase.

■Malfunctions or damages resulting from fire, earthquake, flooding, lightening, and other acts of God.

■Malfunctions or damages resulting from the factors unrelated to our product.

■When repair, modification, or disassembly of our product is done by other than our company.

■In case this warranty is not presented to us.

■Replacement of repair parts (consumable parts).

Please acknowledge that our company is not liable for all sorts of financial loss such as direct, indirect, collateral or consequential losses resulting from the use malfunction of our product.

*Note   • This warranty will not be reissued. Therefore, please keep it in a space place.

        • This warranty is valid only in Japan.

After-Sales Service

For inquiries about our products, contact us.

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