

# NX series

Digital Temperature Controller—2nd Edition **INSTRUCTION MANUAL**



# CONTENTS

1. SAFETY INFORMATION-----	P.4
2. INSTRUCTION-----	P.6
3. ORDERING INFORMATION-----	P.6
4. SPECIFICATION-----	P.11
5. DIMENSIONS & PANEL CUTOUT---	P.15
6. TERMINAL ARRANGEMENT-----	P.17
7. WIRING EXAMPLE-----	P.19
8. TABLE OF SETTING ITEMS-----	P.21
9. NAME & FUNCTION-----	P.23
10. SETTING METHOD-----	P.24
11. CONTROL GROUP-----	P.25
12. INPUT GROUP SETTING-----	P.26
13. OUTPUT GROUP SETTING-----	P.28
14. SET VALUE GROUP SETTING-----	P.29
15. AUTO TUNING GROUP-----	P.29
16. P.I.D GROUP-----	P.30
17. HEATER BREAK ALARM GROUP---	P.31
18. ALARM GROUP SETTING-----	P.31
19. RETRANSMISSION GROUP-----	P.33
20. COMMUNICATION-----	P.33
21. FUNCTION-----	P.34

# NX Series

---

- ◆ High Accuracy 0.5 class 250 ms





## Features

- Fuzzy
- Auto Tuning
- Alarm Output
- Retransmission Output
- Various Type of Inputs and Outputs
- Prescale function (Voltage/Current Input)
- Ramp function
- Heating / Cooling
- Zone PID
- Group PID (1,2,3)
- Power supply for sensor (12 V d.c)
- Output Limit Setting for Input Break
- Communication (RS485 / 422)
- 3 Set points
- Heater break alarm
- IP65 front face

# 1 SAFETY INFORMATION

Before using, please read this (SAFETY INFORMATION) and then use this controller.  
It is most important that the instructions in this manual are followed when using this instrument.  
Please keep this manual for future reference.  
Precautions are classified in **WARNING** and **CAUTION**.

 <b>WARNING</b>	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
 <b>CAUTION</b>	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury

## WARNING

### 1. Caution on wiring

- Use an external protection circuit if a fault in the control loop could possibly lead to a serious problem.
- This instrument do not have a switch for power and a fuse, so please set them if it is needed.  
(Fuse rating 250 V, 0.5 A)

### 2. Power supply

- Use a rated voltage to prevent damage or trouble.
- To avoid electrical shock or damage, do not turn ON the power until the wiring is completed.

### 3. Prohibit use in gas atmosphere

Do not use it at a place exposed to combustible or explosive gas.

### 4. Handling of unit

- To avoid malfunction, electrical shock or fire, this unit must not be disassembled or repaired.
- Do not touch the terminals to avoid electrical shock or malfunction.

### 5. Caution on maintenance

- Turn OFF the power before mounting or removing the instrument.
- To ensure continuous and safe operation of the instrument, periodical maintenance is recommended. Some parts are limited in life.
- The warranty period is 1 year only if using in the correct way.

## CAUTION

### 1. Caution on handling

- ◎ Do not install the instrument under any of the following condition.
- The ambient temperature exceeds 0 ~ 50 °C
- The ambient humidity exceeds 20 ~ 90 % RH.
- A place where temperature changes suddenly or icing occurs.
- A place exposed to corrosive gas or combustible gas.
- Vibration or shock is likely to be transmitted to the instrument.
- A place exposed to water, oil, chemicals, steam, sunlight.
- A place exposed to much dust, salt or iron.
- A place with much inductive disturbance, static electricity, magnetism noise.
- A place where heat such as radiant heat stays.

## 2. Installation

- For NX9, 7, 3 and 2, attach the brackets (2 units) on the fixed halls and tighten with a screwdriver.

Fixing torque is about 14.7N. cm (1.5kg.cm). NX1 and NX4 has a plastic bracket.  
(Care should be taken not to tighten forcedly.)

## 3. Caution on terminal connections

- Use a compensating cable with thermocouple.
- For R.T.D input use a cable which is a small lead wire resistance and without resistance difference to 3 wires.
- To avoid inductive noise to input wires separate from the power and output wires.
- Keep input wires away from output wires and use shielded wires to earth.
- If the wiring has noise, use the following step: connect a surge absorber to the conductor coil side if the conductors are connected to the load output, such as the relay contact output.
- Use an insulating transformer with a noise filter when the power supply has much noise.
- Noise filter should be mounted on a panel which has been earthed and the wiring between the noise filter output and the instrument power terminals should be shorten.
- It is effective to use a twisted cable for power supply against noise.
- The heater power supply and the instrument power supply should be connected using the same power supply when a heater break alarm.
- Time for preparation of contact output is required at power ON. When the output signal is used for an external interlock circuit, connect a delay relay.

## 4. For load circuit connection

- Use an extra relay when the frequency of operation is rather high. In thick case, SSR output type is Recommended.
  - Electromagnetic switch : Proportional cycle time is Min. 30 sec
  - SSR : Proportional cycle time is Min. 1 sec
  - Contact output life : Mechanical : Min. 10 million times (no load)  
Electrical : Min. 100 thousand times (rated load)
  - SSR drive pulse voltage, DC 4 – 20 mA are not insulated with internal circuit.  
Use non-grounded sensor to R.T.D and thermocouple.

## 5. For waterproof (Waterproof type)

The instrument has IP65. Use rubber packing when installing the instrument to panel.  
Please attach the rubber in correct way. (Exception : NX 1)

## 6. Caution on key operation / trouble

- If alarm function is not set correctly, alarm output can not be operated at a trouble.  
Be sure to check the alarm operation.
- If the input cable is disconnected, the display shows "b.oUt".  
When replacing the sensor, please turn OFF the power supply.

## 7. Other

Do not use organic solvents such as alcohol, benzine when cleaning. (Use neutral detergent)

## 2

## INSTRUCTION

This instrument has process-value (PV) and set-value (SV) each 4 digits with 7 segment FND. This instrument is divided into a normal type and a heating-cooling type and each setting items has 10 groups. Function and feature : Group P.I.D, Universal-input (19 types), Universal-output (Relay, SSR, Current), Local input, Remote input, External contact input, Ramp function, Auto-tuning 2 types (standard type, low PV type), Retransmission, Communication (RS485 /422), Power supply for sensor, 21 types of alarm, Sampling cycle 250 ms, 0.5 % of FS high accuracy.

## 3

## ORDERING INFORMATION

## 3-1) NX1 Suffix code

Model	Code	information		
NX1 -	<input type="checkbox"/> <input type="checkbox"/>	Multi I/O temperature controller 48(W) X 24(H) mm		
Control type	0	Normal type		
	1	Heating/Cooling control (simultaneous control)		
Normal type		Options	Heating output	Cooling output
	0	RET	Relay	-
	1	None	S.S.R/S.C.R	-
	2	RS485/RET	Relay	-
	3	RS485	S.S.R/S.C.R	-
	4	ALM	S.S.R/S.C.R	-
	5	ALM/RS485	S.S.R/S.C.R	-
Heating/Cooling type	0	None	Relay	S.S.R/S.C.R
	1	None	S.S.R/S.C.R	Relay
	2	RS485	Relay	S.S.R/S.C.R

(Note) Control output 6, 9, 10 and 11 are available in NX1-□

## ■ NX1 control output composition

Type	Output code	Heating side		Cooling side		Default value (Output option)
		Relay ⑥-⑦	S.S.R/S.C.R ④-⑤	Relay ⑥-⑦	S.S.R/S.C.R ④-⑤	
Normal type	0	Relay(ON/OFF)	RET	-	-	1
	1	ALARM	S.S.R			
	2		S.C.R(4 - 20 mA d.c)			
	3	Relay(P.I.D)	RET			3
Heating/Cooling type	6	Relay	-	-	S.S.R	6
	9		-	-	S.C.R	
	10	-	S.S.R	Relay	-	10
	11	-	S.C.R(4 - 20 mA d.c)	Relay	-	

(Note) Please set the control output after checking the suffix code

### 3-2) NX2, 3, 7, 9 Suffix code

Model	Code	Information
NX	<input type="checkbox"/> - <input type="checkbox"/> <input type="checkbox"/>	Multi I/O temperature controller
Dimension	2	48(W) X 96(H) mm
	3	96(W) X 48(H) mm
	7	72(W) X 72(H) mm
	9	96(W) X 96(H) mm
Control method	0	Normal type(Heating control)
	1	Heating/Cooling control (Simultaneous control)
NX9 Option	0	None
	1	RS485, HBA
NX7 Option	0	None
	1	RS485, HBA
	2	SV2, SV3, HBA
NX2,NX3 Option	0	SV2, SV3
	1	HBA
	2	RS485

### ■ NX2,3,7,9 control output composition (HBA is unavailable when control output is SCR.)

#### ① Normal type

	Output selection	Control output(OUT1)		OUT2		Default value
		Relay output	S.S.R / S.C.R output	Relay output	Retransmission output	
Normal type	0	Relay(ON/OFF)	-	AL2	RET (Retransmission output)	1
	1	-	S.S.R			
	2	-	S.C.R(4 - 20 mA d.c)			
	3	Relay(P.I.D)	-			

#### ② Heating/Cooling type

	Output selection	Heating (OUT1)		Cooling (OUT2)		
		Relay output	S.S.R / S.C.R output	Relay output	S.S.R / S.C.R / R.E.T	Default value
Heating/ Cooling type	4		S.S.R	AL2	S.S.R	4
	5		S.C.R(4 - 20 mA d.c)			
	6	Relay	RET			
	7		S.S.R		S.C.R	
	8		S.C.R(4 - 20 mA d.c)			
	9	Relay	RET			
	10		S.S.R	Relay ( AL2 )	RET	
	11		S.C.R(4 - 20 mA d.c)			
	12	Relay				

#### ⚠ Caution

##### ● Wiring of control output

When wiring or removing the control output, please turn OFF the power of controller body and external power supply. Not doing so may cause an electric shock to occur. Please use the SHIELD wire when wiring the voltage pulse output (S.S.R) and current output (S.C.R).

### 3-3) NX4 Suffix code

Model	Code	Information
NX4-	<input type="checkbox"/> : <input type="checkbox"/>	Multi I/O temperature controller 48(W) × 48(H) mm
Control type	0	Normal type(Heating control)
	1	Heating/Cooling control (Simultaneous control)
	2	Heating/Cooling control (Only for NX4-20)
NX4 Options	0	None
	1	HBA, AL2
	2	SV2, SV3
	3	RET, RS485
	4	RS485, S.S.R/S.C.R
	5	AL1, AL2
	6	AL1, AL2, SV2
	7	RS485, HBA

(Note) Option 1: OUT1 (①-②-③) is applied as AL1. But only when control output SSR/SCR is selected

Option 3: OUT2 (⑪-⑫) is applied as RET

Option 4: OUT2 (⑪-⑫) is applied as SSR/SCR

Option 5: OUT1 (⑥-⑦) cannot be applied as SV2

Option 6: OUT1 (⑥-⑦) is applied as SV2. But only with the relay control output.

### ■ NX4 control output composition (HBA is unavailable when control output is SCR.)

#### ① Control output (NX4-00)

Normal type	Output selection	OUT1(Heating)		-		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	⑬-⑭	⑪-⑫	
NX4-00	0	Relay (ON/OFF)	-	-	-	1
	1	AL1	S.S.R	-	-	
	2	AL1	S.C.R(4 - 20 mA d.c)	-	-	
	3	Relay (P.I.D)	-	-	-	

#### ② Control output (NX4-01)

Normal type	Output selection	OUT1(Heating)		Alarm and current transformer		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	Relay⑬-⑭	Current Transbmer ⑪-⑫	
NX4-01	0	Relay (ON/OFF)	-	AL2	-	1
	1	AL1	S.S.R	AL2	CT	
	2	AL1	S.C.R(4 - 20 mA d.c)	AL2	-	
	3	Relay (P.I.D)	-	AL2	CT	

※ Selecting number 21 in alarm type will assign the HBA output as 1-2-3 terminal or 13-14 terminal



### ③ Control output (NX4-02)

Normal type (Heating)	Output selection	OUT1(Heating)		External input (D.I)		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	⑬-⑭	⑪-⑫	
NX4-02	0	Relay (ON/OFF)	-	SV2	SV3	1
	1	AL1	S.S.R			
	2	AL1	S.C.R(4 - 20 mA d.c)			
	3	Relay (P.I.D)	-			

### ④ Control output (NX4-03)

Normal type (Heating)	Output selection	OUT1(Heating)		Communication and Retransmission		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	⑬-⑭	⑪-⑫	
NX4-03	0	Relay (ON/OFF)	-	Communication (RS485)	Retransmission (RET)	1
	1	AL1	S.S.R			
	2	AL1	S.C.R(4 - 20 mA d.c)			
	3	Relay (P.I.D)	-			

### ⑤ Control output (NX4-04)

Normal type (Heating)	Output selection	OUT1(Heating)		Communication		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	⑬-⑭	⑪-⑫	
NX4-04	0	Relay (ON/OFF)	-	Communication (RS485)	-	1
	1	AL1	S.S.R			
	2	AL1	S.C.R(4 - 20 mA d.c)			
	3	Relay (P.I.D)	-			

### ⑥ Control output (NX4-05)

Normal type (Heating)	Output selection	OUT1(Heating)		Alarm output		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	Relay ⑬-⑭	Relay ⑪-⑫	
NX4-05 (AL1, AL2)	0	Relay (ON/OFF)	-	AL1	AL2	1
	1	-	S.S.R			
	2	-	S.C.R(4 - 20 mA d.c)			
	3	Relay (P.I.D)	-			

### ⑦ Control output (NX4-06)

Normal type (Heating)	Output selection	OUT1(Heating)		Alarm output		Default value
		Relay ①-②-③	⑥-⑦	Relay ⑬-⑭	Relay ⑪-⑫	
NX4-06 (AL1, AL2) (SV2)	0	Relay (ON/OFF)	SV2	AL1	AL2	1
	1	-	-			
	2	-	-			
	3	Relay (P.I.D)	SV2			

⑧ Control output (NX4-07)

Normal type (Heating)	Output selection	OUT1(Heating)		Communication and Current Transformer		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	⑬-⑭	⑪-⑫	
NX4-07 (RS485) (HBA)	0	Relay (ON/OFF)	-	Communication (RS485)	-	1
	1	AL1	S.S.R		CT	
	2	AL1	S.C.R(4 - 20 mA d.c)		-	
	3	Relay	-		CT	

⑨ Control output (NX4-10)

Heating/ Cooling	Output selection	Heating		Cooling(OUT2)		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	⑬-⑭	S.S.R / S.C.R ⑪-⑫	
NX4-10	4	AL1	S.S.R	-	S.S.R	4
	5	AL1	S.C.R(4 - 20 mA d.c)			
	6	Relay	-			
	7	AL1	S.S.R	-	S.C.R (4 - 20 mA d.c)	
	8	AL1	S.C.R(4 - 20 mA d.c)			
	9	Relay	-			

※ Only when it is heating/cooling control

⑩ Control output (NX4-14)

Heating/ Cooling	Output selection	Heating		Communication and cooling output		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	⑬-⑭	S.S.R / S.C.R ⑪-⑫	
NX4-14	4	AL1	S.S.R	Communication (RS485)	S.S.R	4
	5	AL1	S.C.R(4 - 20 mA d.c)			
	6	Relay	-			
	7	AL1	S.S.R		S.C.R (4 - 20 mA d.c)	
	8	AL1	S.C.R(4 - 20 mA d.c)			
	9	Relay	-			

※ Only when it is heating/cooling control

⑪ Control output (NX4-20)

Heating/ Cooling	Output selection	Heating(OUT1)		Cooling(OUT2)		Default value
		Relay ①-②-③	S.S.R / S.C.R ⑥-⑦	⑬-⑭	⑪-⑫	
NX4-20	10	-	S.S.R	AL1	Relay	4
	11	-	S.C.R(4 - 20 mA d.c)			
	12	Relay	-			

## 1) INPUT

Input	Thermocouple : K, J, E, T, R, B, S, L, N, U, W, PL2(Please refer to the input signal and measurement range) R.T.D : Pt 100 $\Omega$ , KPt 100 $\Omega$ , DC voltage : 1 – 5 V, –10 – 20 mV, 0 – 100 mV, DC current : 4 – 20 mA (connect a 250 $\Omega$ resistor to the input terminal)
Sampling time	250 ms
Input resolution	Below decimal point of measurement range
Input impedance	T/C and DC current input : 1 M $\Omega$ min., DC voltage input : 1 M $\Omega$
Allowable signal source resistance	Thermocouple: Max 250 $\Omega$ , DC voltage: Max 2 K $\Omega$
Lead wire tolerable resistance	R.T.D : 10 $\Omega$ max. / wire (But, the three wires should have the same resistance)
Input tolerable voltage	$\pm 10$ V (T/C, R.T.D, Voltage : mV d.c) $\pm 20$ V (Voltage : V d.c)
Noise removal rate	NMRR(normal mode) : 40 dB min. (50 / 60Hz $\pm 1$ %) CMRR(common mode) : 120 dB min. (50 / 60Hz $\pm 1$ %)
Standard	T/C, R.T.D : KS, IEC, DIN
Standard junction temp. compensation tolerance	$\pm 1.5$ $^{\circ}$ C(15 ~ 35 $^{\circ}$ C), $\pm 2.0$ $^{\circ}$ C(0 ~ 50 $^{\circ}$ C)
Input Break detection(Burn-out)	T/C: OFF, Up/Down selectable R.T.D : Up scale (Detection current : 50 nA)
Measurement Accuracy	$\pm 0.5$ % (Full scale)
Input range	Refer to "Input signal and Measurement range" T/C and R.T.D are changeable within range of input signal and measurement range. Voltage : min. voltage and max. voltage are available within range of measurement. Scaling available.

## 2) OUTPUT

## ① ALARM (HBA OUTPUT)

Relay contact output	Contact capacity : 240 V a.c 1 A, 30 V d.c 1 A(resistive load) Contact : 1a Output points : Refer to "Terminal Arrangement"
Heater break alarm	Point : 1 point (NX2, NX3, NX4, NX7, NX9) Current measurement range : AC 1 ~ 50 A (resolution : 0.5A, $\pm 5$ % $\pm 1$ digit of F.S) Alarm output : Selectable in Alarm types Deadband : 0 ~ 100 % of max. range · HBA is available when On/Off control or time proportional output (but, when current output or cooling control, HBA is not available) · Break detection is not possible in 0.2 sec. when output on.

## ② RETRANSMISSION OUTPUT

Current output	Current output range : 4 – 20 mA d.c Load resistance : 600 $\Omega$ max. Accuracy : $\pm 0.5$ % of max. scale (4 – 20 mA range) Resolution : Approx. 3,000 Output ripple : 0.3 % (P-P) max. scale (150 Hz) Sampling : 250 ms
----------------	---



## 4) OPERATING ENVIRONMENT

Installation environment	Continuous vibration (5 ~ 14 Hz) : Peak to Peak 1.2 mm max. (4 ~ 150 Hz): 4.9 %g (0.5G) max. Short-term : 14.7 %g (1.5G), 15 sec. max. (each 3 direction) Shock : 147 %g (15G), 11 ms max. (6 direction each 3 times) Panel cutout : Page 11, 12
Normal operation condition	Ambient temperature : 0 ~ 50 °C Ambient humidity : 20 ~ 90 %RH (no condensation) Influence of magnetic : 400 AT/m max. Warm-up time : 30 min. min.
Influence of ambient temperature	T/C, Voltage input : $\pm 1 \mu\text{V}/^\circ\text{C}$ or $\pm 0.01 \%/^\circ\text{C}$ of max. range R.T.D input : $\pm 0.05 \Omega /^\circ\text{C}$ max. Analog output : Below $\pm 0.05 \%/^\circ\text{C}$ of max. range (continuous output)

## 5) STORAGE CONDITION

Storage temperature	-25 ~ 70 °C
Storage humidity	5 ~ 95 %RH (no condensation)
Shock	1m max. in packing condition

## 6) STRUCTURE

MODEL	EXTERNAL DIMENSION	PROTECTION	WEIGHT	MATERIAL
NX1	48(W)×24(H)×100(D) mm	IP 65 front face	94g	Plastic case (ABS)
NX2	48(W)×96(H)×100(D) mm		342g	
NX3	96(W)×48(H)×100(D) mm		340g	
NX4	48(W)×48(H)×100(D) mm		342g	
NX7	72(W)×72(H)×100(D) mm		344g	
NX9	96(W)×96(H)×100(D) mm		472g	

## 7) POWER SUPPLY

Power supply	100 – 240V a.c(90 – 264 V a.c)	24 V a.c / V d.c
Frequency	50 – 60Hz	
Power consumption	6.0 W max., 10 VA max., 8 VA(NX1)	
Insulation resistance	Between primary terminal and secondary terminal : 500 V d.c, 20 M $\Omega$ min. Between primary terminal and ground : 500 V d.c, 20 M $\Omega$ min. Between ground and secondary terminal : 500 V d.c, 20 M $\Omega$ min.	
Dielectric strength	Between primary terminal and secondary terminal : 2,300 V a.c 50/60Hz for 1 min. Between primary terminal and ground : 2,300 V a.c 50/60Hz for 1 min. Between F · G and secondary terminal : 1,500 V a.c 50/60Hz for 1 min.	
Power supply for sensor	12 V d.c 20 mA max. (But, it is not available in retransmission output)	

## 8) INTERFACE

Standard	EIA RS 485
Communication address	0 ~ 31, 1 ~ 99 ADDRESS setting is available
Communication method	2 wire half duplex or 4 wire half duplex (Depending on wiring)
Synchronization	Nonsynchronous
Communication sequence	None
Communication distance	1.2Km max.
Communication speed	2400, 4800, 9600, 14400, 19200 BPS (Speed is changeable by parameter)
Start bit	1 BIT
Data bit	7 or 8 BIT
Parity bit	None, even numbers, odd numbers
Stop bit	1 or 2 BIT
Communication protocol	PC LINK WITHOUT SUM(0), PC LINK WITH SUM(1), Modbus ASCII(2), Modbus RTU(3)
Response time	Reception processing time + (Response time × 10 ms)

## 9) INPUT SIGNAL and MEASUREMENT RANGE

### ⚠ Caution ● Wiring for measuring input sensor

- When you wire measuring input sensor, please turn off the power of the controller and other external units to prevent electronic shock.
- Please check polarity when you wire it. Incorrect polarity may cause a malfunction of this product.
- Please use SHIELD wire for input sensor. And also, please shield to ground.
- The measuring input sensor needs to keep distance from Power circuit and ground circuit.  
If possible, please keep the measuring input sensor away from power circuit and ground circuit.

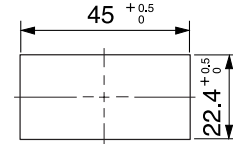
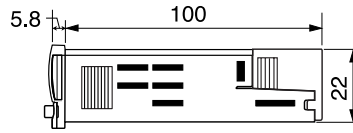
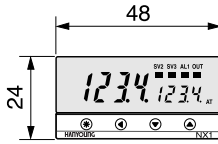
Input type	Input Code	Input Type	Range (°C)	Accuracy	Remarks
Thermocouple (T.C)	1	K * 2	-200 ~ 1370	±0.5% of F.S ±1digit	• F.S is maximum value ~ minimum value of each RANGE. • Digit is minimum value of display *1 0 ~ 400 °C : ±10 % of F.S±1digit *2 0 °C and below : ±1.0 % of F.S±1digit *3 -150.0 ~ 150.0 °C range : ±1.0 % of F.S±1digit
	2	K * 2	-199.9 ~ 999.9		
	3	J * 2	-199.9 ~ 999.9		
	4	E * 2	-199.9 ~ 999.9		
	5	T * 2	-199.9 ~ 400.0		
	6	R * 2	0 ~ 1700	±0.5% of F.S ±1digit	
	7	B * 1	0 ~ 1800		
	8	S	0 ~ 1700	±0.5% of F.S ±1digit	
	9	L * 2	-199.9 ~ 900.0		
	10	N	-200 ~ 1300	±1.0% of F.S ±1digit	
	11	U * 2	-199.9 ~ 400.0	±0.5% of F.S ±1digit	
	12	W	0 ~ 2300		
	13	PlatineIII	0 ~ 390		
R.T.D	* 20	KSPt100* 3	-199.9 ~ 500.0	±0.5% of F.S ±1digit	
	* 21	Pt100 * 3	-199.9 ~ 640.0		
Direct voltage (VDC/mVDC)	30	1 - 5V	1 ~ 5V	±0.5% of F.S ±1digit	
	32	-10 - 20mV	-10 ~ 20mV		
	33	0 - 100mV	0 ~ 100mV		
Direct voltage (mV)	* 30	4 - 20 mA d.c	* When using current input, use the resistor 250 Ω 0.1 % on input terminal.		

5

DIMENSIONS & PANEL CUTOUT

1) NX1 (48×24 mm)

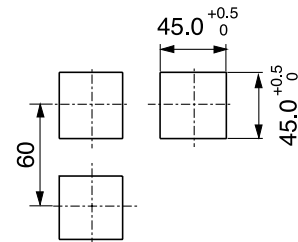
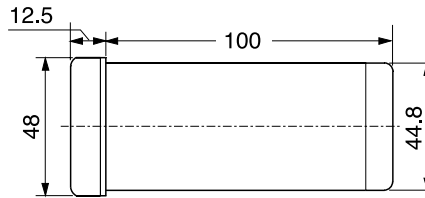
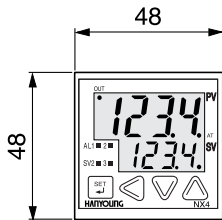
● Panel cutout



(Unit : mm)

2) NX4 (48×48 mm)

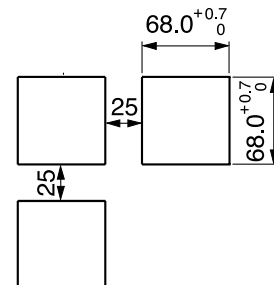
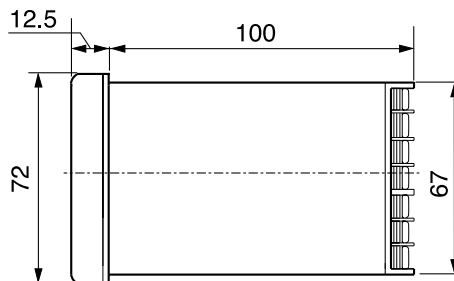
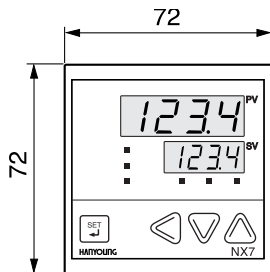
● Panel cutout



(Unit : mm)

3) NX7 (72×72 mm)

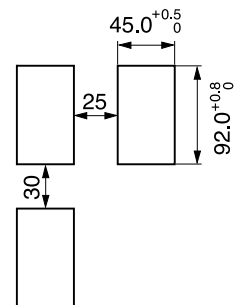
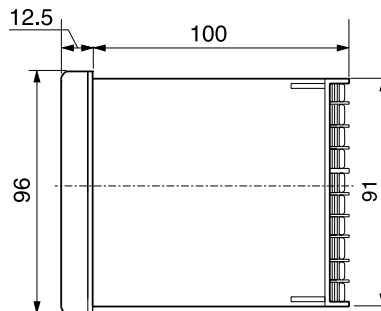
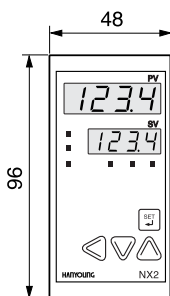
● Panel cutout



(Unit : mm)

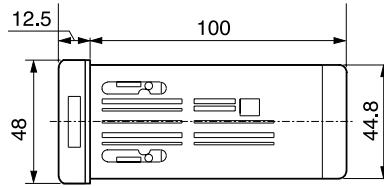
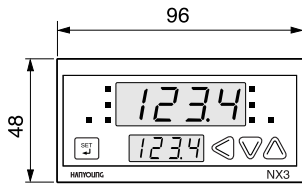
4) NX2 (48×96 mm)

● Panel cutout

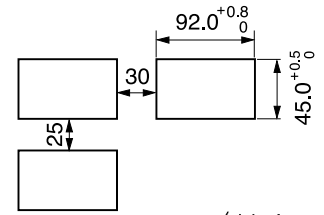


(Unit : mm)

5) NX 3 (96×48 mm)

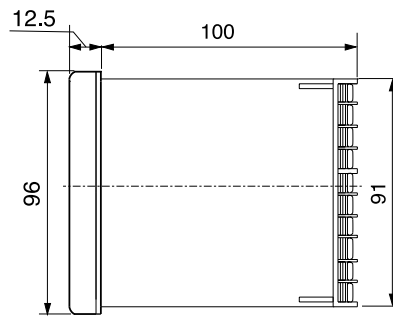
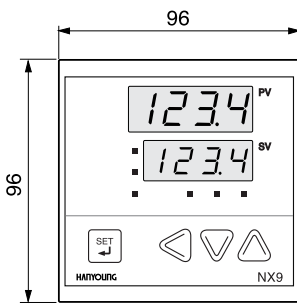


● Panel cutout

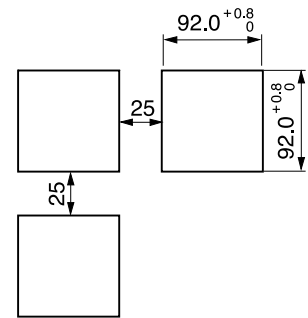


(Unit : mm)

6) NX 9 (96×96 mm)

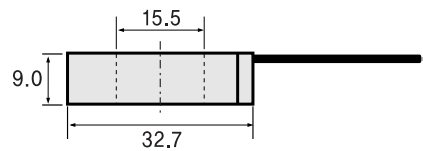
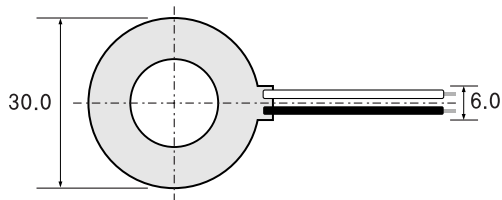


● Panel cutout



(Unit : mm)

7) CURRENT TRANSFORMER ( Model : CT-50N)



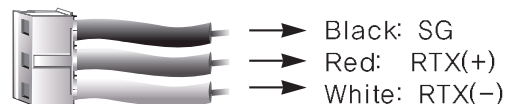
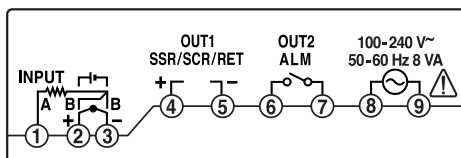
(Unit : mm)



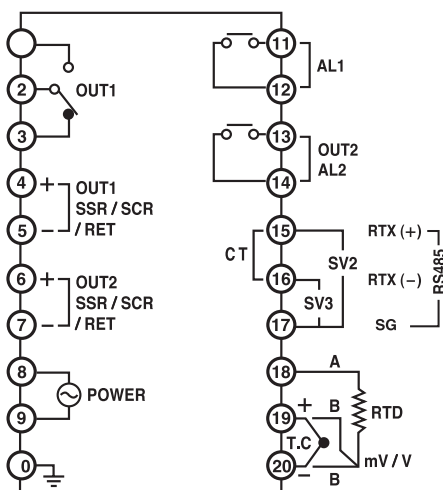
### ※ Terminal ( Model NX2, NX3, NX9 )

1) OUT1 ( Output 1 )	Heating side output when Heating / Cooling type. ● Relay output ( terminal no. ① ② ③ ) ● SSR / SCR output ( terminal no. ④ ⑤ ) But, If you do not use SSR / SCR output as output 1, you could use it as retransmission output (RET : 4 – 20 mA d.c)
2) OUT2 ( Output 2 )	Cooling side output when Heating / Cooling type. ● Relay output ( terminal no. ⑬ ⑭ ) ● SSR / SCR output ( terminal no. ⑥ ⑦ ) ● RET ( Retransmission output ⑥ ⑦ ) when SSR/SCR is not using.
3) SV2 / SV3	Terminals for SV2 or SV3 ⑮ – ⑰ : SV2 , ⑯ – ⑰ : SV3
4) POWER SUPPLY	100 – 240 V a.c 50/60 Hz / 24 V d.c (made-to-order)
5) Input sensor (signal)	Thermocouple : ⑲ → + , ⑳ → - R.T.D : ⑱ → A , ⑲ ⑳ → B
6) AL1 / AL2 (Alarm output 1 / Alarm output 2)	When you do not use output 2 as control output , you could use it as alarm 2.

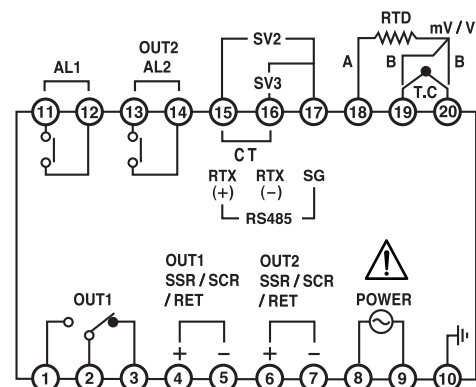
#### 1) NX 1 ( 48×24 mm)



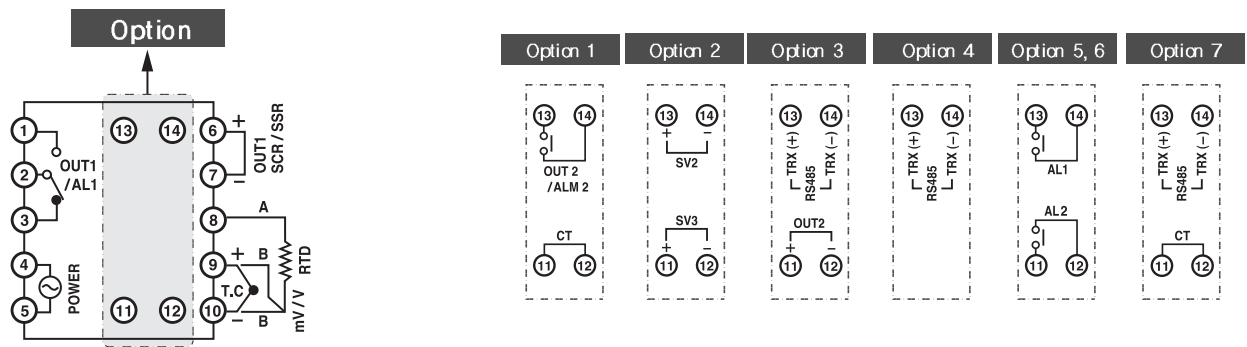
#### 2) NX 2 ( 48×96 mm)



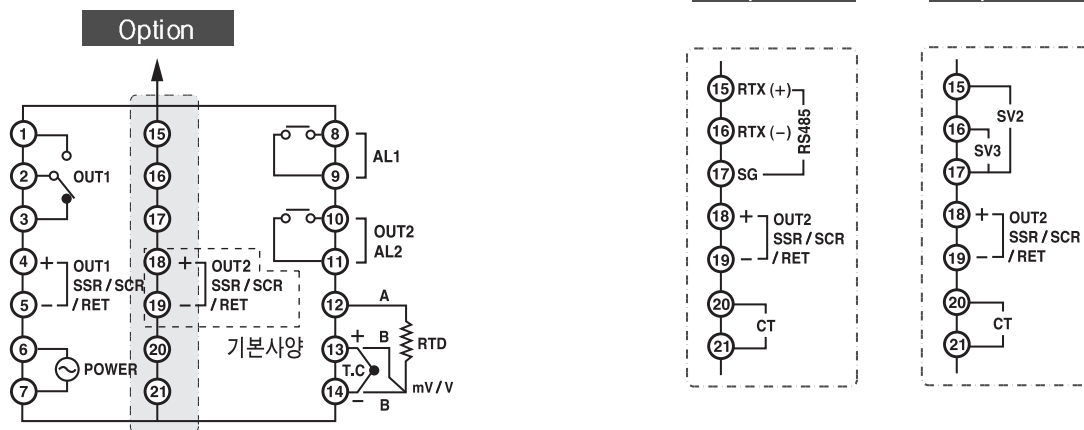
#### 3) NX 3 ( 96×48 mm)



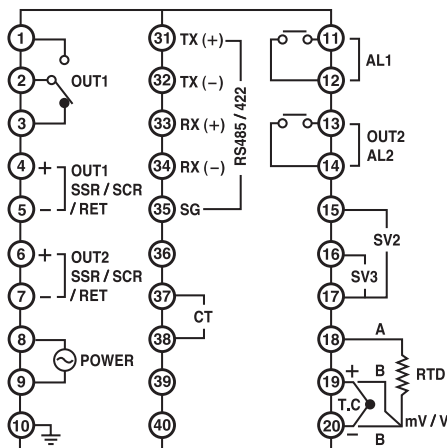
#### 4) NX 4 (48×48 mm)



#### 5) NX 7 (72×72 mm)



#### 6) NX 9 (96×96 mm)



#### ⚠ Caution

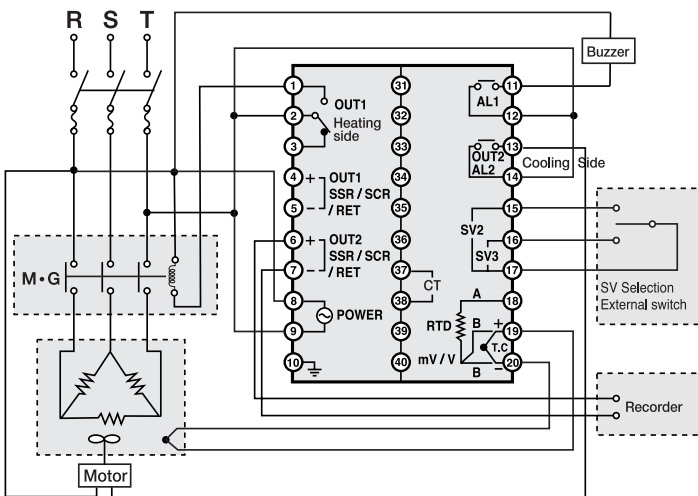
- Grounding wire
  - Please use more than 2 mm<sup>2</sup> thickness wires for grounding. And also use more than 3 class grounding (ground resistance max. 100Ω).
  - Please wire ground within 20 m length
  - Please make 1 point ground from the terminal.

※Model: NX9

Heating • Cooling Type

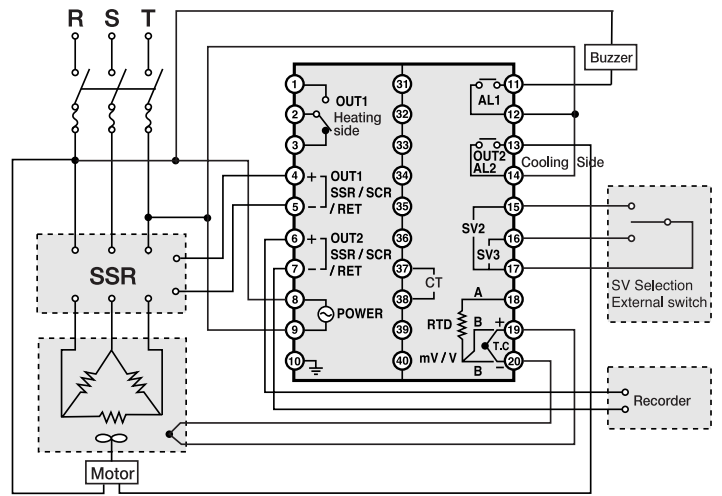
Heating Side  
Relay Output

Cooling Side  
Relay Output



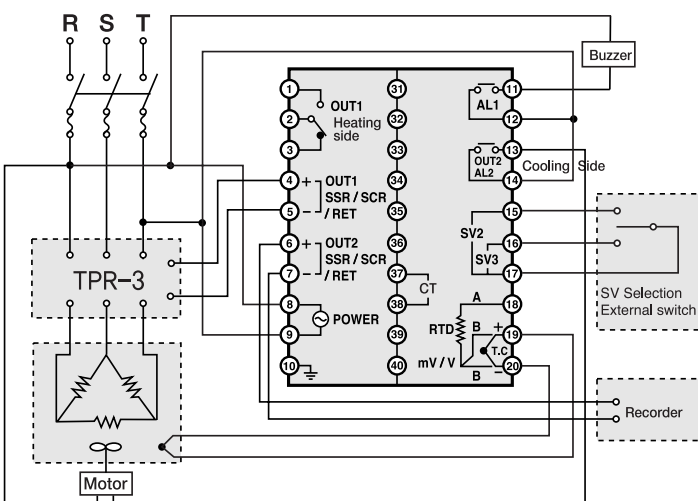
Heating Side  
SSR Output

Cooling Side  
Relay Output



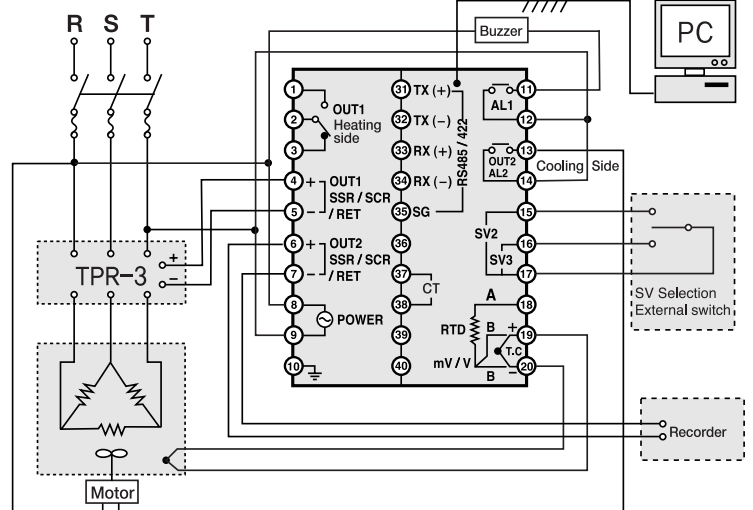
Heating Side  
4-20mA Output

Cooling Side  
Relay Output



Heating Side  
4-20mA Output

Cooling Side  
Relay Output

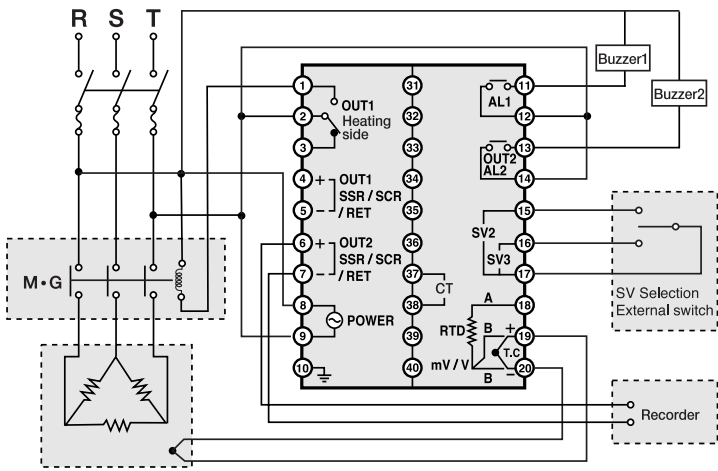


※ Optional: Communication + Heater break alarm

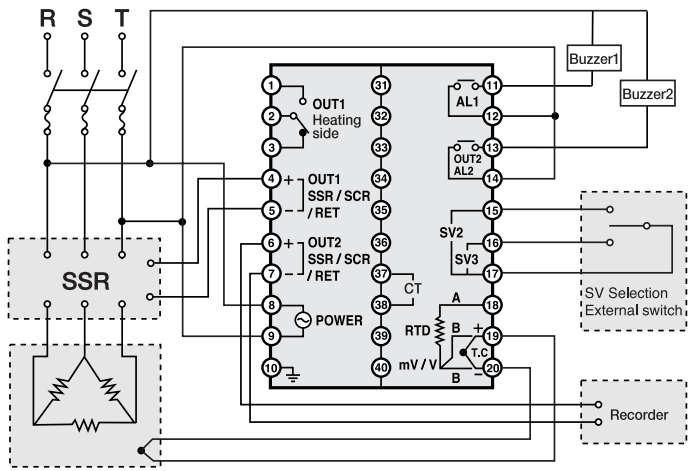
※Model: NX9

Normal Type

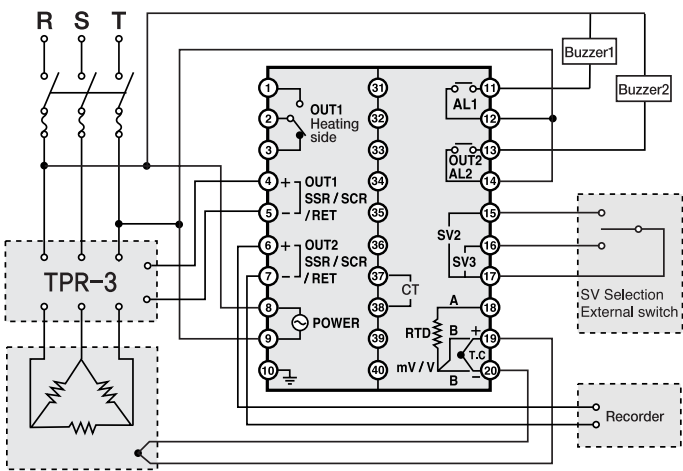
Heating Side  
Relay Output



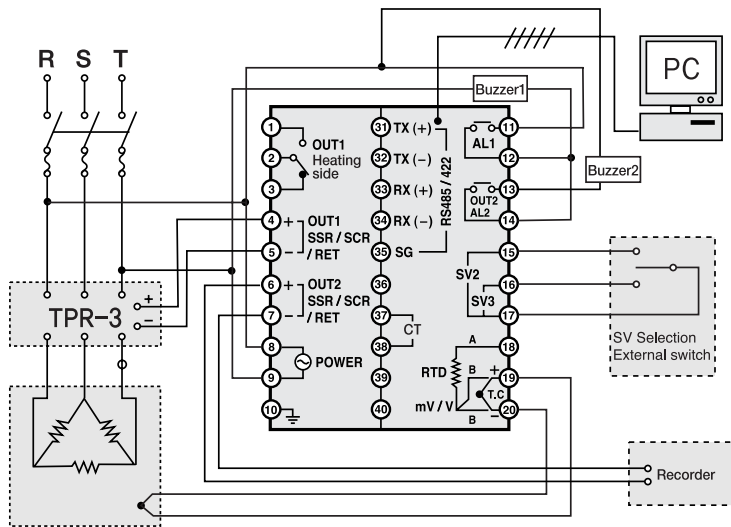
Heating Side  
SSR Output



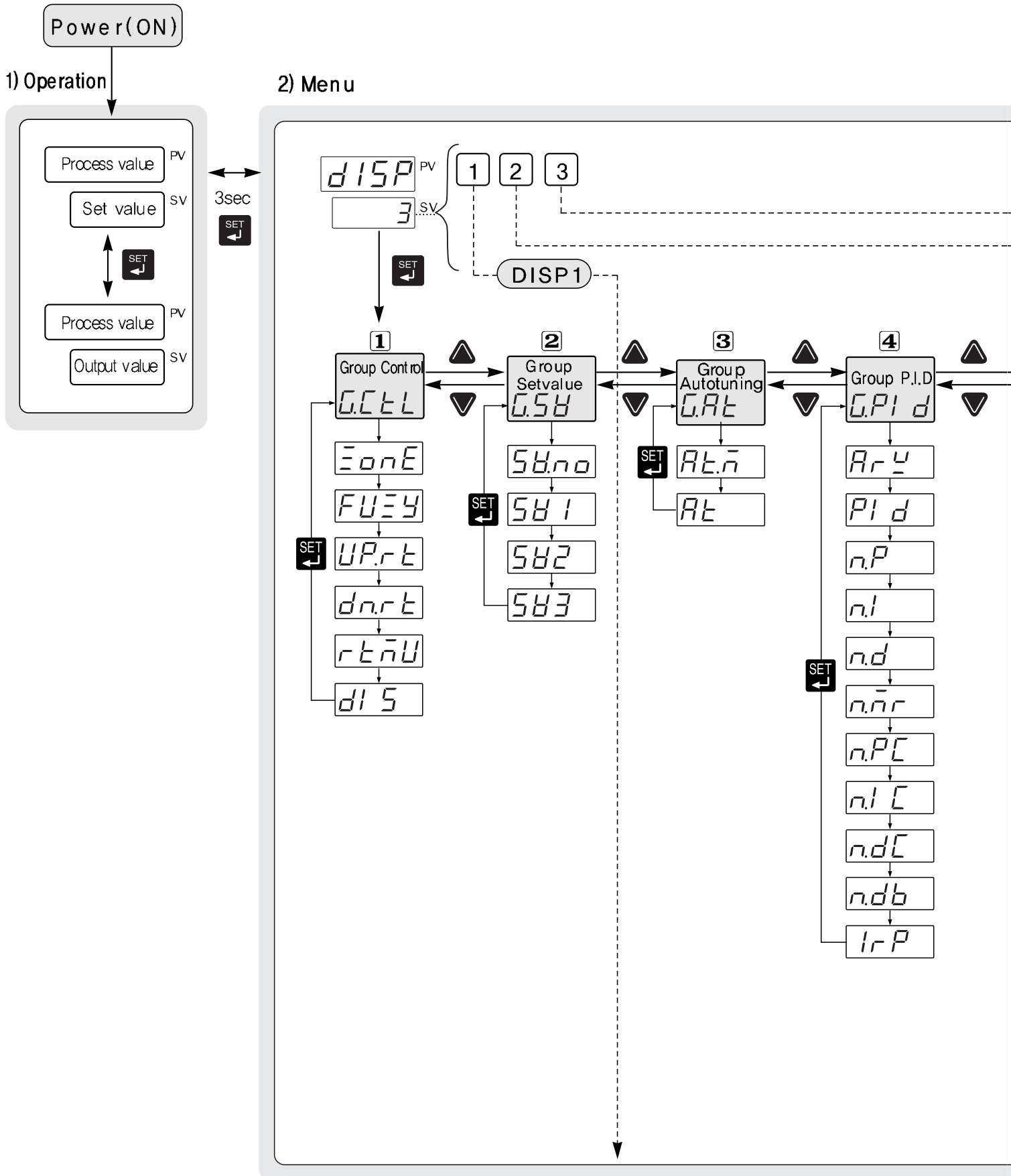
Heating Side  
4-20mA Output

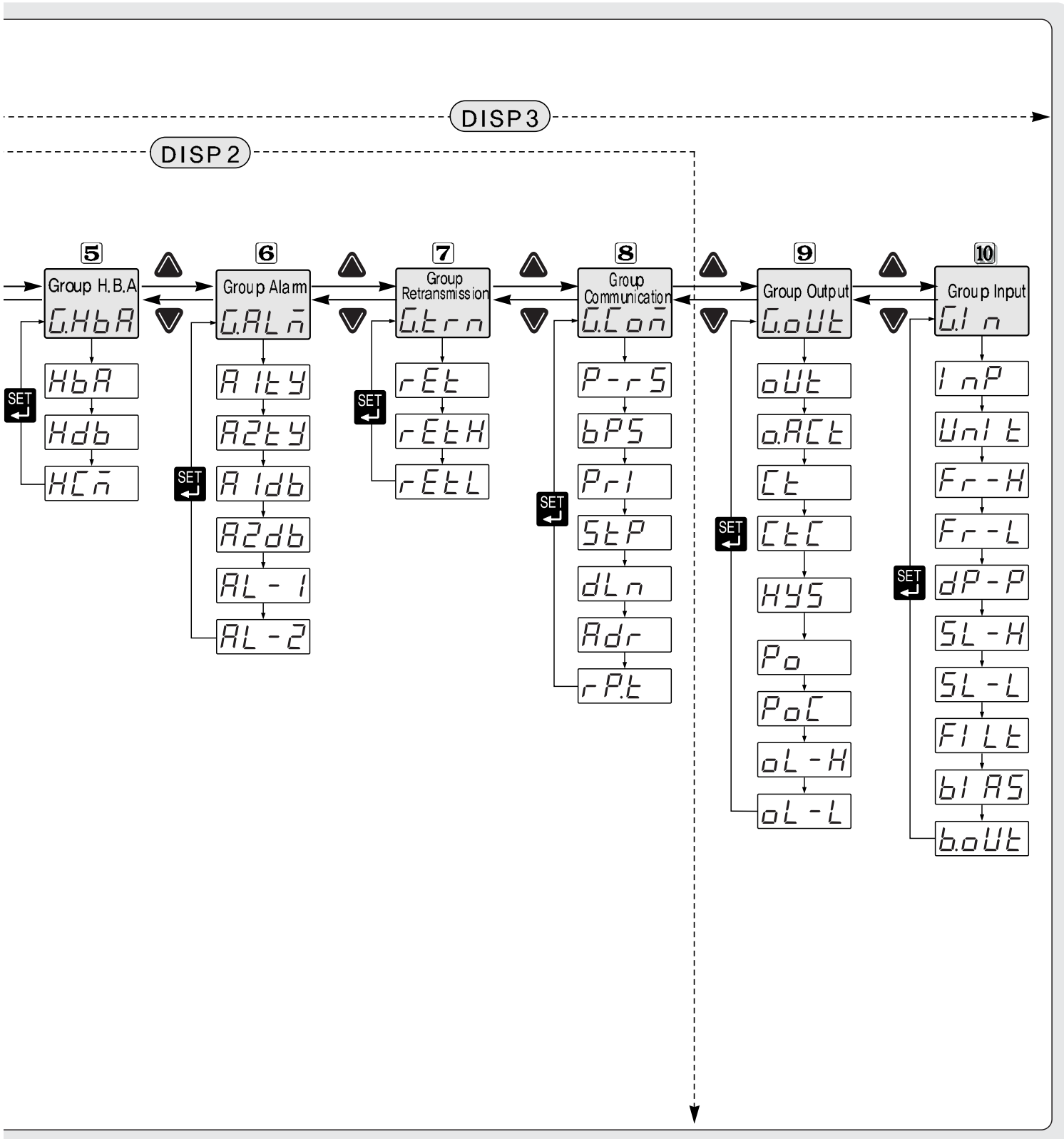


Heating Side  
4-20mA Output

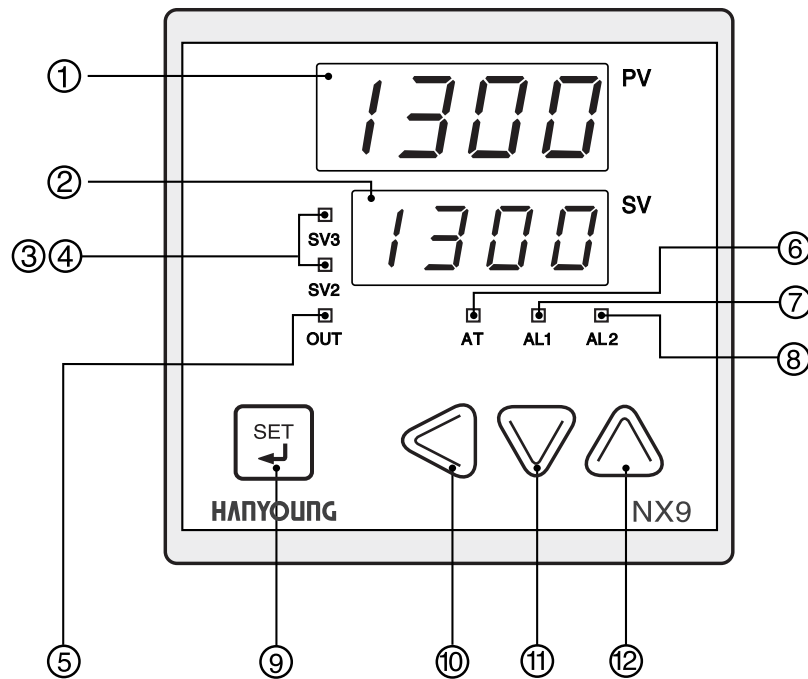


※ Optional: Communication + Heater break alarm









## 1) Names and Functions of Front Panel



## 2) Displays

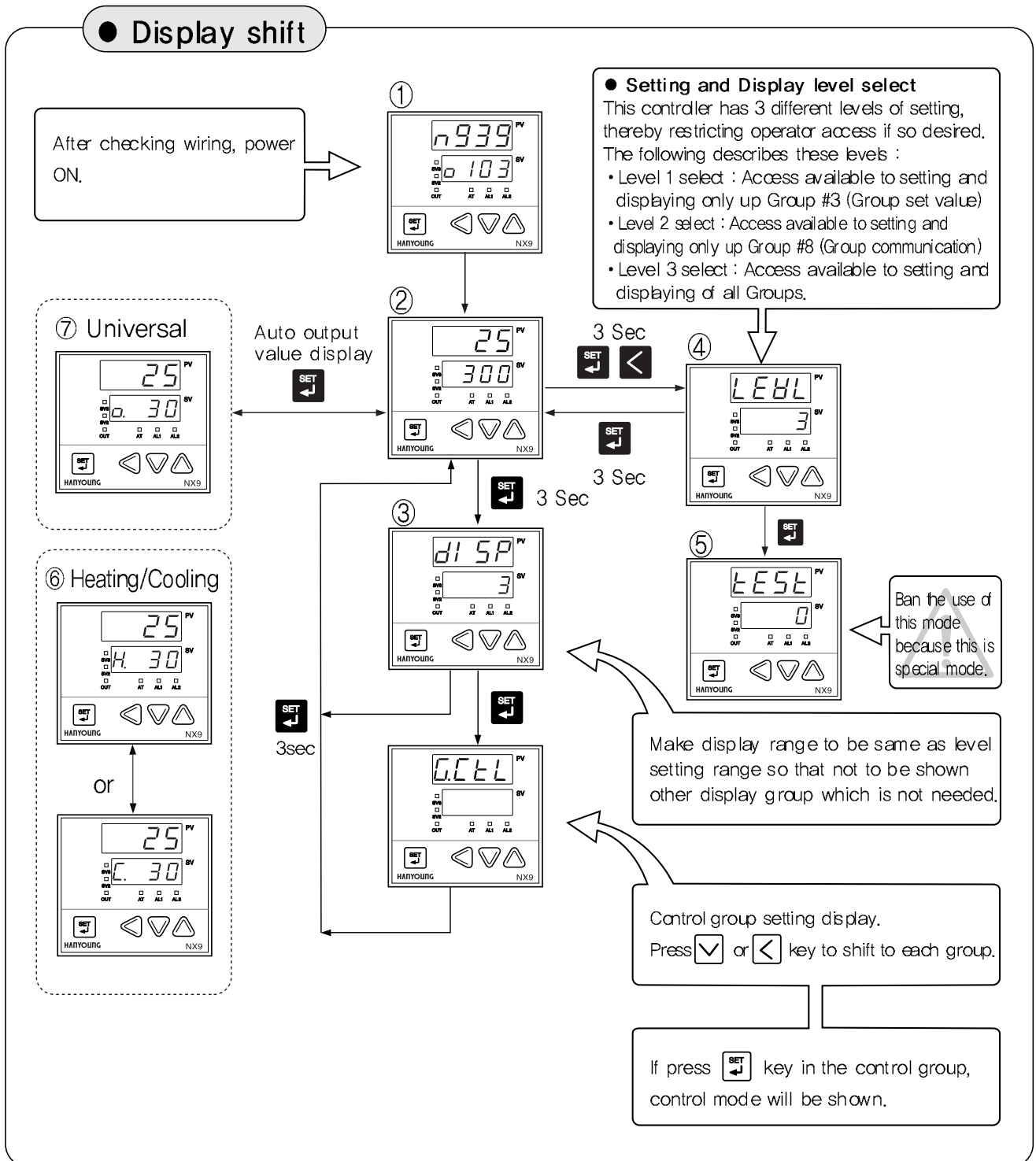
Name of respective parts	Functions
① Process-value (PV)	Displays the process temperature value.
② Set-value (SV)	Displays various set value, message, and parameter.
③④ Set-value display indicator	Lights when the SV2 or SV3 is displayed.
⑤ Output indicator	Lights when the control output is ON.
⑥ Auto tuning indicator	Flickers when the auto tuning operates.
⑦ Alarm 1 indicator	Lights when the alarm 1 Operates.
⑧ Alarm 2 indicator	Lights when the alarm 2 Operates.

## 3) Control key

Key	Functions
⑨ 	Used to change from the operation mode to the setting mode, to select parameters, and to register set-value. Press this key for 3 sec to display setting mode, set-value, and process value.
⑩ 	Used to select digit for changing.
⑪ 	Used to decrease set-values and to select setting mode.
⑫ 	Used to increase set-values and to select setting mode.

● AFTER COMPLETION OF WIRING, APPLY POWER ON

- (1) Management version is indicated as ① and then present PV and SV will be indicated as ②.
- (2) For setting a level, press **SET** and **←** at a time for 3 sec. to enter **LEVEL** (LEVEL) setting mode. (Level 3 is set at the factory refer to page 19 table of setting items.)
- (3) In the ② condition, press **SET** for 3 sec to enter **DISP**(display) selection mode. (This mode is limited by level setting mode ④ )  
( In condition of set value and process value display, press **SET** to indicate an auto output value as ⑥,⑦ )





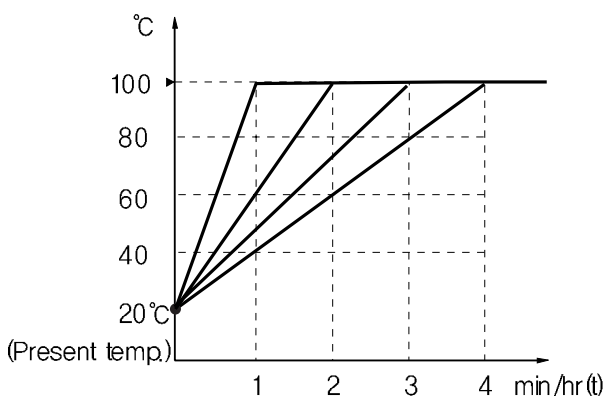
- Control zone, fuzzy function, and ramp function are available.
- Fuzzy function is operating in the P.I.D control. (not operating in the ON/OFF control)
- Using two external contact input (SV2, SV3) as ON/OFF, it is possible to control 3 kinds setting values.

Signal	Name	Operation	Display condition	Initial Value
	Control group display	Set a control mode	—	—
	Zone selection 1	OFF / ON	Always display	OFF
	Fuzzy function selection	OFF / ON	P.I.D control	OFF
	Initial increasing temperature	OFF / EUS (0 ~ 100 %)	Always display	OFF
	Initial decreasing temperature	OFF / EUS (0 ~ 100 %)	Always display	OFF
	Time unit	HOUR / MIN	Always display	HOUR
	External contact input selection	OFF / ON (Refer to chart 1)	Always display	OFF

- 1) **Control zone selection ?** This function is useful when controlling wide temperature range.
- 2) **Fuzzy function ?** When occurring big gap between SV and PV, automatically a set value will be changed to lower subsidiary set value to eliminate overshoot.  
After eliminating overshoot, the set value will be returned to origin.
- 3) **Ramp function ?** It is a rate of set value to arrive to initial set value (SV1, SV2, SV3) according to setting temperature and time.

**exam.)** Present temp. 20 °C , set value 100 °C , 20 °C per min. or hour. (Picture 1)

- 1) Initial uprising set value (up.rt) : 100 °C
- 2) Unit time : Minute (min.)



(Picture 1)



DIS selection	Set value selection by external contact signal		
OFF	No external contact signal		
ON	External signal	SV2	SV3
	Display	OFF	OFF
	SV1 display	ON	OFF
	SV3 display	ON	ON






(Chart 1)

### ⚠ Caution

- External contact input wiring
  - When you wire external contact input, please turn off this model and get off power to prevent electronic shock.
  - Please use no-voltage contact (relay contact etc.)
  - The no-voltage needs to have enough capacity for opening and shutting. (Around 5 V terminal voltage when it is OFF and about 1 mA current when it is ON.)
  - When using TRANSISTOR, the external contact has 2 V voltage when it is off, And also the external contact The wire need to have max 2 V when contact on.

### ● Input type selection

After power ON and when PV is indicating, press  key for 3 sec to be displayed  at PV and 3 at SV. (If it is not indicated 3, set again in the level setting mode)

① Control group is indicated when press  key once more. At the time, ⑩ input group is indicated when press  key and then "Input type and range selection is shown at SV when press . At this time the input and range is selected by  or  key.

### CAUTION






When setting, "Input type selection number" must be selected in the input type selection mode and also "Output type selection number" must be selected in the output type selection mode before moving to other mode.

If not, data of other group will be changed to prior value.

### ● Display unit (°C/°F)

After selecting input type and range, press  key to select display unit. Press  key to choose °C or °F and press  key when finishing selection.

### ● Maximum and Minimum range

After selecting display unit, press  key to set Maximum and Minimum range using  or  or  key. Press  key once more to finish.

### ● Decimal point

Parameter is not indicated in T.C and R.T.D input, but when selecting voltage input (code 30,32,33), "Decimal point" mode is indicated. (set 1 : 0.0, set 2 : 0.00, set 3 : 0.000)

### ● Maximum and Minimum on scale

It is the same function as Maximum and Minimum Range setting when R.T.D or thermocouple input. This mode is indicated when voltage input ( 30, 32, 33 )





### ● PV filter

When PV value becomes unstable due to effects of noise, the filter helps suppress the unstable status. (Range: OFF or 1~120sec. initial value: OFF)

### ● PV bias

Use this function to adjust PV value in cases where it is necessary for PV value to agree with another recorder or indicator, or when the sensor cannot be mounted in correct location.

(Range : -100.0 ~ 100.0 % of SPAN, Initial value : 0.0 %)

Setting a value using  or  or  key and press  key to finish.

Signal	Name	Description	Condition	Initial value
	Input group	Input type and mode selection	—	—
	Input signal selection	Refer to input signal and range (P.14)	Always display	Selection NO.1
	Measurement range unit	°C, °F	Thermocouple or R.T.D	°C
	High limit	Refer to input signal and range	Always display	1370
	Low limit	( Notice : FR-H > FR-L )	Always display	-200
	Decimal point (on voltage input)	Thermocouple or R.T.D : decimal point of instrument / DC Voltage : 0 ~ 3	On voltage input (mV,V)	1
	Maximum on scale (on voltage input)	-1999~9999	On voltage input (mV,V)	100.0
	Minimum on scale (on voltage input)	Notice : SL-H > SL-L Decimal point : according to DP-P		0.0
	PV filter	OFF/1 ~ 120sec	Always display	OFF
	PV bias	EUS (-100.0 ~ 100.0 %)	Always display	EUS(0.0 %)
	Burn-out	OFF / UP / DOWN	Always display	UP

## 13 OUTPUT GROUP SETTING

This Digital temperature controller is divided into 2 type: UNIVERSAL TYPE AND HEATING / COOLING TYPE Output is selectable from Relay, SSR and Current (4 – 20 mA d.c)

Output type range (output code) is ①~③ for universal type and ④~⑫ for Heating /Cooling type. Sometimes retransmission output and alarm output are not available according to control output (EX. when you choose output code (OT) 2, it is current output of Universal type. In this case, retransmission output and alarm output are available. But, In Heating / Cooling control type with SSR on Heating side and Relay output on Cooling side (output code ⑩), the retransmission output is available but alarm output 2 is not available.

### ⚠ CAUTION

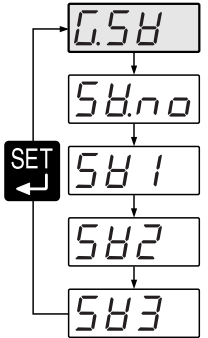
When setting, “**Input type selection number**” must be selected in the input type selection mode and also “**Output type selection number**” must be selected in the output type selection mode before moving to other mode.

If not, data of other group will be changed to prior value.

Signal	Name	Description	Condition	Initial value
	Output group	Output type and mode selection	—	—
	Output signal	Refer to type of control output	Always display	( 0 / 3 )
	Output operation	REV : Reverse DIR : Direct action	Output code 1~3	REV
	Cycle time	1 ~ 1000 sec	Relay / SSR	30 sec
	Cycle time of cooling output	1 ~ 1000 sec	Output code 4~12	30 sec
	Hysteresis of universal type	EUS(0.0 ~ 100.0 %)	ON/OFF Control	EUS(0.5 %)
	Hysteresis of Heating/Cooling type	0.0 ~ 10.0 %	Heating/Cooling	0.5 %
	Output volume when input disconnection Output 1 (Out1)	Universal : -5.0 ~ 105.0 % Heating / Cooling : 0.0 ~ 105.0 %	Always display	0.0 %
	Output volume when input disconnection Output 2 (Out2)	0.0 ~ 105.0 %	Heating / Cooling	0.0 %
	Maximum value of output	Universal : OL-L + 1Digit ~ 105.0 % Heating / Cooling : 0.0 ~ 105.0 %	PID Control	100.0 %
	Minimum value of output	Universal : -0.5 %~ OL-H-1Digit Heating / Cooling : 0.0~ 105.0 %	PID Control	0.0 % 100.0 %

## 14 Set value (SV) setup group

In the set value (SV) setup group, you can setup 3 kinds SV in advance (1, 2, 3 SV) then select each value by external contact signal (or the button on the front panel).

Signal	Name	Description	Condition	Initial value
	Display setup of SV	group for set value	—	—
	Select number of set value.	1~3 (Selected SV is displayed and controlled)	Always display	1
	1st SV setup mode	* EU(0.0 ~ 100.0 %)		EU(0.0 %)
	2nd SV setup mode	EU(0.0 ~ 100.0 %)		EU(0.0 %)
	3rd SV setup mode	EU(0.0 ~ 100.0 %)		EU(0.0 %)

\* EU : Engineering unit.

\* : It is not available in NX1.

## 15 Auto tuning setup group

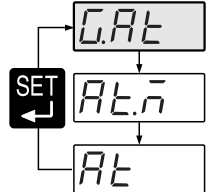
### ⚠ Caution

- Auto tuning operation/stop  
Please do not use "Auto tuning" function in case as follows.
  - Quick response control process as flow control or press control
  - Process which temporary on/off output is not allowed
  - Process which huge load on operation unit is not allowed
  - Process with risk of bad effect on product quality by changing of SV is over allowed range






This Digital temperature controller has two types of auto-tuning as STD (Standard type) and LOW(Low PV type : SV - 10 %. Low PV type is the value 10% lower than the set value. Use this type where overshoot is to be suppressed.

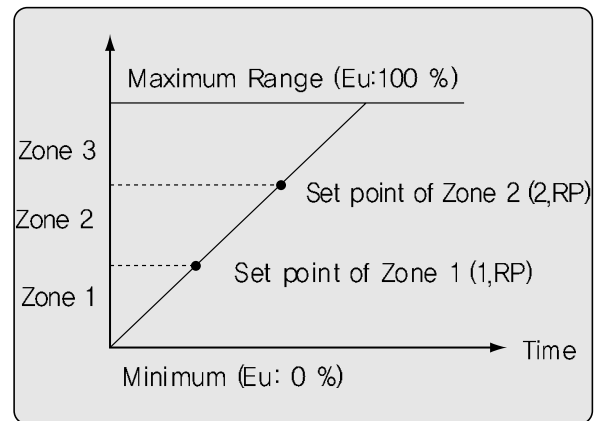
※**Auto-tuning** : The Auto-tuning function automatically measures, computes and set the optimum P.I.D and ARW constants. The Auto-tuning function can be activated at any time during the process after power ON : while temperature is rising or when control has stabilized.

Auto tuning is not operated when selecting "OFF" in selection mode of auto tuning start and when selecting 1 ~ 3, among 3 kinds set value (SV1, SV2, SV3) selecting number will be auto tuned "Auto" mode will be operated when ZONE is ON. When setting a value on 1.rp 2.rp, it is separated in group 1, 2, 3.

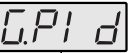











Signal	Name	Description	Condition	Initial value
	Auto tuning group	Indicates Auto tuning	—	—
	Auto tuning type	Standard (STD) : <i>S t d</i> / Low PV (LOW) : <i>L o w</i>	ABS	STD
	Auto tuning start	OFF / 1~3 / <i>A U T o</i> (AUTO)	ABS	OFF

When checking P.I.D. values or setting SV in manual mode, this can be done in P.I.D. Group.

Press  key to get Anti Reset Wind value by auto or manual and then press  once more to be indicated P.I.D mode which is selectable 3 types of P.I.D group (0~3). Example, "0" is no P.I.D mode and after selecting "1" using  or  and pressing , it is available to change P.I.D value in zone "1". ("2" and "3" are same as "1") When integral time is 0, manual reset mode is indicated and then you could set reset value to remove off set. (range: -5 % ~ 105.0 % of proportional band). You could set 3 zones by selecting zone mode ON.



※ In diagram, "n" is available to set 1~3 and proportional band of cooling side, integral time of cooling side, hysteresis are indicated in Heating / Cooling type.

Signal	Name	Description	Condition	Initial value
	P.I.D group	Set P.I.D mode	—	—
	Anti Reset Wind-Up	Auto / 50.0 ~ 200.0 %	P.I.D control	Auto
	P.I.D group selection	0 / 1~3	Always display	0
	n. Proportional band(P)	0.1 (H/C TYPE:0.0) ~ 999.9 %	P.I.D group	5.0 %
	n. Integral time (I)	OFF / 1 ~ 6000 sec.	Always display	240 sec.
	n. Derivative time (D)	OFF / 1 ~ 6000sec.	Always display	60 sec.
	n. Manual reset	-5.0 ~ 105.0 %	Integral time: OFF	50.0 %
	n. Proportional band of cooling side (P)	0.0(ON/OFF제어) / 0.1 ~ 999.9	Heating • Cooling type	5.0 %
	n. Integral time of cooling side (I)	OFF / 1 ~ 6000 sec.	Heating • Cooling type	240 sec.
	n. Derivative time of cooling side (D)	OFF / 1 ~ 6000 sec.	Heating • Cooling type	60 sec.
	n. Hysteresis	-100.0 ~ 50.0 %	Heating • Cooling type	3.0 %
	n. Zone point	EU (0) < 1.RP < 2.RP < EU (100.0 %)	ZONE = ON	EU(100.0 %)

## 17 HEATER BREAK ALARM GROUP

Heater break alarm group consist of output dead band and current detection display mode and detects 2 spots.

(to be ordered separately: current transformer mode CT-50N, Measuring range: 1 – 50 A)

Signal	Name	Description	Condition	Initial value
	Heater break alarm group	Set HBA mode	—	—
	Current setting mode of HBA	OFF / 1 – 50 A	Optional	OFF
	Hysteresis setting mode HBA	EUS (0.0 ~ 100.0 %)		EUS(0.5 %)
	Current measurement value of HBA	Only display (0 – 50 A)		

## 18 Alarm setup group

### ⚠ Caution

#### ● wiring of alarm output

Please do not use “Auto tuning” function in case as follows

- In case of relay contact output, if it's over contact capacity (240 V a.c resistance load 1A, 30 V d.c resistance load 1 A), please use relay for ON/OFF.
- When you use micro-ampere, please use Bleeder register so that it has enough current to open and close of relay. Relay has its life (more than 100K times [resistance load]). Make it sure to contact CR Filter (when using AC) or Diode to DC L load.

There are 2 alarm outputs available per controller. In Alarm Group, setting are made for mode, dead band and value of each alarm. Refer to the next page for the 22 different types of alarm functions. In Heating · Cooling type of, \* is not indicated when selecting 10,11,12 (Refer to page 21.)

Signal	Name	Description	Condition	Initial value
	Alarm group	Set alarm mode	—	—
	Type of Alarm 1	OFF / 1 ~ 22 Refer to “Alarm type and code”	Always display	1
	Type of Alarm 2			2
	Dead band of Alarm 1	EUS ( 0.0 ~ 100.0 % )	Always display	EUS(0.5 %)
	Dead band of Alarm 2			
	Set value of Alarm 1	PV alarm, Deviation alarm EU ( -100.0 ~ 100.0 % )	Always display	EU(100.0 %) EU(0.0 %)
	Set value of Alarm 2			

※ Reference : Display lamp will be OFF when output ON in inverted type.



# ALARM TYPE AND CODE

**(Notice)** : Display lamp will be ON when output OFF in inverted type.

Hysteresis (  $\Delta$  : Set point ,  $-\blacktriangle$  : Minus Alarm set point ,  $\blacktriangle$  : Alarm set point )

Code NO.	Alarm type	Function
1	High absolute value	
2	Low absolute value	
3	High deviation value	
4	Low deviation value	
5	High deviation value (inverted)	
6	Low deviation value (inverted)	
7	High · Low deviation value	
8	High · Low band	
9	High absolute (inverted)	
10	Low absolute (inverted)	
11	High absolute with hold function	
12	Low absolute with hold function	
13	High deviation with hold function	
14	Low deviation with hold function	
15	High deviation with hold function (inverted)	
16	Low deviation with hold function (inverted)	
17	High · Low deviation with hold function	
18	High · Low band with hdd function	
19	High absolute value with hold function (inverted)	
20	Low absolute value with hold function (inverted)	
21	Heater break alarm 1 ( HBA 1 )	



## 19 RETRANSMISSION GROUP

For the retransmission output, you can select one function among Process Value(PV), Set Value(SV), Manipulation Value(MV), Sensor Power Supply(SPS), etc. And also you can set high or low limit of value for retransmission.

※**Reference** : Retransmission group will be indicated when selecting retransmission in output group.  
If selecting code 4, 5, 7 or 8 in output group, retransmission will not be indicated.

Signal	Name	Description	Condition	Initial value
	Retransmission group	Set retransmission mode	※Reference	—
	Retransmission type or Power for sensor	PV / SV / Output volume (MV) / Power for sensor (SPS)	Optional	PV
	High limit of retransmission	Thermocouple / R.T.D : FR -H ~ FR- L DC voltage : SL -H ~ SL-L	PV / SV	
	Low limit of retransmission	but, RET. H > RET.L		

### ⚠ Caution

- Wiring of retransmission output
  - Please be sure turn off the controller unit and cut the external power supply when installing/uninstalling receiving set because there is a risk of electric shock.
  - The retransmission output and S.C.R/S.S.R/S.P.S output use same terminal and please select a output of the terminal depending on PARAMETER
  - The retransmission output is 4–20 mA dc
- Wiring of the Sensor Power Supply (SPS) output
  - Please be sure turn off the controller unit and cut the external power supply when installing/uninstalling this unit because there is a risk of electric shock.
- Function of retransmission output
  - The retransmission output and Sensor Power Supply(SPS) function are unavailable when using control of heating/cooling as current output.
  - The retransmission is unavailable when using Sensor Power Supply(SPS)

## 20 COMMUNICATION

NX series are equipped with 4 wire /2 wire half-duplex the RS485 / RS422 communication interfaces. Using the interfaces, communications are available with maximum 31 devices.

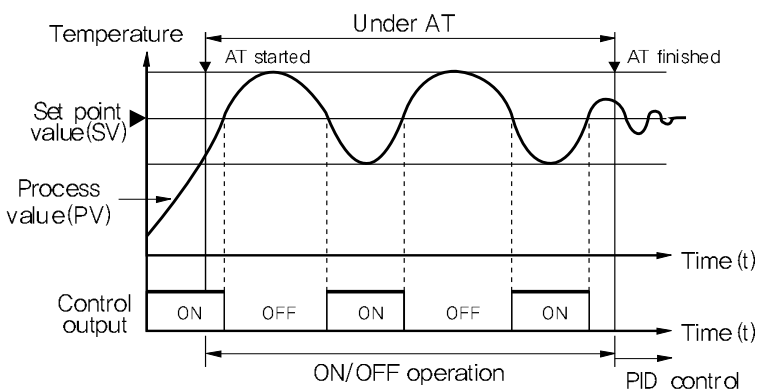
Signal	Name	Description	Condition	Initial value
	Communication group	Set communication mode	—	—
	RS 485 / RS 422 Protocol	PC.LINK (Set value:0) / PC.LINK SUM (Set value:1) Modbus ASCII (Set value:2), Modbus RTU (Set value:3)	Optional	0
	Communication rate (B.P.S)	2400(SV:2) / 4800(SV:3) / 9600(SV:4) 14400(SV:5) / 19200(SV:6)		4
	Parity check	NONE(SV:0)/EVEN(SV:1)/ODD(SV:2)		1
	Stop bit	1bit (SV:1) / 2bit (SV:2)		1
	Data length	7bit (SV:7) / 8bit (SV:8) (Except PC LINK :8)		8
	Address	1~99 , maximum 31 devices		1
	Response time	0~10. response time = (handling time + response time) X 10 ms		0

**1) AUTO TUNING**

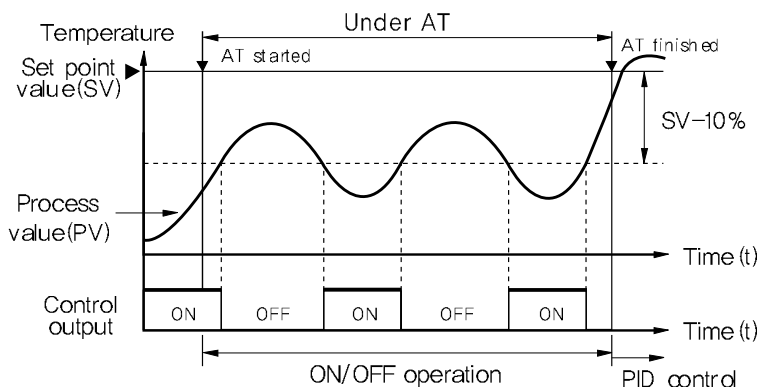
The Auto tuning function automatically measures, computes and sets the optimum Proportional band(P), Integral time(I), and Derivative time(D). When Auto-tuning, the controller performs ON/OFF control and determine proper P,I and D. (Limit cycle type) NX series controller have two types of Auto-tuning as below.

- ① Standard type auto-tuning :  
This type is based on set point value (SV)
- ② Low PV type auto-tuning :  
This type is based on the value 10% lower than the set point value (SV)

**a) STANDARD TYPE AUTO-TUNING**

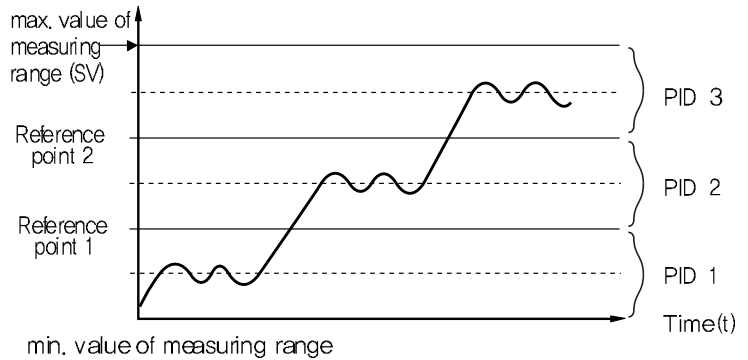


**b) LOW PV TYPE AUTO-TUNING**



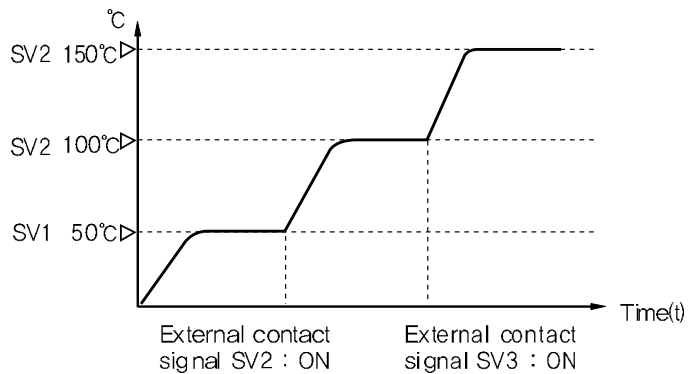
**2) Auto-tuning in Zone PID**

Zone PID automatically sets PID group in accordance with a measured value. In Zone PID, auto-tuning sets the proper PID value by recognizing a mid-value of reference point as set point value.



**3) EXTERNAL CONTACT INPUT**

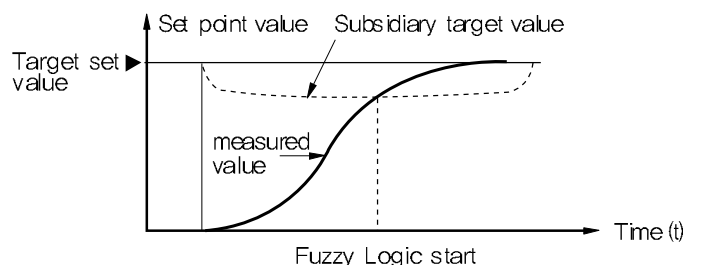
The slope of the changing set value (SV) when user changes set value (SV). When set value is increasing, it has slope as like "UP,rt/RTMU (Initial uprising set value/Selected time value). And when set value is decreasing, it has slope as like "DN,rt/RTMU (Initial decreasing set value/Selected time value). On the Ramp function, the set value (SV) when turn on power and Process value is same.



**4) FUZZY CONTROL**

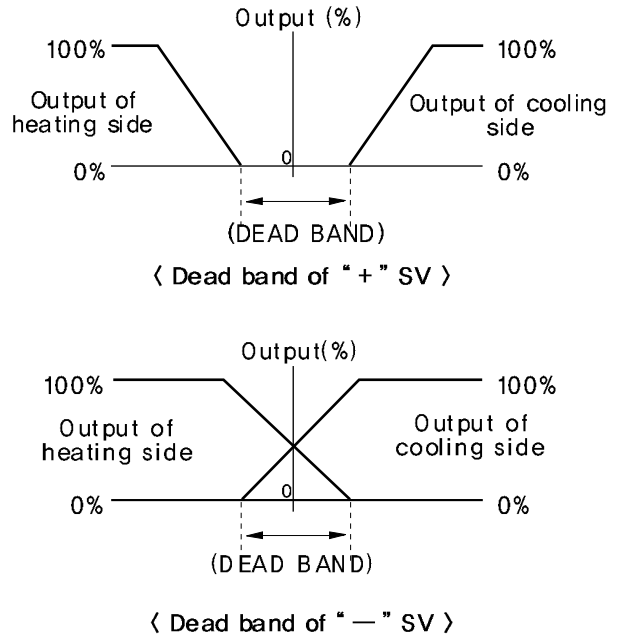
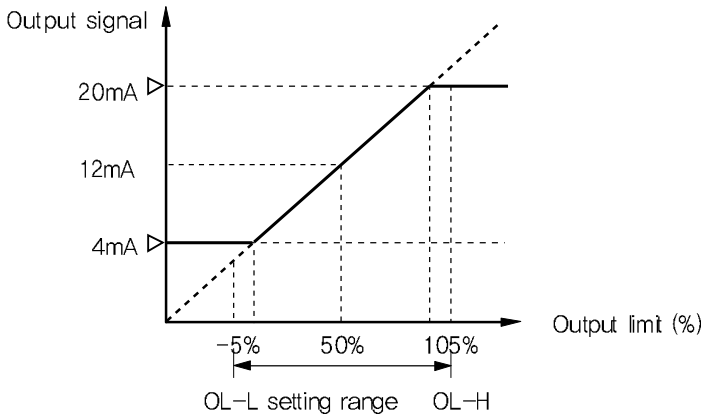
Fuzzy control eliminates overshoot using Fuzzy Logic. Employing Fuzzy control and Auto-tuning, the controller effectively control as below.

- ① When the controller starts control at the position which has a big gap between SV and PV.
- ② When reducing warming up time
- ③ When the load is fluctuating extremely
- ④ When changing a set point value frequently



### 5) OUTPUT LIMIT

Control output is set in high and low limit as operating range.  
Output limit is -5 ~ 105 % of output.



### 6) HEATER BREAK ALARM (HBA)

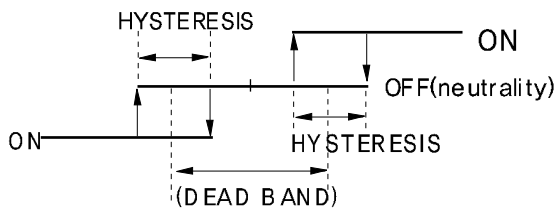
Set-value of HBA to be set about 85 % to input of CT but the set-value should be less in case that the ratio of voltage variation is high. HBA detects an heater disconnection and makes an alarm operation.

- ① Using current transformer (CT) designated by **HANYOUNG**.
- ② Set using voltage and set-value of HBA by front keys.
- ③ Phase angle control type by thyristor could not use. (SCR Output)

### 7) HEATING / COOLING CONTROL

Heating / Cooling control output two signal decided for heating and cooling. It is available to output PID control or ON / OFF control in heating side and cooling side each, also could select a output among relay, SSR, or current output (4 - 20 mA).

When heating and cooling side are ON / OFF control, hysteresis will be shown as below.



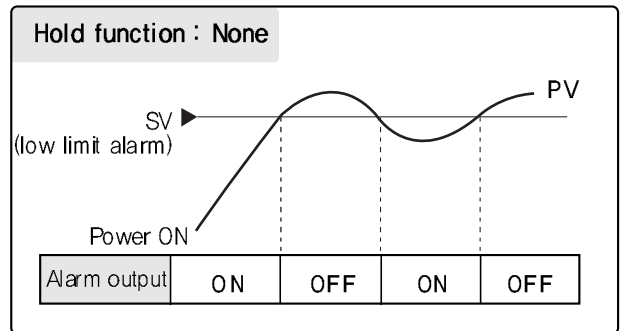
When heating and cooling side are PID control, hysteresis will be shown as below.

### 8) Emergency output

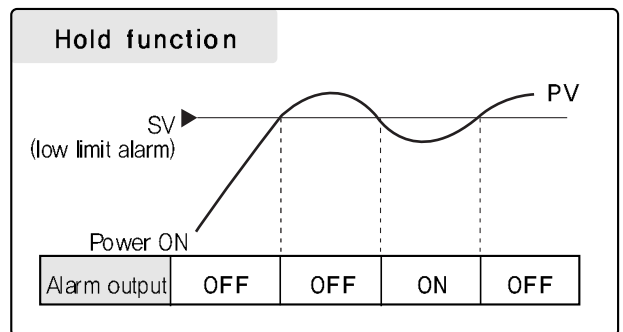
When A/D error or input disconnection occur in auto mode, PID output is cut and than Pre-set output is operated. (PO Output)

### 9) Hold function

Without hold function, Low limit alarm will be ON when increasing temperature. (Picture 1)



(Picture 1)



(Picture 2)





**HEAD OFFICE**

1381-3, Juan-Dong, Nam-Gu Incheon, Korea

TEL: (+82-32) 876-4697 FAX: (+82-32) 876-4696

<http://www.hynux.net> E-mail. [overseas@hynux.com](mailto:overseas@hynux.com)

MA0202E120404