

NP100

Programmable Controller

Manual






HANYOUNG nux

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1. SAFETY INFORMATION

Before using the product, please read the safety information thoroughly and use it properly. Alerts declared in the manual are classified to Danger, Warning and Caution by their criticality

 Danger	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
 Warning	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
 Caution	CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury

Danger

Do not touch or contact the input/output terminals because they may cause electric shock.

Warning

1. If there is a possibility of an accident caused by errors or malfunctions of this product, install external protection circuit to prevent the accident.
2. This product does not contain an electric switch or fuse, so the user needs to install a separate electric switch or fuse externally. (Fuse rating : 250 V 0.5A)
3. When setting, "Input type selection number" must be selected in the Group Input(G.In) and also "Output type selection number" must be selected in the Group Output(G.Out) before moving to other group. If not, data of other group will be changed to the initial stage.
4. To prevent defection or malfunction of this product, supply proper power voltage in accordance with the rating.
5. To prevent electric shock or device malfunction of this product, do not supply the power until the wiring is completed.
6. Since this product is not designed with explosion-protective structure, do not use it at any place with flammable or explosive gas.
7. Do not decompose, modify, revise or repair this product. This may cause malfunction, electric shock or fire.
8. Reassemble this product while the power is off. Otherwise, it may cause malfunction or electric shock.
9. If you use the product with methods which are not specified by the manufacturer, there could be bodily injuries or property damages.
10. Due to the danger of electric shock, use this product installed onto a panel while an electric current is applied.

Caution

1. The contents of this manual may be changed without prior notification.
2. Before using the product you have purchased, check to make sure that it is exactly what you ordered.
3. Check to make sure that there is no damage or abnormality of the product during delivery.
4. The ambient temperature do not exceed 0 ~ 50 °C & The ambient humidity do not exceed 35 ~ 85 %RH (no icing).
5. Do not use this product at any place with corrosive (especially noxious gas or ammonia) or flammable gas.
6. Do not use this product at any place with direct vibration or impact.
7. Do not use this product at any place with liquid, oil, medical substances, dust, salt or iron contents.
(Use at the Pollution level 1 or 2)
8. Do not polish this product with substances such as alcohol or benzene.
9. Do not use this product at any place with excessive induction trouble, static electricity or magnetic noise.

10. Do not use this product at any place with possible thermal accumulation due to direct sunlight or heat radiation.
11. Install this product at place under 2,000 m in altitude.
12. Attach the bractets(2pcs) on the fixed halls and tighten with a screwdriver. Fixing torque is about 14,7 N · cm (1,5 kg · cm)
13. When the product gets wet, the inspection is essential because there is danger of an electric leakage or fire.
14. Use a compensating cable with thermocouple.
15. The lead wire resistance is small for RTD input use and please use the one which has no resistance difference to 3 wires.
16. To avoid inductive noise to input wires, seperate from the power and output wires.
17. Keep input wires away from output wires and use shielded wires to earth.
18. Use non-grounded sensor to R.T.D and thermocouple.
19. If there is excessive noise from the power supply, using insulating transformer and noise filter is recommended.
The noise filter must be attached to a panel grounded, and the wire between the filter output side and power supply terminal must be as short as possible.
20. It is effective to use a twisted cable for power supply against noise.
21. If alarm function is not set correctly, alarm output can not be operated at a trouble.
22. When replacing the sensor, please turn OFF the power supply.
23. Use an extra relay when the frequency of operation is rather high. In this case, SSR output type is recommended.
 - Electromagnetic switch : Proportional cycle time is Min. 20 sec
 - SSR : Proportional cycle time is Min. 1 sec
 - Contact output life : Mechanical : Min.10 million times (no load)
Eletrical : Min. 100 thousand times (rated load)
 - SSR drive pulse voltage, 4 ~ 20 mA DC are not insulated with internal circuit.
24. The instrument has IP65. Use rubber packing when installing the instrument to panel.
25. Do not connect anything to the unused terminals.
26. After checking polarity of terminal, connect wires at the correct position.
27. When this product is connected to a panel, use a circuit breaker or switch approved with IEC847-1 or IEC947-3.
28. Install the circuit breaker or switch at near place for convenient use.
29. Write down on a label that the operation of circuit breaker or switch disconnects the power since the devise is installed.
30. For the continuous and safe use of this product, the periodical maintenance is recommended.
31. Some parts of this product have limited life span, and others are changed by their usage.
32. The warranty period for this product including parts is one year if this product is properly used.
33. The heater power supply and the instrument power supply should be connected using the same power supply when a heater break alarm.
34. When the power is on, the preparation period of contact output is required. In case of use for signals of external interlock circuit, use with a delay relay.
35. When changing a contorller to extra one, please check all parameters.



● Summary

Program temperature controller is consisted of three types of modes: operation indicator mode, engineering mode, and program mode.

Operation indicator mode is displayed when the power is ON and it indicates process value and set value, process value and output volume, and remaining time of the corresponding segment when in operation.

Engineering mode sets up the basic functions of the instrument including types of input (sensor) and output, communication, retransmission, alarm, control output, PID, and auto tuning.

Program mode sets up the control program. It establishes the number of program repetition, pattern number, segment number setup, program start condition, time signal, program ending mode, and each segment's parameter.

● Feature

Function		Description
Option		RS 485 / 422, Time signal 2 points
PV display	Digit number	4 digits
	Accuracy	$\pm 0.1\%$
	Sampling time	250 ms
	Input type	Universal input (selectable by parameter) refer to page 8
Control Output	Output type	Universal output (selectable by parameter) refer to page 8 SSR / SCR Relay
Retransmission output		Current / SPS (power supply for sensor) (Use RET output terminal)
Alarm output	Relay	2 points
Time signal output	Transistor	2 points
Pattern & Segment number		2 patterns & 20 segments (1 PT is max. 10 seg.)
Communication	Standard	RS485/422
	Speed	600 ~ 9600 bps
	Max. Com. line	31
Hard Ware	Measurement input	1 point
	Contact input	3 points (RUN, RESET, HOLD)
	SCR / SSR pulse	1 point (Current or SSR output)
	Retransmission output	1 point
	Relay control output	1 point (C contact)
	Alarm output	2 points (A contact)
	Transistor output	2 points (Time signal)
Power supply		100 – 240 V AC 50 – 60 Hz

2. ORDERING INFORMATION

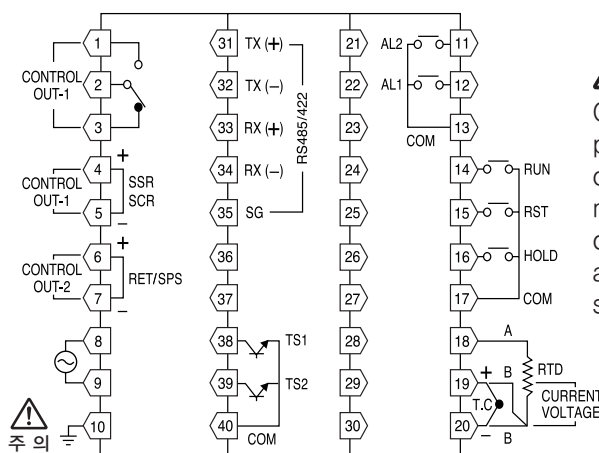
Model	Code	Information
NP100-	<input type="checkbox"/> <input type="checkbox"/>	Programmable Controller
Control type	0	Universal type (Heating)
Option	0	None
	1	Time signal 2 points
	2	RS 485/422
	3	Time signal 2 points +RS 485/422

3. Connection diagram

⚠ Caution

Main power must be OFF before wiring

POWER : 100 - 240 VAC
50-60 Hz
CONTACT OUT1 : 3 A 240 VAC
(Resistive load)
AL1, AL2 : 1 A 240 VAC
OUT1.2 (SCR, RET) : 4 - 20 mA DC
(Resistive load 600Ω max.)
OUT1 (SSR) : 24 VDC 30 mA
(Resistive load 600Ω min.)
TS1, TS2 : 24 VDC 30 mA
"MAX.AMBIENT TEMP : 50 °C"
"NOTE : Use Copper or
Copper clad Aluminum
Conductors Only"



⚠ Caution

Operate after disconnecting the main power and confirming the discontinuation of power to the cable connected to the main power by using a tester. There is danger of possible electric shock. Avoid any contact with the terminal when sending electricity.

⚠ Caution • ground-wiring (⏏)

- Ground connection cable is a thick wire that is over 2 mm² in width. Wire with more than the third type ground connection (below 100Ω ground connection resistance).
- The length of the ground connection cable must be within 20m.
- Ground 1 point from the ground terminal.
- Do not spread cable between the ground terminals.

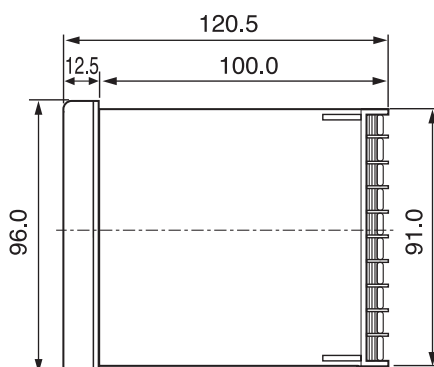
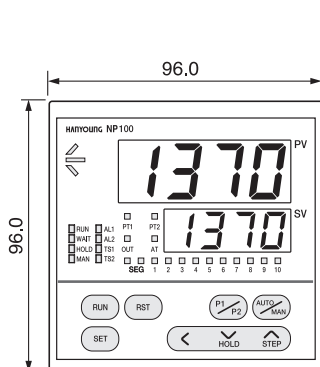
4. DIMENSION & PANEL CUTOUT

⚠ Caution

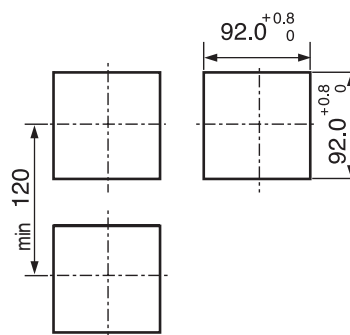
Use panels with 2 ~ 10 mm thickness steel sheet.

[Unit : mm]

● Dimension



● Panel cutout



5. INPUT & OUTPUT



Caution • Measurement Input Wiring

- When wiring the input line, cut off the controller and the external power.
- Be careful with polarity and wire the input signal at some interval from power circuit and ground connection circuit.
- Use shielded input cable when wiring and earth the shield 1 point.

• Input type and Measurement range

Input type	Code	Input	Range (°C)	Accuracy
Thermocouple (T.C)		K *1	–200 ~ 1370	±0.10 % of F.S ±1digit
		K *1	–199.9 ~ 999.9	
		J *1	–199.9 ~ 999.9	
		E *1	–199.9 ~ 999.9	
		T *1	–199.9 ~ 400.0	
		R	0 ~ 1700	±0.15 % of F.S ±1digit
		B *2	0 ~ 1800	
		S	0 ~ 1700	
		L *1	–199.9 ~ 900.0	±0.1 % of F.S ±1digit
		N	–200 ~ 1300	±0.2 % of F.S ±1digit
		U *1	–199.9 ~ 400.0	±0.1 % of F.S ±1digit
		W	0 ~ 2300	
		Platinel II	0 ~ 1390	
		Platinel II	0 ~ 1390	
RTD		JPT100	–199.9 ~ 500.0	±0.1 % of F.S ±1digit
		PT100	–199.9 ~ 640.0	
Direct voltage		1 – 5 V **	Scaling range SL–L ~ SL–H = –1999 ~ 9999 **When using current input, use the resistor 250 Ω 0.1 % on input terminal to use 4 – 20 mA DC input.	
		0 – 10 V		
		–10 – 20 mV		
		0 – 100 mV		

※ Display range : –5 % ~ +105 % of range

*1 : below 0 °C : ±0.2 % of F.S ±1digit

*2 : 0 ~ 400 °C : ±5 % of F.S ±2digit



Caution • Control output wiring

- In case of wiring or eliminating the control output, cut off the controller and the external power.
- Use a shielded line for SSR pulse or Current output when wiring.

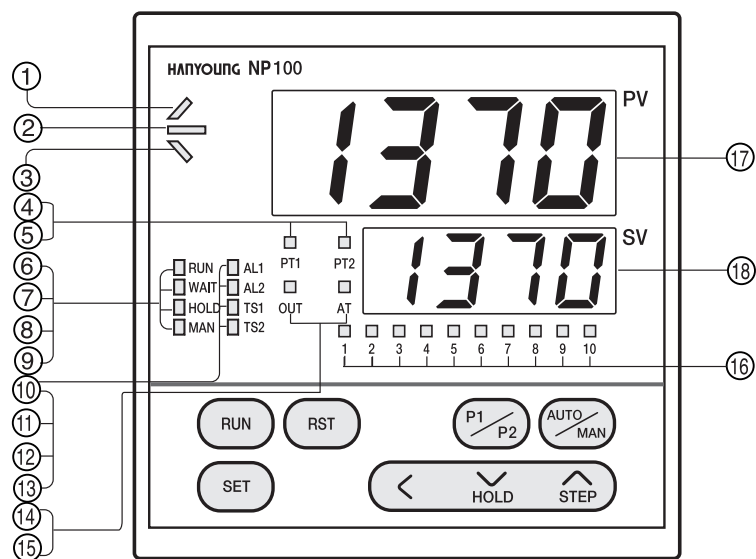
• Control output type

Output symbol	Control output (OUT1)		Control output (OUT2)
	Relay output	SSR / SCR (Current)	RET / SPS
	ON – OFF control* ① – ② – ③		RET(Retransmission output) / SPS(External power supply) ⑥ – ⑦
		SSR ④ – ⑤	
		SCR ④ – ⑤	
	Relay ① – ② – ③		

※ ① ~ ⑦ : Terminal number

6. NAME AND FUNCTION

● Function description









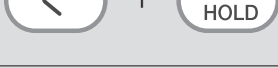
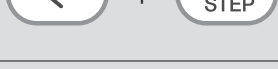


6-1. The function of individual LED

LED display	Function
① display lamp	Lights when there is an ascending section of the segment.
② display lamp	Lights when there is a soak section of the segment.
③ display lamp	Lights when segment is descending section.
④ PT1 display lamp	Lights when selecting the pattern 1.
⑤ PT2 display lamp	Lights when selecting the pattern 2.
⑥ RUN display lamp	Lights when the program is in operation.
⑦ WAIT display lamp	Lights when WAIT is in operation while the program is running on.
⑧ HOLD display lamp	Lights when HOLD is in operation while the program is running on.
⑨ MAN display lamp	Lights while manually operating
⑩ AL1 display lamp	Lights when Alarm 1 is in operation
⑪ AL2 display lamp	Lights when the Alarm2 is in operation.
⑫ TS1 display lamp	Lights when the time signal 1 is in operation
⑬ TS2 display lamp	Lights when the time signal 2 is in operation
⑭ OUT display lamp	Lights when the control output is ON.
⑮ AT display lamp	Lights during the auto tuning.
⑯ SEG1~10 display lamp	Display present segment while the program is in operation.
⑰ PV display lamp	Display process value.
⑱ SV display lamp	Display set value.

6-2. Function of control key

Caution

- Press the key firmly with your finger
- Do not press the key with any sharpened thing. It could cause key malfunction

Name	Function
	<ul style="list-style-type: none"> • Operate the current pattern number.
	<ul style="list-style-type: none"> • Input the parameter setup value • Use when moving the parameter • Press 2.5 seconds or longer to alternate the operation indicator mode and the engineering mode.
	<ul style="list-style-type: none"> • Exit running program and convert to stop. • Exit running MAN operation and convert to reset mode. • Use to finish program setup mode.
	<ul style="list-style-type: none"> • Press to move to other digit.
	<ul style="list-style-type: none"> • Use for changing the parameter value. • Use for moving to other group.
	<ul style="list-style-type: none"> • Use for changing the parameter value. • Use for moving to other group.
	<ul style="list-style-type: none"> • When the program is running, press it to hold ongoing segment. • Press it again to release the holding
	<ul style="list-style-type: none"> • Exit the running segment while operating program and operate the next segment.
	<ul style="list-style-type: none"> • Use to change the pattern number. • Press key to alternate P1 and P2
	<ul style="list-style-type: none"> • AUTO : Use for changing from MAN control to Program Mode. • MAN : Use for changing Program mode to MAN control. • Press key to alternate AUTO and MAN.

Caution

- Automatic/Manual Operation Selection Method

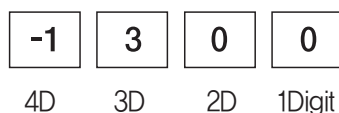
Press the AUTO/MAN key on the front panel to choose automatic and manual operation.

On manual mode, the MAN LED will be turned on and MAN LED will be turned off for automatic mode.

The control output value can be changed continuously with the operation of ascent and descent keys.

6-3. Function of 4 digits LED

1. Digital Formation

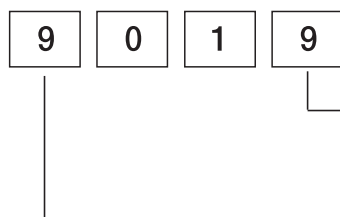



2. Possible range of maximum indication using the or button.




3. Rounding Up & Off of Digits

· Rounding Up



· When it becomes “9” in any digit besides the 4th digit (4D), it will be rounded up to the next digit when the  button is pressed continuously.

· When the 4th digit indicates “9”, there will be no changes despite pressing of  continuously.


· Rounding Off



① Represented data is “+”.

→ When it becomes “0” in any digit besides the 4th digit, it will be rounded off to the next digit when the  button is pressed continuously.

② Represented data is “-”.

→ When “9” is indicated, it will be rounded off from the next digit when the  button is pressed continuously.

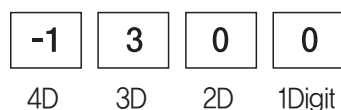
4. Maximum & Minimum Indication

It indicates the greatest or the least of the selected item when it gets out of the range of the selected item (parameter).

Ex.) If WTM = 0.00 ~ 99.59





→ If user selects over 99.60, it sets up 99.59, which is the maximum value. Moreover, it sets up the minimum value of WTM 0.00 if less below -0.01 is selected.



5. Operation of Button



It blinks in its change operation position.

6. Operation of button

Use , ,  buttons to change to the desired value. Then move to the next setup item (parameter) after registering with the .

However, this setup value must be within the range of each setup item (parameter).  button leads to the next setup item without pressing any other buttons besides the .

7. Position of “- (minus)”

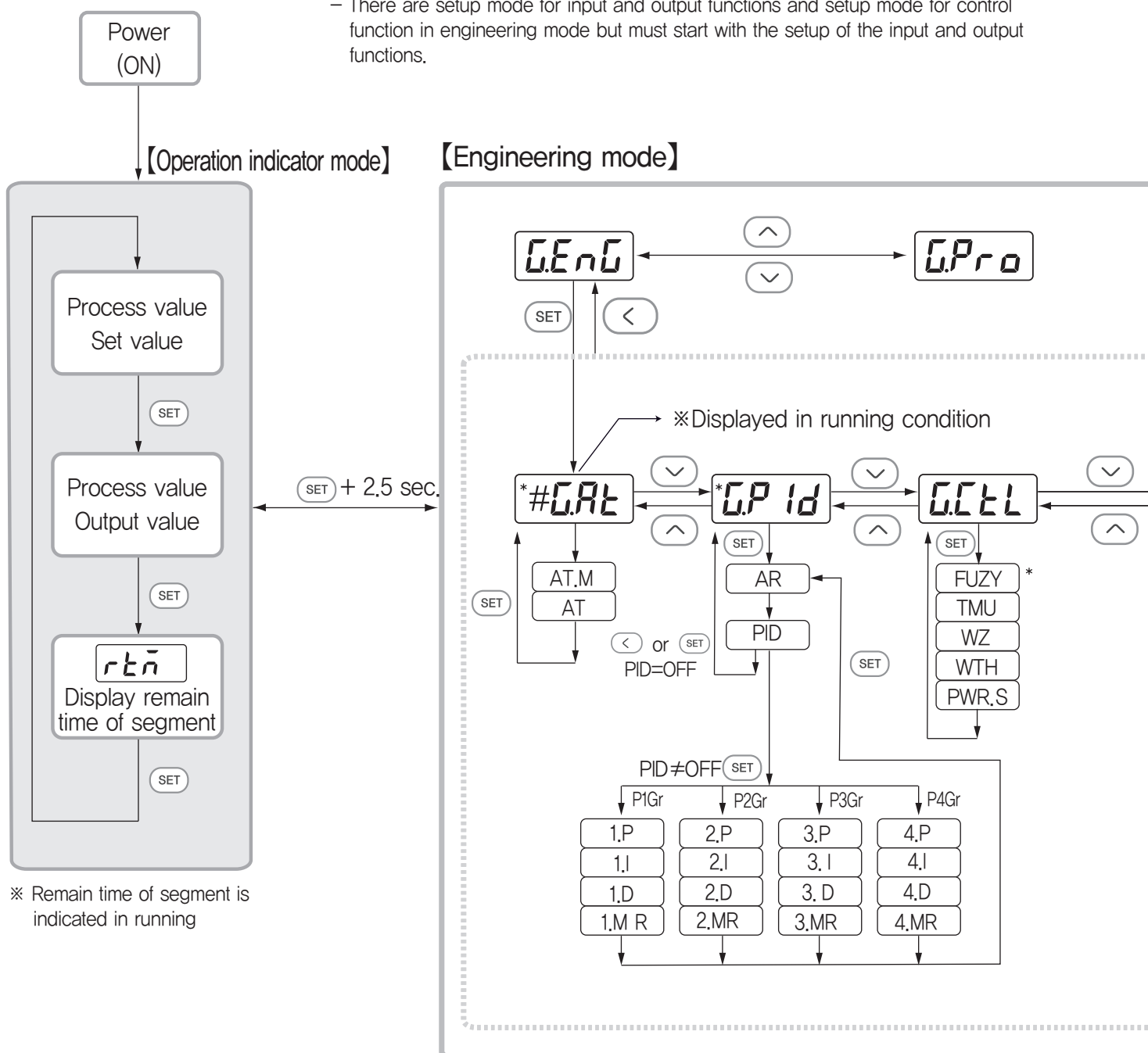
· It is always indicated in the 4th digit.

7. LIST OF SETUP ITEMS

NP100

⚠ Caution

- Preparation must be carried out in engineering mode when operating the controller.
- There are setup mode for input and output functions and setup mode for control function in engineering mode but must start with the setup of the input and output functions.



⚠ Caution

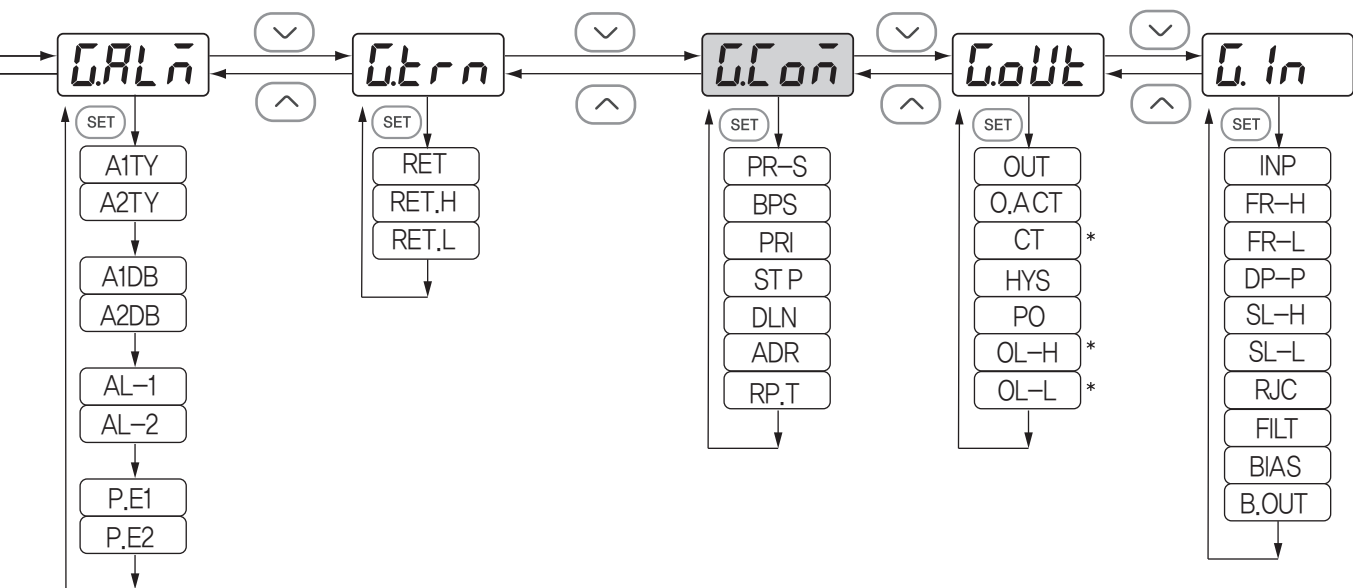
Operation when power is on.

- 1) When control setup group recovers from a power failure, it resets if selected "COOL," from the control mode but keeps operating the program just before the power failure if "HOT," is selected.
- 2) When power turns on from its OFF mode in manual operation condition, it operates in the output of the manual operation condition if "HOT" is selected from the motion mode at the time of power recovery of the control setup group.



Caution • Mode Setup

- Mode setup is recommended after completing the Program operation since the set value varies in accordance with the setup of the specific parameter.
- Each parameter may not be indicated in accordance with the selection of form, addendums, control type and varieties of the control system.



: It is indicated when option is ordered.

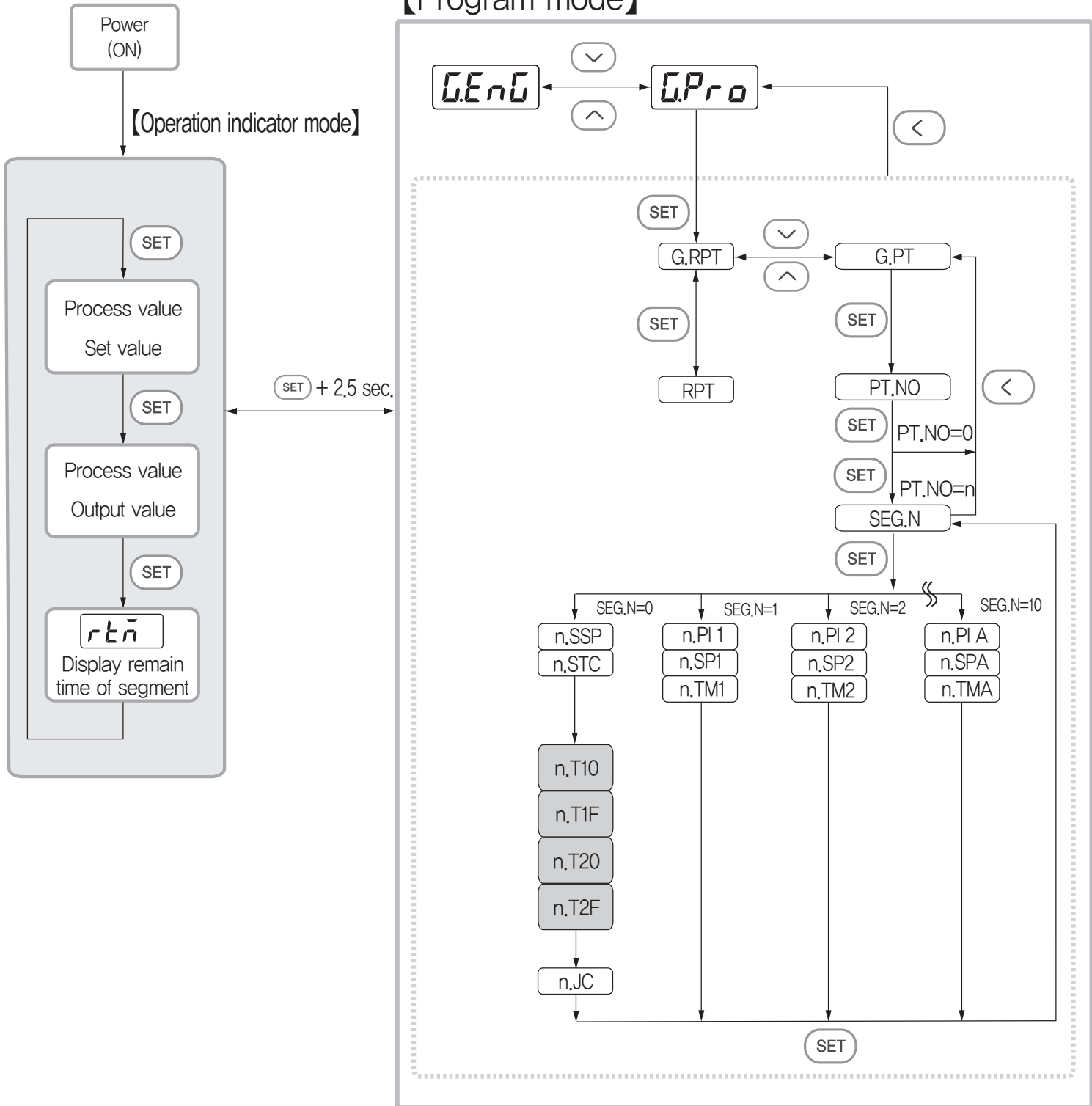
* : It is not indicated in ON/OFF control.
: It is indicated in running.

Caution

- We recommend you to use program mode after engineering mode is closed.
- A set up value is changed and initialized depending on change of particular engineering mode.
- There is a mode which cannot show up depending on controller's types, optional items, and control types, etc.

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【Program mode】



 : It is indicated when option is ordered.

8. SETUP METHOD

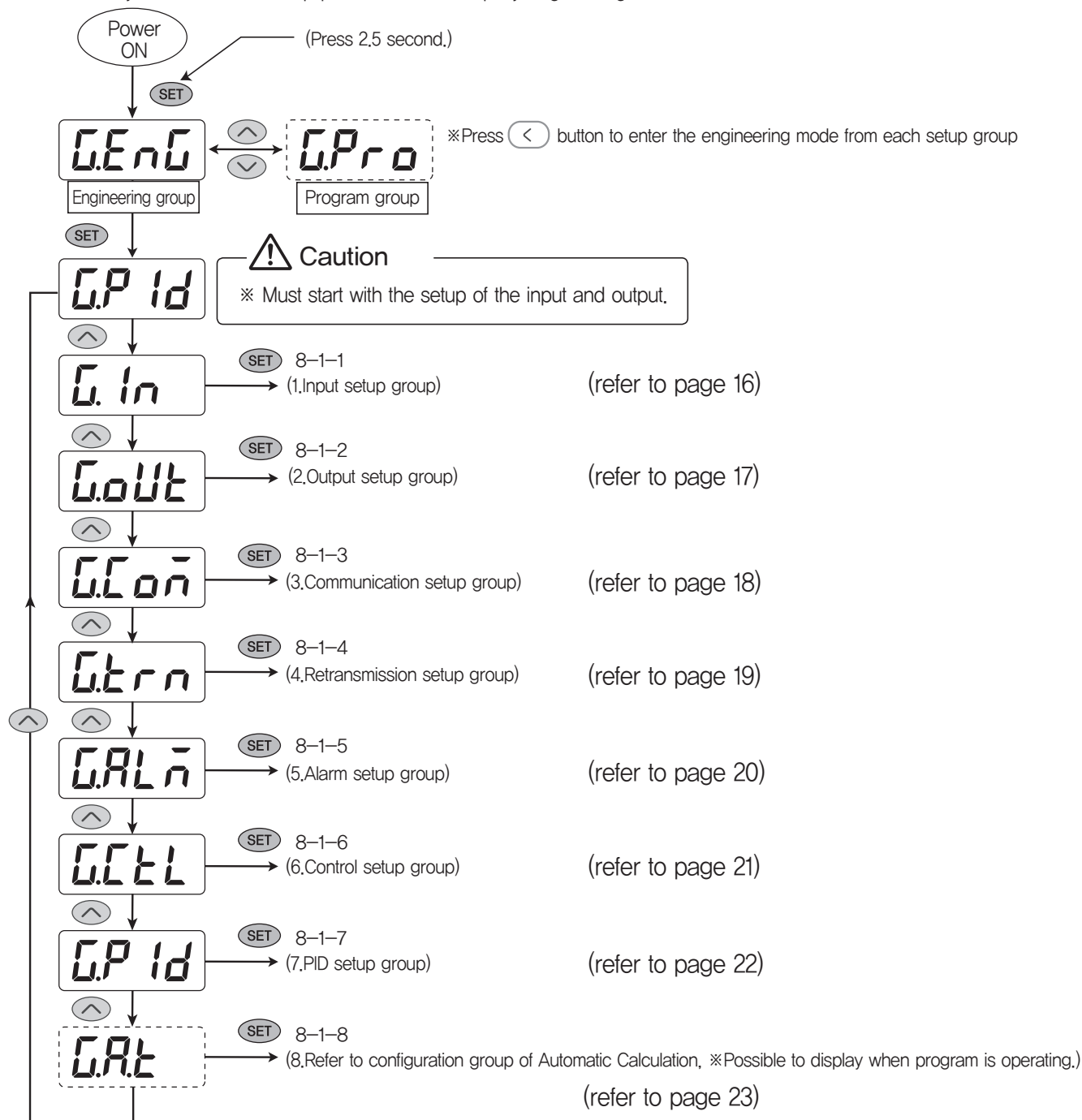
- Model NP 100 program temperature controller is divided into operation indicator mode and program mode and this program mode is further divided into engineering group and program group.

Operation Indicator Mode	Operation indicator mode is displayed when the power is ON and it indicates process value and set value, process value and volume of output, and remaining time of the corresponding segment when in operation.
Engineering Group	Engineering mode sets up the basic functions of the instrument including types of input and output, communication, retransmission, alarm, controlling movement, PID, and auto tuning.
Program Group	Program mode sets up the control program. It establishes the number of program repetition, pattern number, segment number setup, program start condition, time signal, program ending mode, and each segment's parameter.

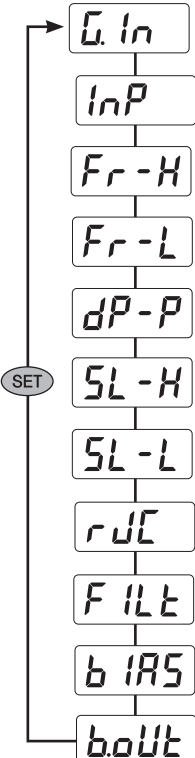
8-1. Engineering Group Setup

⚠ Caution

- When controller is running on, preparatory work should be operated on engineering mode.
- Since there are set up mode of input and output function and mode of control function, please set up an order like input → output → other groups.
- Because a set up point can be changed and initialized depending on particular engineering mode, we recommend you to record a set up point which is set up by engineering mode



8-1-1. Input Setup group

Signal	Item	Setup range	Display condition	Initial value
	Input group	Setup below items.		
InP	Input type selection	Refer to Input type and measurement range	Always	K(1)
Fr-H	Max. limit selection	Refer to Input type and measurement range (FR-H > FR-L)	Always	1370
Fr-L	Min. limit selection			-200
dP-P	Decimal point position	0~3	In Voltage input	1
SL-H	Max. scale setup	-1999~9999 (SL-H > SL-L)	In Voltage input	100.0
SL-L	Min. scale setup			0.0
rJC	Temperature compensation	ON , OFF	TC	ON
F ILt	PV filter	OFF , 1~120	Always	OFF
b IAS	PV bias	-100~100 %(EUS)	Always	0 %
b.oUt	Burn-out	OFF , UP ,DOWN	Always	UP

1) Selection of Input Type :

NP100 Program Temperature Controller supports universal input and can be conveniently used by selecting and setting up the input signal symbol of the "Input Type Range" List. This list includes the application input sensor and input types in accordance with voltage among the total of 18 types of input such as 12 types of thermocouple input (13 types of range), 2 types of R, T, D input, and 4 types of direct current voltage input.

2) Selection of Maximum and Minimum Range :

Select the maximum and minimum value of the range within the maximum range for the setup item in changing the range.

3) Setup of Decimal Point Position :

When selecting voltage input (V, mV) for the input type, decimal point can be indicated by selecting the position of first through third in order to indicate process value in decimals.
(Select "1" to indicate one decimal place "000.0".)

4) Selection of Maximum and Minimum Scale :

Select the maximum and minimum scale when selected voltage input (V, mV) for the input type.

5) Selection of Temperature Compensation :

As for the thermocouple input, select "ON" for the selection of temperature compensation to compensate voltage for the terminal temperature. Otherwise, it will show declination as much as the terminal temperature (surrounding temperature).

6) Selection of Process Value Filter :

When instability of the measurement value for the digital instrument is severe due to the external noise, reduce the instability of the process value by selecting the filter value.

7) Selection of Process Value Bias :

Select correction value when it is necessary to correct the process value due to the error in input sensor.

8) Selection of Burn-Out Operation :

As the safety mode of output in OFF condition by ordering the maximum or minimum value and comparing with the set value when input (sensor) is disconnected, maximum process value is indicated if UP is selected and minimum is indicated when DOWN is selected, thus output remains in OFF condition.

8-1-2. Output Setup Group

Signal	Item	Setup range	Display condition	Initial value
	Output group	Setup below parameters.		
	Output type selection	Refer to the output's types ON/OFF : ON/OFF SSR : Contact-less relay output SCR : Current Output(4 – 20 mA) RLY : Relay Output	Always	RLY
	Heating / Cooling control selection	REV : heating, DIR : cooling	Always	REV : Heating
	Heating cycle time	1 ~ 1000 sec.	SSR, Relay	30 sec.
	Hysteresis	0 ~ 100 % (EUS)	ON/OFF control	0.5%(EUS)
	Preset output volume	-5.0 ~ 105.0 %	Always	0.0
	Max. output value	OL-L+1Digit ~ 105.0 %	PID control	100.0 %
	Min. output value	-5.0 ~ OL-H -1Digit %		0.0 %

1) Selection of Output Type :

Control output can be selected from the relay on-off output, relay PID control output, SSR Driving Pulse output, and voltage output by choosing "Output Type Selection Symbol" from the Control Output Type List.

2) Selection of Heating & Cooling control :

Control method includes controlling by heating and cooling by freezing function.

Choose REV (reverse motion) for heating control and DIR (ordinary motion) for cooling control.



3) Heating Cycle Time :

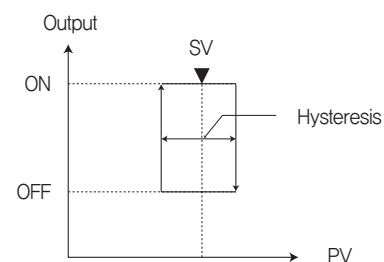
When selecting relay or SSR output for the control output, it is an item that selects the frequency of ON-OFF in proportion to output. Generally, set 30 seconds for the relay output and 2 seconds for the SSR output in consideration of the life span.

4) Hysteresis :

This item sets the range between the ON temperature and OFF temperature when relay ON-OFF control is selected from the control output.

5) Preset Output Volume :

This is useful when preheating condition must be maintained through continuous output volume previously set up by disconnecting the output from the PID calculation during the burn-out (disconnected sensor) A/D error.



6) Maximum & Minimum Value of Output :

This item allows the setup of maximum and minimum percentage in which the output volume of the control output would be operated by.

8-1-3. Communication Setup Group



Caution

● PC-LINK Communication / LADER Communication Wiring

- Must disconnect the controller and the external power source when connecting to the communication terminal due to the danger of electric shock.
- Connect the termination resistor (220Ω 1/4W) at the end or master located at the both ends of the communication equipment.

Signal	Item	Setup range	Display condition	Initial value
	Communication setup group	Setup below items.		
	Protocol selection	PCL,0 : PC LINK PCL,1 : PC LINK SUM	Option	PCL,0
	Communication rate (BAUD RATE)	600/1200/2400/4800/9600 bps		9600
	PARITY	NONE/EVEN/ODD		NONE
	STOP BIT	1 or 2 bit		1
	DATA LENGTH	7 or 8 (except PC Link : 8)		8
	ADDRESS	1 ~ 99 (max. 31 devices)		1
	RESPONSE TIME	0 ~ 10		0

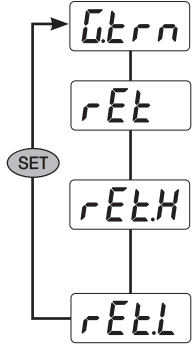
※ Response time = (handling time + response time) × 10 ms

- 1) Selection of communication protocol : Select PCL,0 when PC LINK come out and select PCL,1 when PC LINK SUM come out.
- 2) Selection of communication speed : 600/1200/2400/4800/9600 bps
- 3) Parity Check : Select among NONE, EVEN and ODD
- 4) Stop Bit : Select 1 or 2
- 5) Select length of data : Select 7 or 8 (Select 8 except for PC LINK)
- 6) Address : 1 ~ 99, But, up to maximum 31
- 7) Response time : 0 ~ 10 (Conditioning time + Response time) ms

8-1-4. Retransmission Setup Group

Caution

- Retransmission Output Wiring
 - Must disconnect the controller and external power source when setting up/removing a receiver since there is a danger of electric shock.
 - Use same terminal for retransmission output and SPS output. Use of the terminal with what function of output is selected through parameter.
 - 4/20m ADC is outputted for the retransmission output.
 - When using the retransmission output, it is impossible to use the SPS function for sensor.
- SPS Output Wiring for Sensor
 - Must disconnect the controller and external power source when setting up/removing a sensor since there is a danger of electric shock.
 - Same terminal is used for the SPS output and the previous retransmission output. Which side a terminal is outputted and used is set up depending on the parameter. (24 V DC 20 mA DC MAX)

Signal	Item	Setup range	Display condition	Initial value
	Retransmission setup group	Setup below items.		
	Retransmission output selection	PV, SV, MV(output volume), SPS	Always	PV
	Max. Retransmission output	T.C, R.T.D : FR-H~FR-L mV,V : SL-H~SL-L (RET.H > RET.L)	RET=PV MV,SV Selected	T.C,RTD : FR-H mV, V : SL-H
	Min. Retransmission output	T.C, R.T.D : FR-H~FR-L mV,V : SL-H~SL-L (RET.H > RET.L)	RET=PV MV,SV Selected	T.C,RTD : FR-H mV, V : SL-H

1) Selection of retransmission Output :

Process value, output volume or setup value can range from 4 – 20 mA DC as retransmission output and when SPS is selected, power for external sensor will be outputted. (24 V DC 20 mA max)

2) Selection of Maximum & Minimum Retransmission Output :

4 – 20 mA DC output can be selected within the range of value from the maximum range selection (FR-H) and the minimum range selection (FR-L) in case of thermocouple or R. T. D input. As for the voltage output (V, mV), select the desired maximum and minimum range within the maximum scale (SL-H) and (SL-L).

8-1-5. Alarm Setup Group

⚠ Caution ● Alarm Output Wiring

- In relay close contact output, use relay to operate ON/OFF when the close contact capacity exceeds 240 V AC, resistance 1 A, and 30 V DC resistance load 1 A.
- Connect the Bleeder resistance for the current to flow more than the opening and closing volume of the relay when opening or closing of small amount of current.
- There is life span ([Resistance load] for over 100,000) for relay.
Connect CR Filter (when using AC) or diode in the direct current L load).

Signal	Item	Setup range	Display condition	Initial value
	Alarm setup group	Setup below items.		
AL1	Alarm 1 selection	OFF / 1~22 Refer to "Alarm type and code" (33, 34 page)	Option	3
AL2	Alarm 2 selection			4
AL1db	Dead band of Alarm 1	0.0 ~ 100.0 %(EUS)	Option	0.5 %
AL2db	Dead band of Alarm 2			
AL-1	Alarm 1 set value	Absolute value : 0.0~100.0 %(EU) Deviation value : -100.0~100.0 %(EUS)		0.0
AL-2	Alarm 2 set value			0.0
PE1	Patter 1 End	OFF,PUL,CONT	code 21 selection	OFF
PE2	Patter 2 End	OFF,PUL,CONT		OFF

1) Alarm – Select 1 or 2 Types :

Select code number of the Alarm type from the "Alarm Type and Code" list.

2) Alarm – Set up Dead Band 1 or 2 :

Set the ON-OFF width (dead band) when operating Alarm 1 and 2.

3) Alarm – Set Value of 1 or 2 :

Set value for Alarm 1 & 2.

4) Pattern 1 ending signal :

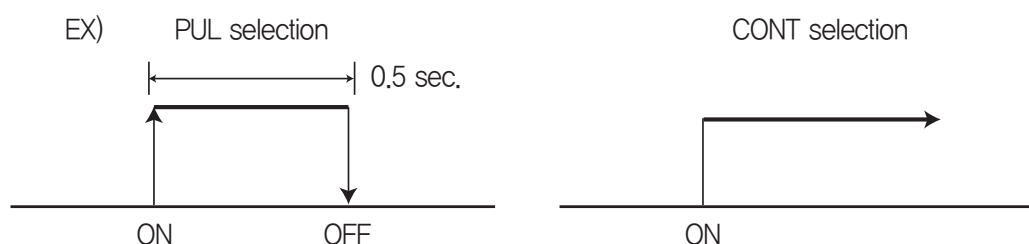
Since there is no separate output, pattern 1 ending signal setup item will be indicated when selected number 21 from the Alarm 1 type selection. (However, pattern-1 ending signal will not activate when pattern - 2 is selected from the setup item at the completion of the program.)

5) Pattern 2 ending signal :

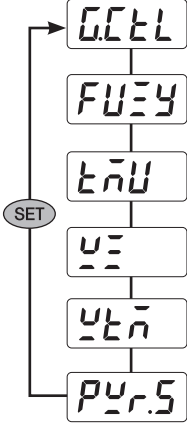
Pattern-2 ending signal setup item is indicated when #21 is selected from the Alarm 2 type selection. (Pattern ending signal setup item will not be indicated if #21 is not selected.)

Here, if OFF is selected from the pattern ending signal setup item, it doesn't activate, PUL allows output to be on for about 0.5 seconds and lastly if CONT. is ending, already setup alarm output will continue on.

Press RST Key to remove the alarm.



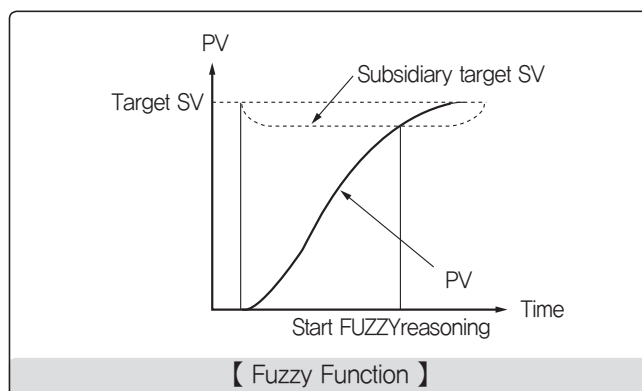
8-1-6. Control Setup Group

Signal	Item	Setup range	Display condition	Initial value
	Control setup group	Setup below items.		
	Fuzzy function selection	OFF/ON	Except ON / OFF	OFF
	Time unit selection	HH,MM (00 hr. 00 min.) MM,SS (00 min 00 sec.)	Always	HH,MM
	Wait zone setup	OFF/0~max. range		OFF
	Wait time setup	OFF / 0.01~99.59		OFF
	Power recovery motion mode	COOL / HOT		COOL

1) Selection of Fuzzy Function :

Fuzzy function is an over shoot inhibitory function using the fuzzy reasoning. Fuzzy function can provide control effects in the following situations

- Starting the control when there are variation between the desired set value and actual process value
- Wanting to reduce the operative preheating period
- Having severe load changes
- Having frequent changes to set value



2) Selection of Time Unit :

Maximum of 99 hours 59 minutes or 99 minutes 59 seconds can be selected in the setup item for the selection of time unit.

3) Setup of Wait Zone :

Process value must agree in accord to the process of programmed set value in program temperature controller but unpredicted events occur. Here, if the temperature variation set in the wait zone when moving segments, program can continue on to the next segment. However, if it is outside the variation range, it doesn't move on from the current segment to the next segment but rather waits until it enters the set range of wait zone.

4) Setup of Wait Time :

When the process value doesn't agree with the progress of the programmed set value in the program temperature controller, in other words, when the process value is not controlled within the range of set variation between the set value + the wait zone, program continues on when the wait time elapses.

5) Power Recovery Motion Mode :

Can choose between COOL or HOT in the set up item. If COOL is selected, the system resets when recovered from the power failure and if HOT is selected, it continues on from the segment operated just before the failure.

- ※ However, must start from the beginning of the segment even if the system recovers to the segment just operated before the power failure.

8-1-7. PID Setup Group

Signal	Item	Setup range	Display condition	Initial value
	PID setup group	Setup below items.		
	Anti Reset wind up	Auto/50.0 ~ 200.0 %	P.I.D control	Auto
	PID indication group	OFF / P1Gr ~ P4Gr	Always	0
	n. Proportion	0.1 ~ 999.9 %	P.I.D control	5.0 %
	n. Integral	OFF / 1 ~ 6000 sec.	Always	240 sec.
	n. Differential	OFF / 1 ~ 6000 sec.	Always	60 sec.
	Manual reset	-5.0 ~ 105.0 %	Integral time OFF	50.0 %

1) Anti Reset Wind Up :

Anti Reset Wind Up operation is carried out to prevent over-integral when the control output value reached the limitation. Integral time is not "0" and integral time executes the ARW operation under the following conditions when AUTO is selected for the auto tuning execution from the auto tuning setup group.

- $DV \geq 0$ & output value maximum restriction
- $DV < 0$ & output value maximum restriction

2) Selection of PID Indication Group Number :

The PID control integer possesses 4 types and the operated PID integer can indicate and set up the items when selecting manual operation. The operative integer of the PID group in agreement with the selected number from the auto tuning selection in the auto tuning setup group is applied to each pattern segment of 4 types due to the selection of pattern segment PID group number of segment #0 in memory program setup mode.

3) n. Proportion :

If select PID 1 group (P1GR) from the setup item of PID indication group number selection, 1 group proportion (1,p) with n. proportion is indicated. Here, the proportional value of the operated 1 group is indicated and can be changed and set up manually.

4) n. Integral Time :

According to the PID indication group number selection, 1~4 group integral time will be indicated in the setup item and will be automatically remembered and manually changed/set up due to the auto tuning.

5) n. Differential Time :

According to the PID indication group number selection, 1~4 group differential time will be indicated in the setup item and will be automatically remembered and manually changed/set up due to the auto tuning.

6) Manual Reset :

If "0" is selected as the integral time, variation occurs in control due to proportionate movement. Such variation can be eliminated through manual reset.
(Parameter appears only when the integral time is set up "0")

8-1-8. Auto Tuning Setup Group

Signal	Item	Setup range	Display condition	Initial value
	Auto tuning setup group	Setup below items. Please select 1 at "the AT operation selectin" to run.		
	Auto tuning type	STD : Standard AT LOW : Low PV AT(*1)	Except RUN& ON/OFF	STD
	AT operation selection	OFF/1~4	Except RUN& ON/OFF	OFF

⚠ Caution • Auto Tuning Operation/Stop

Do not use the auto tuning function in the following process.

- Control process with fast response system such as flow control and pressure control.
- Process that doesn't allow ON and OFF of an output not even momentarily.
- Process that can't handle huge loads in the operation.
- Process that is in danger of having negative influence on the product quality by exceeding the allowed range of changes in set value.
- If the desired set value is changed during AT, the changed goal will carry out AT and when AT is completed, the desired set value will be changed to the new value.
- When burn out and A/D error occurs during AT, AT will be stopped and Preset output will be outputted.

(*1) When Low is selected from the auto tuning type selection, it is operated from the -10% of the set value.

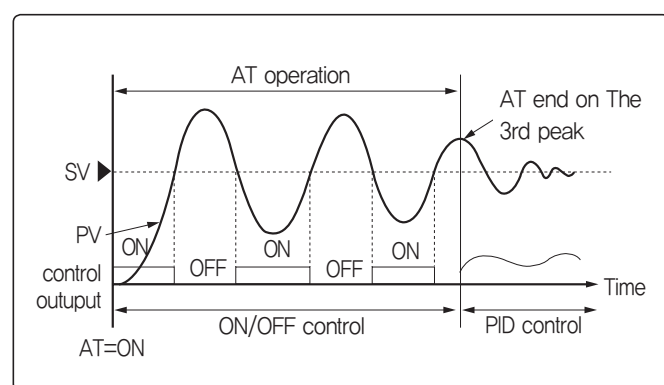
※ The symbol for the auto tuning setup group is only indicated in operative period. The auto tuning output is not indicated if ON-OFF has been already selected.

1) Selection of Auto Tuning Type :

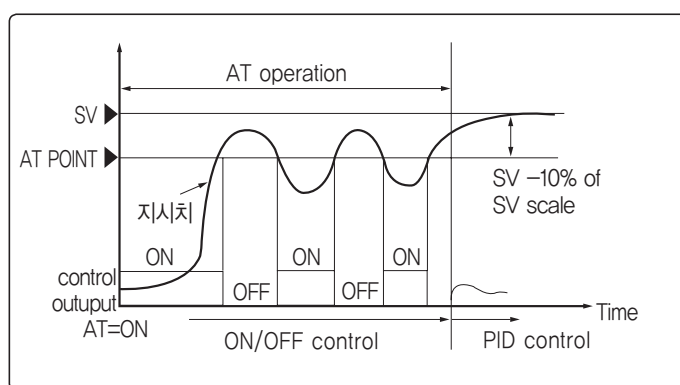
Must select one method from the two types : standard auto tuning method and low process value auto tuning method. The standard auto tuning method is a method that operate based on the set value and low process value auto tuning is operating from the -10% value of the set value scale (set value scale : Scale from the minimum range or the maximum range to the set value scale.) If such method is selected, the over shoot on the set value can be reduced since it's controlling from the operated PID value.

※ What is Auto Tuning?

It refers to the automatic setup function for optimum PID number by a controller that automatically measures and calculates the characteristics of the control system. The auto tuning method generates limited cycle by producing ON/OFF control output during the 2.25 time frame and then calculates PID base on the time frame and amplitude.



【Standard AT】



【Low PV AT】








2) Selection of Auto Tuning Operation :

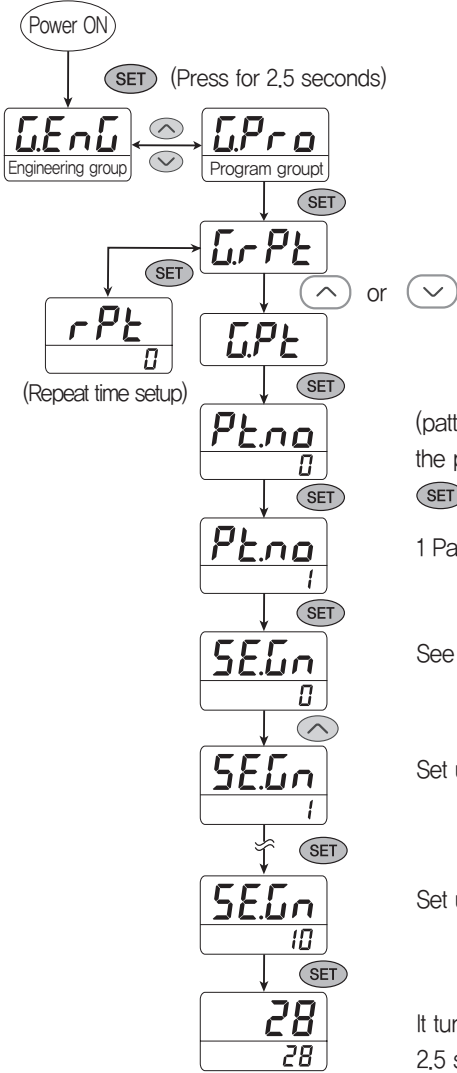
As for the auto tuning operation selection, can choose from OFF or 1~4 groups and if OFF is selected, auto tuning is not executed. If #1 of the groups from 1~4 groups have been selected, then the auto tuning is executed and stored in #1 PID when the operation is completed.





3) Stop on Auto Tuning :

If desire to stop the long hours of auto tuning, select off during auto tuning operation. It returns to PV/SV indication screen after OFF selection.

8-2. Program Group Setup

- ① After "finishing the setup of the engineering group, go into the program mode by pressing  or  on "Group mode".
- ② Also, on operation mode condition (initial mode when power is ON), engineering group  will be indicated when pressing  for 2.5 seconds, and program mode  will be represented when pressing  or  .





(pattern number is initially set "0". Use    buttons in order to select the pattern number wish to set up. It indicates as a superior group when pressing  at the "0" setup condition.).

1 Pattern has been assigned.

See page 24 of "0" segment parameter of program setup.

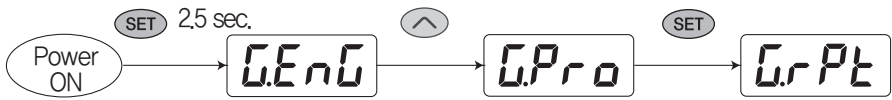
Set up segment number 1. See 1 segment parameter.

Set up the next segment in the same way as the segment 1.

It turns to operation mode when pressing  button for over 2.5 seconds, here, press  to turn to program.

8-2-1. Setup Group for Program Repeat Frequency

※ Setup group for program repeat frequency is indicated if the system is operated as follow when power is ON.

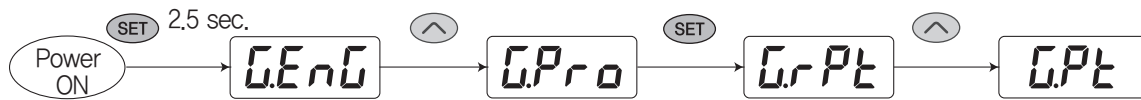


Signal	Item	Setup range	Display condition	Initial value
	Setup group for program repeat frequency	It sets up the repeat frequency and set up items.		
	Repeat frequency setup	0 : limitless frequency / 1~99	Always	1

- 1) Set up of repeat frequency : It is an item the decides the number of repetition for the program established in each pattern. It keeps repeating when “0” is set and the number could range from 1 to 99.

8-2-2. Program Setup Mode

※ Setup group for program frequency will be indicated if operated as follow under the power ON condition (operation indicator mode). However, if you do not operate the key for more than 30 seconds, operation indicator mode will be displayed.



Signal	Item	Setup range	Display condition	Initial value
	Program setup group	It sets up the program to be controlled after finishing the engineering mode setup.		
	Patter number selection	0 ~ 2	Always	0
	"0" segment setup	0~10	When selecting pattern	0
	Setup of start set value	Within range	Segment "0"	-200
	Start type selection	SSV : Start SV PV : Process value	Segment "0"	SSV
	Setup of n. pattern time signal-1 ON time	OFF / 00.00 ~ 99.59	Segment "0"	OFF
	Setup of n. pattern time signal-1 OFF time	OFF / 00.00~99.59 (ON time < OFF time)	Segment "0"	OFF
	Setup of n. pattern time signal-2 ON time	OFF / 00.00 ~ 99.59	Segment "0"	OFF
	Setup of n. pattern time signal-2 OFF time	OFF / 00.00~99.59 (ON time < OFF time)	Segment "0"	OFF
	Program completion mode	RST/HOLD/PT-1/PT-2	Segment "0"	RST(RESET)
	Segment number (1 ~ 10)	0~10	Always	1
	n pattern 1 segment PID group no. selection	1 ~ 4	PID control	1
	Target set value	Within range	Always	-200
	Setup of n pattern 1 segment time	OFF / 00.00~99.59 (Time unit is set at the control setup group)	Always	OFF
<hr/>				
	Segment number selection (1 ~ 10)	0~10	Always	10
	n pattern 10 segment PID group no. selection	1~4	PID control	1
	Target set value	Within range	Always	-200
	Setup of n pattern 10 segment time	OFF / 00.00~99.59 (Time unit is set at the control setup group)	Always	OFF

1) Selection of Pattern Number :

NP100 temperature controller can set up pattern 1, and pattern 2. Select "pattern 1" to operate in the setup item of pattern number selection. (Pattern refers to one setup program.)

2) Selection of segment number :

It is designed to set up to 10 segments for each pattern. At the beginning, choose "0" segment then set up basic condition of the program.

3) Setup of Start Set Value :

In the program temperature controller, start temperature value can be set up. It could either start from the current temperature in the beginning of the first operation of the system or can even start from the set value in the start set value.

4) Selection of Start Type :

Select the start conditions when operating the program.

If process value (PV) is selected, it starts from the currently sensed temperature and if the start set value (SSV) is selected, it starts from the temperature set up in the start set value item.

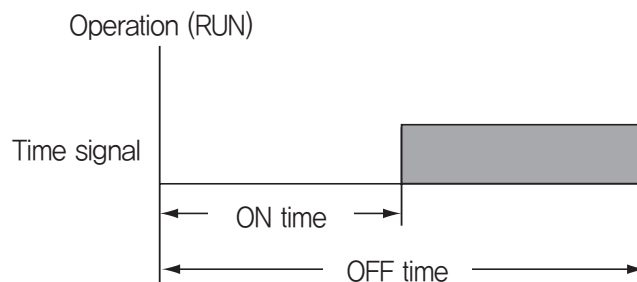
5) Setup of n pattern time signal-1 ON time :

It turns ON after the set time of time signal -1 of already selected pattern.

6) Setup of n pattern time signal -1 OFF time :

It turns OFF after the set time of time signal -1 of already selected pattern.

※ The ON time and OFF time setup of n pattern time signal-2 is the same as the setup method of time signal -1.



※ Output turns ON after the setup time in the ON time mode and the output turns OFF after the setup time of OFF time.

7) Program Completion Mode :

- When pattern 1 is selected as mode upon the completion of pattern 1, the system operates until the program repetition frequency set in the system and then resets. However, when HOLD is selected, the last set value is maintained.
- When pattern 2 is selected upon the completion of pattern 1, patterns 1 and 2 get connected.
- When pattern 1 is selected upon the completion of pattern 2, pattern 1 will be connected.
- When pattern 2 is selected upon the completion of pattern 2, it operates repeatedly for the number of RPT frequency. For example, when selecting the pattern 2 as mode upon completing the program Pattern 1 and after setting 3 times for the program repetition frequency, patterns 1 and 2 will be operated once and then the pattern 2 will be operated twice.

8) Selection of n pattern and n segment PID group number :

PID group can be applied to each pattern and each segment of 4 types of PID group to be controlled. However, stable control result can be acquired when group 1 is operated besides the peculiar situations.

9) Setup of Target Value :

Set up the target temperature value for each pattern and segment under control.

10) Time Setup of n pattern and n segment :

Set up the time that reaches or maintains the target temperature value for each pattern and segment under control.

※ Each segment can set up to 10 segments with the above method.

9. SPECIFICATION

9-1. Input

Input channel number	1 channel
Input type	Thermocouple, R.T.D(pt), Direct voltage
Input range	Possible to change thermocouple thermoresistance within table's temperature range. DC Voltage is going to be minimum voltage sensitivity within each of ranges, and maximum range is variable
Sampling time	250 ms
Input resolution	Below decimal point of measurement range
Input resistance	Thermocouple / mV input : 1 M Ω min, V DC input : Approx. 1 M Ω
Allowable signal source resistance	Thermocouple : max. 250 Ω mV / V DC input : max. 2 K Ω
Allowable wiring resistance	RTD input : max. 10 Ω / 1 wire
Allowable input voltage	mV/TC/RTD : ± 10 V DCV : ± 20 V
Noise removal rate	NMRR : 40 dB min (50/60 Hz ± 1 %) CMRR : 12 dB min (50/60 Hz ± 1 %)
Standard	TC/RTD(JIS/IEC/DIN)
Standard junction temp. compensation tolerance	± 1.5 $^{\circ}\text{C}$ (15 \sim 35 $^{\circ}\text{C}$) ± 2.0 $^{\circ}\text{C}$ (0 \sim 50 $^{\circ}\text{C}$)
Burn-out detection	Possible to select among OFF, UP SCALE and DOWN SCALE. TC BURN - OUT 시 UP SCALE/DOWN SCALE RTD BURN - OUT 시 UP SCALE TC/RTD BURN - OUT 검출전류 약 50 nA
Accuracy	± 0.1 % of F.S

9-2. Control output

Relay contact output	Contact capacity : 240 V AC 3 A, 30 V DC 3 A (resistive load) Contact : 1C Output operation : P.I.D control, ON / OFF Proportional cycle : 1 ~ 1000 sec. Output limit : 0.0 ~ 100.0 % range, higher limit(OL-H) or lower limit(OL-L) selectable (valid when AT) ON/OFF hysteresis : 0 ~ 100 % Time resolution : 0.1 % or 10 ms
SSR drive voltage output	ON voltage : 25 V DC min.(resistive load 600Ω min., 30mA limit when short) OFF voltage : 0.1 V DC max. Proportional cycle : 1 ~ 1000 sec. Output operation : P.I.D control Output limit : 0.0 ~ 100.0 % range, higher limit(OL-H) or lower limit(OL-L) selectable (valid when AT) Time resolution : 0.1 % or 10 ms
(Current output) SCR output (4 – 20 A DC)	Current output range : 4 ~ 20 mA DC Resistive load : 600Ω max. Accuracy : ±0.3 % of full scale (4 ~ 20 mA range), Resolution : Approx. 3,000 Output ripple : 0.1 % (P-P) of max. scale (150 Hz) Sampling time : 250 mS Output operation : P.I.D control Output limit : -5.0 ~ 105.0 % range, higher limit(OL-H) or lower limit(OL-L) selectable (valid when AT)

9-3. Alarm Output

Relay output	Contact capacity : 240 V AC 1 A, 30 V DC 1 A (resistive load) Setup point : 1a × 2 Output : ON / OFF Dead band : 0.0 ~ 100.0 % EUS
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9-4. Retransmission Output

Retransmission output	<p>Current output range : 4 – 20 mA DC</p> <p>Resistive load : 600 Ω max.</p> <p>Accuracy : ± 0.3 % of max. scale (4 – 20mA range)</p> <p>Resolution : Approx. 3,000</p> <p>Output ripple : 0.1 % (P-P)max. of scale (150Hz)</p> <p>Sampling : 250 ms</p> <p>Power supply for external sensor : 24 V DC 20 mA Max.</p>
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※ If selecting SPS in the retransmission group, power supply for external sensor will be outputted from terminal ⑥ & ⑦.

9-5. Communication Interface

Standard	EIA RS485
Communication address	31, 1~99 setting available
Communication method	2 wire half duplex
Synchronization	Start-stop synchronous mode
Communication sequence	None
Communication distance	1.2Km max.
Communication speed	600, 1200, 2400, 4800, 9600 BPS
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
Response time	Reception treatment time + (Response time × 10mS)

9-6. Operating Environment

Installation environment	Continuous vibration (5 ~ 14 Hz) : Forward width 1.2 mm max. (4 ~ 150 Hz) : 4.9 % (0.5 G) max. Vibration : 14.7 % (1.5 G), 15 sec. max. (each 3 direction) Shock : 147 % (15 G), 11msec max. (6 direction each 3 times)
Normal operation condition	Ambient temperature : 0 ~ 50 °C Ambient humidity : 35 ~ 85 % RH (no condensation) Influence of magnetic : 400 AT/m max.
Influence of ambient temperature	Warm-up time : 30 min. min. T/C, Voltage input : ±1 µV/°C or ±0.01 %/°C of F.S. R.T.D input : ±0.05 Ω/°C max. Analog output : ±0.05 % of F.S / °C max. (continuous output)
Influence of voltage regulation	Analog input : ±1 µV / 10 V or ±0.01 % of F.S. / 10 V Analog output : ±0.05 % of F.S / 10 V max.

9-7. Storage Condition

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

9-8. Structure

Material	Plastic case
Weight	696 g (including brackets & box)
Panel cutout	96(W) × 96(H) × 100(D)

9–9. Power Supply

Rated voltage	100 – 240 V AC, 50 – 60 Hz
Tolerable voltage regulation	±10 % of rated voltage
Power consumption	MAX 10 VA(6.0 W max)

9–10. Insulation Resistance

Primary terminal ← — → Secondary terminal	MIN. 500 V DC 20 MΩ
Primary terminal ← — → Ground	MIN. 500 V DC 20 MΩ
Ground ← — → Secondary terminal	MIN. 500 V DC 20 MΩ

9–11. Dielectric strength

Primary terminal ← — → Secondary terminal	2300 V AC 50/60 Hz for 1 minute
Primary terminal ← — → Ground	2300 V AC 50/60 Hz for 1 minute
FG ← — → Secondary terminal	1500 V AC 50/60 Hz for 1 minute

9-12. Function

Measuring Input	Bias	-100.0 ~ 100.0 % for measuring input range Valid setting a correction value.
	Scaling	According to setup of SL-H, SL-L of measuring range, scaling is available.
	Filter	OFF, 1 ~ 120 sec.
Control	Pattern	2 Patterns
	Segment	10 Segments / 1 pattern
	PID Group	4 Kinds
	Auto Tuning	According to SV, AT is operating. (Selection STD or Low PV)
	Proportional Band (P)	0.1% – 999.9 %.
	Integral Time (I)	OFF, 1 – 6000 sec.
	Differential Time (D)	OFF, 1 – 6000 sec.
	ON, OFF Control	Select ON-OFF control in output group.
	Manual Reset	-0.5 ~ 105.0 %. (Valid when I=OFF)
	Direct/Reverse action	Select Direct or Reverse action in output group.
	Emergency (Preset)	-0.5 ~ 105.0 % of output value.
	ON/OFF Hysteresis	0.0 ~ 100.0 % of range. When selecting ON/OFF control, follow the HYS set up of output group.
	Auto/Man	Changeable by front button
	ARW	AUTO, 50.0 ~ 200.0 % at the PID group.
	Fuzzy	OFF, ON select. (Select ON in the control setup group of fuzzy function selection mode.)
Retransmission	Retransmission Signal	Select among PV, SV, MV and SPS.
	Scaling	Possible to set up (PV, SV), set up upper limit of transmission output and the lowest limit.
	SPS	24 V DC 20 mA max
Alarm	Setup Point	2 points. (max.)
	Type of Alarm	High / Low alarm, High / Low deviation alarm.
	Setup Range	Process alarm : 0 ~ 100 % of Range. Deviation alarm : -100 ~ 100 % of Range.
	Alarm Hysteresis	0.0 ~ 100.0 % of instrument range.

9-13. Alarm Type

1) Output Tangent (When alarm rings : ON)

Name	Code	ON condition	OFF condition
High absolute alarm	1(11)	$PV \geq ALM$	$PV < ALM - HYS$
Low absolute alarm	2(12)	$PV \leq ALM$	$PV > ALM + HYS$
High deviation alarm	3(13)	$DEV \geq ALM$	$DEV < ALM - HYS$
Low deviation alarm	4(14)	$DEV \leq -ALM$	$DEV > -ALM + HYS$
High deviation alarm(inverted)	5(15)	$DEV \geq ALM$	$DEV < ALM - HYS$
Low deviation alarm(inverted)	6(16)	$DEV \leq -ALM$	$DEV > -ALM + HYS$
High · Low deviation alarm	7(17)	$DEV \geq ALM$ ($DEV \leq -ALM$)	$DEV < ALM - HYS$ ($DEV > -ALM + HYS$)
High · Low deviation band alarm	8(18)	$DEV \leq ALM$ $DEV \geq -ALM$	$DEV > ALM - HYS$ ($DEV < -ALM + HYS$)
High absolute alarm(inverted)	9(19)	$PV \geq ALM$	$PV < ALM - HYS$
Low absolute alarm(inverted)	10(20)	$PV \leq ALM$	$PV > ALM + HYS$
Pattern ending signal	21	Pattern ending signal (see 21 page)	

※ The number inside of () of code number exists when there is a stand-by mode.

PV : Directive value, ALM : Alarm setup value, DEV : Deviation setup value

※ Output mode

Tangent : When alarm rings, ON show up When alarm is not ringing, OFF show up.

Adversative : When alarm rings, ON show up, When alarm is not ringing, OFF show up.







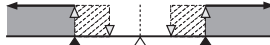







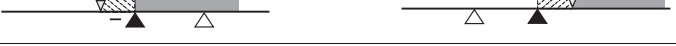

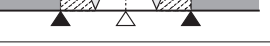


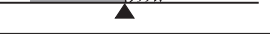

※ Condition of holding

When Power is switched ON, When changing the alarm types.

10. ALARM TYPE AND CODE

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










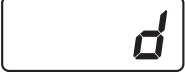
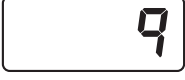
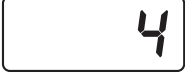






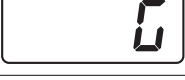
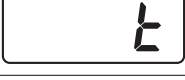
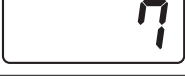
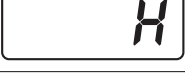
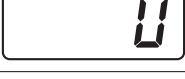
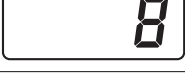
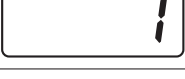
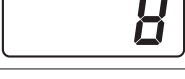
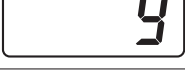
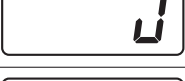
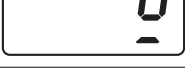
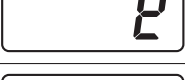
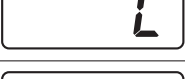
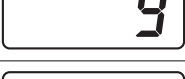


Hysteresis  (△ : Set point , -▲ : Mins Alarm set point ▲ : Alarm set point)

Code NO.	Alarm type	Function
1	High absolute alarm	
2	Low absolute alarm	
3	High deviation alarm	
4	Low deviation alarm	
5	High deviation alarm (inverted)	
6	Low deviation alarm (inverted)	
7	High · Low deviation alarm	
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 hold function	
19	High absolute alarm with hold function (inverted)	
20	Low absolute alarm with hold function (inverted)	
21	Pattern ending alarm	

11. FND DISPLAY

※ FND display in English

In the introduction manual, please refer to a sign which is displayed as FND is marked as following English characters for some reason.

Alphabet	FND	Alphabet	FND	Alphabet	FND
A		N		1	
B		O		2	
C		P		3	
D		Q		4	
E		R		5	
F		S		6	
G		T		7	
H		U		8	
I		V		9	
J		W		0	
K		X	None		
L		Y			
M		Z			

12. PROGRAM SETUP CHART

8-1-1 Input setup group	Input type	High limit range	Low limit range	High limit scale	Low limit scale

8-1-2 Output setup group	Output type	Cycle time	Hysteresis	Preset output	Max. output	Min. output

8-1-5 Alarm setup group	Alarm type	Alarm dead band	Set value of alarm	Pattern ending signal
Alarm-1				Pattern-1:
Alarm-2				Pattern-2:

8-1-6 Control setup group	Fuzzy	Time unit	Wait zone	Wait time	Power recovery motion mode

8-1-7 PID setup group	ARW	P	I	D	Manual reset
Group 1					
Group 2					
Group 3					
Group 4					

Segment		1	2	3	4	5	6	7	8	9	10
Mode	SV										
	Time										
PID segment											
Time signal	TS-1										
	TS-2										

8-1-8 Auto tuning	AT type	AT operation	8-2-1 Program repeat frequency	Frequency

8-2-2 Program setup mode	Start SV	Start type	TS-1		TS-2		Program completion mode
			ON time	OFF time	ON time	OFF time	



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