

Temperature Controller

# DX series

## INSTRUCTION MANUAL

We appreciate you for purchasing HanYoung NUX Co.,Ltd product. Before using the product you have purchased, check to make sure that it is exactly what you ordered. Then, please use it following the instructions below.

### MAIN PRODUCTS

- DIGITAL : Temperature Controller, Counter, Timer, Speedmeter, Tachometer, Panel Meter, Recorder
- SENSOR : Proximity Switch/Photo Electric Sensor, Rotary Encoder, Optical Fiber Sensor, Pressure Sensor
- ANALOG : Timer, Temperature Controller

### HEAD OFFICE

1381-3, Juan-Dong, Nam-Gu Incheon, Korea  
 TEL: (82-32)876-4697 FAX: (82-32)876-4696

HANYOUNG NUX



## Safety information

Before you use, read safety precautions carefully, and use this product properly. The precautions described in this manual contains important contents related with safety; therefore, please follow the instructions accordingly. The precautions are composed of DANGER, WARNING and CAUTION.

### DANGER

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

### WARNING

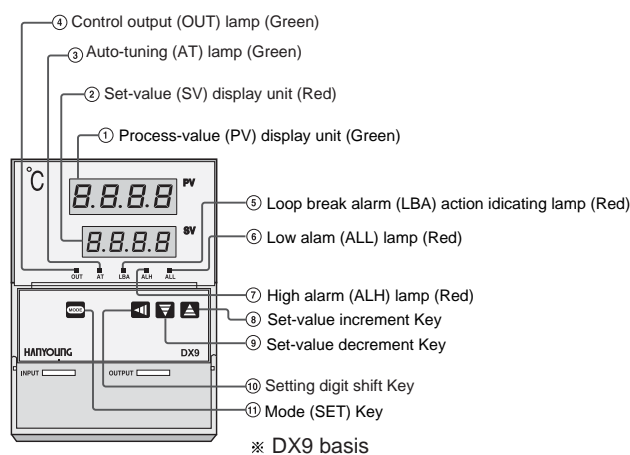
1. If there is a possibility of an accident caused by errors or malfunctions of this product, install external protection circuit to prevent the accident.
2. This product does not contain an electric switch or fuse, so the user needs to install a separate electric switch or fuse externally. (Fuse rating : 250V 0.5A)
3. To prevent deflection or malfunction of this product, supply proper power voltage in accordance with the rating.
4. To prevent electric shock or device malfunction of this product, do not supply the power until the wiring is completed.
5. Since this product is not designed with explosion-protective structure, do not use it at any place with flammable or explosive gas.
6. Do not decompose, modify, revise or repair this product. This may cause malfunction, electric shock or fire.
7. Reassemble this product while the power is off. Otherwise, it may cause malfunction or electric shock.
8. If you use the product with methods other than specified by the manufacturer, there may be bodily injuries or property damages.
9. 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 maybe 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 is 0 ~ 50 °C and the ambient humidity is 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 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 2,000m in altitude.
12. When the product gets wet, the inspection is essential because there is danger of an electric leakage or fire.
13. Use a compensating cable with thermocouple.
14. For R.T.D input use a cable which is a small lead wire resistance and without resistance difference to 3 wires.
15. To avoid inductive noise to input wires separate from the power and the load wire.
16. Keep input wire away from output wire.
17. Use a non-earth sensor with thermocouple.
18. 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.
19. It is effective to use a twisted cable for power supply against noise.
20. Check the alarm function before operating.
21. Turn off the power before changing a sensor.

22. 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. 1 million times (no load)  
 Electrical - Min. 100 thousand times (rated load)
23. Do not connect anything to the unused terminals.
24. After checking polarity of terminal, connect wires at the correct position.
25. When this product is connected to a panel, use a circuit breaker or switch approved with IEC947-1 or IEC947-3.
26. Install the circuit breaker or switch at near place for convenient use.
27. Write down on a label that the operation of circuit breaker or switch disconnects the power since the device is installed.
28. For the continuous and safe use of this product, the periodical maintenance is recommended.
29. Some parts of this product have limited life span, and others are changed by their usage.
30. The warranty period for this product including parts is one year if this product is properly used.
31. 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.
32. When changing this unit to spare unit, please check again all parameters.

## Functional Description




## Operation


### PV/SV display and SV setting modes

Process value (PV) display unit	Set-value (SV) display unit	Description
Process value	Set-value (SV)	Displays process-value. Set-value (SV) can be set ※1

※1 : Set-value (SV) is a control target, It is settable within the input range.




## ■ Normal setting mode

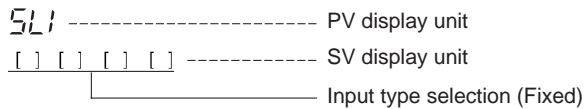
※press the  key continuously for 5 sec.

Process value (PV) display unit	Name	Description
ALH	High alarm	Displays high alarm set-value.
ALL	Low alarm	Displays low alarm set-value.
P	Proportional band	Set when proportional control is performed. Control becomes ON/OFF action with P set to "0".
A	Anti-reset windup	Prevents overshoot and/or undershoot caused by integral action effect. Integral action is turned OFF with ARW set to "0"
I	Integral time	Eliminates offset occurring in proportional control. Integral action is turned OFF with this action set to "0"
 D	Derivative time	Prevents ripples by predicting output change thereby improving control stability. Derivative action turns OFF with this action set to "0"
LbA	Control loop break alarm	Indicates control loop break alarm setting.
C	Proportioning cycle	Displays manipulated output cycle (sec.)
HYS	Hysteresis (ON/OFF action)	Displays hysteresis Set-Value for main output
※2 F-r	Full scale limit	Transmission output signal corresponds to the full scale limit.
※3 U-r	Under scale limit	Transmission output signal corresponds to the under scale limit.
LoL	Set data lock	Turns the set data lock ON/OFF

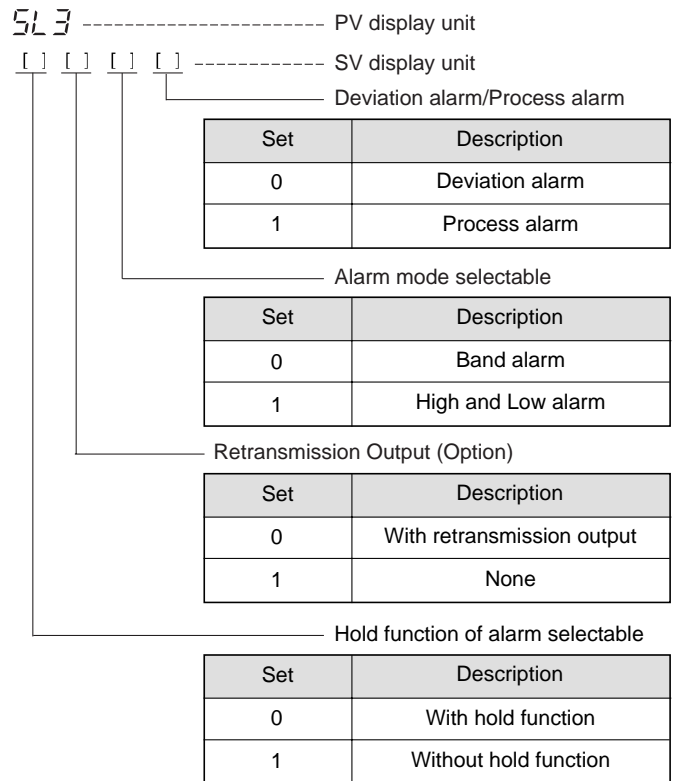
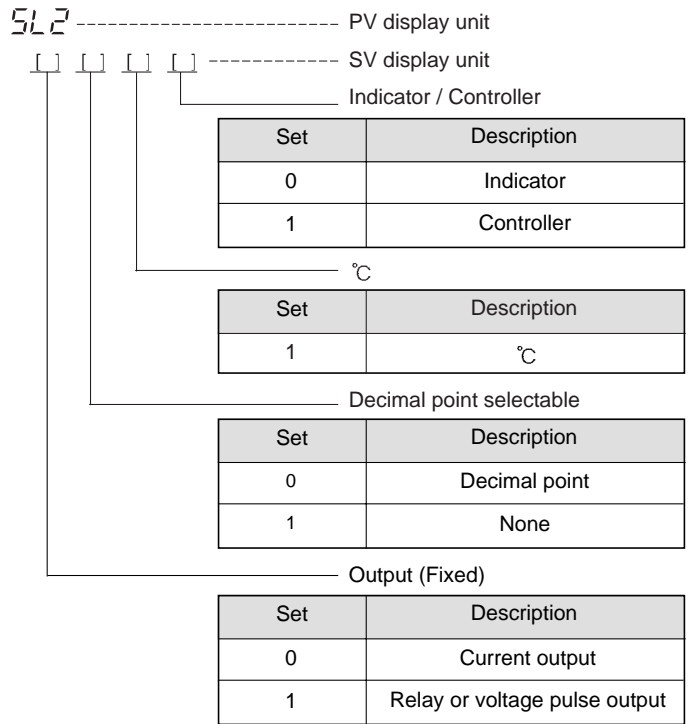
※2 F-r / ※3 U-r (option)... NO display when transmission output is not attached. (No transmission output function is for DX4 and DX7)  
 ※1:ALH and ALL are initialized if you change the SL3.

## ■ Initial set mode

- Press  key and  key simultaneously for 3 seconds to enter the setting mode.
- Press  key for 3 seconds to enter the PV / SV setting mode.



Set	Description
0000	1 ~ 5 V d.c or 4 ~ 20 mA
0001	K (CA)
0010	KS Pt100 Ω
0011	DIN Pt100 Ω
0100	R (PR)
0101	J (IC)
1111	0 ~ 10 V d.c



※ ALH & ALL will be initialized if you change the deviation alarm or process alarm at the SL3

PV display unit	Description	SV display unit (Setting range)	Remark
SL4	Decimal point position selection	0 ~ 4	If you want 000.0, set 0002 on SV display unit.
SL5	Input correction	-100 ~ 100 % of FS	
SL6	Hysteresis of high alarm (ALH)	0 ~ 10 % of FS	
SL7	Max. value of temperature setting range	Within input range	Refer to input scale range
SL8	Min. value of temperature setting range	Within input range	Refer to input scale range
SL9	Control operation	0, 1	0 : Reverse operation 1 : Direct operation
SL10	Hysteresis of low alarm (ALL)	0 ~ 10 % of FS	
SL11	Input filter	0 ~ 100 second	
SL12	Max. input scale setting	9999	Only for voltage input
SL13	Min. input scale setting	-1999	Only for voltage input
SL14	Delay time of high alarm	0 ~ 100 second	
SL15	Delay time of low alarm	0 ~ 100 second	

※ DCV 입력일 경우에, SL12, 13을 변경하면 온도에 관련된 파라메타들이 초기화 됩니다.

## ■ Main Functions

### ■ Control loop break alarm (LBA) function

#### ● Setting procedure

Usually set the set-value of the LBA to a value of twice the integral time (I). The LBA can also be set by the auto-tuning (AT) function. In this case, the set-value is automatically set to a value of twice the integral time (I).

#### ● Description of operation

LBA function starts to measure time from the moment that the PID Computed Value (Output ON time/cycle) becomes 0 % or 100 %, and detects the amount of process Value change at each LBA setting time, and determines by the amount of change whether LBA is to be ON or OFF.

- When the status at a 100 % PID computed value continues beyond the LBA setting time, the LBA turns ON if the process-value (PV) does not rise by 2 °C(°F) or more.  
(In direct action, the above alarm turns ON if the process-value does not fall by 2 °C(°F) or more.)

- When the status at 0 % PID computed value continues beyond the LBA setting time, the LBA turns ON if the measured-value (PV) does not fall by 2 °C(°F) or more.  
(In direct action, the above alarm turns ON if the measured-value does not rise by 2 °C(°F) or more.)

#### ● Causes of action

The LBA is activated under the following conditions.

- Controlled object trouble : Heater break, no power supply, incorrect wiring, etc.
- Sensor trouble : Sensor disconnected, shorted, etc.
- Actuator trouble : Burnt relay contact, incorrect wiring, relay contact not closed, etc.
- Output circuit trouble : Burnt internal relay contact, relay contact not open or closed, etc.
- Input circuit trouble : The process-value does not change even if input changes, etc.

※If causes of the above trouble cannot be identified, check the control system.

#### ● Cautions for control loop break alarm (LBA) function

- The LBA function is activated only at the 0 % or 100 % PID computed value. Therefore, the time from trouble occurrence till the activation of the LBA function equals the time until the PID computed value becomes 0 % or 100 % plus the LBA setting time.
- No LBA function is activated while the auto-tuning (AT) function is activated.
- The LBA function is influenced by disturbances (heat sources, etc) and as a result may be activated even if there is no trouble in the control system.
- If LBA setting time is too short or does not match the controlled object, the above alarm may be turned ON/OFF or not be turned ON. In such a case, set the setting time of LBA to be slightly longer.

### ■ Auto-tuning (AT) function

The Auto-tuning function automatically measures, computes and set the optimum P. I. D and ARW constants, The Auto-tuning function is activated any time from any process states after power-on, while temperature is rising and or when control is stabilized.

- After finishing settings other than PID and ARW, perform the Auto-tuning operation.
- Press the key and key at the same time then, A. T indication lamp flashes to start the Auto-tuning function.
- If Auto-tuning function ends, the A. T indication lamp stops flashing automatically. When checking the auto-tuned value, press the key and conform in turn.
- When changing the constants automatically set by the Auto-tuning, changes each constant according to each parameter setting
- When you want Auto-tuning function to be suspended, press the key and key simultaneously, then the A. T indication lamp stops flashing to release Auto-tuning function. In this case P. I. D and ARW values are not changed (Maintain the value before the Auto-tuning starts)
- When you want to changes the SV (set-value) during Auto-tuning, suspend it and perform PID control using the values before Auto-tuning starts.

### ■ Set data lock function

The set data lock function is used to prevent the changing of each set-value by the front key and the activation of the auto-tuning function, i.e., prevent misoperation after setting has ended.

For set data lock, display by pressing the , then set the following value in accordance with setting procedure thereby enabling data lock ON or OFF.

0000 : No set data locked.

0001 : Only set-value (SV) can be changed with the set data locked.

0010/0011 : All set data locked.

### ■ Alarm Function

※ The action each alarm becomes all follows

(▲ : Set-value (SV) △ : Alarm set-value)

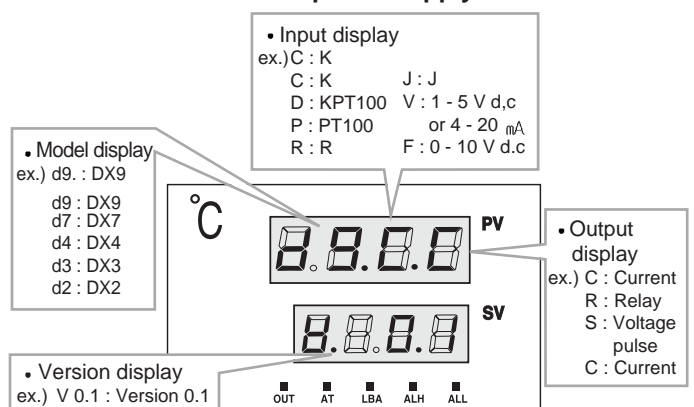
Alarm type	Alarm name	Deviation alarm
		<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>High &amp; Low alarm</p> </div> <div style="text-align: center;"> <p>Band alarm</p> </div> </div>
Process alarm	Alarm name	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>High &amp; Low alarm</p> </div> <div style="text-align: center;"> <p>Band alarm</p> </div> </div>

※Band alarm : operate only ALH relay

### ■ Overscale and underscale

- If a process value exceeds the high setting range limit due to upscale, etc., process-value display starts flashing. Further, if it exceeds the high input display range limit, the process-value(PV) display unit flashes overscale display 「」
- If a process-value becomes below the low setting range limit due to downscale, etc., process-value display starts flashing. Further, if it becomes below the low input display range limit, the measured-value(PV) display unit flashes under-scale display 「」

### ■ Model information on power supply



## Control operation

Set a control operation at the SL9.

- ① 0 : Reverse operation for heating control
- ② 1 : Direct operation for cooling control

## Input Filter

Select the calculation time by SL11. Noise ingredient is contained in the input signal, the tremble activity of the process value is calculated during the pre-set time and is shown, so this is a function that removes the tremble tendency of the process value. When 「0」 is set, input filter function is turned OFF.

## Input scale

Set a range of input voltage for DCV input.

For instance, SL1 = 0000 (1-5 V DCV) input, SL12 = 100.0, SL13 = 0.0 will be displayed as below.

Input Voltage	1 V	3 V	5 V
Display	0.0	50.0	100.0

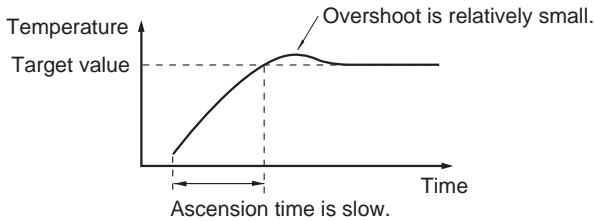
## Alarm delay time

Set high and low alarm delay time at SL14 and SL15 respectively. Even when alarm condition is met, if delay is set at SL14 and SL15, the alarm is triggered after those settings are exceeded. However, alarm cancellation is not related to the delay setting.

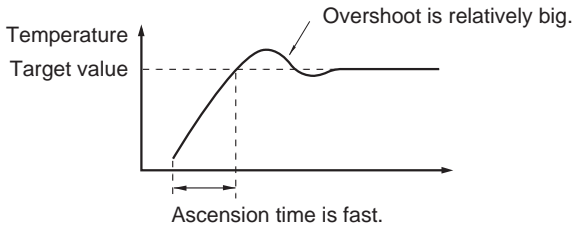
## Anti Reset Wind-up

Set overload prevention with "A" parameter.

- ① Control in case of A = Auto (0)



- ② In case of a set value for temperature on "A" parameter.



※ If "A" is too small, large overshoot or undershoot occurs. Set the value the same as the proportional value.

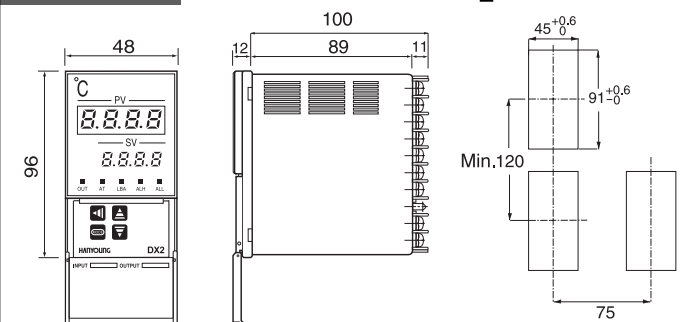
## Ordering Information

Model	Suffix code	Description
DX9		96 × 96 mm
DX7		72 × 72 mm
DX4	□ □ □ □ □	48 × 48 mm
DX3		96 × 48 mm
DX2		48 × 96 mm
		PID Auto-tuning
Input	K	K(CA)
	J	J(IC)
	R	R(PR)
	D	KS Pt 100 Ω
	P	DIN Pt 100 Ω
	V	1 - 5 V d.c
	C	4 - 20 mA d.c
Control output	F	0 - 10 V d.c
	M	Relay contact
	C	Current 4 - 20 mA d.c
Alarm output	S	SSR drive pulse voltage (Min. 12 V d.c)
	W	Single alarm (Only for DX4)
Option	A	Dual alarm (Not available for DX4)
	N	Transmission output
Control operation *1	R	None (DX4 & DX 7)
	D	Reverse operation (For heating control)
		Direct operation (For Cooling control)

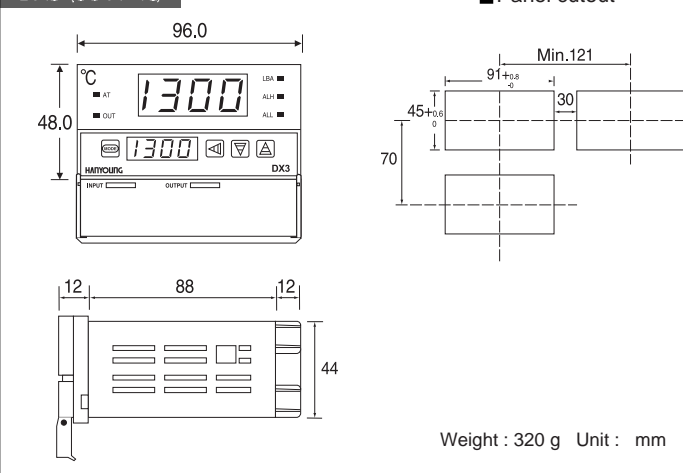
\*1 : Control operation can be changed at the SL9 and initial operation is reverse action.

## Dimension & Panel cutout

### DX2 (48 X 96)



### DX3 (96 X 48)



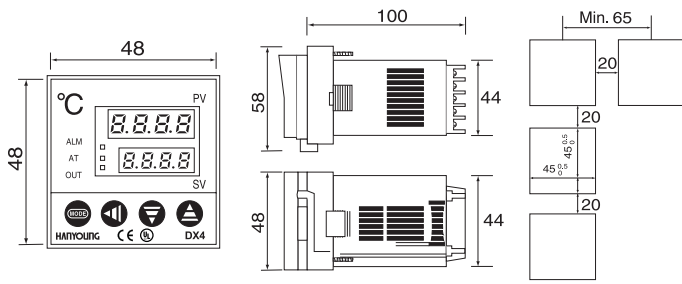
## Input Type

Classification	SL1	Input type	Range	
			1 °C (SL2 : X1XX)	0.1 °C (SL2 : X0XX)
Thermo-couple (T.C)	0001	K	- 50 ~ 1300 °C	-50.0 ~ 999.9 °C
	0101	J	- 50 ~ 600 °C	-50.0 ~ 600.0 °C
	0100	R	0 ~ 1700 °C	0.0 ~ 999.9 °C
RTD	0010	KPt100	- 199 ~ 500 °C	-199.0 ~ 500.0 °C
	0011	Pt100	- 199 ~ 640 °C	-199.0 ~ 640.0 °C
DCV	0000	1 - 5 V, 4 - 20 mA *1	- 1999 ~ 9999	Decimal point is set by SL4
	1111	0 - 10 V *1	- 1999 ~ 9999	

※ Accuracy : ± 0.5 % of FS

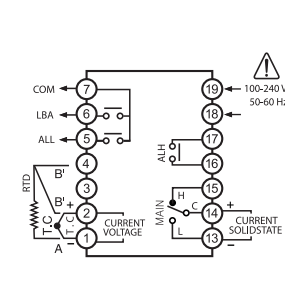
\*1 : ± 1 % of FS

### DX4 (48 X 48)



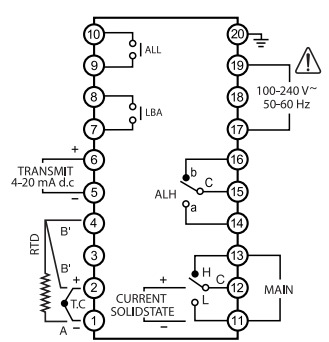
Weight : 180 g Unit : mm

### DX7 (72 X 72)

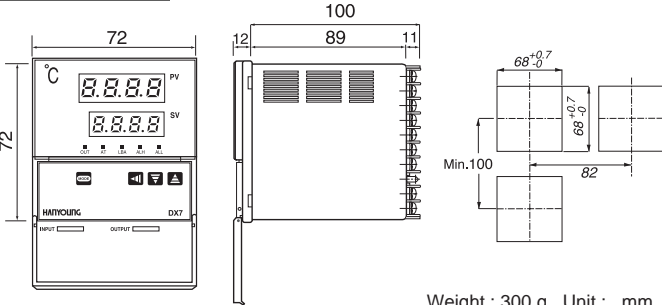


※ Reference : CURRENT : 4 - 20 mA d.c, SOLID STATE : 12 Vd.c Min.  
 ※ There is no earth terminal for DX4 and DX7.  
 Be careful this matter when you use.

### DX9 (96 X 96)

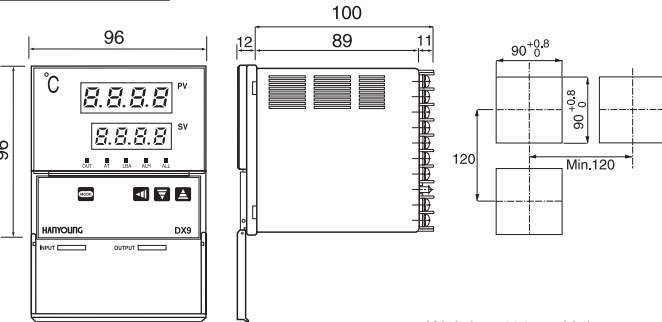


### DX7 (72 X 72)



Weight : 300 g Unit : mm

### DX9 (96 X 96)



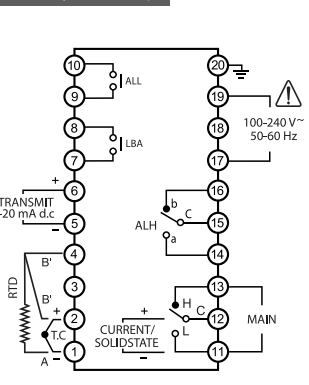
Weight : 400 g Unit : mm

## Specifications

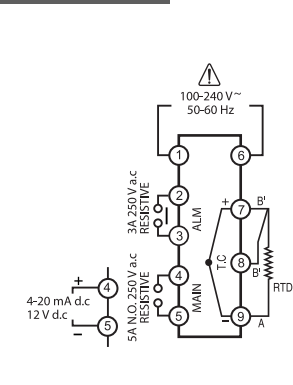
Power supply	100 - 240 V a.c (± 10 %), 50 - 60 Hz	
Power consumption	Max. 12 VA	
Input	Type	Refer to "input type chart"
	Input sampling time	250 ms
	Accuracy	± 0.5 % (Refer to "input type chart")
	Tolerable voltage	20 V d.c for 1 minute
	Standard junction temp. compensation tolerance	± 3.5 °C (Within 0 ~ 50 °C)
	Input disconnection	Up Scale
Output	Relay output	NO : 5 A 250 V a.c, 5 A 30 V d.c (Resistive load) NC : 3 A 250 V a.c, 1 A 30 V d.c (Resistive load) Switching Life : 1,000,000 times (No-load)
	Voltage output	ON voltage : 12 V d.c Min. OFF voltage : 0.1 V d.c Max. Resistive load 600 Ω Min.
	Current output	Range : 3.2 - 20.8 mA Accuracy : ± 0.2 mA Resistive load 600 Ω Max.
Transmission output	Range : 3.2 - 20.8 mA Accuracy : ± 0.2 mA Resistive load 600 Ω Max.	
Alarm	5 A 250 V a.c, 5 A 30 V d.c (Resistive load) Switching Life : 1,000,000 times (No-load)	
Control	Type	ON/OFF, PID control
	Operation	Reverse, Direct
	Over-integral protection	Auto(A=0), 0.1 ~ 100.0 %
Insulation resistance	More than 20 MΩ between 1st terminal and 2nd terminal	
Dielectric strength	2,300 V a.c, for 1 minute between 1st terminal and 2nd terminal	
Operating environment	Temp. & Humidity	0 ~ 50 °C, 35 ~ 85 %RH (No condensation)
	Environment	Refer to "safety information"

## Connections

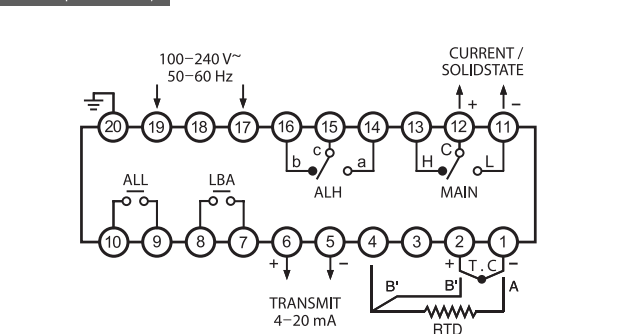
### DX2 (48 X 96)



### DX4 (48 X 48)



### DX3 (96 X 48)



# GR100 Graphic Recorder

## Bright color TFT LCD & Touch panel system



### FEATURES

- Bright color TFT LCD & Touch panel system
- Various input types (T/C 12 kinds, R.T.D 2 kinds, DC voltage 3 kinds)
- Horizontal & Vertical trend, Text, Bar graph, History view
- 6 or 12 channel analog inputs, 6 external inputs (D/I), 6 or 12 relay outputs (D/O)
- 4 alarms per channel
- Computing, Function, Conversion function
- RS232, RS422/485, USB, ETHERNET communication (MODBUS-RTU, MODBUS on TCP)
- Support Large capacity SD memory card (FAT 16 / 32)

### Programmable Temperature & Humidity Controller



#### TH500

- High Accuracy Control
- History management
- 300 pattern setting
- Temperature & Humidity PID group
- Convenient communication data management
- Various output type

### Programmable Temperature Controller



#### TD500

- Touch screen color LCD screen
- 4 P.I.D zone
- Universal Input
- Time signal 8 points
- Alarm output 4 points
- Heating / Cooling control output
- Contact input (D.I) 8 points/ Contact output (D.O) 16 points
- Communication function