Temperature Controller

KXN Series

INSTRUCTION MANUAL

Thank you for purchasing HANYOUNG NUX CO,.Ltd. Product. Please check whether the prouduct you purchased is the exactly same as you ordered. Before using product, please read instruction maunal carefully.

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

■ Safety Information

Please read safety information carefully before use and then use this product properly. Safety information described in this manual contains important contents related with safety. So please follow the instructions accordingly. Safety information is composed of DANGER, WARNING and CAUTION.

DANGER

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

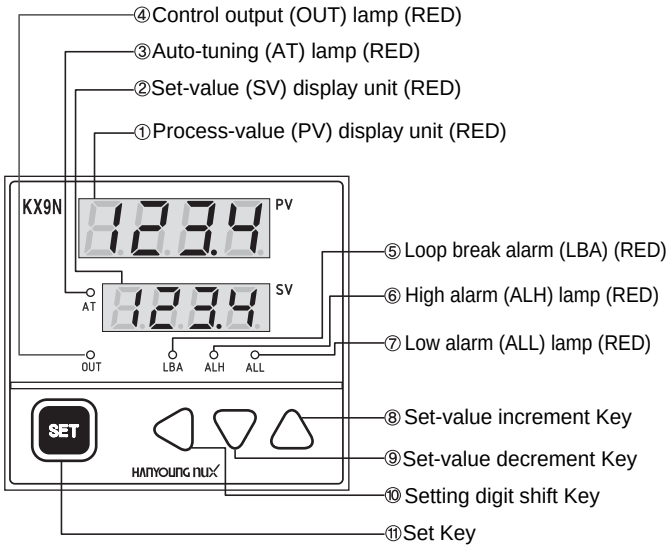
WARNING

- If there is a possibility of an accident caused by errors or malfunctions of this product, install external protection circuit to prevent the accident.
- 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)
- To prevent defection or malfunction of this product, supply proper power voltage in accordance with the rating.
- To prevent electric shock or devise malfunction of this product, do not supply the power until the wiring is completed.
- Since this product is not designed with explosion-protective structure, do not use it at any place with flammable or explosive gas.
- Do not decompose, modify, revise or repair this product. This may cause malfunction, electric shock or fire.
- Reassemble this product while the power is off. Otherwise, it may cause malfunction or electric shock.
- If you use the product with methods other than specified by the manufacturer, there may be bodily injuries or property damages.
- Due to the danger of electric shock, use this product installed onto a panel while an electric current is applied.

CAUTION

- The contents of this manual maybe changed without prior notification.
- Before using the product you have purchased, check to make sure that it is exactly what you ordered.
- Check to make sure that there is no damage or abnormality of the product during delivery.
- The ambient temperature is 0 ~ 50 ℃ and the ambient humidity is 35 ~ 85 % R.H. (No icing).
- Do not use this product at any place with corrosive(especially noxious gas or ammonia) or flammable gas.
- Do not use this product at any place with direct vibration or impact.
- 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)
- Do not polish this product with substances such as alcohol or benzene.
- Do not use this product at any place with excessive induction trouble, static electricity or magnetic noise.
- Do not use this product at any place with possible thermal accumulation due to direct sunlight or heat radiation.
- Install this product at place under 2,000m in altitude.
- When the product gets wet, the inspection is essential because there is danger of an electric leakage or fire.
- 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 the load wire.
- Keep input wire away from output wire.
- Use a non-earth sensor with thermocouple.
- 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.
- It is effective to use a twisted cable for power supply against noise.
- Check the alarm function before operating.
- Turn off the power before changing a sensor.
- 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. 30 sec.
  - SSR : Proportional cycle time is min. 1 sec.
  - Contact output life : Mechanical - Min. 10 million times (no load)
    Electrical - Min. 100 thousond times (rated load)
- Do not connect anything to the unused terminals.
- After checking polarity of terminal, connect wires at the correct position.
- When this product is connected to a panel, use a circuit breaker or switch approved with IEC947-1 or IEC947-3.
- Install the circuit breaker or switch at near place for convenient use.
- Write down on a label that the operation of circuit breaker or switch disconnects the power since the devise is installed.
- For the continuous and safe use of this product, the periodical maintenance is recommended.
- Some parts of this product have limited life span, and others are changed by their usage.
- The warranty period for this product including parts is one year if this product is properly used.
- 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.
- When changing this unit to spare unit, please check again all parameters.

■ Functional Description



■ Operation

■ PV / SV Set Mode

PV display unit	SV display unit	Description
Process-value (PV)	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.

■Parameter Setting Mode
*press the SET key continuously for 3 sec.

Process value (PV) display unit	Name	Initial value	Set value	Description
*1 SV1	Set-value 1	-50 ℃	Within Input range	Control target value.
*1 SV2	Set-value 2	-50 ℃	Within Input range	Control target value 2
ALH	High alarm	1,300 ℃	Within Input range	Displays high alarm set-value
ALL	Low alarm	-50 ℃	Within Input range	Displays Low alarm set-value
P	Proportional band	20 ℃	0~100 % of F.S	Set when proportional control is performed. Control becomes ON/OFF action with P set to "0" or "0.0".
A	Anti-reset windup	20 ℃	0~100 % of F.S	Prevents overshoot and/or undeshoot caused by integral action effect. Integral action is turned OFF with ARW set to "0"
I	Integral time	240 sec	0~3600 sec	Eliminates offset occurring in Proportional control. Integral action is turns OFF with this action set to "0"
d	Derivative time	60 sec	0~3600 sec	Prevents ripples by predicting output change and Improves control stability. Derivative action turns OFF with this action set to "0"
LbA	Control loop break alarm	480 sec	0~7200 sec	Indicates control loop break alarm setting.
Ct	Proportioning cycle	*3	1~100 sec	Displays manipulated output cycle (sec.)
HYS	Hysteresis (ON/OFF action)	1 ℃	0~100 % of F.S	Displays hysteresis Set-Value for main output
*2 F-r	Full scalelimit	1,300 ℃	Within Input range	Transmitting output signal corresponds to the full scale limit.
*2 U-r	Under scale limit	-50 ℃	Within Input range	Transmitting output signal corresponds to the under scale limit.
LoC	Set data lock	0	0~3	Turns the set data lock ON/OFF

* 1 is only for the KX4S (It is not displayed in other models)
* 2 is an option (If the model does not have transmitting output, 2 is not displayed)(KX4S and KX7N can not select transmitting output)
* 3 : Initial value will be changed according to contol output (Relay output : 20 sec, SSR : 2 sec)

■ Selection of Initial Set Mode

(1) Push △▽ keys together for 3 seconds to enter Initial set mode.
(2) If you push SET key for 3 seconds, it moves back to PV / SV mode.

SL1 ---------- PV display unit
[ ][ ][ ][ ] ---------- SV display unit
Input mode selection
Select input type
* Please refer to 'INPUT RANGE' to select input type.

SL2 ---------- PV display unit
[ ][ ][ ][ ][ ] ---------- SV display unit

Indicator / Controller Selectable

Set-value	Description
0	Indicator
1	Controller

℃

Set-value	Description
1	℃

Decimal Point selectable

Set-value	Description
0	With decimal ponit
1	Without decimal ponit

Output mode (fixed)

Set-value	Description
0	Current output
1	Relay or Voltage Pulse output

SL3 ---------- PV display unit
[ ][ ][ ][ ][ ] ---------- SV display unit

Deviation alarm / Absolute Alarm

Set-value	Description
0	Deviation alarm
1	Absolute alarm

Alarm Mode Selectable

Set-value	Description
0	Alarm within range
1	High and Low alarm

Transmission Output (PV):Option

Set-value	Description
0	With transmission output
1	Without transmission output

Hold Function of Alarm selectable

Set-value	Description
0	With hold function
1	Without hold function

Process value (PV) display unit	Description	SV-Display unit (Setting range)	Remark
SL4	Decimal point Position selection	0 ~ 3	0 → 0000 1 → 000.0 2 → 00.00 1 → 0.000
SL5	Input Correction value	-100 ~ 100 % of F.S	
SL6	Hysteresis of High alarm(ALH)	0 ~ 10 % of F.S	
SL7	Upper limit of temperature setting range	Within Input range	Refer to Input range
SL8	Lower limit of temperature setting range	Within Input range	Refer to Input range
SL9	Control direction	0, 1	0 : Reverse action 1 : Forward action
SL10	Hysteresis of Low alarm(ALL)	0 ~ 10 % of F.S	
SL11	Input filter	0 ~ 100 sec	
SL12	Max. Input scale	9999	In case of Voltage input
SL13	Min. Input scale	-1999	In case of Voltage input
SL14	Delay time of High alarm (ALH)	0 ~ 100 sec	
SL15	Delay time of Low alarm (ALL)	0 ~ 100 sec	

* If the values of SL1, SL2 are changed, all parameters of temperature will be initialized. So SL1 and SL2 have to be set first.
* In case of DCV input, if the values of SL12, SL13 are changed, SL7 and SL8 will be initialized.
* If the alarm mode is changed from SL3, the value of alarm (AHL, ALL) will be changed.

■ Main Functions

■ Control Loop Break Alarm (LBA function)

●How to set
Usually set the Set-Value of LBA more two times than the Integral Time (I). Also LBA can also be set by Auto-Tuning function. In this case, the Set-Value is more two times than Integral Time (I) automatically.

●Description of Operation
LBA function starts to measure time from the moment when PID computed value (Output On time/cycle) becomes 0% or 100%. LBA On/Off will be determined according to the changes of Process Value under LBA setup time.

• When 100% P.I.D computed value continues more than LBA setup time, LBA will be ON if Process Value(PV) does not rise more than 2℃. (In case of forward action, LBA will be ON if PV does not drop more than 2℃.)

• When 0% P.I.D computed value continues more than LBA setup time, LBA will be ON if Process Value(PV) does not drop more than 2℃. (In case of forward action, LBA will be ON if PV does not rise more than 2℃.)

●When LBA Works

LBA function works under the following conditions

• Trouble of controlled objects : Heater Break, No Power Supply, Incorrect Wiring, etc.
• Sensor trouble : Sensor disconnected, shorted, etc.
• Actuator trouble: Burnt relay contact, incorrect wiring, relay contact not open or closed etc.
• Output circuit trouble: Internally burnt relay contact in the unit, relay contact not on or off, etc.
• Input circuit trouble: PV does not changed even though input is changed.

※But causes of the above troubles cannot be identified, check the control system in consecutive order.

●Cautions for LBA Function

• LBA function will be activated when PID computed value is 0% or 100%. Therefore the time (from trouble occurrence to LBA activation) equals to the time PID computed value becomes 0% or 100% plus LBA setup time.
• LBA function is not activated while AutoTuning function is being operated.
• LBA function might be operated even though there are no troubles in the control system because LBA is influenced by disturbances(other heat sources, etc)
• In case LBA setup time is short or control object does not match, LBA might be ON/OFF or LBA might be not ON. In this case, please set LBA setup time slightly longer.

■ Auto-Tuning(AT) Function

Auto-Tuning function measures, computes and sets the optimum P.I.D or ARW Constant automatically. It can be used anytime after power is on, while temperature is rising or when control is stabilized.

• After finishing setup of P.I.D, ARW and others, perform Auto-Tuning.
• Press SET key and △ key at the same time. Then Auto-Tuning begins to function and AT indication lamp flashes.
• When Auto-Tuning ends, AT indication lamp stops flashing automatically. Press SET key in consecutive order if you want to check the auto-tuned values.
• When changing the constants set by Auto-Tuning automatically, change each constant according to each parameter setup method.
• If you want to stop Auto-Tuning while Auto-Tuning is being operated, press again SET key and △ key at the same time. Then Auto-Tuning will be finished and AT indication lamp stops flashing. In this case each constant of P.I.D and ARW are not changed. (Maintaining the values before starting Auto-Tuning)
• When changing SV(Set Value) during Auto-Tuning, Auto-Tuning will be finished and P.I.D control before Auto-Tuning will be started.

■ Set Data Lock Function

Set date lock function prevents the changes of setup values by front key or Auto-Tuning activation. It can be used to prevent malfunction after setup is finished. Set Data Lock is displaying LoC by pressing SET key and Lock function can be ON,OFF according to the below parameter setup method.

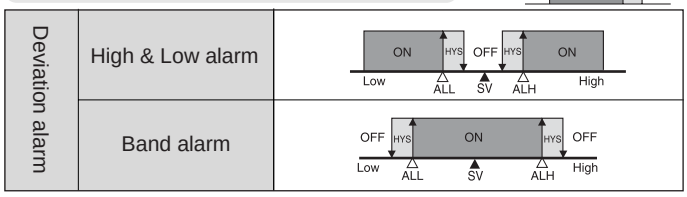
0000: Set Data Lock function is OFF
0001: Set Date Lock function is ON, SV (Set Value) can be changed only.
Others: All set data and Auto-Tuning function will be locked.

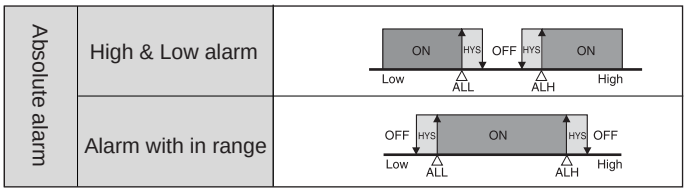
※Checking each setting is possible during data lock.

■ Alarm Funtion

※ Each alarm could be set as below table
(▲: Set-value (SV) △ : alarm set-value)

Hysteresis



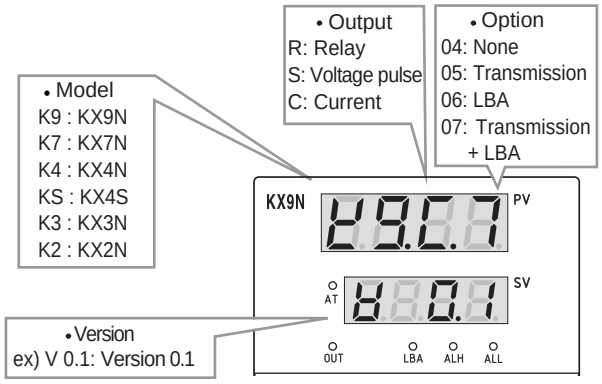


※Alarm within range : It operates in ALH Relay only

■ Up Scale and Down Scale

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

■ Model Number when Power is On



■ Control Direction

Control action can select from SL9
0 : Reverse action for heating control
1 : Forward action for cooling control

■ Input Filter

Input filter time can select from SL11. When PV value becomes unstable due to effects of noise, the filter helps to eliminate the unstable status (If select [0], Input filter is off)

■ Input Scale

In case of DCV input, it's a setup range of input range
Example, SL1=0000 (1 - 5V DCV), SL12=100.0, SL13=0.0, Input scale is as follows.

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

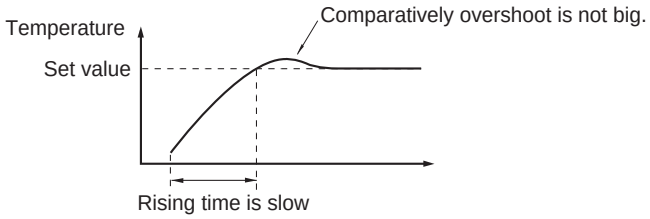
■ Alarm Delay Time

Delay time of High alarm and low alarm can set from SL14 and SL15. If user set it, alarm will be available after passing delayd time. (Cancellation of alarm has nothing to do with delay time)

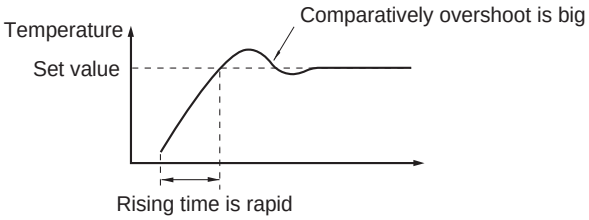
■ Anti-Reset Windup (ARW)

Set anti-reset windup from “A” parameter to prevent over - integral.

① A = In case of Auto (0) control.



② A = User setting (Set value manually)



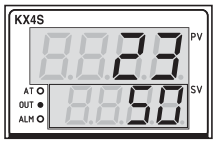
※If ARW value is too small or too big, overshoot or undershoot will happen. Please use same value as P (Proportional band)

■ Select Set Value (Only for KX4S)

- Set SV1 or SV2 by Digital input

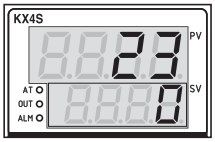
① Digital input is OFF (SV2=OFF)

- Display SV1, start control according to the SV1.



② Digital input is ON (SV2=ON)

- Display SV2, start control according to the SV2.



■ Model and Suffix Code

Model	Suffix code							Contents
KX□N	□	□	□	□	□			Digital Temperatrue Contoller
Size	KX2N							W)48 × (H)96 × (D)100 ㎜
	KX3N							(W)96 × (H)48 × (D)100 ㎜
	KX4N							(W)48 × (H)48 × (D)100 ㎜
	KX4S							(W)48 × (H)48 × (D)72 ㎜ (11pin socket type)
	KX7N							(W)72 × (H)72 × (D)100 ㎜
	KX9N							(W)96 × (H)96 × (D)100 ㎜
Control output		M						Relay Output
		S						Voltage pulse output (12 V d.c)
		C						Current output (4 - 20 ㎃ d.c)
Alarm output			C					Alarm 1 contact (ALM) * Only for KX4N, KX4S
			E					Alarm 2 contacts (ALL+ALH) * Exception: KX4S
			K					Alarm 3 contacts(ALL+ALH+LBA) * Exception: KX4N, KX4S
Option				A				transmission output (4 - 20 ㎃ d.c) * Exception : KX4S, KX7N
				N				None
Power supply					A			100 - 240 V a.c
					D			24 V d.c * Exception KX4S

※KX4N with Alarm1 contact supports transmission output

■ Input Range

Input type	SL1	Input type	Range	
			1 ℃ (SL2 : X1XX)	0.1 ℃ (SL2 : X0XX)
Thermocouple	0001	K	-50 ~ 1300 ℃	-50.0 ~ 999.9 ℃
	0101	J	-50 ~ 600 ℃	-50.0 ~ 600.0 ℃
	1100	E ×2	-199 ~ 999 ℃	-199.0 ~ 999.0 ℃
	1101	T	-50 ~ 400 ℃	-50.0 ~ 400.0 ℃
	0100	R	0 ~ 1700 ℃	0.0 ~ 999.9 ℃
	0110	B ×1	0 ~ 1800 ℃	0.0 ~ 999.9 ℃
	0111	S	0 ~ 1700 ℃	0.0 ~ 999.9 ℃
	1000	L ×2	-199 ~ 900 ℃	-199.0 ~ 900.0 ℃
	1001	N ×2	-199 ~ 1300 ℃	-199.0 ~ 999.9 ℃
	1010	U	-50 ~ 400 ℃	-50.0 ~ 400.0 ℃
	1011	W	-0 ~ 2300 ℃	0.0 ~ 999.9 ℃
	1110	PL2	-0 ~ 1300 ℃	0.0 ~ 999.9 ℃
RTD	0010	KPt100	-199 ~ 500 ℃	-199.0 ~ 500.0 ℃
	0011	Pt100	-199 ~ 640 ℃	-199.0 ~ 640.0 ℃
DCV	0000	1 - 5 V ×3	-1999 ~ 9999	Decimal point: According to SL4
	1111	0 - 10 V ×3	-1999 ~ 9999	

※Accuracy : ±0.5 % of F.S

※When using 4 - 20 ㎃ input, please use resistor 250Ω and select SL1=0000 (1 - 5 V d.c input)

×1 : 0 ~ 400 ℃ range ±10 % of F.S

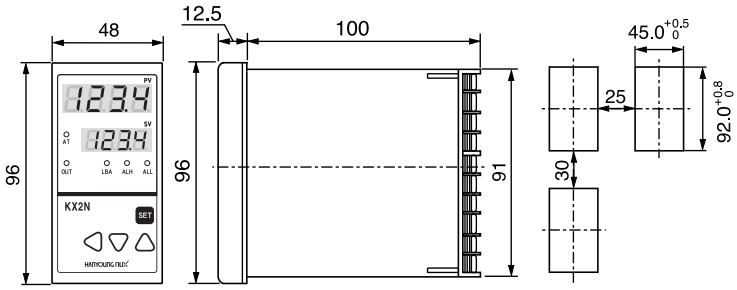
×2 : Below 0 ℃ ±1 % of F.S

×3 : ±1 % of F.S

■ Dimension & Panel Cutout

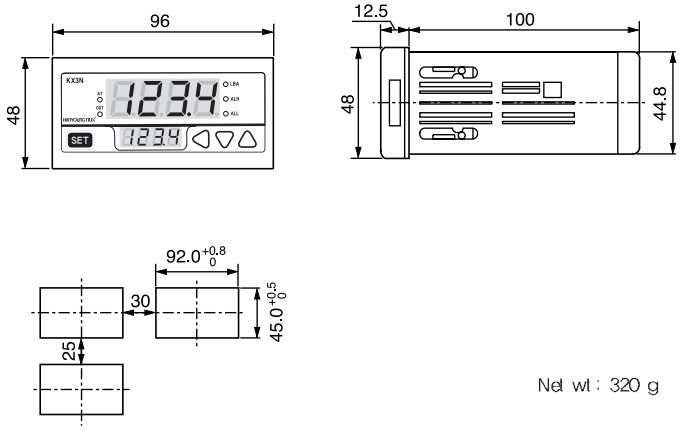
Unit : (㎜)

■ KX2N (48 X 96)



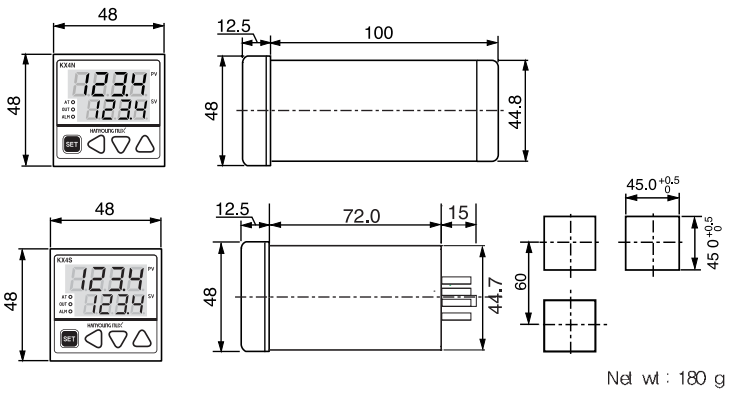
Net wt : 320 g

■ KX3N (96 X 48)



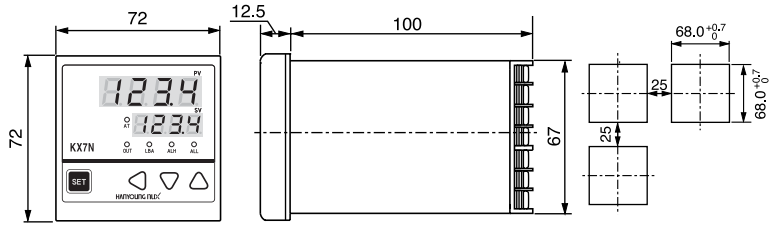
Net wt : 320 g

■ KX4N / KX4S (48 X 48)



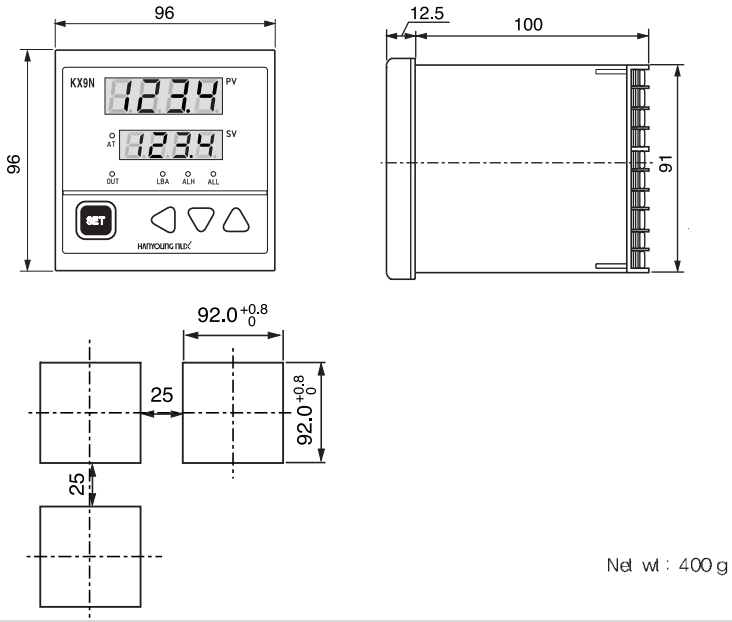
Net wt : 180 g

■ KX7N (72 X 72)



Net wt : 300 g

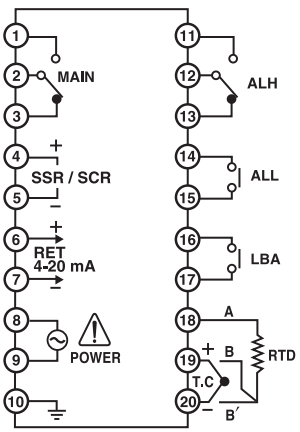
■ KX9N (96 X 96)



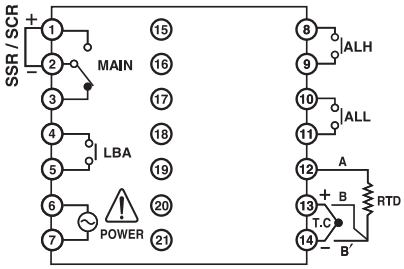
Net wt : 400 g

■ Connection Diagram

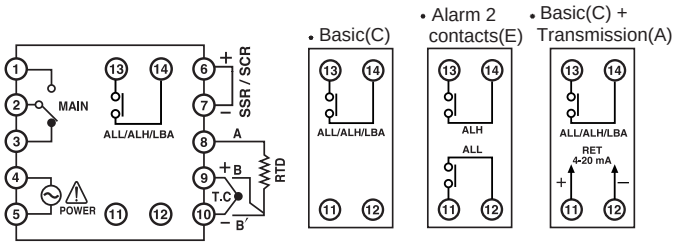
■ KX2N / 3N / 9N



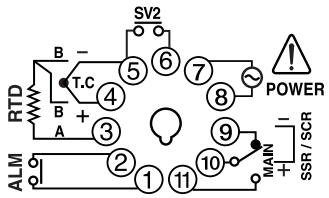
■ KX7N



■ KX4N



■ KX4S



※Remark: current : 4 - 20 mA d.c, SOLID STATE : over 12 V d.c
※KX4N, KX4S, KX7N: These models do not have earth terminal

■ Specification

Power supply		100 - 240 V a.c (±10 %), 50 - 60 Hz 24 V d.c (±10 %)
Power consumption		Below 11 VA Max.
Input	Input type	Please refer to Input type
	Sampling	250 ms
	Accuracy	±0.5 % (Please refer to Input type)
	Permissible voltage	20 V d.c for 1 minute
	Standard junction temperature	±3.5 ℃ (0 ~ 50 ℃)
	Input disconnection	Up Scale
Control output	Relay output	NO : 5 A 250 V a.c, 5 A 30 V d.c(Resistive load) NO : 3 A 250 V a.c, 1 A 30 V d.c(Resistive load) Switching Life : 1 million times (No load)
	Voltage output	ON voltage : More than 12 V d.c OFF voltage : Less than 0.1V d.c Resistive load : More than 600Ω
	Current output	Range : 3.2 ~ 20.8 mA Accuracy : ±0.2 mA Resistive load: Less than 600Ω
Transmission output		Range : 3.2 ~ 20.8 mA Accuracy : ±0.2 mA Resistive load: Less than 600Ω
Alarm transmission		5 A 250 V a.c, 5 A 30 V d.c(Resistive load) Switching Life : 1 million times (No load)
Contact input		OFF resistance value : Less than 1KΩ ON resistance value: More than 10 KΩ
Control part	Type	PID control, ON/OFF
	Control action	Reverse action, Forward action
	Anti-reset wind-up	Auto (A=0), 0.1 ~ 100.0 %
Insulation Resistance		More than 20 MΩ between 1st and 2nd terminals
Dielectric strength		2,300 V a.c between 1st and 2nd terminals, for 1 minute
Operating environment	Temperature & Humidity	0 ~ 50 ℃, 35 ~ 85 % R.H.(Without condensation)
	Environment	Please refer to safety information

HANYOUNG NUX

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 NEW

TH500

- ■ High Accuracy Control
- ■ History management
- ■ 300 pattern settings.
- ■ Temperature & Humidity PID group
- ■ Convenient communication data management
- ■ Various output types.

Programmable Temperature Controller NEW

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

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