Temp. Controller & Voitage, Current meter

CP series

INSTRUCTION MANUAL

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

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■ 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 : 250 V 0.5 A)
- 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.
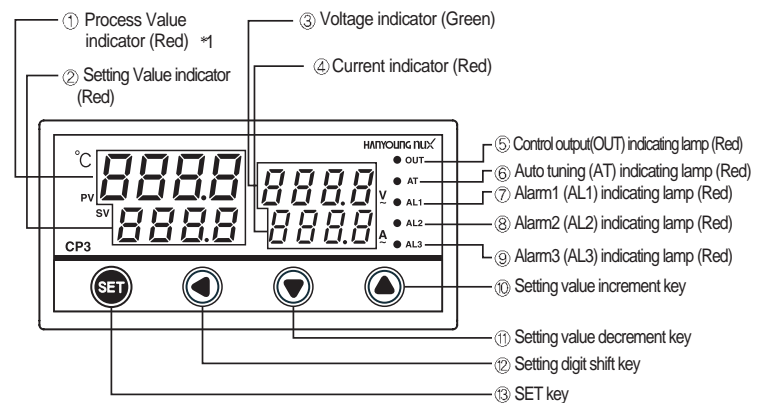
CAUTION

- 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 2,000 m 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 thousand 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.

■ Suffix Code Structure

Model Name	Suffix code		Description
C P			Temp. controller (Control temperature and display voltage andcurrent)
Dimension	3		(W)96 x (H)48 x (D)102.6 ㎜
	7		(W)72 x (H)72 x (D)87 ㎜
Input method	0		Temperature + Voltage + Current
Output method		0	Relay output
		1	SSR / SCR output

■ Function and name of each parts

① Process Value indicator (Red) *1
② Setting Value indicator (Red)
③ Voltage indicator (Green)
④ Current indicator (Red)
⑤ Control output(OUT) indicating lamp (Red)
⑥ Auto tuning (AT) indicating lamp (Red)
⑦ Alarm1 (AL1) indicating lamp (Red)
⑧ Alarm2 (AL2) indicating lamp (Red)
⑨ Alarm3 (AL3) indicating lamp (Red)
⑩ Setting value increment key
⑪ Setting value decrement key
⑫ Setting digit shift key
⑬ SET key

*1 : In case of CP7 : Green

■ Operation method

■ Operation Screen

Display	Description
Process value (PV)	Displays process-value.
Setting value (SV) *1	Display setting value Enter into SV setting mode by pressing ⑬key Set the target value that want to control by pressing ⑫ , ⑩ and ⑪key

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

■ Menu

- Enter into the MENU by pressing ⑬ key for 3 seconds in operation screen.
- Return to the operation screen by pressing ⑬ key more than 3 seconds in the MENU
- Move to the each of other groups by pressing ⑩ and ⑪ key.
- Press ⑬ to move sub menu of each groups

1) Temperature group setup

Process value display unit	Parameter	Setting description	Initial value	Reference
G.tEn	Temperature group	-		
ALH	High alarm	Within input range	1300	
ALL	Low alarm	Within input range	-50	
P	Proportion band	-100 ~ 100 % of F.S	20	
A	Prevent over integral	AUTO, 0.1 ~ 100.0 %	100.0	
I	Integral time	1 ~ 6000 sec	240	
d	Derivative time	1 ~ 6000 sec	60	
LbA	Loop Break Alarm	OFF, 1 ~ 7200 sec	480	
Ct	Cycle time	1 ~ 1000 sec	20	RLY : 20 sec SSR / SCR : 2 sec
HYS	Hysteresis	0 ~ 10 % of F.S	1	
LoC	Set data lock	OFF, ON	OFF	

*P (proportion band) only when performing proportion control. Set to 0 will convert to ON/OFF control.
*A (anti-reset wind up) prevents over shoot and under shoot by integral effectiveness.
*I (integral time) decrease offset which caused by proportional control and reaches to the setup value faster.
*D (derivative time) predicts change of output so it prevents ripple and improves control safety.
*LBA (Loop break alarm) displays setting value of control loop break alarm. OFF setting cancels control loop break alarm.
*CT (proportional cycle) displays cycle (sec) of control output. Initial value is changed depends on control output.
*HYS (hysteresis) sets adjustment sensitivity of control output (with ON/OFF control)
*LOC (Set data lock) turn ON/OFF set data lock function.

2) Voltage group setup

Process value display unit	Parameter	Setting description	Initial value	Reference
G.Uol	Voltage group	-		
U.bS	voltage input compensation	-100 ~ 100 % of F.S	0	
AL2	Alarm 2 type	1 ~ 4	1	Refer to Alarm 2
A2	Alarm 2 setting value	0 ~ 100 % of F.S	500	
HYS2	Alarm 2 hysteresis	0 ~ 10 % of F.S	3	

*Input type : AC voltage input (apply only to sine wave)
*Input range : 0 - 500 V a.c

3) Current group setup

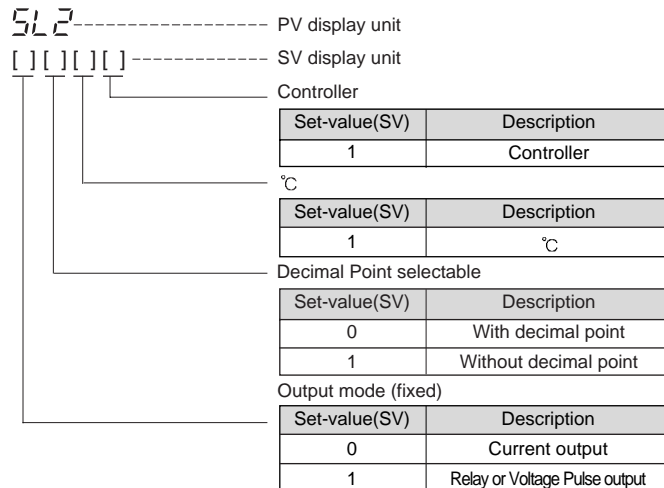| Process value display unit	Parameter	Setting description	Initial value	Reference
G.AmP	Current group	-		
A.bS	Current input compensation	-100 ~ 100 % of F.S	0	
A-H	High current display	0 ~ 300	300	
A-L	Low current display	A-H > A-L	0	
AL3	Alarm 3 type	1 ~ 4	1	Refer to Alarm 3
A3	Alarm 3 setting value	0 ~ 100 % of F.S	300	
HYS3	Alarm 3 hysteresis	0 ~ 10 % of F.S	2	

*Input type : AC voltage input (apply only to sine wave) due to CT
*Input range : CT Secondary side 0 - 5 A a.c
*Voltage input and current input are not insulated. Must use CT.
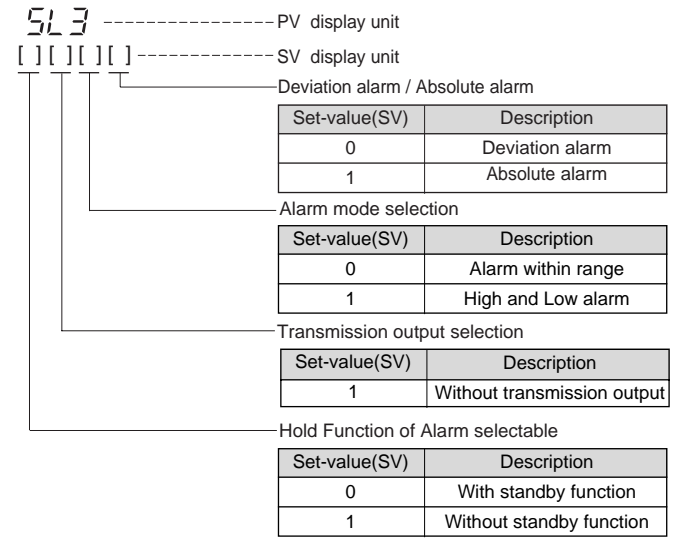
■ Selection of Initial Set Mode

(1) Enter into initial setting mode by pressing ▲ key and ▼ key for 3 seconds at the same time.
(2) Return to PV/SV setting mode by pressing SET key for 3 seconds or more
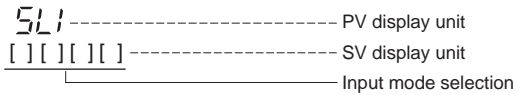
SL1 ----------------------- PV display unit
[ ] [ ] [ ] [ ] ---------------- SV display unit
 └──────────── Input mode selection
※ Please refer to "input type chart" for input type selection.

SL2 ------------------ PV display unit
[ ] [ ] [ ] [ ] ------------ SV display unit
 └─── Controller

Set-value(SV)	Description
1	Controller

℃

Set-value(SV)	Description
1	℃

Decimal Point selectable

Set-value(SV)	Description
0	With decimal point
1	Without decimal point

Output mode (fixed)

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

* 1. If it is relay output it is fixed with 1. If its output is SSR or SCR then users can select 0 or 1.

SL3 ----------------- PV display unit
[ ] [ ] [ ] [ ] -------------- SV display unit
 └───────── Deviation alarm / Absolute alarm

Set-value(SV)	Description
0	Deviation alarm
1	Absolute alarm

Alarm mode selection

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

Transmission output selection

Set-value(SV)	Description
1	Without transmission output

Hold Function of Alarm selectable

Set-value(SV)	Description
0	With standby function
1	Without standby 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	Set the input compensation value	-100 ~ 100 % of F.S	
SL6	Set the hysteresis of High alarm (ALH)	0 ~ 10 % of F.S	
SL7	Max temperature setting range	Within Input range	Refer to Input range
SL8	Min temperature setting range	Within Input range	Refer to Input range
SL9	Control direction	REV, DIR	0 : Reverse action 1 : Forward action
SL10	Set the hysteresis of low alarm (ALL)	0 ~ 10 % of F.S	
SL11	Input filter	OFF, 0 ~ 100 sec	
SL12	Set the Max. input scale	9999	In case of Voltage input
SL13	Set the Min. input scale	-1999	In case of Voltage input
SL14	Set the delay time of High alarm (ALH)	0 ~ 100 sec	
SL15	Set the delay time of Low alarm (ALL)	0 ~ 100 sec	

※If the values of SL1 and SL2 are changed, all parameters of temperature will be initialized. Therefore, SL1 and SL2 should be the first one to be set
※In case of DCV input, changing SL12 and SL13 will initialize SL7 and SL8.
※Changing alarm type in SL3 will change the alarm value (ALH, ALL)

■ Main Functions

■ Loop Break Alarm (LBA function)

（1）**How to set**
Set the set value of LBA about twice as Integral Time (I). Also, it is possible to set LBA by auto tuning (AT). In this case, it is going to be set twice as integral time (I) automatically.

（2）**Operation description**
LBA function starts to measure the time from the moment when PID computed value becomes 0 % or 100 %. Also, LBA ON/OFF will be determined according to the changes of process value under the LBA setup time.

① When 100 % of P.I.D computed value continues on more than the LBA setup time and process value does not rise more than 2 ℃ then LBA will become ON. (with proper operation, LBA will become ON if PV does not get dropped more than 2 ℃)

② When 0 % of P.I.D computed value continues on more than the LBA setup time and process value does not drop more than 2 ℃ then LBA will become ON. (with proper operation, LBA will become ON if PV does not get raised more than 2 ℃)

（3）**Operation detail**

  LBA function operates under the following conditions

① Trouble of controlling object : heater break, no power supply, incorrect wiring and etc.

② Sensor trouble : Sensor disconnection, shorted and etc.

③ Actuator trouble: burnt relay contact, incorrect wiring, unable to ON or OFF and etc.

④ Output circuit trouble : Internally burnt relay contact in the unit, unable to ON or OFF and etc

⑤ Input circuit trouble : PV does not get changed when input is changed..

※ In here, causes of the above troubles cannot be identified so please check the control system in consecutive order.

（4）**Cautions for LBA function**

① LBA function activated only when PID computed value is 0 % or 100 %. Therefore, the time (from trouble occurrence to LBA activation) equals to the time of computed value of PID becomes 0 % or 100 % plus (addition) LBA setup.

② LBA function is not activated while Auto Tuning function is being operated.

③ LBA function might be operated even though there are no troubles in the control system and the reason for that is because LBA is influenced by disturbances such as other heat sources and etc

④ There are cases when LBA setup time has to be set slightly longer. Such cases are time is short or control object does not match, LBA might be ON/OFF or LBA does not get turn ON.

■ Set data locking function

'Set data locking function' prevents front key to change the set value and validate auto tuning. Use it for preventing malfunction after setting up.


■ Auto - Tuning(AT) function

Auto-Tuning function measures, computes and sets the most proper integer to P.I.D automatically.

(1) Run Auto-Tuning after setting P.I.D and ARW

(2) Pressing 🔘key and 🔘 key at the same time will make AT indicating lamp to flickers and begins Auto-Tuning function

(3) Once Auto-Tuning is finished, A.T indicating lamp will be turned off automatically and when checking for the integer created by Auto-Tuning in consecutive order, please press 🔘key

(4) When changing integers which set by Auto-Tuning automatically, please change each integer according to the each parameter setup method.

(5) If users want to stop operating auto-tuning while it is operating, press the 🔘 key and 🔘 key at the same time, then A.T lamp will be turned off and auto-tuning will be finished. In this case, each integers of P.I.D does not get changed. (Maintains the values before operating auto-tuning)

(6) When changing SV (set value) during auto-tuning, auto-tuning will stop operating and control P.I.D (P.I.D which before operating auto-tuning)

■ Alarm Function

1) Alarm 1

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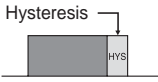
※ Each alarm could be set as below table
(▲: Set-value (SV) △ : alarm set-value)

| Deviation alarm | High and Low alarm | |
| | Alarm within range | |

This is setting method that alarm will start to operate when temperature is higher than certain degree or lower than certain degree regarding SV. For example, if main temperature setting is 200 ℃ and want to operate within High alarm (ALH) 205 ℃ and Low alarm (ALH) 190 ℃ then set 5 ℃ with ALH and 10 degree Celsius with ALL. At this moment, changing main temperature setting to 300 ℃ will make alarm to operate when high alarm temperature is 305 ℃ and low alarm temperature is 290 ℃.
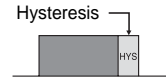
| Absolute alarm | High and Low alarm | |
| | Alarm within range | |

Cautious) it operates within setting temperature of ALH and ALL. Set value does not affect anything.

※ Alarm (AL1) relay starts to operate when alarm is being operated.

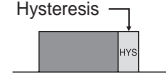※ Changing alarm type in SL3 will change alarm value (ALH, ALL)

2) Alarm 2

Hysteresis

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

AL2	Alarm type	operation	standby operation
1	absolute high voltage		X
2	absolute low voltage		X
3	absolute high voltage		O
4	absolute low voltage		O

3) Alarm 3

Hysteresis

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

AL2	Alarm type	operation	standby operation
1	absolute high current		X
2	absolute low current		X
3	absolute high current		O
4	absolute low current		O

■ Control Direction

Select control direction from SL9

1) REV : Used when controlling reverse operation and heater

2) DR: Used when controlling forward operation and refrigerating machine.

■ Input Filter

Select input filter operation time from FILT of temperature group. When indicating value becomes unstable due to effects of noise, the filter helps to eliminate unstable status.

■ Input Scale

In case of DCV input, it sets range of displaying inputted voltage.

For example, if input is SL1=0000 (1 - 5 V d.c) and SL12=100.0 and SL13=0.0 then 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 be set from SL14 and SL15. Even though it has condition that alarm may occur, if delay time is set in SL14 and SL15 then alarm will operate after delay time is passed.

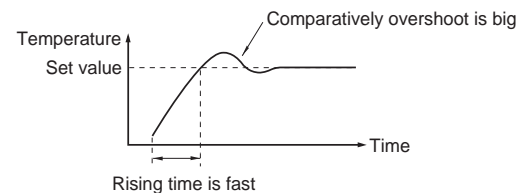However, alarm cancellation does not have anything to do with delay time.

■ Anti-Reset Windup (ARW)

  Set the over integral prevention function within A parameter of control group

(1) A = in case of AUTO control
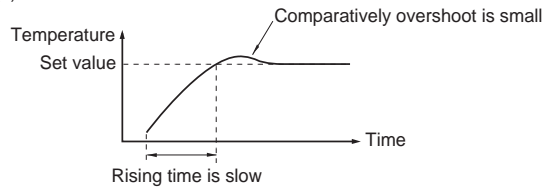
2) In case of set-value is set in A

※ if value of A is too small, huge overshoot or undershoot will occur
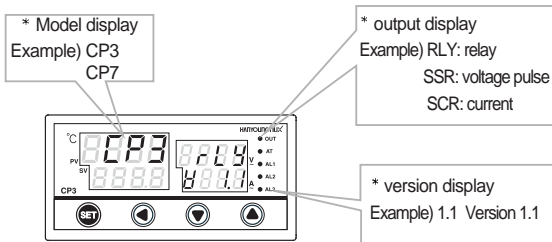 A = please set to 100.0 % value and use it

■ Input error and solution

List	Display	Description	Reference
+OVER	OVER ⇌ PV	Input OVER	
–OVER	M.OVR ⇌ PV	Input –OVER	
RJC Error	RJC ⇌ PV	Standard contact Error	Request A/ S
EEPROM Error	EEP ⇌ PV	EEPROM Error	Request A/ S
AD Error	ADC.E	AD Error	Request A/ S
SYSTEM Error	SYS.E	SYSTEM Error	Request A/ S
BURN OUT	B.OUT	Sensor Error	Sensor check

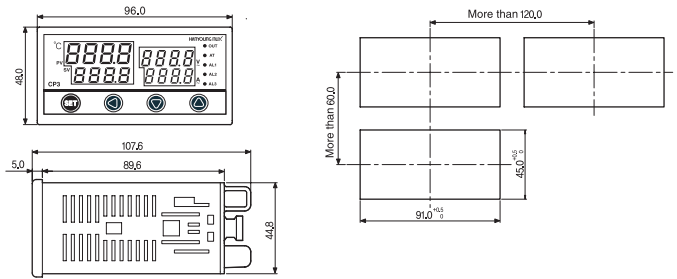## ■ Indicate the exceeded max range of voltage/current

If the measured value of voltage and current rise and exceed max range(108 % of F.S) of voltage/current then measured value of voltage/current will flicker
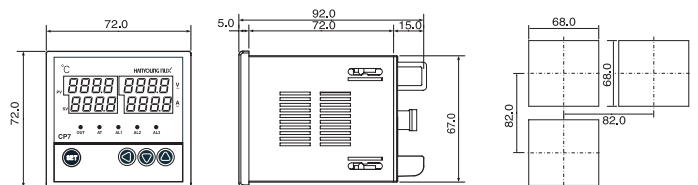
■ Display model when power is supplied

* Model display
Example) CP3
  CP7

* output display
Example) RLY: relay
  SSR: voltage pulse
  SCR: current

* version display
Example) 1.1 Version 1.1

■ Input types

classification	SL1	Input types	Range	
			1 ℃(SL2 : X1XX)	0.1 ℃(SL2 : X1XX)
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 ℃	-199.9 ~ 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	Decimalpoint: according to SL4
	1111	0 - 10 V *3	-1999 ~ 9999	

※Accuracy : ±0.5 % of F.S
※When using 4 - 20 ㎃ input, please connect given 250 ㏁ resistor to voltage input terminal (+), (-) and select SL1 = 0000 (1 - 5 V d.c input)
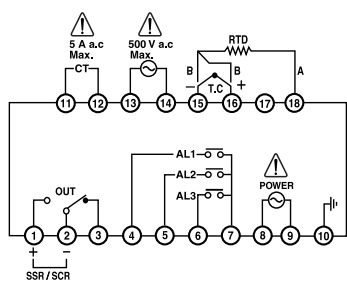＊1 : within range of 0 ~ 400 ℃, ±10 % of F.S
＊2 : Range of less than 0 ℃, ±1 % of F.S
＊3 : ±1 % of F.S

■ Connection

■ CP3

■ CP7

■ Dimension and panel cutout

■ CP3 (96x48)

■ CP7 (72x72)

■ Specification

Power supply			100 - 240 V a.c, 50 - 60 ㎐
Power consumption			Max. 6W
Temperature Part	Temperature input	Type	Please refer to input chart
		Sampling Cycle	250 ㎳
		Accuracy	±0.5 % (Please refer to input chart)
		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, 3 A 30 V d.c (Resistive load)
			Switching Life : 1 million times (No load)
		Voltage output	ON voltage : Min. 12 V d.c
			OFF voltage : Max. 0.1 V d.c
			Resistive load : More than 600 Ω
		Current output	Range : 4 - 20 ㎃
			Accuracy : ±0.2 ㎃
			Resistive load: Less than 600 Ω
	Current	Type	ON/OFF PID control
		Direction	Reverse action, Forward action
		Anti-reset wind-up	AUTO. 0.1 ~ 100.0 %
A.C voltage input part		Input range	0 - 500 V a.c, 50 - 60 ㎐
		Sampling Cycle	250 ㎳
		Accuracy	±1 % of F.S
		Display accuracy	1 V a.c
		Display range	0 - 500
A.C current input part		Input range	Detect by CT sensor (secondary part 0 - 5 A a.c)
		Sampling Cycle	250 ㎳
		Accuracy	±1 % of F.S
		Display accuracy	1 A a.c
		Display range	0 - 300
Alarm output part			5 A 250 V a.c, 5 A 30 V d.c (Resistive load)
			Switching Life : 1 million times (No load)
Control resistance			Over 20 ㏁between primary terminal and secondary terminal
			Over 20 ㏁between primary terminal and FG terminal
			Over 20 ㏁between secondary terminal and FG terminal
Dielectric strength			2300 V a.c between primary terminal and secondary terminal for 1 minute
			1500 V a.c between primary terminal and FG terminal
			500 V a.c between secondary terminal and FG terminal
Measuring category			CAT Ⅲ
Operating environment		Temp. and humidity	0 ~ 50 ℃, 35 ~ 85 % R.H.(Without condensation)
		Environment	Please refer to safety information