Digital Temperature Controller

HY series

INSTRUCTION MANUAL

Thank you for purchasing HANYOUNG product.
Please check whether the product is the exactly same as you ordered.
Before using the product, please read this instruction manual carefully.
Please keep this manual where you can view at any time

HANYOUNG NUX

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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

There is a danger of occurring electric shock in the input/output terminals so please never let your body or conductive substance is touched.

⚠ Warning

• If there is a concern about a serious accident caused by a malfunction or abnormality of this product, please install an external protection circuit and devise a scheme for preventing an 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, apply a proper power voltage in accordance with the rating.
• To prevent electric shock or malfunction of 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 any place with flammable or explosive gas.
• Do not decompose, modify, revise or repair this product. This may be a cause of malfunction, electric shock or fire.
• Reassemble this product while the power is OFF. Otherwise, it may be a cause of 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.
• There is a possibility of occurring electric shock so please use this product after installing it onto a panel while it is operating.

⚠ Caution

• The contents of this manual may be changed without prior notification.
• Before using the product you purchased, make sure that it is exactly what you ordered.
• Make sure that there is no damage or abnormality of the product during the delivery.
• Use this product within the range of the operating ambient temperature, 0 ～ 50 ℃ (When it is closely installed Max 40 ℃) and ambient humidity, 35 ～ 85 % R.H (No condensation).
• Do not use this product at any place with occurring 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. (Use neutral detergent.)
• Do not use this product at any place with a large inductive difficulty or occurring 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.
• In case of inputting thermocouple, use a compensating cable.
  (If using a normal wire, there is a possibility of occurring temperature error.)
• For R.T.D input, use a cable which is a lead wire has small resistance and resistances of three wires shall be the same. (If the three wires have different resistances then there will be a temperature error.)
• To avoid an effect of inductive noise to input signal cables, use the product after separating the input signal cables from power, output and load cables.
• Separate an input signal cable from an output signal cable. If separating is not possible, please use the input signal cable after shielding it.
• Use non–earth sensor with thermocouple. (In case of using earth sensor, there is a possibility of occurring malfunction caused by a short circuit.)
• 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 which is already connected to a ground and the wire between the filter output side and power supply terminal must be short as possible.
• If twisting the power cables closely together then it is effective against noise.
• If the alarm functions are not properly set then it will not be output when the product is malfunctioning. Therefore, make sure its movements are properly working before the operation.
• Turn the power OFF when replacing a sensor.
• Use an auxiliary relay in case of high frequent operation such as proportional operation or etc. its life span will be shorter if connecting a load without permissible rating of output relay. In this case, using SSR output type is recommended.
  · Using Electromagnetic Switch: Proportional Cycle : set it above 20 sec.
  · Using SSR : Proportional Cycle : set it above 1 sec.
  · Life Span of Contact Point Output : Mechanical Life Span: above 10 million times (with no load)
                    Electrical Life Span : 100 thousand times (250 V a.c 3 A: with the rated load)
• Do not connect anything to the unused terminals.
• After checking the polarity of terminal, connect wires at the correct position.
• When this product connected onto a panel, use a circuit breaker or switch approved with IEC60947–1 or IEC60947–3.
• Install a circuit breaker or switch at near place for convenient use.
• Write down on a label that if the circuit breaker or switch is operating then the power will be disconnected since the circuit breaker or switch 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 using signals of external interlock circuit or etc., use it with a delay relay.
• In case of replacing this unit with a spare unit, make sure its compatibility because its operation can be different by different parameter settings even though the model name is the same.
• Before using a temperature controller, there could be a temperature difference between PV of the temperature controller and the actual temperature so please operate the temperature controller after compensating the temperature difference appropriately.

Suffix code

Model		Code		Description
HY–	☐	☐☐☐☐☐☐		Digital temperature controller
Dimension	8000S			96(W) × 96(H)
	8200S			96(W) × 96(H) (Alarm setting general specification)
	72D			72(W) × 72(H)
	48D			48(W) × 48(H)
	800S			96(W) × 96(H)
	72I			72(W) × 72(H)
	48I			48(W) × 48(H)
Control type		F		ON/OFF control
		P		Proportional control
Input			K	K thermocouple
			J	J thermocouple
			R	R thermocouple
			D	RTD, KPt100 Ω
			P	RTD, Pt100 Ω(IEC)
			V	1 – 5 V d.c
			C	4 – 20 mA d.c
Control output			M	Relay
			C	Current coutput (4 – 20 mA d.c)
			S	S.S.R (12 V d.c, Voltage pulse output)
Alarm output			N	None
			O	High alarm (HY–8200S)
Control action (Internal selection)			R	Reverse action (Heating control)
			D	Direct action (Cooling control)
Range code				Refer to the range and input code

※ Mark the range code for temperature display (HY–800S, HY–72I, HY–48I) when composing the model name and suffix code.

※ Alarm Output can not be specified other than model name HY–8200S.

Range and input code

Classification	Code	HY–8000S, 8200S		HY–72D		HY–48D	
		Input type	Range (℃)	Input type	Range (℃)	Input type	Range (℃)
Thermocouple	4	–	–	–	–	K, J	0 ～ 299
	5	–	–	–	–		0 ～ 399
	6	K, J	0 ～ 199	K, J	0 ～ 199		
	7		0 ～ 299		0 ～ 299		
	8		0 ～ 399		0 ～ 399		
	9		–		0 ～ 599		
	10		0 ～ 599		0 ～ 799		
	11	K	0 ～ 799	K	–		–
	12		–		0 ～ 1199		
	13		0 ～ 1199	R	600 ～ 1699		
	14	R	600 ～ 1699	–	–		
RTD	1	–	–	–	–		–49 ～ 49
	2		–99 ～ 99		–99 ～ 99		–99 ～ 99
	3		–99 ～ 199		–99 ～ 199	–	0 ～ 199
	4		0 ～ 99		0 ～ 99		0 ～ 299
	5	Pt100 Ω	–	Pt100 Ω	–		0 ～ 399
	6		0 ～ 199		0 ～ 199		
	7		0 ～ 299		0 ～ 299	–	
	8		0 ～ 399		0 ～ 399		
Voltage/Current (DC)	–	1 – 5 V	0 ～ 99	1 – 5 V	0 ～ 99	1 – 5 V	0 ～ 99
	–	4 – 20 mA	0 ～ 99	4 – 20 mA	0 ～ 99	4 – 20 mA	0 ～ 99

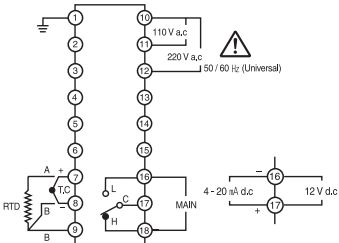| Code	HY-800S		HY-72I		HY-48I	
	Input type	Range (℃)	Input type	Range (℃)	Input type	Range (℃)
1	Pt100 Ω	−49 ~ 199	−	−	−	−
2	Pt100 Ω	0 ~ 399	Pt100 Ω	−99 ~ 99	Pt100 Ω	−99 ~ 99
	K, J					
3	K	0 ~ 1199	−	−	−	−
4	R	600 ~ 1699	−	−	−	−
5	−	−	−	−	Pt100 Ω	0 ~ 399
					K, J	
8	−	−	Pt100 Ω	0 ~ 399	−	−
			K, J			
12	−	−	K	0 ~ 1199	−	−
13	−	−	R	599 ~ 1699	−	−

Specification

| Model	HY−8000S, HY−8200S, HY−72D, HY−48D	HY−800S, HY−72I, HY−48I
Power supply voltage	110 / 220 V a.c, 60 Hz (universal) But, HY−48D, 48I are Selected by the Internal Dip S/W (Default : 220 V a.c)	
Voltage fluctuation	±10 % of the power voltage	
Power consumption	Approx. 3 VA max	
Input	Thermocouple, Resistive, DC Current, DC Voltage	Thermocouple, Resistive
Adjusting sensitivity	Approx 0.2 % F.S (Fixed)	−
Control method	HY−8000, 72D, 48D − Time Proportion ON/OFF HY−8200S − Time Proportion + ON/OFF − ON/OFF + ON/OFF	−
Setting Method	Set by BDC Switch	−
Display Method	LED 7 Segment all Display	LED 7 Segment all display
Control Output	Relay Output : Capacity 250 V a.c 3 A (Resistive Load) Contact : 1c SSR Output : 12 V a.c (Constant Voltage Pulse) (Resistive Load: above 800 Ω) Current Output : 4 − 20 mA d.c (Resistive Load : Below 600 Ω)	
Setting Accuracy	±0.5 % F.S max	−
Display Accuracy	±1.0 % of F.S ±1 Digit	
Proportional Band	HY−8000S, HY−8200S, HY−72D : Approx.1 ~ 10 % of Max. Range (Variable) HY−48D : Approx. 3% of Max. Range (fixed)	−
Proportional Cycle	Relay : 25 ~ 30 sec, SSR : 2 ~ 4 sec	−
External Input esistance	Thermocouple : Below 100 Ω, Resistive : Below 10 Ω (But, the 3 Wires Should have the Same Resistance)	
Resolution	1 ℃	
Dielectric Strength	2000 V a.c 50 − 60 Hz 1 minute (Between Terminals After Charging 2 Polar)	
Ambient Temperature/Humidity	0 ~ 50 ℃ / 35 ~ 85 % R.H. (Without Condensation)	

Connection diagram

■ HY−8000S

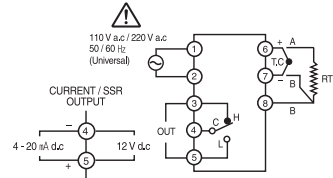### ■ HY−800S
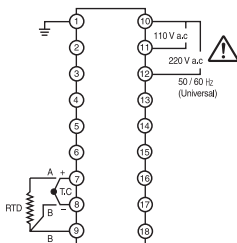
■ HY−8200S (Built−in Alarm Output)
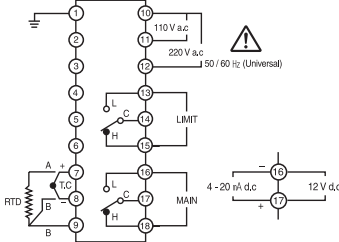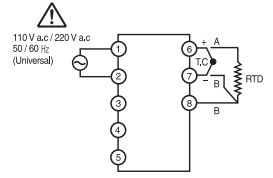

■ HY−72D
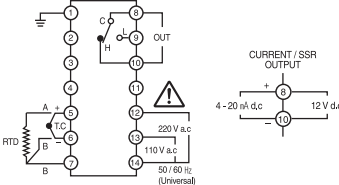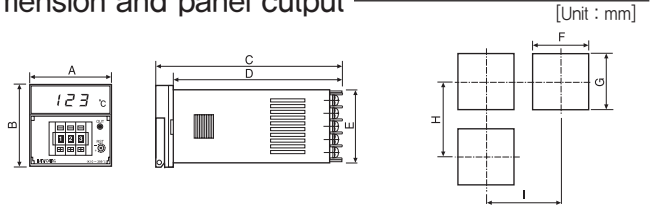

■ HY−72I
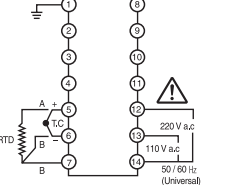
■ HY−48D

■ HY−48I

(Note) for model HY−48I, 48D, 110 V a.c or 220 V a.c can be selected by the internal dip switch. (Default : 220 V a.c)

Dimension and panel cutout

[Unit : mm]

| Model	A	B	C	D	E	F	G	H	I
HY−48D, 48I	48	48	112	100	44	45 $^{+0.5}_{-0}$	45 $^{+0.5}_{-0}$	Above 60	Above 60
HY−72D, 72I	72	72	125	110	67	68 $^{+0.5}_{-0}$	68 $^{+0.5}_{-0}$	Above 90	Above 90
HY−8000S HY−8200S, 800S	96	96	141	125	89	91 $^{+0.5}_{-0}$	91 $^{+0.5}_{-0}$	Above 120	Above 120

Terminology & Function Explanation

■ Proportional Control

Proportional Control is that an output capacity regarding a setting value (SV) is proportionally operated by a deviation. The width which the output is varied within 0 ~ 100 % is called Proportional Band (PB). Therefore, for Reverse Action, if PT=Present (Process) Temperature.

PB=Proportional Band
PT 〈 PB → Output capacity 100 %
PT 〉 PB → Output capacity 0 %
PT = PB → Output capacity 50 %
· PT : Present (Process) Temperature
· PC : Proportional Cycle
· SV : Setting Value (Temperatrue)
· PB : Proportional Band
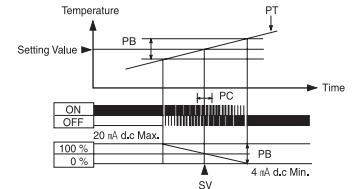
■ ON−OFF Control

This is a control method that if PT is higher than SV then output will be OFF or if PT is less than SV, then the output will be ON. Also, it is called 2−position control since it outputs either 0 % or 100 %. The status which the temperature is unstable and there is high/low wave around SV is called hunting. The width between the point where its output is OFF because PT is higher than SV and the point where its output is ON since PT is less than SV is called adjusting sensitivity.

hysteresis. If the width, hysteresis, is narrow, then high/low wave becomes smaller but the cycle of ON−OFF gets smaller so that it may severely damage to electromagnetic switch, electrovalve or etc.. Especially, for controlling burner which is using freezer or electrovalve, 2−postion control is generally used.
· PT : Present (Process) Temperature
· SV : Setting Value (Temperature)
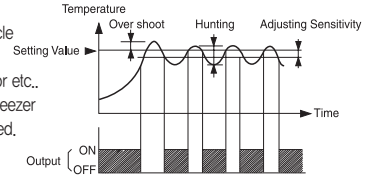
Proportional Control / ON−OFF Control Selection

It is depending on its specification code when you are ordering.

Usage of the Front Volume

■ Proportional Band (PB)

· For Proportional Control :
If the proportional band (PB) is narrow, then the output's variable width will become smaller so that the time which the controlling temperature(PT) is approaching to SV* is fast. Also, OFF−Set (deviation) becomes small. However, if PB* is too narrow, then there is over shoot or hunting. PB* can be set within the max range of 1 ~ 10 %. If turn the PB volume in clockwise then PB* gets larger. If turn the PB volume in counterclockwise then PB gets smaller.

· For ON−OFF Control:
For the case of selecting ON−OFF Control, the adjusting sensitivity is varied within the max range of 1 ~ 10 % by PB volume.

■ Reset Volume (RST)

For Proportional Control, when the controlling temperature(PT) and SV* are the same, it generates 50 % of output so that there is constant error (normal deviation) by heat capacity or etc. of a controlling target.
To eliminate this matter, change the output capacity by Reset volume.
· Display Value 〈 Setting Value: Turn the volume in clockwise.
· Display Value 〉 Setting Value: Turn the volume in counterclockwise.

■ Limit (HY−8200S)

Output: example of ON/OFF + ON/OFF operation
· PT* : Present (Process) Temperature
· PC* : Proportional Cycle
· SV* : Setting Value (Temperatrue)
· PB* : Proportional Band