

Analog Temperature Controller

# HY-1000/2000/3000/AF1

## 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

	<b>DANGER</b>	DANGER indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury
	<b>WARNING</b>	WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury
	<b>CAUTION</b>	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 deflection 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 °C (When it is closely installed Max 40 °C) 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 2,000m 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 is 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- AF-	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	HY-1000, HY-2000, HY-3000, AF1
Adjusting Action	F	2-Position Control (ON/OFF)
	P	Proportional Action
Input	K	K (CA)
	J	J (IC)
	R	R (PR 13 %)
	D	Pt100 Ω (KS Standards)
	P	Pt100 Ω (DIN Standards)
	V	* 1 - 5 V d.c
Control Output	C	* 4 - 20 mA d.c
	M	Relay Contact
	S	Current (4 - 20 mA d.c)
		* SSR driving (Voltage Pulse 12 V d.c)
Alarm Output or Operation	N	None
	O	High Limit Operation Alarm Output
	P	Low Limit Operation Alarm Output
	W	High/Low Limit Operation Alarm Output
Control Action	R	Reverse Action Control (for Heating Control)
	D	Direct Action Control (for Cooling Control)
Range Code		Standard Range Code Number Selection

\* Non-display product does not have the feature.

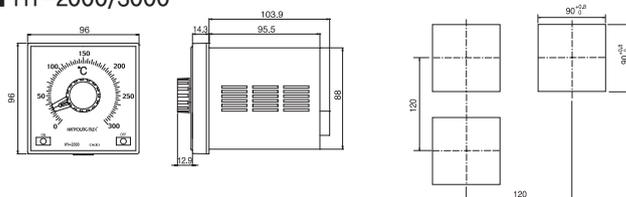
## Standard Range

Model Code No.	HY-1000		HY-2000, 3000		AF1	
	Input	Temp.Range	Input	Temp.Range	Input	Temp.Range
1	Pt	-50 ~ 50			Pt	-99 ~ 99
2			Pt	-50 ~ 50		
3	Pt	0 ~ 100				
4			Pt, K, J	0 ~ 100	Pt	0 ~ 99
5	Pt, K	0 ~ 200	Pt, K, J	0 ~ 200	Pt, K	0 ~ 199
6	Pt, K	0 ~ 300	Pt, K, J	0 ~ 300	Pt, K	0 ~ 299
7	Pt, K	0 ~ 400	Pt, K, J	0 ~ 400	Pt, K	0 ~ 399
8	K	0 ~ 600	K	0 ~ 600		
9	K	0 ~ 800	K	0 ~ 800		
10	K	0 ~ 1200				
11			K	0 ~ 1200		
12			R	0 ~ 1600		

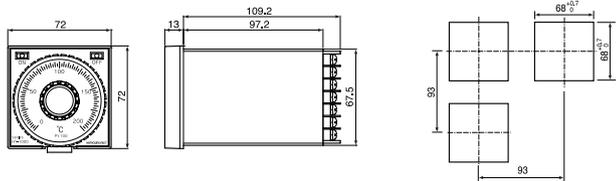
## Dimension and Panel cutout

[Unit : mm]

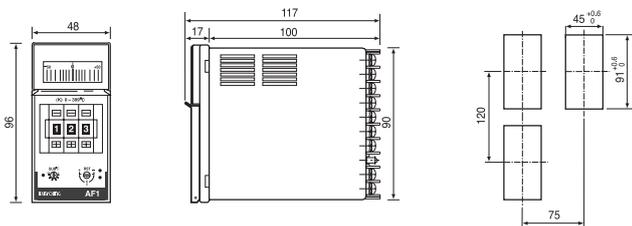
### ■ HY-2000/3000



■ HY-1000



■ AF1

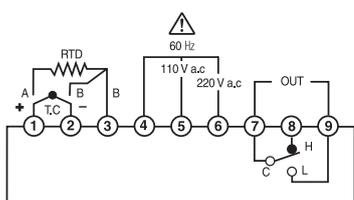


Specification

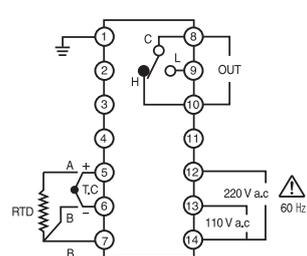
Model	HY-1000, 2000	HY-3000	AF1
Contents	HY-1000, 2000	HY-3000	AF1
Power supply voltage	110 V a.c / 220 V a.c 60 Hz		
Permissible Voltage Fluctuation Range	Rated Voltage $\pm 10\%$		
Consumption Power	Approx. 3 VA max		
Input	Thermocouple, Resistive	Thermocouple, Resistive, DC Current, DC Voltage	Thermocouple, Resistive
Adjusting Sensitivity	$\pm 0.2\%$ (fixed) of Max. Range		
Control Method	Time Proportional Control, ON/OFF Control		
Setting Method	Analog Setting		Digital BCD Switch Setting
Display Method	Non-Display	Deviation Display	
Control Output	Relay Output : Capacity 250 V a.c 3 A	Relay Output : capacity 250 V a.c 3 A SSR Output : 12 V d.c Load Resistance : Above 800 $\Omega$	
Setting Accuracy	Within $\pm 2.0\%$ of Max. Range		Same as Display Accuracy Without Relative Error
Display Accuracy	HY-1000 : $\pm 1.0\%$ (fixed) of Max. Range HY-2000 : $\pm 2.0\%$ (fixed) of Max. Range	$\pm 2.5\%$ (fixed) of Max. Range	$\pm 1.0\%$ (fixed) of Max. Range
Proportional Band	3 % of Max. Range (fixed)		
Proportional Cycle	Relay Output : Approx. 20 sec, SSR Output : Approx. 2 sec		
External Input Resistance	Thermocouple : Below 100 $\Omega$ , Resistive : Below 10 $\Omega$ Per 1 Wire (The Resistance of Each Wire Should be the Same.)		
Reset Range	None	Above 1.5 % of Max. Range	
Alarm Setting Range	-	※ Within 50 °C of High/Low Limit to the Operating Point of Main Setting Value	
Alarm Output Adjusting Sensitivity	-	※ 1.5 °C of Max. Range (fixed)	
Hysteresis	Thermocouple : 1.2 °C (Below 600 °C), 2.4 °C (Above 600 °C) Resistive : 0.6 °C (Below 200 °C), 1.2 °C (Above 200 °C)		
Dielectric Strength	2000 V a.c 60 Hz for 1 Minute		
Relay Life Expectancy	Mechanical : Above 10 Millions Times, Electrical : Above 100 Thousands Times (250 V a.c, 3 A Resistive Load)		
Operating Ambient Temperature/Humidity	0 ~ 50 °C, 35 ~ 85 % R.H (Without Condensation)		
Weight	HY-1000 : 358 g (Including Brackets), HY-2000, 3000 : 558 g (Including Brackets)	Approx. 356 g (Including Brackets)	

Connection diagram

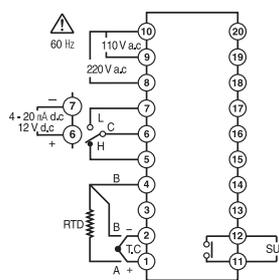
■ HY-2000, 3000



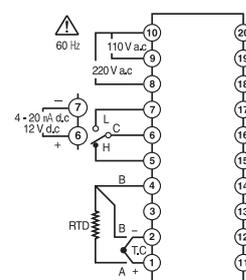
■ HY-1000



■ AF1 (Built-in Alarm Output)



■ AF1



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 %

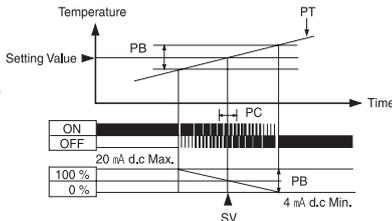
PT = PB → Output capacity 50 %

· PT : Present (Process) Temperature

· PC : Proportional Cycle

· SV : Setting Value (Temperatru)

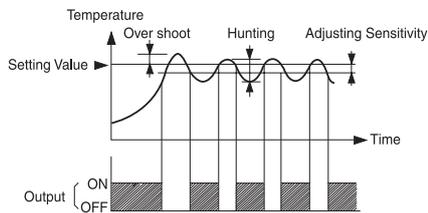
· PB : Proportional Band



■ 2-position Control, 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-position control is generally used.

· PT : Present (Process) Temperature



Proportional Control / ON-OFF Control Selection

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

Usage of the Front 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.

■ Alarm Volume (ALM)

For Alarm Operation,  $\pm 0 \sim 50$  °C of the setting value (SV) can be set and high limit, low limit or high/low limit operation can be selected.

Ex) for case of setting Alarm (ALM) as 50 °C

High Limit Operation : it will operate when it is 50 °C higher than SV\*.

Low Limit Operation : it will operate when it is 50 °C lower than SV\*.

High/Low Limit Operation : it will operate when it is 50 °C higher or 50 °C lower than SV\*.

· PT\* : Present (Process) Temperature

· PC\* : Proportional Cycle

· SV\* : Setting Value (Temperatru)

· PB\* : Proportional Band

