

Thyristor Power Regulator

TPR-2

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 Sensor/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 contain important contents related with safety; therefore, please follow the instructions accordingly. The precautions are composed of DANGER, WARNING and CAUTION.

⚠ 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

1. If this product is used with the machinery which may be caused human injury or serious property damage then use it after surely installing the protection equipment for two or three times.
2. To prevent deflection or malfunction of this product, apply a proper power voltage in accordance with the rating.
3. To prevent electric shock or malfunction of product, do not supply the power until the wiring is completed.
4. Do not decompose, modify, revise or repair this product. This may be a cause of malfunction, electric shock or fire.
5. Reassemble this product while the power is OFF. Otherwise, it may be a cause of malfunction or electric shock.
6. If you use the product with methods other than specified by the manufacturer, there may be bodily injuries or property damages.
7. There is a possibility of occurring electric shock so please use this product after installing it onto a panel while it is operating.

⚠ CAUTION

1. The place of operating this product affect to the its functions and life cycle so that avoid to use it in the following circumstance.
 - A place of having high humidity and not circulating air
 - A place of piling up dust or impurity or having high ambient temperature or high vibration
2. The contents of this manual may be changed without prior notification.
3. Before using the product you purchased, make sure that it is exactly what you ordered.
4. Make sure that there is no damage or abnormality of the product during the delivery.
5. After turning OFF power sources of all instruments, please wire them.
6. The Thyristor Power Regulator should be installed perpendicularly.
7. Install exhausting fan in internal and upside of the panel.
8. Tighten BOLT of the input and output wire enough.
9. Distribute the load equally.
10. Do not use this product at any place with corrosive (especially noxious gas or ammonia) or flammable gas.
11. Do not use this product at any place with direct vibration or impact.
12. 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)
13. Do not polish this product with substances such as alcohol or benzene. (Use neutral detergent.)
14. Do not use this product at any place with a large inductive difficulty or occurring static electricity or magnetic noise.
15. Do not use this product at any place with possible thermal accumulation due to direct sunlight or heat radiation.
16. Install this product at place under 2,000 m in altitude.
17. When the product gets wet, the inspection is essential because there is danger of an electric leakage or fire.
18. Do not connect anything to the unused terminals.
19. After checking the polarity of terminal, connect wires at the correct position.
20. For the continuous and safe use of this product, the periodical maintenance is recommended.
21. Some parts of this product have limited life span, and others are changed by their usage.
22. The warranty period for this product including parts is one year if this product is properly used.

※How to Operate

- When installing the unit, the input and output terminals should be attached in the direction of facing downward perpendicularly for the natural cooling.
- Make sure that install high-speed breaking fuse between terminal R and power source.
- By the internal volume, the output voltage can be limited. (Only if the external volume is not connected)
- When the output voltage limitation setting is externally used, connect the external volume (B 10 kΩ 1 W) to VR1, VR2, VR3 terminals. At this time, make sure that the internal volume should be set at max (INC side).
- When using without the external signal (when a temperature controller is not used), please connect ref terminal and C1 (+) terminal.

■ Model and Suffix code

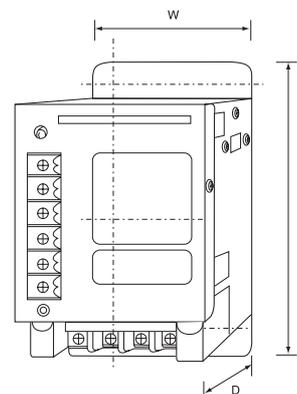
Model Name	Suffix Code				Description
TPR-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Single Phase
Phase	2				Phase
Control Method	P				Control
Power Supply (AC 60 Hz) ※25A of TPR-2 are only available 110 V and 220 V.	110				110 V
	220				220 V
	380				380 V
	440				440 V
Rated Current	25				25 A
	35				35 A
	50				50 A
	70				70 A
	100				100 A
	150				150 A
200				200 A	
Input Method		M			4 ~ 20 mA
Load Characteristic		R			Resistive Load

■ Ratings

Power Supply	110 V AC, 220 V AC, 380 V AC, 440 V AC, 60Hz (But, 25 A of TPR-2 are only available 110 V and 220 V)
Rated Current	25 A, 35 A, 50 A, 70 A, 100 A, 150 A, 200 A
Ambient temperature	0 ~ 50 °C (humidity below 90 %)
Protection Circuit	Above 100 A protected by high - speed breaking fuse
Applied Load	Resistive Load
Control Input	Current Input : 4 ~ 20 mA DC, Voltage Input : 1 ~ 5 V DC Contact Input : ON-OFF
Output Voltage	Above 97 % of input voltage
Cooling Method	Natural Cooling, forced cooling by fan for above 100 A
Insulation Resistance	Above 200 MΩ (500 V mega)

■ Aspect Dimension

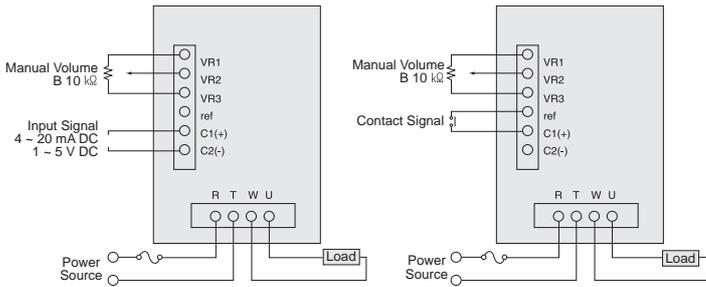
[Unit : mm]



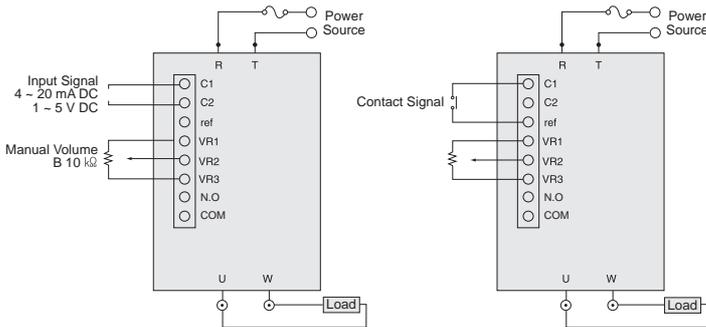
Capacity	Dimension	W	H	D
25 A		86	130	63
35 A, 50 A, 70 A		126	190	116
100 A, 150 A, 200 A		165	305	170

Wiring Diagram

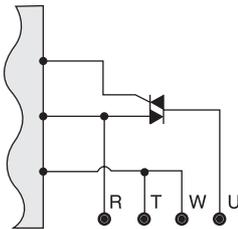
25 ~ 70 A



100 ~ 200 A



Internal Structure



How to operate

Temperature Controller for Current Output

This is not followed the method of the relay output which is used up to the date. This controller outputs the current of 4 ~ 20 mA DC (Internal Standards) from the setting value of $\pm 5\%$.

For example

Temperature Controller for 400 °C

If Setting value = 300 °C

It outputs 20 mA DC up to 280 °C

It outputs 12 mA DC up to 300 °C

It outputs 4 mA DC beyond 320 °C

Thyristor Power Regulator is operating as following the signal of 4~20 mA DC from the above

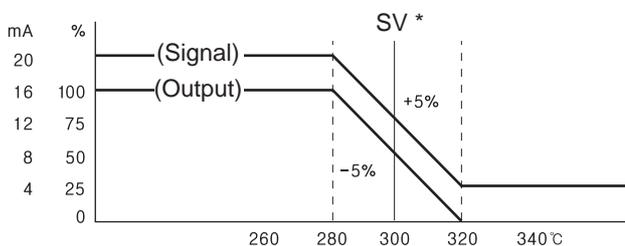
It outputs the power like the bottom

4 mA 0%, 8 mA 25%, 12 mA 50%, 16 mA 75%, 20 mA 100%

※refer to the picture 1

(Picture 1)

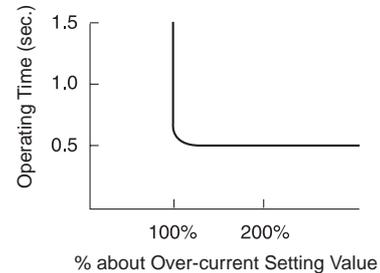
*SV: Setting Value



Function Explanation

Detecting Over-current Function

Our Thyristor power regulator employs electronic over-current circuit. In the case of flowing over-current in the load, as the detecting over-current circuit is operating, it stops the gate's signal of the control element, Thyristor, so that the control element, Thyristor, becomes "OFF." At this moment, the front over-current indicator (OC) of the Thyristor power regulator will be lighting. At this time, by using the alarm contact, you can use the alarm.



Function Explanation

Control Method of Thyristor Power Regulator

By the function of Temperature Controller, it can be divided into two ways, ON-OFF control method and continuous control method.

By using Thyristor power regulator, a temperature controller device can be used ON-OFF, continuous control or etc. as only converting the input signal of the gate. Specially, for an electric furnace which contains high thermal capacity or a control target which is slowly responded, these methods are suitable.

ON-OFF Control Method

This method is operating when the current temperature is higher or lower the setting temperature of the controller and it has a simple structure and economical. However, the operating area is ON-OFF around the setting value so there is the up and down occurrence by 2-position operation.

To eliminate the occurrence, we need the fact that if the adjusting sensitivity becomes narrower then there might be the output's tremble occurrence or it can be affected by the noise and if the adjusting sensitivity, Dead Band, becomes wider, the accuracy can be a problem. But, if the width of the up and down, cycling, occurrence is within the allowable temperature width then ON-OFF control can be applicable.

Continuous Control Method

The proportional operation is the basis as the continuous control of electrical furnace and this is the method which is applying the proportional outputs to the heating element in the furnace in accordance with the deviation signal magnitude after comparing the temperature in the furnace with the setting value.

If applying only the proportional control (P), theoretically, there is unavoidable error by the circuit constant. To prevent this error and to obtain more accurate control, it is more effective to employ the integral operation (I) or to make the response time faster, it is more to use the differential operation (D). Therefore, P.I or P.I.D control is generally used.

Constant Voltage (Current) Control Method

For the case of doing an individual or batch control the temperature of the target which the temperature detection is difficult, generally, the constant voltage control is employed. This method controls the average value of the voltage or the effective value which applies to the furnace constantly with ignoring many little disturbances about the controller. Therefore, instead of getting the return signal from the controller of the temperature detection type, detect the furnace's temperature and then make it as the signal of the power regulator it becomes the constant voltage control.

At this time, you have to decide whether you use the average value or the effective value to control. Since the heating effect of the heater is controlled by the effective power, the latter one looks more suitable. However, generally, the detection of the effective value of the voltage in comparison with the detection of the average value it requires more high technology so it costs more. Therefore, for the target which is not required the high accuracy, normally, the average value control is used.

Constant Power Control Method

Unlike the purely resistive heating element, the resistances of the silundum heating element and the molybdenum heating element are changed steeply according to the operating or elapse of the time. Even though using the control method which is mentioned before, it remarkably shortens the element's lifetime as it becomes overpowered or underpowered. The constant power control is to solve for this faulty matter. To control the constant power, detect the effective power which can mean to obtain it by multiplying the apparent power and the power factor as using non-linearity of the combined circuit after detecting the two elements of the effective voltage as well as the effective current. Therefore, it is the same way of the general control method except installing the above power detector into the front of the gate control area from the constant power control device.