Power REGULATOR

TPR-2SL

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

HANYOUNGNUX

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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

To prevent electric shock while it is running, put to earth with the fixed screw of the unit and do not touch the radiator panel since it is very hot. Do not touch or contact the input/output terminals because they cause electric shock.

⚠ Warning

- If you use the product with methods other than specified by the manufacturer, there may be bodily injuries or property damages.
- Since this product is not designed as a safety device if it is used with systems, machines and equipment that could lead to a risk of life or property damage, please implement safety devices and protections for both lives and the applications and plan for preventing accidents.
- To prevent damage or failure of this product, please supply the rated power voltage.
- To prevent electric shock or equipment failure, please do not turn on the power until completing wiring.
- Never disassemble, modify, or repair the product. There is a possibility of malfunction, electric shock, or a risk of fire.
- Please turn off the power when mounting / dismounting of the product. This is a cause of electric shock, malfunction, or failure.

⚠ Caution

- Since the product operating environment influences the product performance and expected life span, please avoid using in the following places.
  · a place where humidity is high and air flow is inappropriate.
  · a place where dust or impurity accumulates, ambient temperature is high and vibration level is high.
  · a place where corrosive gas (such as harmful gas, ammonia, etc.) and flammable gas occur.
  · a place where there is direct vibration and a large physical impact to the product.
  · a place where there is water, oil, chemicals, steam, dust, salt, iron or others (Contamination class 1 or 2).
  · a place where excessive amounts of inductive interference and electrostatic and magnetic noise occur.
  · a place where heat accumulation occurs due to direct sunlight or radiant heat.
- Please do not wipe this product with organic solvents such as alcohol, benzene and others. (Please use mild detergent)
- Please make sure to inspect the product if exposed to water since there is a possibility of electric leakage or a risk of fire.
- Please connect the product and other units after turning off all the power of the product, instruments and units.
- Please make sure that the power control (TPR) is installed perpendicularly.
- Please install the product inside of the control panel and install an exhaust fan onto the top of the control panel.

Suffix code

Model	Code		Information
TPR-2SL	□	□	Slim type Single phase power regulator
Rated current	040		40 A
	055		55 A
	070		70 A
	090		90 A
	110		110 A
	130		130 A
Power supply voltage		L	100 – 240 V AC (Low)
		H	380 – 440 V AC (High)

※ Please supply 100 – 240 V AC to the control unit of the power controller (thyristor) separately.

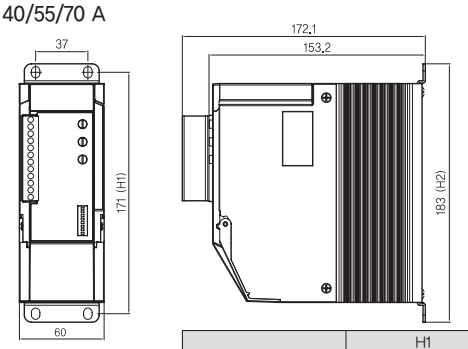
Specification

Model		TPR-2SL040L	TPR-2SL055L	TPR-2SL070L	TPR-2SL090L	TPR-2SL110L	TPR-2SL130L
	High	TPR-2SL040H	TPR-2SL055H	TPR-2SL070H	TPR-2SL090H	TPR-2SL110H	TPR-2SL130H
Power supply voltage		100 – 240 V AC (Low) 380 – 440 V AC (High)					
Circuit input power		100 – 240 V AC					
Power frequency		50 Hz / 60 Hz (Dual usage)					
Rated current		40 A	55 A	70 A	90 A	110 A	130 A
Applying load		Resistive load					
Control Input	Current input	4 – 20 ㎃ DC (Impedance : 100 Ω)					
	Voltage input	1 – 5 V DC					
	Contact input	ON/OFF					
	External V.R	External volume (10 kΩ)					
Control method		Phase control, Fixed Cycle control, Variable Cycle control, ON/OFF control					
Movement type		SOFT START, SOFT UP/DOWN					
Output voltage		More than 98% of the power supply voltage (In case of maximum current input)					
Cooling method		Natural cooling		Forced cooling	Natural cooling		Forced cooling
Display method		Display by LED					
Insulation resistance		Min 100 MΩ (Base on 500 V DC mega)					
Output control range		0 ~ 100 %					
Dielectric strength		3000 V AC 50/60 Hz for 1 min					
Line noise		Noise by noise simulator (3,000 V)					
Ambient temperature		0 ~ 40 ℃ (Without Condensation)					
Ambient Humidity		30 ~ 85 % RH					
Storage temperature		–25 ℃ ~ 70 ℃					
Weight		1388 g		1478 g	2820 g		3100 g

Appearance

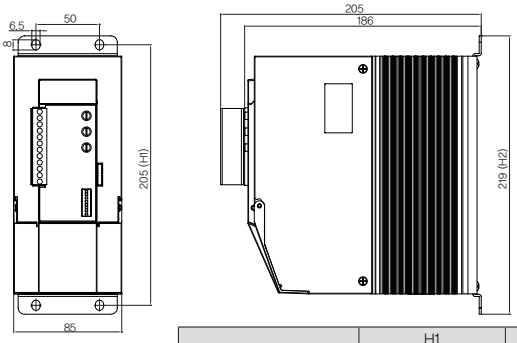
[Unit : mm]

■ 40/55/70 A



	H1	H2
70 A (With cooling fan)	191 mm	203 mm

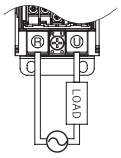
■ 90/110/130 A



	H1	H2
130 A (With cooling fan)	231.5 mm	245.5 mm

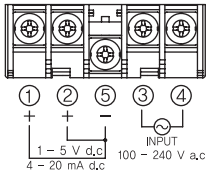
Connection diagram

■ Connection diagram of load terminal (R, U)



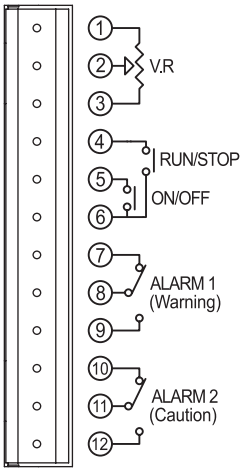
· 40/55/70A items does not have fuse. (90/110/130A items have fast-acting fuse).
· When connecting terminals, please use crimp connectors and securely fasten them due to the high current flow.
· Max space for solder less terminal connection is – 40/55/70A : 16 mm
– 90/110/130A : 26 mm

■ Connection diagram of input signal and power terminal



· Current input : 4 – 20 mA DC (connect no. ① and ⑤)
· Voltage input : 1 – 5 V DC (connect no. ② and ⑤)
· Input power voltage (for control unit) :
100 – 240 V AC (no. ③ and ④)

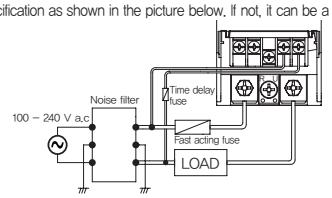
■ Connection diagram of signal and alarm terminal



- No. ①, ② and ③ : manual V.R
  · Use variable resistor of 10 kΩ
  · Control 0 ~ 100 % manually
- No. ④ and ⑥ : RUN/STOP
  · Be sure to attach RUN contact while it is operating.
- No. ⑤ and ⑥ : ON/OFF control
  · When inputting contact, it is operated with 100% output, irrespective of other control input.
- No. ⑥ is GND terminal of the circuit.
- No. ⑦, ⑧ and ⑨ : Alarm 1 – Warning
  This is a "warning" alarm which implies that there may be a cause of damage to the product and load. At this moment, TPR stops the output by itself and "warning" alarm is activated.
  · Warning error : Overcurrent, overheated heat sink (85 ℃), SCR short-circuit, abnormal frequency and power.
- ⑩, ⑪, ⑫: Alarm 2 (Caution)
  This is a "caution" alarm which implies there is not a serious problem, but user needs to check for its system because small and minor problems cause this alarm. At this moment, the output of TPR is normally operating but only "caution" alarm is activated.
  · Caution error : partial load break, overheated heat (65 ℃)
- Initially ⑦ & ⑧ connect. If alarm 1 is activated, ⑧ & ⑨ will be connected.
- Initially ⑩ & ⑪ connect. If alarm 2 is activated, ⑪ & ⑫ will be connected.

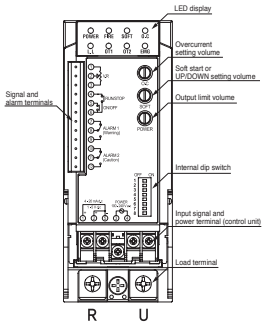
■ Recommended connection diagram

· In case of low voltage model, we suggest connect it as following picture. (90/110/130A have fuse).
· If the product is used in a place where there is an excessive amount of noise from power then make sure to use a noise filter satisfied its specification as shown in the picture below. If not, it can be a cause of malfunction.



· When the voltage is used higher than 380 V AC, please make sure that the input power for the control unit is separately connected to 100 – 240 V AC.
· Please use a 2 A fuse for the time delay fuse.
· Please select a fuse that satisfied with operating current/voltage for the fast acting fuse.
(example) actual operating current 40 A : BUSSMANN FWH–40 (please use 40 A r.m.s min)

Part name and function



■ LED indicator and explanation

LED indicator name	Description
POWER	POWER indicator is ON when the power is being supplied to the control unit
FIRE	Fire indicator is ON proportionally to the control input. It lights longer if the output amount is large and it is continuously ON if it outputs 100 % continuously.
SOFT	To use Soft start, Soft up/down function, turn Soft VR clockwise and SOFT indicator will be ON.
O.C	If the current flows higher than set value of O.C volume when there is overcurrent then O.C indicator is ON, the TPR stops the output to protect the product and the load and alarm 1 is activated.
L.L	This is partial heater break alarm. If heaters are connected in parallel 2~4 and one or more of heater is broken, alarm 2 will be activated. But in this case, alarm is activated and regulator operates properly. (But in case of heater break, LL led will be displayed when total load current is more than 7A or falling load current more than 3A)
O.T1	While TPR is operating, the temperature of the heat sink is higher than 65 ℃, OT1 indicator is ON and alarm 2 is activated but the output of TPR is normally operating. If the temperature of the heat sink is below approximately 55 ℃, alarm 2 is deactivated.
O.T2	While TPR is operating, the temperature of the heat sink is higher than 85 ℃, OT2 indicator is ON and alarm 1 is activated but TPR stops the output.
EMG	The following situation when EMG LED indicator is ON. (This situation is for when alarm 1 (warning) outputs) 1. Power failure : when the power (100 – 240 V AC) of the control unit is being supplied, EMG LED is ON if the power for the load is not being supplied or the heater is broken. 2. SCR short : If SCR is short–circuited then the heater gets overheated since the power is being supplied to the load regardless of the output of TPR, EMG is ON if the current flows without the control input. 3. Frequency variation : EMG is ON when the frequency other than 50/60 Hz that TPR cannot control.

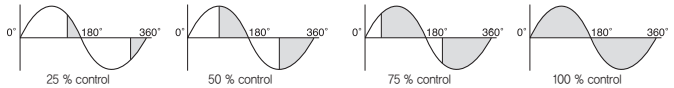
■ Internal dip switch operation

Number	ON	OFF	Default mode
No. 1	–		OFF ON 1 2 3 4 5 6 7 8 1. input mode : 4 – 20 mA DC 2. control mode : phase control 3. others : Restart mode ON, partial load break function OFF
No. 2	–	Partial load break function	
No. 3	–	Restart mode ON	
No. 4	Fixed cycle control	Phase control (Linear output)	
No. 5	Variable cycle control		
No. 4, 5	Phase control		
No. 6	Limit mode	–	
No. 7	1 – 5 V DC	Use external and internal V.R simultaneously	
No. 8	External V.R		
No. 7, 8	4 – 20 ㎃ DC		

Function description

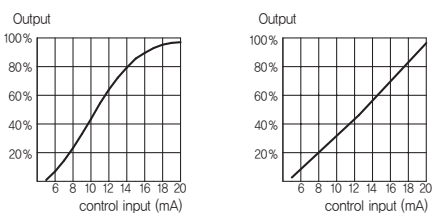
■ Phase control

Phase control is to control the AC power supply applied to the load proportionally according to the control input signal as changing phase angle (0 ~ 180 degree) in a each half cycle, 8.33 ms.



■ Phase control (Linear output)

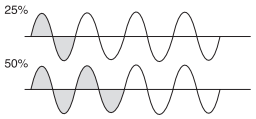
The control method is the same as the phase control but it outputs more linearly than the phase control.



〈Ordinary phase control〉 〈Phase control (Linear output)〉

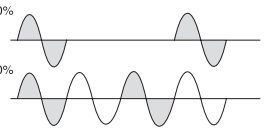
■ Fixed cycle control

As setting the constant cycle of the output, (1 sec), fixed cycle control is to control the AC power supply repeatedly with a constant rate of ON/OFF according to the control input.



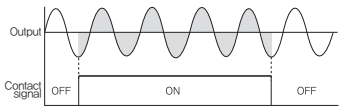
■ Variable cycle control

Without setting a constant cycle, variable cycle control is to control AC power supply with using the number of cycle.



■ ON/OFF control

If ON/OFF contact is ON, then the output is 100 %. ON/OFF always operates near zero point.



• Even though the control input signal is ON, the output is 100 % when ON/OFF control is used.

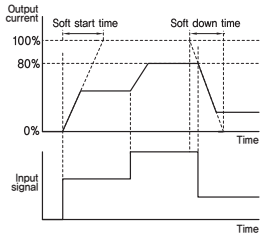
■ Restart function

When a warning or caution alarm occurs, TPR gives alarm 1 or 2 or stop the output. This function is used to return to normal operation mode when factors caused errors are eliminated.
This function can be used in power failure, frequency variation and SCR short of EMG and OT1, 2 of overheated heat sink. (This function is not applicable to when overcurrent occurs.)

■ V.R Explanation

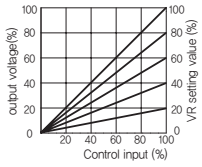
1. O.C (overcurrent setting function)
When overcurrent occurs, protection function for TPR and load (Only for phase control)
• V.R gradation for overcurrent setting position.

TPR–2SL040/055/070	TPR–2SL090/110/130
37 A 17 A 58 A O.C	57 A 26 A 87 A O.C



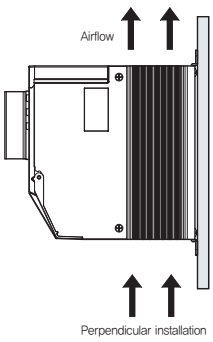
• Depending on load type and VR error, overcurrent setting position can be different.
• The overcurrent setting can be different depending on the types of load or VR tolerance. In order to set an accurate position of the overcurrent setting, adjust the control signal that TPR can have the current that needs to be alarmed. Turn the O.C VR until the O.C indicator is ON. The position of the O.C VR is the overcurrent setting value.
• If OC V.R turning to the right of the maximum, overcurrent function does not work.

2. SOFT
This volume is to set time for Soft start or Soft up/down. (only applicable to phase control, ON/OFF control)
– Soft start : Protection functions against big load of start current (inrush current). It increases output softly.
When control input is applied and power is on, Soft start operates when rung signal is applied.
In case of maximum VR, it set 60 second. (Example : 20 mA : 60 sec, 12 mA : 30 sec)
– Soft up / down : When run signal and power are applied and if control input is applied, it will operate. It case of maximum VR, it set 15 second.
– If VR turn up to the right, the function does not work. And if VR turn right, time will be reduced.



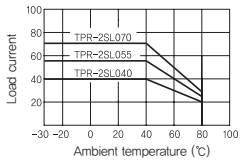
3. POWER (output limit function)
This function is to limit the output regardless of the control input amount. Even though the control input is 100 %, the output will decrease as turning POWER volume counterclockwise.

Installation



1. Please install it perpendicularly. If the product is installed vertically in unavoidable circumstances, please use 50 % of rated current.
2. When multiple products are closely installed, please install them with keeping a distance of more than a width of 5 cm and a length of 10 cm as shown in the picture.
3. In order to not block the air flow, please install the wiring duct less than the half of the heat sink height.
4. Please consider whether the air flow is good enough when installing the product. If the ambient temperature is as low as possible in the inside then the life span of the product is increasing as the durability and reliability of the product are improving. The operating ambient temperature is 0 ℃ ~ 40 ℃. Please refer to the following graph. However, if the ambient temperature is higher than 40 ℃, the maximum load current is decreasing like the below.

• Characteristic of current and temperature



5. When connecting R and U, please securely fasten them with using crimp connectors since high current flows into these terminals. If the contact surface of the connectors and terminals are poor, it may lead to a fire since the wires and terminal gets overheated.
6. Before applying power, this model need more than the third class grounding to prevent electric shock. This model does not have separate grounding terminal so we suggest using grounding terminal and bracket together when install this model to a panel.