PAC11P Series

Single-Phase Thyristor Power Regulator

Instruction Manual

Thank you for purchasing a Shimaden PAC11P Series Single-Phase Thyristor Power Regulator.
After making sure the product fits the desired description, you should carefully read the instructions and get a good understanding of the contents before attempting to operate the equipment.

Request

The instruction manual should be kept in a handy place where the end user can refer to it when necessary.

Preface

The instruction manual has been prepared for those involved in setup, wiring, operation or routine maintenance of PAC11P Series equipment.
The manual provides information concerning mounting, wiring and precautions when working with PAC11P Series equipment.
You should therefore keep it in a handy place to refer to when operating and handling the equipment.
Be sure to observe all precautions and adhere to the procedures provided in the manual.
Safety rules, precautions concerning equipment damage, additional instructions and notes are written based on the following headings.

◎ Matters that could result in injury or death if instructions are not followed.

⚠ WARNING

◎ Matters that could result in equipment damage if instructions are not followed.

⚠ CAUTION

◎ Additional instructions and notes

Note

⚠ WARNING

PAC11P Series instrument is designed to control heater power, etc., used by industrial equipment. It should not be used for nuclear power generation, traffic control, communications or medical equipment. You should either take appropriate safety measures or avoid using for control that could have a serious effect on human life. The manufacturer shall not be liable for an accident that results if used without taking appropriate safety measures.

1. The power regulator should be used so the terminal elements in the control box, etc., are not touched by human beings.
2. The power regulator should not be used as a switch.
   Even if output is zero, power is present in the capacitors and resistors of the output circuit, and could result in accident involving human life or serious bodily injury due to electrical shock.
3. Radiation fins and chassis become extremely hot. Never touch the radiation fins or chassis. Doing so could result in burn injury.
4. Do not supply power when wiring. Doing so could result in electrical shock.
5. Do not touch terminal elements or other charged parts while conducting electricity. Also, do not introduce foreign objects or matter into the equipment.
   If a foreign object or matter accidentally gets inside, be sure to turn off the power and make sure all is safe before introducing tools or your hands.

⚠ WARNING

If there is danger of damage to any peripheral device or equipment due to failure of the power regulator, you should take appropriate safety measures such as mounting a rapid fuse or overcurrent circuit breaker.

1. Concerning the ⚠ alert symbol on the power regulator's plate, a ⚠ alert symbol is printed on the label applied to the outer surface of the device.
   The symbol is provided to prompt you to employ special care not to touch the device because doing so could result in electrical shock if parts that conduct power are touched when power is present, or could result in burn injury if touched when hot, etc.
2. Provide a switch or breaker as a means of cutting off power for external power circuit connected to the power terminal of the device.
   Mount a switch or breaker near the controller where the operator can get to it easily and label it as an electrical breaker for the device.
3. Be sure to securely fasten conductor cable connections before using.
   Failure to do so could result in burning from overheating due to contact resistance.
4. Be sure power supply voltage and frequency do not exceed the rating.
5. Do not apply voltage/current other than rated input to the input terminal.
   Doing so could shorten the life of the product or result in equipment failure.
6. Voltage/current of load connected to the output terminal should not exceed the rating.
   Using voltage/current that exceeds the rating could shorten the life of the device by raising the temperature, and could result in equipment failure.
7. Be sure to mount the terminal cover that comes with the device after wiring.
8. The user should absolutely not modify or use the device in any way other than it was intended to be used.
9. Be sure to observe the notes and precautions provided in the manual to use the device safely and maintain its reliability.

Note: Shimaden shall bear no responsibility, monetarily or otherwise, for accident or damages caused by failure to observe warnings, notes and precautions contained in the instruction manual.

SHIMADEN CO., LTD.

MPA011P-E01-A
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Contents

1. Ordering information

1-1. Preliminary check

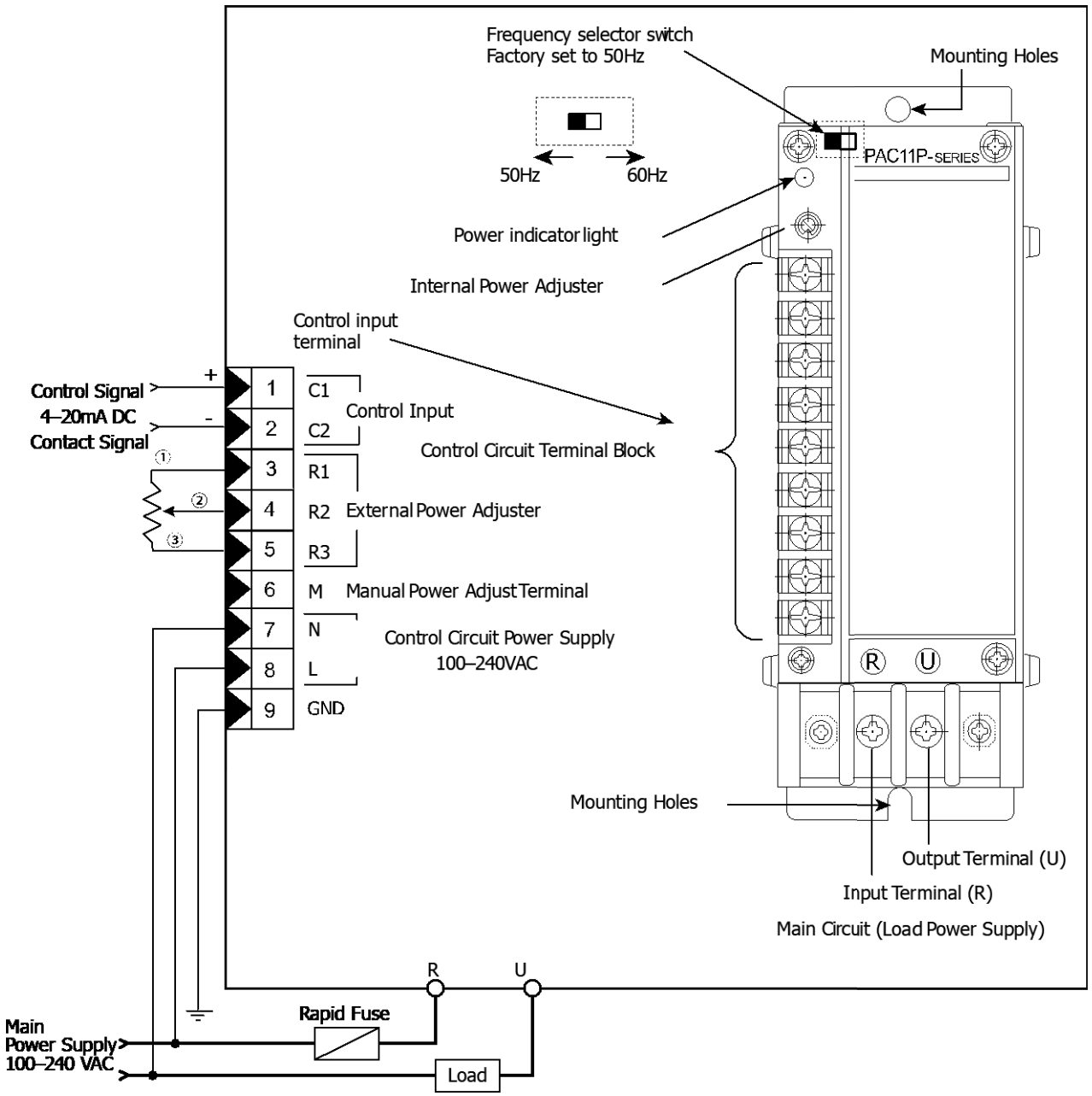
The equipment has undergone sufficient quality control inspections, but you should check the specification code, inspect the equipment and confirm you have all the accessories to make sure nothing is missing or damaged.
Compare the specification code on the case with the following to make sure it is the product you ordered.

■ Ordering information

Item	Code	Specifications			
1. SERIES	PAC11P	Phase Angle Single Phase Power Regulator (with soft start)			
2. CONTROL INPUT		0	4 to 20mA DC, Receiving impedance: 100Ω		
		2	Non-voltage contact		
3. CURRENT CAPACITY		020	20A		
		030	30A		
		045	45A		
		060	60A		
4. POWER SUPPLY		90-	100 to 240V AC±10%　50/60Hz		
5. EXTERNAL POWER ADJUSTER		Current Input	N	None (Internal installation as standard)	
			P	External power adjuster	
			M	Manual power adjuster	
			B	Base power adjuster	
			W	External power adjuster + manual power adjuster	
			Y	External power adjuster + base power adjuster	
		Contact Input	P	High power adjuster (standard)	
			B	High power adjuster (standard) + Low power adjuster	
6. REMARKS			0	Without	
			9	With (Please consult before ordering.)	

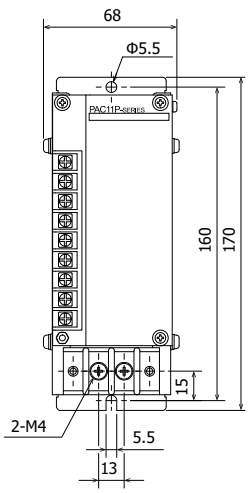
○ All external power adjuster are equipped with a B10kΩ (1W) scale plate, knob, and lead wire of 1m.

2. Panel part names and control terminals

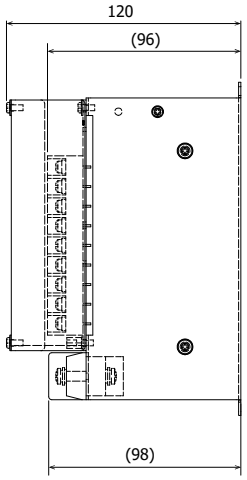


3. External dimensions / terminal dimensions / weight

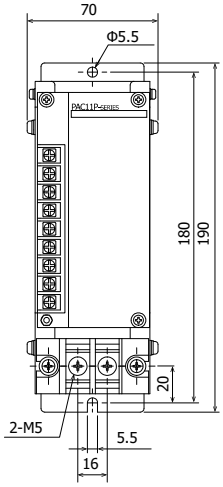
20A, 30A



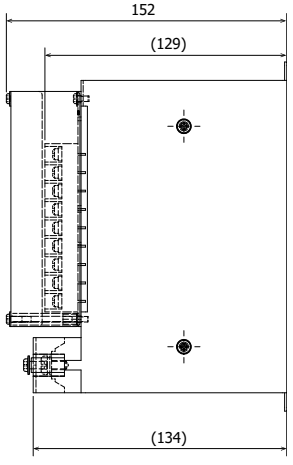
Weight: approx. 1.1kg



45A, 60A



Weight: approx. 1.9kg



Unit: mm

4. Setup location

The device is designed to be used under the following conditions. Observe the following environmental conditions when using:

1) Indoor use
2) Elevation: Max. 2000 m
3) Temperature range: -10 to 50°C
4) Humidity range: Max. 90% RH Must be no dew condensation.
5) Transient overvoltage category: II
6) Pollution class: 2 (IEC 60664)

⚠ CAUTION

Do not use in the following locations. Doing so could lead to equipment failure, damage or fire.

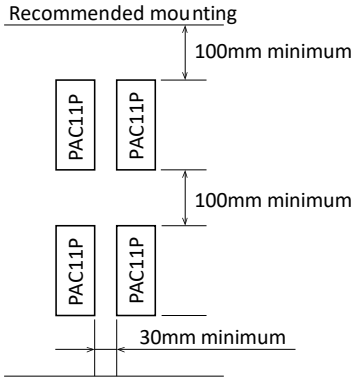
- Places exposed to flammable or corrosive gases, oil mist, or excessive dust that could cause insulation to deteriorate.
- Places subject to vibration or impact.
- Places exposed to water dripping or direct sunlight.
- Places directly exposed to air from heater or air conditioner.
- Places where maintenance cannot be performed safely.

5. Mounting

Fasten to control panel, wall, rack, etc., when using. To ensure safety, arrange so that people cannot easily come into contact with the equipment.
Be sure to mount vertically to allow heat to dissipate. If the device has to be mounted horizontally, operate at no higher than 70% of the current capacity. The internal heating value of this unit is as follows

Note: Please pay close attention to heat dissipation and ventilation inside the panel.

Rated current	20A	30A	45A	60A
Heat value	24W	36W	48W	60W



6. Terminal arrangement and wiring example

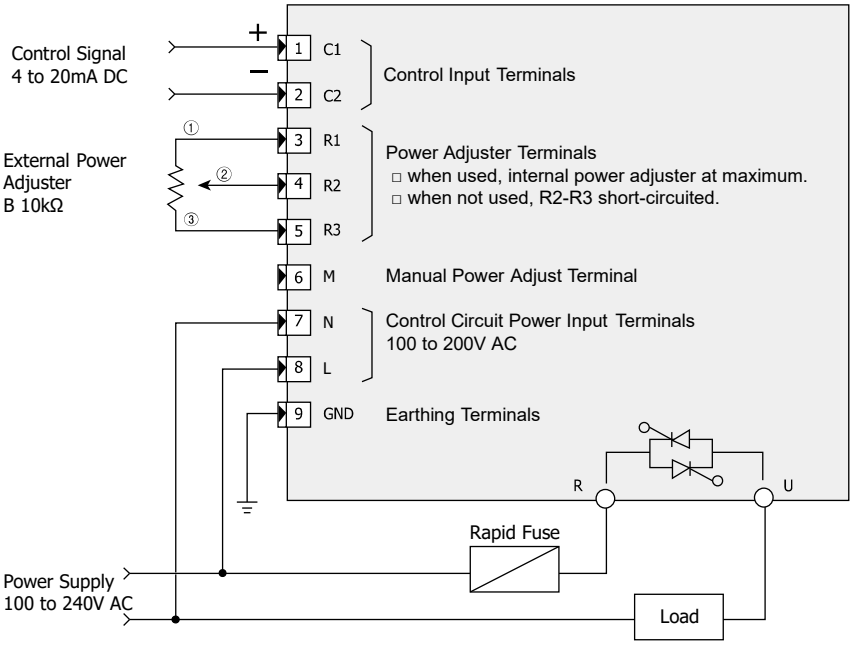
⚠ CAUTION

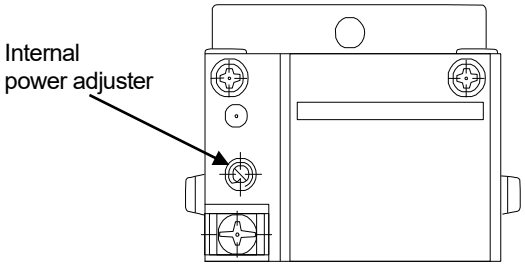
- Do not supply power when wiring. Doing so could result in electrical shock.
- Do not touch terminal elements or other charged parts while conducting electricity.

This unit requires separate wiring for the main circuit (power supply for the load) and the control circuit power supply.

6-1. For current input

This function can be used by connecting an external regulator (B 10kΩ/VR) to the terminals of each function.

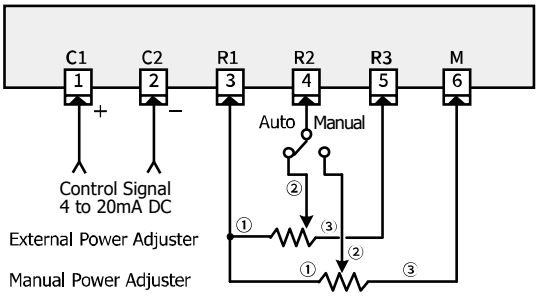




Power adjustment is performed to optimize thyristor output in the range of 0%-100% when the control type is 100%.

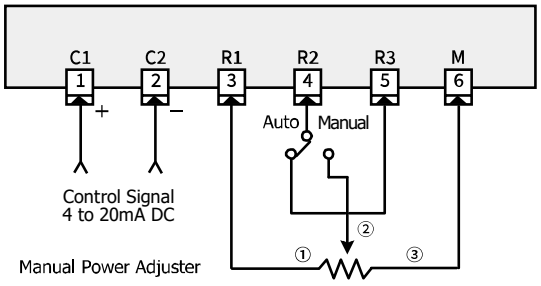
■ Connection of various power regulators

(1) Using external power/manual switching

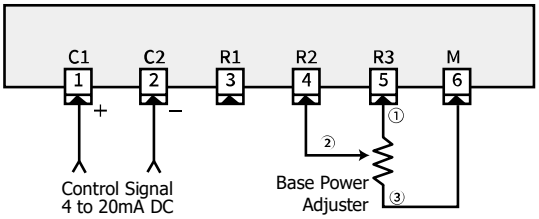


□ Set the internal power regulator to maximum.
□ If the external power regulator is not used, automatic operation will start when R2-R3 is shorted, and the output at this time will be performed by the internal power regulato r.

(2) Using automatic/manual sw itching

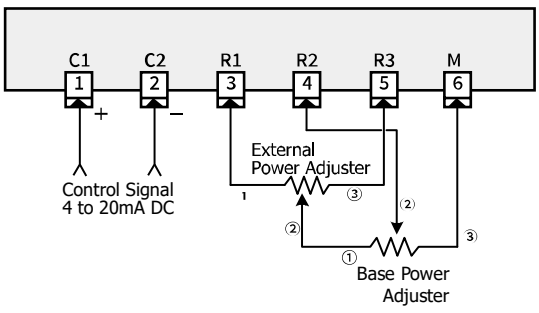


(3) Adjusting base power



□ In this case, power adjustment is performed using the internal power regulator.

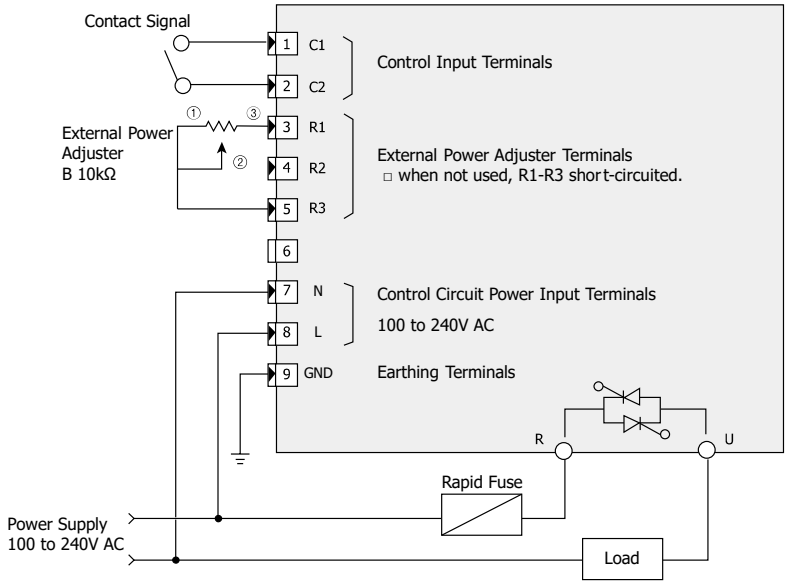
(4) When using external power adjustment and base power adjustment simultaneously



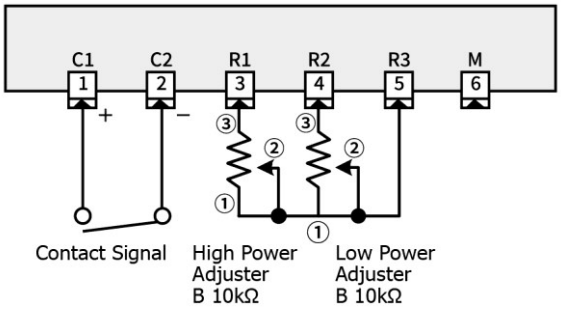
□ In this case, the external power regulator and base power regulator will interfere with each othe r.
□ Set the internal power regulator to maximum.

6-2. For contact input

For use with Standard features



6-2-1 High/Low adjustment



Note: When the contacts (C1-C2) are conducting, the output can be adjusted from 0 to 100% by the high power adjuster.
When the contact is released, the remaining output can be adjusted to 0 to 100% against the adjusted value of the high power regulator.

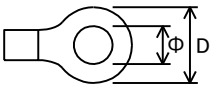
Low output = high adjustment value + low adjustment – 100 (%)

In the above calculation, if the low output is negative, the low output will be zero.

7. Power supply and load wiring

7-1. Wiring

Wire referring to the figure above. If using a rapid fuse, place at entrance to the terminal R of power supply.
Remove the terminal block cover to connect wires to the terminal block.
Loosen the fastening screws mounted on the device and wire.

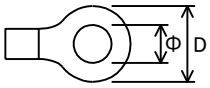


Control terminal

ϕ (mm^2)	Min. 3.5
D (mm^2)	Max. 8.0
Screws	M3.5
Fastening torque (N· m)	0.8 to 1.2
Recommended wire thickness (cross-sectional area)	Max. 2.0mm^2

7-2. Power supply and load wiring

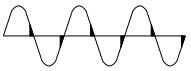
PAC11P employs 2-terminal wiring. M4 screws are used for the R and U terminals of 20/30A, M5 for 45/60A.
Use the proper terminal and securely fasten the screws.



	Current capacity		
	20A/30A	45A	60A
ϕ (mm^2)	Min. 4	Min. 5	
D (mm^2)	Max. 10	Max. 13	
Screws	M4	M5	
Fastening torque (N· m)	1.2 to 1.4	2.0 to 2.4	
Recommended wire thickness (cross-sectional area)	3.5mm^2	8.4mm^2	13.3mm^2
Thickness (cross-sectional area) of wire used for grounding	Min. 2mm^2		

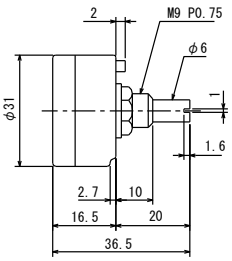
Use wiring of material that matches current capacity for R and U terminals.

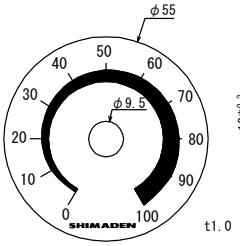
8. Control mode・Output waveforms

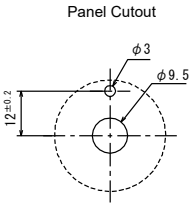
Item / Control mode	Noise	Swing of movable coil type meter	Output waveforms		
			10% output	50% output	90% output
Phase control	Yes	Continuous			

9. External power adjuster

	Phase control	Lead wire	Specifications
Current input	QSV002	3 wires	Resistor: B 10kΩ Lead wire length: 1m M3.5 Crimp terminal
Contact input	QSV001	2 wires	







Note: The external power adjuster is convenient to operate in a place away from the instrument, but when wiring, do not bundle it with the high-voltage circuit, but wire it apart.
If it is unavoidable to wire together, use a shielded wire and ground at one point.

10. Specifications

- Control mode : Phase angle (with soft start)
- Possible Loads : All resistance loads.
- Power Supply Cycle : 50/60Hz (Switched by the internal switch: factory set: 50Hz)
- Output Voltage Control Range : 0 to 95% min. of input voltage.
- Power Lamp : Green LED lamp.
- Current capacity : 20, 30, 45, 60A
- Power Supply : 100 to 240V AC ±10% 50/60Hz
- Control input
  - Current : 4 to 20mA DC (Receiving impedance: 100Ω)
  - Contact : Non-voltage contact.
- Power Adjuster
  - Current input : Internal installation as standard. (External installation as option)
  - Contact input : External installation as option.
- Auto/Manual Power Adjuster : Only current input type is available – optional.
- Thyristor Element Cooling : Natural air.
- Over-Current Protection : None available. (Use a fuse for semiconductor)
- Minimum Load : 10% min. of current capacity. (no operation at no load)
- Operating Ambient
  - Temperature : -10 to 50℃
  - Humidity : 90% RH (No dew condensation)
  - Elevation : 2000 m above sea level or lower.
  - Pollution class : 2 (IEC 60664)
- Storage temperature : -20 to 65℃
- Insulation Resistance : 500V DC 20M ohms between power supply and grounding terminals.
  500V DC 20M ohms between power supply and input terminals.
- Dielectric Strength : 1 min. at 2000V AC between power supply and grounding terminals.
- Dimensions and Weight : See “3.External dimensions / terminal dimensions / weight”

Temperature and Humidity Control Specialists
SHIMADEN CO., LTD.
Head Office: 2-30-10 Kitamachi, Nerima-ku, Tokyo 179-0081 Japan
Phone: +81-3-3931-7891 Fax: +81-3-3931-3089
E-MAIL: exp-dept@shimaden.co.jp URL: https://www.shimaden.co.jp