

°C	Series PAC27P THYRISTOR SINGLE PHASE POWER REGULATOR
%RH	



RoHS directive supported

BASIC FEATURES

- **Current Capacity: 20, 30, 45, 60, 80, 100A**
- **Power Supply: 100 to 120/200 to 240V AC**
- **On the condition that the product is used with a noise filter as specified by SHIMADEN, the CE safety standard (EMC Directive) shall be satisfied.**
- **As we attach importance to safety aspects, the instrument has a number of alarm circuits including a built-in voltage feedback circuit as a standard function.**
- **If you select the current or the voltage control system, or the voltage square switching control system from the optional functions, control of special types of heaters and transformer loading is possible.**

- As the PAC27P series has a built-in overcurrent protection circuit, an alarm action signal is output when the overcurrent gate breaking circuit is placed in operation, upon malfunction of the rapid fuse, when SCR is overheated, or upon detection of SCR shorting.

The availability of various optional functions allows for a wide range of uses.

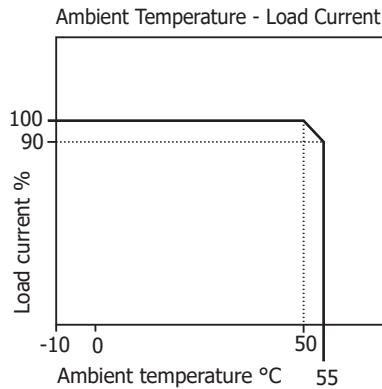
One of the current, power, or voltage square feedback systems being selectable, that control which is most appropriate for the characteristics of your heater can be carried out.

• Special Heater and Feedback Control

Type of heater	Feedback control system Additional function
Kanthal Super	Constant voltage control + current limiting, Constant power control + current control, Constant current control
Pure metals (platinum, molybdenum, tungsten, etc.)	Constant voltage control + current limiting, Constant power control + current control, Constant current control
Carbon	Constant voltage control (+ current limiting), Constant power control
Salt bath	Constant voltage control (+ current limiting), Constant current control
SiC (silicon carbide)	Constant voltage control (+ current limiting), Constant power control, Constant current control

□ Ambient Temperature and Load Current

The current rated for the PAC27 is at 50°C of ambient temperature. In case ambient temperature exceeds 50°C, the instrument should be used with load current as illustrated below.



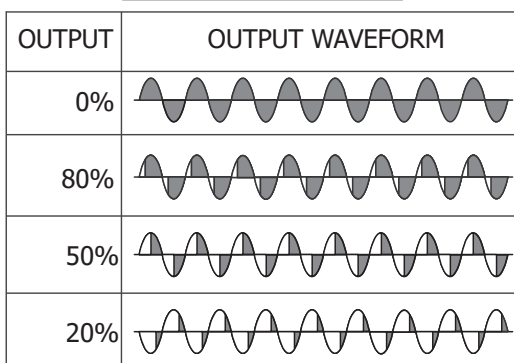


■Names of monitor lamps	
• PL	Power display (phase control)/Output display (cycle operation)
• O.C.	Overcurrent protection action display
• FUSE	Rapid fuse fusing display (option)
• O.H.	Thyristor overheating alarm display
• THY	Thyristor short circuit display/open load display
• H.B.	Heater break alarm action display (option)
■Names of adjuster	
• POWER	Power adjuster
• SOFT START	Soft start time adjuster
• HEATER SET	Heater setting device for heater break alarm (option)
• H.B. SET	Heater break alarm setting device (option)
■Terminal codes and description	
• C1-C2	Control input signal
• R1-R2-R3	External power
• M	Manual operation power (voltage/current input)
• L2-L3	Low power (contact input)
• CL1-CL2-CL3	Current limit setting device (option for phase control)
• AL1-AL2	Alarm output
• HB1-HB2	Heater break alarm output (option)

Terminal No	Code	Terminal code	
		Voltage/current input	Contact input
Upper terminal	1	C1 (+)	C1
	3	C2 (-)	C2
	5	R1	R1
	7	R2	R2
	9	R3	R3
	11	--	L2
	13	M	L3
	15	--	--
	17	--	--
Lower terminal	2	CL1	
	4	CL2	
	6	CL3	
	8	--	
	10	--	
	12	AL1	
	14	AL2	
	16	HB1	
18	HB2		

CONTROL SYSTEM AND OUTPUT WAVEFORM

PHASE CONTROL SYTEM



Control input and Ratings

- Control element configuration: Thyristor (SCR) x 2 Anti-parallel connection
- Power supply: 100 to 110V, 110 to 120V, 200 to 220V, 220 to 240V AC ±10% 50/60 Hz
- Rated frequency: Common to 50/60Hz
- Current capacity: 20, 30, 45, 60, 80, 100A
- Control input signal:
 - Current: 4 to 20 mA DC / Receiving impedance: 100 Ω
 - Voltage: 1 to 5 V DC & 0 to 10 V DC / Input impedance: 200kΩ minimum
 - Others: Voltage, current signal
 - Contact: No-voltage contact signal
- Power Adjuster: Voltage and current input types - Internal power adjuster is equipped on standard basis.
External power adjuster is mountable at option.
- Element protection system: Electronic overcurrent gate breaking circuit (when in action, alarm is output.)
Rapid fuse (option) (Upon fuse breaking, alarm is output.)
- Alarm action: When overcurrent gate breaking circuit is in action, when rapid fuse breaks, when thyristors are overheated, when shorting of thyristors is detected, when current flows across alarm output terminals (AL1 and AL2) (contact 240V AC, 1A)
- Additional functions (Common options)
 - Rapid fuse: with alarm output
 - External power
 - Adjustment functions: External power
 - Manual power
 - High/low power
 - High power Low power
 - External power + manual power
 - Heater break alarm: To be set at 0 to 100% of rated current
- Operating environment:
 - Ambient temperature range: between -10 and 50°C
 - Ambient humidity range: 90% RH maximum with no dew condensation
 - Storage temperature: between -20 and 65°C
- Applicable standards: Safety IEC 60947-4 & EN 60947-4
EMC EN 60947-4 on condition that designated noise filter is used.
RoHS directive supported
- Insulation resistance/dielectric strength
 - Insulation resistance: 500VDC 20MΩ minimum between power supply terminal and chassis
 - Dielectric strength: 2000VAC/min. between power supply terminal and chassis
2300VAC/min. between power supply terminal and control input
- Control System: Phase control
- Soft start time: Adjustable possible between 1 and 30 seconds
- Output voltage control range: 0 to 97% of input voltage
- Degree of output stability: Output fluctuation ±2% maximum as against input fluctuation ±10%
- Output voltage characteristics: Linear output by voltage feedback (various characteristics are selectable as designated)
- Applicable load: All heaters (additional functions to be selected suitably for characteristics)
Inductive load and transformer primary control
- Power supply display: Green LED lamp lights.
- **Additional functions (options)**
 - Power adjuster functions: See appropriate item in common specifications.
 - Constant current control
 - (current FB): Output current in proportion to control input signal
 - Constant power control
 - (power FB): Output power in proportion to control input signal
 - Power linear control
 - (voltage² FB): Control and the square of output voltage are proportional to each other.
 - Current limiting function: Current is limited to 50 to 100% of the rating.

■ Current Capacity and Calorific Value

When current flows in the thyristors, voltage (0.9-1.3 V) is generated across the terminals.
The product (W) of this voltage across the terminals and the current is Joule heat, which raises the temperature of the thyristor elements.
Full consideration needs to be given to radiation of heat and ventilation.

PAC27 Internal Calorific Value (Calorific value conversion formula: 860kcal=1000W)

Current Capacity	20A	30A	45A	60A	80A	100A
Calorific value without fuse	23W	35W	54W	59W	79W	103W
Calorific value with fuse	25W	37W	58W	63W	85W	110W

ITEMS	CODE	SPECIFICATIONS	
SERIES	PAC27P	Phase Angle Control Single Phase Power Regulator	
CONTROL INPUT	2	Contact	
	3	1 to 5V DC Input Resistance: 200kΩ min.	
	4	4 to 20mA DC Receiving Resistance: 100Ω	
	6	0 to 10V DC Input Resistance: 200kΩ min.	
	9	Others (Please consult before ordering)	
POWER SUPPLY	13-	100 to 110V AC±10%, 50/60Hz	
	14-	110 to 120V AC±10%, 50/60Hz	
	15-	200 to 220V AC±10%, 50/60Hz	
	16-	220 to 240V AC±10%, 50/60Hz	
CURRENT CAPACITY	020	20A	
	030	30A	
	045	45A	
	060	60A	
	080	80A	
	100	100A	
FEEDBACK FUNCTION	0	Constant Voltage Control (standard feature)	
	1	Constant Current Control	
	2	Constant Power Control	
	3	Power linear Control	
CURRENT LIMIT FUNCTION	0	None	
	1	With	
EXTERNAL POWER ADJUSTER	CONTACT INPUT	N	None (Internal installation as standard)
		P	External power adjuster QSV002 x 1 included
		B	Base (low) power adjuster QSV002 x 1 included
	CURRENT/VOLTAGE INPUT	H	High/Low power adjuster QSV002 x 2 included
		P	External power adjuster QSV002 x 1 included
		M	Manual power adjuster QSV002 x 1 included
		W	External power + Manual power QSV002 x 2 included
HEATER BREAK ALARM	0	Without	
	1	With	
RAPID FUSE	0	Without	
	1	With	
REMARK	0	Without	
	9	With (Please consult before ordering.)	

note) 1. In order to comply with the EMC Directive, use the noise filter specified by us, which is sold separately, and wire according to the specified method.

One filter is required for each PAC27 series thyristor type power regulator.

- Variable resistance heating elements such as silicon carbide (SiC) heaters have a high negative temperature coefficient (their resistance greatly affected by temperature). During a temperature rise, their resistance falls far below that within the ordinary temperature range, leading to inadequate power.

Maintaining output power within an appropriate range at every temperature requires the device's current capacity to be multiplied by a square root of the heating element's resistance ratio.

To give an example, the approximate resistance ratio of SiC heaters is 1:3, a square root of which is $\sqrt{3}$, or approx. 1.73. The required current capacity when using those heaters is thus 1.73 times the original capacity.

However, since heater deterioration may further widen the ratio, a current capacity even higher than the abovementioned must be selected. As for use of SiC heaters, we recommend about double the original capacity.

■Rapid fuse (option)

Rated current	PARTS NO.
20A	350GH-32SUL
30A	350GH-40SUL
45A	250GH-63SUL
60A	350GH-80SUL
80A	350GH-160SUL
100A	350GH-160SUL

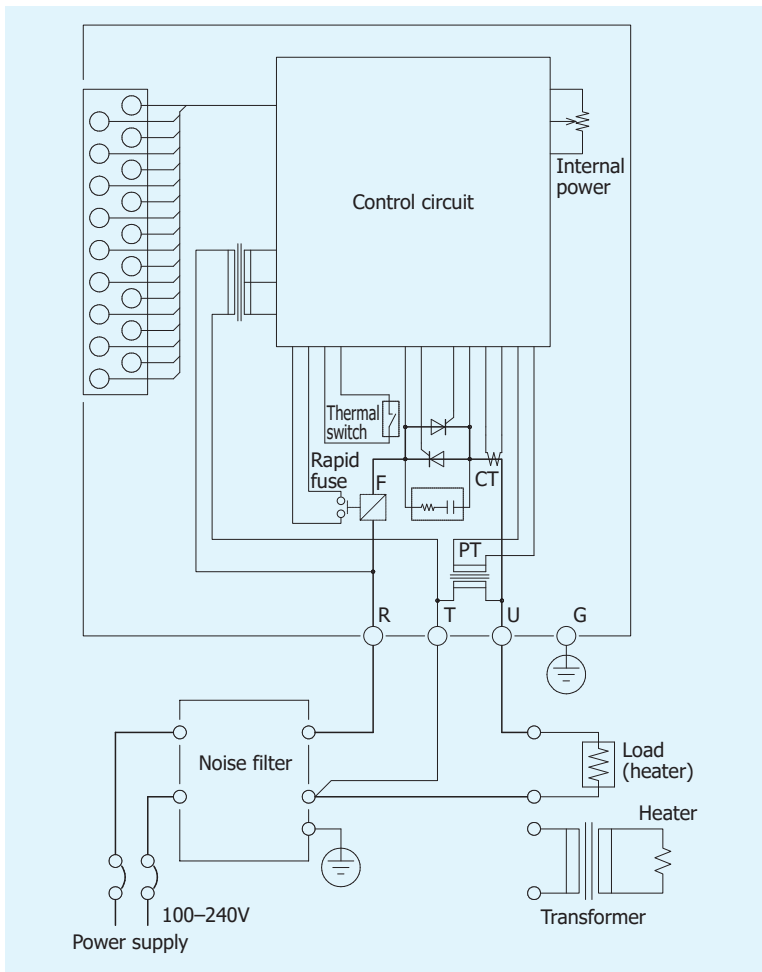
Fuse maker : HINODE EKECTRIC CO.,LTD

■Noise Filter (Option)

Current capacity	Type
20A	NF2020C-SDG
30A	NF2030C-SDG
45A	NF2050C-SDG
60A	NF2060C-SDG
80A	NF2080C-SDG
100A	NF2100C-SDG

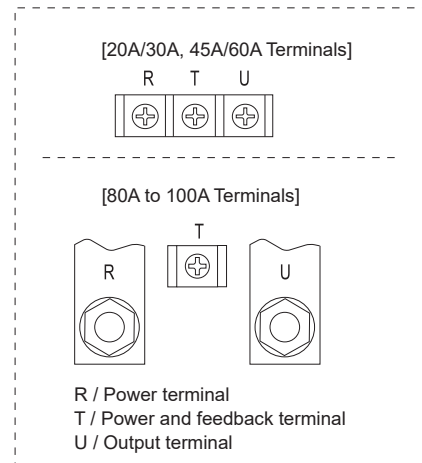
■External Power Adjuster

CODE	SPECIFICATIONS
QSV002	with B10kΩ, knob, scale panel, lead wire 1m



- Terminal Marking -

- Control terminal
No.1 to 18 (See panel information and control terminals.)
- Power supply / Load circuit

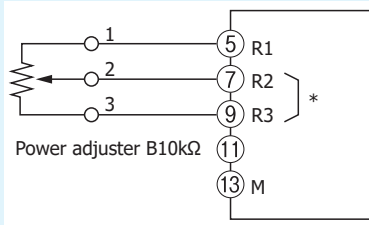


R / Power terminal
T / Power and feedback terminal
U / Output terminal

Output Adjusting Function (Upper Terminal)

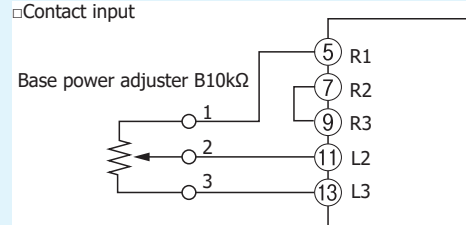
This function is available by connecting adjuster (rating B 10kΩ 1W), after delivered to the user.

External power adjuster



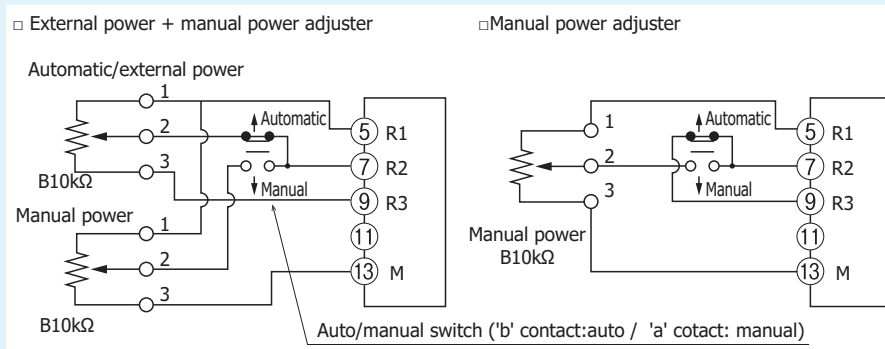
* When an external power adjuster is not used, the terminals 7 (R2) and 9 (R3) should be shorted.

Base (residual) power adjuster



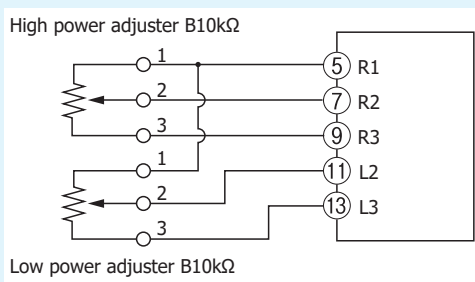
This is used to allow for output even when the control signal is at 0%. Adjusting range is 0 to 100%.

When automatic operation + manual power adjuster switch is used (voltage/current input type)



Provide an auto/manual switch contact externally as shown in the drawing. It is safe to use the 'b' contact for auto and the 'a' contact for manual.

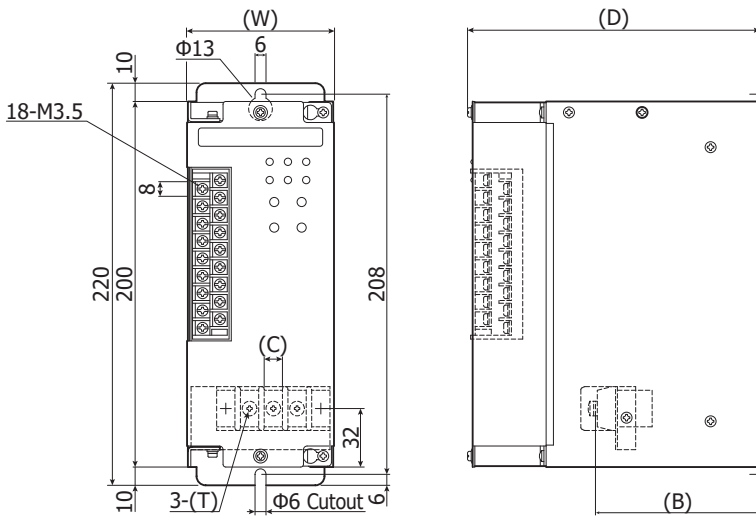
Contact input High-low power adjuster



- High power: When current flows across C1-C2, output can be adjusted in a range from 0 to 100%
- Low power: When C1-C2 are open, residual output is regulated. Residual output = (high power) x (low power)

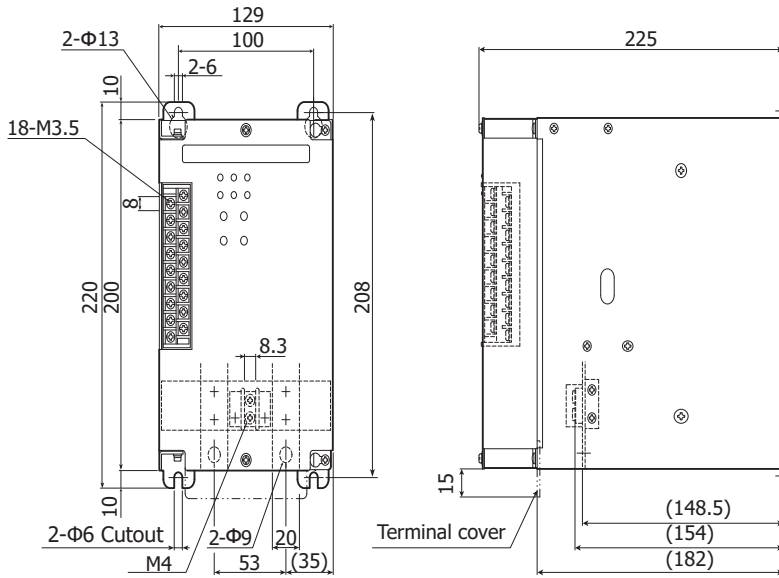
Example: When high power = 70% and low power = 40%, residual output is 70% x 40% = 28%

20A, 30A, 45A, 60A



Code \ Current	20A/30A	45A/60A
W	81	102
D	160	176
B	90	108
T	M4	M5
C	10	13
Weight	Approx. 2.2kg	Approx. 3.1kg

80A, 100A

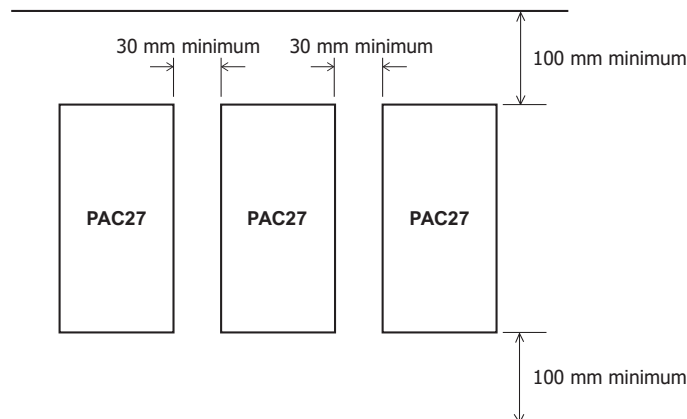


Weight
80A, 100A : Approx. 4.4kg

Unit: mm

INTERVALS REQUIRED for MOUNTING

Open the cover when wiring is carried out for the instrument. Stick to the following interval sizes.



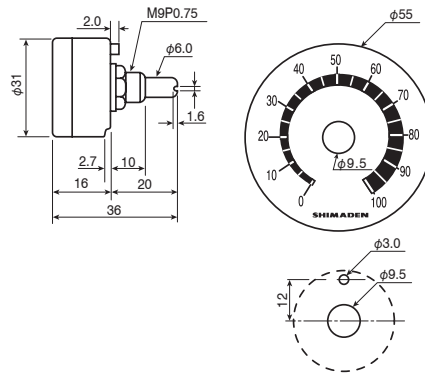
Rating

Model : QSV002
 Resistance value : B10kΩ
 Length of lead wire : 1m
 M3.5 crimp terminal



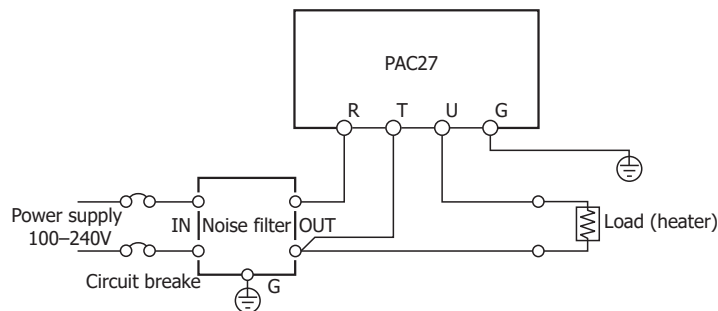
External dimensions and mounting sizes

Lead wire : With 1m vinyl lead
 Panel / Knob : With 1 each



Unit: mm

Especially with phase control for thyristors, part of the power supply sine wave is dropped. This produces distortion in the sine wave if power supply impedance is high. Also, because power supply is switched each half cycle, switching noise is produced. The power supply distortion and noise may affect other equipment. Use a noise filter if necessary.



Install the noise filter on the same metal plate as PAC27, and be sure to ground it.
 Keep the wiring between the noise filter and the PAC27 as short as possible.

Noise filter (sold separately)

The frequency of noise produced by the thyristor is distributed in a place below several megahertz, and the noise dampening effect of common commercially available noise filters is insufficient. Using noise filters specified by Shimaden can dampen this noise. This noise filter is specially designed for our thyristor power regulators.

For details on the noise filter, refer to the noise filter NF series single item catalog.

Head Office & Saitama Factory
 ISO 9001/ISO 14001 Certification Obtained

(The contents of this brochure are subject to change without notice.)

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