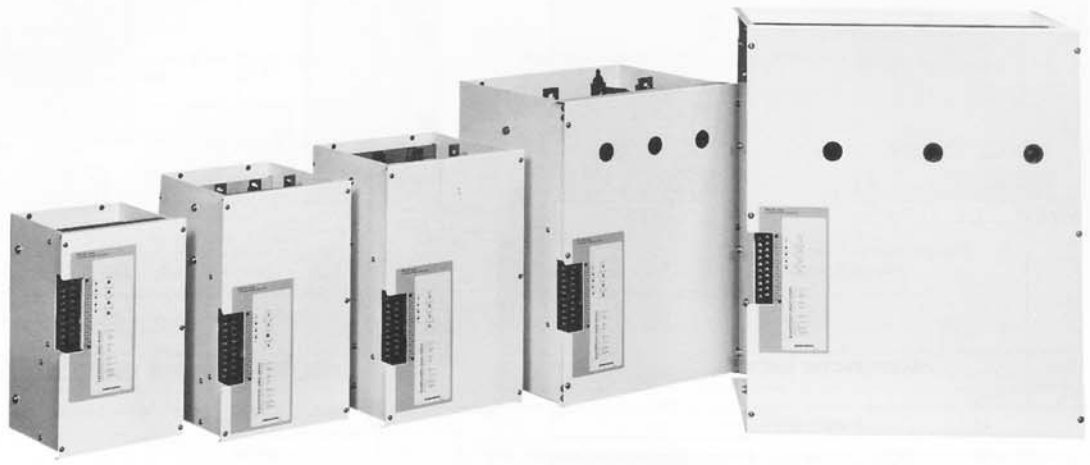
THREE PHASE POWER REGULATOR

SERIES PAC36P 20~600A

- Wide application with variety of functions
- Suitable for air conditioning, electric furnace, dryer, bio engineering, food industry, chemical industry, plastic formation and control of heat source applications.



20A 30A, 45A 60A, 90A 135A, 180A 240A, 300A 450A, 600A

FUNCTION

Standard Function

Electronic over current protect function:	Protects thyristor element by shutting off the over current detected by a load current monitoring CT.
Constant voltage characteristics by means of voltage feedback:	Stable output provided by the voltage control function and easy operation achieved by the linear characteristics of control input and output voltage.
Soft start function:	Setting suitable soft start time for the load.

Additional Function (option)

Automatic power adjusting function:	The suitable power for the control temperature is continuously controlled by a signal from the programmable controller, computer and adjuster. Applicable for soft control of the low range.
Constant-current control (Current feedback):	Applicable to controlling the pure metallic heater and the Kanthal Super heater.
Constant-power control (Power feedback):	Applicable to controlling the SiC and the carbon heater, and applicable to high stability controlling.
Power linear control (Voltage square feedback):	Applicable to precise controlling for Nichrome heater load with power linear characteristics of the control input/output voltage.
Current limiting function:	Applicable to loads with rush current on starting and continuous usage over current condition such as pure metallic,Tungsten and Molybdenum heaters.
Start up output limiting function:	Applicable to the rush current reduction and load protection on turning on the power supply.
Heater break alarm:	Alarm display and output in case of detecting the low power condition of the broken heater and heater defect.
Rapid fuse:	Perfect protection for the thyristor device and the power line from the over current of the short circuit and the grounding.
Power adjustment function:	Addition of various manual equipment used for adjusting ramp, base (residual output), manual and high/low.

Monitor and Alarm Output on the Trouble Situation

Over-current protection:	[O.C] monitor lights and alarm output on
Fan stop (for models over 180A):	[FAN] monitor lights and alarm output on
Rapid fuse burnt out:	[FUSE] monitor lights and alarm output on
Heater break alarm:	[H/B] monitor lights and warning output on

SPECIFICATION

Control Input and Rating
- Current input: 4~20mA/DC, Receiving impedance: 100Ω
- Voltage input: 1~5V/DC, Input impedance: 200kΩ min. 0~10V/DC, Input impedance: 200kΩ min.
- Contact signal: Non-voltage contact signal Note: Select external power (P) or (H) in the table of code Selection Item 7. (Output Adjusting Function)

Power Supply and Rating
- 200V type: 200~220V AC ±10% 50/60Hz
- 220~240V AC 〃
- 400V type: 380~400V AC 〃
- 400~440V AC 〃

Control Mode: Phase angle control system
- Soft start: Adjustable approx. 1~10 sec. (time for reaching 90%)
- Applicable load: Resistive load, inductive load (transformer primary side control)
- Output voltage control range: 0~98% minimum of input voltage
- Output stability (95% or less of output voltage): Input fluctuation ±2% or less when input fluctuation is ±10%
- Control element configuration: Mixed antiparallel configuration of SCRs and diodes

Over-current Protection System
- Electronic type (gate signal breaking system) standard: approx. 130% of rated current
- Rapid fuse type (option): 130~150% of rated current
- Reset
  - Electronic type: Turn power OFF and reapply
  - Rapid fuse: Replace fuse.

Current Capacity and Cooling System
- 20A,30A,45A,60A,90A,135A: Self-cooling system
- 180A,240A,300A,450A,600A: Forced air cooling system

Alarm Monitors and Rating
- Over-current: [O.C] monitor lights./AL1-AL2 conducting
- Fan stop: [FAN] monitor lights./AL1-AL2 conducting
- Fuse burnt out: [FUSE] monitor lights./AL1-AL2 conducting
- Heater break: [H/B] monitor lights./HB1-HB2 conducted
- Output contact rating: 240V AC 1A/Resistive load

Power Lamp
- Correct phase sequence: Green LED lights.
- Open/opposite phase sequence: Red LED lights.

Operating Environment
- Ambient temperature range: –10~50°C
- Ambient humidity: 90% RH max. with no condensation

Insulation Resistance
- Power terminal and chassis: 500V DC 20MΩ min.
- Input terminal and power terminal: 500V DC 20MΩ min.

Dielectric Strength
- Power terminals and chassis:
  - 200~240V power supply: 2000V AC 1 minute
  - 380~440V power supply: 2500V AC 1 minute

Material/Finish: Ordinary steel plate/paint coating (equivalent to N8.5 Munsell number)

External Dimensions and Weight: See external dimension drawings.

Terminal Cover: Installed as standard equipment.

Additional functions (option)
- Power adjuster
- Connection to voltage/current output type controller: 0~100%
- Internal Power (standard): 0~100%
- External power: 0~100%
- Manual power: 0~100%
- Base power: 0~100%
- External power+Manual power:
- External power+Base power: 0~100%
- Connection to contact output type controller
- External power: 0~100%
- High-low power: 0~100%
- Constant current control (current feedback)
  - Applicable loads: Pure metallic heaters, super Kanthal, e
- Constant power control (power feedback)
  - Applicable loads: SiC, carbon heaters
- Power linear control (voltage feedback)
  - Applicable loads: Nichrome heater
- Output limiting function
  - Current limit: 50~100% of rated current
  - Start up output limiting: 0~60% output for 1~60 sec.
- Rapid fuse: With alarm output function
- Heater break alarm: Setting at 0~100% of rated current
- Automatic power adjusting function: 50~100%

INTERNAL HEAT GENERATED

Internal heat generated by series PAC36P at maximum current operation is as follows. The heat decrease is proportional to the current decrease. Ventilation should be considered for the system.

Rating current (A)	20	30	45	60	90	135	180	240	300	450	600
Internal heat generated (W)	82	121	151	196	274	442	620	731	1040	1567	2000

Approx. 10% more heat is generated in case of using rapid fuse.

THREE PHASE POWER REGULATOR

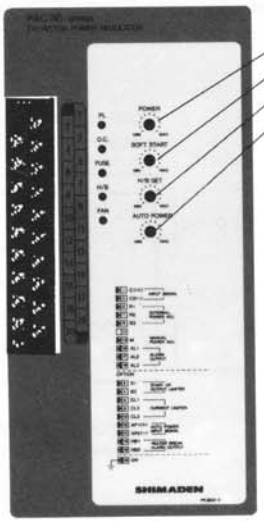
ORDERING INFORMATION

ITEM	CODE		SPECIFICATIONS	
SERIES	PAC36P		Phase Angel Cotrol 3-Phase Power Regulator	
CONTROL INPUT	3		1~5V DC, Input Impedance: 200kΩ / contact signal	
	4		4~20mA DC, Receiving Impedance: 100Ω / contact signal	
	6		0~10V DC, Input Impedance: 200kΩ / contact signal	
	9		Others (please consult before ordering.)	
POWER SUPPLY	15-		200~220V	
	16-		220~240V	
	17-		380~400V	
	18-		400~440V	
CURRENT CAPACITY	200~240V		380~440V	
	CODE		CODE	
	021	20A	022	20A
	031	30A	032	30A
	041	45A	042	45A
	061	60A	062	60A
	091	90A	092	90A
	131	135A	132	135A
	181	180A	182	180A
	241	240A	242	240A
	301	300A	302	300A
	451	450A	452	450A
	601	600A	602	600A
FEEDBACK FUNCTION	0		Constant voltage (standard feature)	
	1		Constant current	
	2		Constant power	
	3		Voltage Square-root	
OUTPUT CONTROL FUNCTIONS	0		None	
	1		Startup time output control limiting (0~60%, 1~60 sec.)	
	2		Current limiting	
	3		Startup time output control + Current limiting	
EXTERNAL POWER ADJUSTER	WHEN USED WITH VOLTAGE AND CURRENT OUTPUT CONTROLLER	N	None (Internal installation as standard)	
		P	External power adjuster	
		M	Manual power adjuster	
		B	Base power adjuster	
		W	External power + Manual power	
		Y	External power + Base power	
	WHEN USED WITH CONTACT OUTPUT	P	External power adjuster	
		H	High / Low power adjuster	
HEATER BREAK ALARM	0		Without	
	1		With (0~100% setting of rated current)	
RAPID FUSE	0		Without	
	1		With (See rapid fuse table.)	
AUTO POWER ADJUSTMENT FUNCTIONS	0		Without	
	4		4~20mA DC, Receiving impedance: 100Ω	
	6		0~10V DC, Input impedance: 200kΩ	
REMARKS	0		Without	
	9		With (Please consult.)	

THREE PHASE POWER REGULATOR

PANEL INFORMATION AND CONTROL TERMINALS

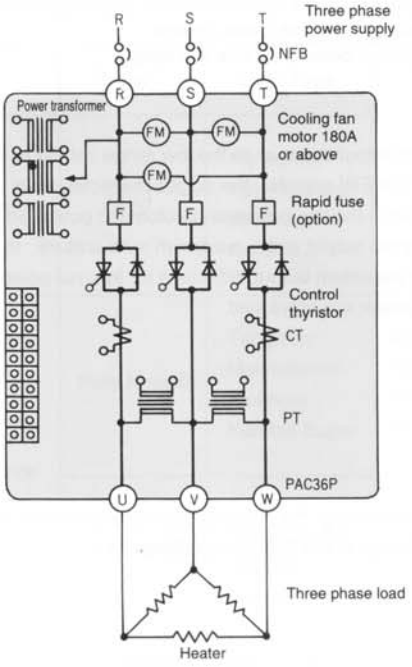
	Terminal No.	Terminal code
Upper terminal	1	C 1 (+)
	3	C 2 (−)
	5	R 1
	7	R 2
	9	R 3
	11	—
	13	M
	15	AL 1
	17	AL 2
	19	AL 3
Lower terminal	2	S 1
	4	S 2
	6	CL 1
	8	CL 2
	10	CL 3
	12	AP 1
	14	AP 2
	16	HB 1
	18	HB 2
	20	G



- **Adjusters**
  - Internal power adjuster (standard)
  - Soft start time adjuster (standard)
  - Heater break alarm setting device (option)
  - Automatic power adjuster (option)
- **Monitor Lamps**
  - P.L : Power supply
    - : Green LED turns on at correct phase sequence.
    - : Red LED turns on at open/opposite phase sequence.
  - O.C: Over-current
  - Fuse: Burning-out of rapid fuse (option)
  - H/B: Heater break alarm (option)
  - FAN: Stoppage of cooling fan (standard for 180A or above)
- **Terminal Codes and Functions**
  - C1-C2: Control input
  - R1-R2-R3: External power (option)
  - M: Manual/base adjuster (option)
  - AL1-AL2-AL3: Alarm output common to over-current, FAN and FUSE
  - S1-S2: External sequence signal for start up time output control limiting
  - CL1-CL2-CL3: Current limiting adjuster
  - AP1-AP2: Automatic Power signal input
  - HB1-HB2: Heater break alarm output

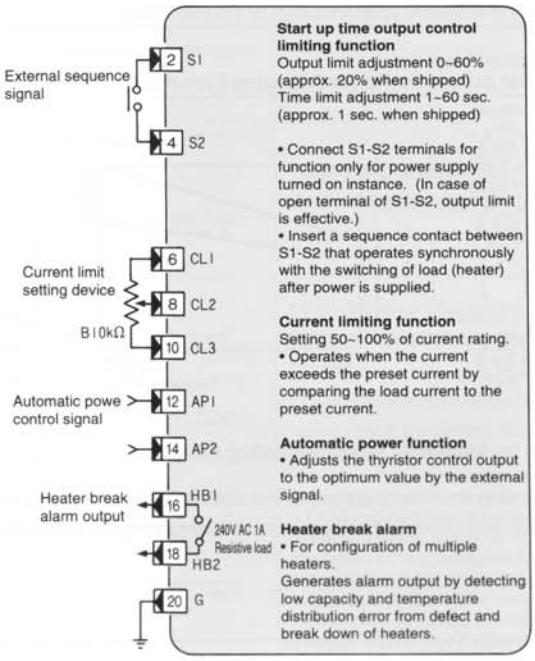
CIRCUIT BLOCK AND WIRING OF CONTROL TERMINAL

• Circuit Block



• Additional Function (Option) (Lower Terminal)

Additional function terminals are all optional items. No addition can be made after delivery. Select the option on ordering.

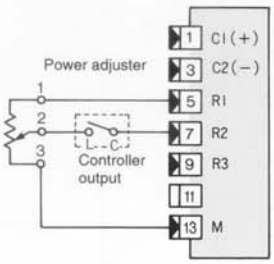


• Output Adjusting Function (Upper Terminal)

This function is available by connecting adjuster (rating B 10kΩ 1W), after delivery.

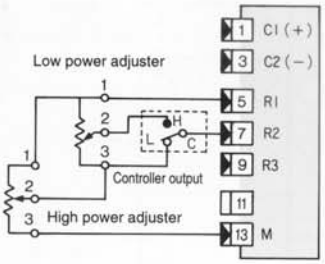
Wiring with contact output controller

External power



- To adjust output of contact ON (Controller output contact C-L conducted).
- Conduct ON: 0~100%

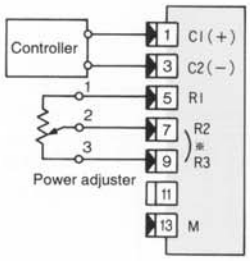
High/low power



- To adjust maximum output for conducted (on) output contact C-L and to maintain non-conduct (off) (C-H conducted) output.
- High power: With C-L on 0~100%
- Low power: With C-H on High power × Low power

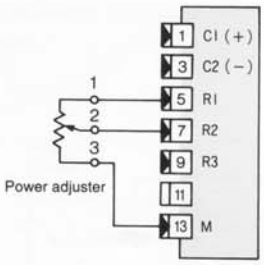
Wiring with voltage/current output controller

External power



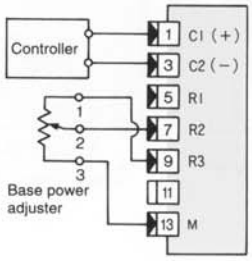
- Internal power adjuster as standard
- Short circuit R2 and R3 when power adjuster is not used. (Adjust by internal power adjuster)
- Input of 100%: 0~100%

Manual power



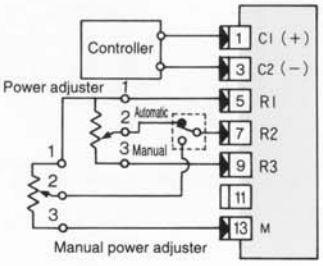
- To adjust power manually.

Base (residual) power



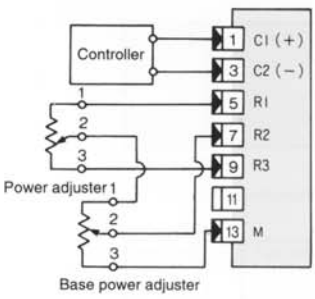
- To keep output steady when the control signal is at 0%.
- The maximum power is adjusted by internal power adjuster.
- Input of 0%: 0~100%

External power+Manual power (auto/manual)



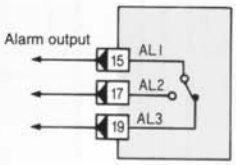
- External contact switches automatic/manual for power adjusting selection of automatic and manual operations.
- Please prepare the automatic/manual switch.

External power+Base (residual) power



- To adjust maximum output and to maintain some part of output of 0% control signal.

Alarm circuit

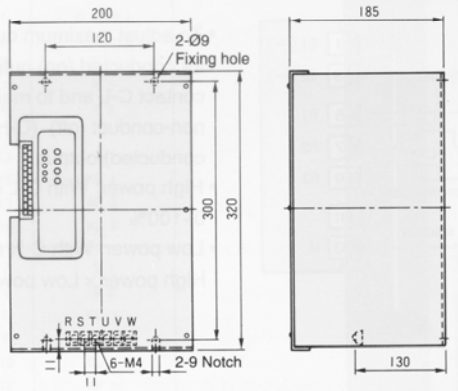


- Alarm output.
  Conduct between AL1 and AL2.
  Non conduct between AL1 and AL3.
- Operation
  Over-current protection circuit on operation.
  Fuse burnt out.
  Cooling fan stopped.

THREE PHASE POWER REGULATOR

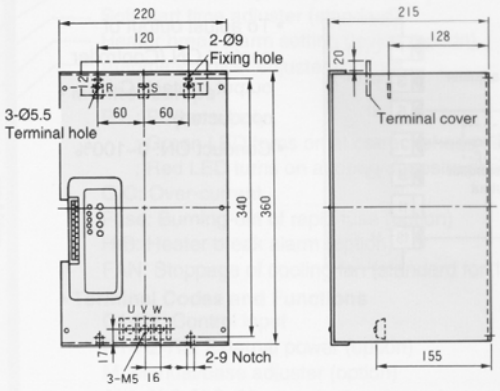
EXTERNAL DIMENSION, WEIGHT, MOUNTING

20A



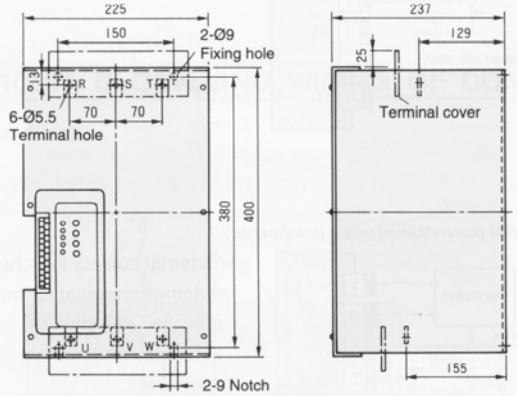
Weight: approx. 9kg.

30A • 45A



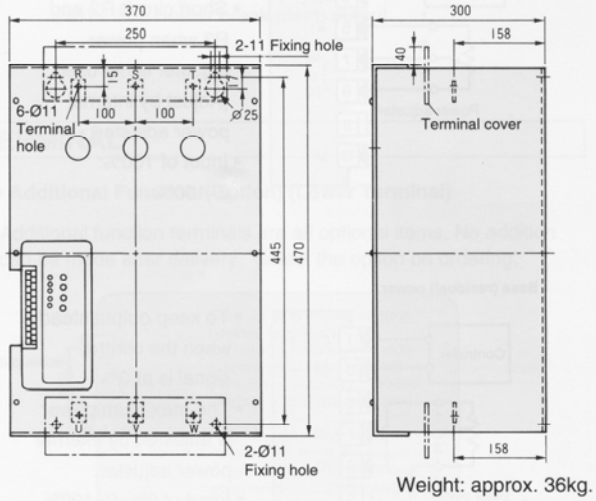
Weight: approx. 12kg.

60A • 90A



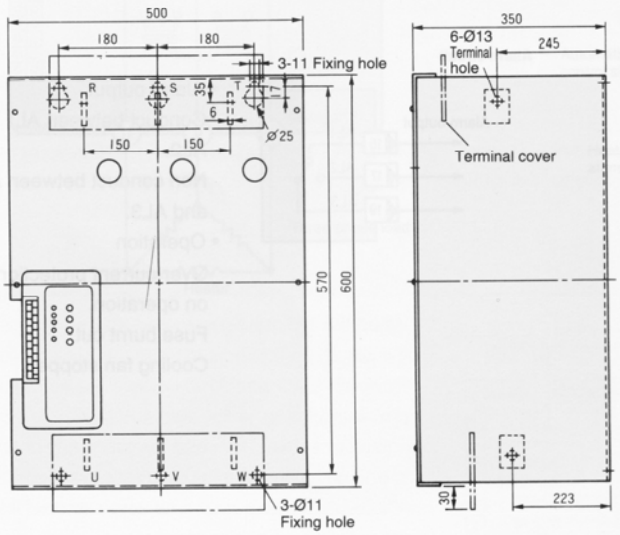
Weight: approx. 16.5kg.

135A • 180A • 240A • 300A



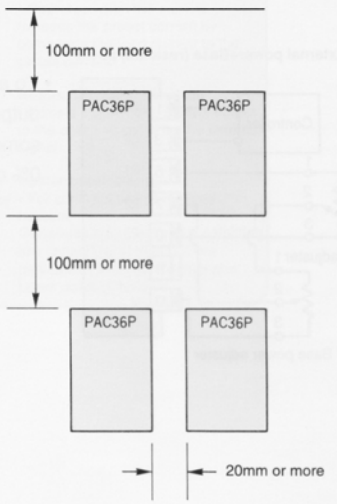
Weight: approx. 36kg.

450A • 600A



Weight: approx. 55kg.

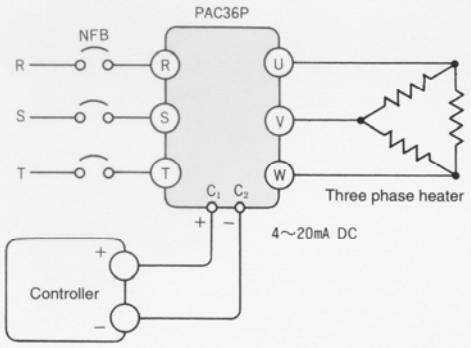
Mounting diagram



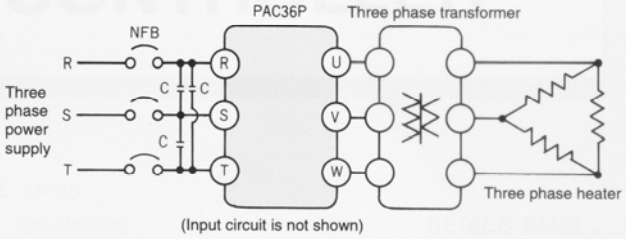
Unit: mm

APPLICATION EXAMPLES

• Application Connecting a Conventional Heater



• Application with Transformer



(Input circuit is not shown)

* Noise absorbing capacitor
C Oil capacitor
0.1~0.5μF / 1500V

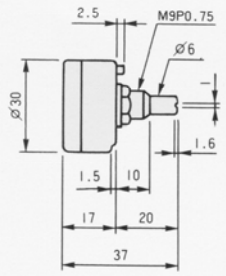
The aim of transformer
• Isolates primary/secondary circuits.
• Adjust to the terminal voltage of the load.

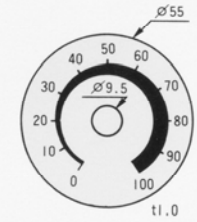
— Note for transformer design —
Generally, margin is set for magnetic flux density in application of switching controlling. The value of the magnetic flux density should be less than 8000 Gauss. Avoid unbalance of load and rush current from magnetic saturation.

EXTERNAL POWER ADJUSTER

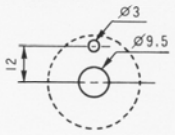
• Rating
Type: RV30YN 20S
Characteristics/Resistance: B 10kΩ 1W

• External dimension and mounting
Lead: Vinyl lead wire 1meter
Panel/Knob: 1 ea





Panel Cutout



Names and scale
• External power/0~100%
• Manual power/the same as above
• Base power/the same as above
• High/Low power/the same as above
• Current Limiter/50~100%

Unit: mm