

SUNGWAN

HEATER CONTROL UNIT

SPR-D series

MULTI

Digital Communication



Our powerful Digital SPR Type !

the best choice for heater control !

The quality our heater control units keeps your trusts with continued techniques for 20 years.

 **株式會社 成完電氣**
SUNGWAN ELECTRIC CO., LTD.

• General comparisons of SCR power controllers

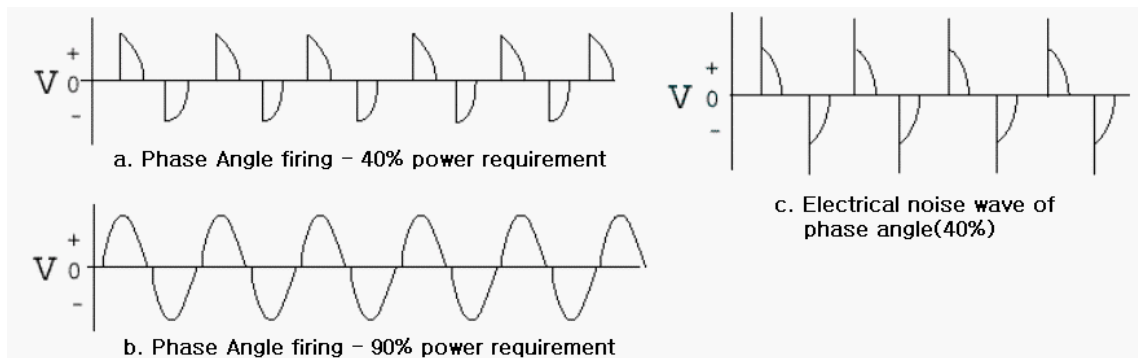
1) SCR Switching control type

This type can not control the angle of thyristor (SCR) as below mentioned phase angle control and zero-crossing, but only turns on/off thyristor (SCR) at sending control signals to SCR. This type has more efficiency and fewer harmonics than SCR phase angle control type, and can produce low cost. But the resistance element temperature experiences very large temperature swings.



2) SCR Phase angle control type

This type is phase angle control base which turns on/off thyristor (SCR) at a certain angle with the controlling input of waveform 0~180 degree of load power. This type is effective to control a specific voltage and current, and to use the control of inductive load. This type generates harmonics, because of producing wave distortion. So this type takes miss-operations to be surrounded electronic machines and tools, and reduces the efficiency of the transformer because of generating ineffective power during turning off SCR.



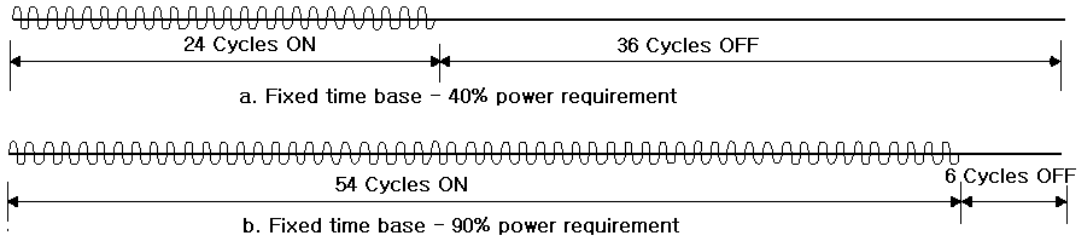
3) SCR Zero-crossing(Zero-voltage switching) control type

This type is time control base which turns on/off thyristor (SCR) at zero point of ac power sine wave, and this does not produce wave distortion. Thus this type does not generate harmonics and ineffective power. Today, this type is better for controlling a big heater and heaters surrounded with sensitive machines to noise than SCR phase angle control type. But this type cannot control induction heater load. The Zero-crossing control type can use fixed time base zero-crossing, variable time base zero-crossing, and mixed(phase angle+variable time zero-crossing) control.

1) Fixed Time Base Zero-Crossing control

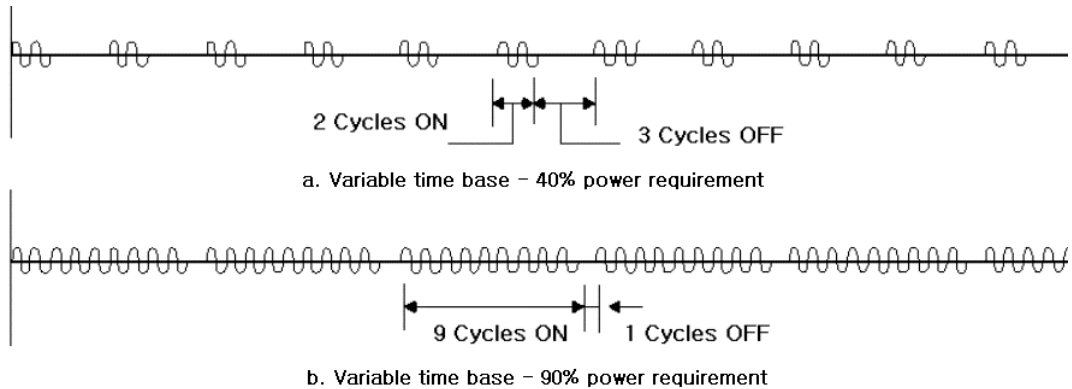
A fixed time base means that the “cycle time” on the SCR power controller is permanently set or fixed(not adjustable). During this time period(1 second, for example), the SCR power controller will turn the SCR ON and OFF the provide the correct percentage of power to the heater. For example, the SCR has a fixed time base of 1 second, and the power supply is 60Hz.

If the process output demands a 40% power requirement,the SCR will be turned on for 24 cycles(40% of 60 cycles) and turned off for 36 cyles.



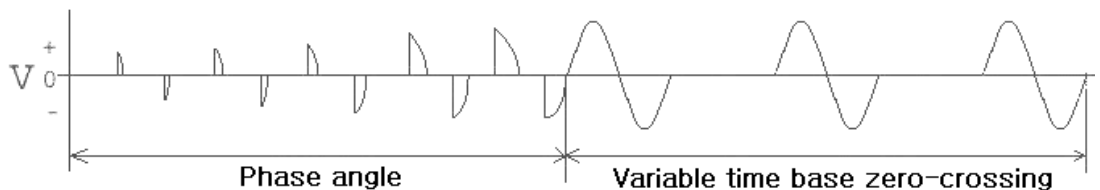
2) Variable Time Base Zero-Crossing control

A SCR power controller with a variable time base changes th time base according to the power requirement, and uses the smallest possible number of ac power cycles to deliver the required percentage power to the heater.If the process output demands a 40% power requirement, the SCR will be turned on 2 cyles out of every 5 cyles. For 90% power requirement, the SCR will be turned on 9 out of out of every 5 cyles.



4. SCR Mixed Control (Phase angle + Variable Zero-Crossing control)

This type combines the best features of the phase angle and variable time base zero-crossing firing method, and is utilized on the power control of variable resistive heater loads(for example, halogen , molybdenum,tungsten heater). This mixed type is under phase angle control during initial power application and then switch to variable time base zero-crossing. So, this ensures maximum controlability when needed, and then revert to RF interference free zero-crossing control after process stabilization.



• Features

1. Unparalleled application Flexibility with digital technology

Field configurable phase-angle or zero-crossing or mixed-firing(phase angle+zero-crossing) for improved application flexibility on site. Adjustable soft start for application flexibility.

2. Heater and control diagnostics capabilities

Monitor actual heater and control performance and help eliminate initial start up problems

3. Non-harmonics

Zero-crossing mode generates minimal harmonics, and virtually eliminate the possibility of interference with other electronic equipment.

4. Saving power rate, because of non-ineffective power

Zero-crossing mode can save 10~15% of power rate, because does not generate ineffective power during controlling heater.

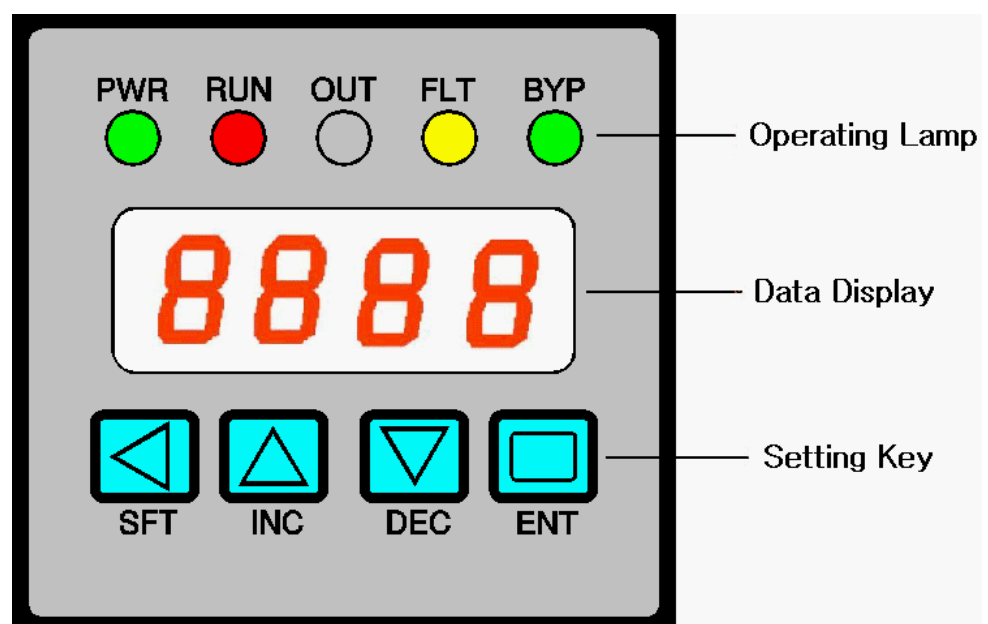
5. Multi function

Over-load detecting, Heat sink over-temperature detecting
Fuse-SCR-load fault detecting, Load initial conditions detecting

6. Serial communication with RS-232

Remote control setup, computer control and monitoring of load status.

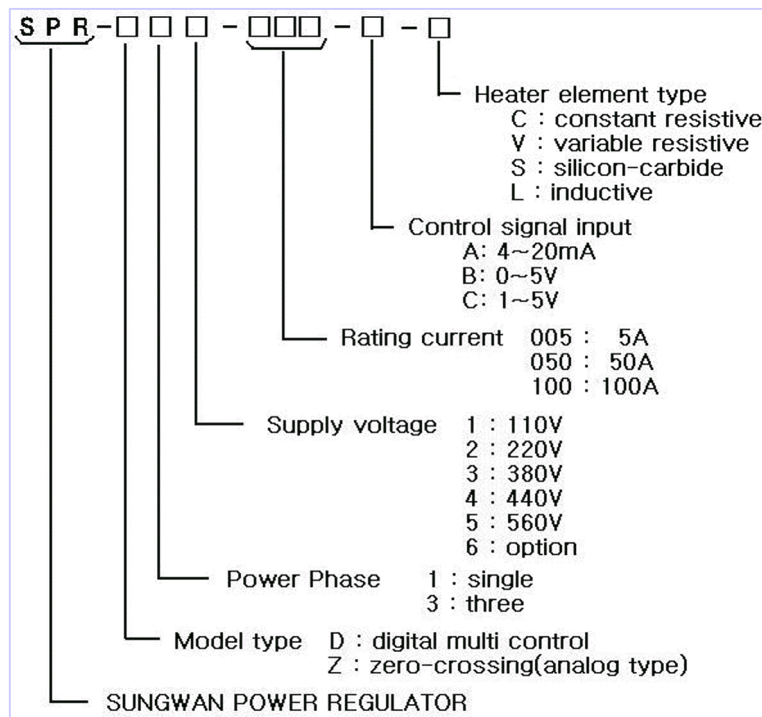
• Key & Display



•Typical SCR firing methods for the heater loads

Heater Load		Firing Method	Remarks
Constant Resistive Load	Nichrome, Kanthal, Calrod, Ceramic, Catridge, Immersion Infrared(long,medium)	Zero-Crossing Phase Angle Control	Load resistance does not change with temperature.
Variable Resistive Load	T-3 Lamp(Halogen), Quartz Lamp,Super Kanthal Infrared(short wave) Molybdenum,Graphite	Phase Angle+Zero-Crossing Mixed Phase Angle Control	Load resistance changes with temperature.
Silicon-Carbide	Silicon-Carbide	Phase Angle Control	Load resistance changes Over the elements lifetime.
Inductive Load	Transformer-Coupled	Phase Angle Control	Inductive Load

•Ordering Information



Ordering guide) Supply voltage : three phase , 440V, 60Hz
 Heater element : Nichrome
 Load current : 200A
 Command signal : 4~20mA
 Type : Digital

➔ **SPR-D34-200-A-C**

•Specifications

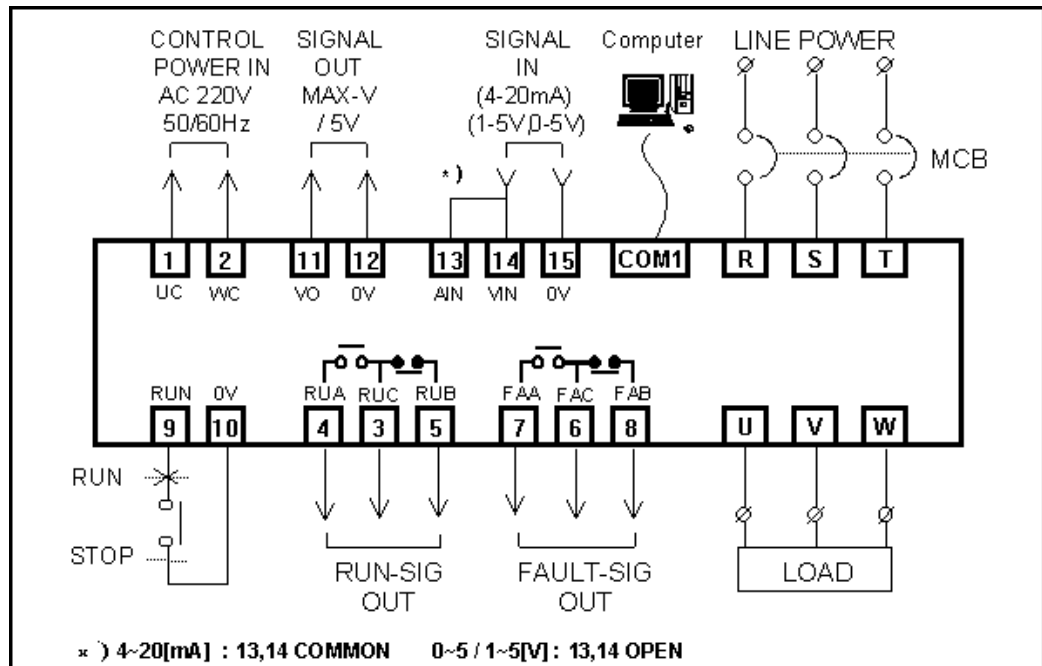
TYPE	SPR-D SERIES	
Firing mode	1) Zero-Crossing 2) Phase Angle 3) Mixed (Phase Angle + Zero-Crossing)	
Phase	Single Phase / Three Phase	
Supply voltage	100/110, 200/220, 380, 440, 480, 560 V \pm 10%, 50/60Hz(line-to-line voltage)	
Rated current	25,35,50,75,100,150,200,300,400,500,600,700,1000 A	
Load type	All heater load ; resistive load, inductive load, transformer coupled	
Main Functions	1) Selectable firing modes - Fixed time base zero-crossing - Variable time base zero-crossing - Phase angle - Constant current control - Mixed (phase angle + zero-crossing)	
	2) Soft start , current limit, Over current trip	
	3) Data display : load current , load voltage	
	4) Applicable inside delta connection	
AUTO Mode	\pm 4~20mA	Internal resistive impedance : 250 Ω
	\pm 1~5V	Internal resistive impedance : 47k Ω
MANU Mode	\pm 0~5V	External variable resistor : 3~10k Ω
Control supply voltage	0~100%	
Control Input Switch	AC 220 V \pm 10%, 50/60Hz	
Meter connection	Output signal : current, voltage, Signal output spec : DC 0~5V, 5mA	
Contact output	At fault : 250V 5A 1a1b contact output	
Protection	1) Over-load detect, 2) Heat sink over-temperature detect 3) Fuse open detect, 4) SCR shorted detect 5) Load open/failure detect, 6) Load condition detect 7) Load unbalance detect	
Communication	RS-233 for serial communication. Monitoring and Setting functions	
Ventilation	Nature-Air & Fan cooling	
Temperature	0~50 $^{\circ}$ C	
Insulation	AC 2,000V 1min., 20M Ω or more (at DC500V Megger)	

(Other specifications will be available on your request.)

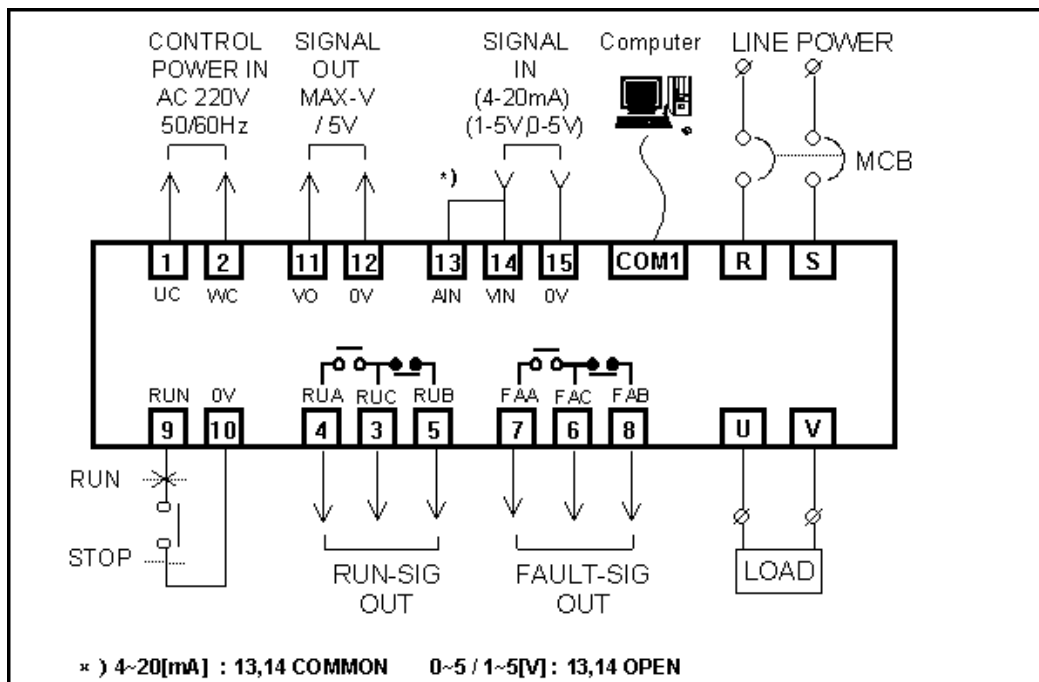
•CONNECTION DIAGRAM

Typical Connection

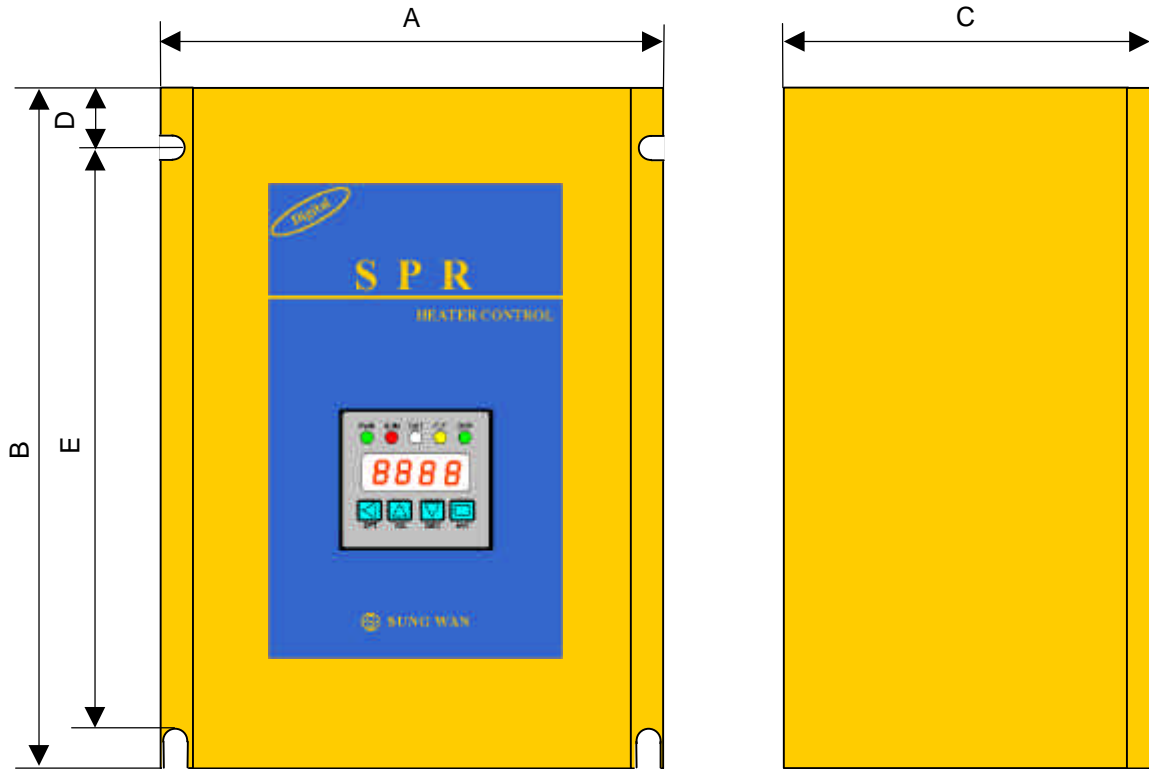
•Three Phase



•Single Phase



•DIMENSION

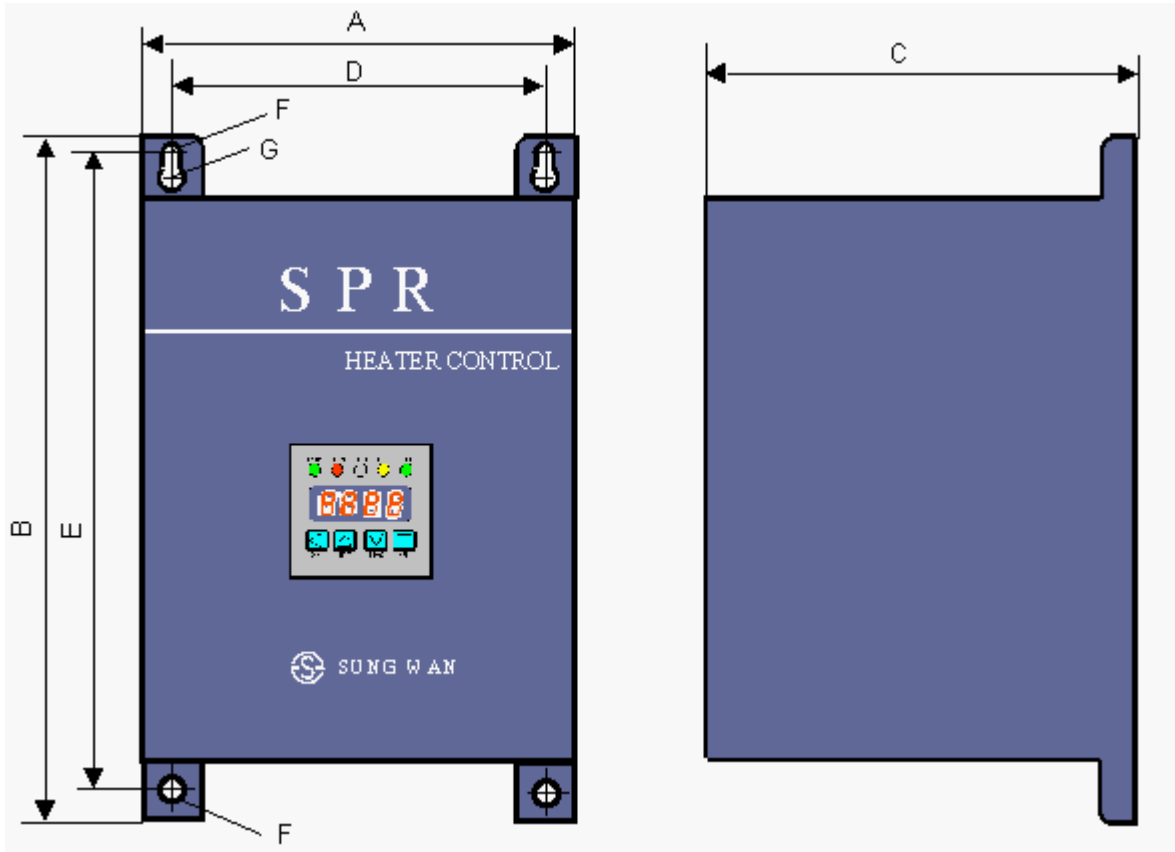


	Rated Current (A)	Dimension(mm)					Weight (approx.)
		A	B	C	D	E	
Single Phase	25~100	210	280	165	25	240	6.5kg
	101~160	210	330	165	25	290	6.8kg
	161~300	210	360	165	25	320	7.2kg
Three Phase	25~50	210	280	165	25	240	6.5kg
	51~80	210	330	165	25	290	6.8kg
	81~110 *	210	360	165	25	320	7.5kg
	111~150 *	210	400	165	25	360	8.0kg
	151~180 *	210	450	165	25	410	8.5kg

(* . Fan-cooled)

(Other specifications will be available on your request.)

DIMENSION



	Rated Current (A)	Dimension(mm)							Weight (approx.)
		A	B	C	D	E	F	G	
Three Phase	181~300 *	325	490	265	300	470	7	15	25kg
	301~700 *	470	720	360	435	690	8	18	55kg
	701~1,000 *	650	1100	450	615	1070	8	18	85kg

(* . Fan-cooled)

(Other specifications will be available on your request.)

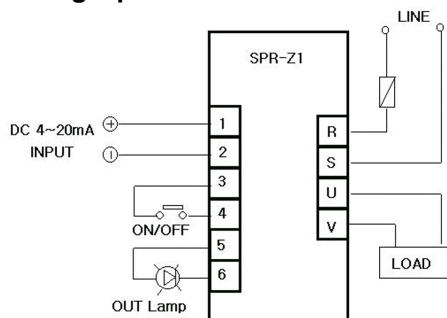
HEATER CONTROL UNIT (SPR-Z Series)

Specification

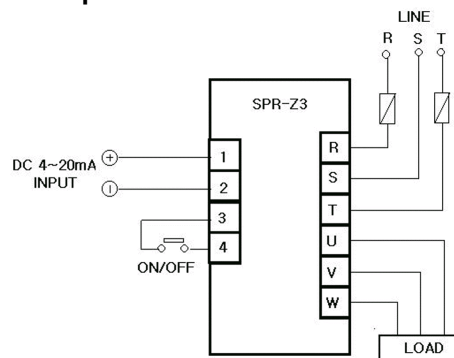
Type	SPR-Z Series	
SCR Firing Method	SCR Zero-Crossing(Analog Type)	
Phase	Single Phase	Three Phase
Supply Voltage	100/110, 200/220, 380, 440,560 V $\pm 10\%$, 50/60Hz	
Rating Current	25, 35, 50, 60 A	30 A
Load Type	Constant resistive heater	
Output adjustment	0~100%	
Ventilation	Natural-Air	
Temperature	0~50°C, 80% or below	
Insulation	AC2,000V 1min. , 20M Ω or more (At DC500V Megger)	
Control signal input	$(\pm)4\sim 20\text{mA}$	
Contact output	NPN OPEN Collector	

CONNECTION DIAGRAM

- Single phase

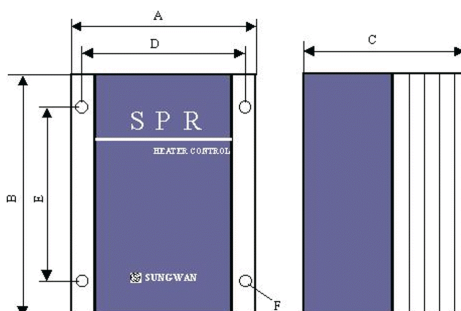


- Three phase

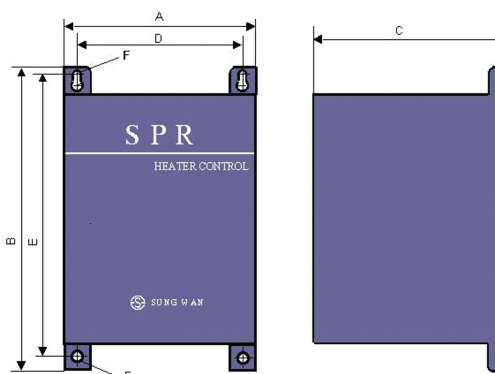


DIMENSION

- Single phase



- Three phase



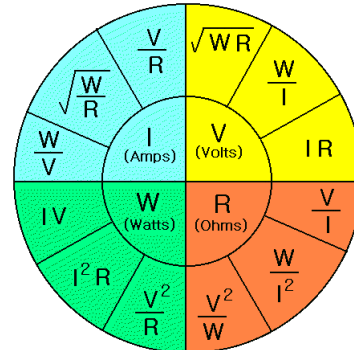
	Rated Current (A)	Dimension(mm)						Weight (approx.)
		A	B	C	D	E	F	
Single Phase	30	100	200	145	90	150	5	2kg
	60	120	235	145	100	123	5	3kg
Three Phase	30	120	235	145	100	123	5	3kg

•Techincal Data

1) Ohm's law & power calculation

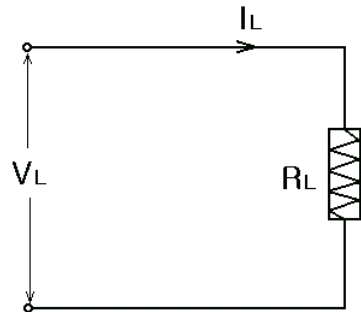
The relationship between wattage(W), voltage(V), current(I), and resistance(R) is determined by ohm's law.

Ohm's law



2) Single phase & Three phase calculations

- . Single phase load



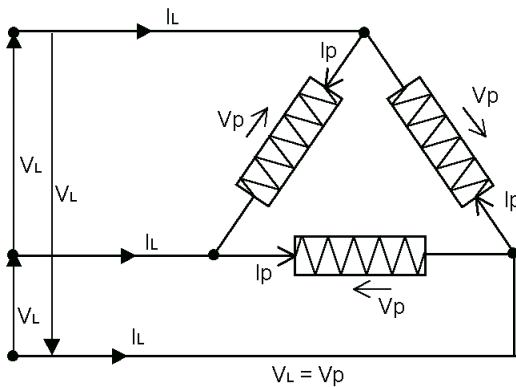
$$P = V_L \times I_L \times \cos\phi$$

$$I_L = \frac{V_L}{R_L}$$

$$\cos\phi = 1.0$$

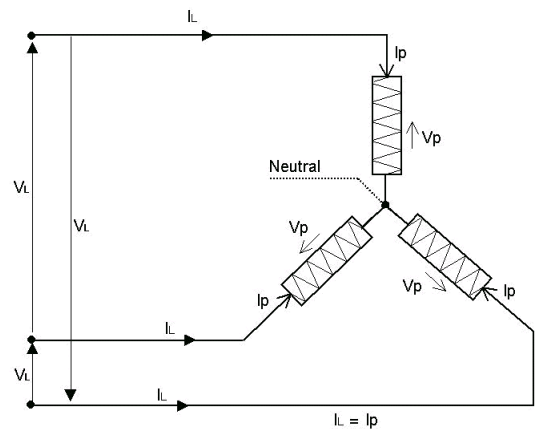
Resistive heater load

- . Three phase load



(a) Delta connection

For Delta connection
 $I_L = \sqrt{3} \times I_p$
 $P = \sqrt{3} \times V_L \times I_L \times \cos\phi$
 $P = 3 \times V_L \times I_p \times \cos\phi$
 (resistive load, $\cos\phi = 1.0$)



(b) Wye(Y) connection

For wye(Y) connection
 $V_L = \sqrt{3} \times V_p$
 $P = \sqrt{3} \times V_L \times I_L \times \cos\phi$
 $P = 3 \times V_p \times I_p \times \cos\phi$
 (resistive load, $\cos\phi = 1.0$)

▶ The Products of heater control panel

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◆ Main products

- Heater Control Unit & Panel
- Soft starter for AC motor
- Aircon for control panel
- Cable & Wire Manufacturing machine control
- DC Motor Driver & Panel
- On-Line HV cable insulation monitoring system
- HV cable fault locator
- Other automation system

◆ ENGINEERING

- On-Line HV cable insulation diagnosis
- High voltage cable fault locating



- HEAD OFFICE & FACTORY
197-17 KURO-DONG KURO-KU SEOUL KOREA
TEL: 02-866-1231~3 , 02-866-8611~2
FAX: 02-863-9449
<http://www.sungwan.co.kr>
E-mail : sales@sungwan.co.kr