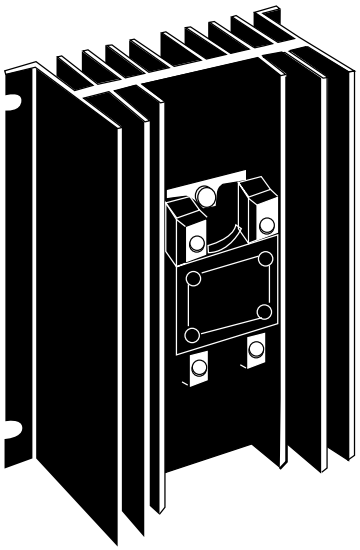
S S R



Solid State Relay Offers More For Less: Longer Heater Life at Lower Cost

Watlow's SSR series of solid state relays offers many of the advantages of solid state power controls, yet at a lower cost. Watlow's extensive knowledge in power control design has led to the development of a special input card—the SBL—that enables a solid state relay to operate from a standard 4-20mA instrumentation command signal.

Test results have shown the SSR in combination with the SBL card promotes closer temperature control and longer heater life through a time proportional cycle rate of 1/10 of a second.

There are two different versions available: the first rated for applications up to 240V~(ac); and the second rated for applications up to 480V~(ac). Both products include back-to-back SCRs for a more rugged design than the traditional triac based solid state relay. The internal design allows it to handle high currents and the harsh electrical environments of heavy industry.

Watlow can provide all the components necessary for trouble-free operation. This includes two standard convenience items: a thermal foil to ensure proper thermal transfer from the relay to the heat sink; and belville washers that ensure the relay is mounted with sufficient pressure for good heat transfer. Matched semiconductor fuses and heat sinks are available to complete the power switching package.

Features

- Fast cycle card
- Zero cross firing
- Back-to-back SCR design
- UL® recognized
  file #E151484
  CSA certified
  file #LR81689M31
  VDE 0805
  License #90995UG

Benefits

- Heater life is increased, temperature control is optimized and higher watt density heaters can be used
- Minimal electrical noise
- Will withstand harsh or hostile industrial environments
- For applications requiring agency approval

WATLOW

Watlow Controls

A subsidiary of Watlow, Designer and Manufacturer of Industrial Heaters, Sensors and Controls

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ISO 9001
Registered Company
Winona, Minnesota USA

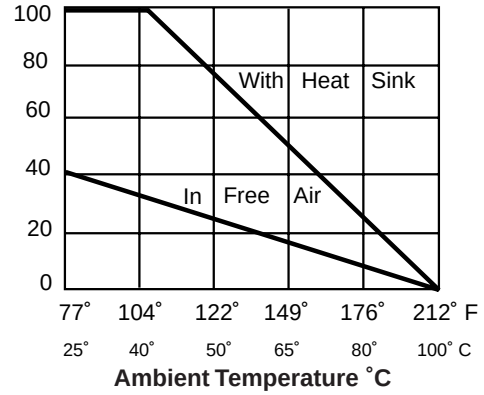
Specifications

Specifications standard to all SSRs:

Dielectric Strength (Volts)	4000 RMS
Input, DC Control	
Voltage range	3-32V⎓(dc)
Input current	4mA (max) @ 5V⎓(dc)
Turn on voltage (max)	3V⎓(dc)
Turn off voltage (min)	1V⎓(dc)
Input, AC Control	
Voltage range	90-280V~(ac)
Input current	2mA (max) @
120V~(ac)	
Turn on voltage (max)	90V~(ac)
Turn off voltage (min)	10V~(ac)
Output (Maximum)	
Forward voltage drop	1.5V~(ac)
Min. holding current (mA)	50mA

Temperature Operating Curve

% of Rated Current



This derating curve applies to 10, 25 and 40 amps relays only at 120/240V~(ac).

120/240VAC

Model Number	SSR-240-10A-DC1	SSR-240-25A-DC1	SSR-240-40A-DC1	SSR-240-10A-AC1	SSR-240-25A-AC1	SSR-240-40A-AC1
Current output	10 amps	25 amps	40 amps	10 amps	25 amps	40 amps
Nominal voltage	120/240V~(ac)	120/240V~(ac)	120/240V~(ac)	120/240V~(ac)	120/240V~(ac)	120/240V~(ac)
Frequency range	47-63Hz	47-63Hz	47-63Hz	47-63Hz	47-63Hz	47-63Hz
One cycle surge current	120 amps	250 amps	625 amps	120 amps	250 amps	625 amps
One second surge current	40 amps	100 amps	130 amps	40 amps	100 amps	130 amps
Thermal resistance	1.48° C/W	1.05° C/W	0.65° C/W	1.48° C/W	1.05° C/W	0.65° C/W
Base plate temperature	-40 to 167°F	-40 to 167°F	-40 to 167°F	-40 to 167°F	-40 to 167°F	-40 to 167°F
	(-40 to 75°C)	(-40 to 75°C)	(-40 to 75°C)	(-40 to 75°C)	(-40 to 75°C)	(-40 to 75°C)
Output (Maximum)						
Voltage range	48-280V~(ac)	48-280V~(ac)	48-280V~(ac)	48-280V~(ac)	48-280V~(ac)	48-280V~(ac)
Over voltage rating	600V~(ac)	600V~(ac)	600V~(ac)	600V~(ac)	600V~(ac)	600V~(ac)
Off state leakage	10mA	10mA	10mA	10mA	10mA	10mA

120/240VAC

480VAC Random Fired

Model Number	SSR-240-50A-DC1	SSR-240-75A-DC1	SSR-240-50A-AC1	SSR-240-75A-AC1	SSR-480-50A-RND	SSR-980-75A-RND
Current output	50 amps	75 amps	50 amps	75 amps	50 amps	75 amps
Nominal voltage	120/240V~(ac)	120/240V~(ac)	120/240V~(ac)	120/240V~(ac)	480V~(ac)	480V~(ac)
Frequency range	47-63Hz	47-63Hz	47-63Hz	47-63Hz	47-63Hz	47-63Hz
One cycle surge current	625 amps	1000 amps	625 amps	1000 amps	625 amps	1000 amps
Thermal resistance	0.63° C/W	0.31° C/W	0.31° C/W	0.31° C/W	0.63° C/W	0.31° C/W
Base plate temperature	-13 to 185°F	-13 to 185°F	-13 to 185°F	-13 to 185°F	-13 to 185°F	-13 to 185°F
	(-25 to 85°C)	(-25 to 85°C)	(-25 to 85°C)	(-25 to 85°C)	(-25 to 85°C)	(-25 to 85°C)
Output (Maximum)						
Voltage range	48-280V~(ac)	48-280V~(ac)	48-280V~(ac)	48-280V~(ac)	80-530V~(ac)	80-530V~(ac)
Over voltage rating	600V (peak)	600V (peak)	600V (peak)	600V (peak)	1200V (peek)	1200V (peek)
Off state leakage	10mA	10mA	10mA	10mA	10mA	10mA

480VAC

Model Number	SSR-480-25A-DC1	SSR-480-50A-DC1	SSR-480-75A-DC1	SSR-480-25A-AC1	SSR-480-50A-AC1	SSR-480-75A-AC1
Current output	25 amps	50 amps	75 amps	25 amps	50 amps	75 amps
Nominal voltage	480V~(ac)	480V~(ac)	480V~(ac)	480V~(ac)	480V~(ac)	480V~(ac)
Frequency range	47-63Hz	47-63Hz	47-63Hz	47-63Hz	47-63Hz	47-63Hz
One cycle surge current	250 amps	625 amps	1000 amps	250 amps	625 amps	1000 amps
Thermal resistance	1.02° C/W	0.63° C/W	0.31° C/W	1.02° C/W	0.63° C/W	0.31° C/W
Base plate temperature	-13 to 185°F	-13 to 185°F	-13 to 185°F	-13 to 185°F	-13 to 185°F	-13 to 185°F
	(-25 to 85°C)	(-25 to 85°C)	(-25 to 85°C)	(-25 to 85°C)	(-25 to 85°C)	(-25 to 85°C)
Output (Maximum)						
Voltage range	80-530V~(ac)	80-530V~(ac)	80-530V~(ac)	80-530V~(ac)	80-530V~(ac)	80-530V~(ac)
Over voltage rating	1200V (peak)	1200V (peak)	1200V (peak)	1200V (peak)	1200V (peak)	1200V (peak)
Off state leakage	10mA	10mA	10mA	10mA	10mA	10mA

Heater Life

Watlow has extensively tested electric heating elements with a variety of power switching devices. Results prove that the life of an electric element dramatically increases when the ON/OFF cycle time that is used to time-proportion the heater is kept at less than one second. This reduces the thermal expansion and contraction of the element and improves heater life as much as 20 times. This very fast cycle time controls temperature much more accurately and allows the use of higher watt density heating elements.

Fast Cycled Card (SBL)

In order to obtain the very rapid cycling time required for longer heater life, accurate temperature control and higher watt densities, Watlow has developed a loop-powered firing card for solid state relays. This card operates from a standard instrumentation signal of 4 to 20mA and controls solid state relays with a time proportional cycle rate of less than one second (3V~(ac) cycles ON and 3V~(ac) cycles OFF at 50 percent power).

Thermal Transfer

A thermal foil is provided with each solid state relay for mounting on the base of the relay to improve heat transfer. In addition, two belville washers are supplied to provide the proper pressure for this transfer of heat. Use two #8-32 screws ⅝ inch long to secure the relay to the heat sink. See derating curve for operation without heat sinks.

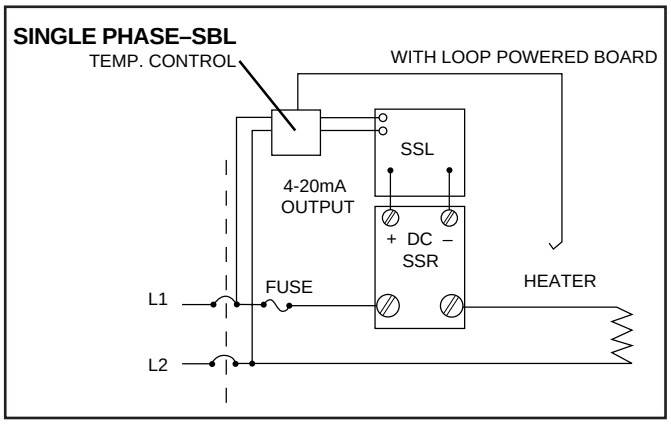
Replacing Contactors or MDRs

Improvements in heater life and control accuracy can be anticipated with solid state relays operated with rapid cycle times as compared to slower operating electromechanical relays or even mercury displacement relays. When replacing these types of relays with the SSR, it is important to consider two aspects:

1. **Heat**
   Solid state devices require a small voltage to turn on, which is consumed as heat (approx 1.5 volts x amps = watts). This heat must be removed from the device and is usually accomplished by mounting the relay on heat sinks.

2. **Failure Mode**
   Solid state devices should last for many years when properly protected with voltage and current snubbers mounted on appropriate heat sinks, and when fused with semiconductor fuses against the high currents caused by electrical shorts. However, if the unit fails, the most probable condition will be a short. Both mechanical relays mentioned above also have a good probability of failing short. In all cases where uncontrolled full power can cause damage, it is recommended that a high limit temperature control and contactor be used for protection.

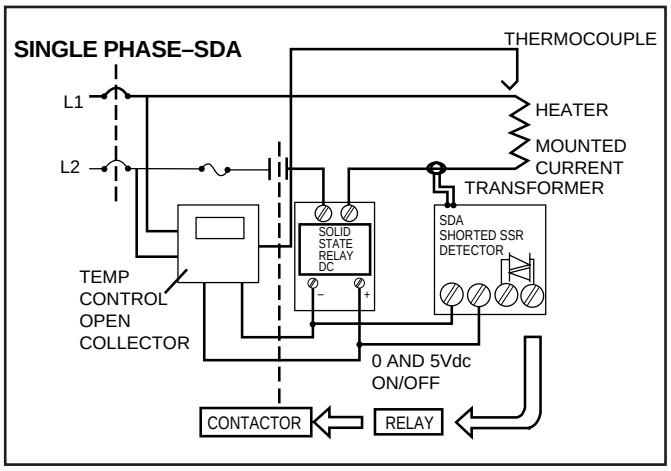
Wiring Diagrams



Shorted SSR Alarm-SDA

The most prevalent concern when using solid state relays is the possibility of a relay failing in a shorted condition. With this in mind, Watlow has designed a cost effective “Shorted SSR Alarm” SDA.

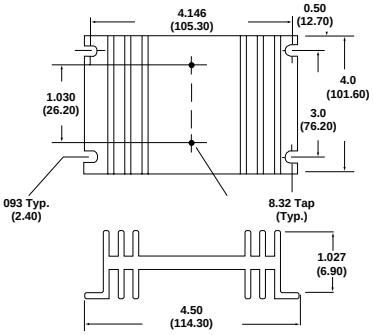
The device monitors the output (current through the heater) and activates a triac (alarm) if there is no command signal from the temperature control. The triac can be wired to a bell, or to a normally closed latching relay to remove power to the heater.



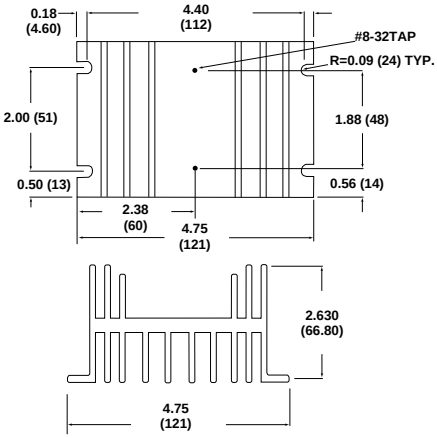
S S R

Dimensions
inches (mm)

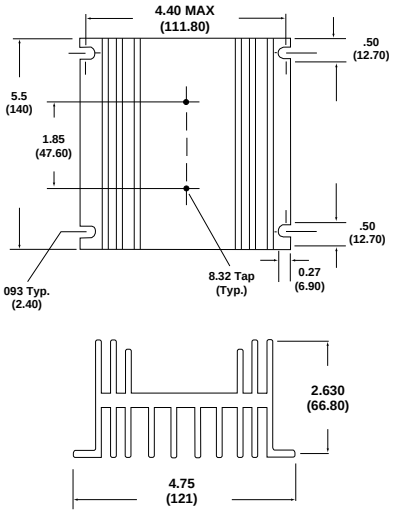
Heat Sink
HS-10



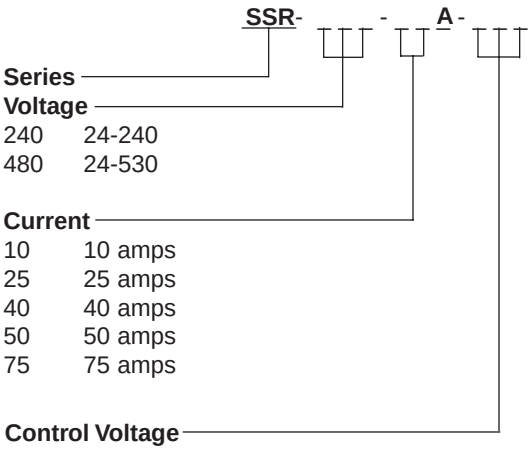
HS-25



HS-40



Ordering Information



Note: Relay will also include thermal foil, two belville washers and #8-32 screws for mounting to a heat sink.

Heat Sinks (Sold Separately)
HS-10 for 10 amps SSR
HS-25 for 25 amps SSR
HS-40 for 40 amps SSR
Heat sinks for other currents, consult factory

Loop Powered Firing Card
SBL for direct mounting on zero cross dc input solid state relay. Shorted SSR alarm card. SDA for direct mounting on zero cross dc input solid state relay.

Sub Cycle Fuses-I²t (Sold Separately)
Recommended and available with holders

Dimensions
inches (mm)

Solid State Relay