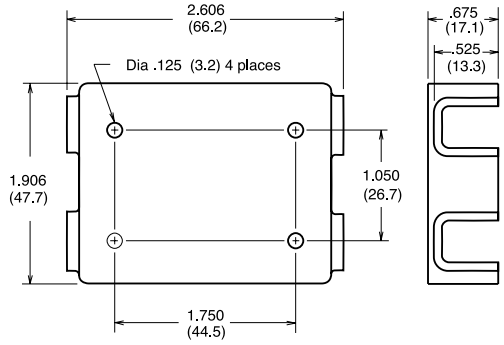
Safety Cover

Continental Industries' Safety Covers meet European touch safety requirements and can be used on any of the SV, S505-, SS- series or RSDC units. The covers snap on, forming a tight fit. Holes in the lid provide easy access for probe testing. Safety covers are included with the SV-Series. Part Number: COVR-SAFETY-000

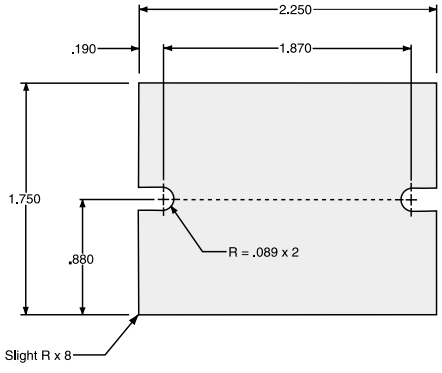


COVR-SAFETY-000

Thermal Transfer Pads

These Thermal Transfer Pads are die-cut to fit the bases of Continental's Panel Mount Relays. They are an excellent replacement for thermal greases, proven to provide the lowest thermal resistance values of any commercially practical interface material, while being more convenient and less messy. Available in sets of 5 and 25. Part Numbers: THERMAL-PAD-005 (5 pcs), THERMAL-PAD-025 (25 PCS).

- 60° C Phase Change Temperature
- Total Interface Pad Thickness = 3 mils
- Lowest Contact Thermal Impedance Available
- No "run out" in vertical mounting applications
- Heat sensitive material, store below 30° C / 85° F
- Ruggedized material that is resistant to handling damage in transit



Heatsinking *(Please also see page 6)*

Heat is generated by all Solid State Relays in direct relation to the amount of current being switched. Approximately 0.8-1.4 watts will be generated by the SSR for every Amp switched. This heat must be dissipated as fast as generated otherwise the temperature of the relay will keep on increasing until it fails. 90% of the problems with relays are directly related to heat.

Adequate heatsinking, including consideration of air temperature and flow, is essential to the proper operation of a solid state relay. Units should not be mounted in an enclosed area without proper air flow. Units should also never be mounted to a plastic base or to a painted surface. *Failure to provide adequate heatsinking will cause a solid state relay to fail.* We recommend mounting our units on the heatsinks listed on page 6 of this catalog. However, when this is not possible, and the units are to be mounted to some other heatsinking object, material heat conductivity should be kept in mind. Our heatsinks are approximately equivalent, in heat dissipation, to a sheet of aluminum 1/8" thick by the dimensions shown:

HEATSK-DIN-1.6	10" x 10"	(254 x 254mm)
HEATSK-DIN-1.0	14" x 14"	(355.6 x 355.6mm)

(Given proper ventilation and ambient temperature.)

In comparison, **twice the amount of steel and four times the amount of stainless steel** would be needed to achieve the same effect.

Any panel mount Solid State Relay must be mounted to a clean, bare (non-painted) surface that is free of oxidation.

Since even the best heatsink surfaces have some imperfections, there will be many air pockets between the base of the relay and the heatsink (or panel) surface.

Air is a very poor conductor of heat and will cause the relay to run hotter than it should. To fill these pockets, **Thermal Transfer Pads (pg 17) should be placed on the metal base of the relay before mounting to a metal surface.** We suggest torque of 10 inch-pounds on both of the SSR mounting screws.

Alternately, an evenly applied 0.002" thick layer of Dow Corning 340 (or equivalent) may be used. Note that a thicker layer of thermal compound actually decreases heat transmission.

Since airflow will affect its performance, a heatsink should be mounted in a manner that assures unrestricted airflow over its surface. Recommended mounting is on a vertical metal surface, with the fins oriented vertically so that air may flow unimpeded along the surfaces of the heatsink. Horizontal or inverted mounting is possible but not recommended, the SSR must be derated accordingly.

Care must be taken when mounting multiple SSRs in a confined area. SSRs should be mounted on individual heatsinks whenever possible. *Panel mount SSRs should never be operated without proper Heat Sinking or in Free Air as they will THERMALLY SELF DESTRUCT UNDER LOAD.*

A simple Rule-Of-Thumb for monitoring temperature is to slip a thermocouple under a mounting screw. If the base temperature does not exceed the "max heat sink temperature" (shown in column 2) under normal operating conditions, the SSR is operating in an optimal thermal environment. If this temperature is exceeded, the relays current handling ability must either be thermally improved by the use of a larger heatsink, or greater air flow must be provided over the device through the use of a fan. Some cases may require the selection of a higher current output SSR and thermally derating the device accordingly.

Remember that the heatsink removes the heat from the Solid State Relay and transfers that heat to the air in the electrical enclosure. In turn, this air must circulate and transfer its heat to the outside ambient. Providing vents and/or forced ventilation is a good way to accomplish this.

80% Power Rule

All Solid State Relays are capable of running at full rated power (with proper heatsink). However, it is strongly suggested that they be used at no more than 80% power to provide a safety margin in case of higher than expected voltage, temperature, or dust on the heatsink, etc. Additionally, voltage can vary up to +/- 10%, and a heating element up to +/- 10% over its life--two main reasons for the 80% rule.

DIN mounted single and three phase relays:

These devices are provided with an integral heatsink and should be mounted so as to provide 1" (25mm) of space between the units, for best air flow (the 80% of power rule described above still applies). They can be mounted against each other if the end units in a row are derated by 10% and the middle units are derated 10% more than the end ones.

For proper airflow, these units should also be mounted in a manner leaving space above and below the heatsink equal to or greater than the height of the heatsink.

Since airflow will affect performance, relays with integral heatsinks should be mounted in a manner providing unrestricted airflow over their surfaces. Recommended mounting is on a vertical surface, with the fins oriented vertically, so that air may flow unimpeded along the surfaces of the heatsink.

Heatsink Calculations for SV Family of Solid State Relays

Continental Industries International SV Power Dissipation

SVxA/3V10	**SVxA/3V25**
10 Amp Relays	25 Amp Relays
10A/11W 8A/9W 6A/6W 4A/4W 2A/2W	25A/31W 20A/23W 15A/16W 10A/10W 5A/5W
Max heat sink=90°C Pwr Ref: V_O=0.80V_O Rt=0.038 ohms	Max heat sink=85°C Pwr Ref: V_O=0.80V_O Rt=0.021 ohms
SVxA/3V50	**SVxA/3V75**
50 Amp Relays	75 Amp Relays
50A/59W 40A/44W 30A/30W 20A/18W 10A/9W	75A/84W 60A/63W 45A/44W 30A/27W 15A/13W
Max heat sink=105°C Pwr Ref: V_O=0.80V_O Rt=0.0092 ohms	Max heat sink=105°C Pwr Ref: V_O=0.85V_O Rt=0.0046 ohms

All calculations are in degrees C. See derating curves on next page. Continental provides you three ways to calculate the heatsink for your application.

1) Heat Sink Calculation Method

Maximum heat sink temperature minus maximum ambient temperature divided by the power dissipation (use the chart above for power dissipation at desired current).

(Max Heat Sink Temp - Max Ambient Temp) / Watts = ___

For Example, use a
- SVDA/3V25 running at 20 Amps in a 45°C ambient
- From the chart, at 20 Amps it dissipates 23 Watts
- A 25A unit can have a 85°C heat sink
- (85-45 ambient) = 40°C temp rise is allowed
- 40°C/23W = 1.74°C/W heat sink rating or less (less temperature rise per watt is better)
- Therefore, the recommended heatsink would be part number: HEATSK-DIN-1.6 (rated at 1.6°C/W) or any equivalent heat sink that is 1.74 or LESS. Remember, the lower the heatsink value, the better it dissipates the heat. The relay must be connected to the heatsink using an appropriate thermal conduction grease or thermal pad.

2) De-Rating Calculation Method

Maximum heat sink temperature minus maximum ambient temperature divided by the heat sink rating (use the previous chart for power dissipation).

(Max Heat Sink Temp - Max Ambient Temp) / Heat sink rating = ___(Max allowed Watts)

For Example, use a
- SVDA/3V10 in a 60°C ambient with a 2.0°C/W heat sink.
- 90°C - 60°C = 30°C heat sink temperature rise is allowed.
- 30°C divided by 2.0°C/W =15W.
- From the table, full load current of 10A only dissipates 11W.
- Thus, a SVDA/3V10 mounted on a 2.0°C/W heat sink can switch 10A at 60°C.

3) Power Calculation in Place of the Charts

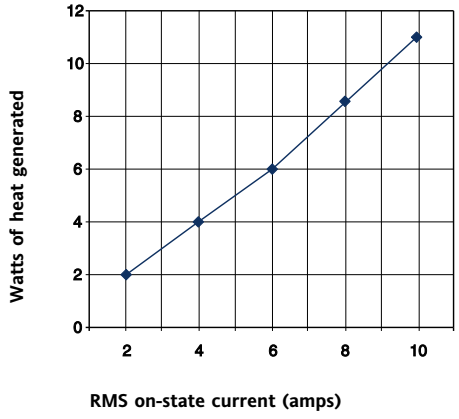
Heat rise calculation of a SV solid state relay based upon amperage switched "ON" 100% of the time. Please note, the Continental "SV" SSR uses engineering techniques that provide maximum surge survivability while generating a low temperature rise.

$(0.9 \times Irms \times V_0) + (Irms^2 \times Rt) = Power.$

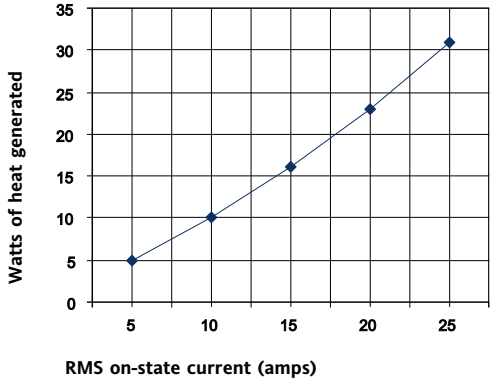
For Example, use a
- SVDA/3V25 for a 21A application.
- $(0.9 \times 21A \times 0.80V) + (21^2 \times 0.021\Omega) = 24.4$ W.

Solid State Relay Power Curves

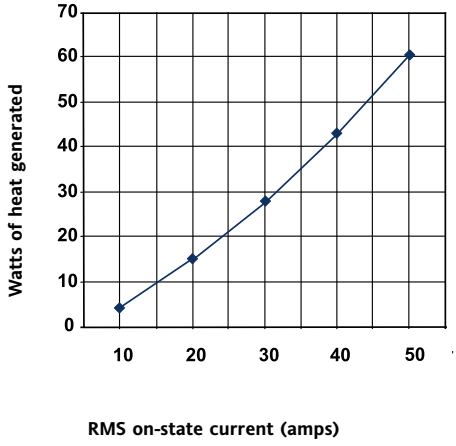
10 Amp Relay



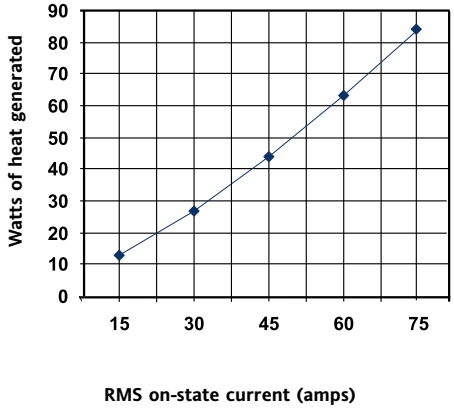
25 Amp Relay



50 Amp Relay



75 Amp Relay



Motor Applications (RS - 3 Phase Unit):

The Continental 3-Phase solid state relay is designed for switching power to 3-phased asynchronous motors and to resistive loads. For guidance in its application, refer to the following notes:

(380 Volt, 50/60 HZ Motors - Direct Start)

	Motor Size (KW)	Start Current (A_{RMS})	Operating Current (A_{RMS})
2-Pole- 3000 RPM	3	43.4	6.2
4-Pole - 1500 RPM	3	38.0	6.9
6-Pole - 1000 RPM	4	47.7	9.0
8-Pole - 750 RPM	3	36.6	8.7

(220 Volt, 50/60 HZ Motors - Direct Start

2-Pole - 3000 RPM	2.2	45.0	7.0

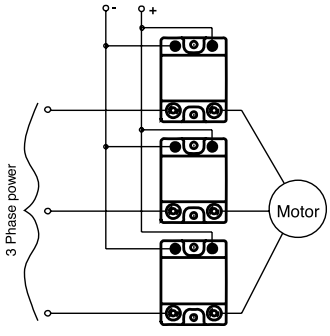
Overload Capacities:

In the event that a load completely or partially short circuits, the following table indicates the absolute maximum current that the 3 Phase RS-Unit relay can withstand for various time limits:

Time (Sec)	Current (Arms)	Time (Sec)	Current (Arms)
.2	275	8.0	80
.4	228	10.0	75
.6	188	12.0	72
.8	161	14.0	71
1.0	150	16.0	70
2.0	124	18.0	69
4.0	95	20.0	67
6.0	86	40.0	58

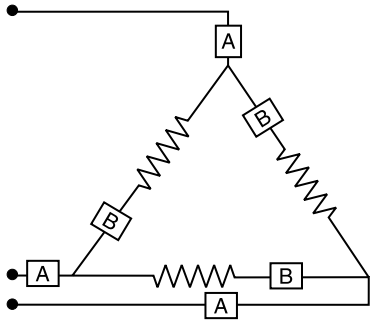
Three Phase Motor Control: (SV Series)

Three phase motors can be controlled as shown. Note that only two SSRs are required, the third is optional. The inputs are shown in a parallel arrangement, but they can also be connected in series as long as the minimum control voltage is provided to power each relay.

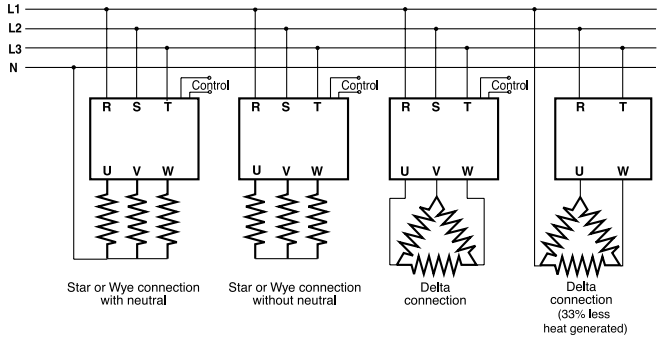


Three Phase Wiring Suggestion:

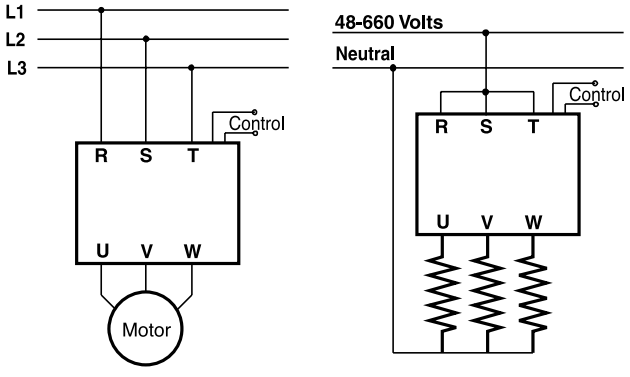
Relay positioning in a three-phase circuit impacts the current draw and therefore the amount of heat generated. When positioned in location "A", as indicated below, a relay will draw 73.2% more current than position "B". Using position "B" will enable you to use a smaller relay or will provide an increased safety margin. Additionally, by drawing less current, heat generation is reduced by 40%.



Example Wiring (RS-3 Phase Unit)



Maximum wattage is less with Delta configuration



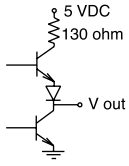
Logic Signal (TTL) Operation:

One of the primary advantages of SSRs and I/O modules is their compatibility with low-level, solid state logic. Any logic gate, buffered or not, capable of delivering the required current and voltage within its maximum power dissipation rating can be used to control an SSR or I/O module.

Many TTL gates, for example will safely dissipate 40 mW or more; and the total package will dissipate up to one watt. This gate power must not be confused with relay input power. Whereas a SSR whose input requires 6 mA at 5V DC consumes 30 mW of power, the TTL gate sinking this 6 mA may have a voltage drop of only 0.2 volt, and power consumption of just 1.2 mW!

TTL gates can only sink relay input current, not source it. This is because as shown, the sourcing transistor has a pull-up resistance in its collector circuit. Pulling 11 mA through this resistance, in this case 130 Ohms, would leave insufficient input voltage to operate the relay. For example, a SSR requiring a nominal 5VDC may not operate on less than 4 volts.

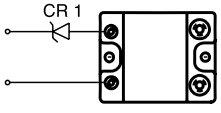
Typically, the drop across the transistor and diode at 11 mA would approximate 0.8 volt; and the drop across 130 Ohms is 1.4 volt. This 2.2 volt drop would leave only about 1.8 volts for the relay to operate, not enough for relay turn-on.



Since TTL gates can only sink current to the relay, and since current sinking is done from a “zero” logic signal, the relay can only be turned on from a “zero” signal. This is contrary to normal relay operation, which prefers that the relay be turned on as a result of a “one” signal. To obtain relay actuation from a logical “one” signal, it is necessary to use an inverting gate. With such a gate, when a “one” signal is received, the sink transistor will turn on and conduct relay input current.

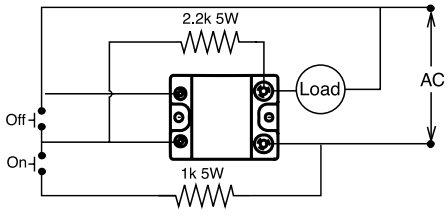
Changing pick-up and drop-out voltage:

By using a zener diode in series with the input, the pick-up and drop-out voltage of a Solid State Relay or an I/O Module can be increased by the value of the zener. For example, a typical SSR has a maximum pick-up voltage of 4 VDC and a minimum drop-out of 1 VDC. By adding a 6 volt zener as shown, the new pick-up will be 10 volts and the new drop-out 7 volts.



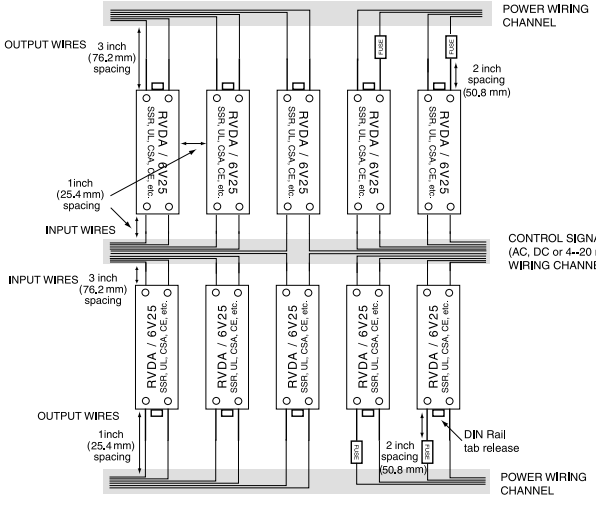
Latching SSR:

An AC SSR can be made to self latch (at the sacrifice of input-output isolation), thus permitting the use of momentary action switches for on/off or stop/start operation. It may be necessary to insert an RC filter across the relay input to prevent the relay from turning on due to switching transients upon application of system power. Note that the SSR employed here must be an AC input type.



Installation Density

To achieve maximum installation density and to provide separate wiring channels for the high voltage/high current wires vs the control signal wires. Continental’s RV family of 25 or 40 amp products can be installed as shown below. Please ensure that you observe the wire teminal numbers. The spacing shown is the minimum requirement for most industrial applications. Unrestricted airflow is needed for the Continental product to perform at its’ rated capacity.



Transformer loads:

Transformer loads can have **severe in-rush current** problems depending on the state of the transformer flux at turn-off. The in-rush current is created when the transformer saturates during the first half of the next applied voltage cycle. A relay must be selected to handle the surge current for 1/2 cycle. As a rule of thumb, the relay should have a 1/2 cycle surge current rating greater than the maximum applied line voltage divided by the transformer primary resistance. (Roughly 12 times the rated current)

Recommended Transformer Loads:

SSR Rating	at 120VAC	at 240VAC
10A	200VA	400VA
25A	400VA	800VA
50A	600VA	1.2KVA
75A	1KVA	2KVA.

Crimped-on Wire Terminals

When using either Ring or Spade crimped terminals with the SV or RSDC relays, do not use the saddle clamps that are provided. It is sufficient to secure the Ring or Spade Connectors with the enclosed screws.

When using electrical wire that is larger than #10 AWG with the RVDA, RVAA, or RVMA relays, 25-40 amp models, then use crimped lug, Amp# 790368-1 or equivalent

DIN Rail Sizes:

All DIN Rail mountable relays and modules will fit on any standard 35mm rail.

Heater loads:

Solid State Relays are well suited for driving heaters, however, in some temperature control applications the load is rapidly and almost continuously switched on and off. This is ideal for purely resistive loades (0.9-1.0 power factor). For loads of power factor 0.8-0.9 CII recommends increasing the controller cycle time to 5 sec minimum. Loads with power factor <0.8 should be derated for inductive load.

Recommended Heater Loads:

SSR Rating	at 120VAC	at 240VAC	at 480 VAC
10A	960W	1.9KW	3.8KW
25A	2.4KW	4.8KW	9.6KW
50A	4.8KW	9.6KW	19.2KW
75A	7.2KW	14.4 KW	28.8KW

Low cold resistance elements such as Tungsten or Short Wave Infra Red have special design considerations. Please consult the factory, due to high inrush currents.

Lamp loads:

Since all of our SSRs are zero voltage switched, they are the ideal device for driving incandescent lamps. An electro-mechanical relay can turn on a lamp at any point of the AC cycle, causing a large in-rush of current through the cold filament. A zero switched SSR will instead drive the lamp with a gradually increasing current, reducing the in-rush current and prolonging lamp life.

Recommended Lamp Loads:

SSR Rating	at 120VAC	at 240VAC
10A	600W	1.2KW
25A	1.5KW	3.0KW
50A	3.0KW	6.0KW
75A	4.5KW	9.0KW

CAUTION: Using SSRs for driving mercury, fluorescent, or HID lamps should be avoided. If they must be used, the SSR must be severely derated and thoroughly tested in the specific application.

Solenoid Valves and Contactors:

All of Continental's Power SSRs use high noise immunity circuitry in addition to a snubber network to handle the electrical noise generated by inductive loads.

However, the cycling of a Solenoid load will generate large current spikes which will decrease the power capability of the SSR. The power rating of the SSR will be reduced by the power rating percentage shown.

Cycle Time	Power Rating
20 sec.	80%
5 sec.	65%
1 sec.	40%

Recommended Solenoid Loads = V x I x (Power Rating)
Recommended Solenoid at 5 sec. cycle time.

SSR Rating	at 120VAC	at 240VAC
10A	780W	1.9KW
25A	2.0KW	3.9KW
50A	3.8KW	7.6KW
75A	5.8KW	14KW

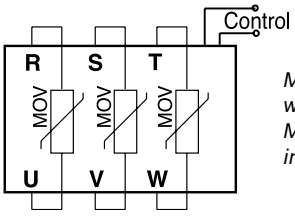
Short-Circuit Protection:

The relay can be short-circuit protected with an appropriate semiconductor fuse. The load integral of the relay (I^2t) determines which size of fuse is to be used. The fuse load integral must be below that of the relay for the appropriate protection. Be certain to analyze the fuse current/time curve to insure that the fuse can withstand the motor starting current (if applicable).

NOTE: Overload protection should be provided by another slow-acting fuse in series with the short circuit protection fuse. (An overload being an over-current condition that is not of high enough amplitude to be considered a short circuit).

Transient Voltage Protection:

When operating a relay in an electrically noisy environment, large voltage transients may damage the relay. To protect against this occurrence, it is advisable to install appropriate varistors across the respective supply and load terminals of the relay output.



Model RS_A-660-30-3D0 shown with customer-installed MOVs. Model RS_A-560-30-3D2 has 3 internal MOVs installed

If your application is located near inductive loads, or sharing power sources with large inductive loads, that are creating transients in excess of the blocking voltage of the Continental solid state relay, then you must install a metal oxide varistor (MOV) to protect the solid state relay. It is up to the installation company to properly size the MOV to the application!!!!! Ideally, the MOV protection is near the noise generating inductive load (such as a motor, drive, or other large inductive coil) or you can place MOVs directly across the output terminals of the SSR. Some “typical” MOVs include:

600 volt application - Harris V660 LA80B
480 volt application - Harris V575 LA80B
300 volt application - Harris V320 LA40B

The new SV and RV families of solid state relays include the Superior Surge Survival™ technology that dramatically reduces your need to install an external MOV except in extremely noisy environments or inductive load applications.

Single Phase Motor control:

The following table gives guidelines for selecting relays for single phase non-reversing motors. **Driving reversing motors is not recommended due to the potentially destructive voltage doubling and capacitive discharge that they create.**

Recommended Loads:

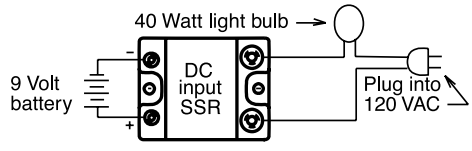
SSR Rating	at 120VAC	at 240VAC	at 480VAC
10A	1/4 Hp	1/2 Hp	-
25A	1/3 Hp	1 Hp	2 HP
50A	3/4 Hp	2 Hp	3 HP
75A	1 1/4Hp	3 Hp	7 1/2 HP

Lamp Test:

An AC output solid state relay can be quickly and easily tested. To evaluate whether or not it is operative, connect the relay as follows using the appropriate voltages. The lamp bulb should not turn "On" until the control voltage is applied (and "Off" when control voltage is removed). If the lamp comes "On" with no control voltage, the output is shorted.

Shown is an AC output solid state relay. DC units can be checked the same way with appropriate DC voltages and load.

Safety:



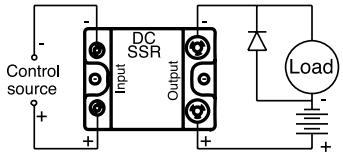
Solid State Relays are NOT open circuits, even when in the off-state, due to their leakage current. Safety can only be achieved by a mechanical disconnect between the solid state relay and the power lines.

DC Output relay - Transient protection:

Most loads are inductive, even ones that are not so labeled. An inductive load will produce harmful transient voltages when it is turned off. Power MOSFET outputs can be susceptible to the transient voltages produced by seemingly “non-inductive” loads and can be damaged if not properly protected. A protection diode across the load is recommended.

Input and output polarity must be observed. Inductive loads must be diode suppressed.

The diode used should be of the fast-recovery type with a reverse voltage rating at least equal to the supply voltage.



Examples of fast-recovery diodes that may be used for transient suppression:

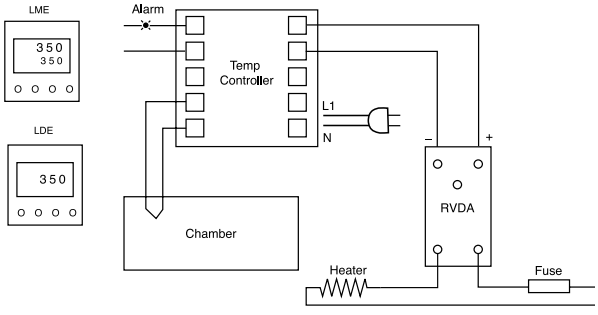
RELAY MODEL	MOTOROLA DIODES	GE DIODES
RSDC	MR851	A115A

These diodes are suitable for most applications. For fast repetition rates consult factory for further information.

Typical Temperature Control Installation

Electrically heated chamber application

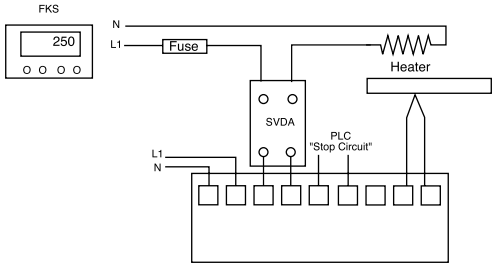
- DC activated RVDA solid state relay.
- Thermocouple input
- Alarm for operator warning



Typical Temperature Control Application

Packaging or food processing application

- SVDA solid state relay.
- Analog sensor input
- Alarm circuit to stop PLC or related equipment



Locking Screws-RS and RV Units:

Screws are prevented from self-loosening by a special design. The automatic progressive locking principle generates an increasing thread friction as the screw is tightened. Repeated tightening and loosening does not cause fatigue of the locking components. Recommended torque is 7-9 in/lbs. Care should be taken not to overtighten screws.

Fusing Considerations:

Circuit Breakers and slow blow fuses offer no protection to Solid state relays. Fast, "I^2T Semiconductor Fuses" are the only reliable way to protect SSRs.

All solid-state relays have an I^2T rating. This rating is the bench mark for their ability to handle a shorted output condition. Continental Industries advocates circuit protection through the use of a properly selected I^2T (semiconductor fuse).

Devices such as electromechanical circuit breakers and slow blow fuses cannot react quickly enough to protect the SSR in a shorted condition and are not recommended!!

For fuses I^2T is the measure of let-through energy in terms of current versus time. For solid state relays, I^2T is based directly on the output thyrsistor's single-cycle peak surge current determined by:

$$I^2T = \frac{I^2pk(surge)}{2} \times .0083 \text{ (Seconds)}$$

The procedure is to select a fuse with an I^2T let-through rating that is less than the I^2t capability of the solid state relay for the same duration.

An I^2T fuse protects the solid state relay. You still need a regular fuse or circuit breaker to protect the complete installation, in accordance with your local electrical code.

Leakage - effect on input:

Many Temperature Controllers and PLC's use Triacs as output devices and most manufacturers place a ".022 microfared snubber" across their triacs for their own protection. This snubber can produce enough leakage when the controller is "off" that it can cause the Solid State Relay connected to it to go "on" or at least to not turn "off" properly.

A solution to this problem is to place a 10K Ohm, 2 Watt resistor (for 120 Volt control), across the input (control) of the Solid State Relay.

The SVAA and RVAA family typically does NOT need the additional burden resistor. This saves you installation time and cost.

Output Leakage

Solid state relays typically have 8mA leakage current, even in their off-state. The only safe way to prevent shock is to have a mechanical disconnect between the line and the relay.

Direct Copper Bonding:

Continental Industries employs the proven reliability of direct copper bonding technology to all of its SCR chip assemblies. This direct bonding provides a more reliable mechanical connection between the SCR and the heatsink, by reducing the physical stress on the chips and also provides for better heat dissipation by reducing the layers heat must travel through to the ambient. These benefits result in a more durable relay and a longer usable relay lifetime.

Using SSRs with Electromechanical Relays:

Using a SV or RV relay to activate an electromechanical or mercury contactor is possible. Electromechanical relays produce a significant amount of electrical noise which could cause a solid state relay to mistrigger. If these two types of relays are used together, surge voltage protection may be required.

Caution:

Continental Industries International's Solid State Relays, Input/Output Modules, controls, and other Continental automation products can (as is possible with any electronic component) fail without warning. For this reason Continental Industries International cannot recommend, condone or warrant any application of our products that could cause harm or injury, in any manner, to any person, equipment, or facility upon such failure of the product.

For your safety and to protect the equipment from damage in the event of failure, it might be necessary to insert some type of upper-limit device (e.g. thermal) in series with the relay output to cause discontinuance of current to the load. Additionally, it is advisable to have a mechanical disconnect in the load circuit for service purposes.

Caution: the heatsinks shown in this catalog are capable of being over 100°C (212°F) when they are operating correctly in an installation. This could cause burns. ALWAYS completely de-energize a SSR and let it cool down before touching the unit. All heatsinks must be installed on a vertical metal surface with unrestricted airflow that flows up, through the fins, and out the top of the heatsink. Mounting the heatsinks on a horizontal surface, or limiting airflow due to other components being installed nearby, will severely decrease the ability for the heatsink to perform as specified.

Always disconnect the electrical power before touching the SSR or the load. Otherwise, an electrical shock hazard may exist. Failure to do this may result in electrocution or death.

Continental Industries International's products are intended for use where access is limited to qualified service personnel. Continental Industries International's products are not intended for use in explosive atmospheres.

CE installation catagory is Class 3 or lower.

Please contact the factory if you have any doubts or questions as to whether this caution applies to your application.

Warranty:

Continental Industries International warrants its products for a period of one year from date of manufacture to be free from defects in both workmanship and materials. Continental Industries International, however, assumes no risk or liability for results of the use in combination with any electrical or electronic components, circuits, systems, assemblies, or unsuitability of any product for use in any circuit or assembly. Purchaser's rights under this warranty shall consist solely of requiring Continental Industries International to repair, replace, free of charge, F.O.B. factory, any qualified, returned items. In no event shall Continental Industries International be liable for any express or implied warranty as to merchantability, fitness, description or for special or consequential damages or for delay in performance of this warranty.