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Solid State Relays

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WARNING: These products are not designed for use in, and should not be used for, patient-connected applications.

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PRECAUTIONS

A number of essential safety precautions must be observed in the installation and use of a Solid State Relay (SSR).

The SSRs should be installed and serviced by qualified technicians familiar with high voltage and current circuits. Note that an SSR has a small leakage current when the contacts are “open”. Normal failure condition is contacts “closed”. A special Fast Blowing I^2T fuse and a mechanical interrupt switch are recommended in the load circuit. In certain applications a mechanical interrupt switch should be installed in the control circuit.

GENERAL DESCRIPTION

The Omega® Solid State Relays (SSR’s) are a series of single-pole, normally open, solid state switching devices with no moving parts, capable of tens of millions of cycles of operation. It is designed to control 120V, 240V or 480V (up to 660V) alternating current (VAC), and provides zero voltage switching and 2500VAC isolation between the load terminals and the control signal. A control signal (AC or DC input, depending on unit selected) causes the SSR to switch the ac load ON or OFF just as a conventional mechanical contact switch does but with none of the problems associated with moving contact relays, such as corrosion, pitting, arcing, radio frequency interference (RFI) and bounce. The result: much longer life for the SSR.

The SSR is designed around a pair of SCR’s mounted on a heat-spreading metal base to eliminate thermal fatigue failures. To dissipate the heat developed naturally in an SSR due to a nominal voltage drop across the device, the SSR must be mounted on a Finned Heat Sink (FHS), or on a metal plate of adequate size (see Section 4). It is advisable to install an SSR where the ambient temperature is relatively low because its current-switching rating is decreased as its temperature increases.

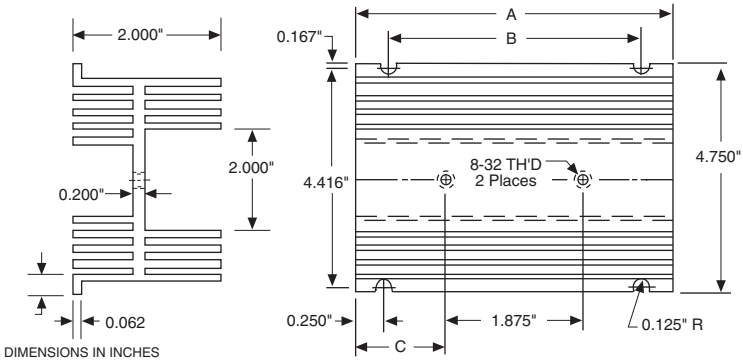
Control resistance heaters up to 40 kW use solid state relays in conjunction with lower-rated temperature controllers. Three-phase loads can be controlled using 2 or 3 SSR’s. Use 3 SSR’s for Y-phase loads using a neutral line. Three solid state relays are also used when there is no neutral load to provide redundancy and extra assurance of control. Two SSRs will control “delta” loads with no neutral line.

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FINNED HEAT SINKS (FHS)

The Finned Heat Sinks (FHS) are anodized, aluminum fabrications which come complete with tapped mounting holes, and screws to mount the SSR.

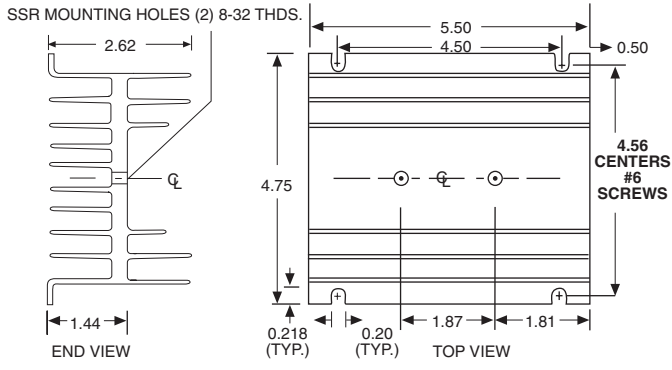
FHS-1 and FHS-2 Heat Sink



	A	B	C	THERMAL RATING
FHS-1	3.00"	2.50"	0.56"	2°C/W
FHS-2	5.50"	5.00"	1.81"	1.2°C/W

FHS-1 - FHS-2 Heat Sink

FHS-6 Heat Sink (0.7°C/W Thermal Rating)



FHS-6 Heat Sink

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FUSE PROTECTION

The load side of the SSR should be protected by a Fast-Blowing I^2T fuse. Recommended fuses and part numbers are given in below. Although a semiconductor relay is designed for virtually countless operation cycles, it can be destroyed by an over-voltage or a short circuit, unless protected adequately by the fast fuse.

Table 3-1 shows the part numbers of the fuses and fuse blocks that can be used with each of the SSRs. Lower rated fast-blow fuses should be used if the current being controlled is below the rated capacity of the SSR. Bussman or equivalent fuses should be used. It is essential that a proper fast-blow (I^2T) fuse is used. SSR's normal failure mode on overloaded circuits is closed contacts (ON-STATE).

SSR Part Number	Maximum Current Capacity	Fuse Part Number	Fuse Block Part Number
SSRL240AC10	10 Amps ac	KAX-10	FB-1, FB-2, FB-3
SSRL240AC25	25 Amps ac	KAX-25	FB-1, FB-2, FB-3
SSRL240AC50	50 Amps ac	KAX-50	BS101
SSRL240AC75	75 Amps ac	KAX-70	BS101
SSRL240AC100	100 Amps ac	KAX-100	BS101
SSRL240DC10	10 Amps ac	KAX-10	FB-1, FB-2, FB-3
SSRL240DC25	25 Amps ac	KAX-25	FB-1, FB-2, FB-3
SSRL240DC50	50 Amps ac	KAX-50	BS101
SSRL240DC75	75 Amps ac	KAX-70	BS101
SSRL240DC100	100 Amps ac	KAX-100	BS101
SSRL660AC50	50 Amps ac	KAX-50	BS101
SSRL660AC75	75 Amps ac	KAX-70	BS101
SSRL660AC100	100 Amps ac	KAX-100	BS101
SSRL660DC50	50 Amps ac	KAX-50	BS101
SSRL660DC75	75 Amps ac	KAX-70	BS101
SSRL660DC100	100 Amps ac	KAX-100	BS101

LEAKAGE CURRENT

In the OFF state, all SSRs have a small leakage current through their contacts, typically .1mA for 240V versions and .25mA for 660V versions. As a result, a voltage potential will always exist on the LOAD SIDE, even when the "contacts" are "open". The voltage level is a function of the load resistance. In accordance with E = IR, the voltage level equals leakage current times load resistance.

The voltage level will rise to FULL LINE VOLTAGE under NO LOAD (open circuit) or high resistance conditions. Under normal operating conditions, however, it is very small. A 120-Watt (W) load has a resistance of 1 ohm. With "open contacts", a leakage current of 15mA will cause 15mV across the load (E = 15 mA $\times$ 1 ohm). A mechanical switch is recommended between the AC power source and the SSR to provide electric isolation for servicing the load.

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ELECTRICAL SPECIFICATIONS

Output-ac Load							
Model No.	Nominal ac Line Voltage	Nominal Load Current	Max. Contact Voltage Drop	Max. Off-State Leakage (25°C max. ambient) 120Vac	240Vac	660Vac	Max Forward Voltage Drop
SSRL240AC10	24 to 280Vac	10 A	1.6V	0.1 mA	0.1 mA	N/A	1.35
SSRL240AC25		25 A		0.1 mA	0.1 mA		1.35
SSRL240AC50		50 A		0.1 mA	0.1 mA		1.35
SSRL240AC75		75 A		0.1 mA	0.1 mA		1.3
SSRL240AC100		100 A		0.1 mA	0.1 mA		1.3
SSRL240DC10	24 to 280Vac	10 A	1.6V	0.1 mA	0.1 mA	N/A	1.35
SSRL240DC25		25 A		0.1 mA	0.1 mA		1.35
SSRL240DC50		50 A		0.1 mA	0.1 mA		1.35
SSRL240DC75		75 A		0.1 mA	0.1 mA		1.3
SSRL240DC100		100 A		0.1 mA	0.1 mA		1.3
SSRL660AC50	48 to 660Vac	50 A	1.6V	0.25 mA	0.25 mA	0.25 mA	1.35
SSRL660AC75		75 A		0.25 mA	0.25 mA	0.25 mA	1.3
SSRL660AC100		100 A		0.25 mA	0.25 mA	0.25 mA	1.3
SSRL660DC50	48 to 660Vac	50 A	1.6V	0.25 mA	0.25 mA	0.25 mA	1.35
SSRL660DC75		75 A		0.25 mA	0.25 mA	0.25 mA	1.3
SSRL660DC100		100 A		0.25 mA	0.25 mA	0.25 mA	1.3

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ELECTRICAL SPECIFICATIONS

Model No.	Type	Input-Control Signal				
		Control Signal Voltage	Control Signal Turn-On	Control Signal Turn-Off	Max Input Current	Peak Voltage * (60 sec. max)
SSRL240AC10 SSRL240AC25 SSRL240AC50 SSRL240AC75 SSRL240AC100	AC Control Signal	90 to 280VAC	90VAC	10VAC	10mA	800V
SSRL240DC10 SSRL240DC25 SSRL240DC50 SSRL240DC75 SSRL240DC90	DC Control Signal	3 to 32VDC	3VDC	1VDC	14mA	800V
SSRL660AC50 SSRL660AC75 SSRL660AC100	AC Control Signal	90 to 280VAC	90VAC	10VAC	10mA	1200V
SSRL660DC50 SSRL660DC75 SSRL660DC100	DC Control Signal	4 to 32VDC	4VDC	1VDC	14mA	1200V

*Transients above table value should be suppressed.

The following SSRs are available from OMEGA Engineering.

Part Number	Description	Nominal Load Current (AC Amps)
SSRL240AC10 SSRL240AC25 SSRL240AC50 SSRL240AC75 SSRL240AC100	AC Control Signal (24 to 240VAC line)	10 25 50 75 100
SSRL240DC10 SSRL240DC25 SSRL240DC50 SSRL240DC75 SSRL240DC100	DC Control Signal (24 to 240VAC line)	10 25 50 75 100
SSRL660AC50 SSRL660AC75 SSRL660AC100	AC Control Signal (48 to 660VAC line)	50 75 100
SSRL660DC50 SSRL660DC75 SSRL660DC100	DC Control Signal (48 to 660VAC line)	50 75 100

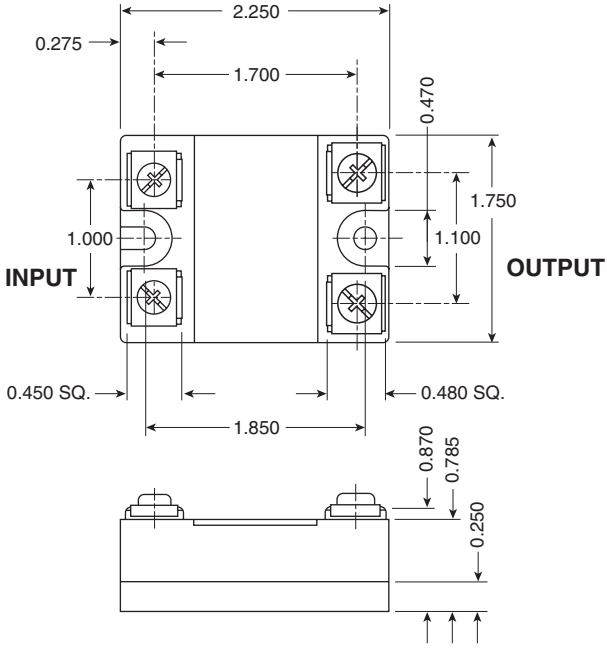
MOUNTING THE SSR

The SSR assembly (including heat sink) can be located close to the load, minimizing the lengths of power cables. The actuating device, such as a temperature controller, can then be located in an area more convenient to the operator.

The FHS on which the SSR is to be mounted has been pre-drilled and tapped, and is supplied with mounting screws. The SSR is supplied with a thermally conducting pad (attached). Mount the SSR securely to the heat sink with the mounting screws.

The best location for the SSR is an open area with unrestricted air movement. The FHS should be mounted on a vertical surface with the fins vertical. If it is mounted with the fins horizontal, or on a horizontal surface, the thermal coefficient must be re-dated by 20%. For air flow, allow at least ½ in. clearance at each end and 1 in. on the sides.

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SSR Dimensions (inches)

Mounting Dimensions Fuse Blocks (in.)

FB-1 3.25L x 0.75W x 1.3H

FB-2 3.5L x 2.0W x 1.18H

FB-1 3.5L x 3.0W x 1.3H

BS101 1.75W x 2.29H
supplied in 2 sections to adjust for length of fuse
max. length with 100A fuse approx. 5 in.

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SPECIFICATIONS

GENERAL SPECIFICATIONS(1)

PARAMETER	ALL DEVICES
Operating Temperature Range	–20° to +80°C
Storage Temperature Range	–40° to +80°C
Input to Output Isolation Voltage(2)	4000 V rms
Input/Output to Ground Isolation Voltage	2500 V rms
Capacitance Input to Output (Max)	8 pF
Line Frequency Range	47 to 63 Hz

INPUT SPECIFICATIONS(1)

PARAMETER	SSRs	DC SSRs
Control Voltage	90–280 VAC	3–32 VDC (4)
Drop Out Voltage	10 Vrms	1.0 VDC
Maximum Input Current(3)	10 mA rms	14 mADC
Turn-On Time	20 ms	0.5 Cycle Max.(5)
Turn-Off Time	30 ms	0.5 Cycle Max.
Nominal Input Impedance	Current Regulated	

OUTPUT SPECIFICATIONS(1)

PARAMETER	SSRs					UNITS
Maximum On-State Current(6)	10	25	50	75	100	Arms
Minimum On-State Current	50	50	100	100	100	mArms
Maximum 1-Cycle Surge(7)	150	300	750	1000	1200	Apeak
Maximum 1-Second Surge(8)	30	75	150	225	300	Apeak
On-State Voltage Drop(9)	1.35	1.35	1.3	1.3	1.3	Vpeak
I^2T (60 Hz)	416	937	2458	5000	6000	A^2sec

FOOTNOTES
(1) Specifications apply to T_A –30 to +80°C unless otherwise noted.
(2) At T_A of 25°C for one second, maximum leakage 1 mA.
(3) At maximum input voltage.
(4) 660V versions 4-32VDC
(5) Zero cross over firing.
(6) With relay properly mounted on an adequate heatsink.
(7) At T_A of 25°C, non-repetitive.
(8) At T_A of 25°C.
(9) At T_A of 25°C and maximum on-state current.

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OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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