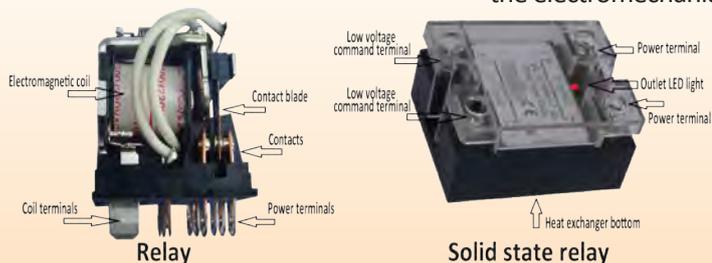


Introduction to the use of solid state relays (SSR)

The solid state relay, also called solid state contactor or SSR (English acronym for Solid State Relay) is the electronic equivalent of the electromechanical power contactor.

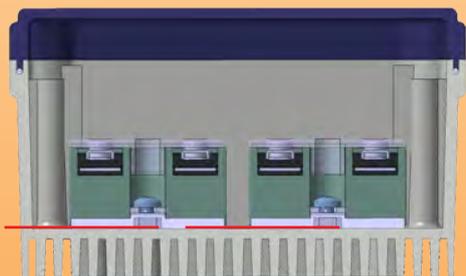


The relay or electromechanical contactor: The coil is made of a very large number of turns of a very thin copper wire. When a sufficient current goes through the coil, it produces a magnetic field that attracts the movable part and moves the reeds with electrical contacts. When the current no longer flows in the coil, the contacts return to their initial position thanks to a restoring spring.

The solid state relay: the input circuit, equivalent to the contactor coil is electrically isolated from the power circuit with an optocoupler (also known as photocoupler), composed of a LED and a phototransistor. This miniature electronic component can separate two electronic or electrical circuits whose grounds are not at the same voltage. The input circuit command is usually done by of low DC voltage pulses consuming a few milliamps. This input circuit controls a power circuit usually consisting of thyristors or triacs. Accurate controls, particularly those with PID action, may require very high heating opening and closing frequencies, with durations sometimes less than one second. These frequencies cause the electromechanical contactors quick wear but do not affect the static switches. It is the same for On/Off controlled applications with low differential (hysteresis) of systems submitted to sudden changes in temperature. Over the past two decades, the dimensions and characteristics of solid state relays connection were gradually standardized, and most models are now interchangeable.

General comparison between solid state and electromechanical relays

	Radio interferences	Wear	Noise	Dimensions	Overheating	Insulation	Cost
Solid state relay	99% removed by the cut to zero technique and filters	No	No	Small except if a heat-sink is required	Significant, often requires a heatsink	Open position: Residual leakage current	Medium, dropping
Electromechanical relay	Few interferences	The electrical contacts wear at each cycle	Click	Large for power contactors	Low	Open position: no current flows	Low



Installation example of solid state relays in an aluminum Ultimheat housing (thermal compound in red).

Heat dissipation: approximately 0.3% of the average power (about 1W per Ampere rms) passing through is dissipated by Joule effect in the solid state, and must be evacuated. For instance: a solid state 20A 240V relay, operating at 100% power, dissipates around 15 watts, which is sufficient in the case of a control box, to raise its internal temperature of 30-40 ° C. SSRs have a lower surface of aluminum which is used to remove that power. The temperature of this wall can not exceed 115 ° C. Heat sinks should be provided to properly exhaust the heat generated. For this, it is necessary that this surface has an excellent thermal contact with the wall it is mounted on. A contact grease is necessary to improve the exchange. For Ultimheat boxes provided for solid state relays, the heat dissipation is achieved by aluminum fins incorporated into the rear of the case itself. This does not lead to any size or cost increase, unlike other concepts using separate heatsinks.

Residual current: an important parameter to consider when installing solid state relays is that there always remains a few milliamperes residual current when turned "OFF" (Unlike most electromechanical contactors where no current flows when the contacts are open).

Transient overvoltages: the sensitivity of solid state relays to transient overvoltages, which were an early weaknesses of these products, is now greatly reduced by using protective circuits generally based on MOV varistors.

Current rating: in the same way as electromagnetic relays, the current rating of solid state relays is given for a resistive load. Because of the extra currents of inductive opening and breaking loads, as well as extra power-currents of self-regulating heating elements, it is necessary to apply a reduction coefficient of the nominal current ratings in these applications.

Table of current rating reduction coefficients

Resistive load	Filament lamp	Electromagnetic coil	Transformer	Single phase motor	Three phase motor	Self-regulating heating cables*
1	0.8	0.5	0.5	0.12/0.24	0.18/0.33	0.6

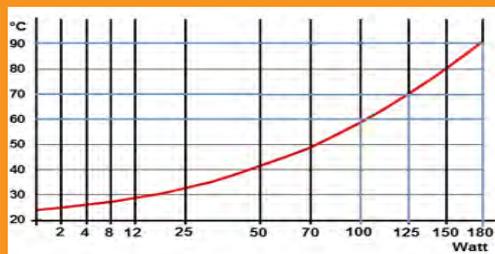
*Average value, depending on cable ambient temperature at startup, see the manufacturers manuals and Standard CEI60898

Temperature of the SSR rear side according to the dissipated power (Ambient temperature = 25°C, Blue lines = safety thermostat set points, see page 45)

Aluminum main housing (180x130x63mm) without fan

Aluminum main housing (180x130x63mm) with fan

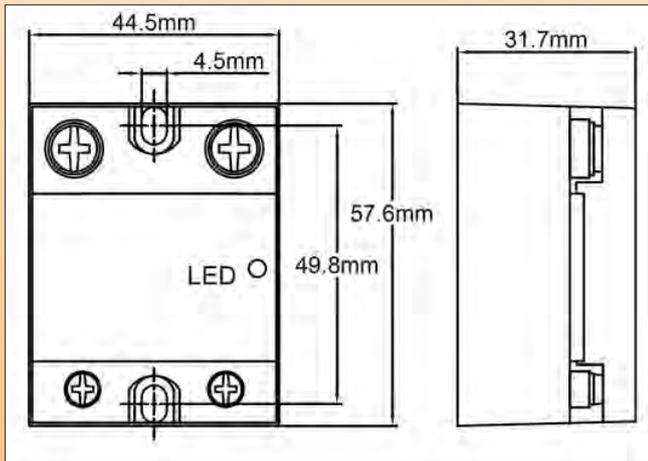
Aluminum additional housing (175x86x40 mm)



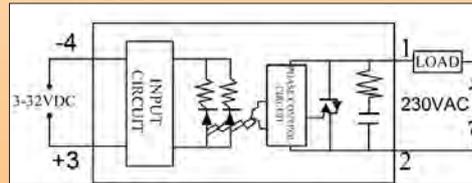
Single and Three-phase solid state relays

Solid state relay, 3-32VDC input, cut to zero.
Compatible with the relay (SSR) output of electronic controllers.

Single phase



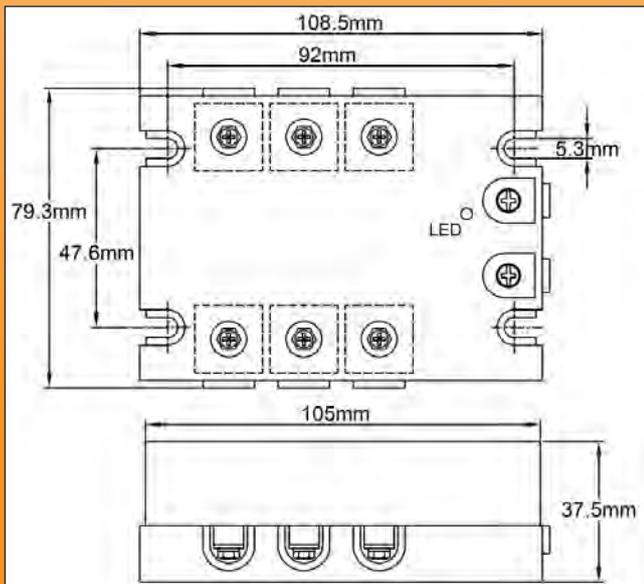
Dimensions: 58 x 45.5 x 30.5 mm
Mounting: two holes dia 4.5 holes, 47.5 to 50 mm spacing
Operating voltage range: 28-285 V AC, 47 to 63 Hz
Input signal: 3-32V DC, 3 to 35 mA current
Voltage drop in open position (current flowing): <1.5VAC
Closed position leakage current (current not flowing): <2mA
Opening and closing maximum times: less than 10 ms
Dielectric insulation: 2500VAC
Non repetitive over-current (I_{tsm}) :
 10A modele: 100A
 20A modele: 200A
 30A modele: 300 A
Insulation resistance: > 100 Mohms /500VAC
Output indication On: with LED
Operating temperature: -30 +75 ° C
Thermal dissipation: approx. 0.3% of the average power
Connections :



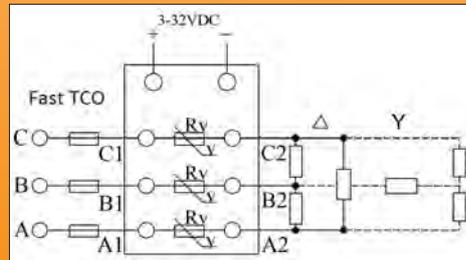
Reference	Current
91GJW10240	10A
91GJW20240	20A
91GJW30240	30A

Electromagnetic contactors and relays: see page 85

Three phase



Dimensions: 108.5 x 76.3 x 37.5 mm
Mounting: 4 holes M4, 48 x 92 mm spacing
Operating voltage range: 24-440 V AC, 47 to 63 Hz
Input signal: 3-32V DC, 12 to 25 mA current
Voltage drop in open position (current flowing): <1.5VAC
Closed position leakage current (current not flowing): <10mA
Opening maximum times: < 10 ms
Non repetitive over-current (I_{tsm}) :
 10A modele: 100A
 20A modele: 200A
 30A modele: 300 A
Dielectric insulation: 2500 VAC
Insulation resistance: > 100 Mohms /500VAC
Output indication On: with LED
Operating temperature: -30 +75 ° C
Connections :



Reference	Current
91GJH10440	10A
91GJH20440	20A
91GJH30440	30A

Electromagnetic contactors and relays: see page 85

The solid state relays in this range are cut-to-zero equipped. They are compatible with the electronic controllers SSR outputs. The insulation between the control circuit and the power circuit is carried out by photo-electric coupling. They include an RC protection against power surges.

Because of permanent improvement of our products, drawings, descriptions, features used on these data sheets are for guidance only and can be modified without prior advice

