CUSTOM SENSORS & TECHNOLOGIES

crydom®

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Solid Statements:
Hybrid Relay Technology

As the global market leader in power solid state relays, we at Crydom have spent many years explaining the advantages of using solid state relays over electromechanical relays and contactors. To name just a few;

- Life expectancy in excess of 50x typical EMRs and contactors
- No moving parts, which eliminates switch-bounce and arcing
- No audible noise during switching
- Fast turn-on / turn-off time allows for accurate load control
- Zero-crossing capability to reduce surge currents
- Low-power input allows for the switching of high current loads with only a few mA of supply current
- High shock and vibration resistance

However, we at Crydom are also fully aware that there are a couple of limitations to the use of solid state relays over typical EMR solutions. Next to price, the most common reason for not using a solid state relay is heat. SSRs dissipate approximately 1 watt of power for every amp of load current. As we discussed in previous editions, the heat dissipated by an SSR must be properly managed in order to prevent it from being damaged in the application. In some applications it is not possible to manage this dissipation due to available panel space, enclosure size or design, location, etc. In such cases, engineers are usually forced to stay with their existing EMR solution, regardless of their shortcomings.

Hybrid Solid-State Relays

A “Hybrid” solid state relay is one that combines the benefits of both SSRs and EMRs. As mentioned above, the primary advantage EMRs have over a typical solid-state relay is the low impedance of its contacts. Quite commonly this can be as low as one or two milliohms. Therefore, a SSR switching a 50 amp load will dissipate 50 Watts of power, but a mechanical contactor in the same application may dissipate less than 5 Watts ($P = I^2R$). Such an application would definitely require the use of a heat sink with the solid state relay and adequate panel ventilation, ultimately increasing the cost of the solution.

On the other hand, the life expectancy of the EMR is significantly

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less than a solid-state relay. A normal "off the shelf" SSR may last between 500x and 5000x longer than a typical EMR. In fact, the most common reason for an engineer to change from EMR technology to solid-state technology is due to the increase in life expectancy. The difficulty arises when an engineer wants the life-expectancy benefits of a solid-state relay but does not have a panel suitable for dissipating heat. Such cases are the ideal opportunity for hybrid technology.

The output circuit of a hybrid SSR contains both a solid-state and an electromechanical device. The solid-state section of the output energizes immediately after the application of a control signal. This eliminates any arcing typically associated with EMRs and contactors switching at high line voltages or into heavy surge-current conditions. The electromechanical portion of the relay is in parallel to the SSR output and closes a few cycles after the load is energized. Since the Vf of the SSR output is only ~1Vrms, there is no arcing across the contacts. Furthermore, once the EMR portion closes the power dissipation drops to only a few Watts max, depending upon the load current. Therefore, no heat sink is required in the application. This process reverses when the control signal is removed.

The end result is a relay with a significantly higher life expectancy than a contactor or EMR, but without the heat dissipation associated with a SSR.

Marketing Stuff:

Additional information on Crydom's hybrid solid-state relays is available in the RHP section of our website (links below).

RHP Website

RHP White Paper

RHP PDF Training

RHP Catalogue Page

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