How to verify the proper Heat Sink

Courtesy of: Crydom

In certain instances, once the heat sink requirements for a SSR in a particular application have been determined and installed, (see the Crydom paper entitled SELECTING A SUITBLE HEATSINK), it may be desirable to verify that the system does indeed provide adequate cooling to ensure reliable SSR operation.

The following is a relatively simple method to check this suitability, and essentially uses some of the calculations from SELECTING A SUITABLE HEAT SINK in a reverse manner. This technique may also be used on existing systems in the field that might have been more or less "empirically" designed, to gain information on their performance and potential reliabilty. This method involves determining the temperature of the internal power devices, (SCR's or Triac), within the SSR and then comparing that temperature with a "standard" absolute maximum temperature that the SSR power devices must never exceed. The maxium power device temperature is generally considered to be 125°C but for an added safety margin, 115°C should be used. (Of course for the truest indication, the **entire system** being evaluated should be stable and operating at its **maximum rated parameters** including load currents, ambient temperatures, and with doors and access panels in their normal operating positions).

There are three additional pieces of data needed to perform this evaluation. They are the actual load current switched by the SSR, the specified "Thermal Resistance – Junction to Case" - Rθjc of the SSR, and the measured temperature of the SSR base plate. Ideally, the temperature measurement of the SSR base plate should be taken directly from the bottom center of the SSR. However, since in most installations this is not practical since the SSR is mounted to a heat sink surface, the next best accessible location is on the top surface of the base plate near the mounting screw holes at the junction of the plastic case to the base plate surface. (To compensate for this measurement location, it is a good practice to add 3 to 5 degrees to the actual measurement.)

Using the above data, and an estimated power drop of 1 Watt for every 1 Arms of load current, the total internal dissipation in Watts can be calculated. (e.g. 35 Arms load = 35 Watts of internal dissipation.) Next, multiply the internal dissipation in Watts by the Rθjc value, (in °C/W), to determine the internal temperature rise. This temperature value is added to the measured base plate temperature to arrive at the calculated temperature of the internal power devices. If this value is less than the 115°C "standard maximum with safety margin" value, then the heat sink is adequate.

In some cases, the heat sink information and derate curves provided within the SSR specification sheets may include expected base plate temperatures, but generally do not consider the safety margin values.