GE Electrical Distribution & Control

Advantages of Bimetal vs. Eutectic Alloy Overloads

Overloads protect motors from damaging overcurrent conditions. There are many designs and styles of overload relay devices on the market with many unique features. By far, the largest class of overloads consists of thermo-mechanical devices, including bimetal overloads and eutectic alloy overloads.

Differences in operation

Bimetal overloads use a bimetallic strip, which bends when heated, to trip the overload and stop the motor. With sufficient heat, the bimetal will bend enough to trip an over center mechanism that releases a normally closed contact. The heater, which is either fixed or interchangeable, is selected based on the motor current requirements. With interchangeable heater overloads, like GE's NEMA devices, the heater is selected for each motor and its full load current. The heater is installed into the overload by the user. Fixed heater overloads, such as GE's IEC devices, have one set of heaters and bimetals, but also dials for setting the motor full load current. GE's NEMA overloads also have an adjustment knob to allow precise setting of the overload.

Eutectic alloy overloads use a solder-like material contained in a tube. When solid, the solder binds a ratchet mechanism. When the solder material reaches its melting temperature, the ratchet is released almost instantaneously and the normally closed contact is opened. The solder tube, ratchet mechanism and heater are combined in interchangeable modules. These modules are installed into the overload to obtain the exact current rating for proper motor protection. The method for selecting heater modules is similar to that for bimetal overloads.

Differences in application

There are advantages to both bimetal and eutectic alloy overloads but, in most applications, both types of devices will perform well. The eutectic alloy overload may perform better in high vibration environments because the solid material tends to firmly bind the mechanism. However, severe vibration is a concern only in a very limited set of specific circumstances. GE's bimetal overload resists the shock and vibration of normal applications.

There are some features a eutectic alloy overload cannot provide. Its design precludes such features as automatic reset and ambient compensation, which are common in bimetal overloads. Ambient compensation is important when the temperature of the overload enclosure is subject to severe fluctuation or if the enclosure is expected to run either hotter or colder than the motor ambient temperature. Automatic reset, available on GE's 700-Line IEC and 300-Line NEMA style overloads, is critical in some applications, such as crane devices or air

conditioners, where the overload is hard to access. (Note: The use of automatic reset overloads is restricted by the NEC and some local codes.) Also, GE's 300-Line overloads have two bimetals for improved trip response. The second or anticipating bimetal adjusts the trip response of the overload to provide optimum protection and eliminate nuisance tripping.

Another disadvantage of a eutectic alloy overload is that, if the overload is reset as the solder is solidifying, the relay mechanism may not reset and it may be necessary to replace the heater module. This will not happen with a bimetal overload.

Overload selection

When choosing an overload relay to protect a motor, the primary concern should be the features required by the application. The proper selection of heaters or — in the case of IEC type overloads — current ranges, is critical. Other considerations include the necessity for automatic reset and ambient compensation. If either of these features is required, then bimetal overloads, such as the GE NEMA and IEC overload relays, are the only choice.

Note to InVision Program Coordinators: Please file in the General Purpose Controls Product Reference file under the "Application" tab.

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DET-022 0993 BL