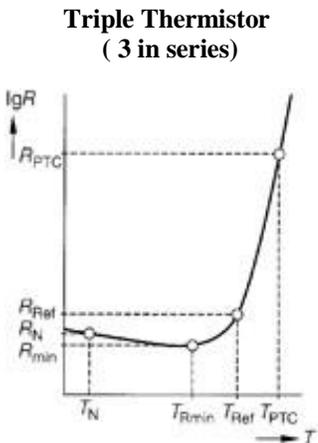
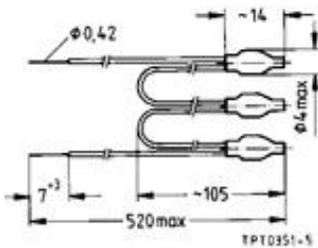
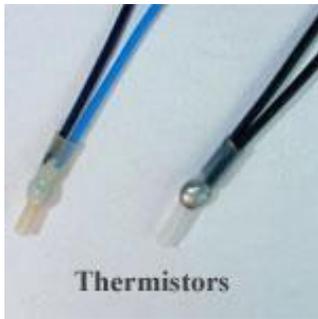


Q. We just got in a new piece of equipment and the motor on it has 2 small wires in the junction box as well as the power leads. I was told they were thermistor wires. Would you tell me what they are and what they do?

A. Yes indeed. These 2 wires provide temperature overload protection for the motor, when used with a Thermistor Protection unit, and they really are well worth using.



1. PTC (positive temperature coefficient) thermistors are used in electric motors and the leads of the thermistors are color coded indicating its temperature rating. For example, with an insulation class F thermistor, the lead colors will be **blue** and black. PTC thermistors have a resistance that increases with rise in temperature.
2. The thermistor itself usually has a diameter of 3 to 4 mm and is covered usually with an insulating coating
3. Each thermistor is made of a polycrystalline ceramic material that are normally highly resistive but are made semiconductive by the addition of dopants. They are most often manufactured using composites of barium, lead and strontium titanates with additives such as yttrium, manganese, tantalum and silica.
4. These devices have a resistance-temperature characteristic (as shown on graph on lower left) that exhibits a very small negative temperature coefficient (NTC) until the device reaches a critical temperature, that is referred to as its switch or transition temperature. As this critical temperature is approached, the devices begin to exhibit a rising positive temperature coefficient of resistance as well as a large increase in resistance. The resistance change can be as much as several orders of magnitude within a temperature span of a few degrees
5. A triple sensor is usually used to protect the electric motor. This is simply 3 sensors in series, 1 in each phase of the endwinding.
6. The large increase in resistance at the switching temperature is detected by the Thermistor Protection Unit (TPU), similar to the Siemens Type 3RN1 shown to the left, and is converted to a contact output, to warn or shut down the motor starter. At ambient temperatures the resistance of a set of 3 thermistors will be about 200 ohms and this will increase rapidly to approx. 3,000 ohms.

Conclusions

Thermistors respond to the actual temperature of the motor windings and rotor. They alone can detect the effect of an external influence on a motor such as broken or missing fans, blocked cooling fins on stator housing, heating problems associated at times with variable frequency drives. For maximum electric motor protection use thermistor protection in conjunction with an electronic OL relay.

