



TECHNICAL INFORMATION

TITLE: TEMPERATURE SENSORS AND HOT-MOTOR COMPENSATION

TEMPERATURE SENSORS

The MPU-16A has an input for either a positive-temperature-coefficient thermistor (PTC) or a resistance-temperature detector (RTD).

A PTC sensor is a non-linear device that is not suitable for direct temperature measurement. It has a low resistance (<200 ohms) at temperatures below the nominal response temperature (NRT) and a high resistance (>3000 ohms) at temperatures above the NRT.

The most common RTD sensors for direct temperature measurement are 100-ohm platinum, 120-ohm nickel, 100-ohm nickel, and 10-ohm copper. In most industries, 100-ohm platinum (DIN 43760) is regarded as the preferred sensor.

HOT-MOTOR COMPENSATION

The rate at which heat is produced in a motor is equal to the difference between the electrical power input and the shaft power output. At steady state, heat produced is equal to the heat dissipated and motor temperature will be constant. Under locked-rotor, high-inertia-starting, or overload conditions, the heat produced will exceed the heat dissipated and motor temperature will increase. The temperature rise in the stator will lag the temperature rise in the rotor because of the time required for heat to transfer from the rotor to the stator. If a temperature sensor is embedded in a stator winding, it will accurately indicate steady-state temperature; however, the sensor response is too slow to protect against most overload conditions.

Although the MPU-16A has programmable trip-and-alarm temperature set points, the most important function of a RTD sensor is to provide hot-motor compensation. This function can be enabled in MODE 8 to bias the thermal model and provide protection against loss of ventilation and high ambient temperature. Only one RTD is required since the variation among sensors in the same motor is usually small compared to the temperature rise of the motor.

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