Speed Sensor Requirements for Motor Protection

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A speed sensor is sometimes required for motor protection because the **locked rotor damage curve is below the acceleration trace** in some motors. In other words, if the rotor is prevented from turning and the motor is energized, it draws current similar to starting current but rotor damage occurs before the typical acceleration time elapses.

Rotor damage does not occur during starting because rotor resistance decreases with slip and the I^2R losses. The rotation during acceleration also helps to dissipate heat.

The speed sensor stops a **timer set shorter than the locked rotor damage time**. This timer activates when the motor starts. Motor starting is normally identified when current increases from zero to above full load in a short time. If the speed sensor fails to detect rotation, it will trip the supply when the timer expires. If the speed sensor detects rotation, it resets the timer.

If the locked rotor damage time is longer than the acceleration time, a speed sensor is not necessary because a simple acceleration timer also protects the rotor.