

## MP-03 : SERVICE FACTOR INFLUENCE ON THE OVERLOAD CURVE

There are a number of reasons that users set the service factor on a motor protection relay above the rated value of the motor it is protecting. Most electrical codes allow the overload protection to be set up to 115% or 125% for 1.0 and 1.15 service-factor motors respectively. Some motors, especially large older ones, have very conservative ratings as evidenced by a measured temperature rise at full-load current (FLA). Some motors operate in an environment substantially cooler than 40°C. Whatever the reason for increasing the service-factor setting, the user should be aware of the consequences. The user should also know that mechanical limitations affect a motor's rating and that a low operating temperature is not sufficient justification for increasing the protection envelope.

With respect to the MPU-32 and MPS, time-to-trip at 600% FLA is the default overload class. Overload class is derived from the motor's allowable locked-rotor time which is related to the thermal capacity of the motor. It is possible to program the overload class to represent time-to-trip at other percentages of FLA as well. It is the percent of full-load current that will ultimately cause temperature rise and the relay to trip. Service factor is related to a motor's thermal resistance—a measure of its ability to get rid of heat. The product of thermal capacitance and thermal resistance is a thermal time constant. Increasing the service factor decreases the ultimate temperature rise at any current and the time constant in the thermal model. The resulting time-to-trip will be increased for all values of current. Minimum and maximum service-factor curves for a class-20 overload show that time-to-trip during starting is unaffected by service factor—its effect is significant only for overloads less than 200% FLA.

