

General Motor Knowledge  
Part 7  
Lynn R. Dutro  
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GMK7.WP5

Impedance protection, ZP, is a second means of protecting a motor from overheating. Remember, last month we discussed the thermal protector as one means of keeping a motor from overheating.

Impedance protecting a motor is easy to do, you simply do not do anything. It is however, harder to explain. It seems the "impedance" of a motor winding has to do with the resistance of the wire, the number of turns, the properties of the stator steel, and other things that generally impede the flow of an AC or alternating current. To simplify this discussion, we will concentrate on the resistance.

The resistance of a conductor will increase when the temperature increases. This is so dependable that you can measure the resistance of a winding at a known temperature, then measure the resistance when the winding is hotter or colder and calculate the new temperature. So, as the motor winding heats, its resistance (impedance) will increase.

Voltage is the current times the resistance. The line voltage did not change. The resistance increased. Therefore the current must go down as the winding gets hotter. Power, watts, is the voltage times the current. We just said that the voltage did not change and the current is going down as the winding gets hotter. The power or watts input into the motor is decreasing. The power heating the motor is decreasing. The motor is not getting hot as fast as it was. When the rate of heating is equal to the heat radiated and conducted from the motor into the air and its surroundings, the motor temperature will be stable.

In other words, an impedance protected motor will heat only to a point and will simply not get any hotter. We do not have to do anything, the motor takes care of itself. It can not fail!

UL and CSA specify an 18-day endurance test for an impedance protected motor, just like the thermally protected motor. The motor temperature must not exceed 175 degrees celsius, 347 fahrenheit. If it does, we must use a thermal protector. Impedance protection works for our lower output motors.

Next month we will have some fun! We will digress from our discussion of general motor knowledge and explore a little known scientific principal.