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Temperature Effect on Synchronous Field Resistance

The synchronous field on an AC synchronous motor consists of a series connected DC field windings wrapped around laminated pole pieces connected to the shaft. This is often referred to as a field circuit. It is standard for the motor nameplate to indicate the field voltage and current. The other element in Ohms Law besides voltage and current is resistance. Therefore, knowing the voltage and current allows us to calculate the field circuit resistance. However, the nameplate voltage and current is based on a given temperature and it is expected that changes in temperature would result in different current and resistance values. When measuring the DC resistance of the field windings on a synchronous motor, remember that the temperature greatly affects the resistance value. Copper winding has a positive temperature coefficient, which means the resistance decreases as temperature decreases. The expected resistance found in the motor specification is based on a normal operating temperature (commonly 40 degrees Celsius). If the motor has cooled off, the resistance will be much lower than the expected value and must be temperature corrected for accurate comparison to the nameplate specifications. Non temperature corrected field circuit resistance will often exceed an alarm set point.

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