



ELECTRIC MOTOR TEMPERATURE

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Insulation Ratings

It is given that thermal aging (loss of dielectric quality) of a motor's wire insulation occurs over usage time due to the inherent application load. With today's manufacturing technology and commercially viable materials, time is typically manufacturer warranted at three years (24 x 364 x 3 = 26,208 hours) from the date of shipment from the factory. Given the shipment lead-time, possible temporary storage, site installation with testing, equipment start-up, partial to full load conditions as the application process requires, assorted process fault shutdowns, and an annual plant turn-around (maintenance) schedule, a motor's insulation is typically usage rated to sustain its maximum full-load temperature rating for an average of 20,000 operational hours (20,000 / (24 x 364) = 2 years & 3+ months) during the warranty period. It is therefore intuitive that when an electric device is not operated at its maximum rated temperature, the insulation's thermal life is extended as will be rule-of-thumb discussed within the first paragraph on page 5.

Comment: Issues such as airborne abrasives and blocked vents, possible mechanical abrasion (armature to stator rub) from excessive start torque, bearing lubricant seepage, chemical corrosion, frequent starts over time or per hour, fungus growth, high ambient temperature, high inertia load, high or low or unbalanced voltage, hot spots, internal condensation-moisture, overload, and vibration can shorten insulation life.

Comment: Most motor manufacturers use insulation materials having a higher temperature rating than what is shown on the motor nameplate. The total insulation system materials include the magnetic wire coating, the junction box leads, sleeves over the leads to magnetic wire connections, stator slot liners to avert wire chafe, other non-conducting materials to hold the wiring in place, with an impregnation varnish to bind the windings into a solid mass.

Electric motor manufacturers provide four common (standardized) insulation system thermal ratings, depending on the motor application and its operating environment. Designated as the A,

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