

General Motor Knowledge
Part 25

Rotor Resistance Testing

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Common practice is to die cast the squirrel cages of induction motor rotors. A die cast rotor is simple, durable, rugged and low in cost. The die casting process in general tends to produce a perfect outside surface while the inside may contain voids, blow holes or porosity maybe even resulting in an open bar. We start with nearly pure aluminum, but it is very easy to introduce impurities during the die cast process. Even a small amount of impurity will result in lowered conductivity. Poor rotor quality is usually the largest single cause of poor motor performance. We can usually prove this claim by exchanging rotors to correct poor motor performance. It is desirable, then, to detect and reject a poor or improper rotor before it is assembled into a motor. It is prudent to detect and correct the problem as early in the manufacturing process as possible.

There are several things that can go wrong with a rotor such as, laminations, stack height, slot spiral, finished diameter or end rings. These can be verified by visual inspection or measured with simple tools. Low aluminum conductivity or voids in the casting that can not be seen are not as easily detected. Conductivity of the aluminum or the number of voids and holes that reduce the area of the aluminum rotor cage do, however, work together to change the resistance of the rotor. Stator resistance can be measured with an ohm meter. Measuring rotor resistance is not quite that easy but it is not hard to determine either.

If we measure amperes and watts input to a motor, with the rotor held so that it is not turning, if we make special case assumptions and simplify the equations.

$$\text{ROTOR RESISTANCE} = (\text{WATTS}/\text{AMPS}^2) - \text{STATOR RESISTANCE}$$

We have "Rotor Resistance Testers" available in each manufacturing plant. These testers have all of the assumptions we made controlled or known. A all that is necessary is to drop the rotor into the test stator, read the current and compare that reading to an established limit. The rotor can be tested "as cast", finished or each step in between to determine which step, if any, in our process went wrong.

Merry Christmas and Happy New Year!