Minimum Acceptable Meg-Ohm Values

For Baker Models: ST103/106206, ST112/212, ST115/165, MT165/265, D6000/D12000, D15000,DS215, D165/DS265, D24000/DS224, D30000/DS230, PP30D, D185/285, AWA Series II and III

Question: I do Meg-Ohm/Insulation Resistance testing on several different types of AC and DC rotating machines. What is an acceptable Meg-Ohm/Insulation Resistance value for my testing? In other words, what is a good Pass/Fail criteria for Me-Ohms?

Answer: Meg-Ohm (and PI testing) is governed by IEEE 43. This standard for many years has given a MINIMUM acceptable value for Electric Motor windings as:

1 Meg-Ohm + 1 Meg-Ohm per Kilovolt of machine operating voltage. Machines that measure LESS then should be deemed unfit for service and corrective actions should take place.

Example 1: A 480 VAC three-phase motor would be tested with a Baker Instrument at 500 VDC. The resulting Meg-Ohm value measured at 60 seconds must be higher than 1.48 Meg-Ohms when using the IEEE Guideline.

For those Baker models that do not offer a digital readout, such as the ST series, this means the following:

Use Ohm's Law: At 500 VDC, the tester should indicate LESS than 338 micro-amps (This is the MINIMUM acceptable Meg-Ohm value).

Example 2: A 6600 VAC three phase induction motor would be tested with a Baker Instrument at 2500 – 5000 VDC. The resulting Meg-Ohm value measured at 60 seconds must be higher than 7.6 Meg-Ohm's

In most applications, motors that are in reasonable operating condition will show upwards of 100 Meg-Ohm's, and it is common to see many apparatus that exhibit upwards of 1000 Meg-Ohms.

For motors with extremely high Meg-Ohm Values, greater than 5000 Meg-Ohm's:

IEEE 43 2001 has been appended to reflect the changes seen in electrical insulation. Modern (circa 1975) insulation systems seen in most new motor windings have been improved. These modern insulation systems do not readily allow leakage current. These windings may show Insulation Resistance upwards of 20000 Meg-Ohm's. IEEE 43 2001 states apparatus that exhibit this range of Meg-Ohm values may or may NOT supply meaningful information. Also, in this latest revision of IEEE 43 they talk about how with these modern motors, it may be unacceptable to see any value less than 100 Meg-Ohm's regardless of surface contaminant's on the motor windings.

For motors with very low Meg-Ohm values, near or less than the IEEE minimum's:

An example of a motor that has a very low Meg-Ohm value would be certain types of submersible pump motors. A motor winding that is submerged in liquid may need to use lower values. Perhaps as low as 600 Kilo-Ohms at 500 VDC might be acceptable (Depends on manufacturers specifications).

Application Tip:

The Meg-Ohm test may be influenced by surface leakage due to ambient humidity, a good example of this is the weather phenomena called "dew point" This is the combination of ambient temperature and the humidity present in the atmosphere. At temperatures below dew point, surface condensation of water droplets can and will occur. This is what causes water droplets (or frost) to appear on the windshield of your car in the morning. An electric motor that is in an environment where condensation can occur might give quite low Meg-Ohm values. If possible, turn on the motor heaters to drive out the moisture. If not possible, be aware that this phenomenon exists and adjust test expectations accordingly.