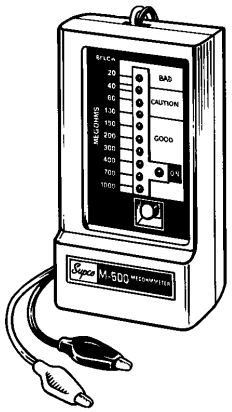
M500 MEGOHMMETER

WHY ALL SERVICE TECHNICIANS NEED THIS INSTRUMENT...



You have often heard the expression, "THE MOTOR IS BURNT OUT" or "THE MOTOR IS HALF COOKED" or "IT WAS OVERHEATED". Actually, the reference is being made to the condition of the motor winding insulation. The wire itself is rarely, if ever, destroyed. It is always the motor-winding insulation that determines if the motor is good, bad, or on the verge of becoming bad.

The winding insulation prevents the current, which is going through the wire, from traveling into the motor body. The expression, "THAT MOTOR IS GROUNDED", simply means that the insulation of the winding has deteriorated or has become damaged from heat and can no longer resist the current from going into the motor body. You can TEST the resistance of the insulation, or you can MEASURE the resistance of the insulation.

THERE ARE TWO WAYS OF TESTING THE INSULATION:

1. A high voltage test from wire to ground (motor body).

2. A high voltage breakdown test from wire to ground. A high voltage test is usually performed at the factory where the product is manufactured. The Underwriters Laboratory standard is to test an electrical product from wire to ground with a voltage equal to 1,000 plus twice the operating voltage, as an example: If a motor was operating at 115VAC, you would conduct the test at, 230VAC from wire to ground and measure if there was any current going into the body.

A high voltage breakdown test is performed to determine at what voltage point the insulation will breakdown and allow current to pass into the motor body. Since you are actually destroying the insulation, a breakdown test is usually performed in a laboratory where different insulations are being tested for their resistance to high voltage, or a more technical term, dielectric strength. The two above methods are used to TEST the insulation resistance.

MEASURING THE INSULATION RESISTANCE:

Since the measurement of electrical resistance is the OHM, we use an ohmmeter. When measuring the insulation resistance of a motor winding, we are involved in resistances in the range of 50 to 100 million ohms. As an example, the starting winding of a small motor may measure 11 5 ohms, and the resistance of the insulation of a good motor may measure 90,000,000 ohms. Most ohmmeters are incorporated in the popular multimeters where one meter can serve as an ampmeter, voltmeter and ohmmeter. However, when this meter is used to read ohms, the circuit does not permit measurements more than a few million ohms or megohms. The SUPCO M500 megohmmeter is specifically designed to detect ohms with a scale that reads up to 1,000 megohms (1,000,000,000 ohms). To accomplish this with some degree of accuracy, you have to apply at least 500 volts. Some instruments use 1,000 volts. Although you can "feel" the 500 volts, it is not lethal because the instrument current is self-limiting, allowing only microamps to go through. This limiting circuit is also the main reason why the use of a megohmmeter can never damage the insulation of a winding.

100-150 Megohm Readings

Most electrical engineers and motor designers agree that a measurement of 150 or more megohms across an electrical terminal to its ground would be considered excellent insulation, and a reading of 100 to 150 megohms is very good.

60-100 Megohm Readings

Measurements of 60 to 100 megohms would show a decline in the insulation resistance, either in an area or a specific spot. This is a most important measurement. It tells you that if you do not take corrective steps, the insulation will completely breakdown. With open type motors it is a matter of good housekeeping by cleaning the dust and any grime from the windings, using a recommended solvent.

20-60 Megohm Readings

A 40 to 60 megohms reading in a hermetic compressor is an indication that you can have any one of a few problems; a winding that was overheated, contaminated oil, or moisture circulating in the system. Sampling the oil for a burning odor will tell you immediately that the winding was overheated. If the oil is clean and odor free, it can still have some contamination that is causing the low megohm reading. A 20 megohm reading shows severe contamination and failure of the system is likely. The best overall protective procedure is to dump and replace the entire oil, change and install a new liquid line drier. If the oil had an odor, a thorough check of the condensing medium, air fans, cooling tower and all motors for worn bearings should be made.

Now that you have discovered a low megohm reading and have taken the necessary preventative measures, the follow-up is very important. Take another reading in a few weeks, and if the reading remains the same or improves, take another measurement in a few months. If the reading shows more deterioration, you can forewarn the owner that there is going to be a major breakdown in his system. One of the best maintenance programs for a new system is to log the megohmmeter readings when the unit is first installed and compare the readings every six months.

HARD STARTING AND OVERLOAD PROBLEMS:

Answering a call where the problem is a hard-starting condition is more involved than merely replacing a defective relay, start capacitor, or installing a starting "Pow-r-pak". The unknown factor is how long did the unit cycle on the overload before the consumer realized the food compartment was getting warm and called the service dispatcher. In other words, was the winding overheated to a point that could have damaged the insulation?

This unknown factor of overheated windings is also present on calls that relate to dirt-clogged condensers, defective condenser fan bearings or motors and brownouts. Whenever a sustained motor overload condition existed before you arrived on the job site, a megohmmeter test tells both you and the consumer if there was any damage to the winding insulation.

Putting this information on the consumer's receipt and recording it in the office records is sound business practice for any future problems and assures the customer that the service engineer "KNOWS HIS BUSINESS".

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APPLICATION

Hermetic Refrigeration Motors

Hermetic motors require special test parameters since the winding operates in an oil and refrigerant atmosphere.

Under normal conditions the oil and refrigerant have a high electrical resistance. However, when they are contaminated with moisture, the electrical resistance changes and a low megohm reading of the winding terminal to ground may actually be the resistance of the contaminants in the oil and not in the winding insulation.

New hermetic motors have a resistance value of more than 100 megohms. Readings of 50 megohms or less would indicate that either the winding insulation is deteriorating or the oil/refrigerant is contaminated.

Installing an oversized drier may clean up th system or another possible solution could be replacing all the compressor oil. In either case, if the megohm tests show even the slightest improvement in resistance values, the remedy may have checked a declining condition.

A good “rule of thumb” is to smell a small sample of the oil. If at any time in the history of the unit the motor was severely overloaded, it will leave a tell tale trace in the oil that can never be removed other than by discharging all the refrigerant and replacing the oil.

The odor of burnt insulation is easily recognized and a low resistance value of 20 megohms or less will verify that the motor insulation may be severely damaged.

SPECIFICATIONS

Range.....20 to 1000 Megohms
Applied Voltage.....500 Volts
Power Source.....(2) “C” Size Batteries
Test Leads.....(2) 9” Long (Store within case)

OPERATION

1. Install two new alkaline “C” size batteries. Polarity is indicated on bottom of the battery compartment.
2. Remove ALL wires that are connected to the terminals that are to be tested. Attach one test lead from the megohmmeter to ANY WINDING TERMINAL and the other test lead to the METAL CASE of the motor. Make sure the point of contact is clean to the BARE METAL (no paint).
3. Depress “POWER” button, wait approximately 10 seconds then proceed to read the insulation value shown on the corresponding illuminated LED lamp.
4. Illuminated “BELOW 20” lamp indicates low insulation or a short circuit in the unit being tested.
5. If the “ON” lamp is illuminated but no light appears on the megohm scale, then the insulation value is MORE THAN 1000 MEGOHMS.
6. If the “ON” light is not illuminated when the “POWER” button is depressed, then the batteries are installed improperly or the batteries are weak and should be replaced.
7. Remember, all tests are made from the motor TERMINAL to the METAL CASE.

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