

PdMA® Motor Circuit Evaluation (MCE)

Increase motor reliability and uptime thru condition monitoring

NORTH AMERICAN COVERAGE



UNITED STATES www.ips.us

Beaumont, TX	888-868-9475
Birmingham, AL	800-978-2212
Chicago, IL	800-978-4559
Cincinnati, OH	800-998-8447
Cleveland, OH	800-433-7801
Corpus Christi, TX	361-459-2600
Denver, CO	800-448-0899
Detroit, MI	800-992-9466
Des Moines, IA	515-608-8215
Dothan, AL	334-699-8080
Erie, PA	724-479-9066
Evansville, IN	812-665-4400
Folcroft, PA	484-498-4848
Houston, TX	800-221-3698
Indiana, PA	800-537-0097
Lake Benton, MN	507-368-4015
Litchfield, MN	888-694-6200
Philadelphia, PA	800-451-5718
Portland, OR	800-366-4951
Rock Hill, SC	800-868-3702
Shreveport, LA	800-366-6030
Sulphur, LA	409-833-9477
Sweetwater, TX	325-933-4274
Washington, PA	800-441-2553

CANADA www.ips.ca

Regina, SK	306-586-0000
Saskatoon, SK	306-651-0400
Winnipeg, MB	204-237-6066



IPS field service technician uses a PdMA MCEmax™ tester to analyze a pump motor for rotor, stator and air gap anomalies by performing a Rotor Influence Check (RIC). The RIC measures phase to phase inductance values captured at a series of rotor positions.

Has your critical motor had its annual physical?

Let IPS field service technicians use the PdMA MCEmax to perform quarterly, semi-annual or annual health checks of your critical AC & DC motors. Motor Circuit Evaluation (MCE) testing can detect mechanical and electrical problems before catastrophic failures occur. MCE testing is available in static (offline) or dynamic (online) for any size AC induction, synchronous, wound rotor and DC motors.

The MCEmax provides comprehensive fault analysis for a more complete understanding of your motors health. This approach analyzes the Power Quality, Power Circuit, Insulation, Stator, Rotor and Air Gap of your electric motor. All six zones should be analyzed and trended over time to accurately assess the overall health of your motor.

If you are looking to beef-up the reliability and up-time of your critical motors by ensuring that they are indeed healthy, please call your IPS sales representative or visit www.ips.us or www.ips.ca.

- Portable, on-site, non-destructive testing for critical AC & DC motors
- PdMA static & dynamic testers
 - » MCE™ - static only
 - » Emax™ - dynamic only
 - » MCEmax™ - static & dynamic
- Comprehensive motor health analysis:
 - » Power Quality
 - » Power Circuit
 - » Insulation
 - » Stator
 - » Rotor
 - » Air Gap
- Quality assurance motor inspections:
 - » Pre-stocking & installation
 - » Pre end-of-warranty
- Motor torque, efficiency and energy cost analysis available



MCEmax™ is portable, weighing only 26 lbs. and comes standard with 10 Ft. test leads providing connection accessibility

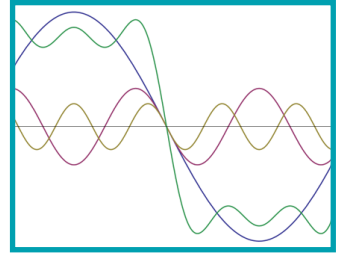


MCEmax™ static (offline) testing of a critical spare motor in storage

PdMA TESTING—ANALYZING SIX MOTOR HEALTH ZONES

Power Quality

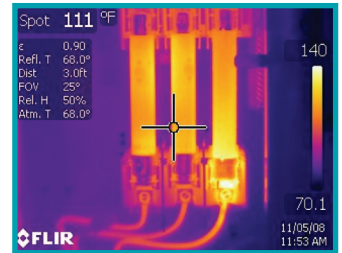
The MCEmax takes a Power Quality snapshot by measuring phase-to-phase voltages and currents, and then evaluates the effect it will have on the motor per thresholds defined in IEEE519 - Recommended Practice and Requirements for Harmonic Control in Electric Power Systems. An ongoing concern about Power Quality is the possibility of the distortion of voltage and current levels from AC & DC Drives, non-linear motor loads, starting and stopping of nearby equipment, voltage spikes, and more. These influences can cause undesirable harmonics on the distribution system that increase current demand resulting in excessive heat. Left undetected, heat above acceptable levels leads to premature thermal aging of a motor's insulation system.



Voltage imbalance from harmonics

Power Circuit

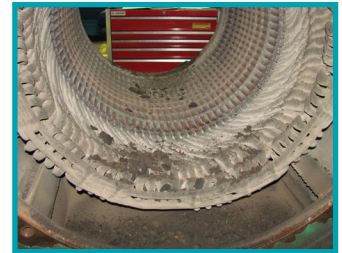
The Power Circuit consists of all conductors and connections, including any breakers, fuses, contactors and lug connections, from the point of origin of testing to the connections at the motor. Common defects that lead to possible voltage and current imbalance in the Power Circuit include: high-resistance connections (e.g. excessive heat), contact surfaces (e.g. loose, oxidized or corroded terminal connections), cabling (e.g. different size conductors) and power factor correction capacitors. The MCEmax evaluates the health of the Power Circuit by measuring phase-to-phase voltages and currents, and determining their respective imbalances. The collected data is compared to industry standards (e.g. NEMA MG-1) and warning thresholds are set based on impact to motor efficiency, performance and reliability.



Overheated connector

Insulation

The MCEmax is capable of evaluating the health of motor insulation by performing the following tests: Resistance-To-Ground (RTG), Capacitance-To-Ground (CTG), Polarization Index (PI), Dielectric Absorption (DA), and Step Voltage (less aggressive than hi-pot) up to 5 kV DC. Test results identify potential insulation damage caused by various motor stresses, including: electrical (e.g. voltage surge, transients, partial discharge...), thermal (e.g. heat, voltage imbalance, aging...), environmental (e.g. moisture, dirt, contaminants...) and mechanical (e.g. abrasion, vibration, improper stator winding cleaning...).



Contamination & moisture build-up

Stator

Common stator faults include winding failures (e.g. turn-to-turn, grounding in the slot, phase-to-phase, coil connections) and damaged stator core (e.g. core loss). The MCEmax identifies stator faults by analyzing the presence of inductance, resistance and current imbalances, which result in excess heat and expedite thermal aging of insulation. The MCE static test can perform a Rotor Influence Check (RIC) to measure phase-to-phase inductance over rotation and helps identify turn-to-turn shorts. The RIC test also aids in identifying broken or cracked rotor bars and an uneven/eccentric air gap.



Turn-to-turn short

Rotor

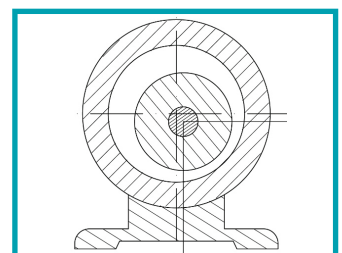
The percentage of motor failures attributed to rotor faults is low; however, left unchecked they can lead to extensive damage. Typical rotor faults include: cracked or broken bars, porosity, defective rotor iron and lamination damage resulting in mechanical damage, increased heat and reduced motor torque. The MCEmax analyzes In-Rush Current, Current Demodulation, Current Signal Analysis (CSA), RIC, and Inductive Imbalance.



Broken rotor bar

Air Gap

An optimal Rotor/Stator air gap is distributed evenly around 360 degrees. Unfortunately, the air gap between a stator and rotor can become eccentric (uneven or non-symmetric) resulting in an unbalanced magnetic field and high vibration levels. Over time an eccentric air gap can lead to bearing failure, winding failure, rotor/stator rubbing and decreased motor efficiency. The MCEmax analyzes air gap eccentricity thru Current Signature Analysis (CSA) and the Rotor Influence Check (RIC) test.



Eccentric air gap