

# REFERENCE GUIDE : PdMA MOTOR TESTING EQUIPMENT



What is PdM? stands for Predictive Maintenance

Who is PdMA? PdMA Corporation designs and manufactures portable motor testers: **MCE - Static (offline) tester**, EMAX - Dynamic (online) tester and MCEMAX - combination (offline/online) tester.

## Which Industries can benefit from PdM Testing?

- Manufacturing
- Utilities
- Field Servicing
- Automotive
- Petro/Chemical
- Pulp and Paper
- Steel
- Mining

## PdMA/MCE Usage:

By adding the PdMA/MCE Test equipment to your quality assurance practices, you are able to provide an electrical footprint for the motors that you repair. The motor footprint created allows for a baseline to be set for each motor allowing the customer to be proactive and schedule repair and maintenance to their equipment on a preventative, predictive schedule. Since the MCE is equipped with the MCE GOLD motor management software, you are able to keep and monitor the entire test history of your customer's motor. The software also allows you to evaluate the data collected against the latest in acceptance criteria from IEEE and NEMA.

With this additional equipment, you will be able to assist your customers in predicting the maintenance required for their equipment. This in turn will help your customers maintain control over their processes versus waiting for or hoping against equipment failure. Repair cost will also be better controlled, by performing maintenance repairs versus catastrophic failure repairs.

## MCE Product Information:

- Portable and battery powered
- Monitors power circuits, insulation, stator, rotor & air gap
- Variable test voltages from 250 to 5000 V
- Automatic IR, PI, DAR and Step Voltage Tests
- Measures insulation resistance to 3 TΩ
- Precision resistance from 10μΩ to 2000Ω using 4-wire bridge test measurements
- Measures capacitance (pF) and inductance (mH)

## Data Includes:

- Phase-to-phase Resistance
- Phase-to-phase Inductance
- Balance of Resistance
- Balance of Inductance
- Ground Capacitance
- Polarization Index
- Dielectric Absorption Ratio
- Measured Ground Resistance
- Corrected Ground Resistance
- Rotor Influence Check
- Field Inductance
- Field Resistance
- Field Capacitance
- Field Ground Resistance
- DC Armature Tests
- Synchronous Motor Tests
- Wound Rotor Motor Tests
- More...

# EASILY EVALUATE ALL 6 FAULT ZONES

## POWER CIRCUIT

All connections, components, and cables between the MCC and the motor must be resistively balanced. Potential problems occur when loose or corroded connections are introduced in a circuit. MCEGold compares each phase of resistance, current, and voltage to ensure a perfect balance.

## POWER QUALITY

The power being fed to a motor is the fuel it uses to operate. MCEGold monitors three phases of voltage and current, and alerts users when an unhealthy condition exists.

## ROTOR

Identify cracked/broken rotor bars, porosity and high resistance connections on the end rings through motor current signature analysis (MCSA) and the rotor influence check (RIC).

## AIR GAP

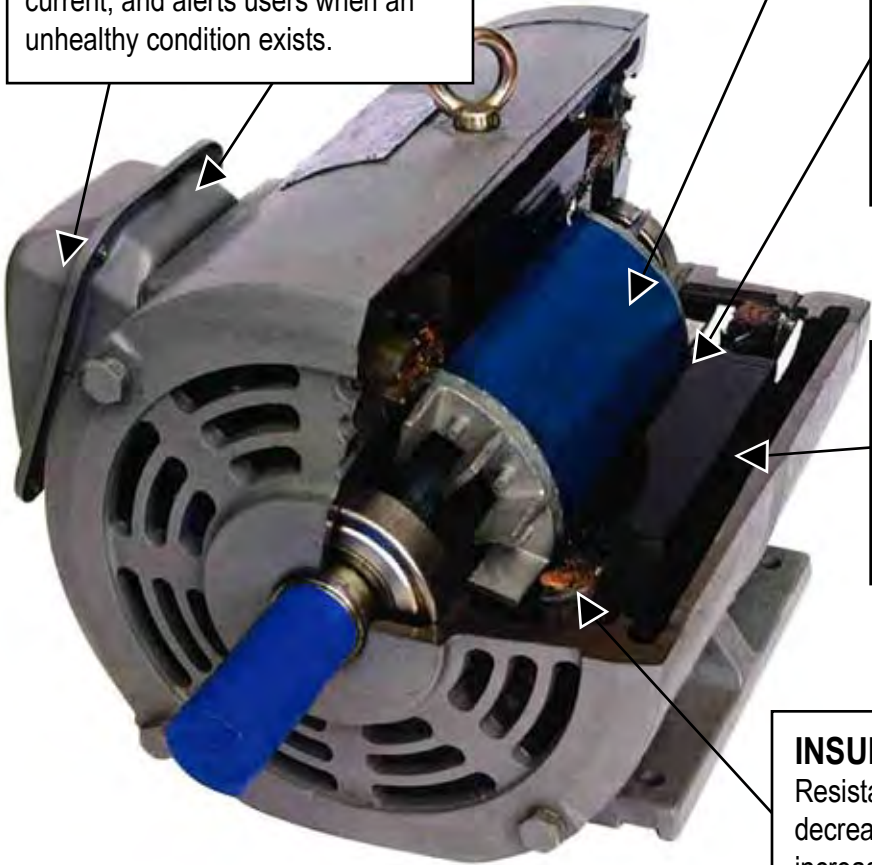
Bowed shafts, cracked end rings and degraded journal bearings create magnetic imbalances. These imbalances show up as 1st and 3rd sidebands around the eccentricity frequency or as a "bow tie" shape on the RIC.

## STATOR

Phase-to-phase resistance, inductance, impedance and current imbalances are used to determine turn or phase shorts as well as faulty internal connections.

## INSULATION

Resistance-to-ground values for motor windings decrease as moisture and contamination increases. MCEGold provides testing capabilities up to 5000VDC and offers continuous graphing polarization index (PI) and computer automated step voltage tests.





# MCEMAX<sup>®</sup> Product Information

## M-Series 5kV Electric Motor Analyzer



- Portable and battery powered
- Monitors Power Circuit, Insulation, Stator, Rotor, and Air Gap
- Variable test voltage from 250 to 5000V
- Automatic IR, PI, DAR, and Step Voltage Tests
- Measures insulation resistance to 3 TΩ
- Precision resistance with resolution to 10 μΩ using a 4-wire bridge test measurement
- Measures capacitance (pF) and inductance (mH)
- Six channel simultaneous acquisition
- Torque and efficiency analysis
- Impedance and phase angle measurement
- Power and current signature tests

## Description

The MCEMAX<sup>®</sup> Motor Circuit Evaluation test equipment offers the most versatile approach to troubleshooting and trending electric motors on the market today.

It is equipped with a fully functional laptop computer and loaded with MCEGold<sup>®</sup>, the gold standard in motor management software.

With MCEGold<sup>®</sup> the entire test history of your electric motor along with the latest in acceptance criteria from IEEE and NEMA is at your fingertips. Immediately following the test, Red or Yellow color-coded alarms identify any test data that is outside the acceptance criteria.

The MCEMAX<sup>®</sup> provides dynamic and static testing for all types of motors and generators including AC Induction, Synchronous, Wound Rotor, and DC motors.

Whether your motor is running or shutdown, the MCEMAX<sup>®</sup> can provide a health assessment of the six fault zones.

The MCEMAX<sup>®</sup> evaluates:

- Incoming **Power Quality** and alerts the user if the distortion or harmonic content exceeds IEEE limits.
- Cables and **Power Circuit** to verify the severity of a high resistance connection.
- Ground **Insulation** for deterioration,
- **Stator** turn insulation for shorts/opens.
- **Rotor** cage for breaks and shorted iron.
- **Air Gap** for non-symmetry or eccentricity.

The case is made of ultra high impact ABS material for ruggedness. It is easy to carry and no AC power is required, making tough to reach motors or starters easier to test.

Data Includes:

- Phase-to-Phase Resistance
- Phase-to-Phase Inductance
- Balance of Resistance
- Balance of Inductance
- Ground Capacitance
- Polarization Index
- Dielectric Absorption Ratio
- Measured Ground Resistance
- Corrected Ground Resistance
- Rotor Influence check
- DC Field Inductance
- DC Field Resistance
- DC Field Capacitance
- DC Field Ground Resistance
- DC Armature Tests
- Synchronous Motor Tests
- Wound Rotor Motor Tests
- Current Spectral Analysis
- High Frequency Eccentricity Analysis
- Three Phase In-Rush/Start-Up
- Phase-to-Phase and Line-to-Neutral Voltage
- Voltage Imbalance
- Crest Factor
- Total Harmonic Distortion (THD)
- % Full Load Amps
- Phase Current RMS
- Phase Impedance
- Impedance Imbalance
- Power (KW, KVA, KVAR)
- Power Factor
- Efficiency
- Energy Cost Analysis
- Output Power
- Torque

**Capacitance Measurement:**

Range (Accuracy):

- 1000 to 220,000 pF @1200 Hz ( $\pm 5\%$ )
- 220,000 to 1,000,000 pF @300 Hz ( $\pm 5\%$ )

Resolution:

250 pF

**Ground Resistance Test Voltages:**

250-5000 V in 50 V steps

\*250-1000 V in 50 V steps

Range (Accuracy):

20 K $\Omega$  to 100 M $\Omega$  @250-500v ( $\pm 2\%$ )

100 M $\Omega$  to 1 G $\Omega$  @250-5000v ( $\pm 2.5\%$ )

1 G $\Omega$  to 220 G $\Omega$  @500-5000v ( $\pm 5\%$ )

220 G $\Omega$  to 1000 G $\Omega$  @1kV-5kV ( $\pm 5\%$ )

1 T $\Omega$  to 3 T $\Omega$  @1kV-5kV ( $\pm 20\%$ )

Short circuit/charge current:

2 mA

**Inductance Measurement:**

Range (Accuracy@1200 Hz):

.05mH to 250mH ( $\pm 1\%$ )

Range (Resolution):

.05mH to <50mH (.01mH)

50mH to <100mH (.05mH)

100mH to 250mH (.1mH)

Range (Accuracy @300 HZ):

220mH to <700mH ( $\pm 1\%$ )

700mH to 2000mH ( $\pm 2\%$ )

>2000mH to 5000mH ( $\pm 5\%$ )

Resolution:

220mH to 500mH (.5mH)

500mH to 700mH (1mH)

700mH to 2000mH (2mH)

2000mH to 3500mH (5mH)

3500mH to 5000mH (25mH)

**Resistance Measurement:**

Range (Accuracy):

100  $\mu\Omega$  to 2000  $\Omega$  ( $\pm 1\%$ )

Range (Resolution):

.00010 $\Omega$  to .02000 $\Omega$  (.00001 $\Omega$ )

.0200 $\Omega$  to 2.000 $\Omega$  (.0001 $\Omega$ )

2.00 $\Omega$  to 50.0 $\Omega$  (.001 $\Omega$ )

50.00 $\Omega$  to 1000.00 $\Omega$  (.01 $\Omega$ )

1000.0 $\Omega$  to 2000.0 $\Omega$  (.1 $\Omega$ )

**Voltage Measurement:**

AC Voltage 0-1000 Vrms  
Direct line ±1% (10 to 100% of range)  
Secondary line ±1% + PT error (10 to 100% of range)  
MTAP Leads 0-35 VAC ±1% +PT error (10 to 100% of range)

DC Voltage 0-1000 Vpeak(qualitative only)

**Current Measurement AC/DC:**

±0.5% of input (± accuracy of the probes)

**Standard Current Probes:**

PdMA 2128.14  
±1%(of reading) ±0.1mV from 1 to 12A  
@100mV/A  
±1%(of reading) ±2mV from 10 to 80A  
@10mV/A  
±2.5%(of reading) ±2mV from 100 to 150A  
@10mV/A

**Power Measurement:**

THD/HVF/ Spectrum – 50<sup>th</sup> harmonic

**Current Spectrum Analysis:**

8,000 lines resolution

**In-Rush/Start-Up Test:**

Sampling rate 3,600/second  
Test duration 1 minute

**Rotor Evaluation test:**

Sampling rate 960/second  
Fmax 0-480 Hz  
Resolution 8,000 lines

**Eccentricity and Power Test:**

Sampling rate 12,288/second  
Fmax 0-6,000 Hz  
Resolution 8,000 lines

**Dimension:**

18.5x14.5x6 in. (46.99x36.83x15.24 cm)

**Weight:**

26 lbs (11.79 kg)

**Test Lead Set:**

10 ft. (3.05 m.) MCE Test Leads  
10 ft. (3.05 m.) fused voltage leads for 3 phases and ground  
10 ft. (3.05 m) current probe cable connects 3 probes via BNC connector  
Voltage probe accessory kit:  
Three 6 ft. (1.83 m.) current probes for three phases

**Computer Voltage Input:**

AC 100-240 V, 50/60 Hz (computer)

**Environmental**

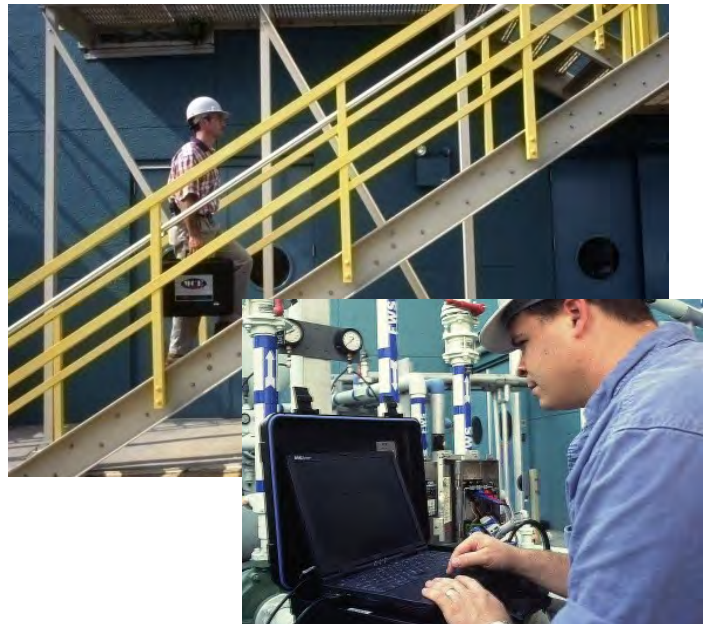
Operating Temperature:  
32°F to 95°F (0°C to 35°C)

Storage Temperature:  
-40°F to 149°F (-40°C to 65°C)

Operating Humidity:  
10% - 90% (non-condensing)

Storage Humidity:  
5% - 95% (non-condensing)

Accuracies to within the specified +/- % accuracy or +/- two resolution steps whichever is greater.



Lightweight Portable Electric Motor Analyzer



This is to certify that the Quality Management System of:

**PdMA Corporation**

5909-C Hampton Oaks Parkway  
Tampa FL 33610  
United States of America

applicable to:

**The design, manufacture and service of analyzers, instruments and monitoring devices to assess the health and condition of electric motors, controls and associated equipment. Associated training and technical assistance is also provided to the customer.**

has been assessed and approved by  
National Quality Assurance, U.S.A., against the provisions of:

**ISO 9001:2015**

For and on behalf of NQA, USA

Certificate Number: 12532  
EAC Code: 19  
Certified Since: May 16, 2001  
Valid Until: February 25, 2024  
Reissued: February 26, 2021  
Cycle Issued: February 26, 2021





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Rev. 08/20