QUALITROL-IRIS POWER IS THE WORLD'S LARGEST PROVIDER OF MONITORING AND TESTING EQUIPMENT FOR MOTOR AND GENERATOR WINDINGS

IRIS POWER
A QUALITROL Company

Iris Power MDSP3

Detecting motor rotor cage-winding faults and air gap eccentricity

MDSP3 with 2 CTs

A Third Generation On-Line Tool to Find Broken Rotor Bars and Rotor Air Gap Eccentricity in Induction Motors

Breaks in squirrel cage induction motor rotor windings as well as rotor unbalance due to eccentricity have long been known to be a significant cause of motor failures. Broken rotor bars are especially likely in motors driving high inertia loads like fans, or motors that see frequent starting. Rotor air gap eccentricity occurs in motors that have not been properly centered in the stator bore or where the bearings are failing. For 30 years stator current signature analysis (CSA) has been used to objectively detect these problems before failure occurs. However, CSA was prone to false indications that reduced the credibility of CSA measurements. Qualitrol has developed the Iris Power MDSP3, a third generation CSA instrument that drastically reduces the risk of missing these problems or incorrectly indicating that rotor winding faults or eccentricity are present. The result is the more accurate identification of which machines need repairs, an essential element of condition based maintenance. The Iris Power MDSP3 replaces the Iris Power CSMeter, a second generation CSA instrument.

WHAT IS MDSP3?

The Iris Power MDSP3 is a portable instrument specifically designed to monitor squirrel-cage induction motors. The Iris Power MDSP3 detects rotor cage winding faults i.e. broken rotor bars, cracked shorting rings, die-cast manufacturing faults, and unequal air gaps as they are the causes of many mechanical and electrical failure mechanisms in induction motors.

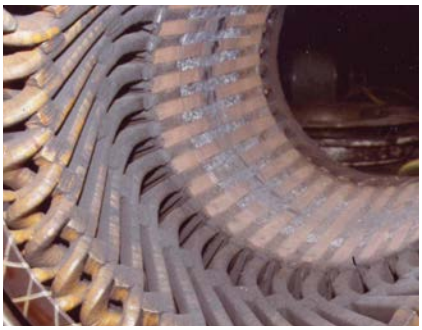
The Iris Power MDSP3 uses the Current Signature Analysis technology which relies on the concept that faults in the induction motor rotor or driven components result in changes to the rotor magnetic field pattern. Unique magnetic rotating fields are produced due to the faults which induce detectable stator current components indicative of the fault.

Rotor core damage due to broken bars

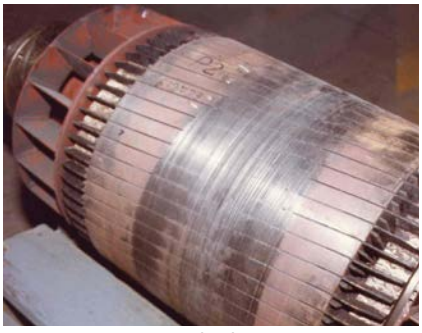
A USER'S PERSPECTIVE:

"The predictive maintenance instrument gives an instant diagnosis of "Very High Risk" and displays a frequency spectrum showing broken rotor bar sidebands on the screen after acquiring and processing the data. Once informed of a very severe case of broken rotor bars we took the motor off-line to avert an in-service failure."

Broken rotor bar



Stator rub due to eccentricity



Rotor rub due to eccentricity

Iris Power MDSP3

BENEFITS:

Advanced Algorithms: Iris Power MDSP3 is developed by combining advanced current signature analysis algorithms to accurately predict the operating slip from the measured current. The slip calculations can also be done at different loads.

Simplicity: Iris Power MDSP3 can detect cage winding faults and eccentricity with the use of a single clamp-on current sensor connected to the secondary side of 50 or 60 Hz motor current transformer; or around one of the phase leads.

Reliability: In line with other Iris Power instruments, the Iris Power MDSP3 is designed to significantly reduce the risk of false indications by distinguishing between noise and legitimate rotor bar problems, with a noise floor greater than 100 dB.

On-line measurements: All testing is done on-line, in less than 75 seconds in normal mode, to find problems before they cause additional motor damage.

Range and accuracy: Iris Power MDSP3 can accurately test motors under varying load conditions where many other test systems give ambiguous results. The Iris Power MDSP3 includes two current probes to cover a wider range of current from 5A to 1000A.

Portable and safe: Iris Power MDSP3 needs only one input from a current probe clamped directly to one of the phase leads or the secondary side of a CT at the motor MCC or breaker. The Iris Power MDSP3 processor is powered through the USB connection or 100 to 200 V 50/60 Hz power supply.

SPECIFICATIONS:

Motor HP: 50hp (37.5kW) & up

Signal/Noise ratio: >100 dB

Sampling rate: >6500/sec

Load Current between 35% and 110% of nameplate and at least 20% of nominal sensors current

Maximum Rotor Slot Passing Frequency: 3000Hz

Minimum Full Slip: 0.8%

Dimensions: 6.5" x 3.75" x 1.25" (16.51cm x 9.52cm x 3.175cm)

Mass: 1 lb (4 kg)

KIT CONTENTS:

- Iris Power MDSP3 processor with 2m silicon rubber current probe cable
- Current sensors: 2 included; 5A, and combined 250A, 500A and 1000A; clamp-on type, 690 V
- Digital tachometer
- DAU USB cable
- Universal power supply—120/240 V, 50/60 Hz
- MDSP3Pro software bundle for computers running Windows 7 or higher
- Quick start guide
- Carrying case (IP67, NEMA 4X)

OPTIONAL DAU:

Rugged data acquisition unit with Windows operating system and preinstalled software for Iris Power MDSP3 (Panasonic Toughbook or similar.

WHY ANALYZE CAGE WINDING FAULTS AND AIR GAP ECCENTRICITY?

Rotor Core damage: Broken bars cause local temperature increases and arcing leading to rotor core damage.

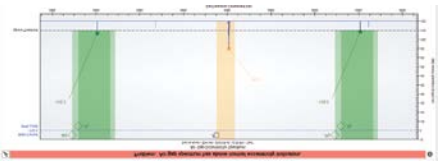
Premature degradation of bearings: Broken rotor bars cause torque and speed oscillations on the rotor. This degrades the bearings.

Rotor bar movement and failure: Broken rotor bars can lift out of the rotor slot due to centrifugal force or pieces of them can break off and cause a stator winding failure.

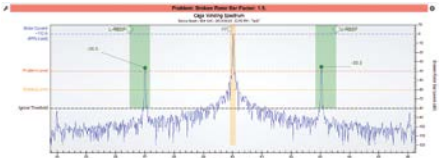
Rotor bending: Large air pockets in rotor windings cause non-uniform bar expansion leading to rotor bending and unbalance.

Rotor eccentricity: For the rotor rotating off-center, both static and dynamic eccentricity in conjunction with the resulting unbalanced magnetic pull can lead to: 1) high vibration levels from rotor unbalance, 2) a rotor to rub against the stator bore which can cause a stator winding failure.

Although these problems may not cause immediate failure, they often lead to deterioration that is expensive to repair or may be catastrophic. Thus early detection using the Iris Power MDSP3 prevents unexpected motor failures.



Air gap eccentricity spectrum analysis



Broken rotor bar spectrum analysis

QUALITROL-IRIS POWER HAS BEEN THE WORLD LEADER IN MOTOR AND GENERATOR WINDING DIAGNOSTICS SINCE 1990, PROVIDING A FULL LINE OF ON-LINE AND OFF-LINE TOOLS, AS WELL AS COMMISSIONING AND CONSULTING SERVICES.

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