

## Service note

# ABB MACHsense-P for monitoring the condition of induction motors

ABB MACHsense-P was developed to address the reliability of cage induction motors, where problems related to the bearings, rotors and other mechanical components account for major percentage of total failures.

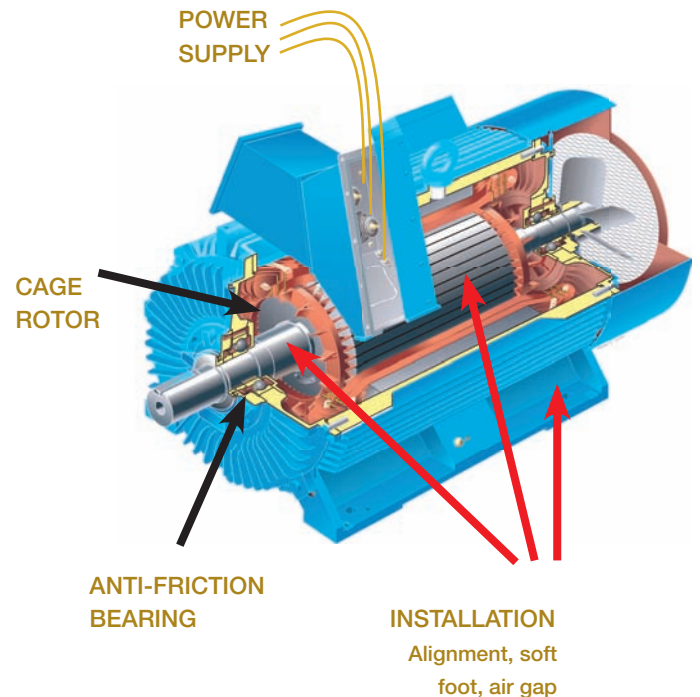


ABB MACHsense-P is a walk around condition monitoring service provided by ABB which specifically focuses on electric motors.

ABB MACHsense-P provides a reliable, early warning system of impending or initiating defects, allowing more time and greater opportunity for efficient maintenance planning while other on-line, off-line, or walk-around type monitoring fault detection systems only give a reliable warning when failure is imminent.

ABB MACHsense-P deploys a custom developed data-collector along with unique analysis tools based on intensive studies carried out in our corporate research centres. It detects, monitors and diagnoses electromagnetic and mechanical problems in cage induction motors.

The condition of the motor is monitored using defect indices derived from a combination of electrical and vibration measurements.

### ABB MACHsense methodology

Data is collected by specialized service engineer. A summary report of the status of the motor is available on site. Detailed reports are soon delivered thereafter.

The reports show the interpretation the test results and an analysis and include defect identification, severity, possible causes and effects on the rotor condition, the condition of the anti-friction bearings, the power supply and the assembly and installation of the motor.

ABB MACHsense-P uses a model based analysis approach and advanced signal processing to facilitate early detection of defects using increased identification sensitivity and better severity quantification.

Defect severity is described by indices derived from vibration and electrical measurements.

In addition the motor design and construction aspects are also accounted for in order to arrive at fault criticality values specific to each type of motor.

A combined current, vibrations and torque analysis helps reduce false positives and negatives.

Solution Levels	Measurements When	Measurements What	Deliverables	Measurement Frequency
<b>STANDARD</b>	<ul style="list-style-type: none"> <li>When the motor is operating at nominal load</li> </ul>	<ul style="list-style-type: none"> <li>Vibration, voltage, current, temperature (winding, cooler and ambient) and speed</li> <li>Operation history, maintenance and failure records</li> </ul>	<ul style="list-style-type: none"> <li>Cage rotor package               <ul style="list-style-type: none"> <li>Rotor winding effects, air gap eccentricity, imbalance, looseness, static and dynamic shaft bends, internal misalignment</li> </ul> </li> <li>Anti-friction bearing package               <ul style="list-style-type: none"> <li>Bearing defects, bearing assembly defect, lubrication interval estimates</li> </ul> </li> <li>Installation               <ul style="list-style-type: none"> <li>Soft foot, misalignment, foundation resonance</li> </ul> </li> <li>Power supply               <ul style="list-style-type: none"> <li>Harmonics and distortion, imbalance, over/under voltage, frequency</li> </ul> </li> <li>Maintenance and inspection recommendations</li> </ul>	<ul style="list-style-type: none"> <li>Every six months</li> </ul>
<b>ADVANCED</b>	<ul style="list-style-type: none"> <li>When the motor is operating at nominal load and with multiple loads and/or start-up</li> </ul>	<ul style="list-style-type: none"> <li>Vibration, voltage, current, temperature (winding, cooler and ambient) and speed</li> <li>Operation history and maintenance and failures records</li> </ul>	<ul style="list-style-type: none"> <li>Same as above</li> <li>Cooler               <ul style="list-style-type: none"> <li>Fouling</li> </ul> </li> <li>Root cause analysis</li> </ul>	<ul style="list-style-type: none"> <li>When a defect is suspected either from standard measurement or from observed problems and there is a need for further investigation</li> </ul>

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### Benefits

- Integrated analysis and reporting
  - Current, voltage and vibration in one analysis and reporting system
- Quick maintenance oriented reports
  - Automated analysis and summary report delivered on site
- Reduction in unplanned downtime
- Early warning system provides adequate time for maintenance planning
- ABB motor service network
- High success rate of fault detection

Vibration signals are measured using four simultaneous data capture channels and analyzed for mechanical and electromagnetic defects. ABB MACHsense-P uses ABB's patented BeAM as well as BeaCon technology to detect anti-friction bearing defects.

ABB's vibration analysis module PCA (Principal Component Analysis) automatically recognises common conditions such as imbalance, misalignment, looseness and soft foot.

Vibration signals are also used along with voltage and current signature analysis to provide information on the rotor winding condition and air gap eccentricity using the ABB autoscan analysis module. Torque signals derived are also analyzed to supplement information.

The effects of power supply deviations and abnormalities on motor behaviour are also analyzed.

Where required, trouble shooting and root cause analysis are facilitated with the advanced ABB MACHsense-P service, where additional start signals are wavelet transform analysed.

For more information please visit:

[www.abb.com/motors&generators](http://www.abb.com/motors&generators)



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