

# SKF Dynamic Motor Analyzer - EXP4000

Portable motor monitoring and analysis



## Introduction

The SKF Dynamic Motor Analyzer – EXP4000 integrates a full spectrum of electric motor monitoring capabilities. Designed for in-service monitoring of source power circuit issues, overall motor health, load, and performance, it gives the user a comprehensive look at overall motor integrity. This instrument is designed for remote monitoring from a Motor Control Center (MCC), or through an SKF Dynamic Motor Link - EP1000 connection. The EXP4000 is a non-hazardous, low voltage, battery-operated unit, which makes it highly portable and durable for use in tight and rugged locations.

## Continuous innovation

The EXP4000 is yet another design breakthrough that demonstrates SKF's ongoing commitment to quality, reliability, and competitive advantage. This instrument provides data on degradation of motor performance and the effects of excessive heating on motor operation.

Survey plant-wide efficiency, determine load mismatches, oscillating load and transient peak energy. Results are immediate, and reveal operating inefficiencies to enable maintenance personnel to determine costs of wasted energy.

## Comprehensive analysis

The SKF Dynamic Motor Analyzer - EP4000 performs seven major functions to enhance a P/PM program. Within these functions evaluate the incoming power, motor and load utilizing a system wide approach to predictive maintenance, troubleshooting and quality assurance. This motor analyzer offers a wide variety of capabilities for users to understand the condition of motors and the rotating equipment they drive.

The EXP4000 collects and delivers information on voltage level, voltage balance, harmonic and total distortion, rotor cage condition, motor efficiency, effective



service factor, over-current, operating condition, torque ripple, load history among others. This wide range of tests allows exploration of the true condition of motor integrity and conditions related to motor performance.

## Advanced data collection and organization

Once testing is completed, results can be saved and stored for each motor. This type of documentation is critical for any maintenance program. It allows recall of information for true trending capabilities. Test results are managed using standard MS Access relational database file formats. Reports can be quickly generated through the main print console, allowing operators visual confirmation of motor integrity.

The software and data transfer package enables the creation of multiple databases to organize collected data to specifications set by users. This eases communication channels by handling data in a manner that is useful, complete and accessible.

## Test domains

### Power quality

This domain identifies non-optimal power quality problems that can cause additional motor stress. Flag frequent problems with voltage level, voltage unbalance, harmonic distortion, total distortion, power and harmonics tests. These issues identify im-

proper tap settings on supply transformers, poorly distributed single phase loads, overloading (saturating) supply transformers, excessive VFDs on low-voltage busses, excessive non-harmonic frequencies on a variable-frequency drive (VFD), missing line inductors on VFD applications, missing or open power factor correction capacitors along with high resistance connections.

### Machine performance

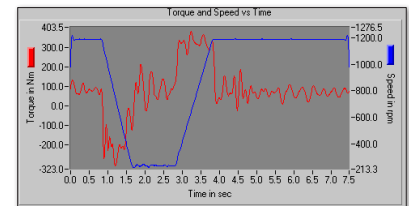
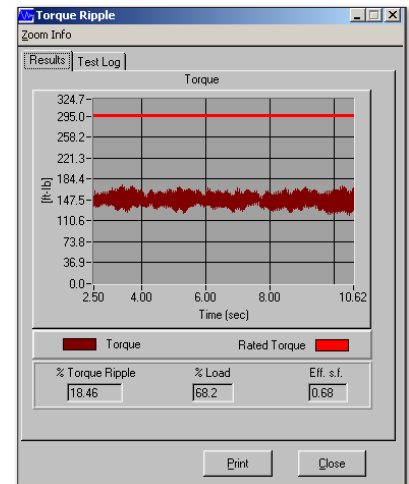
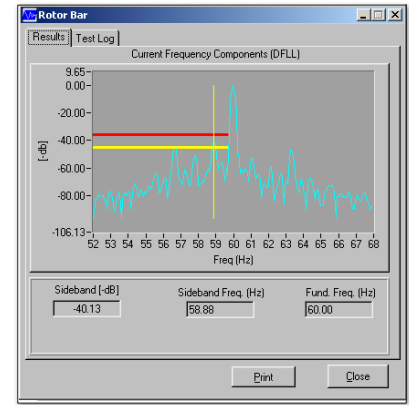
Conclusively evaluate the operation of the motor, identifying stressful operation and its source with this domain. It looks at Effective Service Factor, Load, Operation Condition, Efficiency, and calculates Payback Period. Commonly found problems include thermal overloads and machine degradation among other items that are directly related to motor health and energy wasted with inefficiencies.

### Current

Current level and current unbalance are utilized to determine overall electrical machine health. These parameters are used to determine the following issues: overloading, connection issues, misconnections, iron saturation and improperly-wound motors.

### Spectrum

This domain has the rotor bar test along with V/I spectrum, Demodulated Spectrum, and Harmonics. It shows current and voltage relationships with regards to frequency. Electrically, it will find saturation problems, broken rotor excessive VFD drives on low-voltage busses, and mechanical problems.



### Torque (Optional)

The torque domain is a substantial breakthrough by SKF. Torque Ripple and Torque Spectrum enable the user to find numerous problems quickly and accurately. It specializes in diagnosis of mechanical issues, identifies transient overloads, discerns mechanical imbalances along with bearing problems, and cavitation, among others.

### Connections

This portion of the SKF Dynamic Motor Analyzer - EXP4000 software offers additional tools including phasor diagrams, three currents and voltages, instantaneous voltage, and symmetrical components. This data provides the operator with valuable power data as well as a way to make sure the EXP4000 is correctly connected.

### VFD monitoring (Optional)

Along with any three phase induction motor and generator, the EXP4000 will monitor the activities of VFD applications using the VFD4000 software module. These types of drives have always created problems for maintenance professionals and for the first time comprehensive diagnosis of motor problems are facilitated even under the most demanding VFD operation.

### Continuous monitoring (Optional)

The continuous monitoring software (CM4000) enables the user to monitor 41 data points in real time. This continuous data gathering capability discovers intermittent

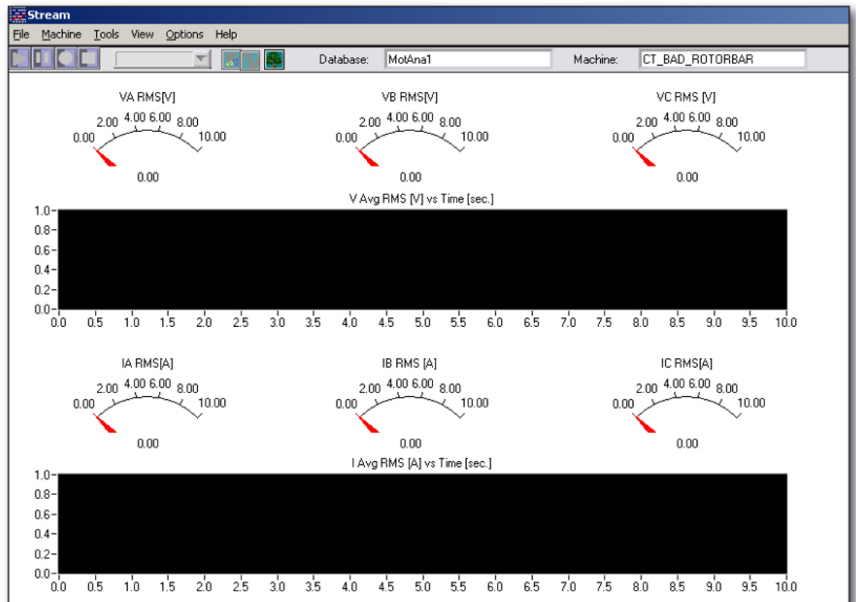
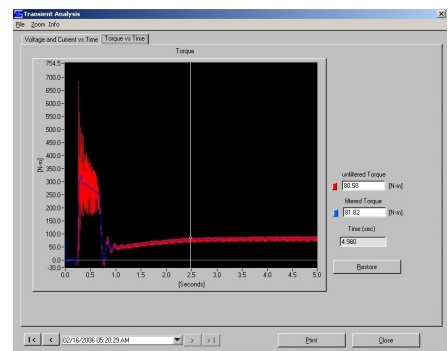
problems with motors, such as electrical trips. This customizable software enables the operator to collect real-time data on whatever is deemed the most important to their operation. This software also acts as a power quality analyzer.

### Transient Analysis

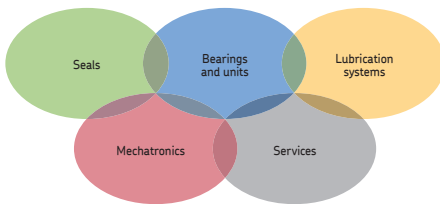
The SKF Dynamic Motor Analyzer - EXP4000 performs a start-up analysis with a transient analysis tool. The traces are the rms currents and voltages of all three phases. This data can be zoomed, panned, and the cursors allow reading of levels and time within the graphs. Along with this powerful analysis capability, start-up Torque versus Time can also be evaluated. These tools allow the user to visually see the amplitude of voltage, current and torque at start up, along with motor startup time. Only by monitoring all three phases of the current, voltage and torque can the maintenance professional separate between a power, motor or load issue on start up.

### Efficiency

Efficiency assessment, payback period and Motor Master+ (V 4.1) identify motors performing under par, and calculates the payback period if replaced by a new motor. The SKF Dynamic Motor Analyzer - EXP4000 exceeds the performance of other instrumentation in both accuracy of efficiency estimation and in ease of use for field environments.



Technical specifications	Benefits	Specifications
<ul style="list-style-type: none"> <li>Voltage Unbalance</li> <li>Voltage THD</li> <li>Current THD</li> <li>Negative Sequence Impedance</li> <li>Speed calculation</li> <li>% Load &amp; % Efficiency</li> <li>Spectrum Voltage</li> <li>Spectrum Current</li> <li>Current Level</li> <li>Effective Service Factor</li> <li>Power details</li> <li>Continuous acquisition</li> <li>0-Scope</li> <li>Auto Phasing</li> <li>Auto testing including timer function</li> <li>One button testing</li> <li>Bearing check</li> <li>Startup Transient Voltage</li> <li>Startup Current</li> <li>Startup Torque</li> <li>Torque Spectrum</li> <li>Torque Time Waveform</li> <li>Efficiency Estimation</li> </ul>	<ul style="list-style-type: none"> <li>Power Quality</li> <li>Poorly performing transformers</li> <li>Connection issues</li> <li>Rotor <ul style="list-style-type: none"> <li>-Cracked bars</li> <li>-Poor welds</li> <li>-Broken bars</li> <li>-Eccentricity</li> </ul> </li> <li>Load Issues <ul style="list-style-type: none"> <li>-Over load</li> <li>-Process</li> </ul> </li> <li>Mechanical <ul style="list-style-type: none"> <li>-Bearing faults</li> <li>-Miss alignment</li> <li>-Fan unbalances</li> <li>-Belt frequencies</li> <li>-Worn Impellers</li> <li>-Gear mesh frequencies</li> </ul> </li> <li>VFD <ul style="list-style-type: none"> <li>-Power quality</li> <li>-Shorted IGBT's</li> <li>-Feedback loop</li> <li>-Process information</li> <li>-Tuning/Setup</li> </ul> </li> <li>Soft Start <ul style="list-style-type: none"> <li>-Tuning/Setup</li> <li>-Troubleshooting</li> </ul> </li> <li>Energy Assessment</li> </ul>	<p><b>Input Power</b> 110-250 VAC, 50/60 Hz integrated power supply</p> <p><b>Maximum Rated Measurement/Testing Voltage</b> 1,000 V AC, 500 V DC</p> <p><b>Current Transformers (all portable)</b> 0-10 A, 0-150 A, 1-1,000 A, 0-3,000 A</p> <p><b>Connections – Amphenol military spec twist type</b> Power entry module (1) Portable voltage connection (1) Portable current connection (1) EP Port (1) Vibration sensor connection (1)</p> <p><b>Computer specifications</b> 40 GB – 4,200 rpm or better 512 MB – 2GB installed RAM Battery or AC power operated Software Platform: Microsoft Windows XP, Professional, Windows 7 or better USB 2.0</p> <p><b>Weight</b> 15 lbs</p> <p><b>Industrial standards</b> NEMA MG-1 IEEE 519 EN61000-2-2 EN 61000-2-7 VDE 839-2-2 VDE 839 -2-2</p>



### The Power of Knowledge Engineering

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