# Baker NetEP On-line motor analysis system

**Megger**

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## Introduction

The Baker NetEP On-line Motor Analysis System is a permanently-installed motor system monitoring solution that continuously acquires health and performance data on electric motors and the rotating machine systems they operate.

With the NetEP, maintenance professionals can gather performance data on critical motors around the clock, and monitor the condition of their rotating equipment from the convenience and safety of a central office – or from anywhere with access to the internet. The system can help to substantially reduce or eliminate costly downtime by providing information that improves maintenance decision-making and planning.

The NetEP represents a new paradigm in predictive maintenance for rotating equipment. It essentially enables an organization's critical motor assets to communicate when they are malfunctioning or experiencing a problem that could lead to failures or downtime. Motor maintenance programs are too often characterized by reactive approaches to motor failures, and rely upon testing to troubleshoot a given motor's condition. These snapshots can help determine if a motor requires replacement or repair, but the data acquired often doesn't reveal transient or infrequent motor system issues that impact motor performance or lead to failure.

The NetEP goes beyond what portable testing does by providing data that shows trends over time.   This maximizes visibility into motor system health and performance. It is not designed to replace route-based maintenance tests using portable equipment. Instead, it complements the use of portable motor analyzers such as the Baker AWA-IV or Baker EXP4000 to minimize catastrophic motor failures and costly unplanned downtime. It can also be used to supply motor system data to an OPC standard server for use with an organization's unique maintenance management and asset analysis systems.



## How NetEP works

Motor systems include three fundamental elements: the power source, the motor, and the mechanism that places a load on the motor, such as a pump or fan. The NetEP monitors motor systems for any degradation of performance, poor power quality and adverse load conditions. It generates alerts, such as excessive current which could indicate a problem.

The NetEP tracks motor on/off cycles, determines load mismatches and identifies any adverse load oscillations or overloads. Performance data and problem notifications are promptly delivered to the operator console.

Built upon the proven technologies of the Baker EXP4000 Dynamic Motor Analyzer, the NetEP features proprietary data collection mechanisms that are coupled with standardized computer server and network protocols. A single NetEP an collect data from up to 32 motors using any combination of up to seven different voltage busses. Multiple NetEPs can be connected to a single computer server over Ethernet, enabling users to monitor hundreds of motors from a central location, anywhere in the world.

The NetEP operates with a single voltage measurement connection per voltage bus, and current sensors installed

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at each motor being monitored. Two data acquisition methods are provided: power quality (acquired every ten seconds) and time waveforms (acquired once per hour). The unit analyzes more than 100 electrical parameters; for 28 of these, it generates alerts if user-defined threshold limits are crossed.

The NetEP monitors all three phases of voltage and current at 20,000 samples per second.

## NetEP architecture overview

The NetEP device (cabinet) is the measurement engine. It connects to an Ethernet network for data transfer to the server.

The NetEP server manages data storage and communication to networked computing resources (i.e. the customer's computer network, data storage resources, and the user interface client). This server, which is supplied by the customer, must run an SQL database.

Megger Motor Condition Surveyor NetEP is the user interface client.
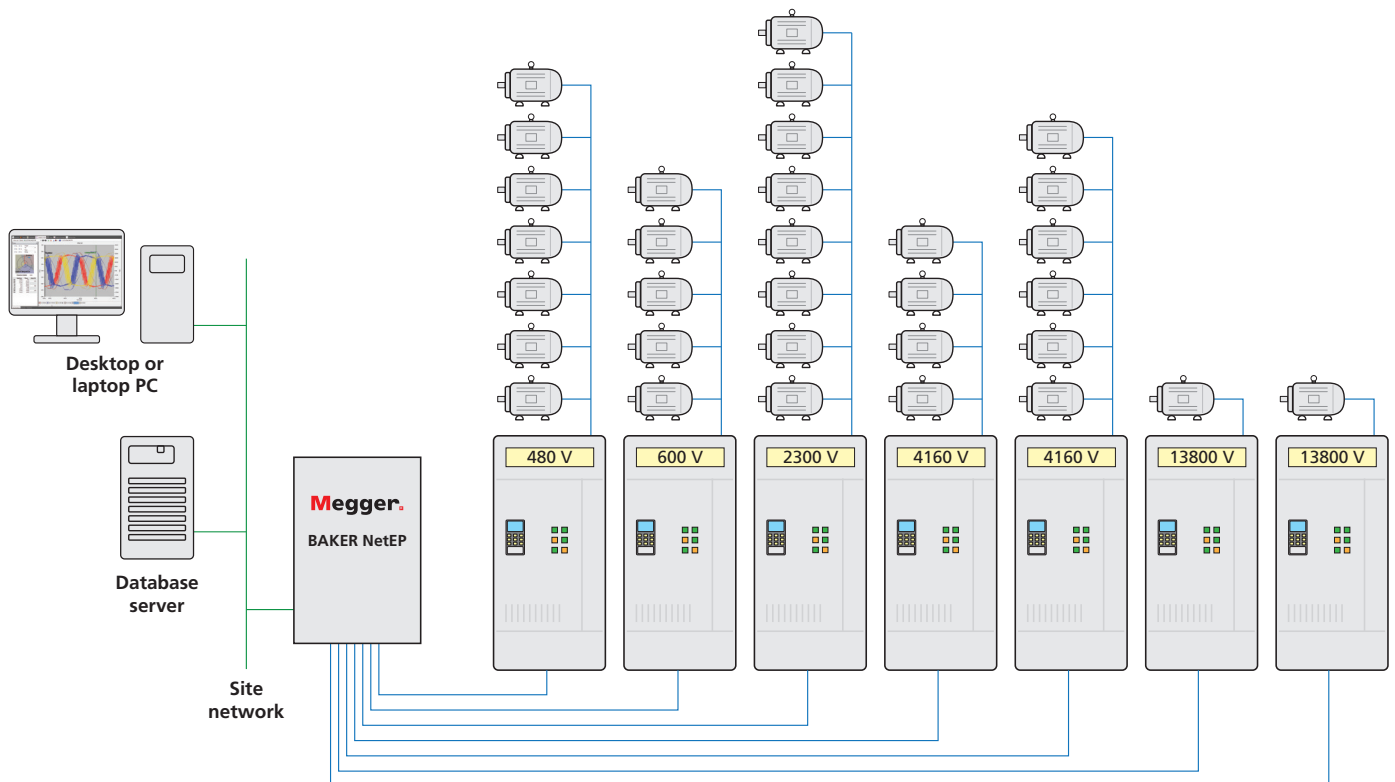


**A diagram showing an example of a NetEP installation. The NetEP can monitor up to seven voltage buses, with up to 32 motors in total.**

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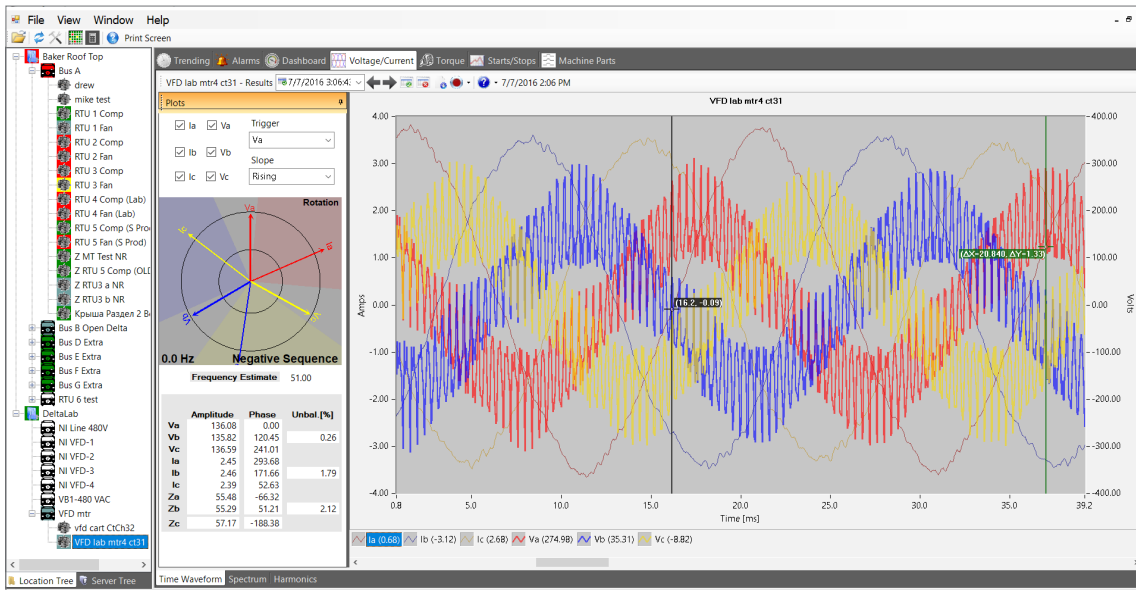


A time waveform plot of a VFD-driven motor, showing voltage and current, with a phasor diagram.

## Surveyor NetEP software

The Surveyor NetEP software constitutes the operator console. It's a Windows PC application which connects to the database that holds data from the NetEP devices.

The software automatically compares collected data to user-defined limits, and indicates the condition of the motor system via five status levels. The condition of each motor is displayed in an alarm view using a color-coded scheme, which is consistently used throughout the software, including the motor tree, for easy identification of motor status.

The motor tree view displays maps of voltage buses and machine hierarchy within the facility or plant. The multi-motor view allows a user to monitor the status of motors connected to each NetEP from a single desktop or laptop screen. The software's markers, cursors, box zoom function, scale sliders and other tools make it easy to navigate through large amounts of data quickly, confirm alarms, and make informed decisions about machine maintenance and operational processes.

Because the NetEP works continuously, a series of watch, caution and warning flags are employed to alert maintenance professionals that a machine condition needs attention. The software also allows an operator to mark and analyze a motor's rotor bar condition by automatically locating rotor bar signatures. An integrated database of 30,000 bearings helps to identify potential bearing faults.

## Variable Frequency Drive (VFD) Monitoring

The NetEP can monitor any three phase induction motor or generator. In addition, it will capture the activities of motors in VFD applications, allowing for analysis of behavior and performance. VFD drives have often created problems for maintenance professionals and for the first time comprehensive diagnosis of motor problems are facilitated even under the most demanding VFD operations.

## Data collection, management and trend analysis

The Surveyor NetEP software delivers data at regular intervals on more than 100 motor condition parameters, and can be set with alarms on up to 38 of them. Some parameters can be set to acquire trend data every ten seconds, while others can be set to gather data once per hour.

There are two types of data acquisition:

- Power quality: This is the default mode for each motor. The NetEP automatically polls each motor to acquire data on power quality, distortion peak levels, unbalances, crest factor and other parameters.

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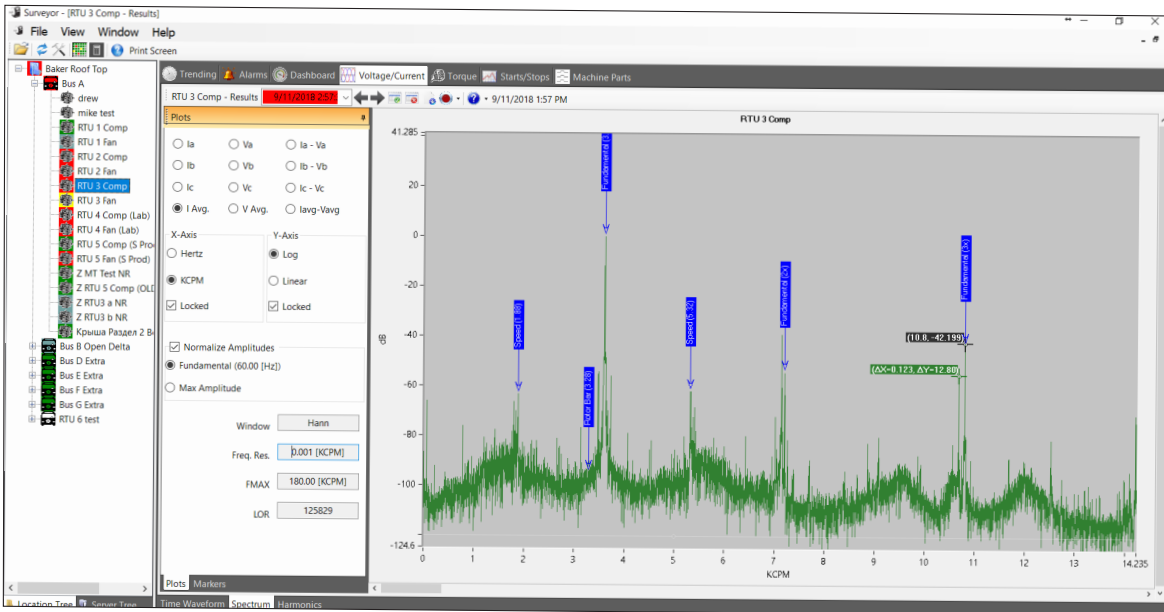


A spectrum plot with markers indicating significant frequencies. Users can add markers to aid analysis.

■ Time waveform acquisition: The NetEP gathers spectral data for current, torque and voltage, in addition to motor speed, rotor bar, eccentricity, power out, percent load, percent efficiency, effective service factor, input power, power factor, torque time waveform and KVAr data.

## Monitoring capabilities

### Power quality monitoring identifies:

■ Improper tap settings on supply transformers
■ Poorly distributed single-phase loads
■ Overloaded (saturating) supply transformers
■ Missing or open power factor correction capacitors
■ Voltage surges/sags

### Motor performance monitoring identifies:

■ Thermal overloading of the motor and machine
■ Deterioration from heat-related issues
■ Motor efficiency
■ Motor speed
■ Percent load

### Current monitoring identifies:

■ Overloading
■ High resistance connections
■ Misconnections
■ Iron saturation
■ Improperly wound motors

### Current/voltage spectrum monitoring identifies:

■ Saturation problems
■ Broken rotor bars
■ Eccentricity

### Torque monitoring identifies:

■ Mechanical issues
■ Transient overloading
■ Mechanical imbalances
■ Bearing problems
■ Cavitation
■ Worn impellers

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**Inspecting a torque plot which shows transient anomalies**

## Technical capabilities and specifications

- Continuously monitor more than 100 parameters on up to 32 motors
- Connect to motors using up to seven voltage buses
- Measurements include: Peak, RMS, THD, TD, CF, unbalance, power factor, input power and symmetrical components for each V, I phase (and in total)
- Spectrum acquisition (three phases, voltage and current)
- Time waveform acquisition
- Torque time waveform, torque spectrum
- Speed
- Eccentricity
- Power out
- Percent load
- Percent efficiency
- Effective service factor

## Identify predictive maintenance opportunities

- Set alarm limits for parameters
- Display trends for parameters

## Surveyor NetEP software capabilities

- At-a-glance condition status for all machines
- View multiple NetEPs on a single display
- Dashboard view of more than 100 measurements
- Time waveform displays
- Spectrum plots with markers
- Trend information
- Machine, alarm, voltage bus editing
- Torque time waveform and spectrum
- Alarm acknowledgement
- Data retention/storage

## Additional specifications

- Local-area network: Ethernet 802.4 standard 10/100/1000 Base T
- AC input power: 110V–240V

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- Current transformers (CTs): 5A–2000A, up to 150 ft CT signal runs on CAT V cable, 25 kHz signal acquisition
- Computers, data storage and computer network connectivity is provided by customer

## Server requirements

- Server processing capability: 2 GHz or faster CPU with 64-bit support and at least 2 cores
- Memory: at least 2 GB; 4GB or more recommended

- Disk space: at least 10 GB of free disk space per NetEP
- Operating system: Microsoft Windows 2012 or later; Windows 8 or later
- Local-area network connection: 10/100/1000 Base T
- Database: Microsoft SQL or SQL Express
- IP address: static
- Power source: UPS (uninterruptible power supply)
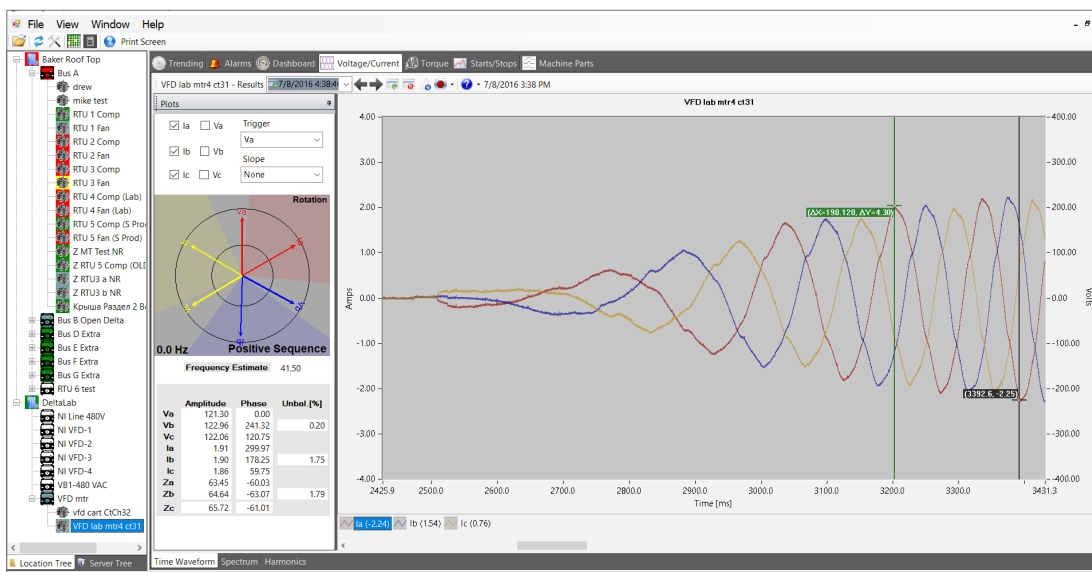
A time waveform plot showing the startup phase of a VFD-driven motor.
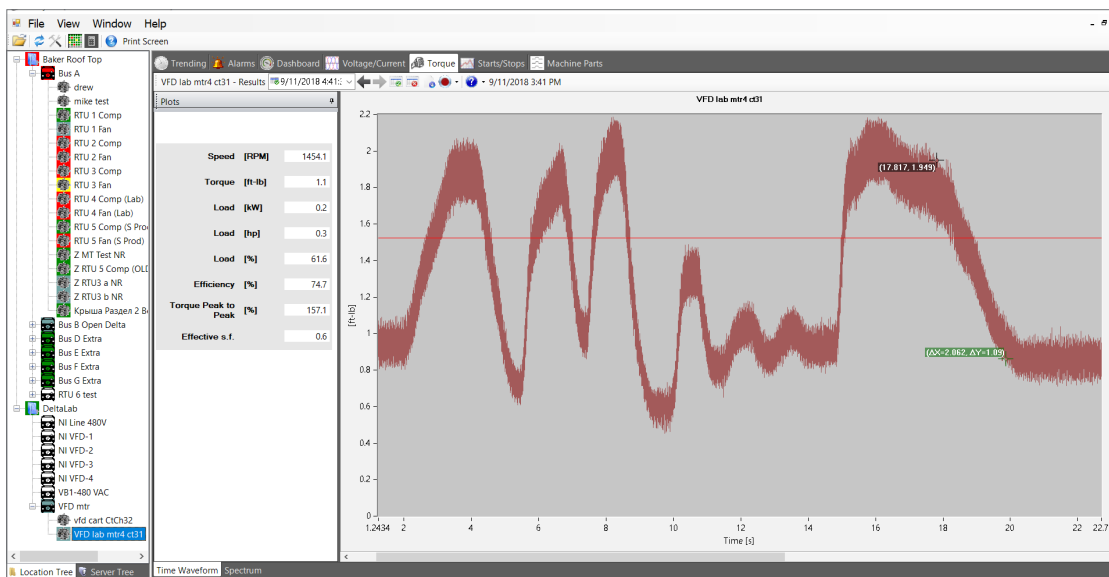
Torque history showing a fluctuating load on the motor.

## Service

Megger provides worldclass global technical support for its motor test and monitoring equipment. You can always call our technical support team at no charge on +1 800-752-8272 (in the US) or +1 970-282-1200 from outside the USA, or send email to
baker.tech-support@megger.com.

From routine calibration to repairs and upgrades for static or dynamic analyzers, our experienced technicians will return your equipment in top condition with fast turnaround and courteous service. Contact Megger's motor test and monitoring product service at
+1 970-282-6079, or email our service team at baker.service@megger.com.

## Training

Want to get the most out of your investment in your Baker NetEP electric motor analysis system? Megger provides training on dynamic motor monitoring and analysis at its training center in Fort Collins, Colorado, USA, or at customer locations on-site, around the globe. Training courses include introductory and advanced seminars on dynamic motor testing that allow you to get the most out of your NetEP. For more information, or for reservations, call +1 970-282-1200 or send an email to baker.sales@megger.com. You can also check out our training schedule at megger.com/baker.

## Product Support Plans

Maximize your Baker NetEP's uptime and performance with Megger electric motor analyzer Product Support Plans (PSPs). These plans assure the fastest turnarounds for service and calibration beyond the standard warranty. For more information about PSPs, contact your local Megger sales representative. In the U.S. call +1 970-282-1200. For global contacts, visit the electric motor test and monitoring solutions website megger.com/baker to find a country representative, or send an email to baker.sales@megger.com.

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