TECHNICAL DATA

Fluke 438–II Power Quality and Motor Analyzer

KEY MEASUREMENTS
Electrical power, harmonics, unbalance, motor speed, torque and mechanical power without the need of mechanical sensors.
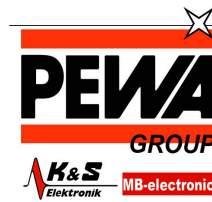
FLUKE CONNECT® COMPATIBLE*
View data locally on the instrument, via Fluke Connect mobile app and PowerLog 430-II desktop software.

SAFETY RATED FOR INDUSTRIAL APPLICATIONS
600 V CAT IV/1000 V CAT III rated for use at the service entrance and downstream

*Not all models are available in all countries. Check with your local Fluke representative.

Quickly and easily discover electrical and mechanical performance of electric motors, and evaluate power quality with a single test tool

The new Fluke 438–II Power Quality and Motor Analyzer adds key mechanical measurement capabilities for electric motors to the advanced power quality analysis functions of the Fluke 430 Series II Power Quality Analyzers. Quickly and easily measure and ana-lyze key electrical and mechanical performance parameters such as power, harmonics, unbalance, motor speed, torque and mechanical power without the need of mechanical sensors.

The ideal portable motor analysis test tool, the 438–II can help locate, predict, prevent, and troubleshoot power quality problems in three–phase and single–phase power distribution systems, while giving technicians the mechanical and electrical information they need to effectively evaluate motor performance.

- Measure key parameters on direct–on–line motors including torque, RPM, mechanical power and motor efficiency
- Perform dynamic motor analysis by plotting of motor de–rating factor against load according to NEMA guidelines
- Calculate mechanical power and efficiency without the need of mechanical sensors, just connect to the input conductors and you're ready to go
- Measure electrical power parameters such as voltage, current, power, apparent power, power factor, harmonic distortion and unbalance to identify characteristics that impact motor efficiency
- Identify power quality issues such as dips, swells, transients, harmonics and unbalance
- PowerWave data technology captures fast RMS data, and shows half–cycle averages and waveforms to characterize electrical system dynamics (generator start–ups, UPS switching etc.)
- Waveform capture function captures 100/120 cycles (50/60 Hz) of each event detected event, in all modes, without set–up
- Automatic transient mode captures waveform data at 200 kS/s on all phases simultaneously up to 6 kV.

Fluke 438-II mechanical metering functions

Motor torque

Calculates the amount of rotational force (displayed in lb.ft or Nm) developed by a motor and transmitted to a driven mechanical load. The motor torque is the single most critical variable that characterizes the instantaneous mechanical performance of rotating equipment driven by electric motors.

Motor speed

Provides the instantaneous motor shaft rotational speed. Combined with the motor torque, motor speed provides a snapshot of the mechanical performance of rotating equipment driven by electric motors.

Motor mechanical load

Measures the actual mechanical power (displayed in hp or kW) produced by motors and provides a direct link to overloading conditions without simply basing it on the motor current.

Motor efficiency

Shows the effectiveness of each motor within a machine, assembly line, plant, and/or facility in converting electric power to useful mechanical work. By properly aggregating the efficiencies of a population of motors the total (aggregate) efficiency can be estimated. Comparisons to expected motor efficiencies at observed operating conditions can help quantify the cost associated with motor energy inefficiency.

How it works

Using proprietary algorithms, the Fluke 438–II Power Quality and Motor Analyzer uses three-phase current and voltage waveforms to calculate motor torque, speed, load and efficiency at a 1 second update rate. The motor air gap field, as observed via the voltage/current waveforms, provides the basis for the measurements. Mechanical sensors and intrusive no–load motor testing is not required, making it faster than ever to analyze overall electric motor performance.

Quick and easy measurement setup

Simply hookup the voltage measurement leads and flexible current probes to the service supplying the motor.

Input details of the motor from the rating plate including rated power, rated speed and motor type from either NEMA or IEC classifications.

Note: Measurement units can be set to local requirements hp/kW, lb ft/Nm etc.

Electrical motor analysis

The Fluke 438–II provides a complete breakdown of electrical parameters. Prior to beginning motor analysis, it's recommended to make base line power quality measurements to assess the state of harmonics and unbalance on the electrical service output as these two properties can have a serious negative impact, on motor performance.

When in Motor Analysis mode, results are summarized for electrical performance, mechanical performance and derating (according to NEMA recommendations).

The easy to understand four–level color severity scale indicates motor performance in relation to the recommended electrical parameter levels including rated power, power factor, unbalance and harmonics.

For mechanical power you can instantly view the mechanical output power along with motor torque and speed. The mechanical output power is instantly compared with electrical power to provide you with live efficiency measurements. With this feature you can easily measure machine performance during each operation cycle.

The NEMA derating screen is updated as the load and the electrical conditions change, and each new measurement is plotted on the tolerance graph as a "+". In this example we can see that motor is within tolerance but is close to the service factor. This indicates that there may be a need for power quality mitigation, motor maintenance or some other performance improving adjustment. By frequently performing these tests over time, known benchmarks and performance trends can be created, enabling informed maintenance investment decisions.
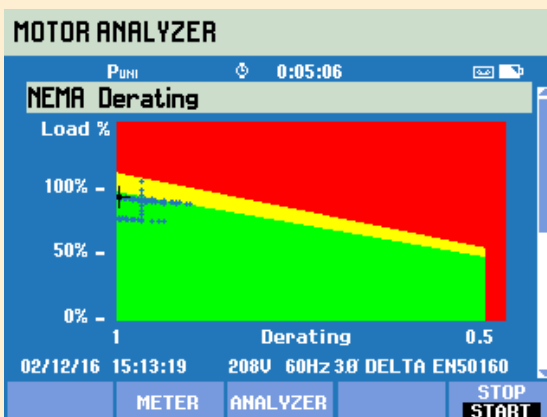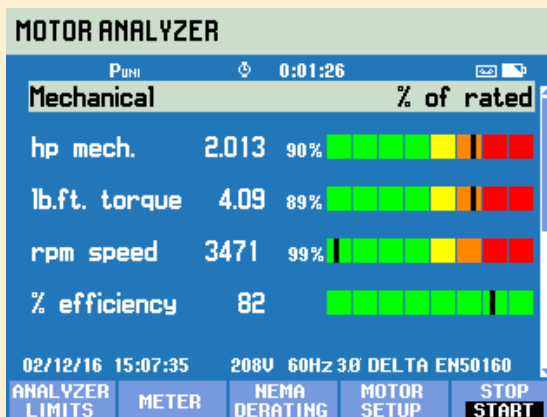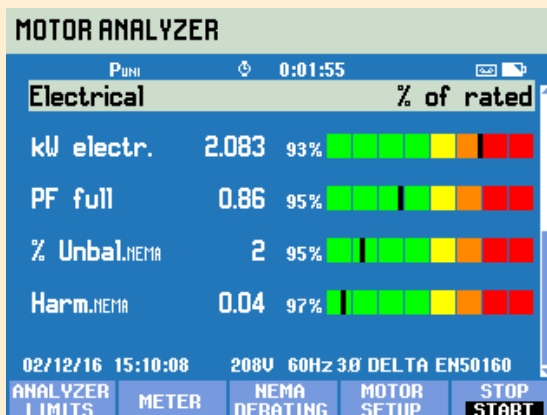
![FLUKE ®]

Specifications

Electrical

For detailed electrical measurement specifications visit the Fluke website, or refer to Fluke 43x–II datasheet.

Mechanical

Mechanical measurements can be performed on direct online motors with a 3 wire connection.

Motor measurement	Range	Resolution	Accuracy	Default limit
Mechanical motor Power	0.7 kW to 746 kW 1 hp to 1000 hp	0.1 kW 0.1 hp	± 3 %[1] ± 3 %[1]	100 % = rated power 100 % = rated power
Torque	0 Nm to 10 000 Nm 0 lb ft to 10 000 lb ft	0.1 Nm 0.1 lb ft	± 5 %[1] ± 5 %[1]	100 % = rated torque 100 % = rated torque
rpm	0 rpm to 3600 rpm	1 rpm	± 3 %[1]	100 % = rated rpm
Efficiency	0 % to 100 %	0.10 %	± 3 %[1]	NA
Unbalance (NEMA)	0 % to 100 %	0.10 %	± 0.15 %	5 %
Harmonics Voltage Factor (NEMA)	0 to 0.20	0.1	± 1.5 %	0.15
Unbalance Derating Factor	0.7 to 1.0	0.1	indicative	NA
Harmonics Derating Factor	0.7 to 1.0	0.1	indicative	NA
Total NEMA Derating Factor	0.5 to 1.0	0.1	indicative	NA

[1]Add 5 % error when selecting Motor design type Other
Specification valid for Motor Power > 30 % of rated power
Specification valid at stable operating temperature. Run the motor for at least 1 hour at full load
(2–3 hours if the motor is 50 HP or higher) to obtain stable temperature.

Notes:
• Supports motor design types NEMA A, B, C, D & E and IEC type H and N.
• Rated torque is calculated from rated power and rated speed.
• Update rate of Motor Measurements is 1x per second.
• Default Trend duration is 1 week.

Ordering information

Fluke-438-II Three-Phase Power Quality and Motor Analyzer

Fluke-438-II/BASIC Three-Phase Power Quality and Motor Analyzer without current flexis (excludes FC WiFi SD card)

Fluke-438-II/INTL Three-Phase Power Quality and Motor Analyzer, International version (excludes FC WiFi SD card)

Fluke-430-II/MA 430-II_Motor Analyzer Upgrade Kit

Fluke-438-II/RU Three-Phase Power Quality and Motor Analyzer, Russia version

Optional/replacement accessories

I430-FLEXI-TF-II-4PK 6000 A Fluke 430 Thin Flexi 61 cm (24 in) 4 pack

C437-II Hard Case 430 Series II with roller

C1740 Softcase for 174X and 43X-II PQ Analyzer

i5sPQ3 i5sPQ3, 5A AC Current Clamps, 3-pack

i400s i400s AC Current Clamp

WC100 WC100 Color Localization Set

GPS430-II GPS430 Time Synchronization Module

BP291 Double capacity Li-ion battery (up to 16 hr)

HH290 Hanging hook for use on cabinet doors

Fluke FC-SD Fluke Connect Wireless SD Card

Preventive maintenance simplified. Rework eliminated.

Save time and improve the reliability of your maintenance data by wirelessly syncing measurements using the Fluke Connect® system.

- Eliminate data-entry errors by saving measurements directly from the tool and associating them with the work order, report or asset record.
- Maximize uptime and make confident maintenance decisions with data you can trust and trace.
- Access baseline, historical and current measurements by asset.
- Move away from clipboards, notebooks and multiple spreadsheets with a wireless one-step measurement transfer.
- Share your measurement data using ShareLive™ video calls and emails.
- 438-ll is part of a growing system of connected test tools and equipment maintenance software. Visit the website to learn more about the Fluke Connect® system.

Find out more at **flukeconnect.com**

All trademarks are the property of their respective owners. WiFi or cellular service required to share data. Smartphone, wireless service and data plan not included with purchase. First 5 GB of storage is free. Phone support details can be viewed at **fluke.com/phones**.

Smart phone wireless service and data plan not included with purchase. Fluke Connect is not available in all countries.

Fluke. *Keeping your world up and running.*®