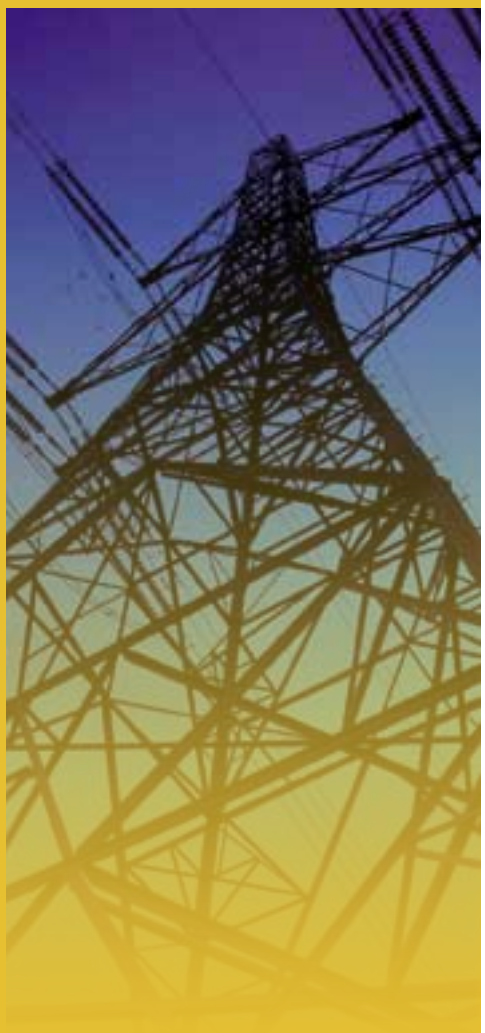
FLUKE®

Power Quality tools

for industrial and commercial applications.

Power quality overview

What is power quality?
How reliably can your systems operate their loads? That is the essence of power quality. Power disturbances can involve voltage, current, or frequency and typically manifest as dips, swells, harmonic distortion, unbalance, flicker, and transients. These problems can originate in your own power system or from the utility. Defined in terms of magnitude and duration, power disturbances can last microseconds, or involve outages of hours or more.



The costs of poor power quality
The increasing cost of electrical energy is driving industries to use energy as efficiently as possible. Fluke power and energy measuring tools are a vital component in gaining control of those costs. The traditional way of reducing energy usage is monitoring and targeting (M & T); Monitoring and targeting determines when and where energy is being used, and by doing so discovers whether or not that energy is being used effectively. Examples of this include comparing building occupancy with energy profiles. Simple things like ensuring lighting and heating systems are not being operated when a building is unoccupied can create significant savings. Other examples of energy waste include the powering of machinery and plants when no production is taking place, and leaving equipment in standby mode for extended periods of time. The power and energy logging capabilities in Fluke Power Quality tools enable the user to monitor and target energy usage to identify these savings opportunities.

Another way of determining whether or not electrical equipment is operating efficiently is to identify potential power quality issues. Poor power quality is expensive. First and foremost, it pushes up your energy costs both from excess power usage, and in penalties your utility may assess for poor power factor or high peak demands.

Poor power quality also takes a toll on equipment, increasing the cost of maintenance and repairs. Premature equipment failures or damage caused by power problems result not only in the expense of replacing the equipment itself, but also in associated labor costs for diagnosis and repair.

When equipment is not operating due to unscheduled downtime, productivity drops and process consistency suffers or fails, which in turn leads to product waste. Fluke's Power Quality tools provide the means to discover the source and magnitude of power quality issues allowing savings opportunities to be identified and capitalized upon. Taking these capabilities one step further, the Fluke 430 Series II Power Quality and Energy Analyzers will quantify the actual fiscal cost of wasted energy due to poor power quality, ultimately saving money in terms of your energy bill and the effects of unplanned downtime.

How do you know you have power quality problems?
You'll easily recognize the symptoms: flickering lights, power outages, nuisance tripping of breakers, PLCs and variable speed drives. Equipment such as motors and transformers will run hot or noisy. Some problems are more subtle such as poor computer performance, causing lock-ups and data loss. All of these problems drive up your utility bills and drive down efficiency.

Where do power quality problems originate?
You might not realize that more than 80 percent of all power quality problems originate within your facility.

Large equipment starting-up or shutting down, improper wiring and grounding, and overloaded circuits or harmonics are just a few of the culprits. Less than 20 percent of power problems originate with the utility transmission and distribution system. Lightning strikes, equipment failure, accidents, and weather conditions all adversely affect the utility. Neighboring businesses, and normal operation of utility equipment can also affect the quality of power delivered to your facility.

Take a pro-active approach
You have the power to improve power quality. Your frontline of defense is regular and frequent inspection of your facility with good maintenance practices, using the right inspection equipment. That's where Fluke can help.

Out-of-the-box solutions for energy optimization and power quality

Fluke tools will help you troubleshoot, record, and analyze power quality and energy parameters with speed and confidence.

- Get detailed information
- Locate a variety of disturbance sources
- Correctly diagnose problems
- Prevent problems

Every Fluke energy optimization and power quality tool is a solution beginning with an intuitive user interface that makes advanced features easy to access. Flexible and powerful software is included with each tool, at no extra cost.

Fluke offers a comprehensive line of troubleshooters, power and energy loggers, and recorders to handle a broad range of power quality applications. But how do you know which tool is right for which job? Use the quick reference guide below to identify the right tool for the problems you're experiencing.

	Troubleshooters	Loggers	Recorders
Why use one?	These instruments include a live display when immediate access to the diagnostic information is needed.	Loggers are the basic tools for creating energy usage profiles used in monitoring and targeting. You can also use a power quality logger to validate voltage quality and look for general trends in the power quality.	Many problems can't be found immediately, especially those caused by different loads interacting. Use these instruments to record indepth voltage and current information over time, so you can better diagnose and resolve problems.
When?	Whenever a recurring problem exists (such as overheating transformers and motors, and nuisance tripping of breakers).	When you need to know the loading on a system, or to understand the general quality of service.	When intermittent voltage disturbances or high-speed transients cause problems.
Who?	On-site electrician or electrical technician	Power quality specialist, on-site electrician or electrical technician, engineer facilities technicians and high-end electrical contractors, commissioners	R&D engineer, facility manager, plant manager, electrician

Industrial and commercial building applications

Recognizing, identifying, and solving power quality problems is increasingly important to businesses—so building this essential knowledge will help you get to the next level. You can count on Fluke to bring you the understanding and the proven tools you need.

Count on Fluke to help you find, fix, and prevent power quality problems

When you need to identify and solve your electrical problems fast, Fluke has the tool for the job.

- **New to energy optimization and power quality?** Fluke offers intuitive and safe troubleshooting tools with online seminars and application notes to help you get started.
- **Seasoned pro?** Fluke has the advanced products and industry case studies to match your most demanding problems.

A Frontline troubleshooting and predictive maintenance

In these applications, a member of the facility's maintenance team responds to failures that may result in downtime.

When the facility is down it is not generating revenue, so there is extreme urgency to get these problems identified so operations can be restored as quickly as possible. With equipment down, the maintenance tech wants to see information about the problem right on the screen of the tool—as opposed to recording it and then analyzing the data later with a PC.

Symptoms include:

- Overheating transformers
- Overheating motors
- Reduced operating life of motors and transformers
- Control system problems (PLCs tripping)
- Nuisance tripping of circuit breakers

B Load studies

Before the installation of new equipment or major distribution changes, load studies are conducted to determine if the system has enough electrical capacity to handle the proposed loads.

The three groups that may conduct a load study include:

- Electrical contractors—who have been hired to install new equipment.
- The maintenance team—if they are installing equipment.
- The utility—when a new facility is being built and there is a need to determine what transformers and other equipment will be needed to meet power requirements.

In the US, regulation NEC 220.87 defines how to properly perform a load study in order to obtain an electrical permit.

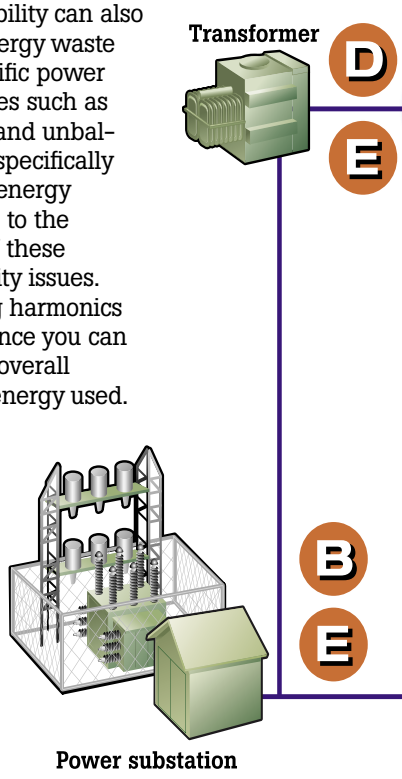
C Energy surveys

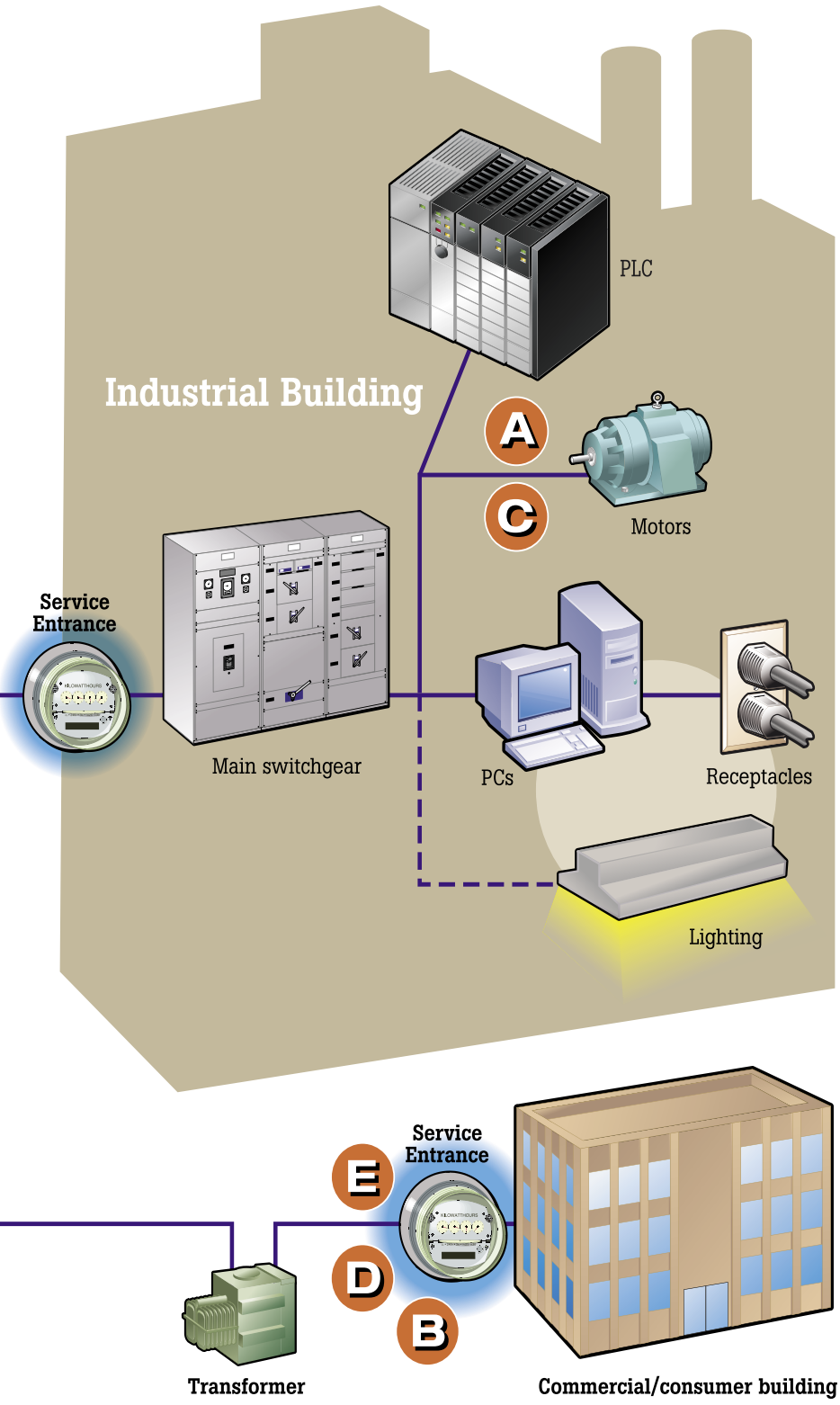
The goal of an energy survey is to reduce the electrical energy usage.

Simple monitoring and targeting can discover savings opportunities by comparing daily and weekly energy usage profiles with facilities activities. Monitoring and targeting can also pinpoint reductions in peak demand charges and power factor penalties.

An energy survey is performed over whatever period of time captures a representative energy profile of the business in question. This could be a day, week, or month depending on industry. The facility uses the results of the survey to guide improvements in energy consumption, such as installing high efficiency equipment or correcting power factor. The test will then be repeated to validate the benefit of the changes.

Fluke's new Unified Power Measurement (UPM) capability can also discover energy waste due to specific power quality issues such as harmonics and unbalance. UPM specifically details the energy wasted due to the presence of these power quality issues. By reducing harmonics and unbalance you can reduce the overall amount of energy used.





D Voltage quality

Customers expect their utilities to supply voltage that meets a minimum level of quality to allow their facilities to run without problems. When a customer experiences a voltage quality issue, they often assume that the utility is at fault, so the customer or the utility will use a tool to validate the voltage quality at the service entrance. In Europe a standard for voltage quality has been established: EN 50160. Many countries outside of Europe accept this standard as well. If the utility is ruled out as the source of the problem, the next step is to conduct voltage quality tests inside the facility and at the load.

Symptoms of voltage quality problems include:

- Flickering lights
- Tripping/resets
- UPS cycling

E Long-term and intermittent analysis

Many times, the problem cannot be identified immediately. It could be the interaction of different loads on the power system causing the problem. In this case, an instrument that can record voltage and current information over time helps the user more easily diagnose the disturbance. These tests often use a series of instruments, recording at multiple locations simultaneously to pinpoint the root cause of the disturbance. Tests can last for months while personnel wait for the symptom to occur so they can correlate it to the specific event that caused the problem.

Symptoms include:

- Intermittent voltage disturbances
- High speed transients

Fluke 345 Power Quality Clamp Meter

Monitor electronic loads.
Combining a power analyzer, power quality logger, and clamp meter, the Fluke 345 is ideal for commissioning and monitoring electronic loads.

- **Set up and troubleshoot variable frequency drives and UPS systems**
  Accurately measure key power quality parameters. A low-pass filter removes high frequency noise.
- **Uncover harmonic issues that damage or disrupt equipment**
  Analyze the harmonic spectrum graphically, with the bright, color, power meter display, or digitally.
- **Measure inrush current to capture nuisance circuit-breaker tripping** from 3 to 300 seconds.
- **Verify** system capacity with load studies—before adding loads.
- **Measure dc current up to 2000 A without breaking the circuit**
  The Hall Effect clamp meter design makes it possible.
- **Analyze trends or catch intermittent problems** with long-term power quality monitoring. Monitor for minutes or months, including harmonics, with high-capacity internal memory.
- **Measures three-phase** balance loads.
- **600 V CAT IV** safety rating for use at the service entrance.
- **Includes Power Log software** for generating reports and viewing graphs.

Fluke 43B Power Quality Analyzer

Get control of power problems.
Maintain power systems, troubleshoot power problems, and diagnose equipment failures with one rugged, handheld tool. The Fluke 43B combines the most useful capabilities of a power quality analyzer, multimeter, and scope.

- **Combines** the most useful capabilities of a power quality analyzer, multimeter and scope.
- **Trends** voltage, current, frequency, and power harmonics.
- **Captures** voltage sags, transients, and inrush current.
- **Tracks intermittent problems and power system performance** with monitoring functions. Records two selectable parameters up to 16 days.
- **Calculates 3-phase power** on balanced loads with a single-phase measurement.
- **Measures** resistance, diode voltage drop, continuity, and capacitance.
- **6.5 hours of operating time** with new NiMH battery.
- **Includes FlukeView® software** for logging readings over time in cluding a complete harmonic profile up to the 51st harmonic.

Fluke 430 Series II Three-Phase Power Quality and Energy Analyzers

Pinpoint power quality problems and monetize energy loss.
The new 430 Series II analyzers offer the best in power quality analysis, and introduce, for the first time ever, the ability to monetarily quantify losses caused by power quality issues. Use for:

- **Frontline troubleshooting**
  Quickly diagnose problems on-screen to get your operation back online.
- **Energy loss management**
  Measure and quantify specific causes of energy losses to enable simple return-on-investment calculation of harmonics and unbalance mitigation equipment.
- **Power inverter efficiency**
  Simultaneously measure AC input power and DC output power for power electronics systems.
- **Capture fast RMS data**, show half-cycle and waveforms to characterize electrical system dynamics.
- **Predictive maintenance**
  Detect and prevent power quality issues before they cause downtime.
- **Quality of service compliance**
  Validate incoming power quality at the service entrance.
- **Long-term analysis**
  Uncover hard-to-find or intermittent issues.
- **Load studies**
  Verify electrical system capacity before adding loads.
- **Dynamic load testing**
  Capture instantaneous values to see the effect of load switch on generators and UPS systems.

Fluke VR1710 Power Quality Recorder

A simple plug-in voltage logger to pinpoint what's happening at single phase outlets.
Whether it's loose connections or transients caused by equipment switching or lightning strikes the VR1710 will find the problem. Power quality parameters including rms average, transients, flicker, and harmonics up to the 32nd, are recorded using a user-selected average period from one second to 20 minutes.

- **Fast and easy recording of voltage trends, dropouts, and power quality**
  Easily pinpoint the root cause of single phase voltage problems.
- **Continuous recording of all values with no gaps**
  Save testing time by getting the whole picture with one instrument that records both events and voltage.
- **Min, Max, and Average rms values (1/4 cycle) with time stamp**
  Quickly see what happened and when.
- **Includes PowerLog software package** for quick download, analysis, and automatic reporting–Save time by generating power quality reports automatically with pre-set templates.

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Fluke 1735 Three-Phase Power Logger

Study energy consumption and loads.
For electricians or technicians who need basic power quality logging. Set it up in seconds. Monitor and record most power parameters for up to 45 days.

- **Load studies**
  Verify electrical system capacity before adding loads.
- **Energy assessments**
  Quantify energy consumption before and after improvements to justify energy-saving devices.
- **Harmonics surveys**
  Capture energy profiles to enable energy optimization actions.
- **Improve reliability by capturing voltage events**
  Monitor for dips and swells from load switching that cause spurious resets or nuisance circuit breaker tripping.
- **Includes Fluke Power Log software**
  Generate reports and view graphs.

Fluke 1740 Series Three-Phase Power Quality Loggers *Memobox*

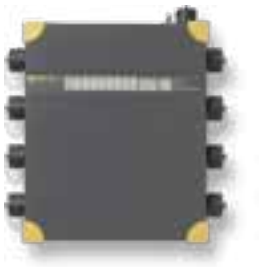
Easy power quality logging.
The everyday power meter for technicians who need to troubleshoot and analyze power quality issues. Simultaneously log up to 500 power parameters for up to 85 days to uncover intermittent and hard-to-find power quality issues.

- **Uncover** root causes of equipment malfunctions.
- **Check** incoming power quality at the service entrance.
- **Establish a power quality baseline** and check compatibility with critical systems before installing new equipment.
- **Load studies**
  Verify system capacity before adding loads.
- **Energy assessments**
  Quantify energy consumption, power factor, and overall power quality before and after improvements, to validate performance.
- **Installs inside the cabinet**
  Compact, fully-insulated housing and accessories fit easily in tight spaces, next to live power.
- **Includes PQ Log software**
  Quickly analyzes trends, creates statistical summaries, and generated detailed graphs and tables.

Fluke 1750 Three-Phase Power Quality Recorder

Threshold-free measurement ensures you'll never miss an event.
Capture every measurement, every event, on every cycle, all the time. The Fluke 1750 makes it automatic. Excellent accuracy and resolution provide complete visibility into your distribution system.

- **Long-term analysis**
  Uncover hard-to-find or intermittent issues.
- **Power quality surveys**
  Quantify power quality throughout a facility, documenting results with professional reports.
- **Quality of service compliance**
  Validate incoming power quality at the service entrance.
- **Portable monitoring**
  Monitor critical equipment to capture power quality events and correlate them with equipment malfunctions.
- **Quick, reliable configuration**
  Android based wireless tablet "font panel interface" provides a window into what the instrument is recording, even in awkward test locations.
- **Threshold-free set-up**
  Apply thresholds after the data is collected.
- **Plug and play**
  Set up in minutes with self-identifying current probes and simple lead voltage connections.
- **Includes Intuitive PC software**
  Easy-analysis and reporting of data with Fluke Power Analyze V2.1 software with automatic report generation.



Fluke 1760 Three-Phase Power Quality Recorder *Topas*

Class-A compliance for your most demanding power quality tests.
For advanced power quality analysis and consistent compliance testing of industrial power distribution systems. The Fluke 1760 is designed for medium-voltage and low-voltage networks.

- **Detailed disturbance analysis**
  Perform high-speed transient analysis and uncover root cause of equipment malfunctions for mitigation and predictive maintenance. Capture even very short impulses such as lightning strikes.
- **Fully compliant to IEC 61000-4-30 Class-A**
  Offers indisputable verification of incoming power quality at the service entrance.
- **Correlate events at multiple locations**
  Use GPS time synchronization to quickly detect where a fault first occurred, either inside or outside the facility.
- **Galvanic separation and dc coupling**
  Make complete measurements on dissimilar power systems. For example, you can troubleshoot UPS systems by simultaneously recording the battery voltage and power output.
- **Power quality and power load studies**
  Assess baseline power quality to validate compatibility with critical systems before installation. Verify electrical system capacity before adding loads.
- **Includes Comprehesive software**
  Fluke Power Analyze V2.1 software provides trend diagrams for root cause analysis, statistical summaries, report writing, and real-time data monitoring in the online mode.

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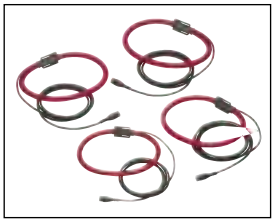
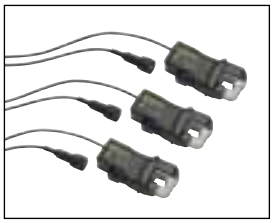
Recommended applications

Applications	Troubleshooters			Loggers			Recorders	
	345	43B	430 II	1710	1735	1740	1750	1760
Frontline troubleshooting and predictive maintenance	•	•	•	•			•	
Load studies			•		•	•	•	•
Energy surveys	•		•		•	•		
Voltage quality			•	•		•	•	•
Long-term/inter-mittent analysis			•			•	•	
Energy monetization			•					
	Single-phase	Single-phase	Three-phase	Single-phase	Three-phase	Three-phase	Three-phase	Three-phase



i430 Thin Flex 4 Pak



i5sPQ3, 5 A ac Current Clamps, 3-pack

GPS430-II Time Synchronization Module

Learn more!

Visit www.fluke.com for:

- Free Power Quality video
- Application Poster
- On-site demo
- Training

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

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