

Measuring Power Quality in Accordance with Class-A

Since the introduction of the IEC 61000-4-30 Class-A standard, it has been possible to measure power quality parameters in a reliable, consistent way. For both utility companies and large-scale energy users, it is important to be able to verify the quality of incoming power, and to be able to determine if a power quality related problem originates from inside or outside the energy consumer's premises. Measurements taken using instruments that conform to Class-A can be used in legal or contractual disputes, making it essential to choose an instrument that has this capability.

Application Note

Power quality measurement is a relatively new, and quickly evolving field. There are hundreds of manufacturers around the world with unique measurement methodologies. Whereas basic single- and three-phase electrical measurements like rms voltage and current were defined long ago, many power quality parameters were not previously defined, forcing manufacturers to develop their own algorithms. With so much variation between instruments, electricians tend to waste too much time trying to understand an instrument's capabilities and measurement algorithms instead of understanding the quality of the power itself!

The new IEC 61000-4-30 Class-A standard takes the guesswork out of selecting a power quality instrument. This standard defines the measurement methods for each parameter to obtain reliable, repeatable and comparable results. In addition, the accuracy, bandwidth and minimum set of parameters are all clearly defined.

Obtaining reliable, repeatable and comparable results

Standardization of power quality measurement is relatively new, and Class-A describes the measurement methods, as well as defines the accuracy, bandwidth, range, time synchronization (for example by GPS), and minimum set of parameters, including:

- Power frequency
- Supply voltage magnitude
- Flicker*
- Harmonics and interharmonics*
- Dips and swells
- Interruptions
- Supply voltage unbalance
- Mains signaling
- Rapid voltage changes

* Details for Flicker and Harmonics are described in the IEC 61000-4-15 and IEC 61000-4-7.

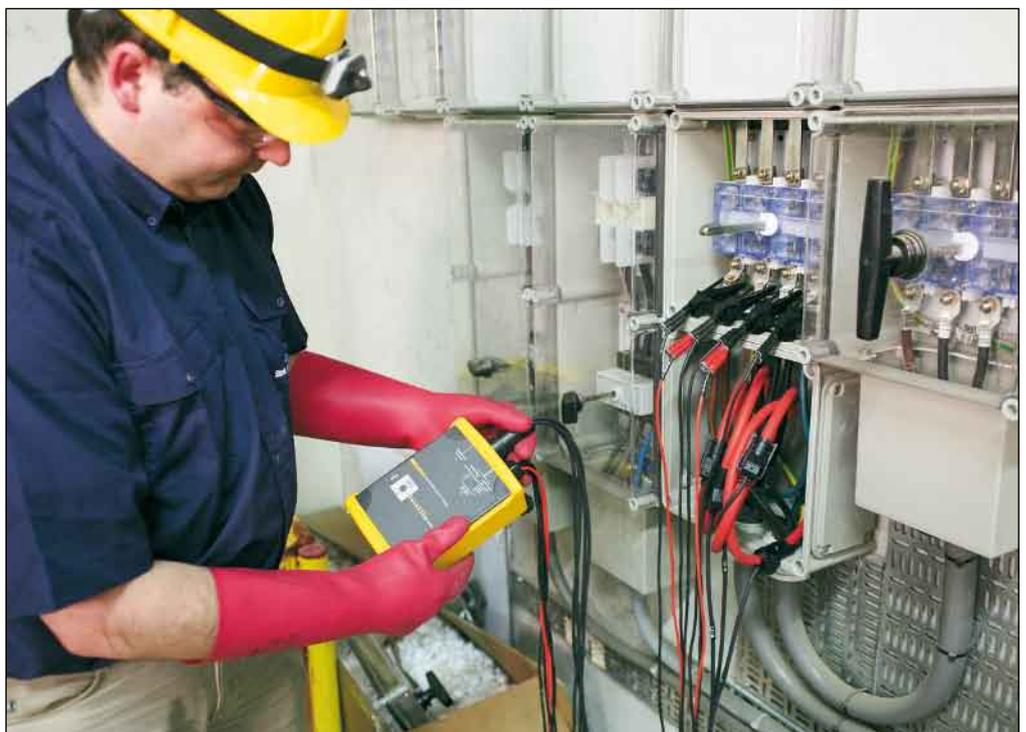
Who pays for poor power quality?

Power quality is a measure of how well an organization's electrical system supports the reliable operation of its loads. Poor power quality is an avoidable source of problems in, among other things, motors, drives, lighting and IT networks. Many businesses underestimate the impact of poor power quality, which in terms of unplanned downtime, lost production, lost data and premature equipment failure can be quite significant. Problems also lead to unnecessarily high energy bills and even fines for 'polluting' the upstream supply.

Power consumers with internal power quality problems that "pollute" the up-stream supply impact other energy consumers, and affect a sub-station's ability to meet contractual power quality obligations.

Meeting contractual obligations

Under these circumstances, it is easy to see why electricity utility companies need to monitor power quality closely. Not only are minimum power quality levels contractually stipulated – especially for energy consumers with critical processes such as semiconductor manufacturers – but also the tendency is to blame local utility companies for poor quality.



However, research carried out by power experts indicates that around two-thirds of all power problems actually originate from within a facility. It is therefore essential to be able to determine if poor power quality originates from power disturbances generated by internal or external causes. To solve disputes in this area, measuring in accordance with Class-A is absolutely essential.

Tools for measuring power quality

Only tools specifically designed to troubleshoot, record and analyze power quality parameters can provide the detailed information needed to locate a disturbance source, and to correctly diagnose the problem. A number of handheld inspection tools are available for first-line power quality troubleshooting, including portable instruments that identify the presence of disturbances such as harmonics and voltage variations on single- and three-phase loads. These tools determine their magnitude on the spot, showing results in the display.

Class-A conformity

Class-A has taken the guesswork out of power quality measurement, and it is the accepted standard for comparing measurement results and solving power quality disputes. It is essential in many applications to choose tools that are fully Class-A compliant.

Power quality analyzers

Once a problem is suspected, it is necessary to locate and analyze it, and this is where a tool like the Fluke 435 Class-A Power Quality Analyzer comes into its own. The latest addition to the 430 Series, it is fully Class-A compliant and has built-in logging functions, user-configurable measurements and a large memory. It's graphic display provides instant results so that you can quickly locate and identify disturbance sources before they cause serious problems. Features like configurable thresholds, scale factors and GPS time synchronization enable precision data correlation. The 435 also has logging capabilities and can capture events over time for later analysis.

Power quality recorders

However, a different kind of tool is required for capturing intermittent disturbances, or validating incoming power quality in high detail over an extended period of time. For these tasks, portable power quality recording and logging tools can be set up and left behind for a period of time, for example a week, month or longer. One such tool is the Fluke 1760 Power Quality Recorder. Specifically designed for utilities and industrial distribution systems in medium- and low-voltage networks, this recorder is able to capture comprehensive details on user-selected parameters. It is used for making detailed disturbance analysis and 'quality-of-service' compliance testing in accordance with the Class-A standard.

Other important considerations are the uninterrupted power supply, which means important events are captured even during outages. A 2 GB data memory enables simultaneous recording of all parameters for extended periods. With this type of tool, the data collected is subsequently analyzed using software to carry out root-cause analysis and statistical summaries, and to generate reports. Features like configurable thresholds, scale factors and GPS time synchronization enable precision data correlation. The 1760 also has capabilities for real-time data monitoring and it can be connected to a company's network to facilitate this.



Fluke 435 Power Quality Analyzer



Fluke 1760 Power Quality Recorder



Fluke 435 Power Quality Analyzer with GPS time synchronization



Setting up the Fluke 1760 for long-term power recording.

A selection of Fluke power quality test tools with Class-A compliance:



Fluke 435 Class-A Power Quality Analyzer

The 435 three-phase power quality analyzer is fully Class-A compliant, and has advanced logging functions, user-configurable measurements, and a large memory for detailed long-term recording of events. It comes with instrument-powered flexible current probes and Power-Log software for analyzing data and creating reports.



Fluke 1740 Series Power Quality Loggers

The Fluke 1740 Series Power Quality Loggers are for everyday troubleshooting and analysis of power distribution systems. Three models offer a choice of functions for applications like disturbance analysis, load studies and 'quality-of-service' compliance. Voltage measurement accuracy is Class-A compliant. The easy-to-set-up instruments can capture events and log 500 parameters for 85 days.



Fluke 1760 Class-A Power Quality Recorder

Intended for utilities and industrial distribution systems in medium- and low-voltage networks, the 1760 Power Quality Recorder captures comprehensive details for disturbance analysis and 'quality-of-service' compliance testing in accordance with Class-A. It is quick to set up, has configurable thresholds and scale factors, GPS time synchronization, an uninterrupted power supply, and a 2 GB memory.

In addition to the Fluke 435, Fluke 1740 Series, and Fluke 1760 Class-A compliant tools, Fluke also has a complete family of power-quality tools including general-purpose loggers and recorders and trouble-shooting tools for technicians and installers.

More information and detailed specifications can be found under www.fluke.com

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