



# **POWER QUALITY AUDIT AND THERMOGRAPHY AUDIT (PQA & TA)**

Power Saving for  
Smart Organizations



[www.prasa-pl.com](http://www.prasa-pl.com)

## What is PQA?

Power Quality Audit (PQA) services, analyze the reliability, efficiency, and safety of an organization's electrical system. Prasa's PQA services allow you to measure the following aspects to diagnose any distortions or disturbances in your system or equipment.

### Continuity of Power Supply

To check if the power in the network is available on a regular basis and is able to support the efficient operation of the equipment.

### Quality of Voltage

To ensure that there are no frequency disturbances in the network capable of damaging the system components.

Prasa's PQA uses network analyzers and instruments designed to detect faults and deteriorations, and record parameters and information that help in locating the causes of any disturbances. The data is then collected and analyzed by experts at Prasa, who diagnose the problems and suggest the most appropriate solutions and actions.



An ideal power supply would be an uninterruptible service, well within voltage and frequency tolerance limits, and a distortion-free sinusoidal waveform. This is not usually the case and the power supply witnesses various deviations from power ratings, which depend on the kind of use, the systems installed, and their requirements.



## What does 'Quality' of Energy Mean?

A good quality electrical power supply is

- available at all times
- always within the frequency and magnitude tolerance limits
- always with a perfectly sinusoidal waveform.

A reliable and efficient power supply is crucial in not just ensuring productivity and precision in your organizations, but also keeping up the health of all your electrical equipment.

Business and industrial organizations, public authorities, hospitals and laboratories, and banking and finance groups are relying more and more on computerized and electronic equipment for their daily work activities. These essential electrical loads are subject to a range of disturbances from the bad quality of the power supply, which can adversely affect the reliability and performance of the electrical system.

## The Problems

The most common issue with an unreliable electrical system is a break in the power supply: either complete breaks, lasting from a few seconds to several hours or voltage sags /drops, when the voltage falls to below the rated level for short times. Longer breaks are a problem for all users, but many processes, such as continuous and synchronized production processes or high-value data processing, are sensitive to even the shortest of breaks. Other electrical disruptions include: over voltages, reduction of power factor, power imbalances, harmonic distortions, etc.

## The Risks

Ignoring the symptoms of possible disturbances in the electrical system could lead to a domino effect starting with drastic effects including damaged equipment, reduced working efficiency, and shortened life span of expensive equipment. These effects may result in a hiatus in critical processes (i.e. machine downtime), which could lead to a loss of earnings that could far outweigh the mere cost of the actual operation. Apart from these risks for the entire duration, when you depend on bad quality power you risk having to bear increased energy costs and pay penalty charges in electricity bills, with the chance of legal disputes with the energy providers.



## The Improvement Measures

The quality of the energy can be improved upon by bringing in simple expert intervention on 3 levels:

- 1) User's electrical system,
- 2) Equipment connected to the system
- 3) Mains power

If there is a problem in the electrical system, the PQA guides the organization to take necessary steps like installing active or passive filters, harmonic compensators, emergency generators or UPS systems, or to intervene directly on the structure of the system (like transformers, new distribution lines, etc). Although technological advancement has allowed for standards that reduce the creation of disturbances and make equipment more disturbance-prone, problems can still arise with the mismatching of non-homogeneous equipment in the same system. The PQA makes it possible to find the right arrangement within the system.

## The Advantages

The final PQA report provides a comprehensive picture of the electrical system's state of operation. The report is a pivotal tool for preventive maintenance, as it lists the series measures required to be taken when disturbances are detected, and before these disturbances can negatively impact the equipment and production.

# Voltage Drop / Flicker

## What is it ?

Voltage drops lasting for fractions of a second, caused by inrush currents

## Causes

Starting or stopping of big loads, such as an air conditioner compressor or a big motor, or equipment that draws current intermittently

## Effects

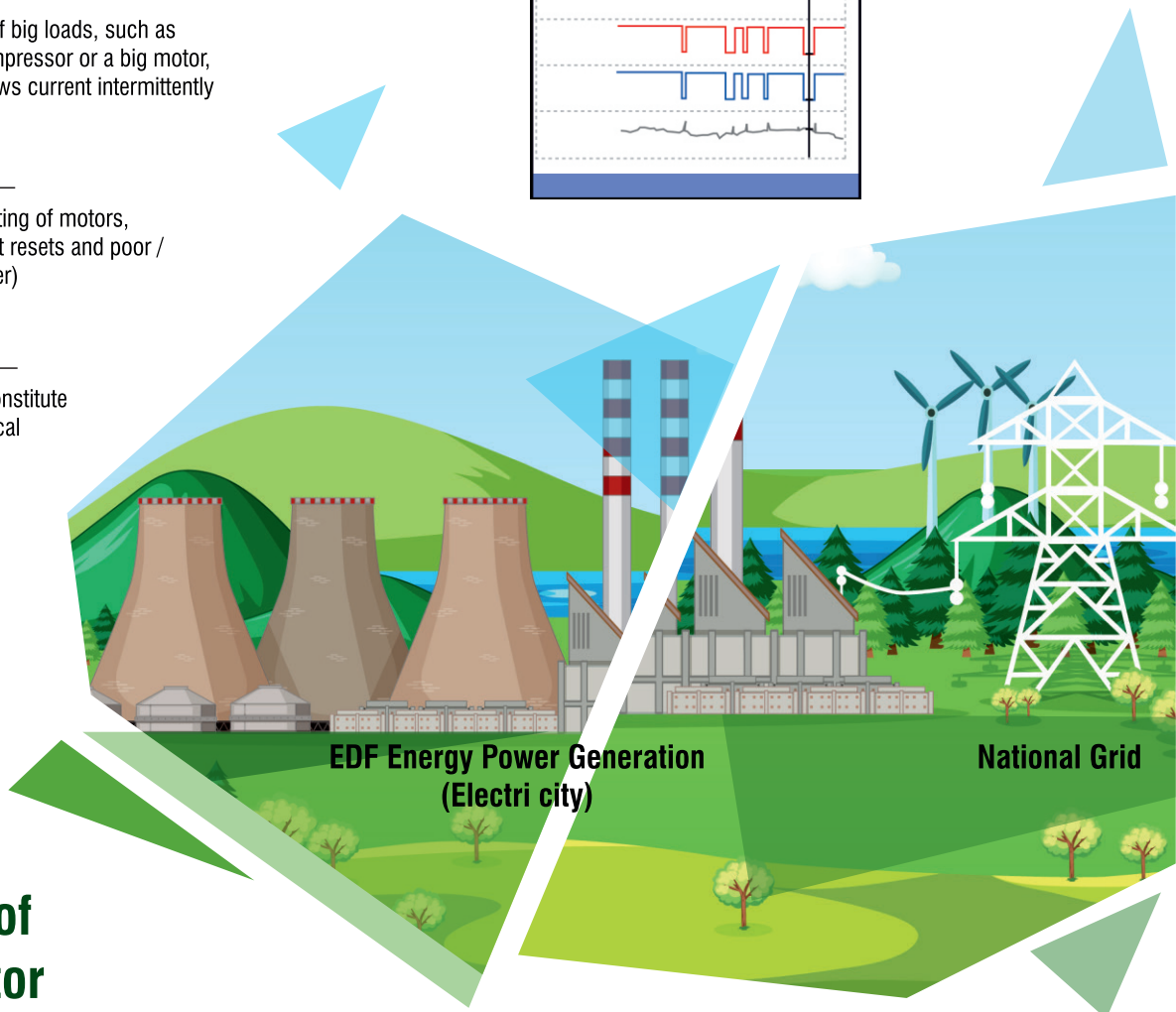
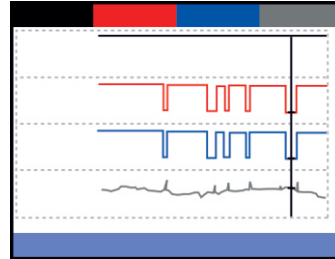
Loss of data, overheating of motors, unexpected equipment resets and poor / uneven visibility (flicker)

## Note

Transitory currents constitute almost 90% of electrical disturbances

## Signs

Perceptible flickering in incandescent lamps



# Reduction of Power Factor

## What is it ?

Increase in the reactive power (VAR) of the load in relation to its active power (W)

## Causes

Addition of excessive capacitive / inductive loads, fault in capacitor filters or compensation system

## Effects

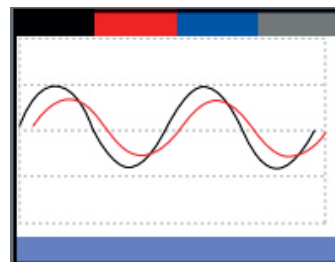
Greater operating costs, penalty charges in electricity bills

## Note

The cost of remedying the reduced power factor problem is much less than the payment of a penalty charge

## Signs

Cosφ is lower than agreed with manufacturer



# Harmonic Distortion

## What is it ?

Alterations to voltage and current waveforms due to absorption by the loads at frequencies differing by 50Hz from the basic one

## Signs

Not visible without instrumentation

## Causes

Non-linear loads (in almost all electronic equipment or drives)

## Effects

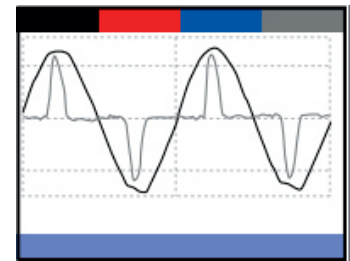
Overheating of electrical equipment, wiring and motors, automatic switch malfunctions, tripping of relays, opening of fuses and a general reduction in the efficiency of the system

## Note

Most distortion is attributable to the third harmonic, typical of IT equipment

Local Distribution Network Operators

Homes & Businesses



## Imbalance on three-phase load

### What is it ?

Imbalance in the voltage value of a phase (> 2 %)

### Signs

Not visible without instrumentation

### Causes

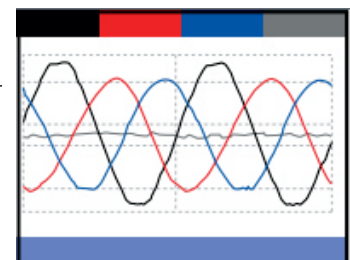
Connected single-phase loads with different powers, three-phase load faults

### Effects

Inefficiencies, overheating, motor and transformer faults

### Note

Imbalances are typical in organisations that keep adding new loads to their systems



# Transitory Current/Over Voltage

## What is it ?

Peak of Short Duration upto 1ms

## Causes

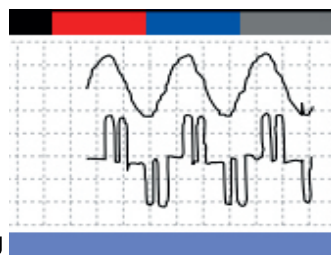
Switching of filter condensers, switching large equipment on and off, short circuit in wires or a lightning discharge

## Effects

Shorter lamp life, equipment stop-ping / damage, PC crashes with memory loss, data processing errors, printed circuit card

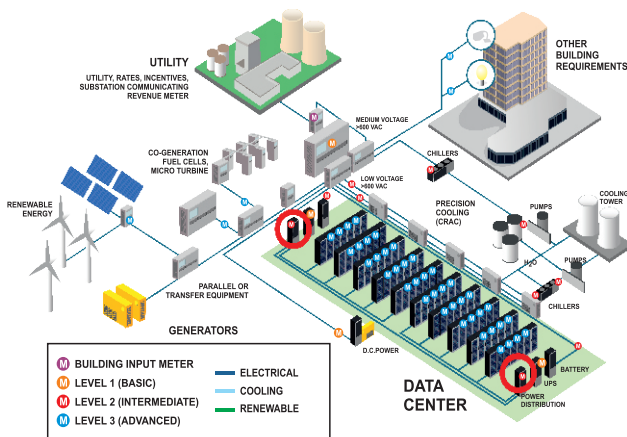
## Signs

Not visible without instrumentation



# Calculate the Cost of Bad Power in ₹

Prasa uses FLUKE Power Analysers for your power audit, which enables us to log in the precise data at your site. With the new Energy Loss Calculator function, the 434 II measures the monetary cost of energy wasted due to poor power quality. The monetization of energy allows you to identify the energy-inefficient areas of your facility and Prasa helps you determine the plan of action leading you to energy saving. By adding just basic power quality measurements you can create a powerful troubleshooting tool.



## Applications

- **Energy monetization** – calculate the cost of energy waste due to poor power quality and reduce your power bills
- **Energy assessment** – quantification of before and after installation energy consumption to justify the cost of energy-saving devices
- **Frontline troubleshooting** – quickly analyze problems on-screen to get your operations back online
- **Predictive maintenance** – detect and prevent power quality issues before they cause any downtime
- **Long-term analysis** – find hard-to-discover or intermittent issues
- **Load studies** – verification of the capacity of the electrical system before adding loads

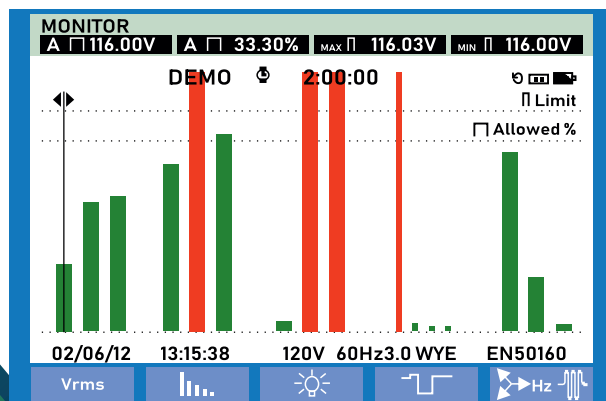
## Unified Power Measurement

Fluke's patented Unified Power Measurement (UPM) system provides the most comprehensive view of power available, measure:

- Parameters of Classical Power (Steinmetz 1897) and IEEE 1459-2000 Power
- Detailed Loss Analysis
- Unbalance Analysis

These UPM calculations help in quantifying the fiscal cost of energy loss caused by power quality issues, which helps you bring down the power bill and the carbon footprint of your organization. The calculations are computed by an Energy Loss Calculator that ultimately determines how much money a facility loses due to wasted energy.

Energy Loss Calculator				
0:03:26				
		Total	Loss	Cost
Effective	kW	35.9	W 488	\$ 48.83 /hr
Reactive	kvar	21.5	W 175	\$ 17.49 /hr
Unbalance	kVA	2.52	W 1.5	\$ 0.15 /hr
Distortion	kVA	7.17	W 57.2	\$ 5.72 /hr
Neutral	A	29.3	W 57.7	\$ 5.77 /hr
<b>Total</b>				<b>\$ 683 /y</b>
11/10/11	10:49:38	230V	50Hz3.0 WYE	EN50160
LENGTH 100M	DIAMETER 25 mm <sup>2</sup>	METER	RATE 0.10 /kwh	HOLD RUN

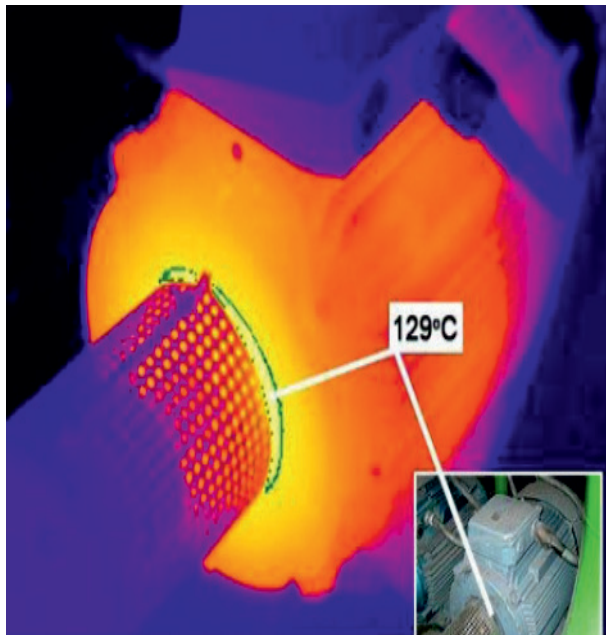


## AutoTrend - Quickly see the trend

Unique AutoTrend gives you rapid insights into continuous changes. Every displayed reading is constantly automatically recorded without the need to set up threshold levels or manually starting up the process. You can instantly see the trends in voltage, current, frequency, power, harmonics, or flicker on all three phases plus neutral.

## Preventive Thermographic Audits

Preventive Audits use infrared imaging to integrate accurate temperature data, which provides the experts at Prasa with important information about the condition of all your equipment. Being a non-contact tool the thermal camera allows the technician to safely make the inspection, even when the equipment is in operation. Thermal imagers do not only help with the troubleshooting but also optimizes the production process and tracks quality control.



## Mechanical Equipment

Some examples of mechanical equipment where thermography is used:

**Process valves:** Open, closed, leakage

**Storage tanks:** Sludge levels

**Pipelines:** Check if and where there are anomalies, for example, locate build-up of scale, etc.

**Motors:** Overheating bearings, misalignment, overheated winding

**Conveyor belts:** Overheated bearings

**Furnace inspections:** With a special camera designed to “see through flames” for high-temperature industrial furnace applications, ideal for monitoring all types of furnaces, heaters, and boilers.

## Electrical Equipment

Some examples of mechanical equipment where thermography is used:

**Primary power source:** Outdoor high voltage switchyard

**Switchgear**

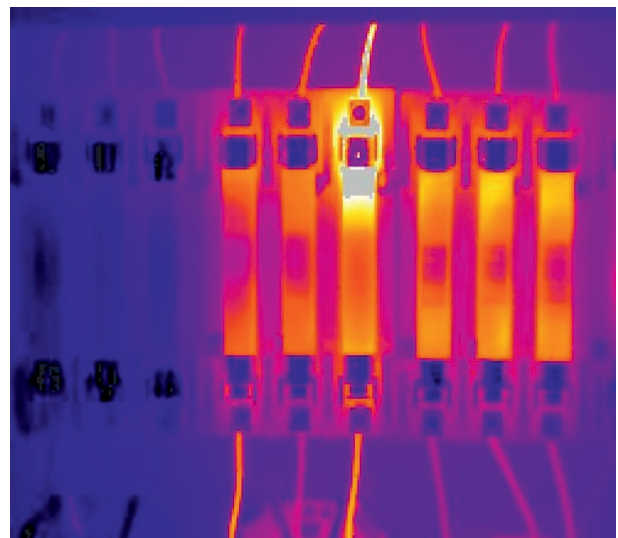
**Transformers**

**Low voltage installations:** Breaker panels, faulty electrical outlets/wall sockets

**Fuse panels**

**Motor control centres (MCC)**

**Motor control centres**



We at Prasa, make use of the infrared camera to audit energy efficiency of your plant environment, including roofing, heating and cooling systems, and building structures.

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