



# PQSoft Case Study

## General Reference Power Quality Glossary

Document ID:	PQS0305	Date:	January 27, 2003
Customer:	N/A	Status:	Completed
Author:	Electrotek Concepts, Inc.	Access Level	PQSoft Subscriber

### Keywords:

Power Quality Category	General Interest		
Solution			
Problem Cause	Poor Power Quality		
Load Type			
Customer Type	Utility	Industrial	Commercial
Miscellaneous1	Simulations	Measurements	
Miscellaneous2			
References			

### Abstract:

The document provides a glossary of terms related to power quality analysis and measurements.

## TABLE OF CONTENTS

<b>TABLE OF CONTENTS</b> .....	<b>2</b>
<b>RELATED STANDARDS</b> .....	<b>2</b>
<b>POWER QUALITY GLOSSARY</b> .....	<b>3</b>
GLOSSARY.....	3
TERMINOLOGY TO AVOID .....	9
<b>REFERENCES</b> .....	<b>9</b>

## RELATED STANDARDS

IEEE Standard 100  
IEEE Standard 1100  
IEEE Standard 1159  
IEEE Standard 142

## POWER QUALITY GLOSSARY

### **Glossary**

#### Active Filter:

A power electronics-based device configured with controls to provide cancellation of harmonic current components created by nonlinear loads.

#### Area of Vulnerability:

Defined with respect to the voltage sag sensitivity of a particular end user or equipment, this is the area of the power system where a fault can cause misoperation of the end user equipment.

#### Average Maximum Demand Load Current ( $I_L$ ):

Maximum load current expected for an end user at the point of common coupling. IEEE Standard 519-1992 recommends that this current be calculated as the average of the maximum demand currents for a twelve-month period.

#### Capacitor Switching Voltage Magnification:

The phenomena where the transient voltage during energizing of a capacitor bank is magnified at a lower voltage capacitor bank due to system resonance conditions.

#### Common Mode Voltage:

The noise voltage that appears equally and in phase from each current-carrying conductor to ground.

#### Commercial Power:

Electrical power furnished by the electric power utility company.

#### Constant Voltage Transformer (CVT):

A ferroresonant transformer used for voltage regulation in single-phase applications.

#### Coupling:

Circuit element or elements, or network, that may be considered common to the input mesh and the output mesh and through which energy may be transferred from one to the other.

#### Current Transformer (CT):

An instrument transformer intended to have its primary winding connected in series with the conductor carrying the current to be measured or controlled.

#### Dip:

Another term for Sag, commonly used in Europe.

#### Distortion Factor (DF):

The ratio of the root-mean-square of the harmonic content to the root-mean-square value of the fundamental quantity, expressed as a percent of the fundamental. Also known as Total Harmonic Distortion (THD).

#### Dropout:

A loss of equipment operation (discrete data signals) due to noise, sag, or interruption.

#### Dropout Voltage:

The voltage at which a device will release to its de-energized position (for this document, the voltage at which a device fails to operate).

Eddy Current Loss Factor ( $P_{EC-R}$ ):

The portion of a transformer's total losses that can be attributed to eddy currents, expressed in per unit or percent of the total transformer losses at full load conditions.

Electromagnetic Compatibility:

The ability of a device, equipment or system to function satisfactorily in its electromagnetic environment without introducing intolerable electromagnetic disturbances to anything in that environment.

Electromagnetic Disturbance:

Any electromagnetic phenomena which may degrade the performance of a device, equipment or system, or adversely affect living or inert matter.

Electromagnetic Environment:

The totality of electromagnetic phenomena existing at a given location.

Electromagnetic Susceptibility:

The inability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance. Note: Susceptibility is a lack of immunity.

Equipment Grounding Conductor:

The conductor used to connect the non-current carrying parts of conduits, raceways, and equipment enclosures to the grounded conductor (neutral) and the grounding electrode at the service equipment (main panel) or secondary of a separately derived system (e.g., isolation transformer). See NFPA 70-1990, Section 100 [B12].

Flicker:

Impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.

Frequency Deviation:

An increase or decrease in the power frequency. The duration of a frequency deviation can be from several cycles to several hours.

Fundamental (Component):

The component of an order 1 (50 Hz or 60 Hz) of the Fourier series of a periodic quantity.

Ground:

A conducting connection, whether intentional or accidental, by which an electric circuit or equipment is connected to the ground, or to some conducting body of relatively large extent that serves in place of the ground. Note: It is used for establishing and maintaining the potential of the ground (or of the conducting body) or approximately that potential, on conductors connected to it, and for conducting ground currents to and from ground (or the conducting body).

Ground Loop:

In a radial grounding system, an undesired conducting path between two conductive bodies that are already connected to a common (single-point) ground.

Harmonic (component):

A component of order greater than one of the Fourier series of a periodic quantity.

Harmonic Content:

The quantity obtained by subtracting the fundamental component from an alternating quantity.

Immunity (to a disturbance):

The ability of a device, equipment or system to perform without degradation in the presence of an electromagnetic disturbance.

Impulse:

A pulse that, for a given application, approximates a unit pulse. When used in relation to the monitoring of power quality, it is preferred to use the term impulsive transient in place of impulse.

Impulsive transient:

A sudden non-power frequency change in the steady state condition of voltage or current that is unidirectional in polarity (primarily either positive or negative).

Instantaneous:

When used to quantify the duration of a short duration variation as a modifier, refers to a time range from 0.5 cycles to 30 cycles of the power frequency.

Interharmonic (component):

A frequency component of a periodic quantity that is not an integer multiple of the frequency at which the supply system is operating (e.g., 50 Hz or 60 Hz).

Interruption, Momentary:

A type of short duration variation. The complete loss of voltage (<0.1 pu) on one or more phase conductors for a time period between 0.5 cycles and 3 seconds.

Interruption, Sustained:

A type of long duration variation. The complete loss of voltage (<0.1 pu) on one of more phase conductors for a time greater than 1 minute.

Interruption, Temporary:

A type of short duration variation. The complete loss of voltage (<0.1 pu) on one or more phase conductors for a time period between 3 seconds and 1 minute.

Isolation:

Separation of one section of a system from undesired influences of other sections.

K-Factor (K):

A characteristic of a current waveform that weights harmonic components according to the square of the harmonic number.

Long Duration Variation:

See Variation, Long Duration.

Magnetic Synthesizer:

A transformer-based voltage regulator for three-phase loads.

Momentary:

When used to quantify the duration of a short duration variation as a modifier, refers to a time range at the power frequency from 30 cycles to 3 seconds.

Noise:

Unwanted electrical signals in the circuits of the control systems in which they occur.

Nominal Voltage. (Vn):

A nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (as 208/120, 480/277, 600).

Nonlinear Load:

Steady state electrical load which draws current discontinuously or whose impedance varies throughout the cycle of the input ac voltage waveform.

Normal Mode Voltage:

A voltage that appears between or among active circuit conductors.

Notch:

A switching (or other) disturbance of the normal power voltage waveform, lasting less than 0.5 cycles, which is initially of opposite polarity than the waveform and is thus subtracted from the normal waveform in terms of the peak value of the disturbance voltage. This includes complete loss of voltage for up to 0.5 cycles.

Oscillatory Transient:

A sudden, non-power frequency change in the steady state condition of voltage or current that includes both positive or negative polarity value.

Overvoltage:

When used to describe a specific type of long duration variation, refers to a measured voltage having a value greater than the nominal voltage for a period of time greater than 1 minute. Typical values are 1.1 to 1.2 pu.

Phase Shift:

The displacement in time of one waveform relative to another of the same frequency and harmonic content.

Point of Common Coupling (PCC):

The point of interface between two different parts of the power system where the propagation and characteristics of a power quality variation can be evaluated. With respect to evaluation of harmonic voltage and current limits at the supply to an end user, this is the point on the system where another end user can be supplied.

Potential Transformer (PT); also, voltage transformer:

An instrument transformer intended to have its primary winding connected in shunt with a power-supply circuit, the voltage of which is to be measured or controlled.

Power Disturbance:

Any deviation from the nominal value (or from some selected thresholds) of the input ac power characteristics.

Power Quality:

The concept of powering and grounding sensitive equipment in a manner that is suitable to the operation of that equipment.

Sag:

A decrease in rms voltage or current at the power frequency for durations of 0.5 cycles to 1 minute. Typical values are 0.1 to 0.9 pu.

Service Voltage:

Voltage at the end user service entrance location.

**Shield:**

As normally applied to instrumentation cables, refers to a conductive sheath (usually metallic) applied, over the insulation of a conductor or conductors, for the purpose of providing means to reduce coupling between the conductors so shielded and other conductors which may be susceptible to, or which may be generating unwanted electrostatic or electromagnetic fields (noise).

**Shielding:**

Shielding is the use of a conducting and/or ferromagnetic barrier between a potentially disturbing noise source and sensitive circuitry. Shields are used to protect cables (data and power) and electronic circuits. They may be in the form of metal barriers, enclosures, or wrappings around source circuits and receiving circuits.

**Short Duration Variation:**

See Variation, Short Duration.

**Slew Rate:**

Rate of change of a quantity such as volts, frequency or temperature.

**Static Var Compensator (SVC):**

Configuration of reactive power compensation equipment (reactors and capacitors) with power electronics switching to achieve continuous control of the reactive compensation provided to the power system.

**Sustained:**

When used to quantify the duration of a voltage interruption, refers to the time frame associated with a long duration variation (i.e., greater than 1 minute).

**Swell:**

An increase in rms voltage or current at the power frequency for durations from 0.5 cycles to 1 minute. Typical values are 1.1 to 1.8 pu.

**Temporary:**

When used to quantify the duration of a short duration variation as a modifier, refers to a time range from 3 seconds to 1 minute.

**Tolerance:**

The allowable variation from a nominal value.

**Total Demand Distortion (TDD):**

The total (RSS) harmonic current distortion in % of the average maximum demand load current (15 or 30 minute demand).

**Total Harmonic Distortion (THD):**

The ratio of the root-mean-square of the harmonic content to the root-mean-square value of the fundamental quantity, expressed as a percent of the fundamental. Also referred to as Distortion Factor.

**Transient:**

Pertaining to or designating a phenomenon or a quantity which varies between two consecutive steady states during a time interval that is short compared to the time scale of interest. A transient can be a unidirectional impulse of either polarity or a damped oscillatory wave with the first peak occurring in either polarity.

Transmission Line Fault Performance:

The expected or actual number of faults per year (defined for each type of fault separately) on a transmission line.

Undervoltage:

When used to describe a specific type of long duration variation, refers to a measured voltage having a value less than the nominal voltage for a period of time greater than one minute. Typical values are 0.8 - 0.9 pu.

Utilization Voltage:

Voltage at end use equipment location.

Variation, Long Duration:

A variation of the rms value of the voltage from nominal voltage for a time greater than 1 minute. Usually further described using a modifier indicating the magnitude of a voltage variation (e.g., Undervoltage, Overvoltage, or Voltage Interruption).

Variation, Short Duration:

A variation of the rms value of the voltage from nominal voltage for a time greater than 0.5 cycles of the power frequency but less than or equal to 1 minute. Usually further described using a modifier indicating the magnitude of a voltage variation (e.g. Sag, Swell, or Interruption) and possibly a modifier indicating the duration of the variation (e.g., Instantaneous, Momentary or Temporary).

Voltage Change:

A variation of the rms or peak value of a voltage between two consecutive levels sustained for definite but unspecified durations.

Voltage Dip:

See Sag.

Voltage Distortion:

Any deviation from the nominal sine wave form of the ac line voltage.

Voltage Fluctuation:

A series of voltage changes or a cyclical variation of the voltage envelope.

Voltage Imbalance (Unbalance), Polyphase Systems:

The ratio of the negative or zero sequence component to the positive sequence component, usually expressed as a percentage.

Voltage Interruption:

Disappearance of the supply voltage on one or more phases. Usually qualified by an additional term indicating the duration of the interruption (e.g., Momentary, Temporary, or Sustained).

Voltage Regulation:

The degree of control or stability of the rms voltage at the load. Often specified in relation to other parameters, such as input-voltage changes, load changes, or temperature changes.

Waveform Distortion:

A steady state deviation from an ideal sine wave of power frequency principally characterized by the spectral content of the deviation.

**Terminology to Avoid**

The following words have a varied history of usage, and some may have specific definitions for other applications.

blackout	frequency shift
blink	glitch
brownout	outage
clean ground	power surge
clean power	raw power
computer grade ground	raw utility power
counterpoise ground	shared ground
dedicated ground	spike
dirty ground	subcycle outages
dirty power	surge
	wink

**REFERENCES**

IEEE Standard 100. Terms and Definitions

IEEE Standard 1100. IEEE Recommended Practice for Powering and Grounding Sensitive Equipment (The Emerald Book).

IEEE Standard 1159. IEEE Recommended Practice on Monitoring Electric Power Quality.

IEEE Standard 142. IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems. (The Green Book) Many of these definitions are also included in Appendix A.