

# GLOSSARY

**Active Filter** – sophisticated power electronic device for eliminating harmonic distortion.

**Air Gap** – physical gap between rotor and stator; ideal conditions are that the air gap is of a uniform width around the entire circumference of the motor. See also *eccentricity*.

**Aliasing** – visual misrepresentation that occurs when an image or model contains more detail than the display device's resolution can present. Note: A result of aliasing is jagged stair stepping of slanted lines.

**Asset** – motors, generators

**Balance of Inductance** – indicates a mismatch in inductance between phases of a three phase motor. The % inductance imbalance is calculated using the three phase inductance measurements and the following equation:  $\% I_{imb} = (\text{max deviation from avg})/\text{avg} \times 100$ .

**Balance of Resistance** – indicates a mismatch in resistance between phases of a three phase motor. The % resistance imbalance is calculated using the three phase resistance measurements and the following equation:  $\% R_{imb} = (\text{max deviation from avg})/\text{avg} \times 100$ .

**Baseline** – reference test to which subsequent tests can be compared; it can be the first test performed on a motor or a test following refurbishment. See also *trending*.

**Capacitance** – characteristics of a circuit to resist a change in voltage.

**Capacitance-to-Ground (CTG)** – capacitance measurement between cables/motor windings and ground; indicates dirt buildup on cables/inside a motor; CTG values are best used for comparison.

**CBEMA Curve** – set of curves developed by the Computer Business Equipment Manufacturers Association which represent the withstand capabilities of computers in terms of the magnitude and duration of the voltage disturbance; de facto standard for measuring the performance of all types of equipment and power systems.

**Common Mode Voltage** – noise voltage that appears equally from current-carrying conductor to ground.

**Comparison** – comparison of data on one motor to data on a separate identical motor.

**Coupling** – circuit element, 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 another.

**Crest Factor** – ratio of the peak of the measured waveform to the RMS value of the fundamental waveform; for example: crest factor of a sinusoidal wave is 1.414.

**Critical Loads** – devices and equipment whose failure to operate satisfactorily jeopardizes the health or safety of personnel, and/or results in loss of function, financial loss, or damage to property deemed critical by the user.

**CTG** – See *Capacitance-to-Ground*.

**Current Analysis** – measurement of current signals to motor; used to analyze rotor bars, eccentricity, in-rush/start-up currents, and high frequency spectrums.

**Current Distortion** – distortion in the AC line current. See also *distortion*.

**Current Imbalance** – indicates a mismatch in current between phases of a three phase motor. The % current imbalance is calculated using the three phase current measurements and the following equation:  $\% I_{imb} = (\text{max deviation from avg})/\text{avg} \times 100$ .

**DA** – See *Dielectric Absorption*.

**DataSync** – copying data between the network server and a tester.

**DC Bar-to-Bar** – test used to determine continuity of armature segments in a DC motor.

**Derating** – reduction of a motor's rated load due to current and voltage conditions to prevent overstress conditions.

**Dielectric Absorption (DA)** – ratio of RTG reading at 60 seconds to RTG reading at 30 seconds; indicates condition of cable/motor insulation.

**Differential Mode Voltage** – voltage between any two of a specified set of active conductors.

**Dip** – See *Sag*.

**Distortion** – any deviation from the normal sinewave for an AC signal.

**DownSync** – syncing the data from the network server to the tester.

**Drive Input** – EMAX test on the AC supply side of the DC drive supplying a DC motor.

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

**Dropout Voltage** – voltage at which a device releases to its deenergized position; the voltage at which a device fails to operate.

**Eccentricity** – non-uniformity of the air gap between the rotor and stator.

**Eccentricity Frequency ( $F_{ecc}$ )** –  $F_{ecc} = B (F_{shaft})$

Where,  $F_{ecc}$  = Eccentricity Frequency, B = the number of rotor bars,  $F_{shaft}$  = Shaft frequency, Shaft Frequency = RPM/60.

**Efficiency** – the ratio of output power to input power.

**EMAX** – name for PdMA Corporation's energized electric motor tester.

**Equipment Grounding Conductor** – 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 (i.e.: an isolation transformer); Refer to NFPA 70-1990, Section 100.

**Failure Mode** – effect by which failure is observed.

**Fast Tripping** – refers to the common utility protective relaying practice in which the circuit breaker or line recloser operates faster than a fuse can blow; also called fuse saving; effective for clearing transient faults

without a sustained interruption, but is somewhat controversial because industrial loads are subjected to a momentary or temporary interruption.

**Fault** – generally refers to a short circuit on the power system.

**Fault, Transient** – short circuit on the power system, usually induced by lightning, tree branches, or animals; can be cleared by momentarily interrupting the current.

**FFT** – Fast Fourier Transform.

**FLA** – See *Full Load Amps*.

**Frequency Deviation** – increase or decrease in the power frequency; duration can be from several cycles to several hours.

**Frequency Response** – generally refers to the variation of impedance of the system, or a metering transducer, as a function of frequency.

**Full Load Amps** – the amount of current a motor draws at design load.

**Fundamental (Component)** – component of order 1 (50 or 60 Hz) of the Fourier series of a periodic quantity.

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

**Harmonic (component)** – component of order greater than 1 (50 or 60 Hz) of the Fourier series of a periodic quantity.

**Harmonic Content** – quantity obtained by subtracting the fundamental component from an alternating quantity.

**Harmonic Distortion** – periodic distortion of a sinewave. See also *distortion* and *total harmonic distortion* (THD).

**Harmonic Filter** – device on power systems for filtering one or more harmonics from the system; most filters are passive combinations of inductance,

capacitance, and resistance; newer technologies include active filters which can also address reactive power needs.

**Harmonic Number** – integral number given by the ratio of the frequency of a harmonic to the fundamental frequency.

**Harmonic Resonance** – condition in which a power system is resonating near one of the major harmonics being produced by nonlinear elements in the system, thus exacerbating the harmonic distortion.

**Harmonic Voltage Factor (HVF)** – root mean square of the odd harmonics as ratioed to the fundamental frequency.

**Hidden Tests** – tests which are stored in the database, but do not appear on the History Chart; use the Show All Tests feature to have all tests appear on the History Chart.

**Horsepower** – unit of power equal to 745.7 watts, or 33,000 foot-pounds per minute.

**Hotstick** – insulated tool used to determine if voltage is present on circuits rated at > 600 volts.

**HP** – See *Horsepower*.

**HVF** – See *Harmonic Voltage Factor*.

**IEEE** – Institute of Electrical and Electronics Engineers, Inc.

**Impedance** – measure of the complex resistive and reactive attributes of a component in an alternating-current circuit (IEEE Std. 100-1992).

**Inductance** – characteristics of a circuit to resist a change in current.

**Inductance Phase-to-Phase** – measurement of inductance between phases 1-2, 2-3, and 3-1.

**Instantaneous** – refers to a time range from one-half cycle to 30 cycles of the power frequency when used to quantify the duration of a short duration variation as a modifier.

**Interharmonic (component)** – frequency component of a periodic quantity that is not an integer multiple of the frequency at which the supply system is designed to operate (50 or 60 Hz).

**Isolated Ground** – insulated equipment grounding conductor run in the same conduit or raceway as the supply conductors; insulated from the metallic raceway and all ground points throughout its length; originates at an isolated ground-type receptacle or equipment input terminal block and terminates at the point where neutral and ground are bonded at the power source. Refer to NFPA 70-1990, Section 250-74, Exception #4 and Section 250-75, Exception.

**Isolation** – separation of one section of a system from undesired influences of other sections.

**kVA** – kilovolt-amperes; apparent power.

**kVAR** – kilovolt-amperes; reactive power.

**kW** – kilowatts; real power.

**LED Display** – Light Emitting Diode Display; located on motor tester to indicate tester battery status.

**Linear Load** – electrical load device which, in steady state operation, presents an essentially constant load impedance to the power source throughout the cycle of applied voltage.

**Line-to-Line** – voltage measurement between two phases.

**Line-to-Neutral** – voltage measurement between one phase and a neutral (usually ground).

**Low Influence Rotor (LIR)** – a rotor that has a low permeability/retentivity and does not retain its magnetic signature once the rotor current is removed. The permeability and retentivity is a function of the rotor material. A LIR will not cause any measurable influence on the stator inductance.

**MCE** – Motor Circuit Evaluation; a predictive maintenance technology which provides comprehensive portable motor testing.

**MCE<sup>TM</sup>** – name for PdMA Corporation's deenergized electric motor tester.

**MCEGold<sup>TM</sup>** – software program used by MCEMAX<sup>TM</sup>.

**MCEGold Network** – software designed to accommodate multiple sites/servers and multiple formats, i.e., desktops, field testers.

**MCEMAX™** – name for PdMA Corporation’s combined deenergized and energized electric motor tester.

**MCSA** – Motor Current Signature Analysis; The analysis of motor current in the frequency and time domain.

**Message Window** – describes a window which appears prior to a function being carried out; it usually has a warning symbol or icon, the message, and control buttons (typically Yes, OK, No, Cancel).

**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.

**Multimeter** – test equipment which can measure voltage, current, resistance, and continuity; used with MCE tester to determine if voltage is present on circuits rated at < 600 volts.

**Mutual Impedance** – values of  $Z_{ab}$ ,  $Z_{bc}$ ,  $Z_{ca}$  in the impedance matrix given by  $[V_{abc}] = [Z_{abc}][I_{abc}]$ .

**Negative Current** – negative sequence component of current signal.

**Negative Mutual Impedance Magnitude** – negative sequence component of the values of  $Z_{ab}$ ,  $Z_{bc}$ ,  $Z_{ca}$  in the impedance matrix given by  $[V_{abc}] = [Z_{abc}][I_{abc}]$ .

**Negative Self Impedance Magnitude** – negative sequence component of the values of  $Z_{aa}$ ,  $Z_{bb}$ ,  $Z_{cc}$  in the impedance matrix given by  $[V_{abc}] = [Z_{abc}][I_{abc}]$ .

**Negative Sequence** – represents a balanced system of phases in the opposite direction of the original signal.

**Negative Voltage** – negative sequence component of voltage signal.

**NEMA** – National Electrical Manufacturers Association.

**NFPA** – National Fire Protection Association.

**Noise** – unwanted electrical signals which produce undesirable effects in the circuits of control systems (including sensitive electronic equipment in total or in part).

**Nominal Voltage ( $V_n$ )** – nominal value assigned to a circuit or system for the purpose of conveniently designating its voltage class (ie: 208/120, 480/277, 600).

**Nonlinear Load** – electrical load which draws current discontinuously or whose impedance varies throughout the cycle of the input AC voltage waveform.

**Normal Mode Voltage** – voltage that appears between or among active circuit conductors.

**Notch** – switching or other disturbance of the normal power voltage waveform, lasting less than a half cycle, 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; includes complete loss of voltage for up to a half cycle.

**Overvoltage** – when used to describe a specific type of long duration variation, refers to a voltage having a value of at least 10% above the nominal voltage for a period of time greater than 1 minute.

**Parallel Port** – port on some tester laptop computers, which can be used to connect the laptop computer to the printer.

**Passive Filter** – combination of inductors, capacitors, and resistors designed to eliminate one or more harmonics; most common variety is an inductor in series with a shunt capacitor, which short-circuits the major distorting harmonic component from the system.

**PC** – personal computer; refers to the desktop computer that MCEGold is installed on.

**PC/MCIA Port** – port on tester laptop computer used to connect the computer to the P-Series EMAX circuit board.

**Phase-to-Phase Inductance** – See *Inductance Phase-to-Phase*.

**Phase-to-Phase Resistance** – See *Resistance Phase-to-Phase*.

**Phase Shift** – displacement in time of one voltage waveform relative to other voltage waveform(s).

**PI** – See *Polarization Index*.

**Polarization Index** – ratio of RTG reading at 10 minutes to RTG reading at 1 minute; indicates condition of cable/motor insulation.

**Pole Pass Frequency (Fp)** – the synchronous magnetic pattern of the stator rotates faster than the squirrel-cage rotor. This implies that any given rotor bar is passed by all of the magnetic poles in one rotation of the slip frequency. The rate at which this occurs is termed the Pole Pass Frequency.

**Positive Current** – positive sequence component of current signal.

**Positive Mutual Impedance Magnitude** – positive sequence component of the values of  $Z_{ab}$ ,  $Z_{bc}$ ,  $Z_{ca}$  in the impedance matrix given by  $[V_{abc}] = [Z_{abc}][I_{abc}]$ .

**Positive Self Impedance Magnitude** – positive sequence component of the values of  $Z_{aa}$ ,  $Z_{bb}$ ,  $Z_{cc}$  in the impedance matrix given by  $[V_{abc}] = [Z_{abc}][I_{abc}]$ .

**Positive Sequence** – represents a balanced system of phases in the same direction of the original signal.

**Positive Voltage** – positive sequence component of voltage signal.

**Power Analysis** – measurement of current and voltage signals to motor; used to analyze indicated voltage imbalances and spikes, excessive harmonic distortion, and stator faults.

**Power Factor (PF)** – ratio of active power to arithmetic apparent power.

**Power Factor (True)** – ratio of active power (watts) to apparent power (voltamperes).

**Power Sequence** – calculations of power based on the sequence data.

**QA** – Quality Assurance; proactive actions which provide confidence that equipment and systems will perform satisfactorily when placed in service.

**Real Impedance** – the real component of the complex impedance value.

**Resistance Phase-to-Phase** – measurement of resistance between phases 1-2, 2-3, and 3-1; indicates condition of cable/motor wiring.

**Resistance-to-Ground** – resistance measurement between cables/motor windings and ground; indicates condition of conductor insulation.

**RIC** – See *Rotor Influence Check*.

**RMS** – See *Root Mean Square*.

**Root Mean Square** – RMS value of an alternating voltage or current is the square root of the mean value of the square of the values during a complete cycle; mean is an arithmetic average.

**Rotor Evaluation** – EMAX test, formerly known as Low Res/High Res.

**Rotor Influence Check (RIC)** – test used to determine condition of air gap between rotor and stator; also used to isolate faults to rotor or stator.

**RTG** – See *Resistance-to-Ground*.

**Safety Ground** – See *Equipment Grounding Conductor*.

**Sag** – decrease to between 0.1 and 0.9 pu in RMS voltage or current at the power frequency for durations of 0.5 cycles to one minute.

**Self Impedance** – values of  $Z_{aa}$ ,  $Z_{bb}$ ,  $Z_{cc}$  in the impedance matrix given by  $[V_{abc}] = [Z_{abc}][I_{abc}]$ .

**Serial Port** – port on tester laptop computer used to connect laptop to the P-Series MCE circuit board.

**Showing Tests** – tests which appear on the History Chart.

**Site** – name given to the database created in the MCEGold stand-alone program that appears at the top of the tree and designates a facility in a particular geographical location.

**Slip Frequency (Fs)** – difference between the synchronous frequency of the stator and the rotor frequency.

**Site Condition** – displays information regarding the numbers and condition of the assets in the site.

**Site Navigator** – a graphical view of the sites (folders) and assets (motors) in the database.

**Software Key** – device connected to PC which allows MCEGold to run on the PC; without the key MCEGold will not operate on the PC.

**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.

**Total Demand Distortion (TDD)** – ratio of the RMS of the harmonic current to the RMS value of the rated or maximum demand fundamental current, expressed as a percent.

**Total Harmonic Distortion (THD)** – ratio of the RMS value of the harmonic content to the RMS value of the fundamental quantity, expressed as a percent of the fundamental.

**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; can be a unidirectional impulse of either polarity or a damped oscillatory wave with the first peak occurring in either polarity.

**Transparent Software Key** – See *Software Key*.

**Tree** – Term found in the software used to indicate the layout of the Site Navigator.

**Trending** – comparison over time of data on a motor to previous data on the same motor.

**Triplen Harmonics** – term frequently used to refer to the odd multiples of the third harmonic, which deserve special attention because of their natural tendency to be zero sequence.

**Unbalance** – maximum deviation of the signals divided by the average \* 100%.

**Undervoltage** – when used to describe a specific type of long duration variation, refers to a measured voltage having a value at least 10% below the nominal voltage for a period of time greater than one minute.

**UpSync** – Syncing the data from the tester to the network server.

**Voltage Change** – 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** – distortion of the AC line voltage. See also *distortion*.

**Voltage Fluctuation** – series of voltage changes or a cyclical variation of the voltage envelope.

**Voltage Imbalance (Unbalance)** – condition in which the three phase voltages differ in amplitude or are displaced from their normal 120 degree phase relationship, or both; frequently expressed as the ratio of the negative sequence or zero sequence voltage to the positive sequence voltage, in percent.

**Voltage Interruption** – disappearance of the supply voltage on one or more phases; usually qualified by an additional term indicating the duration of the interruption (ie: Momentary, Temporary, or Sustained).

**WatchList** – list of assets/motors that is set up to watch for criticality purposes or as a service route.

**Waveform Distortion** – steady state deviation from an ideal sine wave of power frequency principally characterized by the spectral content of the deviation.

**Zero Mutual Impedance Magnitude** – zero sequence component of the values of  $Z_{ab}$ ,  $Z_{bc}$ ,  $Z_{ca}$  in the impedance matrix given by  $[V_{abc}] = [Z_{abc}][I_{abc}]$ .

**Zero Self Impedance Magnitude** – zero sequence component of the values of  $Z_{aa}$ ,  $Z_{bb}$ ,  $Z_{cc}$  in the impedance matrix given by  $[V_{abc}] = [Z_{abc}][I_{abc}]$ .

**Zero Sequence** – represents a balanced system of phases with the same magnitude and angular displacement.