

Electrical Generating Systems Marketing Association**AC**

See ALTERNATING CURRENT

AC GENERATOR

AC generator is the preferred term for referring to a generator that produces alternating current (AC). See ALTERNATOR and GENERATOR.

ACCURACY

The comparison of an indicated value to an actual value. The quality of accuracy is often expressed by stating the difference between the two values as a percentage of the actual value.

ACOUSTIC MATERIAL

Acoustic material is any material considered in terms of its acoustic properties, especially in properties of absorbing or deadening sound.

ACTIVE POWER

Active power is the real power (kW) supplied by the generator set to the electrical load. Active power creates a load on the set's engine and is limited by the power of the engine and efficiency of the generator. Active power does the work of heating, lighting, turning motor shafts, etc.

AIR CIRCUIT BREAKER

An Air circuit breaker automatically interrupts the current flowing through it when that current exceeds the trip rating of the breaker. Air is the medium of electrical insulation between electricity live parts and grounded (earthed) metal parts. Also see POWER CIRCUIT BREAKER.

AIR COOLED ENGINE

The engine of the generator is cooled only by air blown across it by a fan.

AIR GAP

An interruption of a magnetic circuit through which space the magnetic flux must pass. A typical representation of this space is the clearance between the rotor and stator of a generator.

ALTERNATING CURRENT (AC)

Current which varies from zero to a positive maximum to zero to a negative maximum to zero, a number of times per second, the number being expressed in cycles per second or Hertz.

ALTERNATOR

A device for converting mechanical energy into electrical energy in the form of alternating current. Alternator is another term for AC generator.

ALTERNATOR STRIP HEATER

A small heater element mounted permanently in the generators winding or control box to provide a warm, moisture free environment. These are popular in coastal areas or where extreme cold may hamper controls from operating.

AMBIENT TEMPERATURE

The air temperature of the surroundings in which the generating system operates.

AMMETER

An instrument designed to measure electric current flow.

AMORTISSEUR

A short-circuited winding consisting of conductors embedded in the pole faces of the rotor of a synchronous generator. Its function is to damp out oscillations or hunting during load changes, thereby improving transient stability.

AMPERE

The unit of electric current flow. One ampere will flow when one volt is applied across a resistance of one ohm.

AMPACITY

Current carrying capacity of electric conductors expressed in amperes.

AMPERE TURN

A unit of magnetizing force. The product of current flowing multiplied by the number of turns in a coil.

ANNUNCIATOR

An annunciator is an accessory device used to give remote indication of the status of an operating component in a system. Annunciators are typically used in applications where the equipment monitored is not located in a portion of the facility that is normally attended. The NFPA has specific requirements for remote annunciators used in some applications, such as hospitals.

APPARENT POWER

A term used to describe the product of current and voltage, expressed in KVA. It is the real power in KW divided by the power factor.

ARMATURE

The armature of an AC generator is the assembly of windings and metal core laminations in which the output voltage is induced. It is the stationary part (stator) in a revolving field generator.

AUTOMATIC TRANSFER SWITCH (ATS)

An automatic device for transferring an electrical load from one power source to another.

AUTHORITY HAVING JURISDICTION

The authority having jurisdiction is the individual with the legal responsibility for inspecting a facility and approving the equipment in the facility as meeting applicable codes and standards.

AUTO-TRANSFORMER

A transformer having a single continuous winding, portions of which are used for the input and the output windings.

B-

The negative polarity connection of a storage battery or any other direct-current source.

B+

The positive polarity connection of a storage battery or any other direct-current source.

BACKUP PROTECTION

Backup protection consists of protective devices which are intended to operate only after other protective devices have failed to operate or detect a fault.

BASE LOAD

Base load is that portion of a building load demand which is constant. It is the "base" of the building demand curve.

BLACK START

Black start refers to the starting of a power system with its own power source, without assistance from external power supplies.

BLOCK HEATER

Used to keep the engine block warm during periods when the engine is not running. Typically thermostatically controlled to only operate during temperatures below 40 degrees and wired to a Utility supply.

**BRUSH**

A conducting element, usually graphite and/or copper, which maintains sliding electrical contact between a stationary and a moving element.

BRUSHHOLDER

A device which supports the brush in the correct position but allows it to move in correct relationship to its spring.

BUMPLESS TRANSITION

Bumpless transition is make-before-break transfer of an electrical load from one source to another where voltage and frequency transients are kept to a minimum.

BUS

Bus can refer to the current-carrying copper bars that connect the AC generator and loads in a paralleling system, to the paralleled output of the AC generators in a system or to a feeder in an electrical distribution system.

CARB (CALIFORNIA AIR RESEARCH BOARD)

A state run board and regulatory agencies that now govern exhaust emissions from engines. The engines may be in cars, other equipment or generators. The overall effect is to reduce pollution.

CAPACITANCE

The property of any system of dielectric and conductors to store electrical energy. Expressed in micro-farads and its symbol is uf.

CAPACITOR

A device capable of storing electric energy consisting of two conducting surfaces separated by an insulating material. It blocks the flow of direct current while allowing alternating current to flow proportional to its capacitance and the frequency and value of applied voltage.

CIRCUIT

A circuit is a path for an electric current across a potential (voltage).

CIRCUIT BREAKER

A protective switching device capable of interrupting current flow at a pre-determined value.

COLLECTOR RINGS (SLIP RINGS)

The conducting rotating rings of a generator rotor which connects the field winding through brushes to a source of direct current. Also used on rotating armature AC generators to conduct the output current to the brushes.

COMMERCIAL POWER

The term applied power furnished by an electric power company. When available, it is usually the prime power source.

CONDUCTOR

A wire or cable designed for the passage of electrical current.

CONNECTOR

A device for electrically interconnecting two or more conductors.

CONTACTOR

An electro-mechanical device designed for repeatedly establishing and interrupting an electrical power circuit when triggered by an operating coil.

CONTINUOUS LOAD

Any load up to and including full rated load that the generator set is capable of delivering for an indefinitely long period, except for shutdown for normal preventive maintenance.

CONTINUOUS RATING

The load rating of an electric generating system which it is capable of supplying without exceeding its specified maximum temperature rise limits.

COPPER LOSS

That portion of the losses involved in generation caused by the flow of current through the resistances of the coils and conductors within the generator. These losses are proportional to the resistance and the "square" of the current and are referred to as I²R losses.

CORE

The laminations in the generator constituting the magnetic structure thereof.

CROSS-CURRENT COMPENSATION

One of two systems which permit generators in parallel to share the reactive component of the power in proportion to their rating while maintaining constant output voltage. See DROOP COMPENSATION.

CROSS-CURRENT COMPENSATION TRANSFORMER (CCCT)

A current transformer which controls the division of reactive KVA in proportion to the ratings of generators operating in parallel.

CURRENT

The rate of flow of electricity. See AMPERE.

CURRENT LIMITING FUSE

A current limiting fuse is a fast-acting device that, when interrupting currents in its current-limiting range, will substantially reduce the magnitude of current, typically within one-half cycle, that would otherwise flow.

CURRENT TRANSFORMER (CT)

An instrument transformer used in conjunction with ammeters and control circuits that produces an output proportional to primary current.

CYCLE

One complete reversal of an alternating current or voltage, from zero to a positive maximum to zero to a negative maximum back to zero. The number of cycles per second is the frequency, expressed in Hertz (Hz).

CYCLE PER SECOND (CPS)

See FREQUENCY and HERTZ.

CYCLING

The variation in output either above or below the desired operating point.

DC FIELD

The field poles and their winding, which when energized, produce the magnetic flux in a generator.

DC GENERATOR

A generator which transforms mechanical energy into unidirectional or d-c electric energy.

DAMPER WINDING

See AMORTISSEUR.

DAMPING

The process by which cycling is reduced to a minimum.

DECIBEL (DB)

Unit used to define noise level.

DELTA CONNECTION

A three-phase connection in which the start of each phase is connected to the end of the next phase, forming the Greek letter Delta (D). The load lines are connected to the corners of the delta. In some cases a center tap is provided on each phase, but more often only on one leg – thus supplying a four-wire output.

DEMAND FACTOR

The demand factor is the ratio of actual load to the potential total connected load.

DEVIATION FACTOR

The deviation factor of a voltage wave is the ratio of the maximum difference between corresponding ordinates of the wave and of a sine wave of the same root mean square and time base to the peak value of this sine wave when this sine wave is superimposed in such a way as to make this difference as small as possible.

DIELECTRIC

Insulation.

DIELECTRIC STRENGTH

The ability of insulation to withstand voltage without rupturing, usually expressed in volts per mil.

DIFFERENTIAL COMPENSATION

See CROSS CURRENT COMPENSATION.

DIFFERENTIAL RELAY

A differential relay is a protective device which is fed by current transformer located at two different series points in the electrical system. The differential relay compares the currents and picks up when there is a difference in the two which signifies a fault in the zone of protection. These devices are typically used to protect windings in generators or transformers.

DIODE

A solid-state device which allows current to pass in one direction only. Since it allows only one half cycle of an alternating current pass, its output will be unidirectional and it may be considered a rectifying element.

DIRECT CURRENT (DC)

An electric current which flows in one direction only.

DOUBLE-POLE SWITCH

A switch which opens or closes two isolated circuits at the same time. It is actually two switches in one housing operated by a common handle.

DOUBLE-THROW SWITCH

A switch which connects one circuit to either of two other isolated circuits.

DRIFT

A gradual change in output at constant load sometimes caused by a change in temperature.

DROOP COMPENSATION

A system which permits generators in parallel to share the reactive component of the power in proportion to their rating. This system is so named because the voltage droops as the machines become loaded. See also CROSS CURRENT COMPENSATION.

DROOP TYPE GOVERNOR

A governor that controls engine speed at a slightly higher point at no load than at full load. Normally set for desired speed at full load.

EDDY CURRENT

Current circulating in conducting materials, caused by magnetic fields. They represent losses in generators and are reduced by the use of thin laminations of special steel.

EFFECTIVE VALUE

That value of a sinusoidally varying wave which produces steady effects. For example, on a current wave it would be that portion which produces heating or lighting. It is the R.M.S. (root mean square) value of the wave and for sinusoidal variations its value would be 0.707 times the maximum value. Most voltmeters and ammeters indicate R.M.S. values.

EFFICIENCY

The efficiency of a generator set shall be defined as the ratio (expressed as a percentage) of its useful power outputs to its total power input.

EGRESS LIGHTING

The illumination of means of egress (leaving) of a building or structure.

ELECTRICAL DEGREE

One 360th part of a cycle of an alternating current or wave.

ELECTRICAL RADIAN

A part of an alternating current or voltage cycle; a cycle contains 2 radians.

ELECTRO-MAGNETIC FIELD

A magnetic field generated by the passage of current through a coil surrounding a ferrous pole structure.

ELECTRO-MOTIVE FORCE (EMF)

The force which causes current to flow in a conductor; in other words, the voltage or potential.

EMERGENCY POWER

An independent reserve source of electric energy which upon failure or outage of the normal source, automatically provides reliable electric power within a specified time to critical devices and equipment whose failure to operate satisfactorily would jeopardize the health and safety of personnel or result in damage to property.

ENERGY

Capability of performing work. Expressed electrically in KW hours.

EXCITATION

The input of DC power into the field coils of a synchronous generator, producing the magnetic flux required for inducing voltages.

EXCITER

A device for supplying excitation to generator fields. It may be a rotating exciter, that is a DC generator of AC generator with rectifiers, or it may be a static device using tubes or solid-state components.

EXIT LIGHTING

The illumination of exit signs in buildings and structures.

FEEDBACK, NEGATIVE

Negative feedback is a feedback signal in a direction to reduce the variable which the feedback represents.

FEEDBACK, POSITIVE

Positive feedback is a feedback signal in a direction to increase the variable which the feedback represents.

FIELD

A region of space under magnetic influence resulting in a distribution of magnetic lines or flux in that space. The field may be produced electrically or by means of permanent magnets.

FIELD COIL

The coils of the field structure being supplied with direct current for excitation.

FIELD POLE

The part of the magnetic structure of a generator on which the field coils are located.

FLUX

Magnetic lines of force.

FLUX DENSITY

Magnetic lines of force per unit of area.

FRAME

The mechanical portion of a generator consisting of all the non-rotating parts.

FREQUENCY

The number of complete cycles of an alternating voltage or current per unit of time, usually per second. So expressed in CPS, cycle per second, or Hertz (Hz).

FREQUENCY BAND

The permissible variation from a mean value under steady state conditions.

FREQUENCY DRIFT

Frequency drift is a gradual deviation of the mean governed frequency above or below the desired frequency under a constant load.

FREQUENCY DROOP

The change in frequency between steady state no load and steady state full load which is a function of the engine and governing systems.

FREQUENCY REGULATION

The percentage change in frequency from steady state no load to steady state full load, which is a function of the engine and governing system.

$$\%R = \frac{F_{nl} - F_{fl}}{F_{fl}} \times 100$$

FREQUENCY RECOVERY TIME

The interval of time required for the frequency to return to and remain with a prescribed frequency band following an instantaneous load change.

FREQUENCY TRANSIENT

The maximum frequency deviation as a result of a sudden change in load.

FULL LOAD CURRENT

The full load current of a machine or apparatus is the value of current in RMS or DC amperes which it carries when delivering its rated output under its rated conditions. Normally, the full load current is the "rated" current.

FUNDAMENTAL FREQUENCY

Design frequency.

GENERATOR

A general name for a device for converting mechanical energy into electrical energy. The electrical energy may be direct current (D.C.) or alternating current (A.C.). An A.C. generator may be called an alternator.

GENERATOR CONSTANTS

Direct-Axis Synchronous Reactance (X_d). Used to determine current flow at steady-state conditions.

Direct-Axis Transient Reactance (X'_d). Used to calculate the short circuit current produced by the generator after the first few cycles following a fault (six cycles to five seconds). Also used to determine voltage dips resulting from load applications.

Direct-Axis Subtransient Reactance (X''_d). This is the apparent reactance of the stator winding at the instant short circuit occurs. It is used to calculate the current flow during the first few cycles after a short circuit. The subtransient reactance is important when determining the required capacity of a circuit breaker to interrupt a fault within a system.

Negative Sequence Reactance (X_2). Used to determine line-to-line short circuit currents.

Zero Sequence Reactance (X_0). Used to determine line-to-neutral short circuit currents.

Potier Reactance (X_p). Used to calculate excitation of the generator at different loads and power factors.

Direct-Axis Transient Short-Circuit Time Constant (T'_d). Time (seconds) for the slowly decreasing component of the armature current to reach 36.8 percent of its initial value after application of a short-circuit condition when the unit is running at rated speed.

Direct-Axis Subtransient Short-Circuit Time Constant (T''_d). Time (seconds) for the rapidly decreasing component of the armature current (present during the first few cycles after a short circuit) to reach 36.8 percent of its initial value after sudden application of a short-circuit condition when the unit is running at rated speed.

Direct-Axis Transient Open-Circuit Time Constant (T'_{do}). Time measured in seconds for the open circuit voltage of the armature to drop to 36.8 percent of its initial value after the field winding is shorted with the unit running at rated speed.

GOVERNOR

A device used to control prime mover speed.

GRID POWER

Same as COMMERCIAL POWER.

GROUND

A connection, either intentional or accidental, between an electric circuit and the earth or some conducting body serving in place of the earth.

GROUNDING NEUTRAL

A point of an electrical system which is intentionally connected to ground. This current may or may not carry current.

HARMONIC

Deviations from the fundamental frequency sine wave can be expressed as additional sine waves of frequencies which are a multiple of the generated frequency. The additional frequencies are called harmonics. They are expressed as third, fifth, etc., harmonics, denoting their frequency as a multiple of the main frequency.



HARMONIC CONTENT

The harmonic content of a voltage waveform is a measure of the presence of harmonics in the waveform expressed as a percentage of the fundamental frequency at each harmonic. The total harmonic content is expressed as the square root of the sum of the squares of each of the harmonic amplitudes (expressed as percentage of the fundamental).

HEAT SINK

A device which conducts heat away from electronic devices.

HERTZ (Hz)

A term replacing cycles per second as an indication for frequency.

HUNTING

The oscillation of voltage or frequency above and below the mean value. An unstable condition.

IMPEDANCE

The total opposition offered by a circuit to the flow of alternating current. It is composed of resistance and reactance (inductive and/or capacitive) and its symbol "Z" is expressed in OHMS.

INDUCED VOLTAGE

The voltage which is produced in a conductor which has motion relative to a magnetic field, while under the influence of the field.

INDUCTANCE

The property of an electric circuit that opposes any change in current flow. Expressed in henrys and its symbol is L.

INHERENT VOLTAGE DROOP

The decrease in voltage of an unregulated generator from no load to full load with excitation fixed at 100% volts no load.

INRUSH CURRENT

The inrush current of a machine or apparatus is the maximum value of RMS or DC amperes which it carries after being suddenly and fully energized and prior to reaching a stable operating condition.

INHERENT VOLTAGE REGULATION

The inherent voltage droop expressed as a percentage.

INSULATION

Non-conductive material used to prevent leakage of electric power from a conductor.

INSULATION RESISTANCE

The resistance that an insulating material has to the passage of current to ground or to another conductor. It is usually measured in megohms.

INTERMITTENT OVERLOAD

The power in excess of rated power which a generator is capable of delivering, without damage, for a specified period of time.

IR DROP

Voltage drop across a resistance. Equal to the current in amperes times the resistance in ohms.

IRON LOSS

That portion of generator losses involved in magnetic structures caused by the magnetization of the iron. It depends of the flux density, frequency, lamination thickness and chemical composition. These losses are composed of eddy current losses and hysteresis losses.

ISOCHRONOUS GOVERNOR

A governor that maintains constant engine speed from no load to full load. The isochronous governor is a zero droop governor.

KVA

1,000 Volt amperes (Apparent power). Equal to KW divided by the P.F.

KW

1,000 Watts (Real power). Equal to KVA times P.F.

KVAR

1,000 Volt amp reactive (Reactive power).

KW HR

1 KW x 1 hr = 1KW HR. Unit of electric energy or work.

LAGGING POWER FACTOR

Caused by inductive loads, such as motors and transformers, in which the current lags behind the voltage in an alternating current network. See POWER FACTOR.

LAMINATED CORE

A ferromagnetic core consisting of a number of thin laminations of steel, forming a magnetic path.

LEADING POWER FACTOR

Leading power factor in AC circuits (0.0 to 1.0) is caused by capacitive loads or overexcited synchronous motors which cause the current to lead the voltage. See POWER FACTOR.

LEG

A leg is a phase winding of a generator, or a phase conductor of a distribution system.

LINE TO LINE VOLTAGE

The voltage existing between any two conductors in polyphase circuits, the voltage between phase conductors.

LINE TO NEUTRAL VOLTAGE

The voltage existing between any phase conductor and the neutral conductor.

LOAD FACTOR

The load factor is the ratio of the average load to the generator set power rating.

LOSSES

The difference between the input and the useful output of an electric or mechanical device. See EFFICIENCY.

LOW VOLTAGE

In the context of this manual, low voltage refers to AC system operating voltages from 120 to 600 VAC.

MAIN BREAKER

A main breaker is a circuit breaker at the input or output of the bus, through which all of the bus power must flow. The generator main breaker is the device, usually mounted on the generator set, which can be used to interrupt generator set power output.

MAGNETIC LINES OF FORCE

Theoretical, invisible paths along which magnetic forces act in a magnetic field.

MAGNETIC SATURATION

The point at which an increase in excitation current produces little or no increase in flux density.

MANUAL TRANSFER SWITCH

A manually operated device for transferring an electrical load from one power source to another.

MEAN GOVERNED SPEED

The average speed during a given period when an engine generator set is operating under a sustained electrical load with governing system in control. It is the arithmetic mean of all instantaneous values of speed occurring during the period under consideration.

MEDIUM VOLTAGE

In the context of this manual, medium voltage refers to AC system operating voltages from 601 to 15,000 VAC.

MEGGER OR MEGOHMMETER

A high range ohmmeter utilizing a power source for measuring insulation resistance.

MOLDED CASE CIRCUIT BREAKER

A molded case circuit breaker automatically interrupts the current flowing through it when the current exceeds a certain level for a specified time. Molded case refers to the use of a molded plastic as the medium of electrical insulation for enclosing the mechanisms (earthed) metal parts.

MOTORING

In paralleling applications, unless a generator set is disconnected from the bus when its engine fails (usually as a result of a fuel system problem), the generator will drive (motor) the engine, drawing power from the bus. Reverse power protection which automatically disconnects a failed set from the bus is essential from paralleling systems. Also, in certain applications such as elevators, the load can motor the generator set if insufficient additional load is present.

NEC

National Electrical Code. This document is the most commonly referenced general electrical standard in the United States.

NEMA

National Electrical Manufacturers Association

NFPA

National Fire Protection Association

NEUTRAL

The point common to all phases of a polyphase circuit, a conductor connected to that point or the return conductor in a single phase circuit.

NO BREAK POWER

Same as UNINTERRUPTED POWER.

NO LOAD POWER

No load power for a generator set is a state of operation at rated speed wherein all control, monitoring and excitation circuits or devices are energized and functioning and it is only necessary to close the output switching device to provide power to the load. In the event the generator set is equipped with more than one power producing device, such as a battery charger, then these devices shall be treated as separate power producing devices whose no load state shall be as described above.

NONLINEAR LOAD

A nonlinear load is a load for which the relationship between voltage and current is not a linear function. Some common nonlinear loads are fluorescent lighting, SCR motor starters and UPS systems. Nonlinear loads cause abnormal conductor heating and voltage distortion.

OCTAVE BAND

In sound pressure measurements (using an octave band analyzer), octave bands are the eight divisions of the measured sound frequency spectrum, where the highest frequency of each band is twice that of its lowest frequency. The octave bands are specified by their center frequencies, typically: 63, 125, 250, 500, 1,000, 2,000, 4,000 and 8,000 Hz (cycles per second).

OHM

Unit of electrical resistance. One volt will cause a current of one ampere to flow through a resistance of one ohm.

OHMMETER

A device for measuring electrical resistance.

OIL HEATER

See BLOCK HEATER

ONE-LINE DIAGRAM

A one-line diagram is a schematic diagram of a three-phase power distribution system which uses one line to show all three phases. It is understood when using this easy to read drawing that one line represents three.

OUT-OF-PHASE

The overload rating of a device is the load in excess of the nominal rating the device can carry for a specified length of time without being damaged.

OVERSHOOT

Overshoot refers to the amount by which voltage or frequency exceeds the nominal value as the voltage regulator or governor responds to change in load.

OPEN-CIRCUIT VOLTAGE

The voltage produced when no load is attached to the voltage source, such as a generator.

OVERLOAD POWER

Overload power is that load in excess of rated load which the generator set is capable of delivering for a specified period of time. It should be recognized that the voltage, frequency and operating temperature may differ from normal rated values.

OVERLOAD RELAY

A device which functions when a predetermined value of current is reached or exceeded.

OVERSHOOT

The amount by which a quantity such as voltage or frequency exceeds the nominal value after initial correction for a sudden load change.

OUT-OF-PHASE

A condition in which the A.C. voltage waves of two generating systems do not coincide.

PARALLEL CONNECTION

The procedure used to connect two or more generators in parallel, that is, connect them to a common load.

PARALLEL OPERATION

Two or more generators of the same phase, voltage and frequency characteristics supplying the same load.

PARALLELING

The procedure used to connect two or more generators in parallel, that is, connect them to a common load.



PEAK LOAD

Peak load is the highest point in the kilowatt demand curve of a facility. This is used as the basis for the utility company's demand charge.

PEAK SHAVING

Peak shaving is the process by which loads in a facility are reduced for a short time to limit maximum electrical demand in a facility and to avoid a portion of the demand charges from the local utility.

PHASE

The number of complete voltage and/or current sine waves generated per 360 electrical degrees. Each phase requires a complete set of windings.

PHASE ANGLE

The relation between the sinusoidally varying quantities of voltage and current at the same frequency which do not pass through positive maximum at the same instant. One cycle is considered to contain 360 degrees. The extent by which the zero points differ is expressed as a part of the total of 360 degrees. See POWER FACTOR.

PHASE ROTATION

The sequence in which the phases of a generator or network pass through the positive maximum points of their waves. The same sequence must exist when units are paralleled.

PITCH

Pitch is the ratio of the number of generator stator winding slots enclosed by each coil to the number of winding slots per pole. It is a mechanical design characteristic the generator designer may use to optimize generator cost verse voltage wave form quality.

POLE

A part of a magnetic structure, there being two such parts, called a North pole and a South pole. Since neither pole can exist without the corresponding opposite, they always are present in pairs. Hence a generator always has an even number of poles. This term "pole" or "poles" may also be used to indicate the number of circuits affected by a switch.

POLYPHASE

Separate complete voltage and/or current sine waves, each of 360 electrical degrees in length, occurring equally spaced within 360 electrical degrees. E.G. Three phase is three complete separate sine waves spaced 120 electrical degrees apart. Two phase is two complete separate sine waves spaced 180 electrical degrees apart.

POWER

Rate of performing work, or energy per unit of time. Mechanical power can be measured in horsepower, electrical power in kilowatts.

POWER CIRCUIT BREAKER

A power circuit breaker is a circuit breaker whose contacts are forced closed via a spring-charged, over-center mechanism to achieve a fast closing (5-cycle) and high withstand and interrupting ratings. A power circuit breaker can be an insulated case or power air circuit breaker.

POWER FACTOR

(also $\cos \theta$) In a-c circuits, the inductances and capacitances may cause the point at which the voltage wave passes through zero to differ from the point at which the current wave passes through zero. When the current wave precedes the voltage wave, a leading power factor results. This is generally the case. The power factor expresses the extent to which voltage zero differs from the current zero. Considering one full cycle to be 360 degrees, the difference between the zero points can then be expressed as an angle θ . Power factor is calculated as the cosine of the θ between zero points and is expressed as a decimal fraction (.8) or as a percentage (80%). It can also be shown to be the ratio of KW, divided by the KVA. In other words, $KW = KVA \times P.F.$

PRECISE POWER

A descriptive term used to denote high quality power delivered by a generator set. Definitions of precise power vary greatly.

PRIME POWER

That source of supply of electrical energy utilized by the user which is normally available continuously day and night, usually supplied by an electric utility company but sometimes by owner generation.

PRIME POWER RATING

The prime power rating is applicable when supplying electrical power in lieu of commercially purchased power. Prime power is available for an unlimited number of annual operating hours in variable load applications. Applications requiring any utility parallel operation at constant load are subject to running time limitations. In variable load applications, the average load factor should not exceed 70% of the Prime Power Rating. A 10 percent overload capability is available for a period of 1 hour within a 12 hour period of operation, but not to exceed 25 hours per year. (Equivalent to Prime Power in accordance with ISO8528 and Over Load Power in accordance with ISO3046, AS2789, DIN6271 and BS5514.)

RADIO INTERFERENCE

Radio Interference refers to the interference with radio reception caused by a generator set.

RADIO INTERFERECNE SUPPRESSION

Radio interference suppression refers to eh methods employed to minimize radio interference.

RATED CURRENT

The rated continuous current of a machine or apparatus is the value of current in RMS or DC amperes which it can carry continuously in normal service without exceeding the allowable temperature rises. Also see FULL LOAD CURRENT.

RATED POWER

The stated or guaranteed net electric output which is obtainable continuously from a generator set when it is functioning at rated conditions. If the set is equipped with additional power producing devices, then the stated or guaranteed net electric power must take into consideration that the auxiliaries are delivering their respective stated or guaranteed net output simultaneously, unless otherwise agreed to. See EFFICIENCY.

RATED SPEED

Revolutions per minute at which the set is designed to operate.

RATED VOLTAGE

The rated voltage of an engine generator set is the voltage at which it is designed to operate.

REACTANCE

The out-of-phase component of impedance that occurs in circuits containing inductance and/or capacitance.

REACTIVE POWER

Reactive power is the product of current, voltage and the sine of the angle by which current leads or lags voltage and is expressed as VAR (volts-amperes-reactive).

REACTIVE KVA (KVAR)

An a-c value consists of active and wattles components. The active component is expressed in KW, the wattles component in Reactive KVA. The resultant KVA is calculated from $KVA = KW^2 + KVAR^2$.

REAL POWER

A term used to describe the product of current, voltage and power factor, expressed in KW.

**RECTIFIER**

A device that converts AC to DC. See DIODE.

RELAY

An electrically operated switch usually used in control circuits and whose contacts are considered low amperage, compared to a contactor.

RESIDUAL MAGNETISM

The magnet induction which remains after the magneto-motive force is removed.

RESISTANCE

Opposition to the flow of current. See OHM

RESPONSE TIME

The ability to quickly recover to the steady state operating value after a sudden change in load.

RIPPLE VOLTAGE

The varying component of the unidirectional voltage from a source of direct current power.

ROOT MEAN SQUARE (RMS)

The conventional measurement of alternating current and voltage and represents a proportional value of the true sine wave.

ROTOR

The rotating element of a motor or generator.

REVOLUTIONS PER MINUTE

RPM

SCR

(Silicon Controlled Rectifier) A SCR is a three-electrode solid-state device which permits current to flow in one direction only, and does this only when a suitable potential is applied to the third electrode, called the gate.

SATURATION

A core is said to have reached saturation when an increase in excitation produces little or no increase in flux density.

SECONDARY

That part of a transformer to which the load is connected; it receives energy from the primary or input side through electromagnetic induction.

SELECTIVE COORDINATION

Selective coordination is the selective application of over-current devices such that short circuit faults are cleared by the device immediately on the line side of the fault, and only by that device.

SELECT SWITCH

A manually operated multi-position switch for selecting an alternative control circuit.

SERIES CONNECTION

An electrical connection in which the output terminal of one element is connected to the input terminal of another element, thereby providing one path for current flow.

SERVICE ENTRANCE

The service entrance is the point where the utility service enters the facility. In low voltage systems the neutral is grounded at the service entrance.

SHORT CIRCUIT

Generally an unintentional electrical contact between current carrying parts resulting in the passage of current through an undesirable path.

SHORT-OUT

To by-pass or remove a device from the circuit by connecting a jumper across its terminals.

SHUNT CONNECTION

Parallel connection in which the terminals of two or more devices are connected together.

SHUNT TRIP

Shunt trip is a feature added to a circuit breaker or fusible switch to permit the remote opening of the breaker or switch by an electrical signal.

SIGNAL

A signal is information which can be transmitted in a system.

SILICON-CONTROLLED RECTIFIER (SCR)

Solid state device, similar to diode, which permits current to flow in one direction only when triggered by a suitable potential applied to the control lead or terminal, called the gate.

SINE WAVE

A wave which represents the sine of angles on the vertical scale and the corresponding angles on the horizontal scale. A-C voltage and current waves approximate such a curve.

SINGLE PHASE

An A.C. load or source of power normally having only two input terminals if a load or two output terminals if a source.

SLIP RINGS

See COLLECTOR RINGS.

SOFT LOADING

Soft loading refers to the ramping of load onto or off of a generator in a gradual fashion for the purpose of minimizing voltage and frequency transients on the system.

SOUND

Sound is considered both in terms of the sound pressure waves traveling in air (pressures superimposed on the atmospheric pressure) and the corresponding aural sensation. Sound can be "structure-borne", that is, transmitted through any solid elastic medium, but is audible only at points where the solid medium "radiates" the pressure waves into the air.

SOUND LEVEL METER

A sound level meter measures sound pressure level. It has several frequency weighted decibel (dB) scales (A,B,C) to cover different portions of the range of measured loudness. Sound level meters indicate RMS sound, unless the measurements are qualified as instantaneous or peak sound level.

SOUND PRESSURE LEVEL (SPL)

Sound pressure level refers to the magnitude of the pressure differential caused by a sound wave. It is expressed on a dB scale (A, B, C) referenced to some standard (usually 10-12 microbars).

SPEED DRIFT

A gradual deviation of the mean governed speed above or below the desired speed. See FREQUENCY DRIFT.

SPEED DROOP

The change in speed between steady state no load and steady state full load. See FREQUENCY DROOP.



SPEED REGULATION

The percentage change in speed at constant loads between steady state no load and steady state full load.

STABILITY

See RESPONSE TIME.

STANDBY POWER

An independent reserve source of electrical energy which upon failure or outage of the normal source, provides electric power of acceptable quality and quantity so that the user's facilities may continue in satisfactory operation.

STANDBY POWER RATING

The standby power rating is applicable to emergency power applications where power is supplied for the duration of normal power interruption. No sustained overload capability is available for this rating. (Equivalent to Fuel Stop Power in accordance with ISO3046, AS2789, DIN6271 and BS5514). This rating is applicable to installations served by a reliable normal utility source. This rating is only applicable to variable loads with an average load factor of 80 percent of the standby rating for a maximum of 200 hours of operation per year. In installations served by unreliable utility sources (where outages last longer and occur more frequently), where operation will likely exceed 200 hours per year, the prime power rating should be applied. The standby rating is only applicable to emergency and standby applications where the generator set serves as the back-up to the normal utility source. No sustained utility parallel operation is permitted with this rating. For applications requiring sustained utility parallel operation, the prime power or base load rating must be utilized.

STANDBY SYSTEM

A standby system is an independent power system that allows operation of a facility in the event of normal power failure.

STAR CONNECTION

See WYE CONNECTION.

STARTING CURRENT

The initial value of current drawn by a motor when it is started from standstill and voltage is applied across its terminals. Commonly referred to as locked-rotor current. See INRUSH CURRENT.

STATIC EXCITER

A solid state, non-rotating device for finishing direct current to the generator field.

STATOR

The stationary part of a generator or motor.

STATOR WINDING

The winding in which the output voltage is induced, in revolving-field type generators.

STEADY STATE

The operating point under constant load when all fluctuations due to transients have been eliminated.

STEADY STATE FREQUENCY

The mean governed frequency occurring when engine generator is functioning with a steady state electrical load.

STEADY STATE SPEED

The mean governed speed occurring when the engine generator is functioning with a steady state electrical load.

STEADY STATE VOLTAGE

The steady state voltage of an engine generator set is the value of output voltage when the set is operating at a steady state condition; that is, at constant load, under stabilized conditions and with all fluctuations due to a transient or transients having been eliminated.

SURGE

A sudden transient variation in current, voltage or frequency.

SURGE SUPPRESSOR

Surge suppressors are devices capable of conducting high transient voltages. They are used for protecting other devices that could be destroyed by the transient voltages.

SYNCHRONISM

The state of being of the same frequency and in-phase.

SYNCHRONIZING

To match one wave to another by adjusting ones' frequency and phase angle until the two coincide.

SYNCHRONOUS

Applied to a type of motor or generator in which the relation between frequency in cycles per second and the speed in RPM is fixed and invariable.

SYNCHRONOUS GENERATOR

A synchronous generator is an AC generator having a DC exciter. Synchronous generators are used as stand-alone generators for emergency power and can also be paralleled with other synchronous generators and the utility system.

TACHOMETER

A device for measuring rotative speed usually expressed in RPM.

TAP

A connection point in the body of a coil or resistor.

TELEPHONE INFLUENCE FACTOR (TIF)

The telephone influence factor of a synchronous generator is a measure of the possible effect of harmonics in the generator voltage wave on telephone circuits. TIF is measured at the generator terminals on open circuit at rated voltage and frequency.

TEMPERATURE DRIFT

A condition in which temperature changes cause a regulated value to deviate from the nominal value. See DRIFT.

TERMINAL

A fitting for convenience in making electrical connections.

THERMOCOUPLE

A device for measuring temperature. It consists of a connection between two wires of dissimilar material which generates a small voltage proportional to the temperature of the ambient.

THREE-PHASE

See POLYPHASE.

TIME CONSTANT

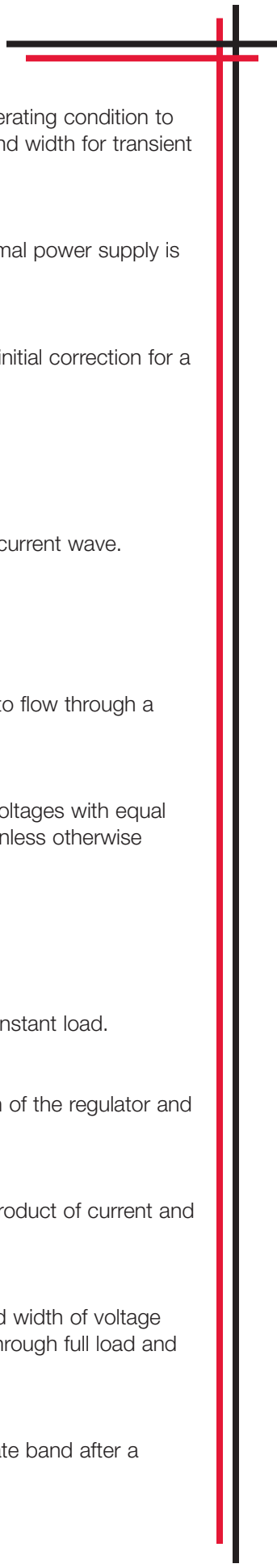
The time required to change from one condition to another, usually a decay or build-up rate.

TRANSFORMER

A component consisting of two or more coils that are coupled together by magnetic induction and used to transfer electric energy from one circuit to another without change in frequency but usually with changed values of voltage and current.

TRANSIENT

That part of the variation in a variable during transition from one steady-state operating condition to another and which ultimately disappears.



TRANSIENT VOLTAGE

The transient voltage is the absolute value of voltage appearing during the transition from one operating condition to another. Performance requirements covering an engine generator set may specify the limiting band width for transient voltages occurring at defined load changes.

UNINTERRUPTIBLE POWER SUPPLY (UPS)

A system designed to provide power without delay or transients, during any period when the normal power supply is incapable of performing acceptably.

UNDERSHOOT

The amount by which quantity such as voltage or frequency drops below the nominal value after initial correction for a sudden load change.

UNIDIRECTIONAL CURRENT

A current which flows in one direction only. It is also called direct current.

UNITY POWER FACTOR

A load whose power factor is 1.0 has no reactances causing the voltage wave to lag or lead the current wave.

UTILITY POWER

The same as COMMERCIAL POWER.

VOLT

The volt is a unit of electrical potential. A potential of one volt will cause a current of one ampere to flow through a resistance of one ohm.

VOLTAGE BALANCE

The voltage balance of an engine generator set is a measure of the line to line, or line to neutral voltages with equal loads. It is expressed as a percentage of the maximum difference divided by the rated voltage, unless otherwise specified.

VOLTAGE DIP

The maximum reduction in voltage resulting from an increase in load.

VOLTAGE DRIFT

A gradual deviation of the mean regulated voltage above or below the desired voltage under a constant load.

VOLTAGE DROOP

The change in voltage between steady state no load and steady state full load which is a function of the regulator and paralleling components.

VOLTAGE DROP

The reduction in voltage, caused by the current which flows through a resistance. Equal to the product of current and resistance.

VOLTAGE RANGE

The voltage range of an engine generator set is a performance requirement which states the band width of voltage through which the set should be capable of adjustment and operation at any load from no load through full load and at specified design conditions.

VOLTAGE RECOVERY TIME

The time required for the voltage to return to and remain within the permissible voltage steady state band after a transient.

VOLTAGE REGULATION

The voltage regulation of an engine generator set is the difference between the mean regulated no load and the mean regulated full load output voltage expressed as a percentage of the mean regulated full load voltage.

VOLTAGE REGULATOR

A device which maintains the voltage output of a generator nears its nominal value.

VOLTAGE UNBALANCE

See VOLTAGE BALANCE.

VOLTMETER

An instrument for measuring voltage.

WATT

Unit of electric power. In direct current equals volts times amperes. In alternating current equals effective volts times effective amps times power factor times a constant dependent on the number of phases. 1,000 watts equals 1 kilowatt.

WATT-HOUR

Unit of electrical energy equal to one watt of power consumed during an hour.

WAVEFORM

The shape of a wave, graphically represented.

WINDING

All the coils of a generator. Stator winding consists of a number of stator coils and their interconnections. Rotor windings consist of all windings and connections on the rotor poles.

WIRING HARNESS

A pre-assembled group of wires of the correct length and arrangement to facilitate interconnection.

WYE CONNECTION

Same as STAR CONNECTION. A method of interconnecting the phases of a three phase system to form a configuration resembling the letter Y. A fourth or neutral wire can be connected to the center point.

ZERO SEQUENCE

Zero sequence is a method of ground fault detection that utilizes a sensor (CT) that encircles all the phase conductors as well as the neutral conductors. The sensor will produce an output proportional to the imbalance of current ground fault in the circuit. This output is then measured by a relay to initiate circuit breaker tripping or ground fault alarm.

ZONES OF PROTECTION

Zones of protection are defined areas within a distribution system that are protected by specific groups of protective sensing and interrupting devices.

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