

## Glossary of Terms

AC RIPPLE - The alternating current superimposed on the DC bias after rectification in a power supply.

ABSORPTION – The adhesion of gas or liquid molecules to the surfaces of solids or liquids with which they are in contact.

AGING – The change in properties of a material with time under specific conditions.

ALTERNATING CURRENT – Electric current that rises from zero to a maximum in one direction, falls to zero and then rises to a maximum in the opposite direction, and then repeats another cycle.

AMBIENT TEMPERATURE – The temperature of the surroundings -cooling medium, such as a gas or liquid, which comes into contact with the heated parts of the apparatus.

ANODE – The electrode through which a direct current enters the liquid, gas, or other discrete part of an electrical circuit; the positively charged pole of an electrochemical cell.

ARCOVER VOLTAGE – The minimum voltage required to create an arc between electrodes separated by an insulation under specified conditions.

BREAKDOWN – A disruptive discharge through the insulation.

BREAKDOWN VOLTAGE – The voltage at which the insulation between to conductors will break down.

CAPACITANCE – That property of a system of conductors and dielectric, which permits the storage of electricity when potential difference exists between the

conductors. Its value is expressed as the ratio of a quantity of electricity to a potential difference. A capacitance value is always positive. The charge which must be communicated to the body to raise its potential one unit, represented by  $C = Q/V$ , where C is the capacitance, Q the quantity of charge, and V the potential. In a parallel plate condenser  $C = KA/D$  where a is the area of plates, D is the distance between them, and K the dielectric constant of the medium.

**CAPACITIVE REACTANCE** – The non-heating impedance component of the capacitor when AC flows.

**CAPACITOR** – An electrical/electronic part that stores electrical charges. In its simplest form it consists of two conducting surfaces separated by a dielectric.

**CATHODE** – The electrode through which an electric current leaves a liquid, gas, or other discrete part of an electric current; the negatively charged pole of an electrochemical cell.

**CHARGE** – In electrostatics, the amount of electricity present upon any substance, which has accumulated electric energy.

**CONDUCTANCE** – The reciprocal of resistance. It is the ratio of current passing through a material to the potential difference at its ends.

**CONDUCTIVITY**- Reciprocal of volume resistance. The conductance of a unit cube of any material.

**CONDUCTOR** - An electrical path, which offers comparatively little resistance. A wire or combination of wires not insulated from one another, suitable for carrying a single electric current.

**CONTAMINANT** – An impurity of foreign substance present in a material which affects one or more properties of the material.

**CORONA** – A luminous discharge due to ionization of the gas surrounding a conductor around which exists a voltage gradient exceeding a certain critical value. A type of discharge sometimes visible in the dielectric of an insulation system caused by an electric field and characterized by the rapid development of an ionized channel which does not completely bridge the electrode. May be continuous or intermittent. Not a materials property, but related to the system, including electrodes.

**CORONA RESISTANCE** – The time that insulation will withstand a specified level field-intensified ionization that does not result in the immediate complete breakdown of the insulation.

**CORROSION** – Chemical action which causes destruction of the surface of a metal by oxidation or chemical combination.

**COULOMB** – Unit quantity of electricity. The quantity transferred by one ampere in one second.

**CREEPAGE** – The electrical leakage on a solid dielectric surface.

**CRITICAL VOLTAGE** – The voltage at which gas ionizes and corona occurs, preliminary to dielectric breakdown of the gas.

**DELAMINATION** – The separation of layers in a laminate.

**DIELECTRIC** – (1) Any insulating medium, which intervenes between two conductors and permits electrostatic attraction and repulsion to take place across it. (2) A material having the property that energy required to establish an electric field is recoverable in whole or in part, as electric energy.

**DIELECTRIC ABSORPTION** – That property of an imperfect dielectric whereby there is an accumulation of electric charges within the body of the material when it is placed in an electric field.

**DIELECTRIC CONSTANT** – That property of a dielectric which determines the electrostatic energy stored per unit volume for unit potential gradient.

**DIELECTRIC LOSS** – The time rate at which electric energy is transformed into heat in a dielectric when it is subjected to a changing electric field.

**DIELECTRIC LOSS ANGLE** – The difference between  $90^\circ$  and the dielectric phase angle.

**DIELECTRIC PHASE ANGLE** – The angular difference in phase between the sinusoidal alternating potential difference applied to a dielectric and the component of the resulting alternating current having the same period as the potential difference.

**DIELECTRIC POWER FACTOR** – The cosine of the dielectric phase angle.

**DIELECTRIC STRENGTH** - The voltage which an insulating material can withstand before breakdown occurs, usually expressed as a voltage gradient.

**DIELECTRIC TEST** – Tests which consist of the application of a voltage higher than that of the rated voltage for a specified time for the purpose of determining the adequacy against breakdown of insulating materials and spacing under normal conditions.

**DISPERSION** – Finely divided particles in suspension in another substance.

**DISPLACEMENT CURRENT** – A current which exists in addition to ordinary conduction current in a/c circuits. It is proportional to the rate of change of the electric field.

**DISRUPTIVE DISCHARGE** – The sudden and large increase in current through an insulation medium due to the complete failure of the medium under the electrostatic stress.

**DISSIPATION FACTOR** – The tangent of the loss angle of the insulating material.

**ELECTRIC FIELD INTENSITY** – The force exerted on a unit charge.

**ELECTRIC STRENGTH** – The maximum potential gradient that the material can withstand without rupture. The value obtained for the electric strength will depend on the thickness of the material and on the method and conditions of the test.

**ELECTRODE** – A conductor not necessarily metal, through which a current enters or leaves a capacitor.

**ELECTRON** – That portion of an atom, which circles around the center, or nucleus. An electron possesses a negative electric charge, and is the smallest charge of electricity known.

**ENCAPSULATING** – Enclosing an article in a closed envelope of plastic or other material.

**EPOXY RESINS** – Straight-chain thermoplastics and thermosetting resins based on ethylene oxide, its derivatives or homologs.

**FARAD** – Unit of capacitance. The capacitance of a capacitor which, when charged with one coulomb, gives a difference of potential of one volt.

**FIBER** – A thread or threadlike structure such as comprises cellulose, wool, silk, or glass yarn.

**FILLER** – A substance, often inert, added to a plastic to improve properties and/or decrease cost.

**FLAME RESISTANCE** – Ability of the material to extinguish flame once the source heat is removed.

FLAMMABILITY – Measure of the materials ability to support combustion.

FLASHOVER – A disruptive discharge around or over the surface of a solid or liquid insulator.

FREQUENCY – The number of complete cycles or vibrations per unit of time.

GRADED INSULATION – Combination insulations with the portions thereof arranged in such a manner as to improve the distribution of the electric field to which the insulation combination is subjected.

GRADIENT - Rate of increase or decrease of a variable magnitude.

GROUNDING PARTS– Parts that are connected so that when the installation is complete, they are substantially of the same potential as the earth.

HARDENER – A substance or mixture of substances added to plastic composition, or an adhesive to promote or control the curing reaction by taking part in it.

HEAT SINK – Any device that absorbs and draws off heat from a hot object, radiating it into the surrounding atmosphere.

HERTZ –A term replacing cycles -per-second as an indication of frequency.

HYGROSCOPIC – Tending to absorb moisture.

HYSTERESIS – An effect in which the magnitude of a resulting quantity is different during increases in the magnitude of the cause than during decreases due to internal friction in a substance and accompanied by the production of heat within the substance. Electric hysteresis occurs when a dielectric material is subjected to a varying electric field as in a capacitor in an alternating current circuit.

**IMPEDANCE** – The total opposition that a circuit offers to the flow of alternating current or any other varying current at a particular frequency. It is a combination of resistance R and reactance X, measured in ohms and designated by Z.  $Z = (R^2 + X^2)^{1/2}$ .

**IMPREGNATE** – To fill the voids and interstices of a material with a compound. (This does not imply complete fill or complete coating of the surfaces by a hole-free film).

**IMPULSE** – A surge of unidirectional polarity.

**INSULATION** – Material having a high resistance to the flow of electric current, to prevent leakage of current from a conductor.

**INSULATION RESISTANCE** – The ratio of the applied voltage to the total current between two electrodes in contact with a specific insulator.

**INSULATOR** – A material of such low electrical conductivity that the flow of current through it can usually be neglected.

**INTERSTICE** – A minute space between one thing and another, especially between things closely set such as the space between crystals of a crystallized material.

**ION** – An electrical portion of matter of sub-atomic, atomic, or molecular dimensions such as is formed when a molecule of gas loses an electron (when the gas is stressed electrically beyond the critical voltage) or when a neutral atom or group of atoms in a fluid loses or gains one or more electrons.

**ION EXCHANGE RESINS** – Small granular or bead-like particles containing acidic or basic groups, which will trade ions with salts in solutions.

**IONIZATION** - Generally, the dissociation of an atom or molecule into positive or negative ions or electrons. Restrictively, the state of an insulator whereby it facilitates the passage of current due to the presence of charged particles usually induced artificially.

**LINE OF FORCE** – Used in the description of an electric field to represent the force starting from a positive charge and ending on a negative charge.

**MOISTURE RESISTANCE** – The ability of a material to resist absorbing moisture from the air or when immersed in water.

**NYLON** – The generic name for synthetic fiber-forming polyamides.

**ORGANIC** – Designating or composed of matter originating in plant or animal life or composed of chemicals or hydrocarbon origin, either natural or synthetic.

**OVER POTENTIAL** – A voltage above the normal operating voltage of a device circuit.

**OVERVOLTAGE** – See over potential.

**PARTIAL DISCHARGE** – A partial discharge is an electric discharge that only partially bridges the insulation between conductors when the voltage stress exceeds a critical value. These partial discharges may, or may not, occur adjacent to a conductor.

**PERMITTIVITY** – Preferred term for dielectric constant.

**PH** – The measure of the acidity or alkalinity of a substance, neutrality being at PH 7. Acid solutions are under 7 alkaline are over 7.

**PLASTIC** – High polymeric substances, including both natural and synthetic products, but excluding the rubbers, that are capable of flowing under heat and pressure at one time or another.



**PLASTIC DEFORMATION** – Change in dimensions of an object under load that is not recovered when the load is removed.

**PLASTICIZER** – Chemical agent added to plastics to make them softer and more flexible.

**POLARITY-** 1.)An electrical condition determining the direction in which current tends to flow. 2.)The quality of having two opposite charges.

**POLYAMIDE** – A polymer in which the structural units are linked by amide or thioamide groupings.

**POLYCARBONATE RESINS** – Polymers derived from the direct reaction between aromatic and aliphatic dihydroxy compounds with phosgene or by the ester exchange reaction with appropriate phosgene derived precursors.

**POLYESTER** – A resin formed by the reaction between a dibasic acid and a dihydroxy alcohol.

**POLYETHYLENE** – A thermoplastic material composed of polymers of ethylene.

**POLYISOBUTYLENE** – The polymerization product of isobutylene, also called butyl rubber.

**POLYMER** - A compound formed by polymerization, which results in the chemical union of monomers or the continued reaction between lower molecule weight polymers.

**POLYMERIZE** – To unite chemically two or more monomers or polymers of the same kind to form a molecule with higher molecular weight.

**POLYPROPYLENE** – A plastic made by the polymerization of high-purity propylene gas in the presence of an organometallic catalyst at relative low pressure and temperatures.

**POLYSTYRENE** – A thermoplastic produced by the polymerization of styrene (vinyl benzene).

**POLYVINYL ACETATE**– A thermoplastic material composed of polymers of vinyl acetate.

**POLYVINYL CHLORIDE (PVC)** - A thermoplastic material composed of polymers of vinyl chloride.

**POLYVINYL CHLORIDE ACETATE** – A thermoplastic material composed of copolymers of vinyl chloride and vinyl acetate.

**POLYVINYLIDENE FLORIDE** - A thermoplastic material composed of polymers of vinylidene floride.

**POTENTIAL VOLTAGE**– The work per unit charge required to bring any charge to the point at which the potential exists.

**POTTING** – Similar to encapsulating, except that the steps are taken to insure complete penetration of all voids in the object before the resin polymerizes.

**POWER** – The time rate at which work is done, equal to  $W/t$  where  $W$  is amount of work done in time  $t$ . Power will be obtained in watts if  $W$  is expressed in joules and  $t$  in seconds.

**POWER FACTOR**– 1.) In an alternating current circuit, it is the number of watts indicated by a wattmeter, divided by the apparent watts, the latter being the watts as measured by a voltmeter and ammeter. 2.) It is the multiplier used with the apparent watts to determine how much of the supplied power is available for use. 3.) That quantity by which the apparent watts must be multiplied in order to give the true power. 4.) Mathematically, the cosine of the angle phase difference between current and voltage applied.

**PRESSURE** – Force measured per unit area. Absolute pressure is measured with respect to zero pressure. Gauge pressure is measured with respect to atmospheric pressure.

**PROTON** – A positively charged particle believed to be a nuclear constituent of all atoms.

**RELATIVE HUMIDITY**– Ratio of the quantity of water vapor present in the air to the quantity which would saturate it at any given temperature.

**RESIN** – An organic substance of natural or synthetic origin characterized by being polymeric in structure and predominately amorphous. Most resins, though not all, are of high molecular weight and consist of long chain or network molecular structure. Usually resins are more soluble in their lower molecule weight forms.

**RESISTANCE** – Property of a conductor that determines the current produced by a given difference of potential. The ohm is the practical unit of resistance.

**RESISTIVITY** - The ability of a material to resist passage of electrical current either through its bulk or on a surface. The unit of volume resistivity is the ohm-cm, or surface resistivity, the ohm.

**ROENTGEN** – The amount of radiation that will produce one electrostatic unit of ions per cubic centimeter volume.

**SCHERING BRIDGE**– An alternating current form of wheatstone bridge, used for comparing capacitances or for measuring the phase angle of a capacitor by comparison with a standard capacitor.

**SEMICONDUCTOR** –A material whose resistivity is between that of insulators and conductors. The resistivity is often changed by light, heat, an electric field, or magnetic field. Current flow is often achieved by transfer of positive holes as well

as by movements of electrons. Examples include germanium, lead sulfide, lead telluride, selenium, silicon, and silicon carbide. Used in diodes, photocells, thermistors, and transistors.

**SHEET** – Any material (conducting, insulating, or magnetic) manufactured in sheet form and cut to suit in processing.

**SHELF LIFE** – Length of time under specified conditions that a material retains its usability.

**SILICONE** – Polymeric materials in which the recurring chemical group contains silicone and oxygen atoms as links in the main chain.

**SOLUTE** – A material, which is dissolved in a solvent, usually dissociating into an ionic solution.

**SOLVENT** – A liquid substance, which dissolves other substances.

**SPARKOVER** – A disruptive discharge between electrodes of a measuring gap, such as a sphere gap or oil-testing gap.

**SPECIFIC GRAVITY** – The density (mass per unit volume) of any material divided by that of water at a standard temperature.

**STAPLE FIBERS** – Fibers of spinnable length manufactured directly or by cutting continuous filaments to short lengths.

**STORAGE LIFE** – The period of time during which a liquid resin or adhesive can be stored and remain suitable for use. Also called shelf life.

**SURFACE CREEPAGE VOLTAGE** – See creepage.

**SURFACE FLASHOVER** – See flashover.

**SURFACE LEAKAGE** – The passing of current over the boundary surfaces of an insulator as distinguished from passage through its volume.

**SURFACE RESISTIVITY** – The resistance of a material between two opposite sides of a unit square of its surface. Surface resistivity may vary widely with the conditions of measurement.

**SURGE** – A transient variation in the current and/or potential at a point in the circuit.

**TEAR STRENGTH** - Force required to initiate or continue a tear in a material under specified conditions.

**TENSILE STRENGTH** – The pulling stress required to break a given specimen.

**THERMAL CONDUCTIVITY** –Ability of a material to conduct heat.

**THERMAL ENDURANCE** – The time at a selected temperature for an insulating material or system of materials to deteriorate to some predetermined level of electrical, mechanical, or chemical performance under prescribed conditions of the test.

**THERMAL EXPANSION** – The fractional change in length (sometimes volume) of a material for a unit change in temperature.

**THERMOPLASTIC** – A classification of resin that can be readily softened and re-softened by heating.

**TRACKING** – Scintillation of the surface of an insulator, may produce enough heat to leave a degraded track of carbon.

**VINYL RESIN** – A synthetic resin formed by the polymerization of compounds containing the group  $\text{CH}_2 = \text{CH}-$ .

**VISCOSITY** – A measure of the resistance of a fluid to flow (usually through a specific orifice).

**VOLT** – Unit of electromotive force. It is the difference of potential required to make a current of one ampere flow through a resistance of one ohm.

**VOLTAGE** – The term most often used in place of electromotive force, potential, potential difference, or voltage drop, to designate electric pressure that exists between two points and is capable of producing flow of current when a closed circuit is connected between two points.

**VOLUME RESISTIVITY** – The electrical resistance between opposite faces of a 1-cm cube of insulating material, commonly expressed in ohm-centimeters. The recommended test is ASTM D257-61.

**WATER ABSORPTION** – Ratio of the weight of water absorbed by a material to the weight of the dry material.

**WIRE** – A conductor of round, square, or rectangular section, either bare or insulated.

**YIELD STRENGTH** – The lowest stress at which a material undergoes plastic deformation. Below this stress, the material is elastic; above it, viscous.