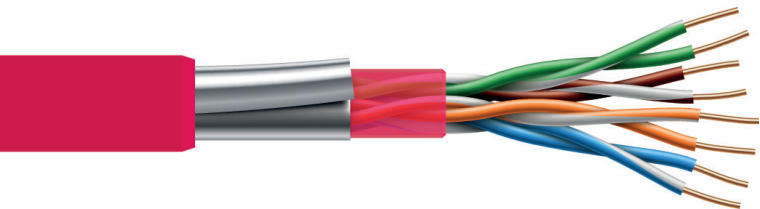


the **BIG**  
*little* book of  
**CABLE**





# INTRODUCTION

Welcome to our BIG little book of cable, where we aim to provide a comprehensive **A to Z** of all things cable (*be sure to let us know if we've missed something!*).

**But first, we'd like to introduce ourselves....**

HEXPOL TPE is an international polymer compounding group specialising in Thermoplastic Elastomer (TPE) materials. We've been around since the 1960s and today we operate plants around the globe.

Our team of polymer scientists and TPE freaks are constantly developing new combinations, looking for ways to create materials that are safer, more durable, more versatile, more sustainable.

You'll find data for our Dryflex® Cable Compounds at  
**[www.hexpolTPE.com](http://www.hexpolTPE.com)**

If you've a material challenge and are looking for a fresh perspective, contact our cable team at  
**[cable@hexpolTPE.com](mailto:cable@hexpolTPE.com)**

# A

**ABRASION MACHINE:** A laboratory device for determining the abrasion resistance of wire and cable. The two standard types of machines are the squirrel cage, with square steel bars, and the abrasive grit type.

**ABRASION RESISTANCE:** The ability of a wire or cable jacket to resist surface wear.

**AC:** Alternating current. See alternating current. Also abbreviated as ac.

**ACCELERATED LIFE TEST:** A test in which a cable is subjected to extreme conditions to determine the life of a cable.

**ACCELERATOR:** Chemical additive which hastens a chemical reaction, e.g. a compound added to rubber to reduce curing time.

**ACR:** Designation for cable with corona resisting insulation.

**ACRS:** Aluminium conductor, steel reinforced. Aluminium wires stranded around a steel core. Usually used for high voltage cross-country transmission lines.

**ADAPTER:** a) Device used for joining two fibre optic connectors together. b) A device for connecting two parts (of different diameters) of an apparatus.

**ADMITTANCE:** Symbol **Y**. The reciprocal of impedance. Given by the formula:

$$Y = G + i B$$

where **G** is the conductance, **B** the susceptance, and **i** equals  $\sqrt{-1}$ . Since impedance, **Z**, is given by:

$$Z = R + i X$$

where **R** and **X** are the resistance and reactance, respectively, then:

$$Y = (R - iX) / (R^2 + X^2)$$

**AIR SPACED COAX:** A coaxial cable in which air is basically the dielectric material. The conductor may be centred by means of a spirally wound synthetic filament, beads, or braided filaments. This construction is also referred to as an air dielectric.

**AIRCRAFT IGNITION CABLE:** A high tension cable designed for use in the ignition systems of internal combustion aircraft engines.

**AIRCRAFT WIRE:** An electrical wire primarily designed for the extreme conditions (temperature, altitude, solvents, fuels, etc.) of airborne equipment.

**AL:** Aluminium.

**ALL RUBBER CABLE:** A cable in which all voids between conductors are filled with a rubber compound. This

construction gives greater resistance to impact, adds strength, and reduces the tendency to kink. It also reduces flexibility.

**ALLOY:** A metal made by the fusion of two or more metals.

**ALS:** A type of cable consisting of insulated conductors enclosed in a continuous, closely fitting aluminium tube.

**ALTERNATING CURRENT:** An alternating current is one where the direction of current is reversed at regular intervals. The rate at which reversals occur is expressed in cycles per second (Hertz or Hz). Abbreviated as AC or ac.

**ALUMINIUM CONDUCTOR:** A wire or group of wires of aluminium, not insulated from each other, suitable for carrying electrical current.

**am:** amplitude modulation. Also abbreviated as AM.

**AMBIENT TEMPERATURE:** The temperature of a medium (gas or liquid) surrounding an object.

**AMERICAN WIRE GAUGE:** Abbreviated AWG. (See AWG)

**AMP:** Abbreviation for ampere. See Ampere.

**AMPACITY:** See current carrying capacity.

**AMPERE:** The unit expressing the rate of flow of an electrical current. One ampere is the current flowing through one-ohm resistance with one volt potential. Abbreviated as amp.

**AMPLIFIER:** A device employing electron tubes or transistors to obtain amplification of voltage, current, or power.

**AN:** Literally 'aircraft number'. For example, AN-6 signifies a wire size of No. 6 AWG.

**ANNEALED WIRE:** Wire which has been softened by heating and gradually cooling. Also called soft drawn wire.

**ANNULAR CONDUCTOR:** An annular conductor consists of several wires stranded in three reverse concentric layers around a saturated hemp core.

**ANODE:** Positive pole of an electric source. Opposite-cathode.

**ANSI:** American National Standards Institute.

**ANTIOXIDANT:** A substance which prevents or slows down oxidation of material exposed to air.

**ARAMID:** A lightweight strong heat-resistant aromatic polyamide material used in fibre optic strength members.

**ARMATURE WIRE:** Stranded annealed copper wire, straight lay, soft loose white cotton braid. Used for low voltage, high current rotor winding motors and generators. Straight lay permits forming in armature slots and compressibility.

**ARMOUR:** An outer braid of metal or spiral steel tapes, primarily for the purpose of mechanical protection. Generally placed over the outer sheath.

**AROMATIC:** An organic material composed of benzene in a ring structure.

**ARTOS STRIPPER:** A machine that will automatically measure to a predetermined length, cut, strip, count, and tie wire in bundles.

**ASTM:** American Society for Testing Materials.

**ATTENUATION:** The loss of power or signal in a circuit, generally expressed in decibels (dB) per unit length. In optical fibre cables, attenuation is the ratio of input power vs. output power, measured in decibels per unit length, usually dB/km.

**AUDIO FREQUENCY:** The range of frequencies audible to the human ear, approximately 20 to 20,000 Hz.

**AUTO PRIMARY WIRE:** A single or multi-conductor wire used for original equipment or replacement on automotive products. Normally low voltage, resistant to oil, acid, and weather.

**AWG:** American Wire Gauge. The system most commonly used in the United States for describing the size of copper wire. It is based on the circular mil system. One (1) mil equals 0.001 inch. Also referred to as the Brown and Sharpe (B&S) wire gauge.

**AWM:** Designation for appliance wiring material, certified if tested to UL 758 (USA)



# B

**B:** Symbol for susceptance. See susceptance.

**B & S GAUGE:** Brown and Sharpe wire gauge used for describing different sizes of copper conductors. It is the same as AWG (American Wire Gauge). See AWG.

**BACKBONE:** A transmission network that carries information in a fibre optic system. Mainly for indoor applications between floors and areas with different types of cables.

**BACKSHELL MOULD:** An aluminium mould used to mould a rubber or other compounds covering over the backshell of a conductor or plug after it is connected to a cable. The compound is usually chemically cured.

**BAND MARKING:** A circular band applied at regular intervals to the insulation of a conductor for the purpose of colour coding or circuit identification.

**BANDED CABLE:** Two or more cables which have been banded together by stainless steel strapping.

**BANDWIDTH:** The frequency range of transmitted electrical or optical signals, expressed in Hertz. The greater or higher the bandwidth, the greater the information carrying capacity.

**BARE CONDUCTOR:** A conductor not covered with any insulating material.

**BASE BAND:** The frequency band occupied by all the transmitted modulating signals.

**BAUD:** Unit of measure for data transmission speed representing bits per second, e.g. 9,600 baud = 9,600 bits per second (bps).

**BC:** Bare copper.

**2BC:** Double bare copper shield.

**BCCS:** Bare copper-clad steel.

**BC-S:** Double shield; 1 bare copper, 1 silver.

**BEADED COAX:** A coaxial cable in which the dielectric consists of beads made of various materials.

**BELL WIRE:** Common term for wire primarily used for making doorbell and thermostat connections.

**BELT (BELTED TYPE CABLE):** The number of layers of insulation on a conductor or layers of jacket on a cable.

**BEND RADIUS:** The radius of curvature that an optical fibre cable can bend without causing harmful effects on the optical or mechanical performance of the cable.

**BENDING LOSS:** In a fibre optic system a form of increased attenuation caused by a) Having the fibre curved around a restrictive radius of curvature; or b) Micro bends caused by minute distortions in the fibre imposed by externally induced

disturbances. Excessive bending loss may result from poor drawing or cable manufacturing technique.

**BENDING RADIUS:** Radius of curvature around which a fibre is bent under a stated pulling force.

**BerC:** Beryllium-copper alloy.

**BIAS:** a) A voltage applied to a device to establish a reference level for operation. b) A high frequency voltage combined with an audio signal to reduce distortion.

**BINDER:** A spirally served tape or thread used for holding assembled cable components in place awaiting subsequent manufacturing operations.

**BOND STRENGTH:** Amount of adhesion between bonded surfaces, e.g. in cemented ribbon cable.

**BONDABLE WIRE:** An insulated wire whose surface has been specially treated to make it possible to adhere to other materials such as potting compounds. The term usually refers to extruded PTFE insulated wires. The etching process roughens the surface of the insulation permitting an interlocking effect with potting compounds.

**BONDED CONSTRUCTION:** A type of insulation construction in which the glass braid and nylon jacket are bonded together as in certain wire sizes of MIL-DTL-5086 Type II.

**BOOT:** A protective covering over any portion of a cable or conductor in addition to its jacket or insulation.

**BPS:** Bits per second.

**BRAID:** A fibrous or metallic group of filaments interwoven to form a covering over one or more wires. Usually saturated with an impregnant to protect it against moisture and fraying.

**BRAID ANGLE:** The smaller of the two angles formed by the shielding strand and the axis of the cable being shielded.

**BRAIDED WIRE:** Woven bare or tinned copper wire used as shielding for wires, cables, and ground wire for batteries or heavy industrial equipment. There are many different types of constructions.

**BRAZING:** The joining of the end of two wires, or groups of wires with a nonferrous filler metal at temps above 427 °C.

**BREAKDOWN OF INSULATION:** Failure of an insulation resulting in a flow of current through the insulation. It may be caused by the application of too high a voltage or defects or decay in the insulation.

**BREAKDOWN VOLTAGE:** The voltage at which the insulation between two conductors breaks down.

**BREAKING STRENGTH:** The maximum load that a conductor can withstand when tested in tension to rupture. This force is usually expressed in pounds (lbs) or kilograms (kgs).

**BREAKOUT:** A breakout is a joint where a conductor or conductors break out from a multi-conductor cable to complete circuits at various points along the main cable.

The rest of the conductors continue within the jacket. The breakout may itself be jacketed and the joint sealed.

**BS:** British Standard

**BUFFER (TUBE):** Metallic or non-metallic tube used to protect optical fibres from physical damage, providing mechanical isolation and/or protection.

**BUILDING WIRE:** Commercial wires used in the building trades such as: Types RR, RH, RL, TW, THW, and THHN wires. General used for light and power, 600 volts or less, usually not exposed to outdoor environment.

**BUNA RUBBER:** A synthetic rubber.

**BUNCH STRANDING:** A conductor in which all individual wires are twisted in the same direction without a predetermined pattern.

**BURIAL CABLE:** Cable installed directly in the earth without use of an underground conduit. Also called 'direct burial cable.'

**BUS (BUS BAR):** A conductor, often a heavy strap or bar, used to make a common connection between several circuits.

**BUTYL:** Used for any of various synthetic rubbers made by polymerising isobutylene.

**BX:** A very common type of armoured building wire in various configurations, rated at 600 volt.

# C

**CABLE:** a) A cable may be a small number of large conductors or many small conductors, cabled together, usually colour coded and with a protective jacket overall. b) A single conductor larger than 9 AWG.

**CABLE ASSEMBLY:** A cable assembly is a cable with plugs or connectors on each end for a specific purpose. It may be formed in various configurations.

**CABLE CORE:** The portion of an insulated cable lying under the protective covering or jacket.

**CABLE FILLER:** The material used in multi-conductor cables to occupy the spaces formed by the assembly of components thus forming a core of the desired shape (normally cylindrical).

**CABLE SHEATH:** A cable sheath is a covering of rubber, TPE, resin, or lead over a wire or cable core.

**CABLING FACTOR:** Symbol **K**. A constant used in determining the approximate finished O.D. of an unshielded, unjacketed cable.  $D = Kd$ , where **D** is the diameter, **K** is the factor, and **d** is the diameter of one insulated conductor. A separate constant is used based on the number of conductors used.

**CAD BR:** Cadmium bronze.

**CADMIUM:** A bluish-white malleable ductile toxic bivalent metallic element used in protective plating's and in bearing metals.

**CAGED ARMOUR:** The armour wires within a polyethylene jacket to increase mechanical protection and tensile strength. Often used in submarine cables.

**CAPACITANCE:** Capacitance is that property of a system of conductors and dielectrics which permits the storage of electricity when potential differences exist between the conductors. The value depends largely on the surface area of the plates, distance between them, and the composition of the medium between the plates. Abbreviation CAP. The unit of measure is farad (f).

**CAPACITANCE, DIRECT:** The capacitance measured directly from conductor to conductor through a single insulating layer.

**CAPACITANCE, MUTUAL:** The capacitance between two conductors with all other conductors, including shield, short-circuited to ground.

**CAPACITANCE, UNBALANCED:** An inequality of capacitance between the wires of two or more pairs which results in a transfer of unwanted signal from one pair to others.

**CAPACITANCE, UNBALANCED to GROUND:** An inequality of capacitance between the ground capacitance of the conductors of a pair which results in a pick-up of external source energy, usually from power transmission lines.

**CAPACITIVE COUPLING:** Electrical interaction between two conductors caused by the capacitance between them.

**CATEGORY 1:** A UL designation for inside telephone cable for voice. Also referred to as Level 1.

**CATEGORY 2:** A UL designation for inside telephone cable for voice. Also referred to as Level 2.

**CATEGORY 3:** A UL designation for inside telephone cable that is the lowest performance level recommended for voice. Also referred to as Level 3.

**CATEGORY 4:** A UL designation for inside cable for Data Grade UTP. Also referred to as Level 4.

**CATEGORY 5E:** A UL designation for inside data cable that is the lowest performance level recommended for enhanced 350 MHz data cable. Also referred to as Level 5.

**CATEGORY 6:** A UL designation for inside data cable that is the highest performance data cable.

**CATHODE:** Negative pole of an electric source. Opposite-anode.

**CBO:** Brewery cord.

**CCA:** Copper-clad aluminium.

**CCS:** Copper-clad steel. See copper-clad.



**CDDI:** Cable distributed data interface.

**CE:** Conformité Européene

**CEC:** Canadian Electrical Code.

**CEN:** Conformité Européene for Standardisation

**CELLULAR POLYETHYLENE:** Expanded or 'foam' polyethylene consisting of individual closed cells suspended in a polyethylene medium.

**CERTIFICATE OF COMPLIANCE (CONFORMANCE):** A certificate which is normally generated by a quality control department which shows that the product being shipped meets the customer's specifications. Abbreviation C of C, sometimes referred to as CERTS.

**CERTIFIED TEST REPORTS:** A report providing actual test data on a cable. Tests are normally run by a quality control department which show that the product being shipped conforms to test specifications. Abbreviation CTR or TR.

**CERTS:** Abbreviation for certificate of compliance. See certificate of compliance.

**CF:** The designation for cotton fixture wire. It is a cotton insulated, impregnated with moisture resisting, flame-retarding compound. It is used in lighting fixtures up to 90 °C.

**CF GLASS:** Means continuous filament glass yarn which is used in braiding, in making glass fabric, and glass thread.

**CHARACTERISTIC IMPEDANCE:** a) The impedance that when connected to the output terminals of a transmission line of any length, makes the line appear infinitely long. b) The ratio of voltage to current at every point along a transmission line on which there are no standing waves.

**CHEMICALLY CURED COMPOUND:** Those compounds which are cured by chemical process rather than by heat and pressure.

**CHLOROPRENE:** A colourless liquid  $C_4H_5Cl$ . Abbreviated as chloro.

**CHLOROSULFONATED POLYETHYLENE:** A synthetic rubber. Resistant to oxidation by ozone, sun, weather, heat, and chemicals, rated 90 °C.

**CHROMATIC DISPERSION:** Different wavelengths travel along an optical medium at different speeds. Wavelengths reach the end of the medium at different times, causing the light pulse to spread. This chromatic dispersion is expressed in picoseconds (of dispersion) per kilometre (of length) per nanometre (of source bandwidth). It is the sum of material and waveguide dispersion.

**CHROMIUM:** A blue-white metallic element found naturally only in combination and used in alloys and in electroplating.

**CIRCUIT (ELECTRIC):** The complete path of an electrical current. When the continuity of the circuit is broken, it is called an open circuit; when continuity is maintained, it is called a closed circuit.

**CIRCUIT SIZES:** A popular term for building wires sizes 14 through 10 AWG.

**CIRCULAR MIL:** A term used to define cross sectional areas of conductors. It is an area equal to the area of a circle one-thousandth ( $10^{-3}$ ) of an inch in diameter. As the number of circular mils increases, the size of a wire increases. Abbreviation CM.

**CL2:** Class 2 cable.

**CL2P:** Class 2 plenum cable.

**CL2R:** Class 2 riser cable.

**CL2X:** Class 2 cable, limited use.

**CL3:** Class 3 cable.

**CL3P:** Class 3 plenum cable.

**CL3R:** Class 3 riser cable.

**CL3X:** Class 3 cable, limited use.

**CLADDING:** a) In fibre optics the layer of material, usually glass, that immediately surrounds the fibre core of optical fibre cable. The cladding is usually coated with another material to provide protection when handling. b) A method of applying a layer of metal over another metal whereby the junction of the two metals is continuously welded.

**CLC:** CENELEC, Comité Européen de Normalisation

**CLEAVING:** The process of separating an optical fibre by a controlled fracture of the glass, for the purpose of obtaining a fibre end, which is flat, smooth, and perpendicular to the fibre axis.

**CM:** a) Communication general purpose cable. b) Abbreviation for circular mil. See circular mil.

**CMP:** Communication plenum cable.

**CMR:** Communication riser cable.

**CMX:** Communication cable, limited use.

**COATING:** A material applied to the surface of a conductor to prevent environmental deterioration, facilitate soldering, or improve electrical performance.

**COAX:** See coaxial cable.

**COAXIAL CABLE:** A cable in which one conductor surrounds the other, the two being coaxial and separated by a continuous solid dielectric or by dielectric spacers. When the outside conductor is grounded, the inside conductor is not susceptible to external fields from outside sources. Commonly called coax.

**COIL:** A coiled conductor, wound on a form or core which uses electromagnetic induction to cause changes in a current.

**COLD BEND:** A test to determine cable or wire characteristics at low temperatures. The test specimen and a specified mandrel are cooled in a low temperature box to the specified temperature. The wire specimen is then wound around the mandrel after which it is examined for cracks or other defects caused by bending at low temperatures.

**COLD FLOW:** Permanent deformation of the insulation due to mechanical force or pressure (not due to heat softening).

**COLD TEST:** Tests performed on cables to check their performance at a specified low temperature as outlined in various specifications.

**COMMON AXIS CABLING:** In multiple cable constructions, a twisting of all conductors around a 'common axis' with two conductor groups then selected as pairs. This method yields smaller diameter constructions than a separate axis, but tends to yield greater susceptible to EMI and ESI.

**COMPACT CONDUCTOR:** Refers to a stranded conductor which is rolled to deform the round wires to fill the normal interstices between the wires in a strand.

**COMPOSITE CABLE:** A cable consisting of two or more different types or sizes of wire and/or cable.

**COMPOUND:** An insulating or jacketing material made by the chemical union of two or more ingredients.

**CONCENTRIC LAY CONDUCTOR:** A single conductor composed of a central core surrounded by one or more

helically laid wires. Each succeeding layers is applied with an opposite direction twist. The number of wires in the centre wire is six, and each succeeding layer consists of six additional wires, so that the number of wires in the strands are 7, 19, 37,61, etc.

**CONCENTRIC STRANDING:** A central wire or core surrounded by one or more layers of helically wound strands in a fixed round geometric arrangement. Generally, each layer, after the first, has six more strands than the preceding layer and is applied in a direction opposite to that of the layer under it.

**CONCENTRICITY:** In a wire or cable, the measurement of the location of the centre of the conductor with respect to the geometric centre of the surrounding insulation.

**CONDUCTANCE:** Symbol **G**. The measure of the ability of a substance to conduct electricity. The ratio of the current flow to the potential difference causing the flow. The real part of the admittance, **Y**, which is given by:

$$Y = G + i B$$

where **B** is the susceptance and **i** equals  $\sqrt{-1}$ .

For a direct current circuit, the conductance is the reciprocal of resistance and is measured in ohms. For a circuit containing both resistance, **R**, and reactance, **X**, the conductance is given by:

$$G = R / (R^2 + X^2)$$

**CONDUCTIVITY:** The capability of a material to carry electrical current, usually expressed as a percentage of copper conductivity (copper being 100%). The reciprocal of resistivity.

**CONDUCTOR:** A material that offers a low resistance to the passage of electric current (see resistivity). When a potential difference is applied across it, a relatively large current flows. A conductor usually consists of copper, aluminium, steel, silver, or other materials. Abbreviated as cond.

**CONDUIT:** A tube or trough for protecting electrical wires or cables.

**CONNECTOR:** A mechanism used to unite two pieces of cable, both physically and electrically.

**CONSERVATION OF ENERGY PRINCIPLE:** A principle in physics; the total energy of an isolated system remains constant irrespective of whatever internal change may take place with energy disappearing in one form and reappearing in another.

**CONSTANTAN:** An alloy of 55% copper and 45% nickel used in thermocouple with copper in the temperature range of 169 °C to 386 °C. Temperature coefficient of electrical resistivity, 0.0002 / °C.

**CONSTRUCTION PRODUCTS REGULATION:** see **CPR**

**CONTACT:** The part of a conductor which carries the electrical current and is touched together or separated to control flow.

**CONTINUITY CHECK:** A test performed on a length of finished wire or cable to determine if the electrical current flows continuously throughout the length. Each conductor may also be checked against each other to ascertain that no shorts exist between conductors.

**CONTINUOUS DUTY:** In some portable cords there are two standard number of strands of a given wire size. The one with the greater number (most flexible) is called continuous duty and the other is called stationary duty.

**CONTINUOUS VULCANISATION:** The process of extruding on a wire, under high pressure, a uniform seamless, close-fitting tube of a rubber or rubberlike compound. The covered wire then continues into a vulcanizing chamber, where, under high pressure and temperature, the insulation or jacket is vulcanised continuously rather than in sections.

**CONTROL CABLE:** A cable used for remote control operation of any type of electrical power equipment.

**COPOLENE:** A dielectric material used in manufacturing coaxial cable. Developed as a substitute for polystyrene, it is composed of polystyrene and polyisobutylene. Since it has undesirable characteristics, it has been replaced by polyethylene. Abbreviated as copo.

**COPOLYMER:** A compound resulting from the polymerisation of two different monomers.

**COPPER-CLAD:** Steel wire with a coating of copper welded to it, as distinguished from copper-plated. Abbreviated CCS.



**COPPER CONSTANTAN:** Copper and constantan are two materials used in making thermocouple wires. The copper is the positive wire and the constantan is the negative wire.

**CORD:** A small, flexible insulated conductor or conductors, usual 10 AWG or smaller and not more than four conductors, jacketed to protect the conductors.

**CORD SETS:** Portable cords fitted with any type of wiring device at one or both ends.

**CORE:** a) In cables, a component or assembly of components over which additional components (shield, sheath, etc.) are applied. b) In fibre optic cable, the central part of the glass construction through which light is transmitted.

**CORONA:** Ionisation of air surrounding a conductor caused by the influence of high voltage.

**CP:** Chlorosulfonated polyethylene. Also abbreviated as CSPE.

**CPC:** Copper polyester copper laminate.

**CPE:** Chlorinated polyethylene, a conductive polyethylene.

**CPR:** The Construction Products Regulation (CPR) lays down harmonised rules for the marketing of construction products in the EU. Building and construction cables manufactured after 1<sup>st</sup> July 2017 are subject to CPR. Products are classified from A to F depending on their flame characteristics with additional classifications for smoke, flaming droplets and acidity (see next page).

## CPR Classifications

EUROCLASS	Reaction to Fire	It's unlikely for many cables to meet Aca		
A <sub>ca</sub>	Gross heat of combustion EN ISO 1716	Smoke Production	Acidity	Flaming Droplets
B1 <sub>ca</sub>	Flame Spread EN 50399 also known as a ladder test and EN 60332-1-2	Mandatory test for smoke production monitored during ladder test for s1, s2 and s3. If it passes s1 it can also undergo an additional higher level of test for s1a and s1b EN 61304-2	Optional separate test to measure the acidity of gases given off. Measured as pH and conductivity µS/mm  a1- best a2- middle a3- worst  EN 60754-2	Optional additional observation during the ladder fire test to monitor flaming droplets  d0- best d1- middle d2- worst  EN 50399
B2 <sub>ca</sub>	Heat Release EN 50399 Measured during the ladder test			
C <sub>ca</sub>				
D <sub>ca</sub>	Heat Release EN 50399 Flame Spread EN 60332-1-2			
E <sub>ca</sub>	Flame Spread EN 60332-1-2 also known as the Bunsen Burner Test. Basic test by independent authorised laboratory (notified body)			
F <sub>ca</sub>	Factory or laboratory test (not necessarily notified body) but does not meet the requirements of class Eca			

Classes A to E have to be tested by an independent authorised laboratory (notified body). Most cables will fall into classes B2ca to Eca. For a cable to meet B1ca, B2ca or Cca, there also needs to be regular factory audits.

**CPVC:** Chlorinated polyvinylchloride.

**CR:** Chloroprene rubber.

**CRAZING:** The minute cracks on the surface of plastic materials.

**CRCS:** Continuous rigid cable support, synonymous with tray.

**CREEPAGE:** Electric leakage on a solid dielectric surface.

**CROSS-LINKED:** Intermolecular bonds between long chain thermoplastic polymers by means of chemical or electron bombardment. The properties of the resulting thermosetting material are usually improved. Abbreviation XL.

**CROSS SECTIONAL AREA OF A CONDUCTOR:** The sum of cross-sectional areas of all the individual wires comprising the strand.

**CROSS TALK:** Signal interference due to cross coupling between nearby conductors producing an unwanted signal in one circuit when a signal is present in the other. A phenomenon usually due to induction.

**CSA:** Canadian Standards Association. This is the Canadian counterpart of the Underwriters Laboratories (UL) in the U.S.

**CSPE:** Chlorosulfonated polyethylene. Also abbreviated as CP.

**CURRENT:** The rate of flow of electricity. Usually measured in amperes. Symbol I.

**CURRENT CARRYING CAPACITY:** The maximum current an insulated conductor can continuously carry without exceeding its insulation and jacket temperature limitations. Also called ampacity.

**CUTOFF WAVELENGTH:** In fibre optics cable, the wavelength at which a single-mode fibre transmits a single-mode of light.

**CV:** See continuous vulcanisation.

**CYCLE:** The complete sequence of alteration or reversal of the flow of an alternating electric current.

## D

**db LOSS:** The loss of signal over a path or conductor, expressed in decibels.

**DCR:** Abbreviation for direct current resistance. The resistance offered by any circuit to the flow of direct current.

**DECA:** A prefix to a unit, denoting a multiple of ten (10) of that unit.

**DECI:** A prefix to a unit, denoting a submultiple of one-tenth ( $10^{-1}$ ) of that unit.

**DECIBEL:** A unit used to express ratios of sound or signal power, defined by the following formula where **n** is the number of decibels.

$$n = 10 \log_{10} (P_2 / P_1)$$

Where  $P_1$  and  $P_2$  are the power levels. Since decibels represent a ratio, it is necessary to establish a reference level in order to indicate an absolute level. For sound, the reference level is a pressure of 0.0002 microbar. Abbreviated as db.

**DEGREE RISE:** The amount of increase in temperature caused by the introduction of electricity into a unit.

**DELAY LINE:** A conductor that is made of a specific material in a specific size and length that will permit the delay of an electrical impulse for a predetermined specific length of time. The delay is measured in microseconds or nanoseconds.

**DENSITY:** The distribution of a quantity (as mass, electricity, or energy) per unit, usually of space.

**DESICCANT:** Water or moisture absorbent material used to prevent moisture from damaging packaged equipment or other merchandise.

**DIELECTRIC:** Any insulating material that is a non-conductor of electricity.

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

**DIELECTRIC CONSTANT:** The factor by which the electric field strength in a vacuum exceeds that in the dielectric for the same distribution of charge. Symbol **K**. The K for air is 1.0.

**DIELECTRIC LOSS:** Energy dissipated as heat when the dielectric is placed in a varying electric field.

**DIELECTRIC STRENGTH:** The maximum potential gradient (volts per mil) a dielectric will stand without breaking down; the voltage stress required to puncture an insulation of known thickness (in volts per unit, usually volts per mil.)

**DIODE:** Any electronic device that has only two electrodes. There are several different types of diodes, their voltage characteristics determining their application. Diodes are most commonly used as rectifiers.

**DIRECT BURIAL CABLE:** A cable installed directly in the earth without use of an underground conduit. Also called 'burial cable'.

**DIRECT CURRENT:** A direct current is one which flows in one direction. Further classifications of direct currents are a) Continuous currents which are steady, non-pulsating direct currents;

b) Constant currents, which continue to flow for a considerable time in the same direction and with unvarying intensity; and c) Pulsating currents, which are regularly varying continuous currents. Abbreviations DC and dc.

**DIRECTION OF LAY:** The lateral direction in which the strands of a cable run over the top of the cable as they recede from you looking along the axis of the cable.

**DISPERSION:** A general term for those phenomena that cause a broadening or spreading of light as it propagates through an optical fibre. The three types are modal, chromatic, and waveguide.

**DOP:** Declaration of Performance

**DOUBLE SHIELD:** Two shields, one over the other. Maximum coverage is 98%.

**DRAIN WIRE:** An uninsulated solid or stranded tinned copper wire which is placed directly under a shield. It touches the shield throughout the cable, and, therefore, may be used in terminating the shield to ground.

A big labour saver in terminating all shielded cables. It is completely necessary on spiral shielded cables because it eliminates the possibility of induction in a spiral shield.

**DRAWING:** In wire manufacturing, pulling of metal through a die or series of dies to reduce diameter to a specific size.

**DROP CABLE:** In a CATV system, the transmission cable from the distribution cable to a dwelling.

**DRYFLEX® CABLE COMPOUNDS:** A range of low smoke, halogen-free cable compounds developed by **HEXPOL TPE**.

To address increasing demands on power and telecommunications infrastructure, we've developed materials for cable sheathing applications. The range includes grades based on different polymer chemistries, including EVA, TPE and TPV technologies. This brings one of the widest ranges of properties and customisation possibilities to the market and gives cable manufacturers the flexibility to select the best solution for their application.

### **KEY PROPERTIES**

- LSZH Low Smoke Zero Halogen
- RoHS, SVHC & REACH compliant
- Superior ageing performance
- Easy processing - with no post vulcanisation required
- Designed to meet various cable standards, such as BSI 7655 LTS3
- Typical LOI values 25 - 42 %

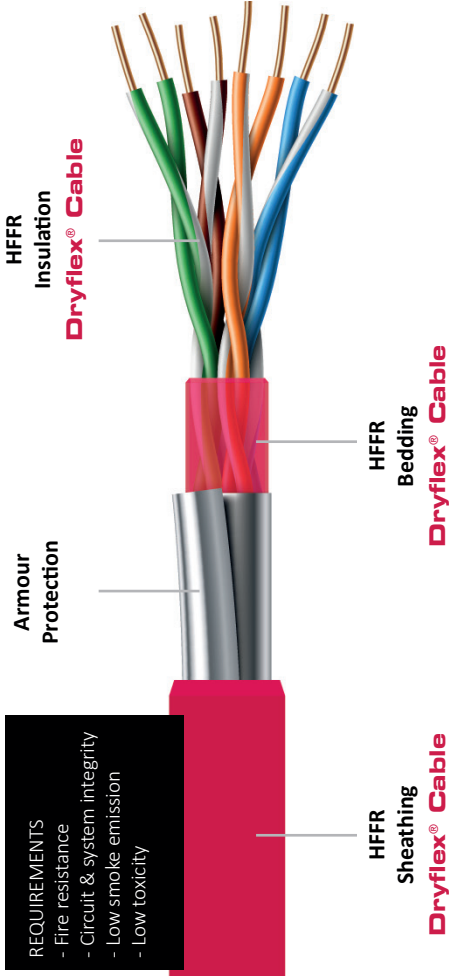
### **TYPICAL APPLICATIONS**

Dryflex Cable compounds provide added security in areas of high human occupancy, where people need to be evacuated quickly and safely. They offer excellent thermomechanical properties making them suitable for both telecommunication and electric cables. Typical applications include low voltage, data, insulation, jacketing and bedding.





# ANATOMY of a CABLE



**DUCT:** An underground or overhead tube for carrying electrical conductors.

**DUPLEX:** Two conductors twisted together, usually with no outer covering. This word has a double meaning and it is possible to have parallel wires and jacketed parallel wires and still refer to them as a duplex.

## E

**EARTH FAULT:** A fault that occurs when a conductor is accidentally connected to earth or when the resistance to earth of an insulator falls below a specific value.

**EARTH POTENTIAL:** The potential of a large conducting body, such as the earth, taken to be the arbitrary zero in the scale of electrical potential. Synonymous with zero potential.

**ECHA:** European Chemicals Agency.

**ECM:** Electronic Counter Measure. The use of equipment to prevent or induce jamming of electronic equipment, missile systems, radar, radio, and other devices.

**ECTFE:** Ethylene chlorotrifluoroethylene copolymer. See ethylene chlorotrifluoroethylene.

**EEA:** Ethylene-ethyl acrylate co-polymer.

**EHF:** Extremely high frequency. See frequency band.

**ELECTRICAL DUCT:** Any electrical conduit or other raceway round in cross section, approved or listed for use underground, and embedded in earth or concrete.

**ELECTRO TINNED:** Wire tinned with pure tin using an electrolytic process.

**ELECTROMOTIVE FORCE:** Pressure or voltage. The force which causes current to flow in a circuit. The algebraic sum of the potential differences in a circuit equals the EMF, which is measured by the energy liberated when unit electric charge passes completely round the circuit. A battery of EMF, **E**, will supply a current, **I**, to an external resistance, **R**:

$$E = I (R + r)$$

where **r** is the internal resistance of the battery.

The term 'electromotive force' applies to a source of electrical energy but is sometimes misused as being equivalent to potential difference. Symbol E. Abbreviated as EMF.

**ELONGATION:** The state of being elongated or lengthened.

**ELV:** Extra low voltage, below 70V. See VOLTAGE

**EMC:** Electromagnetic compatibility. No emission of interference exceeding FCC limits.

**EMI:** Electromagnetic interference.

**EMP:** Electromagnetic pulse.

**EN:** European Norms

**ENAMELLED WIRE:** A conductor with a baked-on varnish enamel; may be 7 AWG through 50 AWG. Intended for use in winding motors, coils, transformers, and other applications of similar usage.

**ENERGISE:** To apply rated voltage to a circuit or device, such as the coil of a relay, in order to activate it.

**ENERGY:** The capacity for performing work.

**EP:** Ethylene propylene.

**EPDM:** Ethylene propylenediene monomer rubber.

**EPN:** Extended performance network cable.

**EPOXY:** A potting resin used in bonding, e.g. to bond PTFE wire to pot connectors to assure that they are moisture proof.

**EPR:** Ethylene propylene copolymer rubber. It has properties like butyl rubber. The polymer is chemically cross-linked.

**ESI:** Electrostatic interference.

**ETCHED WIRE:** A process applied to PTFE wire in which the wire is passed through a sodium bath to create a rough surface to allow epoxy resin to bond the PTFE.

**ETHERNET:** Local area network configuration.

**ETHYLENE:** A colourless flammable gaseous un-saturated hydrocarbon  $C_2H_4$  that is found in coal gas. It can be produced by pyrolysis of petroleum hydrocarbon.

**ethylene chlorotrifluoroethylene:** A high temperature fluoropolymer of high dielectric strength. Abbreviation ECTFE. Also abbreviated as ECTFE-XI.

**ethylene tetrafluoroethylene:** A high temperature insulation of high dielectric strength. Abbreviation ETFE.

**ethylene tetrafluoroethylene copolymer:** A high temperature cross-linked fluoropolymer of high dielectric strength per MIL-C-17. Abbreviation XLETFE.

**Ethylene vinyl acetate:** A plastic made by combining ethylene and vinyl acetate. Soft and elastic. Abbreviation EVA

**ETL:** ETL Testing Laboratory.

**ETSI:** European Telecommunications Standards Institute

**EVA:** Ethylene vinyl acetate. EVA based compounds are known for their halogen free flame retardant properties. They also offer good oil resistance. **The Dryflex® CABLE range from HEXPOL TPE includes EVA based compounds.**

**EXTREMELY HIGH FREQUENCY:** See frequency band.

**EXTRUDE:** To shape (metal or plastic) by forcing through a die.

**EXTRUSION:** The process of continuously forcing a plastic

or elastomer and a conductor core through a die, thereby applying a continuous coating of insulation or jacket to the core or conductor.

## F

**FARAD:** A unit of capacitance. Usually expressed in microfarads ( $\mu\text{F}$ ) one-millionth ( $10^{-6}$ ) of a farad; or picofarads (pf) one-trillionth ( $10^{-18}$ ) of a farad. Abbreviation f.

**FATIGUE RESISTANCE:** Resistance to metal crystallisation that occurs when the conductors or wires break from flexing.

**FAULT CURRENT:** A current that may flow through a circuit or device as a result of a fault, such as a defect in the insulation.

**FDDI:** Fibre distributed data inter-face.

**FEP:** Fluorinated ethylene propylene. It was formerly called X-100 or FEP-100. This is a fluorocarbon resin.

**FEP-IX:** Extruded fluorinated ethylene propylene, type IX per MIL-C-17.

**FEP-XII:** Extruded fluorinated ethylene propylene, type XII per MIL-C-17.

**FF:** There are two types, commercial and military. Commercial type is UL approved fixture wire. Construction is stranded copper conductor, rubber insulation, and cotton braid.

Military type FF is MIL-W-16878D, 1,000 volt, 200° C, sizes 24 AWG to 4/0 AWG. Construction is stranded tin copper conductor, silicone rubber insulation, with or without an outer glass braid.

**FG:** Fibreglass.

**FG BRAID-V:** Fibreglass impregnated type V per MIL-C-17.

**FHPE:** Foamed high-density polyethylene.

**FIBRE OPTICS:** Transmission of energy by light through glass fibres.

**FIELD:** Area through which passes electric and/or magnetic lines of force.

**FIGURE 8 CABLE:** An aerial cable in which the conductors and steel supporting strand are jacketed together in such a manner that a cross section of the cable approximates the figure eight.

**FILLED CABLE:** A telephone cable construction in which the cable core is filled with a material that will prevent moisture from entering or passing through the cable.

**FILLED STRAND:** Conductor in which the interstices between the individual wires are filled with a compound to prevent moisture migration along the conductor.

**FILLER:** a) Fillers are used in multi-conductor cable to occupy the voids formed by the assembled conductors. This is done

so that the resulting configuration will be round. b) An inert substance added to a compound to improve properties or decrease cost.

**FL:** FL poly tape.

**FLAME-RESISTANCE:** The ability of a material not to propagate flame once the heat source is removed.

**FLAME-RETARDANT:** Ability of a material to prevent the spread of combustion by a low rate of travel so the flame will not be conveyed.

**FLAMMABILITY:** The measure of a material's ability to support combustion.

**FLASHOVER:** A disruptive discharge in the form of an arc or spark between two electrical conductors or between a conductor and earth.

**FLASHOVER VOLTAGE:** The voltage between two conductors at which flashover occurs. The dry flashover voltage is the voltage at which flashover occurs when the conductors are separated by a clean dry insulator. The wet flashover voltage is the voltage at which flashover occurs when the clean insulator is wet.

**FLAT CONDUCTOR:** A wire having a rectangular cross section as opposed to round or square conductors.

**FLEX LIFE:** The measure of the ability of a conductor or cable to withstand repeated bending.



**FLUOROCARBON:** Any of various chemically inert compounds containing carbon and fluorine used chiefly as lubricants, refrigerants, non-stick coatings, and formerly aerosol propellants and in making resins and plastics.

**FLUOROPOLYMER:** Insulations or jackets characterised by the presence of fluorine in the formulation.

**FM:** Frequency modulation.

**FOAMED PLASTICS:** Insulations having a cellular structure.

**FP:** Fluorocarbon polymer, modified polytetrafluoroethylene (PTFE). See polytetrafluoroethylene.

**FPL:** Fire protective power-limited signalling circuit cable.

**FPLP:** Fire protective power-limited signalling circuit plenum cable.

**FPLR:** Fire protective power-limited signalling circuit riser cable. FR-1- See VW-1.

**FREQUENCY:** The number of times an alternating current reverses itself in one second. Expressed in Hertz (Hz), which is one cycle per second.

**FREQUENCY BAND:** A range of frequencies that forms part of a larger continuous series of frequencies. The internationally agreed radio frequency bands are shown on the next page.

Wavelength	Band	Frequency
1 mm-1 cm	extremely high frequency (EHF)	300-30 GHz
1 cm-10 cm	superhigh frequency (SHF)	30-3 GHz
10 cm-1 m	ultrahigh frequency (UHF)	3-0.3 GHz
1 m-10 m	very high frequency (VHF)	300-30 MHz
10 m-100 m	high frequency (HF)	30-3 MHz
100 m-1000 m	medium frequency (MF)	3-0.3 MHz
1 Km-10 Km	low frequency (MF)	300-30 KHz
10 Km-100 Km	very low frequency (VLF)	30-3 KHz

Microwave frequencies, ranging from VHF to EHF bands are usually subdivided into bands designated by letters. These are not internationally agreed upon, but the commonly used subdivisions are shown below:

Band	Frequency (GHz)	Wavelength (cm)
P	0.225-0.390	133.3-76.9
L	0.390-1.550	76.9-19.3
S	1.550-5.20	19.3- 5.77
X	5.20-10.90	5.77-2.75
K	10.90-36.00	2.75-0.834
Q	36.0-46.0	0.834-0.652

**FREQUENCY MULTIPLEXING:** The technique of sharing a transmission channel wherein carrier signals of different frequencies are transmitted simultaneously.

**FRHF:** Flame-retardant and halogen-free. A sheathing material which is flame-retardant, halogen-free, noncorrosive, low-smoke, and non-fire propagating.

**FRPE:** Fire retardant polyethylene.

**FRNC:** Flame Retardant Non-Corrosive

**F/S:** Foam skin insulation (expanded polyolefin with a skin of solid polyolefin).

**FT-4:** CSA designation for vertical tray flame test.

**FT-6:** CSA designation for plenum or MI flame test.

**FUSED SPIRAL TAPE:** This refers to a type of PTFE insulated hook-up wire. The conductor is run through a taping head so that each successive wrap overlays the previous wrap. The spiral wrapped conductor is then passed through a sintering oven where the overlaps are fused together. The wire is then sized and polished.

**FUSION SPLICE:** A splice accomplished by the application of localised heat enough to fuse or melt the ends of two lengths of optical fibre. Same as heat shrink splice.

# G

**G. CABLE:** G. cable is a type W or power cable with ground wires. The total CM (circular mil) area of the ground wires is approximately one-half to three-quarters of the CM area of one of the conductors.

**GAS FILLED CABLE:** Paper insulated lead sheath cable filled with gas which provides a self-supervised alarm system. There are three different types; low pressure, medium pressure, and high pressure. They may be installed in ducts, in air, or buried directly.

**GAS PRESSURE COMPENSATED:** A saturated paper insulated cable containing tubes for the transmission of gas pressure along a cable and with external gas feed to the tubes.

**GAUGE:** A term used to denote the physical size of a wire.

**GC:** Ground conductor.

**GFI:** Ground Fault Interrupter. A protective device that detects abnormal current flowing to ground and then interrupts the circuit.

**G-GC:** Type G-GC mining cable with grounding conductor and a ground check conductor.

**GIGA:** A prefix to a unit, denoting a multiple of one billion ( $10^9$ ) of that unit.

**GIGAHERTZ:** A term for one billion ( $10^9$ ) cycles per second.  
Abbreviation GHz.

**GLASS BRAID:** Used to provide thermal and/or mechanical protection to the underlying insulation of certain types of conductors.

**GPU:** Abbreviation for Ground Power Unit. A GPU is a mobile power generator used typically at airports.

**GRADED INDEX:** In fibre optic cable the refractive index profile that varies with the radius of the core. The refractive indices decrease from the centre axis out. The purpose is to reduce modal dispersion and thereby increase fibre bandwidth.

**GROMMET:** A flexible loop that serves as a fastening, support, or reinforcement; an eyelet of firm material to strengthen or protect an opening or to insulate or protect something passed through it.

**GROUND:** An object that makes an electrical connection with the earth; a large conducting body (as the earth) used as a common return for an electrical circuit and as an arbitrary zero potential; synonym for earth.

**GROUND FAULT:** A failure of transmission involving insulation to shield or insulation to ground wire.

**GROUND POWER CABLE:** A cable assembly fitted with the applicable terminations to supply power to an aircraft from a ground power unit (GPU).

**GROUNDING NEUTRAL:** The neutral wire is metallicity connected to ground.

**GS:** Galvanised steel.

**GTO:** Gas tube, sign, and oil burner ignition cable. Stranded tin copper conductor, poly-ethylene insulation, PVC jacket overall. Manufactured in 14 AWG for 10 kV and 15 kV service.

**GW:** Galvanised wire.

## H

**H:** Henry (unit of measure of inductance).

**HALOGEN:** Any of the five elements fluorine, chlorine, bromine, iodine, and astatine that form part of group VII A of the periodic table and exist in the free state normally as diatomic molecules.

**HARD DRAWN:** The conductor is work hardened in the drawing process. Hard drawn refers to the temper of conductors that are not annealed after drawing.

**HARNES:** An arrangement of wires and cables, usually with many breakouts, which have been tied together or pulled into a sheath, used to interconnect an electric circuit.

**HASH MARK STRIPE:** A noncontinuous helical stripe applied to a conductor for identification.

**HD:** High density.

**HDP:** High density polyethylene. Compared to PE (polyethylene) it has higher abrasion resistance, higher weatherability, and lower flexibility at room and low temperature. Also abbreviated as HDPE.

**HDPE:** High density polyethylene. Compared to PE (polyethylene) it has higher abrasion resistance, higher weatherability and lower flexibility at room and low temperature. Also abbreviated as HDP.

**HDXLPE:** High density cross-linked polyethylene.

**HEAT AND PRESSURE CURE:** Uncured rubber or rubberlike compound that is usually cooked in a mould under high pressure at a given temperature. The pressure, temperature, and time required for curing depends upon the type of compound used.

**HEAT ENDURANCE:** The time of heat aging that a material can withstand before failing a specific physical test.

**HEAT SHOCK:** A test to determine stability of a material by sudden exposure to a high temperature for a short period of time.

**HEAT SHRINK:** A material that shrinks when heated. Heat shrink tubing is used for insulation, sealing, and protecting wire connections, terminations, and splices.

**HEAT SHRINK SPLICE:** Same as Fusion Splice except the splice is protected within a heat shrink tube.

**HECTO:** A prefix to a unit, denoting a multiple of 100 ( $10^2$ ) of that unit.

**HELICAL STRIPE:** A continuous spiral stripe applied to the insulation of a conductor for the purpose of circuit identification.

**HENRY:** The unit of measure of inductance. It is defined as the inductance of a circuit in which a counter electromotive force of one volt is generated when the current is changing at the rate of one ampere per second. Abbreviation H.

**HERTZ:** A term replacing cycles per second as an indication of frequency. Abbreviation Hz.

**HF:** a) Heavy Formvar Magnet Wire. Soft bare copper wire with baked synthetic insulation overall. b) Abbreviation for high frequency. See frequency band.

**HFFR:** Halogen Free Flame Retardant

**HF/LS/LT:** Halogen-free, low smoke, low toxicity.

**HI-POT (HIGH POT) :** A test designed to determine the highest potential that can be applied to a conductor without breaking through the insulation.

**HIGH FREQUENCY:** See frequency band.



**HIGH TENSION:** See high voltage. Abbreviation HT.

**HIGH VOLTAGE:** A cable operating 35kV- 230kV

**HL:** CSA mark used to identify cables which comply with the Hazardous Location performance requirements of CSA C22.2 No. 174 specification.

**HMWPE:** High molecular weight polyethylene.

**HOOK-UP WIRE:** A wire used for low current, low voltage (under 1,000 volts) applications within enclosed electronic equipment, usually 12 AWG and smaller.

**HOT TIN DIP:** A process of passing bare wire through a bath of molten tin to provide a coating.

**HPD:** Heater cord, rubber, and high temperature barrier, insulated with an overall braid.

**HR:** High resistance wire.

**HT:** a) high tension. See high voltage. b) high temperature.

**HW:** Type designation for heavy wall, 2,500-volt electronic hook-up wire to MIL-W-76.

**HV:** High Voltage, 35kV-230kV

**HYGROSCOPIC:** Readily absorbing and retaining moisture.



**I:** Symbol used to designate current. See current.

**IACS:** International Annealed Copper Standard. Refined copper for electrical conductors: 100% conductivity at 20 °C for 1 m X 1 mm<sup>2</sup> has 1/58-ohm resistivity, 8.93 (changed to 8.89 in 1977) grams per mm<sup>2</sup> density, 0.000017 per degree C coefficient of linear expansion, and 1/254.45 per degree C coefficient of variation of resistance.

**IC:** Integrated circuit.

**ICEA:** Insulated Cable Engineers Association (USA), formerly IPCEA.

**I.D.:** Inside diameter.

**IEC:** International Electrotechnical Commission, similar to the International Standards Organization (ISO).

**IEEE:** Institute of Electrical and Electronic Engineers.

**IMP:** Impedance. See impedance.

**IMPACT STRENGTH:** A test for determining the mechanical punishment a cable can withstand without physical or electrical breakdown by impacting with a given weight, dropped a given distance, in a controlled environment.

**IMPEDANCE:** A measure of the response of an electric circuit to an alternating current. Measured in ohms (volts per ampere). Symbol  $Z$ . The current is opposed by the capacitance and inductance of the circuit in addition to the resistance. The total opposition to current flow is the impedance, given by the formula:

$$Z = R + iX$$

where  $R$  is resistance,  $X$  is reactance and  $i$  equals  $\sqrt{-1}$

The real part, the resistance, represents a loss of power due to dissipation. The imaginary part, the reactance, indicates the phase difference between the voltage and current. It is either positive or negative depending on whether the current lags or leads the voltage, respectively. In a circuit containing only resistance or in a resonant circuit, the current and voltage are in phase and  $Z$  is purely resistive. In a circuit containing only reactance, the current and voltage are out of phase and  $Z$  is purely imaginary, i.e., there is no dissipation in the circuit. Reciprocal of admittance. Abbreviated imp.

**IMPEDANCE, HIGH:** Generally, 25,000 ohms or higher.

**IMPEDANCE, LOW:** Generally, 1 through 600 ohms.

**IMPREGNATED CABLE:** A cable with paper insulation in which the insulating properties of the paper tapes are improved by impregnating them with an insulating compound, such as oil.

**IMPULSE STRENGTH:** The voltage breakdown of insulation under voltage surges on the order of microseconds in duration.

**IMSA:** International Municipal Signal Association, specification for fire alarm cable.

**INDEX OF REFRACTION:** See refractive index.

**INDUCED CURRENT:** An electric current that flows in a conductor as a result of a changing magnetic flux density, in which lines of magnetic flux intersect with the conductor.

**INDUCTANCE:** The property of a circuit or circuit element that opposes a change in current flow, thus causing current changes to lag behind voltage changes. It is measured in henrys. Symbol L.

**INDUCTION:** The phenomenon of a voltage, magnetic field, or electrostatic charge being produced in an object by lines of force from the source of such fields.

**INDUCTIVE COUPLING:** Cross talk resulting from the electromagnetic field of one conductor on another.

**INSERTION LOSS:** The total optical power loss caused by the insertion of an optical component such as a connector, splice, or coupler.

**INSULATION:** That portion which is relied upon in a cable to segregate and protect the conductor from the other conductors, conducting parts, or from ground.

**INSULATION LEVEL:** The impulse voltage break-down of cables and equipment.

**INSULATION RESISTANCE:** The resistance offered by an insulating material to the flow of current resulting from an impressed DC voltage.

**INSULATOR:** a) A nonconducting substance such as porcelain, plastic, glass, rubber, etc; b) a device made of such material used for separating or supporting conductors to prevent undesired flow of electricity.

**INTERAXIAL SPACING:** Centre to centre conductor spacing in paired wire; centre to centre spacing between conductors in a flat cable.

**INTERCOM WIRE:** Wire used to connect communication instruments, telephones, telegraphs, etc.

**INTERLACED TAPES:** Two or more tapes, generally of different composition, applied simultaneously in such a manner that a portion of each tape overlays a portion of the other tape.

**INTERSTICE:** A space that intervenes between things.

**IPE:** Irradiated polyethylene tape.

**IRON CONSTANTAN:** A combination of metals used in thermocouple, thermocouple wires, and thermocouple lead wires. The iron wire is positive. The constantan is the negative wire.

**IRRADIATION:** In insulations, the exposure of the material to high energy emissions for the purpose of favourably altering the molecular structure by cross-linking.

**ISO:** International Standards Organisation.

**ISO 9000:** An international quality assurance program.

## J

**J-BOX:** Junction box. A box for joining different runs of raceway or cable, plus space for connecting and branching the enclosed conductors.

**JACKET:** A covering over insulation usually non-metallic, plastic, rubber, cotton, fluoropolymer, or glass.

**JOULE:** The unit of measure for energy or work. Equal to the work required to maintain a current of one ampere for one second in a resistance of one ohm.

**JUMPER:** Usually a temporary connection. A short length of conductor to connect between terminals, across a break in a circuit, or around an instrument.

**JUTE FILLER:** Rope like strands of material used in cables for filling in the voids to form a rounded final cable shape.

## K

**K BAND:** A band of microwave frequencies.

**kHz:** Kilohertz. See kilohertz.

**KILOHERTZ:** One thousand (1,000) cycles per second.  
Abbreviation kHz.

**KILOVOLT:** One thousand (1,000) volts. Abbreviation kV.

**KILOVOLT AMPERE:** One thousand (1,000) volts x amperes.  
Abbreviation kVA

**KILOWATT:** A unit of measure of power equal to one thousand (1,000) watts. Abbreviation kW.

**KIRCHOFF'S LAWS:** The algebraic sum of the currents at any point in a circuit is zero; the algebraic sum of the product of the current and the impedance in each conductor in a circuit is equal to the electro-motive force in the circuit.

**KOVAR:** An alloy of iron, nickel, and cobalt.

**kV:** Kilovolt (1,000 volts). See kilovolt.

**kVA:** Kilovolt ampere (1,000 volt ampere). See kilovolt ampere.

**kW:** Kilowatt (1,000 watts). See kilowatt.

## L

**L:** Symbol for inductance. See inductance.

**L BAND:** A band of microwave frequencies. See frequency band.

**LACQUER FINISH:** A finish applied over braided wire or cable for appearance, for moisture proofing, to reduce friction, and resist abrasion.

**LAMINATES:** A build-up of layers of material to increase thickness as in braid varnished cambric (VCB).

**LAN:** Local Area Network. See local area network.

**LATEX:** Rubber material used for insulation of wire.

**LAUNCH FIBRE:** An optical fibre used to couple and condition light from an optical source into an optical fibre. Often the launch fibre is used to create an equilibrium modal distribution in multi-mode fibre. Also referred to as launching fibre.

**LAY:** The length measured along the axis of a wire or cable required for a single strand (in stranded wire) or conductor (in cable) to make one complete turnaround the axis of the conductor or cable.

**LDPE:** Low density polyethylene.

**LEACHING AND NON-LEACHING:** In a leaching wire, the plasticiser will migrate or leave the vinyl compound when exposed to the heat of baking. The wire so treated becomes brittle and hard. A non-leaching wire will retain its plasticiser under extreme temperature conditions and remain flexible



after baking. Non leaching wire is desirable for use as motor lead wire.

**LEAD CURED:** A cable that is cured or vulcanized in a metallic lead mould.

**LEAD-IN:** The cable that connects the active part of an aerial to the transmitter or receiver.

**LEAKAGE:** The passage of an electric current along a path other than that intended due to faulty insulation or isolation in a circuit, component, device, or other piece of apparatus.

**LEVEL 1, 2, 3, 4, & 5:** Underwriters Laboratories' performance designations for unshielded, twisted pair cables. See Category 1, 2, 3, 4, or 5.

**LF:** Low frequency. See frequency band.

**LINE VOLTAGE:** The voltage existing in a cable or circuit.

**LITZ WIRE:** Short for litzendraht wire. A construction of fine individually insulated strands specially woven or braided together to reduce skin effect and thus lower resistance to high frequency currents.

**LOCAL AREA NETWORK:** A baseband or broadband interactive bidirectional communication system for voice, video, or data use on a common cable medium. LAN.

**LOI:** Limiting Oxygen Index

**LONGITUDINAL SHIELD:** A tape shield, flat or corrugated, applied longitudinally with the axis of the core being shielded.

**LOOP RESISTANCE:** The total resistance of two conductors measured round-trip from one end.

**LOOSE TUBE (BUFFER) :** A type of cable construction in which the fibre is placed in a plastic tube with a diameter much larger than the fibre itself. The loose tube isolates the fibre from exterior mechanical forces acting on the cable. The space between the tube and fibre is often filled with a gel which serves to cushion the fibre.

**LOSS FACTOR:** The product of the dissipation and dielectric constant of an insulating material.

**LOW FREQUENCY:** See frequency band.

**LOW LOSS:** A cable that has a small amount of power loss when extended over long lengths.

**LOW NOISE:** A cable constructed in such a manner as to reduce to a minimum any signals generated by the motion of the cable components in respect to each other. Used to reduce the noise level in coaxial or microphone cable circuits.

**LOW TENSION:** Low voltage as applied to ignition cable.

**LS0H:** Low Smoke Zero Halogen.

**LSHF:** Low Smoke Halogen Free.

**LSZH:** Low Smoke Zero Halogen.

**LSF:** Low Smoke and Fume.

**LT:** Low temperature non contaminating jacket, Type II.

**LV:** Low Voltage, up to 1000V.

**LVD:** Low Voltage Directive.

**LW:** Abbreviation for light wall, 300 volt, electronic hook-up wires to MIL-W-76.

## M

**mA:** Milliampere, one-thousandth ( $10^{-3}$ ) of an ampere.

**MAG.OX.:** Magnesium oxide.

**MAGNET WIRE:** Insulated copper wire used for winding coils, motors, and transformers.

**MAINS:** The source of domestic electrical power distributed nationally throughout the U.K. The mains frequency is the frequency at which the electrical power is supplied. This is 50 hertz in the U.K. and 60 hertz in the U.S.

**MARKER TAPE:** A tape laid parallel to the conductors under the sheath in a cable, imprinted with the manufacturer's name and the specification to which the cable is made.

**MARKER THREAD:** A coloured thread laid parallel and adjacent to the strand in an insulated conductor which identifies the manufacturer and sometimes the specification to which the wire is made.

**Mbps:** Megabits per second.

**MC:** Megacycle.

**MCM:** One thousand (1,000) circular mils, e.g. 500 MCM = 500,000 circular mils.

**MECHANICAL SPLICE:** A fibre splice accomplished by fixtures or materials, rather than by thermal fusion. Index matching material may be applied between the two fibre ends.

**MEDIUM FREQUENCY:** See frequency band.

**MEGA:** A prefix to a unit, denoting a multiple of one million (1,000,000) of that unit.

**MEGAHERTZ:** One million (1,000,000) cycles per second. Abbreviation MHz.

**MEGAWATT:** One million (1,000,000) watts. MW.

**MELAMINE:** A thermosetting resin chemically known as melamine formaldehyde. It has excellent resistance to acids and alkalis and good resistance to water and solvents. Has high strength, high insulation resistance as compared to plastics.

**MESSENGER:** The linear supporting member, usually a high strength steel wire, used as the supporting element of a suspended aerial cable. The messenger may be an integral part of the cable or exterior to it.

**MF:** Medium frequency. See frequency band.

**Mfd:** Microfarad. See microfarad.

**MHD:** Medium hard drawn copper wire.

**Mho:** The unit of conductivity. The reciprocal of an ohm.

**MHz:** Megahertz, one million (1,000,000) cycles per second. Formerly mc. See megahertz.

**MI:** Nomenclature for mineral insulated cable, made with one or more conductors using mineral for insulation and overall solid metal tube sheath.

**MICA:** A transparent silicate which separates into layers and has high insulation resistance, high di-electric strength, and high heat resistance.

**MICRO:** A prefix to a unit, denoting a submultiple of one-millionth ( $10^{-6}$ ) of that unit.

**MICRO BENDING:** Minute but sever bends in the fibre of fibre optic cable that result in light displacement and increased loss. Most micro bending can be avoided by the correct selection of materials and proper cabling, handling, and installation techniques.

**MICROFARAD:** A unit of measure for capacitance. One-millionth ( $10^{-6}$ ) of a farad. Abbreviation  $\mu\text{F}$  or Mfd.

**MICROMETRE:** A unit of length equal to one-millionth ( $10^{-6}$ ) of a metre, formerly called micron. Abbreviated  $\mu\text{m}$ .

**MICRON:** A unit of length equal to one-millionth ( $10^{-6}$ ) of a metre, now renamed as the micrometre. Abbreviated  $\mu\text{m}$ .

**MICROSECOND:** One-millionth ( $10^{-6}$ ) of a second.

**MICROWAVE:** An electromagnetic wave with a wavelength in the range 3 millimetres to 1-3 meters, i.e. between infrared radiation and radio waves on the frequency spectrum. See frequency band.

**MICROWAVE FREQUENCY:** See frequency band.

**MIGRATION:** The movement of the non-resinous plasticisers in vinyl which takes place at elevated or lowered temperatures. The migrating plasticiser from the jacket will contaminate the polyethylene core of a coaxial cable and thus change its electrical characteristics.

**MINIATURE WIRE:** Refers to insulated conductors of approximately 20 to 34.

**MIP:** Mylene irradiated polymer.

**MMfd:** One-trillionth ( $10^{-12}$ ) of a farad. Commonly referred to as a picofarad (pF).

**MODAL DISPERSION:** Pulse spreading due to multiple light rays traveling different distances and speeds through a fibre.

**MODE:** A path of light through a fibre of a fibre optic cable.

**MODE FIELD DIAMETER:** In single-mode fibre, the region in which light propagates is larger than the glass core diameter. This mode field diameter is a measured value and often listed as a requirement with core diameter in fibre specifications.

**MODES:** Individual paths in optical waveguides. Single-mode fibre has only one mode, the fundamental mode, while multi-mode fibre has several hundred modes. The upper limit to the number of modes is determined by the core diameter of the waveguide.

**MODULUS OF ELASTICITY:** The ratio of stress to strain in an elastic material.

**MOISTURE RESISTANCE:** Ability of a material to resist absorbing moisture from the air or when immersed in water.

**MOULDED PLUG:** A connector, male or female, moulded on either end of a cord or cable.

**MONOMER:** The basic chemical unit used in building a polymer.

**MP:** Multipurpose cable.

**MPa:** Mega pascal ( $10^6$  pascals), the metric unit of pressure.

**MPG:** Multipurpose general-purpose cable.

**MPP:** Multipurpose plenum cable.

**MPR:** Multipurpose riser cable.

**MSHA:** Mining Safety and Health Administration.

**MT:** Machine tool wire used for internal wiring of appliances or tools. Solid or stranded conductor.

**MTW:** Machine tool wire, plastic insulated, 600 volt, varies 90 °C to 105 °C.

**MULTI-CONDUCTOR:** More than one conductor within a single cable complex.

**MULTI-MODE FIBRE:** An optical fibre whose core diameter is large compared with the optical wavelength and thus can contain many modes.

**MULTIPLEX:** Being or relating to a system of transmitting several messages/signals simultaneously on the same circuit or channel.

**MV:** Millivolt, one-thousandth ( $10^{-3}$ ) of a volt.

**MW:** a) Abbreviation for megawatt, one million ( $10^6$ ) watts.  
b) Abbreviation for milli watt. One-thousandth ( $10^{-3}$ ) of a watt.  
c) Usually, used in reference to one thousand (1,000) volt plastic insulated wire covered by MIL-W-76.



# N

**N:** a) Abbreviation for newtons. See newton. b) Abbreviation for nichrome.

**NA:** Numerical aperture. See numerical aperture.

**NANO:** A prefix to a unit, denoting a submultiple of one-billionth ( $10^{-9}$ ) of that unit.

**NANOMETER:** One billionth ( $10^{-9}$ ) of a meter. Abbreviated nm.

**NANOSECOND:** One-billionth ( $10^{-9}$ ) of a second.

**NC:** a) Abbreviation for nickel-plated copper. Also abbreviated as NPC. b) Abbreviation for nickel-clad copper. Also abbreviated as NCC. c) Abbreviation for nickel conductor.

**NCC:** Nickel-clad copper. Also abbreviated as NC.

**NCCCS:** Nickel-covered copper-clad steel.

**NEC:** National Electric Code (USA). See National Electric Code.

**NEMA:** National Electrical Manufacturers Association (USA).

**NET LOSS:** The difference between the attenuation and the gain in any circuit, device, network, or transmission line.

**NEUTRAL:** a) Having no net positive or negative electric

charge at earth potential. b) Denoting the line that completes the domestic mains supply and is connected to earth at the power station.

**NEWTON:** The unit of force in the metric system of physical units that is of such size that under its influence a body whose mass is one kilogram would experience an acceleration of one meter per second per second. Abbreviated N.

**NICKEL-CLAD COPPER WIRE:** A wire with a layer of nickel on a copper core where the area of the nickel is approximately 30% of the conductor area. The nickel has been rolled and fused to the copper before drawing. It has a very high resistivity and can operate at extremely high temperatures. Abbreviated NCC and NC.

**nm:** Nanometer. One-billionth ( $10^{-9}$ ) of a meter.

**NON-CONTAMINATING:** Refers to a type of PVC jacketing material whose plasticiser will not migrate into the dielectric of a coaxial cable and thus avoids contaminating and destroying the dielectric.

**NONFERROUS:** Not of iron. Refers to alloys which have no iron or steel as ingredients.

**NON-HYGROSCOPIC:** Material does not absorb moisture.

**NON-MIGRATING:** Same as non-contaminating.

**NPC:** Nickel-plated copper. Also abbreviated as NC.

**NPLF:** Non power-limited fire protective signalling circuit cable.

**NPLFP:** Non power-limited fire protective signalling circuit plenum cable.

**NPLFR:** Non power-limited fire protective signalling circuit riser cable.

**NUMERICAL APERTURE:** In fibre optics, the sine of half the angle over which a fibre can accept light, it is a function of the relationship between the refractive index of the core and that of the cladding. It is the 'light gathering ability' of a fibre, defining the maximum angle to the fibre axis at which light will be accepted and propagated through the fibre. Abbreviation NA. NA is also used to describe the angular spread of light from a central axis, as in exiting a fibre, emitting from a source, or entering a detector.

**NYLON:** A group of polyamide polymers which can be used for wire and cable jacketing. Mechanical and chemical protection 105°C.

**NYLON JACKETED:** Refers to the outer covering of nylon on wire or cable which can either be an extruded layer or a braid of nylon filaments.

# O

**O.D.:** Outside diameter.

**OFC:** Optical fibre conductive general-purpose cable.

**OF CG:** Optical fibre conductive fire-resistant general-purpose cable.

**OF CP:** Optical fibre conductive plenum cable.

**OF CR:** Optical fibre conductive riser cable.

**OFFGASSING:** Percentage of a specified gas released during the combustion of an insulating or jacketing material.

**OFHC:** Oxygen free, high conductivity copper. It has no residual deoxidant, 99.95% minimum copper content and an average annealed conductivity of 100%.

**OFN:** Optical fibre non-conductive general-purpose cable.

**OFNG:** Optical fibre non-conductive fire-resistant general-purpose cable.

**OFNP:** Optical fibre non-conductive plenum cable.

**OFNR:** Optical fibre non-conductive riser cable.

**OHM:** The unit of measure for electrical resistance, reactance,

and impedance. A constant current of one ampere produces a force of one volt. Symbol  $W$ .

**OHM (300) LEAD WIRE:** Television lead-in wire. Leads signal in from the antenna to the set.

**OHM'S LAW:** The electric current,  $I$ , flowing in a conductor or resistor is linearly proportional to the applied difference,  $V$ , across it. From the definition of resistance,  $R$ , Ohm's law can be written:

$$V = IR \text{ (i.e. Volts = Current x Resistance)}$$

**OIL FILLED CABLE:** Paper insulated, lead sheathed cable, into which high grade mineral oil is forced under pressure, saturating the insulation. The main object is to prevent moisture and gases from entering. It is also easier to detect flaws due to leakage, as the oil is always kept under constant pressure.

**OIL FILLED PIPE CABLE:** Basically, the same as oil filled cable, but inside of rigid pipe instead of lead sheath. Sometimes it is a standard oil filled cable inserted into rigid pipe under pressure, both units being oil filled. Usually for much higher voltage where constant pressure is always maintained.

**OIL RESISTANT:** Performance characteristics of a material against exposure to a specific oil.

**OPEN WIRE:** Synonymous with overhead line. A conductor that is not surrounded by insulation and is supported separately above ground.

**OPTICAL RECEIVER:** Unit for converting optical signals into electrical signals.

**OPTICAL TIME DOMAIN REFLECTOMETER:** An instrument that measures transmission characteristics of fibre by sending a pulse of light down the fibre and measuring the light scattered across the length and reflected back from the end as a function of time. Used to measure attenuation, point discontinuities, and fibre length, as well as to find breaks.

**OPTICAL TRANSMITTER:** Unit for converting electrical signals into optical signals.

**OUTGASSING:** The dissipation of gas from a dielectric evidencing decomposition.

**OVERCOAT:** Individual strands of tin copper wire stranded together and then covered with a tin coating.

**OVERHEAD LINE:** Synonymous with open wire. A conductor that is not surrounded by insulation and is supported separately above ground.

**OVERLOAD:** Any load delivered at the output of an electrical device, circuit, machine, or other apparatus that exceeds the rated output of the equipment.

**OXIDISE:** To change (a compound) by increasing the proportion of the electronegative part or charge (an element or ion) from a lower to a higher positive valence; remove one or more electrons from an atom, ion, or molecule.

**OXYGEN BOMB TEST:** To determine aging effect, heat, tensile strength, and elongation of wire. The wire is placed in a bomb at 70 °C, under 300 psi using pure oxygen gas for a period of 48 to 96 hours.

**OXYGEN INDEX:** Percentage of oxygen necessary to support combustion of a specified material.

**OZONE:** Form of oxygen produced by discharge of electricity into air. Chemical symbol O<sub>2</sub>.

## P

**PAN CURED:** Method of vulcanising. Coils of un-vulcanised insulated wire are coiled in pans and vulcanised under pressure with live steam.

**PAP:** A commonly used term for air core (unfilled) direct burial telephone cable with a corrugated aluminium shield.

**PAR:** Precision approach radar.

**PARALLEL CABLE:** Two insulated conductors in parallel in a cable.

**PATCH CABLE:** A power cable with plugs or terminals on each end of the conductor or conductors used to connect equipment.

**PATCH CORD:** Usually braid covered, with plugs or terminals

on each end. Used to connect jacks or blocks in switchboards or analog programming systems. Called a patch cord because it is used to 'patch' a circuit.

**P BAND:** A band of microwave frequencies. See frequency band.

**PBX:** Private branch exchange.

**PC:** Physical Contact adaptor. In fibre optics, the physical contact refers to connectors which provide back reflections (also referred to as return loss) of less than 30 db. D4 adaptors allow the fibres to be butted together, resulting in a constant index of refraction in the optical transmission path, thereby eliminating most of the reflection. In non-PC adaptors, the fibre cores are brought into proximity to each other with a small air gap (usually only a few microns) between them.

**PCP:** A commonly used term for air core (unfilled) direct burial cable with a corrugated copper shield.

**PCTFE:** Polychlorotrifluorethylene. One of the fluoropolymers which has a high dielectric strength used at temperatures to 250 °C.

**PE:** Polyethylene. A thermoplastic insulation having excellent electrical properties.

**PEAK VOLTAGE:** The maximum voltage reached during an alternation of frequency.



**PEF:** Polyethylene foam. Also abbreviated as PE Foam.

**PE FC:** Polyethylene flooding compound.

**PE Foam:** Polyethylene foam. Also abbreviated as PEF.

**PE-III:** Clear polyethylene.

**PE-III A:** High molecular weight, black polyethylene, type IIIA, per MIL-C-17.

**PERCENT CONDUCTIVITY:** Conductivity of a material expressed as a percentage of that of copper.

**PERFLUOROALKOXY:** High temperature compound in the fluorocarbon family of dielectrics. Used at temperatures to 250° C. Abbreviation PFA. Also abbreviated as PFA-XII, per MIL-C-17.

**PETROL WIRE:** Wire insulated to withstand immersion in gas and oil. Usually thermoplastic with or without a nylon jacket.

**pF:** Picofarad. See picofarad.

**PFA:** Perfluoroalkoxy resin. See perfluoroalkoxy.

**PFA-XIII:** Perfluoroalkoxy resin. See perfluoroalkoxy.

**PIB:** Polyisobutylene, type B, per MIL-C-17.

**PIC:** A general term for any type of plastic insulated telephone cable.

**PICK:** The distance between two adjacent crossover points of braid filaments.

**PICO:** A prefix to a unit, denoting a submultiple of one-trillionth ( $10^{-12}$ ) of that unit.

**PICOFARAD:** A unit of measure for capacitance; one-trillionth ( $10^{-12}$ ) farads. Abbreviation pF.

**PIGTAIL WIRE:** Fine stranded, extra flexible, rope lay, lead wire.

**PIPE TYPE CABLE:** Pressure cable. Pressure medium is a loose rigid metal pipe.

**PITCH:** In flat cable, the nominal distance between the index edges of two adjacent conductors.

**PLAIN ENAMEL:** Type of magnet wire. Wire is dip coated with a varnish and then baked.

**PLANAR:** Of, relating to, or lying in a plane; two-dimensional in quantity.

**PLASTICISER:** A chemical agent added to plastics to make them softer and more pliable.

**PLATED:** Covered with an adherent layer mechanically, chemically, or electrically.

**PLENUM:** The air return path of a central air handling system, either duct work or open space, over a dropped ceiling.

**PLENUM CABLE:** Cable approved by Underwriters Laboratories for installation in plenums without the need for conduit. Generally, the insulation and jackets are fluorocarbon-based materials.

**PLSJ:** Cord, light duty, all rubber, parallel, two conductor, 300 volt.

**PLT:** Same as PLSJ except plastic.

**PLTC:** Parallel tray cable.

**PNR:** Control cable using polyethylene and nylon on the conductors and PVC jacket.

**PO:** Rayon parallel lamp cord with a stranded copper conductor, separator, rubber insulation, cotton braid, rayon braid overall. Used in dry places on small appliances.

**POLYALKALENE:** A polymer, typically polyethylene, made from alkene monomer. Primary insulation compound used in MIL-W-81044.

**POLYAMIDE:** a) A compound characterised by more than one amide group. b) A polymeric amide (nylon).

**POLYCHLOROPRENE:** Used for jacketing wire and cable that will be subject to rough usage, moisture, oil, greases, solvents, and/or chemicals. May also be used as a low voltage insulating material.

**POLYESTER:** Any of a group of polymers that consists basically of repeated units of an ester and are used especially in making fibres or plastics. More specifically, polyethylene terephthalate which is used extensively in the production of a high strength moisture resistant film used as a cable core wrap.

**POLYETHYLENE:** A thermoplastic material, polymerised ethylene. They are basically pure hydrocarbon resins, often with small amounts of other additives to impart needed properties. All members of the polyethylene family are excellent dielectrics. Outstanding electrical properties include high insulation resistance, high dielectric strength, low dielectric constant, low dielectric loss at all frequencies, excellent resistance to cold flow, and good abrasion resistance. One or more members of the polyethylene family also have the following properties: Resistance to sunlight, weather, chemicals, and flame. Polyethylene is widely used for insulation on telephone, signal and control cables, high frequency electronic cables, high voltage and low voltage power cables, line wire, neutral supported secondary and service drop cables. They are suitable for direct earth burial. Temperature ratings vary with type and application from 75 °C up. Abbreviation PE, POL, and POLY.

**POLYIMIDE:** A relatively high temperature plastic developed for use as a dielectric or jacketing material. Usually laminated to FEP and used as heat sealable tape. It does not burn and has high abrasion resistance.

**POLYMER:** A material of high molecular weight formed by the chemical union of monomers.

**POLYOLEFIN:** A family of thermoplastics based upon the unsaturated hydrocarbons known as olefins. When combined with butylene or styrene polymers, they form compounds such as polyethylene and polypropylene.

**polyparaphenylene terephthalamide:** This synthetic has high tensile strength at low weight, low elongation to break, high modulus (structural rigidity), low electrical conductivity, high chemical resistance, low thermal shrinkage, high toughness (work-to-break), excellent dimensional stability, high cut resistance, flame-resistant, and self-extinguishing properties.

**POLYPROPYLENE:** A thermoplastic polymer of propylene with good electrical characteristics, high tensile strength, and resistance to heat. Abbreviation PP

**POLYSTYRENE:** A rigid transparent thermoplastic of good physical and electrical insulating properties used especially in moulded products, foams, and sheet. Abbreviation PS.

**POLYSULFONE:** A polymer highly resistant to mineral, acid, alkali, and salt conditions. Good dielectric properties.

**POLYTETRAFLUOROETHYLENE:** This is modified ETFE, a copolymer of ethylene and tetrafluoroethylene. This is the most thermally stable and chemically resistant carbonaceous insulating compound. It is unaffected by sunlight, moisture, and practically all chemicals. Temperature range is -90 °C to 250 °C and electrical properties are very constant over the temperature range and a wide range of frequencies. This insulation may be applied by extrusion, taping, dip-coating, and in cases where other material is used, by dispersion

coating. Both conventional and ribbon type wires and cables are made as well as magnet wire. This insulation material is used as dielectric, insulation, and extruded jackets. Abbreviation is PTFE.

**POLYURETHANE:** Enamel that has excellent moisture resistance, easily soldered, also has excellent winding properties as a magnet wire insulation. Abbreviation PU.

**Polyvinylchloride:** A family of insulating compounds whose basic ingredient is either polyvinylchloride or its copolymer with vinyl acetate, in combination with appropriate plasticisers, stabilisers, fillers, and pigments. Like many other plastic materials, these insulations can be compounded to provide a wide variety of properties for various applications. Among the properties obtained are: Resistance to moisture, cold, heat, flame, oils, solvents, chemicals, and ozone. Electrical properties are adequate for low voltage power applications. Temperature ratings up to 105 °C are recognized by UL for certain applications. These insulations are widely used for types T and TW building wires, series street lighting cable, machine tool wiring, hook-up and appliance wiring, overhead line wire, control and signal cables, and many others. Known as PVC or Vinyl. Abbreviation PVC.

**POLYVINYLIDENE FLUORIDE:** VF2 vinylidene fluoride resin is a crystalline, high molecular weight polymer of VF2 having high dielectric strength as well as abrasion resistant characteristics. It is characterised by good mechanical, electrical, and chemical properties. In primary insulation and in jackets for multi-conductor cables. This material can be extruded, applied as a film or solution, or by dispersion coating. This compound

offers excellent resistance to abrasion and cut-through.  
Radiation cross-linking provides improved heat resistance.  
Abbreviation PVDF.

**PORTABLE POWER CABLE:** Extra flexible, all rubber insulated to allow hard usage.

**POTENTIAL DIFFERENCE:** The difference in electric potential between two points, equal to the line integral of the electric field strength between points. If a charge is moved from one to the other of the points by any path, the work done is equal to the product of the potential difference per unit length.

**POTTING:** The sealing of a cable termination or other component with a liquid which thermosets into an elastomer making the joint moisture proof or airtight.

**POWER FACTOR:** The ratio of resistance, **R**, to impedance, **Z**. The ratio of the actual power of an alternating current to apparent power. Mathematically, the cosine of the angle between the voltage applied and the current resulting.

**POWER FREQUENCY:** The frequency at which domestic and industrial mains electricity is supplied and distributed. In the U.K. the standard value is 50 hertz; in the U.S. it is 60 hertz.

**POWER RATING:** AC voltage that can be applied between adjacent conductors.

**POWER RATIO:** The ratio of power appearing at the load to the input power. Expressed in db, it is equal to  $10 \log_{10} (P_1/P_2)$  where  $P_1$  is input power and  $P_2$  is the power at the load.

**PPE:** Polypropylene ethylene.

**PRESSURE CABLE:** Oil impregnated, paper insulated conductors. Lead or steel pipe outer covering, in which positive pressure is constantly maintained. Has higher dielectric strength, greater insulation stability, increased current-carrying capacity, and saves space.

**PRICE'S GUARD WIRE:** A wire conductor used to prevent surface leakage current associated with an insulator from reaching the measuring instrument during determination of insulation resistance, particularly of cables.

**PRIMARY INSULATION:** The first layer of non-conductive material applied over a conductor; whose prime function is to act as electrical insulation.

**PRIMARY VOLTAGE:** Initial or main voltage.

**PROPYLENE:** A flammable gaseous hydrocarbon  $C_3H_6$  obtained by cracking petroleum hydrocarbons.

**PS:** Polystyrene. See polystyrene.

**psi:** Pounds per square inch.

**PS TAPE:** Nonmetallic shielding, very flexible. Remains in positive contact with insulation. Prevents formation of air gaps between conductor and insulation.

**PTFE:** Abbreviation for polytetrafluoroethylene. See polytetrafluoroethylene.



**PU:** Abbreviation for polyurethane. See polyurethane.

**PUFF:** Colloquial term for one picofarad. See picofarad.

**PULLING EYE:** A device on the end of a cable to which a pulling line is attached for pulling the cable into a conduit or duct.

**PULSE CABLE:** Type of coaxial cable with or without a magnetic core constructed to transmit repeated high voltage pulses without degradation. Usually multi-shielded.

**PULSE COMMUNICATIONS:** Telecommunications involving the transmission of information by means of pulse modulation. Pulse communication is used in systems that operate by means of time-division multiplexing.

**PUNCTURE VOLTAGE:** The value of voltage that causes an insulator to be punctured when it is subjected to a gradually increasing voltage.

**PVC:** Polyvinylchloride. See polyvinylchloride.

**PVC-I:** Black polyvinylchloride, contaminating, type I, per MIL-C-17.

**PVC-II:** Grey polyvinylchloride, contaminating, type II, per MIL-C-17.

**PVC-IIA:** Black polyvinylchloride, contaminating, type IIA, per MIL-C-17.

**PVC-IV:** Black polyvinylchloride, contaminating, type IV, per MIL-C-17.

**PVC-105 °C:** Specially compounded high temperature polyvinylchloride.

**PVD:** Polyvinylidene fluoride. Also abbreviated PVDF. See polyvinylidene fluoride.

**PVDF:** Polyvinylidene fluoride. Also abbreviated PVD. See polyvinylidene fluoride.

## Q

**Q BAND:** A band of microwave frequencies. See frequency band.

**QUAD:** A four conductor cable.

## R

**R:** a) Symbol for resistance (see resistance) or resistor. b) 600 volt copper conductor stranded or solid, rubber insulated, cotton braid (rubber filled tape 6 AWG and larger). Cotton braid saturated with moisture resisting, flame-retarding compound smoothly finished. Used for power wiring. c) Abbreviation for riser.

**RAD:** The unit of measure for a radiation dose which is absorbed, equal to 0.01 joule per kilogram.

**RAM EXTRUDER:** Wire making machinery for pressure and heat extruding PTFE insulation over a conductor. A predetermined amount of cylindrical shaped moulded PTFE powder is placed in a cylinder chamber. A ram is pushed through the cylinder by a jack screw, forcing the PTFE through an orifice or tip through which the conductor is moving and forms a homogeneous tube of insulation around the conductor. The unsintered insulated wire is then passed through a curing oven to complete the process. The limitation of a ram extruder is the size of the slug of preformed PTFE powder. Since it is of constant size, when the slug is exhausted it is the end of the run. It cannot be continuously fed. As the diameter increases, the maximum length of wire to be covered decreases.

**RATED TEMPERATURE:** The maximum temperature at which an electric component can operate for extended periods without loss of its basic properties.

**RATED VOLTAGE:** The maximum voltage at which an electric component can operate for extended periods without undue degradation or safety hazard.

**REACH:** Registration, Evaluation, Authorisation and Restriction of Chemicals.

**REACTANCE:** The part of the total impedance of a circuit not due to pure resistance, measured in ohms. Symbol  $X$ . It is the imaginary part of the complex impedance,  $Z$  given by:

$$Z = R + iX$$

where **R** is resistance, **X** is reactance and **i** equals  $\sqrt{-1}$ .

Reactance is due to the presence of capacitance or inductance in a circuit. The effect of reactance is to cause the voltage and current to become out-of-phase.

**RECEIVER:** A detector and electronic circuitry to change optical signals to electrical signals.

**REFLECTION LOSS:** The part of a signal which is lost due to reflection of power at a line discontinuity.

**REFLOW SOLDERING:** The process of connecting two solder coated conductive surfaces by re-melting of the solder to cause fusion.

**REFRACTIVE INDEX:** The ratio of the speed of light in a vacuum to the speed of light in a material. Also called Index of Refraction.

**REFRACTION:** Deflection from a straight path undergone by a light ray or energy wave in passing obliquely from one medium (as air) into another (as glass) in which its velocity is different.

**REPEATER:** A device that receives signals in one circuit and automatically delivers corresponding signals to one or more other circuits, usually amplifying the signal.

**RESIN:** A solid or semi-solid organic substance, originally of plant origin but largely synthesised now. It may be clear, yellowish, or brown, ranging from transparent to translucent; typically, a non-conductor of electricity and soluble in organic solvents but not in water. Consequently, resins are widely used in insulating, potting, and encapsulating. Resins are broadly classified as thermoplastic or thermosetting according to whether they soften or harden with the application of heat.

**RESISTANCE:** The tendency of a material to resist the passage of an electric current and to convert electrical energy into heat energy. Symbol  $R$ . It is the ratio of the applied potential difference across a conductor to the current flowing through it (see Ohm's law). If the current is an alternating current, the resistance, measured in ohms, is the real part of electrical impedance,  $Z$ , given by the formula:

$$Z = R + iX$$

where  $i$  equals  $\sqrt{-1}$  and  $X$  is the reactance.

**RESISTANCE WIRE:** Wire constructed from a material that has a high resistivity and low temperature coefficient of resistance. It is used for accurate wire-wound resistors.

**RESISTIVITY:** An intrinsic property of a material equal to the resistance per unit length and unit cross sectional area. Reciprocal of conductivity. The lower the resistivity of a material the better conductor it is. Materials can be classified as conductors, semi-conductors, or insulators according to their resistivity. Conductors have a resistivity of  $10^{-6}$  to  $10^{-8}$  ohms per meter, semi-conductors have a resistivity of  $10^{-6}$  to

$10^{-7}$  ohms per meter, and insulators have a resistivity of  $10^{-7}$  to  $10^{-23}$  ohms per meter.

**RESPOOL:** To rerun material from one package spool to another for various purposes, such as to verify lengths, inspect for defects, or to a specified packaging by customer.

**RETRACTILE CORD:** A cord in which the insulation and/or jacket has been specially treated so that it will return to its original contracted form from an extended condition.

**RF CONNECTOR:** Connector used for connecting or terminating coaxial cable.

**RFI:** Radio frequency interference.

**RHRW:** Tinned copper conductors, rubber insulation, saturated braid, flame and moisture resistant finish for moist locations.

**RHW:** 75 °C rubber insulated. Heat and moisture resistant insulation with an outer cover of moisture resistant, flame-retardant and a non-metallic covering. Generally used in wet locations.

**RIBBON CABLE:** A flat cable with individually insulated conductors processed together in a parallel position. Conductors may be all in one colour, or each individual conductor may be of a different colour.

**RIDGE MARKER:** One or more ridges running laterally along the outer surface of plastic wire for purposes of identification.

**RIGID COAXIAL CABLE:** Nonflexible coaxial cable, usually a metal tube armoured coaxial cable.

**RIGID WAVEGUIDE:** A type of coaxial cable. A metal form (usually an extrusion) using air as a dielectric.

**RIM Helix:** Resin insulated magnet wire.

**RIP CORD:** A parallel construction of two or more insulated conductors which may be easily separated leaving the insulation of the conductors undisturbed.

**RISER:** A UL designation for cable approved to go from one floor to another floor in a multi-storey building.

**RMS:** Root Mean Square. It is a means of expressing AC voltage in terms of DC. It is approximately 80% of AC peak voltage.

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

**RoHS:** Restriction of Hazardous Substances.

**ROPE LAY STRAND:** A conductor made of multiple groups of filaments. A 7 x 19 rope lay strand has 19 wires laid into a group and then 7 such groups laid cabled into a conductor.

**RR:** An all rubber nonmetallic underground cable suitable for direct burial in the earth or in conduit. It has heat and moisture resistant insulation and an outer jacket.

# S

**S:** a) Abbreviation for silver-plated copper. Also abbreviated as SPC. b) 600 volt senior service rubber insulated portable cord. 18 AWG two conductor through 6 AWG four conductor.

**2S:** Silver-plated copper double shield.

**SA:** a) Abbreviation for silver-covered alloy. b) Nomenclature for silicone rubber insulation with high temperature barrier or glass overall for use up to 125 °C.

**S BAND:** A band of microwave frequencies.

**SC:** Silver-covered copper. Also abbreviated as SCC.

**2SC:** Two silver-plated copper shields.

**SCB:** Silver-plated cadmium bronze. Also abbreviated as SCCad Br.

**SCBerC:** Silver-covered beryllium-copper alloy.

**SCC:** Silver-covered copper. Also abbreviated as SC.

**SCCA:** Silver-covered copper-clad aluminium. Also SCCAL.

**SCCad Br:** Silver-covered cadmium bronze. Also SCB

**SCCAL:** Silver-covered copper-clad aluminium. Also SCCA.



**SCCS:** Silver-covered copper-clad steel. Also SCS.

**SCHSCA:** Silver-coated high strength copper alloy.

**SCPE:** Semi-conducting polyethylene.

**SCS:** Silver-covered copper-clad steel. Also SCCS.

**SD:** Soft drawn (annealed).

**SECONDARY INSULATION:** A high resistance dielectric material which is placed over primary insulation to protect it from abrasion.

**SECTOR STRAND:** A group of wires laid in triangular shape with rounded corners, for use as one conductor of a three conductor cable with 120° angle between faces, and with 90° angle for a four conductor cable.

**SEGMENTAL CONDUCTOR:** In single conductor cables one million (1,000,000) CM or more, the conductors are divided into three or four segments, insulated from each other by paper tapes, to reduce current resistance in AC circuits.

**SELF-EXTINGUISHING:** The characteristic of a material whose flame is extinguished after the igniting flame is removed.

**SELF-SUPPORTING AERIAL CABLE:** A cable consisting of one or more insulated conductors assembled or cabled with a steel core or attached to a separate steel cable, which supports the weight of the cable. It may be from pole to pole or in a vertical position on a tower.

**SELF-SUPPORTING CABLE:** A cable with a steel support strand capable of supporting the cable weight across spans.

**SEMI-CONDUCTING JACKET:** A jacket having a sufficiently low resistance so that its outer surface can be kept at substantially ground potential by a grounded conductor in contact with it at frequent intervals.

**SEMI-CONDUCTOR:** Any of a class of solids whose electrical conductivity is between that of a conductor and that of an insulator in being nearly as great as that of a metal at high temperatures and nearly absent at Low temperatures.

**SEMI-TIGHT BUFFER:** Type of optical fibre cable construction where each fibre is loosely surrounded by a protective coating to a diameter of 900 microns.

**SEPARATOR:** Layer of insulating material between:  
(a) Conductors and insulation; and (b) Between cable components and jacket.

**SERVING OF A CABLE:** A serve is a separator applied directly over the conductor. The serve may consist of one or a combination of materials such as paper, cotton, silk, nylon, or rayon. These materials may be applied spirally or laterally.

**SF:** Fixture wire, silicone rubber insulated. Can be solid or stranded.

**SFF:** Same as SF but in flexible grade stranding.

**SH-A:** Portable power cable, commonly known as shovel

cable, jacket, usually three or four conductors individually shielded. Cable rated 5 kV.

**SH-B:** Similar to SH-A except shield over all conductors.

**SH-C:** Similar to SH-B except with grounds.

**SH-D:** Like SH-A except with grounds.

**SHEATH:** The outer covering or jacket over the insulated conductors to provide mechanical protection for the conductors.

**SHF:** Super high frequency. See frequency band.

**SHIELD:** In cables, a metallic layer placed around a conductor or group of conductors to prevent electrostatic or electromagnetic interference between the enclosed wires and external fields.

**SHIELD COVERAGE (PERCENTAGE) :** The physical area of a cable that is covered by the shielding material and is expressed in percent.

**SHIELDED CONDUCTOR:** An insulated conductor which has been shielded by a copper braid or tape, aluminium foil, copper foil, or a semi-conductive vinyl. The purpose is to confine the electrical field.

**SHIELDED MULTI-CONDUCTOR CABLE:** A cable with a multiplicity of conductors with a metallic or non-metallic shield over the cable core.

**SHORTS:** Less than standard lengths of wire or cable which are generated by making cuts for special orders, i.e. remnants.

**SHRINK TUBING:** A thermoplastic tube, when heated, shrinks and cures to a smaller diameter. Used to seal joints, etc.

**SHUNT WIRE:** A conductor joining two parts of an electric circuit to divert part of the current.

**SIGNAL CABLE:** A cable designed to carry current of less than 1 ampere per conductor.

**SIGNAL GENERATOR:** A device used to furnish current at a known frequency, modulated, and to deliver a measured voltage only at the terminals of the generator without appreciable radiation at any other point.

**SIGNAL-TO-NOISE RATIO:** At any point in an electronic circuit, device, or transmission system, the ratio of one parameter of a desired signal to the same or corresponding parameter of the noise. In broadcast communication the signal-to-noise ratio is often quoted in decibels and the noise parameter taken as its root mean square value.

**SIL/DAC-VI:** Dacron braid over silicon rubber, Type VI, per MIL-C-17.

**SILICONE:** A family of polymers that include any synthetic compound of repeating units of siloxane, which is a chain of alternating silicon atoms and oxygen atoms, combined with carbon, hydrogen, and sometimes other elements. They are typically heat-resistant and either liquid or rubber-like.

**SILICONE IMPREGNATED:** The complete saturation of insulating tapes or braids with a silicone varnish compound. May be performed under a vacuum. The compound serves as a heat and flame-retardant as well as a binder.

**SIMPLEX CABLE:** A single fibre optical cable.

**SINGLE-MODE FIBRE:** An optical waveguide in which only one mode propagates due to its small core diameter of approximately 9 microns.

**SINTERED:** Usually refers to curing of PTFE. To cause to become a coherent mass by heating with-out melting.

**SIS:** XLP (cross-linked polyolefin) switchboard wire.

**SJ:** 300 volt junior service rubber insulated UL ap-proved portable cord, rubber jacket. 18 AWG two conductor through 16 AWG four conductor.

**SJO:** 300 volt junior service rubber insulated UL approved portable cord, jacket.

**SJT:** 300 volt junior service vinyl insulated UL ap-proved portable cord, vinyl jacket.

**SJTO:** 300 volt. Same as SJO except all thermoplastic construction.

**SKELETON BRAID:** Widely separated braid of fibre, copper, or steel may be used to hold core together, for reinforcing jacket or for shielding.

**SKIN EFFECT:** In an alternating current system, a phenomenon that occurs at increased frequencies causing an increase in resistance of the conductor causing the outer skin to carry most of the current. The phenomenon increases in intensity the higher the frequency.

**SLEEVING:** A braided, knitted, woven tube.

**SNCCS:** Silver-covered nickel-covered copper-clad steel.

**SO:** A 600 volt senior service jacket UL approved portable cord; 18 AWG two conductor through 10 AWG four conductor.

**SOLDER:** A metal or metallic alloy used when melted to join metallic surfaces; an alloy of lead and tin so used.

**SOLDERABLE NYLON LITZ:** Litz wire made up of soldereze strands with a nylon serve overall.

**SOLDEREZE:** Magnet wire insulated with polyurethane base enamel.

**SOLID CONDUCTOR:** A conductor composed of one wire. Generally, 18 AWG through 6 AWG, used where flexibility is not required.

**SP-1:** Lamp cord, parallel, all rubber, two conductor, 300 volt.

**SP-2:** Like SP-1 except heavier insulation.

**SP-3:** Like SP-1 except heavier insulation, also may have a ground.

**SPARK TEST:** A test given to wire or cable to determine if there are defects in the insulation. A semi-destructive test, in that it will find weak spots in insulation by a spark breaking through thin spots or pinholes in the jacket when a high voltage potential from the conductor to an outside source is applied. Where these sparks emanate, the cable is cut, thus shortening the cable. This test should only be run once on a wire or cable.

**SPC:** Silver-plated copper. Also abbreviated as S.

**SPECIFIC GRAVITY:** The ratio of the density (mass per unit volume) of a material to that of water.

**SPECIFIC INDUCTIVE CAPACITY:** Dielectric constant of insulating material. Abbreviated as K, SK, SIC.

**SPHINCTER RING:** A high ratio heat shrinkable strain relief grommet that can be placed over the cable assembly after the assembly is fabricated.

**SPIRAL SHIELD:** A metallic shield of fine stranded wires applied spirally rather than braided.

**SPIRAL WRAP:** The helical wrap of a material over a core.

**SPLICE:** A permanent joint between two optical waveguides.

**SP SHIELD:** Silver-plated shield.

**SPT-1:** Same as SP-1 except in plastic.

**SPT-2:** Same as SP-2 except in plastic.

**SPT-3:** Same as SP-3 except in plastic.

**SR:** Silicone rubber insulated cable, 600 volt.

**SRAW:** Silicone rubber insulated, overall glass braid, with nickel-plated copper conductor, flexible stranding, 600 volt.

**SRL:** Structural return loss.

**SRML:** Silicone rubber motor lead.

**SS:** Stainless steel.

**SSC:** Silver-covered strip.

**SSPE:** Semi-solid polyethylene. Also abbreviated as SS poly.

**SS Poly:** Semi-solid polyethylene. Also abbreviated as SSPE.

**SSPS:** Semi-solid polystyrene.

**SSTFE:** Semi-solid tetrafluorethylene, TFE.

**SSTUBE:** Stainless steel tube.

**ST:** Same as SJT, except 600 volt.

**STABILITY FACTOR:** The difference between the percentage power factor at 80 volts/mil and at 40 volts/mil measured on wire immersed in water at 75 °C for a specific time.



**STANDING WAVE RATIO:** In a transmission line, waveguide or analogous system, a figure of merit used to express the efficiency of the system in transmitting power, specifically considering the mismatch between source, line, and load. The standing wave ratio **S** is given by the formula:

$$S = V_{\max} / V_{\min} = I_{\max} / I_{\min}$$

In an ideally matched system, **S=1** indicating the presence of a pure traveling wave and no reflected power. As the proportion of power reflected increases, **S** approaches infinity, which value would indicate a pure standing wave.

**STATIONARY DUTY:** See continuous duty.

**STEP INDEX:** In fibre optics the refractive index profile characterised by a uniform refractive index within the core and a sharp decrease at the core cladding interface. It usually refers to a multi-mode fibre.

**STRAND:** A single uninsulated wire.

**STRANDED CONDUCTOR:** A conductor made with a specified number of strands. Rope lay strand, for example, is a conductor made of multiple groups of strands (filaments). A 7 x 19 rope lay strand has 19 wires laid into a group and then seven such groups cabled laid into a conductor.

**STRENGTH MEMBER:** Included in a cable configuration for purposes of adding tensile strength only. Does not conduct any power or signal.

**STRIP INSULATIONS:** Strip process insulation consists of one or more longitudinal strips of unvulcanised thermosetting material folded around a conductor and vulcanised after application.

**SUBMARINE CABLE:** Cable used underwater from one point to another for power or communication. Lead sheath and/or rubber jacket.

**SUBSTRATE:** Insulating material of a printed circuit.

**SUGGESTED WORKING VOLTAGE:** Usually refers to the AC voltage that can be applied between adjacent conductors.

**SUPER HIGH FREQUENCY:** See frequency band.

**SUSCEPTANCE:** Symbol  $B$ . The imaginary part of the admittance,  $Y$ , which is given by:

$$Y = G + iB$$

where  $G$  is the conductance and  $i$  equals  $\sqrt{-1}$ . For a circuit containing both resistance,  $R$ , and reactance,  $X$ , the susceptance is given by:

$$B = -X/(R^2+X^2)$$

**SVHC:** Substances of Very High Concern also see **REACH**

**SWEEP TEST:** A method to determine the frequency response of a cable by generating an RF voltage whose frequency is varied at a rapid constant rate over a given range. A test commonly made on co-axial cables.

**SWEPT COAX:** Coaxial cable which has been checked by the sweep test and certified by the manufacturer.

**SWITCHBOARD WIRE:** High temperature insulated wire such as TA or AVB, used to wire switchboards and control apparatus. It is heat, flame, and corrosive vapour resistant.

## T

**TA:** The UL designation for switchboard wire insulated with thermoplastic and a high temperature barrier.

**TAGT:** Stranded nickel-clad copper conductor insulated with fused PTFE tape, high temperature barrier, and PTFE impregnated glass braid. 600 volt, 250 °C rating.

**TANK TEST:** A voltage dielectric test in which the test sample is submerged in water and voltage is applied between the conductor and water as ground.

**TC:** a) Abbreviation for tinned copper. b) Type TC power and control tray cable.

**2TC:** Tinned copper double shield.

**3TC:** Tinned copper triple shield.

**4TC:** Tinned copper quadruple shield.

**TCCS:** Tinned copper-clad steel.

**TELEMETRY CABLE:** Cable used for the transmission of information from instruments to the peripheral recording equipment.

**TELEPHONE WIRE:** This is a general term referring to many different types of communication wire. It refers to a class of wires and cables rather than a specific type.

**TELLURIUM CURE:** A curing process similar to selenium cure, except a different element is used.

**TEMPERATURE COEFFICIENT OF RESISTANCE:** The amount of resistance change of a material per degree of temperature change.

**TEMPERATURE RATING:** The maximum temperature at which an insulating material may be used in continuous operation without loss of its basic properties.

**TENSILE STRENGTH:** The pull stress required to break a given specimen. In fibre optics, the maximum allowed pulling force until a specific attenuation is reached. The stated value is short-term.

**TEST LEAD:** A flexible, insulated lead wire which usually has a test probe on one end. It is ordinarily used for making temporary electrical connections. The insulation normally is rubber, the standard colours are red and black.

**TETRAFLUOROETHYLENE:** A fluorocarbon resin. TFE.

**TEW:** Nomenclature for appliance wire by Canadian Standards

Association (CSA), plastic insulated, solid or stranded conductor, 600 volt.

**TF:** The UL designation for fixture wire, solid soft copper conductor, insulated with thermoplastic lead wire.

**TFE:** Tetrafluoroethylene.

**TFF:** Same as TF, except stranded copper conductor.

**TG:** PTFE tape with overall glass braid, stranded nickel-clad copper conductor.

**TGGT:** Flexible stranded nickel-coated copper conductor with PTFE tapes, covered by wrapped fibreglass yarns. A fibreglass braid jacket is applied over insulation and is treated with high-temp saturant. 600 volt, 250 °C rating.

**THERMAL RATING:** The maximum and/or minimum temperature at which a material will perform its function without undue degradation.

**THERMAL RESISTANCE:** The resistance of a substance to conductivity of heat.

**THERMAL SHOCK:** A test to determine the ability of a material to withstand heat and cold by subjecting it to rapid and wide changes in temperature.

**THERMOCOUPLE:** A union of dissimilar metals in which a voltage is generated due to a change in temperature. The voltage is usually in micro or milli volts.

**THERMOCOUPLE EXTENSION:** Same as thermocouple lead wire.

**THERMOCOUPLE LEAD WIRE:** An insulated pair of wires used from the couple to a junction box or to the recording instrument.

**THERMOCOUPLE WIRE:** Wire drawn from special metals or alloys and calibrated to established specifications such as for the U.S. Bureau of Standards or Instruments Society of American standards.

**THERMOPLASTIC:** A material which softens when heated and becomes firm on cooling.

**THERMOSET:** A material which hardens or sets when heat is applied, and which, once set, cannot be re-softened by heating. The application of heat is called 'curing'.

**THERMOSTAT WIRE:** Single or multi-conductor wire, bare soft solid copper conductor, usually PVC insulated. May be twisted and/or jacketed. May have enamelled or nylon covered conductors and may have a metal armour covering. May also have a high temperature barrier insulation. It is used to transmit electrical signals between the thermostat and the heating or cooling unit.

**THHN:** Building wire, plastic insulated, 90 °C, 600 volt, nylon jacket. Used in dry locations.

**THINNET:** RG58 type coaxial cable used in local area network configurations.

**THW:** Building wire, plastic insulated, heat, flame, and moisture resistant, 75 °C.

**THWN:** Same as THW with overall nylon jacket. Used in dry and wet locations.

**TIGHT BUFFER:** Type of fibre optic cable construction where each fibre is tightly buffered by a protective thermoplastic coating to a diameter of 900 microns.

**TINNED COPPER:** Tin coating added to a copper conductor or braid to aid in soldering and inhibit corrosion. TC.

**TINSEL CORD:** Extra flexible cord made with tinsel conductors to give the ultimate in flexibility. Used mostly in the communications field on headsets, handsets, and anywhere that repeated flexibility is necessary.

**TINSEL WIRE:** A low voltage, stranded wire in which each strand is very thin copper ribbon spirally wrapped around a textile yarn. Insulation is generally a textile braid. Intended for use where severe flexing is expected.

**TOKEN RING:** A star-wired ring architecture used for computer LAN data communications.

**TOLERANCE:** a) The allowable deviation from a standard especially the range of variation permitted in maintaining a specified dimension in machining a piece; or b) The variance between the quantity ordered and the quantity shipped, generally accepted in the wire industry to be + or - 10%.

**TOPCOAT:** Bare (untinned) copper wire, stranded, then coated with pure tin.

**TPDDI:** Twisted pair distributed data interface.

**TPE:** Thermoplastic Elastomer. A highly flexible material that displays several rubber like properties, but can be processed (and recycled) like plastic. Commonly used for cable sheathing, insulation or bedding materials. **Dryflex® TPE** is a trademark of HEXPOL TPE.

**TP-PMD:** Twisted pair physical medium dependent.

**TPS:** Styrenic Block Copolymers. Part of the TPE (Thermoplastic Elastomer) material family. Thermoplastic elastomers described as TPS are compounds based on SBS or SEBS. Also abbreviated to TPE-S. **The Dryflex® TPE range from HEXPOL TPE includes TPS based compounds.**

**TPO:** Thermoplastic Polyolefins. Part of the TPE (Thermoplastic Elastomer) material family. TPO compounds are resin blends of polypropylene (PP) and un-crosslinked EPDM rubber and polyethylene. They are characterised by high impact resistance, low density and good chemical resistance. Also abbreviated to TPE-O. **The Dryflex® TPE range from HEXPOL TPE includes TPO based compounds.**

**TPV:** Thermoplastic Vulcanisates. Part of the TPE (Thermoplastic Elastomer) material family. TPV compounds are the next step up in performance from TPO. These too are compounds of PP and EPDM rubber, however they have been dynamically vulcanised during the compounding



step. They were originally conceived to bridge the gap between thermoplastic materials and vulcanised EPDM. Also abbreviated to TPE-V. The **Dryflex® TPE** range from HEXPOL TPE includes TPV based compounds.

**TR:** (certified) test reports. See certified test reports

**TRACER STRIPE:** When colour coding is accomplished by more than one stripe on the same wire. The first stripe, or widest, is called the base stripe, the others, usually narrower, are called tracer stripes.

**TRANSFER MOULD:** A type of rubber/plastic mould. The term derived from the method used of moving the compound into the cavity of the mould. The compound is forced or transferred by pressure, from a cavity in the top of the mould through sprues, into the lower section.

**TRANSFORMER:** A device for transferring electrical energy in an AC circuit by means of electromagnetic induction. Each circuit is represented by a winding around a common magnetic core, the ratio of the voltage in the two circuits being (in an ideal transformer) equal to the ratio of the number of turns. From Ohm's Law and the Conservation of Energy Principle, it follows that (except for losses) the product of current and voltage is the same in both circuits.

**TRANSMISSION LINE:** Synonymous with power line. One or more insulated conductors arranged to transmit electrical energy signals from one locality to another.

**TRANSMITTER:** A driver and a source used to change

electrical signals to optical signals.

**TRAP WIRE:** A low voltage wire used at hinge points, where severe flexing occurs, usually in burglar alarm systems. It is made with tinsel conductor to withstand the repeated flexing.

**TRAY CABLE:** A factory assembled multi-conductor control, signal, and power cable specifically approved under the NEC for installation in trays.

**TRIAD:** A group of three insulated conductors twisted together with or without a sheath overall. Usually colour coded for identification. Also called a triplex.

**TRIAxIAL:** A three-conductor cable with one conductor in the centre, a second circular conductor concentric with the first, and a third circular conductor insulated from and concentric with the first and second, usually with insulation, and a braid or impervious sheath overall.

**TRIBOELECTRIC NOISE:** Noise generated in a shielded cable due to variations in capacitance between shielding and conductor as the cable is flexed.

**TRIPLEX:** A group of three insulated conductors twisted and/or sheathed or held together mechanically. Usually colour coded or ridge marked. Also called triad.

**TW:** The UL designation for thermoplastic insulated wire for use in conduit, underground, and wet locations. It is a common building wire having a bare soft copper conductor, which may be either solid or stranded.

**TWINAX / TWINAXIAL:** A shielded coaxial cable with two central conductors. Also called twinaxial.

**TWIN CABLE:** A pair of insulated conductors of 8 AWG or larger, twisted or laid parallel and/or sheathed or held together mechanically under a common covering.

**TWIN WIRE:** A pair of insulated conductors of 9 AWG or smaller, twisted or bonded together and not identifiable from each other.

## U

**UF:** Single or multi-conductor, with or without ground, used for direct burial underground feeders and branch circuits between buildings, yard lights, floodlights, and similar installations.

**UG:** The two-letter designation that proceeds the number on connectors for coaxial cable. It means Universal Government.

**UHF:** Ultra-high frequency. See frequency band.

**UL:** Underwriters Laboratories Inc.

**UL APPROVED:** A product that has been tested and approved to Underwriters Laboratories standards.

**ULTRA HIGH FREQUENCY:** See frequency band. UHF.

**UNBALANCED CIRCUIT:** A transmission line in which voltage on the two conductors are unequal with respect to ground, e.g. a coaxial cable.

**UNILAY CONDUCTOR:** A central core surrounded by one or more concentric layers of helically wound strands in a fixed geometrical arrangement with the direction of lay the same for each layer and the central core.

**UNSINTERED:** Means uncured. This word is usually used to differentiate between cured and uncured PTFE tape.

**UNSWEPT:** Coaxial cable that has not had an attenuation check (sweep test).

**URC:** Nomenclature for weatherproof wire.

**UTP:** Unshielded twisted pair.

## V

**V:** See voltage.

**VA:** Volt-ampere. A designation of power in terms of volts and amperes.

**VELOCITY OF PROPAGATION:** Is the ratio of the speed of an electric signal down a length of cable compared to the speed of light in free space. All insulated cables have this ratio and it is expressed in percentage. It is the reciprocal of the

square root of the dielectric constant of the cable insulation. For example, in the case of coaxial cables with polyethylene dielectric, this ratio is 65% to 66%.

**VERTICAL RISER CABLE:** Steel wire armoured power cable for vertical runs in a building.

**VERY HIGH FREQUENCY:** See frequency band. VHF.

**VERY LOW FREQUENCY:** See frequency band. VLF.

**VHF:** Very high frequency. See frequency band.

**VLF:** Very low frequency. See frequency band.

**VOLT:** A unit of measure of electromotive force. One volt is the amount of pressure that will cause one ampere of current in one ohm of resistance. Abbreviation V.

**VOLTAGE:** The term often used in place of electromotive force, potential, potential difference, or voltage drop to designate the electric pressure that exists between two points and can produce a current when a close circuit is connected.

<b>ELV</b>	Extra low voltage, below 70V
<b>LV</b>	Low voltage, up to 1000V
<b>MV</b>	Medium voltage, 1000V-35kV
<b>HV</b>	High voltage, 35kV-230kV
<b>EHV</b>	Extra high voltage, 230kV and above

**VOLTAGE BREAKDOWN:** A test to determine maximum voltage of insulated wire before electrical current leakage through insulation occurs.

**VOLTAGE RATING:** The highest voltage which may be applied to a wire or cord for continuous service in conformance with the governing standards or specifications.

**VOLUME RESISTIVITY (SPECIFIC INSULATION RESISTANCE)**  
Electrical resistance between opposite faces of a 1 cm cube of insulating material, commonly expressed in ohms per cm.

**VSWR:** Voltage Standing Wave Ratio. The ratio of the voltage maximum to voltage minimum which exists in a transmission line. Caused when there is reflection of incident wave, due to a discontinuity or improper match to the transmission line (see Standing Wave Ratio).

**VW-1:** Vertical flame test for wire and cable. Established by Underwriters Laboratories. Formerly known as FR-1.

## W

**WALL THICKNESS:** Refers to insulation thickness or jacket thickness that has been applied.

**WATER ABSORPTION:** A test to determine the water absorbed by a material after a given immersion period.

**WATER BLOCKED CABLE:** A multi-conductor cable having

voids filled to prevent water flow or wicking.

**WATT:** The unit of measure of electric power. One watt is equivalent to the power represented by one ampere of current under a pressure of one volt in a DC circuit. Abbreviation W.

**WAVEGUIDE:** A transmission line that consists of a suitably shaped hollow conductor, which may be filled with a dielectric material, that is used to guide ultrahigh frequency electromagnetic waves propagated along its length. The most common shapes of waveguide are rectangular and cylindrical; the most common dielectric is air. A cylindrical waveguide is sometimes known as a wave duct; one that contains a solid rod of dielectric is a uniconductor waveguide. If a wide range of frequencies is to be transmitted, a ridged waveguide may be used. The presence of the ridges extends the possible range of frequencies that may be propagated in a transmission mode, but the transmission is greater than in the equivalent rectangular waveguide.

**WAVEGUIDE DISPERSION:** Dispersion caused by the fact that light travels at different speeds in the core and cladding of single-mode fibres.

**WAVELENGTH:** The distance, measured in the direction of propagation, of a repetitive electrical pulse or waveform between two successive points that are characterized by the same phase of vibration.

**W BAND:** A band of microwave frequencies.

**WEEE:** Waste Electrical and Electronic Equipment.

**WICKING:** The longitudinal flow of a liquid in a wire or cable due to capillary action.

**WIRE:** A slender rod or filament of drawn metal. The term is a generally used one, which may refer to any single conductor. If larger than 9 AWG or multiple conductors, it is usually referred to as a cable.

**WIRE BRAID:** Flexible wire constructed of small size strands woven together in tubular form. Used for shielding or connections where constant flexing is required.

**WIRE GAUGE:** The American Wire Gauge (AWG). A system of numerical wire sizes starting with the lowest numbers for the largest sizes. Gauge sizes are each 20.6% apart based on cross sectional area.

**WOLLASTON WIRE:** Extremely fine platinum wire used for electroscope wires, micro fuses, and hot-wire instruments. Produced by coating platinum wire with a sheath of silver, drawing together into a relatively fine uniform diameter wire, and then dissolving the silver with a suitable acid. Diameters to about one micrometre may be produced by this method.

**WOVEN CABLES:** A method of producing a flat or ribbon type cable by holding the conductors together with thread as a result of a weaving process.



# X

**X:** Symbol for reactance. See reactance.

**X-100:** See FEP.

**X BAND:** A band of microwave frequencies.

**XETFE:** Cross-linked extruded, modified ethylene tetrafluoroethylene copolymer.

**X GUIDE:** A transmission line that is used for the propagation of surface waves and consists of a length of dielectric material with a X-shaped cross section.

**XHHW:** Cross-linked polyethylene insulated, rated at 90 °C in dry locations and 75 °C in wet locations.

**XL:** Cross-linked insulation. See cross-linked.

**XLAP:** Cross-linked extruded alkane-imide polymer.

**XLETFE:** Cross-linked ethylene tetrafluoroethylene copolymer. See ethylene tetra-fluoroethylene copolymer.

**XLP:** Cross-linked polyethylene. Also abbreviated as XLPE.

**XLPA:** Cross-linked extruded polyalkene.

**XLPE:** Cross-linked polyethylene. Also abbreviated as XLP.

**XL POLYOLEFIN:** Cross-linked polyolefin.

**XLPVF:** Cross-linked extruded polyvinylidene fluoride.

**Y**

**Y:** Symbol for admittance. See admittance.

**Z**


**Z:** Symbol for impedance. See impedance.

**ZERO POTENTIAL:** See earth potential.

**ZIP CORD:** Parallel cable that can be easily separated by pulling apart.

The above information is to the best of our knowledge true and accurate, but without guarantee, as the conditions of use are beyond our control.





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