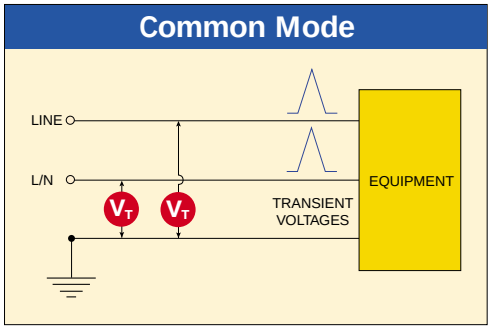
Glossary of Common Surge Protection Terms

Aggregate (Surge) Rating - Sum of the surge current rating of all modes within an SPD, excluding any fuse limiting effects. This figure is used primarily as an indicator of the total life which the SPD can be expected to provide and should not be confused with the maximum single shot surge rating which the device may be capable of withstanding.

Capacitive Coupling - Normally unwanted interference between two nearby conductors due to the strength of the electric field surrounding the source conductor. This is a common method of noise being coupled from a noisy power circuit to a low voltage data circuit.

Clamping Voltage - This term is loosely used in the industry to refer to the voltage at which an SPD limits an applied surge impulse. More correctly, for MOV devices the clamping voltage is the point at which the SPD will start to draw current and is generally regarded as the knee of the VI curve at which 1mA dc current flows.

Common Mode Voltage - A voltage between two or more conductors and ground. This is normally an interference or transient voltage between two lines such as Line and Neutral to Ground. Sometimes referred to as the longitudinal mode.

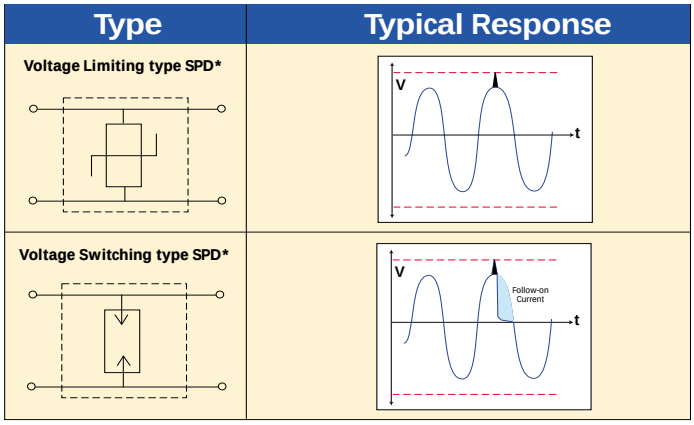


Coupling - Interaction between circuits, during which energy is transmitted from one circuit to the other. May be coupled galvanically (directly), magnetically or capacitively.

Electromagnetic Compatibility (EMC) - EMC is the ability of a device to function satisfactorily in its intended electromagnetic environment without producing interference which may affect other nearby devices.

Energy Rating (in Joules) - Given by some SPD manufacturers to indicate the maximum amount of transient energy that the suppressor can dissipate. Commonly specified for 10/1000µs waveforms. This rating is of little practical value as it is dependent upon three variables: voltage, current and time. Hence an improved current rating will increase the energy rating, but an improved (lower) let-through voltage will lower the energy rating. Therefore, it is unwise to compare energy ratings between two different devices.

Follow-On Current - Where a "Voltage Switching" SPD after "firing" clamps below the AC supply voltage and causes a line frequency current to flow. Follow-on current is normally very large for spark gap (crow bar) type devices. It is for this reason that gas arresters are not used for AC power protection applications. "Voltage Limiting" devices such as MOVs and Silicon Avalanche Diode-based devices do not cause follow-on currents.

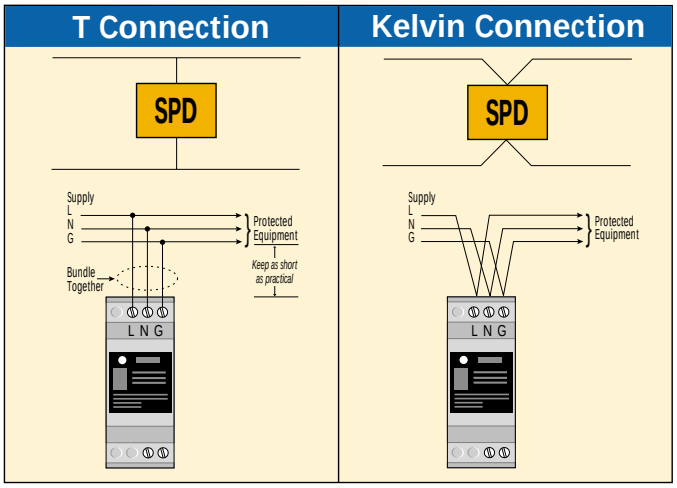


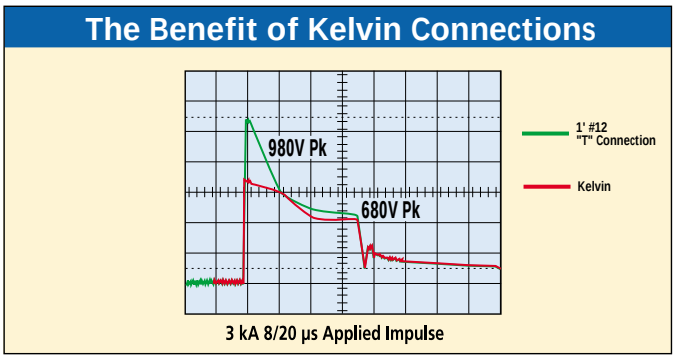
* Example protection device only

Frequency (Noise) Attenuation (dB) - The small signal attenuation for a filter in decibels. This attenuation varies with applied frequency, so it is best given as a graph of frequency versus attenuation. However it is commonly specified at a single point (either at 100kHz, or the frequency at which attenuation equals -3dB). The Decibel scale is non-linear and a large negative number indicates greater attenuation (each increment of -20dB increases voltage attenuation by a factor of 10 times, i.e. 40db = x100, 60dB = x1000). Test signals used are normally in the order of 10V, so attenuation results are an indication of response to noise signals rather than larger surge performance.

Impulse Withstand Voltage - The peak value of the highest impulse voltage with a defined waveshape and polarity, which will not lead to a flash-over or failure of the device under test (DUT) in the given test conditions.

Lead Length - The length of parallel "T" connected SPD leads from the SPD terminals to the circuit to be protected. This lead length (and size, shape and loop area) adversely increases the let-through voltage reaching the protected equipment. A Kelvin connection is recommended where possible to avoid this.





Leakage Current - The miniscule current flowing through insulators and electronic components which are in a non-conductive state, or between any two points which are insulated between each other. A rising leakage current can be a warning of impending insulation or component failure.

Let-through Voltage - The voltage appearing on the equipment side of an SPD when an impulse voltage/current of a defined waveshape and amplitude is applied to the SPD. This is a measure of the SPD's ability to clamp a transient voltage. As let-through voltage depends on the applied current's amplitude and waveshape, these test conditions must be given with the result. Some SPD results will alter depending on if the test was conducted with nominal mains voltage present or not. This should be stated. (Refer also Suppressed Voltage Rating).

Listing - Statement of independent laboratory testing, for safety and/or performance.

Location Categories - ANSI C62.41 defines areas of a typical installation, assigning these location categories with typically maximum expected transient voltages, currents and waveshapes.

Magnetic (or Inductive) Coupling - Formed by the magnetic field surrounding a conductor with a changing current flowing through it. When the magnetic flux lines are cut by another conductor, a voltage is developed on that conductor. The greater the rate of change of the flux lines, the greater the voltage developed. This is the main source of lightning impulses on power circuits, rather than direct (galvanic) strikes.

Maximum Continuous Operating Voltage (MCOV) - The maximum RMS voltage that can be applied continuously to an SPD without inhibiting its correct operation.

Modes (of Protection) - This refers to the way the SPD is connected to the circuit. Each mode is where a dedicated direct SPD element is connected. Note that an SPD may have multiple internal elements allowing one SPD to protect multiple modes, e.g. L-N, L-G and N-G. An SPD that protects only L1-N and L2-N can not be claimed as also having an L1-L2 protection mode as no direct element is provided. Note that not all modes require protection. A 3Ph 4W+G power system has 10 possible modes, but can be adequately protected with a 4 mode SPD.

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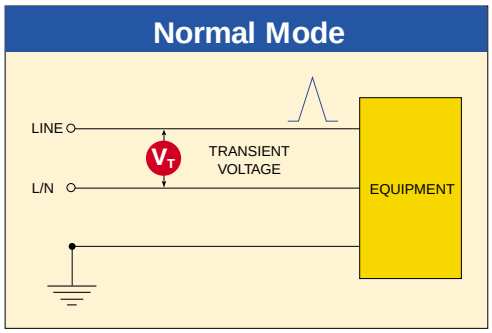
MOV (Metal Oxide Varistor) - Commonly used at the clamping device in SPDs. The Varistor is a bipolar non-linear resistor with a symmetrical voltage/current characteristic curve whose resistance value decreases as the voltage increases.

Nominal Voltage - The normal operating voltage at which the equipment is intended to operate. Generally the actual voltage is expected to be within +/- 10% of this under normal conditions.

Normal Mode Voltage - The voltage interference between two conductors of a circuit (Line to Line). Also referred to as Differential Mode or Transverse Mode.



Residual Voltage - Another term for let-through voltage. However, some standards define residual voltage as being measured when testing is conducted with nominal or MCOV voltage applied. This is optional with let-through results.

Response Time - Most commonly thought to be the time in which it takes an SPD to respond to a transient, but the actual definition as given in standards is the overshoot time of an SPD. Response time is misleading as to the true performance of an SPD and is not a recommended NEMA LS1 specification criteria.

Sparkover-voltage - The voltage at which a spark gap SPD becomes conductive. Normally specified with a voltage increasing at 1kV/s.

Stage (of protection) - Describes the configuration of circuit elements of an SPD where multiple technologies may be used to provide protection.

Suppressed Voltage Rating - A term defined within UL 1449, to measure the let-through voltage with a 6kV 1.2/50µs, 500A 8/20µs impulse. The voltage is then rounded up to the next value of a list on preferred values.

Surge Current Rating - Maximum current withstand of an SPD for a single current impulse waveform (with MCOV voltage applied) of defined waveshape. The clamping voltage after this test should not differ by more than 10% of the value prior to the test. Most commonly surge ratings are quoted for an 8/20µs current waveform, but 10/350µs and 10/700µs are others used.

Surge Filter - An in-line filter specifically designed to reduce the rate of voltage rise (dv/dt) of the preclamped waveform. Requires some series impedance between input and output terminals. This type of product is highly recommended for the protection of sensitive electronic equipment.

Surge Protection Device (SPD) - Internationally accepted term for surge diverters. Also referred to by UL as Transient Voltage Surge Suppressors (TVSSs). Note “Surge Arresters” is a term normally reserved for devices intended for operation on medium voltage systems (>1kV), or prior to the main service entrance disconnect.