

VOLTAGE LET-THROUGH

General

Voltage let-through can be a confusing subject, especially since different manufacturers of power treatment vary their rating techniques. Voltage let-through refers to the amount of transient voltage passed through a power conditioning unit to the load. A transient is a high amplitude, short duration spike or surge superimposed on the normal waveform which is caused by switching electrical loads, switch-mode power supplies, and lightning. In recent years, the use of microelectronic circuits has increased rapidly.

Due to this technological advancement, problems related to transients have also increased tremendously. Surges up to 6000 volts can appear at the power outlets inside buildings. These surges cause equipment to malfunction and component damage.

Electronic components are damaged and disrupted by excessive electrical energy levels that last for very short periods of time. Energy is a function of voltage and current over a period of time. The

ability of a transient to cause disruption or damage depends on the energy contained in the transient.

There are many devices that are designed to suppress transients to safe values. One well known device is the transient voltage surge suppresser (TVSS). Other technologies, such as, power conditioners and isolation transformers provide just as much or better attenuation as the TVSS alone, and provide more total power treatment ability.

ANSI/IEEE C62.41 and UL 1449

The Institute of Electrical and Electronics Engineers (IEEE) 587 states that "6000 volts is the largest transient that the interior of a commercial building would experience, and that it's harshest interior surge environment is one that would experience 100 surges of 6000 volts, 3000 amps in one years time". Factory environments can experience this quantity of surges in one months time. As a result of this, a standard of how to test surge suppressers has been put into place. The American National Standards Institute (ANSI) C62.41 standard is a list of

different waveforms a surge suppresser is to be tested with. There are three categories (A, B, and C) each having three sub-categories (1, 2, and 3). Underwriters Laboratories (UL) 1449 is the listing a surge suppresser gets when it is tested with the ANSI/IEEE C62.41 waveforms, and it refers to the let-through voltage. The ratings range from 330 volts to 6000 volts.

Extreme care must be given when comparing the let-through voltages of different suppressers.

A suppresser that has a let-through voltage of 330 volts when tested with a category A3 waveform may not be any better than a suppresser that has a let through voltage of 400 volts when tested with a category B3 waveform. This is because the category B3 waveform has a current value 2 ½ times larger than the category A3 waveform. When the voltage and/or current is increased on the testing waveform, the let-through voltage also increases.

Ultra-K

The Controlled Power Company *Ultra-K* is a K-rated, multi-shielded isolation transformer which incorporates a TVSS as an option. The let-through voltage of the

Ultra-K with the TVSS is less than 330 volts when tested with a 6000 volt / 3000 amp (category B3) waveform. Attenuation is achieved mainly by the isolation of the

primary and secondary windings. The TVSS is equipped with a fuse and an LED to indicate a blown fuse or TVSS failure.

Other Technologies

Some surge suppression manufacturers say their products protect equipment from surges of up to 6000 volts as described in ANSI/IEEE C62.41, but they do not tell you what type of equipment and how much protection. This information is

misleading to the customer, in order for it to be reliable, you need to know the voltage and current that was used to test these units (if they were tested at all) and the let-through voltage.

There are some high-grade TVSS's that provide good spike attenuation even when used alone. The *Ultra-K*, however, with the combination of TVSS and an isolation transformer gives excellent overall surge protection.

Summary

In order to fully understand a device's spike attenuation capability, three critical pieces of information are needed: the voltage and current the device was tested with, and its let-through voltage. Don't be fooled by specifications that say the unit meets or exceeds ANSI/IEEE C62.41 because that has no relative meaning to the

amount of spike attenuation it provides. The ANSI/IEEE C62.41 standard is just a guideline for testing. For example, you could drill holes in a book, put some wires through it and test it according to ANSI/IEEE C62.41. It would meet ANSI/IEEE C62.41 but provide no spike attenuation.

The *Ultra-K* attenuates a category B3 waveform (6000 volts / 3000 amps) to a let-through voltage of less than 330 volts. When using the *Ultra-K* for electrical noise attenuation and reducing the effects of high harmonic currents, you can be assured that your mission critical equipment will also have excellent spike attenuation.



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