

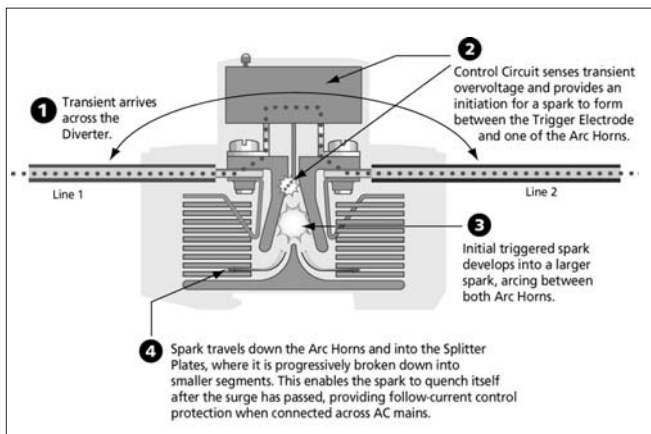
# Advanced Technologies – The ERICO® Advantage

## Triggered Spark Gap (TSG) Technology

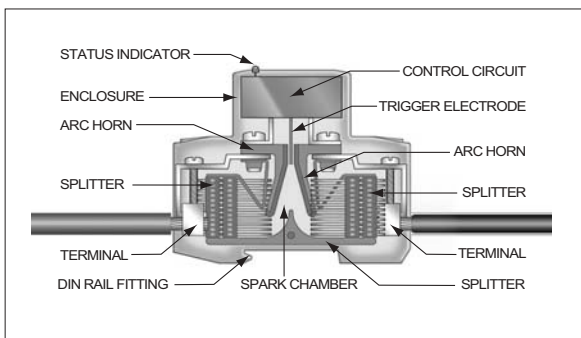
One of the criticisms of traditional spark gap technology has been the high initiating voltage required to form the arc, typically as much as three to four thousand volts. Clearly this is inappropriate for sensitive AC supply where surges of several hundred volts can be lethal to equipment. ERICO® has addressed this problem by incorporating a triggering device, which senses the arrival of a transient and initiates a spark to ionize the region surrounding the spark gap electrodes. This enables the spark gap to operate on significantly lower transient voltages.

A second major criticism of traditional spark gaps has been their follow-current performance. Spark gaps have a low clamping voltage and can clamp a surge below the peak of the AC mains voltage, thereby causing significant follow-current to flow until the next zero crossing point is reached, and the arc is extinguished.

ERICO has incorporated a method of increasing the arc voltage thereby extinguishing it earlier and significantly reducing the follow-current. This feature is effective even on AC supplies with higher prospective fault current capacities and has the added benefit of preventing upstream fuses or circuit breakers from activating.



Activation of the Triggered Spark Gap.



Internal components of Triggered Spark Gap.

## Development of surge reduction filters

ERICO strives to employ the most suitable technology for each application across its range of SPDs, including high performance Surge Reduction Filters (SRFs). The CRITEC® SRF is the most recent development bringing together for the first time, TSG Technology with the benefits of series filtering.

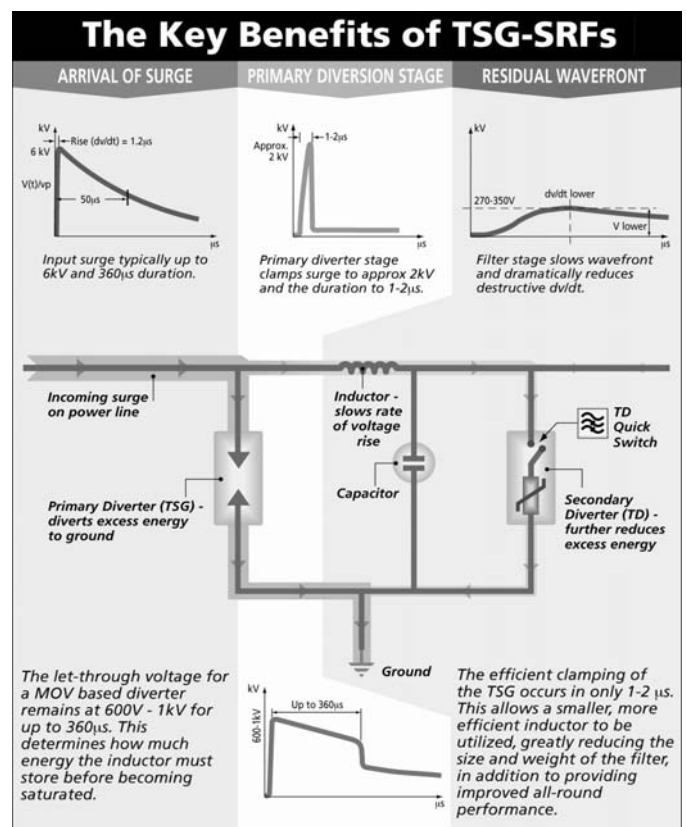
## Fundamental breakthrough in filter design

Incorporating TSG Technology into a surge reduction filter has allowed a fundamental breakthrough in the overall design of the filter. Ferrous-cored inductors, which are much smaller than non-saturating air-cored inductors required in MOV based surge reduction filters, have been used in the CRITEC TSG-SRF.

The use of ferrous-cored inductors is possible because the let-through voltage from a TSG remains high for only a few microseconds. In comparison, the let-through voltage from a MOV based device remains between 600V and 1000V for the duration of the surge. This time can range up to 400 milliseconds for long tail pulses and determines how much energy the inductor will have to store before reaching saturation and becoming ineffective.

## What benefits flow from this technology?

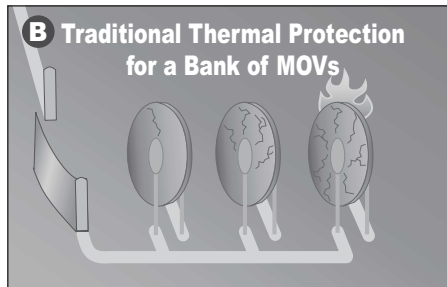
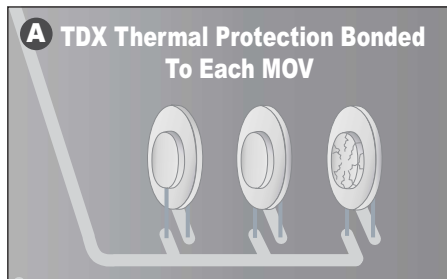
The combination of TSG and series filtering provides the benefits of high surge capability, low let-through voltage and considerably reduced rate of voltage rise (dv/dt). Additional benefits of reduced size, weight and heat dissipation also result.



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## Thermal MOV Technology

MOV components have for many years been used in surge protection devices due to their excellent non-linear clamping characteristics and large energy handling capability. Unfortunately, MOVs can become a hazard should they overheat due to excess stress or aging lowering the clamping voltage. For this reason it is important to have a means of disconnection which safely isolates the MOV during abnormal conditions. In the past this has been achieved by the use of separate thermal disconnects that, due to the distance from the MOV, require significant MOV heat to cause their operation. In low cost designs, several MOVs may share a common thermal device, resulting in more than just the failed MOV from being disconnected. The new thermal protection utilized by ERICO, bonds the thermal disconnect directly to the substrate of each MOV beneath the epoxy coating. This more intimate thermal contact allows the MOV to be immediately and safely disconnected, allowing neighboring MOVs to continue to provide transient protection.



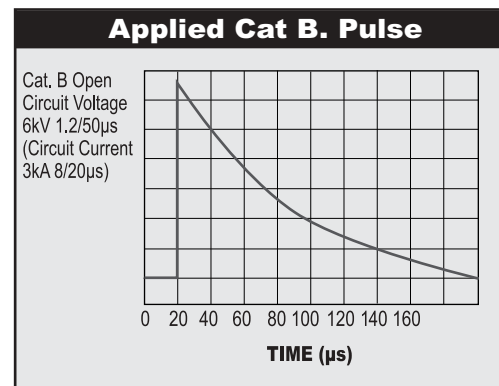
## Filtering Technology

Surge protection devices may include such a filtering stage to help condition the waveshape, thereby providing superior protection for sensitive electronics. This said, it is important to realize that a number of different topologies of filter circuit exist, each providing significantly different performance. At its simplest, a manufacturer may include a capacitor in parallel with the output. This will serve to reduce any fast ringing voltages and will also absorb the energy in a small transient thereby providing a level of attenuation.

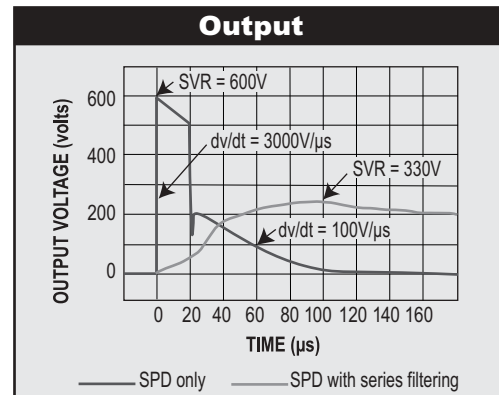
A far more effective approach is the series LC filter. This type of filter is connected after the surge limiting components and is in series with the supply powering the equipment. It consists of a series inductor and parallel capacitors. Surge protection devices of this nature are often referred to as "two port" devices since they have a distinct input and output side.

SPDs with filters offer two primary benefits:

- 1) They reduce the transient voltage reaching the equipment.
- 2) They reduce the rate-of-rise of the leading edge of the impulse. The residual leading edge spike after a standard SPD, although it may only be 500V in amplitude, can cripple electronics due to its extremely high rate-of-voltage rise of 3,000-12,000V/ $\mu$ s. Effective filtering reduces this rate-of-rise to less than 100V/ $\mu$ s. This slower change in voltage is better withstood by electronic equipment using switched mode power supplies. The filter also helps to attenuate small signal RFI/EMI noise problems.



Applied voltage pulse.



Improved reduction in dv/dt with filtering incorporated.



# Advanced Technologies – The ERICO® Advantage

## Transient Discriminating Technology

To meet the fundamental requirements of performance, longer service life and greater safety under real world conditions, ERICO has developed Transient Discriminating (TD) Technology.

This quantum leap in technology adds a level of “intelligence” to the Surge Protection Device enabling it to discriminate between sustained abnormal over-voltage conditions and true transient or surge events. Not only does this ensure safe operation under practical application, but it also prolongs the life of the protector since permanent disconnects are not required as a means of achieving internal over-voltage protection.

### Traditional Technologies

Conventional SPD technologies utilize metal oxide varistors and/or silicon avalanche diodes to clamp or limit transient events. However, these devices are susceptible to sustained 50/60Hz mains over-voltage conditions which often occur during faults to the utility system. Such occurrences present a significant safety hazard when the suppression device attempts to clamp the peak of each half cycle on the mains over-voltage. This condition can cause the device to rapidly accumulate heat and in turn fail with the possibility of inducing a fire hazard.

### The Core of TD Technology

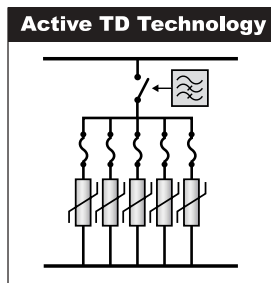
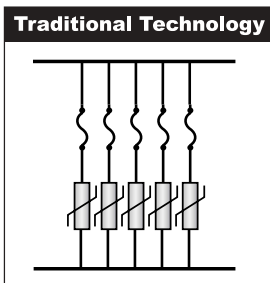
The secret to ERICO’s Transient Discriminating Technology is its *active frequency discrimination* circuit. This patented device can discriminate between a temporary over-voltage (TOV) condition

and a very fast transient, which is associated with lightning or switching-induced surges. When the transient frequencies are detected, the patented Quick-Switch within TD activates to allow the robust protection to limit the incoming transient. The frequency discriminating circuit that controls the Quick-Switch ensures that the SPD device is immune to the effects of a sustained 50 or 60Hz TOV. This allows the device to keep operating, providing safe and reliable transient protection, even after an abnormal over-voltage condition has occurred.

### Meeting & Exceeding UL Standards

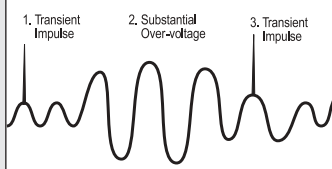
The CRITEC® range of surge protection devices from ERICO employing TD Technology has been specifically designed to meet and exceed the new safety requirements of UL 1449 Edition 2. To meet the abnormal over-voltage testing of UL 1449 Edition 2, many manufacturers of SPD devices have incorporated fuse or thermal disconnect devices which permanently disconnect all protection from the circuit during an over-voltage event. Transient Discriminating Technology on the other hand will allow the SPD device to experience an abnormal over-voltage up to twice its nominal operating voltage and still remain operational even after this event! This allows the device to provide safe, reliable and continuous protection to your sensitive electronic equipment. TD Technology is especially recommended for any site where sustained over-voltages are known to occur, and where failure of traditional SPD technologies cannot be tolerated.

The UL 1449 testing standard addresses the safety of a TVSS device under temporary and abnormal overvoltage conditions, but does not specifically mandate a design that will give a reliable, long length of service in the real world. Specifically, UL 1449 tests that the TVSS remains operational at 10% above nominal supply voltage, allowing SPD manufacturers to design products that permanently disconnect just above that. Most reputable manufacturer’s designs allow for up to a 25% overvoltage, while ERICO’s TD Technology gives even greater overhead.

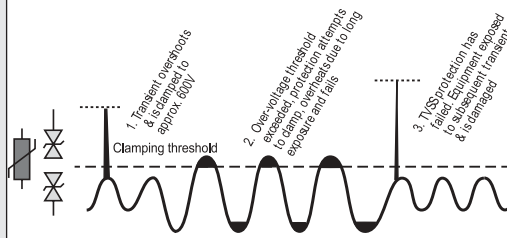


**TD TECHNOLOGY PROVIDES CONTINUED PROTECTION - EVEN AFTER OVER-VOLTAGES**

#### Typical Supply Problems



#### Traditional Technology Response



#### TD Technology Solution

