

Transient Discriminating Surge Diverters



# Surge Protection And Surge Ratings

The stress, which an SPD will experience under surge conditions, is a function of many complex and interrelated parameters. These include:

- Location of the SPD(s) within the structure – are they located at the main distribution board or within the facility at secondary board, or even in front of the end-user equipment?
- Method of coupling the lightning strike to the facility – for example, is this via a direct strike to the structure's LPS, or via induction onto building wiring due to a nearby strike?
- Distribution of lightning currents within the structure – for example, what portion of the lightning current enters the earthing system and what remaining portion seeks a path to remote grounds via the power distribution system and equipotential bonding SPDs?
- Type of power distribution system – the distribution of lightning current on a power distribution system is strongly influenced by the grounding practice for the neutral conductor. For example, in the TN-C system with its multiple earthed neutral, a more direct and lower impedance path to ground is provided for lightning currents than in a TT system.
- Additional conductive services connected to the facility – these will carry a portion of the direct lightning current and therefore reduce the portion which flows through the power distribution system via the lightning equipotential bonding SPD.
- Type of waveshape – it is not possible to simply consider the peak current which the SPD will have to conduct, one also has to consider the waveshape of this surge. It is also not possible to simply equate the areas under the current-time curves (also referred to as the action integral) for SPDs under different waveshapes.

Many attempts have been made to quantify the electrical environment and "threat level" which an SPD will experience at different locations within a facility. The new IEC<sup>SM</sup> standard on lightning protection, IEC 62305-4 "Protection against lightning - Part 4: Electrical and electronic systems within structures" has sought to address this issue by considering the highest surge magnitude which may be presented to an SPD based on the lightning protection level (LPL) being considered. For example, this standard postulates that under a LPL I the magnitude of a direct strike to the structure's LPS may be as high as 200 kA 10/350. While this level is possible, its statistical probability of occurrence is approximately 1%. In other words, 99% of discharges will be less than this postulated 200 kA peak current level.

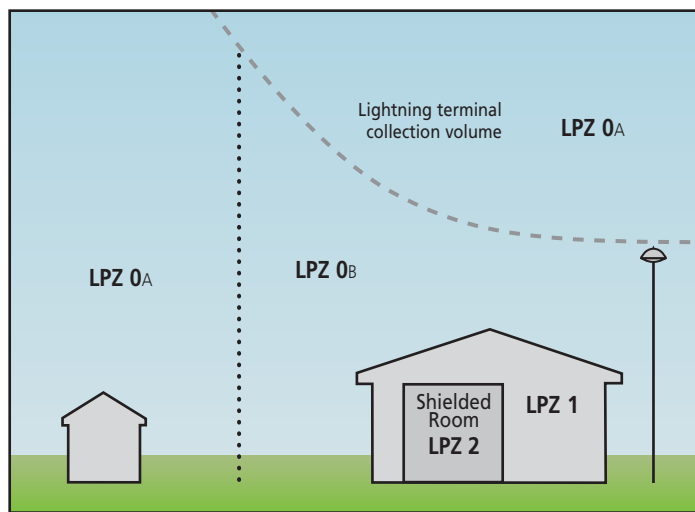
An assumption is made that 50% of this current is conducted via the building's earthing system, and 50% returns via the equipotential bonding SPDs connected to

a three wire plus neutral power distribution system. It is also assumed that no additional conductive service exists. This implies that the portion of the initial 200 kA discharge experienced by each SPD is 25 kA.

Simplified assumptions of current dispersion are useful in considering the possible threat level, which the SPD(s) may experience, but it is important to keep in context the assumptions being made. In the example above, a lightning discharge of 200 kA has been considered. It follows that the threat level to the equipotential bonding SPDs will be less than 25 kA for 99% of the time. In addition, it has been assumed that the waveshape of this current component through the SPD(s) will be of the same waveshape as the initial discharge, namely 10/350, while in reality the waveshape have been altered by the impedance of building wiring, etc.

Many standards have sought to base their considerations on field experience collected overtime. For example, the IEEE<sup>®</sup> guide to the environment C62.41.1 and the recommended practice C62.41.2 present two scenarios of lightning discharge and different exposure levels under each of these depending on the location where the SPD is installed. In this standard, Scenario II depicts a direct strike to the structure, while Scenario I depicts a nearby strike and the subsequent conducted current into a structure via power and data lines. The highest surge exposure considered feasible to an SPD installed at the service entrance to a facility under Scenario I is 10 kA 8/20, while under Scenario II it is considered to be 10 kA 10/350 (exposure Level 3).

From the above, it is apparent that the selection of the appropriate surge rating for an SPD depends on many complex and interconnected parameters. When addressing such complexities, one needs to keep in mind that one of the more important parameters in selecting an SPD is its limiting voltage performance during the expected surge event, and not the energy withstand which it can handle.



Protection zones defined by specific product application.

## 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 help 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

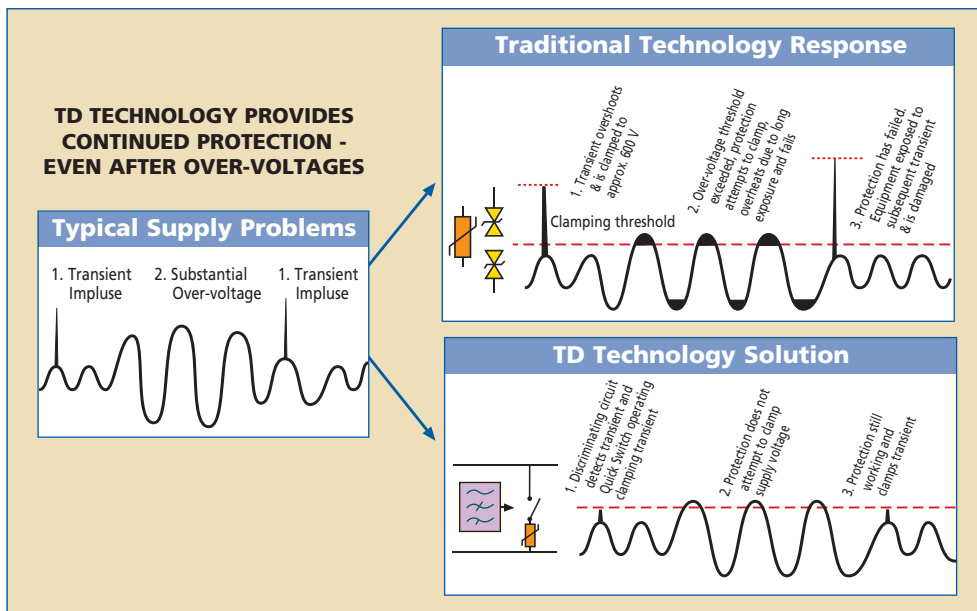
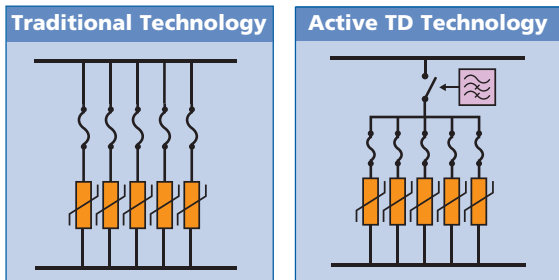
The secret to ERICO’s Transient Discriminating Technology is its *active frequency discrimination* circuit. This patented device can discriminate between a temporary over-voltage (TOV) condition

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 helps ensure that the SPD device is immune to the effects of a sustained 50 or 60Hz TOV. This allows the device to keep operating, in order to help provide safe and reliable transient protection, even after an abnormal over-voltage condition has occurred.

### Meeting & Exceeding UL® Standards

The 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 3. To meet the abnormal over-voltage testing of UL 1449 Edition 3, 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 help provide 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 an SPD 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 SPD 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.



**TDS Surge Diverter - TDS130 Series**

**Features**

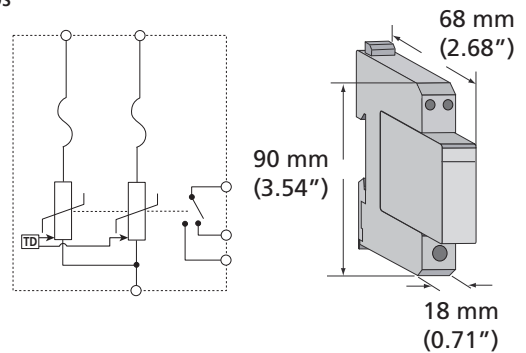
- TD Technology with thermal disconnect protection
- Compact package, modular DIN rail mounting for limited space requirements
- Three modes of protection: L-N, L-PE & N-PE
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 15kA 8/20µs surge rating per mode
- CE, UL® 1449 Edition 3 Listed

Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS130 series of surge suppressors is designed to provide economical and reliable protection from voltage transients on power distribution systems. The TDS130 is specifically designed for the protection of single phase power supplies within instrumentation and control applications. They are conveniently packaged for easy installation on 35 mm DIN rail within control panels.

Transient Discriminating (TD) technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure controlled behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. The TDS130 provides a set of optional voltage-free contacts for remote signaling that maintenance is required.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.



Model	TDS1301TR150	TDS1301TR240
Item Number for Europe	702421	702422
Nominal Voltage, U <sub>n</sub>	120-150 VAC	220-240 VAC
Max Cont. Operating Voltage, U <sub>c</sub>	170 VAC	275 VAC
Stand-off Voltage	230 VAC	440 VAC
Frequency	0-100 Hz	
Nominal Discharge Current, I <sub>n</sub>	8 kA 8/20 µs per mode	
Max Discharge Current, I <sub>max</sub>	15 kA 8/20 µs L-N 15 kA 8/20 µs L-PE	
Protection Modes	L-G, L-N, N-G	
Technology	TD Technology with thermal disconnect	
Short Circuit Current Rating, I <sub>sc</sub>	200 kAIC	
Back-up Overcurrent Protection	63 AgL, if supply > 63 A	
Voltage Protection Level, U <sub>p</sub>	500 V @ 3 kA (L+N-G) 800 V @ 3 kA (L-N)	800 V @ 3 kA (L+N-G) 1,500 V @ 3 kA (L-N)
Status	N/O, N/C Change-over contact, 250 V~/0.5 A, max 1.5 mm <sup>2</sup> (#14 AWG) terminals Mechanical flag / remote contacts (R model only)	
Dimensions H x D x W: mm (in)	90 x 68 x 18 (3.54 x 2.68 x 0.71)	
Module Width	1 M	
Weight: kg (lbs)	0.12 (0.26)	
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)	
Connection	1 mm <sup>2</sup> to 6 mm <sup>2</sup> (#18AWG to #10AWG) Line and Neutral Terminals ≤25 mm <sup>2</sup> (#4AWG) stranded ≤35 mm <sup>2</sup> (#2AWG) solid PE Terminal	
Mounting	35 mm top hat DIN rail	
Temperature	-40°C to 80°C (-40°F to 176°F)	
Humidity	0 % to 90 %	
Approvals	CE, IEC® 61643-1, UL® 1449 Ed. 3 Recognized Component Type 2	
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B IEC 61643-1 Class II UL® 1449 Ed. 3 In 3 kA mode	
Replacement Module	TDS130M150	TDS130M240
Replacement Module (Europe)	702432	702424



TDS Surge Diverter - TDS150 Series

**Features**

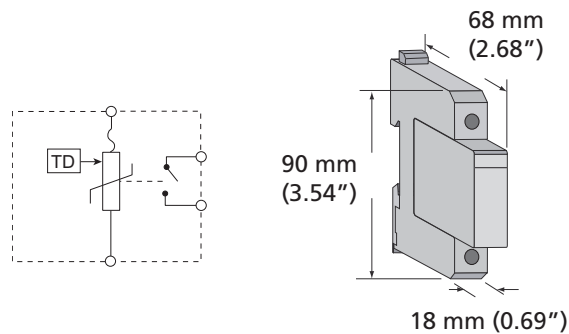
- TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 50kA 8/20 $\mu$ s maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL<sup>®</sup> 1449 Edition 3 Listed

Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS150 series of surge suppressors is designed to provide economical and reliable protection from voltage transients on power distribution systems. They are conveniently packaged for easy installation on 35 mm DIN rail within main distribution panelboards.

Transient Discriminating (TD) technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure controlled behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS150 provides a set of voltage-free contacts for remote signaling that maintenance is required.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.



Model	TDS1501SR150	TDS1501SR240	TDS1501SR277	TDS1501SR560
Item Number for Europe	702404	702406	702407	702408
Nominal Voltage, U <sub>n</sub>	120-150 VAC	220-240 VAC	240-277 VAC	480-560 VAC
Max Cont. Operating Voltage, U <sub>c</sub>	170 VAC	275 VAC	320 VAC	610 VAC
Stand-off Voltage	240 VAC	440 VAC	480 VAC	700 VAC
Frequency	0-100 Hz			
Short Circuit Current Rating, I <sub>sc</sub>	200 kAIC			
Back-up Overcurrent Protection	125 AgL, if supply > 100 A			
Technology	TD Technology with thermal disconnect			
Max Discharge Current, I <sub>max</sub>	50 kA 8/20 $\mu$ s			
Nominal Discharge Current, I <sub>n</sub>	25 kA 8/20 $\mu$ s	20 kA 8/20		
Protection Modes	Single mode (L-G, L-N or N-G)			
Voltage Protection Level, U <sub>p</sub>	400 V @ 3 kA 1.0 kV @ I <sub>n</sub>	700 V @ 3 kA 1.2 kV @ I <sub>n</sub>	800 V @ 3 kA 1.6 kV @ I <sub>n</sub>	1.8 kV @ 3 kA 2.4 kV @ I <sub>n</sub>
Status	N/O, N/C Change-over contact, 250 V-/0.5 A, max 1.5 mm <sup>2</sup> (#14 AWG) terminals Mechanical flag / remote contacts (R model only)			
Dimensions H x D x W: mm (in)	90 x 68 x 18 (3.54 x 2.68 x 0.69)			
Module Width	1 M			
Weight: kg (lbs)	0.12 (0.26)			
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	$\leq$ 25 mm <sup>2</sup> (#4AWG) stranded $\leq$ 35 mm <sup>2</sup> (#2AWG) solid			
Mounting	35 mm top hat DIN rail			
Temperature	-40°C to 80°C (-40°F to 176°F)			
Humidity	0 % to 90 %			
Approvals	CE, IEC <sup>®</sup> 61643-1, UL <sup>®</sup> 1449 Ed. 3 Recognized Component Type 2			
Surge Rated to Meet	ANSI <sup>®</sup> /IEEE <sup>®</sup> C62.41.2 Cat A, Cat B, Cat C ANSI <sup>®</sup> /IEEE <sup>®</sup> C62.41.2 Scenario II, Exposure 2, 50 kA 8/20 $\mu$ s IEC 61643-1 Class II UL <sup>®</sup> 1449 Ed. 3 In 20 kA mode			
Replacement Module	TDS150M150	TDS150M240	TDS150M277	TDS150M560



**TDS Surge Diverter - TDS1100 Series**

**Features**

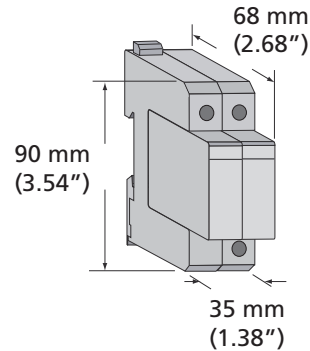
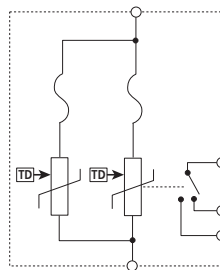
- TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 100kA 8/20µs maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL® 1449 Edition 3 Listed

Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

The TDS1100 series of surge suppressors is designed to provide economical and reliable protection from voltage transients on power distribution systems. They are conveniently packaged for easy installation on 35 mm DIN rail within main distribution panelboards.

Transient Discriminating (TD) technology helps ensure reliable and continued operation during sustained and abnormal over-voltage events. Internal thermal disconnect devices help ensure controlled behavior at end-of-life. A visual indicator flag provides user-feedback in the event of such operation. As standard, the TDS1100 provides a set of voltage-free contacts for remote signaling that maintenance is due.

The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.



Model	TDS11002SR150	TDS11002SR240	TDS11002SR277	TDS11002SR560
Item Number for Europe	702409	702411	702412	702413
Nominal Voltage, U <sub>n</sub>	120-150 VAC	220-240 VAC	240-277 VAC	480-560 VAC
Max Cont. Operating Voltage, U <sub>c</sub>	170 VAC	275 VAC	320 VAC	610 VAC
Stand-off Voltage	240 VAC	440 VAC	480 VAC	700 VAC
Frequency	0-100 Hz			
Short Circuit Current Rating, I <sub>sc</sub>	200 kAIC			
Back-up Overcurrent Protection	125 AqL, if supply > 100 A			
Technology	TD Technology with thermal disconnect			
Max Discharge Current, I <sub>max</sub>	100 kA 8/20 µs			
Impulse Current, I <sub>imp</sub>	12.5 kA 10/350 µs			
Nominal Discharge Current, I <sub>n</sub>	50 kA 8/20 µs	40 kA 8/20 µs		
Protection Modes	Single mode (L-G, L-N or N-G)			
Voltage Protection Level, U <sub>p</sub>	400 V @ 3 kA 1.0 kV @ 20 kA	700 V @ 3 kA 1.2 kV @ 20 kA	800 V @ 3 kA 1.6 kV @ 20 kA	1.8 kV @ 3 kA 2.4 kV @ 20 kA
Status	N/O, N/C Change-over contact, 250 V~/0.5 A, max 1.5 mm <sup>2</sup> (#14 AWG) terminals Mechanical flag / remote contacts (R model only)			
Dimensions H x D x W: mm (in)	90 x 68 x 35 (3.54 x 2.68 x 1.38)			
Module Width	2 M			
Weight: kg (lbs)	0.24 (0.53)			
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)			
Connection	≤25 mm <sup>2</sup> (#4AWG) stranded ≤35 mm <sup>2</sup> (#2AWG) solid			
Mounting	35 mm top hat DIN rail			
Temperature	-40°C to 80°C (-40°F to 176°F)			
Humidity	0% to 90%			
Approvals	CE, IEC® 61643-1, UL® 1449 Ed. 3 Recognized Component Type 2			
Surge Rated to Meet	ANSI®/IEEE® C62.41.2 Cat A, Cat B, Cat C ANSI®/IEEE® C62.41.2 Scenario II, Exposure 3, 100 kA 8/20 µs, 10 kA 10/350 µs IEC 61643-1 Class I and Class II UL® 1449 Ed. 3 In 20 kA mode			
Replacement MOV Module	TDS150M150	TDS150M240	TDS150M277	TDS150M560



TDS Surge Diverter - TDS350 Series

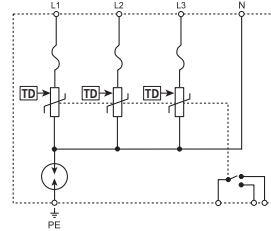
**Features**

- TD Technology with thermal disconnect protection
- Compact design fits into DIN distribution panel boards and motor control centers
- 35 mm DIN rail mount – DIN 43 880 profile matches common circuit breakers
- Indication flags and voltage-free contacts provide remote status monitoring
- Separate plug and base design facilitates replacement of a failed surge module
- 50kA 8/20µs maximum surge rating provides protection suitable for sub-distribution panels and a long operational life
- Available in various operating voltages to suit most common power distribution systems
- CE, UL<sup>®</sup> 1449 Edition 3 Listed

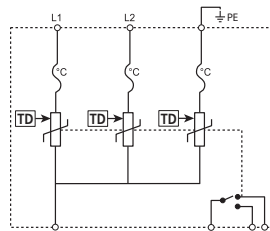
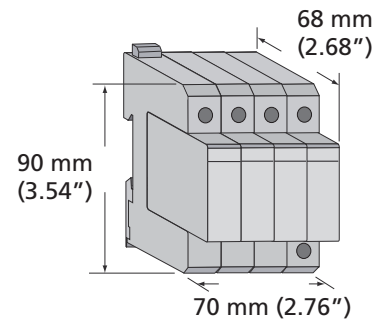
Surges and voltage transients are a major cause of expensive electronic equipment failure and business disruption. Damage may result in the loss of capital outlays, such as computers and communications equipment, as well as consequential loss of revenue and profits due to unscheduled system down-time.

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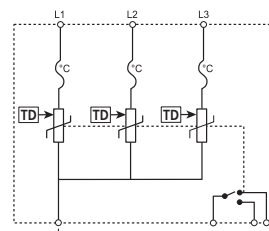
The convenient plug-in module and separate base design facilitates replacement of a failed surge module without needing to undo installation wiring.



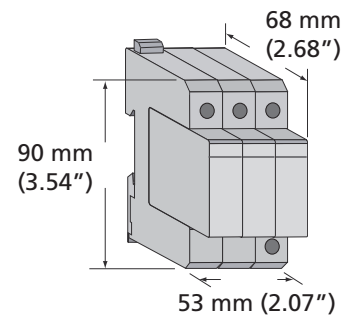
TDS350TT



TDS50120/240



TDS350TNC



Model	TDS350TNC150	TDS50120/240	TDS350TNC277	TDS350TT150	TDS350TT277
Item Number for Europe	702414	702419	702417	702416	702418
Nominal Voltage, U <sub>n</sub>	120-150 VAC	240-480 VAC	240-277 VAC	120-150 VAC	240-277 VAC
Max Cont. Operating Voltage, U <sub>c</sub>	170/295 VAC	240/480 VAC	320/536 VAC	170/295 VAC	320/536 VAC
Stand-off Voltage	240/415 VAC	240/480 VAC	480/813 VAC	240/415 VAC	480/813 VAC
Frequency	0-100 Hz				
Short Circuit Current Rating, I <sub>sc</sub>	200 kAIC				
Back-up Overcurrent Protection	125 AgL, if supply > 100 A				
Technology	TD Technology with thermal disconnect				
Max Discharge Current, I <sub>max</sub>	50 kA 8/20 µs			12.5 kA 10/350 µs N-PE	50 kA 8/20 µs
Nominal Discharge Current, I <sub>n</sub>	25 kA 8/20 µs		20 kA 8/20 µs	25 kA 8/20 µs	20 kA 8/20 µs
Protection Modes	L-N	L-N, N-PE	L-N	L-N, N-PE	
Voltage Protection Level, U <sub>p</sub>	400 V @ 3 kA 1.0 kV @ I <sub>n</sub>		800 V @ 3 kA 1.6 kV @ I <sub>n</sub>	400 V @ 3 kA 1.0 kV @ I <sub>n</sub>	800 V @ 3 kA 1.6 kV @ I <sub>n</sub>
Status	N/O, N/C Change-over contact, 250 V~/.0.5 A, max 1.5 mm <sup>2</sup> (#14 AWG) terminals Mechanical flag / remote contacts				
Dimensions H x D x W: mm (in)	90 x 68 x 53 (3.54 x 2.68 x 2.07)			90 x 68 x 70 (3.54 x 2.68 x 2.76)	
Module Width	3 M			4 M	
Weight: kg (lbs)	0.36 (0.79)			0.5 (1.10)	
Enclosure	DIN 43 880, UL94V-0 thermoplastic, IP 20 (NEMA-1)				
Connection	≤25 mm <sup>2</sup> (#4AWG) stranded ≤35 mm <sup>2</sup> (#2AWG) solid				
Mounting	35 mm top hat DIN rail				
Temperature	-40°C to 80°C (-40°F to 176°F)				
Humidity	0% to 90%				
Approvals	CE, IEC <sup>®</sup> 61643-1, UL <sup>®</sup> 1449 Ed. 3 Recognized Component Type 2				
Surge Rated to Meet	ANSI <sup>®</sup> /IEEE <sup>®</sup> C62.41.2 Cat A, Cat B, Cat C ANSI <sup>®</sup> /IEEE <sup>®</sup> C62.41.2 Scenario II, Exposure 2, 50 kA 8/20 µs IEC 61643-1 Class II UL <sup>®</sup> 1449 Ed. 3 In 20 kA mode				
Replacement MOV Module	TDS150M150		TDS150M277	TDS150M150	TDS150M277
Replacement GDT Module	-			SGD112M	



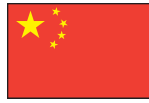
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