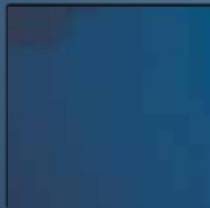
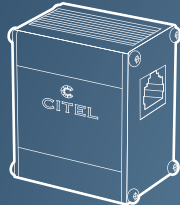
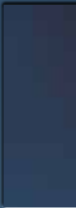
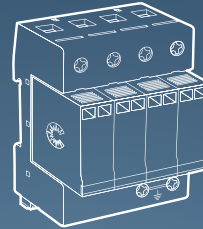




# CITEL

9<sup>th</sup> Edition  
North America

# Surge Protection



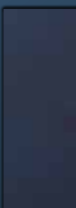
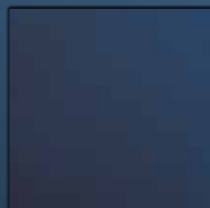
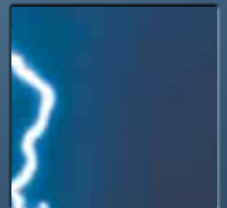
AC & DC Power

Photovoltaic

Telecom

Dataline

Coaxial







# CITEL

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**DIN RAIL AC & DC POWER SURGE PROTECTORS**

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**PHOTOVOLTAIC SURGE PROTECTORS**

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**ENCLOSURE AC POWER SURGE PROTECTORS**

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**TELECOM SURGE PROTECTORS**

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**DATALINE SURGE PROTECTORS**

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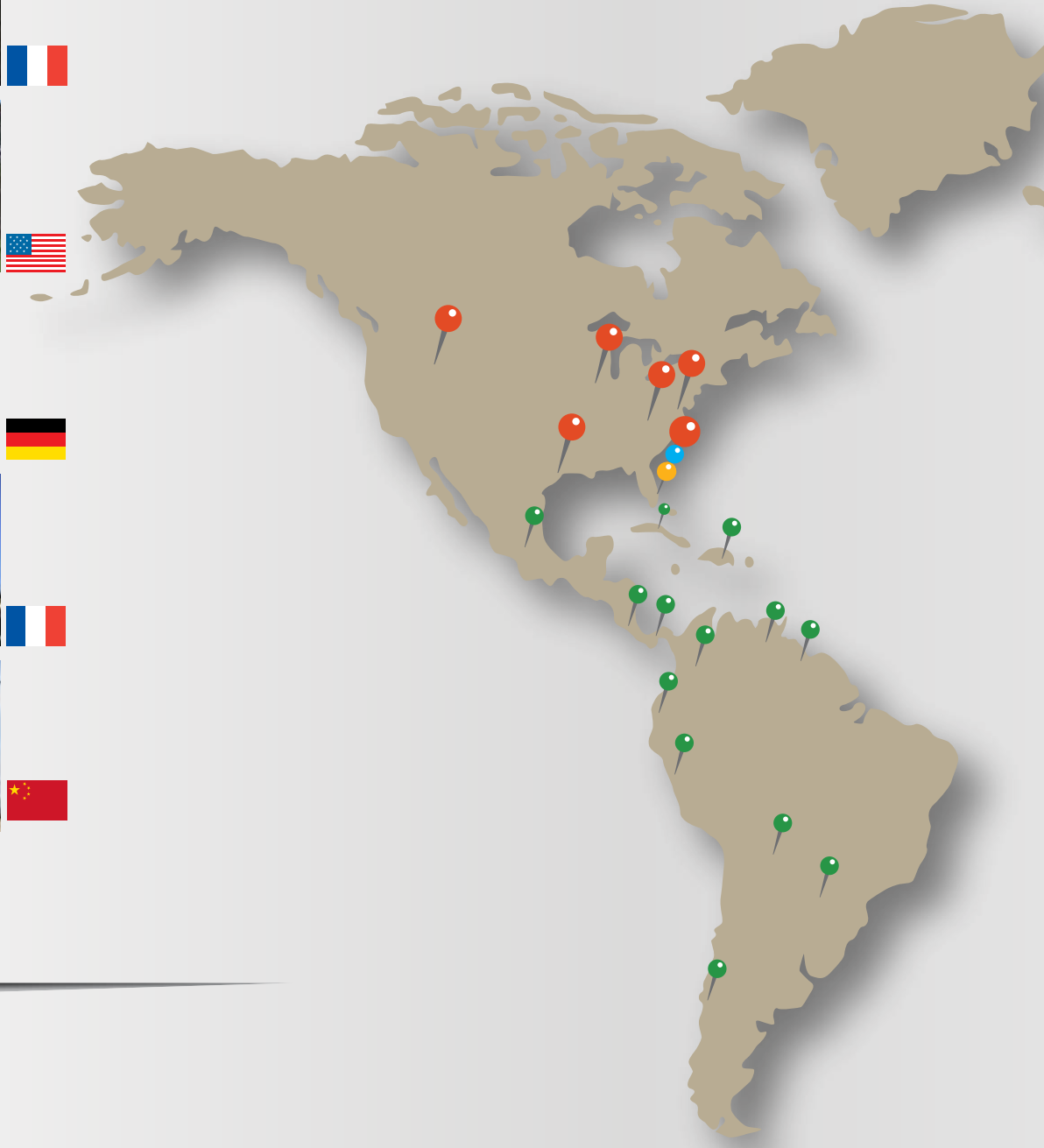
**COAXIAL SURGE PROTECTORS**

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**GAS DISCHARGE TUBES**



# CITEL



 CITEL Office

 Factory

 Test Laboratory

 Distributor



## Locations

### France - Headquarters

- Sèvres :**
- General Management
  - Administration and Finance Department
  - Sales Division : France and Export
  - Research and Development

- Reims :**
- Production and Warehouse

### Regional Offices

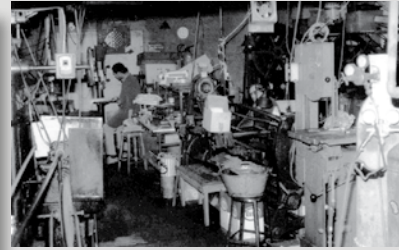
- USA - CITEL Inc.** - Miramar, FL  
**Germany - CITEL Electronics GmbH** - Bochum  
**China - Shanghai CITEL Electronics Co., Ltd** - Shanghai  
**Russia - CITEL Russia** - Moscow  
**India - CITEL India** - New Delhi  
**Czech Republic - CITEL Electronics** - Prague  
*Distributors in more than 50 countries*



# CITEL

## A Long History

- 1937** CITEL founded  
Manufacturer of tubular light bulbs
- 1944** Manufactured first surge protector
- 1976** CITEL acquired by the current management  
Light bulb manufacturing discontinued
- 1985** CITEL Inc. founded in Miami, USA
- 1988** CITEL Electronics GmbH founded in Düsseldorf
- 1992** Acquisition of CLAUDE gas tube line from GTE Sylvania in Reims
- 1992** Acquisition of OBSTA line from GTE Sylvania in Reims
- 1996** Shanghai CITEL Electronics Co., Ltd. founded in Shanghai
- 2000** Launched VG Technology
- 2005** Entered joint venture for coaxial surge protectors in CITEL Tong Da
- 2007** AC surge protectors become the best-selling product at CITEL
- 2010** CITEL Russia founded in Moscow
- 2012** CITEL India founded in New Delhi
- 2014** Established Customer Experience Center in Miramar, Florida



## Testing Labs

To test its products for standards compliance and to ensure continued innovation and reliability, CITEL has test sites in France, USA, and China equipped with:

- Current waveform generators up to 100 kA - 8/20 $\mu$ s
- Current waveform generators up to 100 kA - 10/350 $\mu$ s
- 1.2/50-8/20 $\mu$ s combination wave generators up to 30 kV/15 kA
- 400 Vac 3-phase low voltage network-Icc 1.5 kA / phase for coupling with pulsed current
- HT digital oscilloscopes
- Environmental test chambers for humidity, temperature, and vibration

The G100K test generator in Reims, France, can produce exceptionally high impulse currents of 100 kA and is used for testing structural lightning protection systems as well as Type 1 surge protectors.



## The Specialist in Overvoltage Protection

CITEL's sole focus is protecting sensitive networks and equipment from transient overvoltages originating from lightning strikes and other power quality disturbances.

For this reason, CITEL manufactures two complimentary products lines:

- **Gas Discharge Tubes** (or GDT's) are passive components used to protect telecom equipment from voltage surges.

- **Surge Protection Devices** (or SPD's) are component assemblies or standalone devices combining several protection components. SPD's are designed to be integrated into an existing installation to protect all electric, electronic, and data-processing equipment from transient overvoltages.

# Transient Overvoltages

*Users of electronic equipment and telecom or data-processing systems are faced with the challenge of operating effectively and safely in environments that are at high risk for transient overvoltages.*

*There are several reasons these environments are high risk and require protection:*

- *Integration of many smaller electronic components increases vulnerability*
- *Interruption of service has become unacceptable*
- *Data transmission networks cover larger areas and are more exposed to line disturbances*

## The Origin of Overvoltages

Transient overvoltages have four main causes :

- Lightning
- Industrial and switching surges
- Electrostatic discharges (ESD)
- Nuclear electromagnetic pulses (NEMP)

Overvoltages differ in amplitude, duration, and frequency.

Lightning and other industrial overvoltages have been occurring for a long time but ESD and NEMP disturbances are a much more recent technological development due to the widespread use of semiconductors and thermonuclear devices.

## Lightning

Lightning, studied since Benjamin Franklin's first research in 1749, has become a growing threat to our highly electronic society.

### Lightning Formation

A lightning flash is generated between two zones of opposite charge, typically between two storm clouds or between one cloud and the ground. The flash may travel several miles, advancing toward the ground in successive leaps. The leader creates a highly ionized channel. When it reaches the ground, the real flash or return stroke takes place. A current in the tens of thousands of amperes will then travel from ground to cloud or vice versa via the ionized channel.

### Direct Effects

At the moment of the discharge, there is an impulse current flow that can range from 1,000 to 200,000 amperes in only a few microseconds. This direct effect, with very large current levels, poses only a small risk in damaging electric and electronic systems because it is very localized and generally only impacts the physical structure conducting the event.

The best protection is still the classic lightning rod or Lightning Protection System (LPS) designed to capture the discharge current and conduct it safely to ground.



## Indirect Effects

There are three types of indirect electrical effects :

### Impact on Overhead Lines

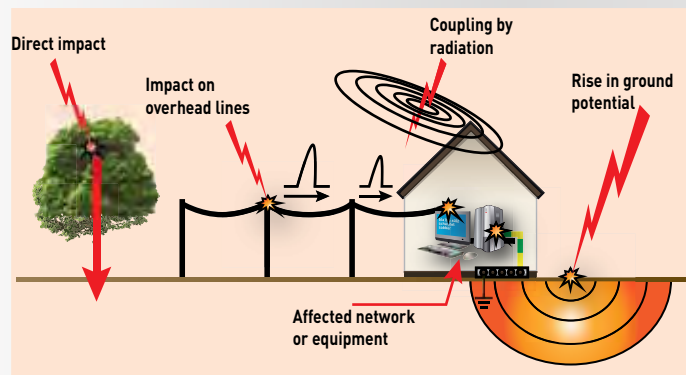
Overhead power lines are highly exposed in nature and may be struck directly by lightning. The resulting transient can either partially or completely destroy the power line before sending a high voltage surge down the conductors to line-connected equipment. The extent of the damage depends on the distance between the lightning strike and the sensitive equipment.

### Rise in Ground Potential

The flow of lightning in the ground causes the potential of the earth to rise according to the intensity of the discharge current and the local earth impedance. In an installation that may be connected to several grounds (e.g. a link between buildings), a strike will cause a very large potential difference and equipment connected to the affected networks will be destroyed or severely disrupted.

### Electromagnetic Radiation

The flash may be thought of as an antenna several miles high carrying an impulse current of several thousands of amperes while radiating an intense electromagnetic field (several kV/m at more than 1 km). These fields induce strong voltages and currents in power or signal lines near or on equipment. The values depend on the distance from the flash and the properties of the connection.



## Industrial Surges

This term covers the phenomena caused by switching electric power sources on or off.

Industrial surges are caused by:

- Starting motors or transformers
- Neon and sodium light starters
- Switching power networks
- Switch "bounce" in an inductive circuit
- Operation of fuses and circuit-breakers
- Falling power lines

These phenomena can generate transients of several kV with rise times of only a few microseconds. These events can disturb sensitive equipment in networks that are connected to the source of the disturbance.

### Electrostatic Overvoltages (ESD)

Electrically, a human being has a capacitance ranging from 100 to 300 picofarads, and can pick up a charge of as much as 15kV by walking on a carpet then touching a conductive object. This potential can be discharged in a few nanoseconds with a current of about ten amperes. Integrated circuits are very vulnerable to this kind of disturbance, but the threat can easily be eliminated with proper shielding and grounding.

### NEMP Phenomena

(Nuclear ElectroMagnetic Pulses)

A high-altitude nuclear explosion can create an intense electromagnetic field (up to 50 kV/m in 10ns) that will radiate down to the ground affecting an area of up to 1200 kilometers in radius.

This field induces very large transient overvoltages into the power lines, transmission lines, and antennas destroying connected sensitive electronic equipment.

The field may reach several kV/ns. While it is difficult to eliminate all overvoltages induced by an electromagnetic pulse, there are ways to reduce them and strengthen the systems to be protected. In spite of the amplitude of the phenomenon, protection can be provided by shielding and filtering surge protectors adapted to NEMP.

## Effects of Overvoltages

Overvoltages have many types of effects on electronic equipment:

### Destruction

- Breakdown of semiconductor junctions
- Destruction of bonding of components
- Destruction of tracks of PCB's or contacts
- Destruction of triacs/thyristors by dV/dt

### Interference with Operation

- Random operation of latches, thyristors, and triacs
- Erasure of memory
- Program errors or crashes
- Data and transmission errors

### Premature Aging

- Components exposed to overvoltages will have a shorter life

## Surge Protection Devices

The Surge Protection Device (or SPD) is a generic name for any device to protect against transient surges. It is a recognized and effective solution for the overvoltage phenomena. To be most effective, the SPD must be carefully chosen for the risk factor of the installation and installed in accordance with the applicable national or local electrical standards.

## Standards

Because of the diversity and importance of transients, standards organizations have created specifications for testing the effects of overvoltages on equipment.

The phenomena were first characterized by engineering standards that defined the environment for surges and where they could be found. These standards produced the 1.2/50 $\mu$ s voltage waveform, 8/20 $\mu$ s and 10/350 $\mu$ s current waveforms. These are an integral part of many of the standards

including:

Surge Protectors for Low-Voltage Installations :

- NF EN 61643-11 (France)
- VDE 0675-6-11 (Germany)
- EN/IEC 61643-11 (Europe/International)
- UL 1449 3rd Edition (USA)
- ANSI/IEEE C62.41-45 (USA/International)

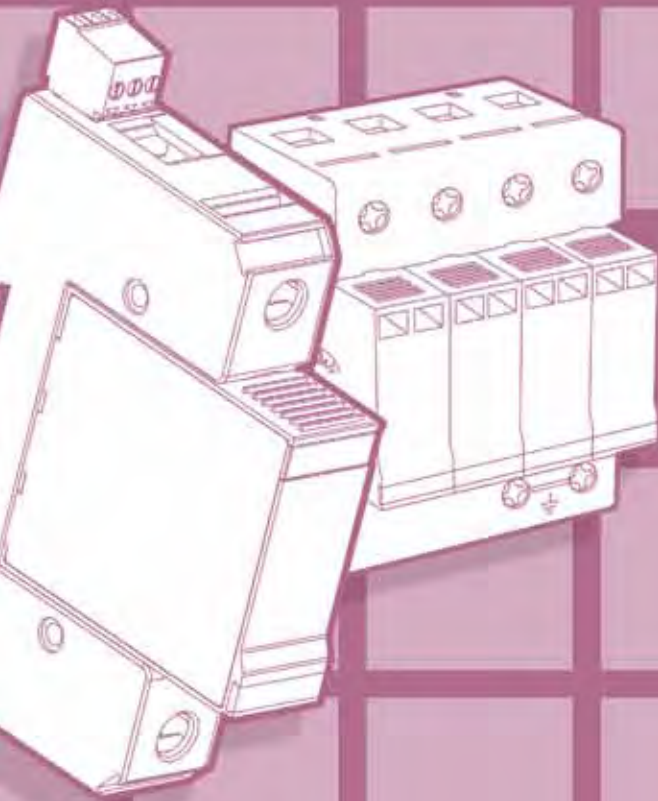
Surge Protectors for Telecom Equipment :

- IEC 61643-21 (International)
- ITU-T recommendations K11, K12, K17, K20, K21, K36 (International)
- UL 497 A/B/E (USA)





**CITEL**



# **DIN RAIL AC & DC Power** Surge Protectors

# DIN Rail AC Power Surge Protectors

CITEL DS Series AC power Surge Protective Devices (SPD's) are designed to meet all your surge protection needs for any low voltage installation.

These DIN rail mounted surge protectors are easy to install in any standardized distribution panel or control cabinet. The SPD's are equipped with a thermal disconnection device and provide real-time fault indicators allowing complete operational safety.

DS Series surge protectors are available with several different protection circuits that comply with even the most demanding installations and international standards.

CITEL AC power surge protectors offer three levels of surge protection capacity that correspond to the different IEC or EN classes; Class I, II and III.



## Standards

To ensure efficient and reliable performance, all of CITEL's AC power surge protectors comply with the leading international standards. The standards for AC surge protection can be split into 3 types:

### Product Standards :

These documents define the type of testing the SPD manufacturer must perform on the devices :

- Europe : EN 61643-11
- Germany : VDE 0675-6-11
- International : IEC 61643-12
- USA : UL1449 3rd Edition
- France : NF EN 61643-11

### Installation Standards :

These documents provide the necessary information on how to properly and safely install surge protectors:

- International : IEC 61643-12 guide
- Germany : VDE 0675-6-12
- USA : ANSI/IEEE C62-41
- France : UTE C15-443 guide

### Selection Standards :

These documents define the basic rules for selecting the surge protector in accordance with the general electrical code :

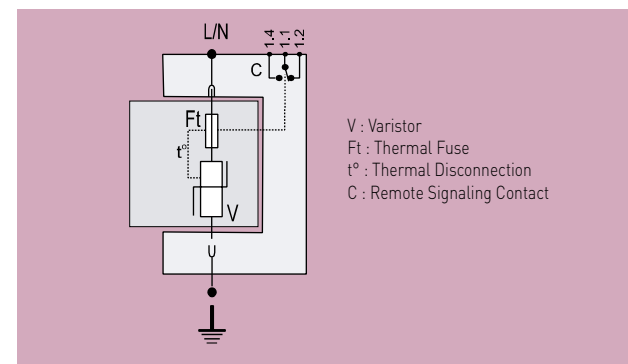
- Germany : DIN VDE 0100 part 443 and 534
- International : IEC 60364-4-433 and 5-534
- France : NF C 15-100 sect. 443 and 534
- USA : NEC Article 285

## Operating Principle

DS Series surge protectors are based on zinc metal-oxide varistor (MOV) technology. This component combines a fast response time (<25 ns) with a high surge discharge current capability; essential characteristics of an efficient surge protection device.

Nevertheless, the end of life of these varistors must be considered. The SPD must be closely monitored and requires a built-in thermal disconnection mechanism for a safe and reliable disconnection from the network (see Disconnection Devices).

### DS40 Surge Protector Diagram



### VG Technology by CITEL

In order to improve the efficiency of a surge protector, CITEL has developed a patented technology which combines a high energy varistor (MOV) network and a specific Gas-Filled Spark Gap (GSG). This specialized circuit incorporated in the VG surge protectors (DS150VG, DS250VG, DUT250VG, DS40VG) can achieve best in class performance for:

- Protection level
- Life expectancy
- Continuous operation
- End of life behavior

These features allow the VG SPD to outperform the same protection efficiency as a two stage device (see page 13).



## Surge Protector Parameters

Surge protectors can be defined by a series of electrical specifications that help the user to select the correct surge protector for their specific application:

### **Operating Voltage - $U_c$**

The maximum continuous operating voltage (MCOV or  $U_c$ ) is the maximum r.m.s voltage that can be applied continuously to the SPD without destruction.

### **Temporary Overvoltage Withstand - $U_T$**

The temporary overvoltage (TOV)  $U_T$  is the maximum r.m.s. value the surge protector can withstand for 5 seconds without destruction.

### **Maximum Discharge Current - $I_{max}$**

The maximum discharge current ( $I_{max}$ ) is the maximum impulse current 8/20  $\mu s$  a surge protector can withstand without destruction .

### **Nominal Discharge Currents - $I_n$**

The nominal discharge current ( $I_n$ ) is the level of impulse current a surge protector Type 1 or Type 2 can withstand repeatedly (15 surges) without destruction.

### **Nominal Discharge Current - $I_{imp}$**

The impulse current ( $I_{imp}$ ) is a Class I test applicable to Type 1 SPD's. It is the maximum impulse at 10/350  $\mu s$  waveform that a surge protector can withstand without destruction. This test simulates the effect, on AC and DC power surge protectors, of a direct lightning strike.

### **Open Circuit Voltage - $U_{oc}$**

This parameter is used only for the Class III test and is applicable to a Type 3 SPD. It consists of the injection of a combination wave (1.2/50  $\mu s$  in open circuit - 8/20  $\mu s$  in short circuit).

### **Protection Level - $U_p$**

Residual voltage of the surge protector during an 8/20  $\mu s$  current impulse waveform (at the maximum  $I_n$  or  $I_{imp}$  declared current value) or with a 1.2/50  $\mu s$  impulse using a 6kV voltage waveform.

### **Protection Level at $I_n$ - $U_{p-I_n}$**

Residual voltage of the surge protector during an 8/20  $\mu s$  current waveform impulse at a determined ( $I_n$  or  $I_{imp}$ ) value. This value will be lower than the  $U_p$  Protection level for all SPD's incorporating VG technology.

### **Short Circuits Capability - $I_{scrr}$**

The surge protection and its associated disconnecter (fuse or circuit breaker) are tested at a maximal short circuit current value. This  $I_{scrr}$  value must be higher than the available short circuit current of the network at the installation point.

### **Follow Current Extinction Capability - $I_{fi}$**

This parameter is only devoted to surge protectors using "air gap" technology. Once they have fired, these surge protectors conduct part of the network current (follow current) and need to interrupt it.

# DIN Rail AC Power Surge Protectors

## Types of Surge Protectors

AC power surge protectors are split into 3 categories by the IEC 61643-11 and EN 61643-11 standards based on the following 3 classes of tests. These different tests depend on the location of the surge protector in the AC network and on external conditions.

### Type 1 Surge Protectors

Type 1 surge protectors are designed to be installed where the risk of a direct lightning strike is high, especially when the building is equipped with an external lightning protection system (LPS or lightning rod). In this situation, EN 61643-11 and IEC 61643-11 standards require the Class I test to be applied to surge protectors. This test is characterized by the injection of a 10/350  $\mu$ s impulse current in order to simulate a direct lightning strike. A Type 1 surge protector must be extremely durable in order to conduct this very high energy impulse current.

### Type 2 Surge Protectors

Type 2 surge protectors are designed to be installed at the service entrance of a facility, typically on the main switchboard, or close to sensitive equipment in facilities without an LPS. These protectors are tested following the Class II test from IEC61643-11 or EN61643-11 standards and are injected with an 8/20  $\mu$ s impulse current.

### Type 3 Surge Protectors

Type 3 surge protectors are used on very sensitive or remote equipment, and provide a secondary stage of protection. Type 3 SPD's are tested with a combination waveform (1.2/50  $\mu$ s - 8/20  $\mu$ s) following the Class III test.

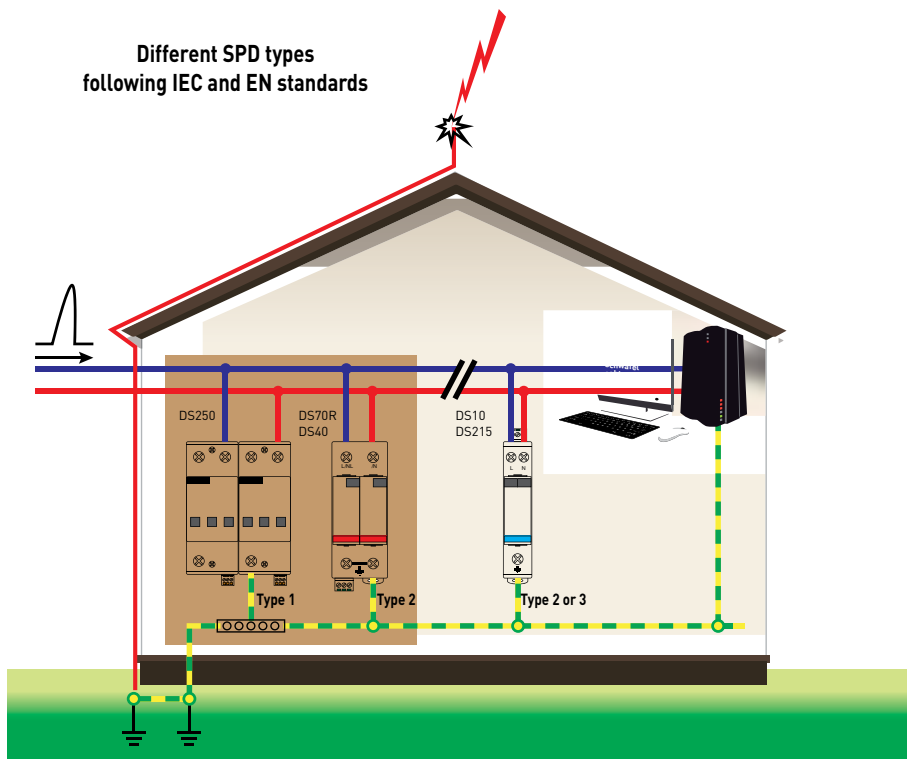
### Combining Surge Protectors

Surge protectors incorporating VG technology provide protection equivalent to the combination of a type 1 + type 2 + type 3 surge protector. The practical advantage is reduced fixed SPD costs and a shorter installation time. In addition, VG technology drastically simplifies the selection criteria of the SPD because calculations are not required to coordinate the various stages of protection (see page 13-14).

### UL1449 3rd Edition SPD Types

The type is linked to the installation point of the surge protector in the network and has nominal discharge current (In) requirements :

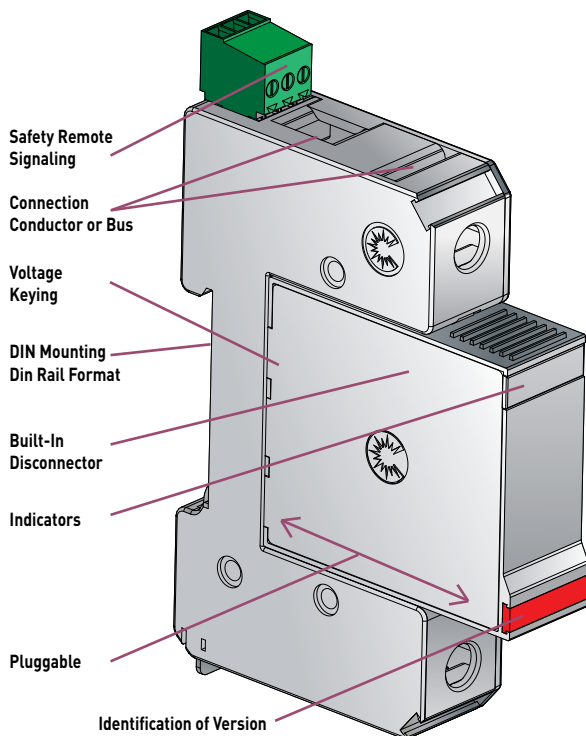
- **Type 1:** An SPD connected on the line or load side of the main service disconnect. The tested In value must be equal to 10 or 20kA, no additional overcurrent protection can be required.
- **Type 2:** An SPD connected on the load of the main service disconnect. The In value must be equal to 3, 5, 10 or 20kA.
- **Type 3:** A point-of-use SPD, directly in front of equipment and further than 30 ft (10 m) from the main service disconnect.
- **Type 4:** An SPD assembly or assembly of surge components including an internal or external thermal disconnect.
- **Type 5:** Surge components, like a gas discharge tube, silicon diode, or metal oxide varistor.



## Disconnection Devices

AC power surge protectors should be equipped with both external and internal disconnection systems in order to provide maximum safety in case of end of life.

- **Internal Thermal Disconnect** - This device will remove the surge protector from the AC network in case of a thermal runaway. The user will be notified of the reduced protection by a visual fault indicator (mechanical or light) on the front of the protector and will require the user to replace the SPD module or SPD.
- **External Electrical Disconnect** - The devices can be fuses or circuit breakers to disconnect the surge protector from the AC network in case of an internal short circuit, usually caused by an excessive impulse current. The rating of the external fuses (or breakers) are related to the surge discharge capability of the SPD and the prospective short-circuit current of the installation. To ease the selection of these components, the rating and type of fuses (or breakers) are noted in the SPD installation instructions.



AC power Surge Protector DS41

## Maintenance

DS Series surge protectors are designed for repeated operation and do not require routine maintenance. Nevertheless, in the case of an extreme surge event, a controlled end of life could occur and replacement must be performed.

### Replaceable Modular Design

The design of some DS Series surge protectors (DS10, DS40, DS240, DS70R, DS130) are based on the use of a replaceable module that plug into a matching base. This makes replacement and restoration of the surge protector both quick and easy. For multiple module surge protectors, the ability to replace a single failed module rather than the entire SPD saves both time and money.

The plug-in module is identified with a color label that relates to the IEC SPD type (Black = Type 1 ; Red = Type 2 ; Blue = Type 2 low power or Type 3) and are marked by operating voltage to avoid misapplication.

### Visual Fault Indication

DS Series surge protectors are equipped with a visual fault indicator (mechanical or light) linked to the internal thermal disconnect. In the event of a safety disconnection, the indicator will switch on and informs the user that the SPD must be replaced.

### Remote Fault Signalization

DS Series surge protectors are available with remote signaling capabilities. This feature provides a method for remotely checking the status of the surge protector. This feature is especially important when the SPD is installed in a hard to reach or unsupervised location.

The remote signaling system consists of an auxiliary changeover dry contact that is activated if the surge protector module changes status. This lets the user monitor :

- The real-time operating status of the SPD
- The presence of the plug-in modules
- The end of life or disconnection of the surge protector

The remote signaling DS models allow for a choice of signaling system appropriate to each specific installation including an LED light, audible buzzer, SCADA, or transmission via modem.

# DIN Rail AC Power Surge Protectors

## Surge Protector Installation

### Location

DS Series surge protectors are installed according to type:

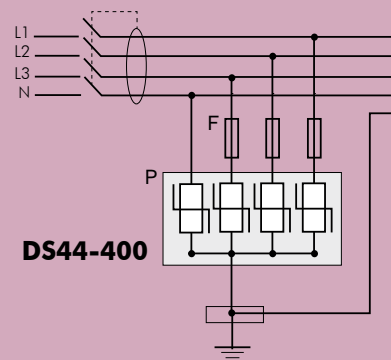
- **Type 1 or Heavy duty** : At the service entrance of the facility, in a standalone enclosure or integral to the main electrical panel, used for brute force protection against lightning strikes.
- **Type 2 or Primary** : At the service entrance of the facility, on the main electrical panel, for elimination of induced surge impulse currents to avoid coupling to the network.
- **Type 2 (or Type 3) or Secondary** : On a secondary sub-panel, near sensitive equipment, to limit ringing and improve the overall level of protection.

### Wiring

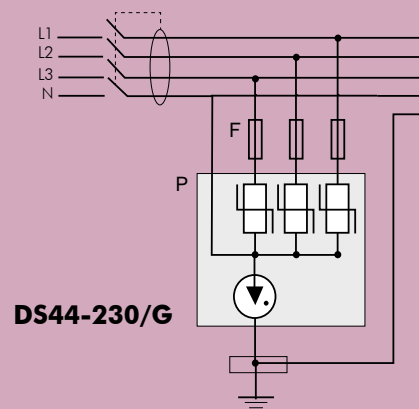
Since lightning surges are essentially common-mode phenomena, DS Series surge protectors are connected mainly in common mode (between the phase conductors and ground).

Some specifications call for additional differential-mode protection (between phase conductors and the neutral conductor). For these applications, CITEC offers a specific GSG version using a gas-filled spark gap module for the neutral to ground (common mode) protection. This type of installation is called a CT2 connection in the IEC 60364 standard and is used in surge protectors such as the DS44-230/G.

### Common Mode Protection CT1 Connection



### Common and Differential Mode Protection CT2 Connection



### Installation

DS Series surge protectors are connected in parallel to the AC network and should be equipped with external fuses (or circuit breakers) for short-circuit protection (see paragraph titled Disconnection Devices).

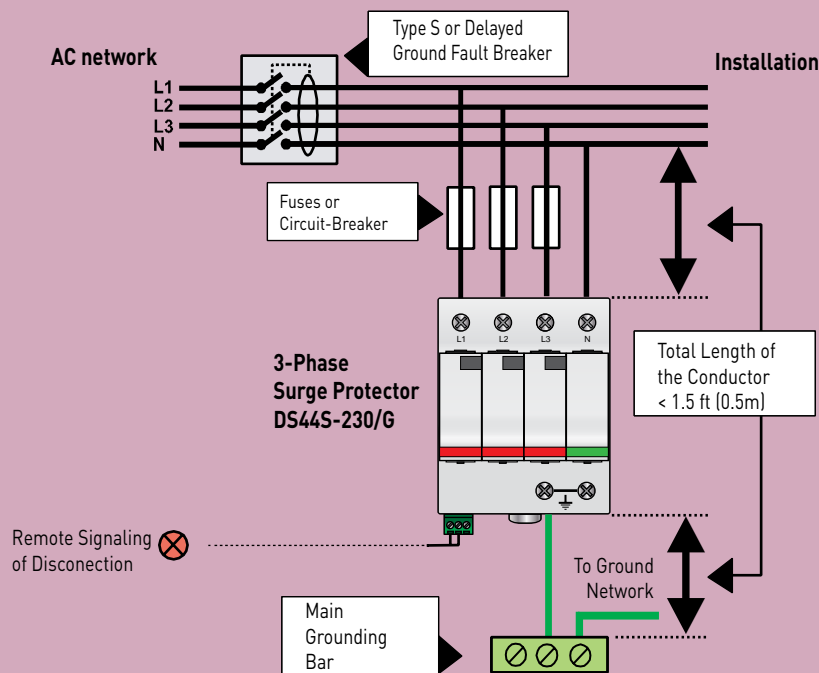
- The total length of the connected leads to the AC network must be less than 1.5 ft (0.5 m) in order to maintain the stated protection level (Up) of the SPD.
- The wiring connections are made by screw terminal connectors. On some models, a distribution bus can be used.
- The ground connection coming from the SPD must be connected to the grounding bar of the electrical panel.
- The cross sectional area of the wire leads must be at least 6 mm<sup>2</sup> for

a Type 2 SPD and 16 mm<sup>2</sup> for a Type 1 SPD.

- Local earthing resistance must be in compliance with the local electrical rules and should be less than 25 ohms.

Further information can be found in the IEC 61643-12 standard (selection and application principles for low voltage SPD).

### Installation Example (Type 2 Surge Protector DS44S-230/G)



# VG Technology for AC and Photovoltaic Surge Protectors

## Overview

Several technologies currently exist on the market for surge protection for AC or DC power networks:

- Metal Oxide Varistor (MOV)
- Air Gap + Trigger
- MOV + Gas-Filled Spark Gap (GSG)

## VG Technology

This technology is the exclusive and patented technology of CITELE. It is based on the use of specific types of Gas-filled Spark Gaps (GSG) in combination with MOV's. This technology is the result of over 75 years of experience in the gas discharge tube field. Their specialized GSG's provide both robust surge handling and operational stability.

CITELE originally developed the VG technology for low voltage Type 1 surge protectors and has since extended this technology to Type 2 surge protectors and photovoltaic applications.

CITELE ranges using the "VG" technology:

- DS250VG : Type 1 AC Surge Protector,  $I_{imp}=25$  kA.
- DUT250VG : Type 1 AC Surge Protector, three phase,  $I_{imp}=25$  kA
- DS130VG : Type 1 AC Surge Protector,  $I_{imp}=12.5$  kA
- DS60VGPV : Type 1 DC Surge Protector for PV application,  $I_{imp}=12.5$  kA
- DS50VGPV: Type 2 DC Surge Protector for PV application,  $I_{max}=40$  kA
- DS40VG: Type 2 AC Surge Protector,  $I_{max}=40$  kA

## Advantages of VG Technology



### 1. Gas-Filled Spark Gap (GSG)

CITELE VG surge protectors use specific Gas-Filled Spark Gaps (GSG's). These components are the result of over 75 years of experience in the gas discharge tube field. They are designed specifically for AC and DC power networks and ensure maximum electrical stability.



→ Increase Reliability



### 2. Very Low Residual Voltage and Very High Surge Current Capability

GSG's are able to conduct very high surge currents ( $I_{imp}$ ,  $I_{max}$ ) with a very low residual voltage ( $U_p$ ). Such characteristics could only previously be reached with the combination of a Type 1 and a Type 2 surge protector.



→ Equivalent to Type 1+2+3 or 2+3 Solutions

→ Maximum Efficiency

→ Compact Design



### 3. Increased TOV Withstand

VG surge protectors can withstand a very high TOV level of up to 450 Vac for a 220/380 Vac system without any degradation to the protection level.



→ Increased Reliability for Unstable Power Networks





#### 4. No Follow Current

Unlike "Air Gap" technologies, "VG" Technology does not create any follow current. VG increases service continuity by not tripping the upstream overcurrent protection devices during surge events.



→ *Increases Network Uptime*



#### 5. Robust Energy Handling and Reliability

All the components of the VG surge protector are designed to handle high impulse discharge currents without any assistance from auxiliary systems. In contrast, the traditional "Triggered Air Gap" technology relies on a control circuit, using very low power components, which are required to handle part of the surge current. During some low amplitude, low voltage transients, this weak trigger circuit will handle the full amount of current and can fail.



→ *Increase Reliability*  
→ *Better Life Expectancy*



#### 6. Safe Disconnection and Real-Time Status Indication

VG surge protectors use a very safe thermal disconnection system and provide real-time status indication of internal components. For "Triggered Air Gap" technology, the disconnection and signalization only can provide the status of the trigger control circuit and not the main protection circuit.



→ *Safe and Efficient Maintenance*



#### 7. Will Not Degrade

During normal operation, varistors are always conducting a small amount of current called working current ( $I_c$ ) and leakage current ( $I_{pe}$ ) due to the varistors connection to the grounding system. This type of conduction can be stressful to the varistor over time, and can cause the varistor to age prematurely. VG technology eliminates both working and leakage current.



→ *Maximum Life*



#### 8. Easier Surge Protection Coordination

In the case of coordinated installations, the surge protector downstream of a VG surge protector does not need any special consideration. A sufficient distance between locations is not required to ensure a working coordination between multiple SPDs. Note: due to its optimized protection level, the VG surge protector can be used without any additional surge protectors.



→ *Easier to Configure*

**CITEL 's VG technology offers the highest level of efficiency and reliability, conditions essential for achieving the maximum performance of your surge protection system.**

# DIN Rail Surge Protectors - Low Voltage

## Choosing Surge Protectors

CITEL's line of AC power surge protectors are designed to support all voltages and configurations in a low voltage power installation.

Key features of SPD's include:

- Type or test class: 1, 2 or 3
- Operating voltage (Uc)
- AC network configuration: Single, Split, 3-Phase(+N)
- Discharge currents: Iimp, Imax, In
- Protection level (Up)
- Protection technology (varistors, VG technology, filter)

The selection of the surge protector must be done following the local electrical codes requirements (like minimum rating for In) and specific conditions (like high lightning density).

### Choosing the Type of Surge Protectors

The type of surge protector is based on its location within the system and the parameters affecting its installation.

Configuration	SPD	Location	CITEL
Installation equipped with LPS or could be hit by lightning	<b>Type 1+2</b> <b>Type 1+2+3</b>	Service entrance (panel or main switchboard)	DS130R DS130VG DS250VG DUT250VG DS250E
Installation without LPS	<b>Type 2</b> <b>Type 2+3</b>	Main switchboard	DS70R, DS40 DS240, DS440
Secondary protection (downstream primary SPD)	<b>Type 2</b> (or Type 3)	Close to protected equipment	DS10 DS215 DS415, DS98

### Choosing the Operating Voltage Uc

The SPD Uc or maximum continuous operating voltage depends on:

- Nominal voltage of the AC network (Uo)
- Type of AC system (TN, TT, IT).
- The level of resistance to temporary overvoltage required (U<sub>T</sub>)

### Operating Voltage Uc (Line/Ground)

AC Network	230/400V			120/208V
	TT	TN	IT	TN
<b>Voltage Uc</b>	<b>255 V</b>	<b>255 V</b>	<b>400 V</b>	<b>150 V</b>
<b>Voltage U<sub>T</sub></b>	<b>400 V</b>	<b>335 V</b>	<b>-</b>	<b>175 V</b>
Example of CITEL product	DS42-230/G	DS42-230	DS42-400	DS42-120

### AC Network Configuration

DS Series surge protectors are available for single, split, 3-Phase and 3-Phase + neutral AC network configurations.

### Choosing Iimp

The Lightning Impulse Current (Iimp) rating is required for Type 1 SPD's. The minimum surge current rating for Iimp is 12.5 kA 10/350 μs per pole following IEC 60364-5-534. This level is consistent with real life expectations. CITEL offers two levels of Iimp current ratings in Type 1 SPD products : 12.5kA 10/350 μs and 25 kA 10/350 μs.

Configuration	Iimp	CITEL
Very high lightning density Poor earthing	<b>25 kA</b>	DS250VG DS250E DUT250VG
High, medium or low lightning density	<b>12.5 kA</b>	DS130VG DS130R

### Choosing In and Imax Currents

The nominal discharge current or In for an SPD is directly related to the lightning risk of the installation and requires a series of test impulses. The minimum In rating for an SPD connected at the service entrance of an installation is 20 kA (8/20 μs waveform) as per UL standard. Nevertheless, higher ratings are advisable in areas with high lightning density. Generally, the higher the value of In current, the longer life expectancy of the SPD.

The maximum discharge current or Imax rating is linked to In and is the maximum surge current the SPD can survive for one test impulse.

Conditions	In	CITEL
Very high lightning density	<b>20 kA</b>	DS70R, DS40, DS40VG, DS150, DS240, DS440
High or medium lightning density	<b>10-20 kA</b>	DS40, DS40VG, DS150, DS240, DS440
Low lightning density or secondary SPD	<b>5 kA</b>	DS10 DS215, DS415

### Choosing the Up

The user must select a surge protector with a protection level or Up below the withstand level of the sensitive equipment. The lower the Up, the better the protection.

IEC 60364 standard calls for the minimum protection level of 2.5 kV for an SPD connected at the entrance of a 230/400 V network. This level is in compliance with the withstand level of a very robust device, like electromechanical equipment.

Electronic-based equipment has lower impulse withstand capability and requires better protection. Surge protectors with a 1.5 kV protection level are necessary to provide efficient protection.

Conditions	Recommended Up	
	230/400 V AC network	120/208 V AC network
SPD at the service entrance	<b>2.5 kV max.</b>	<b>1.5 kV max.</b>
Electromechanical protected equipment	<b>2.5 kV</b>	<b>1.5 kV</b>
Electronic-based protected equipment	<b>1.5 kV</b>	<b>0.8 kV</b>

Carefully choosing the appropriate SPD technology as well as using a coordinated protection scheme will help to maximize the protection level of the installation.

**Choosing the SPD Technology**

Most DS Series surge protectors are based on varistor (MOV) technology. However, CITEL offers some versions that use different electrical diagrams :

- **VG Technology** : This is a Gas-Filled Spark Gap (GSG) and varistor hybrid, used in a Type 1 SPD (DS130VG, DS250VG, DUT250VG, DS40VG). It dramatically improves the reliability and the efficiency of the SPD (see page 13-14).

- **Association with RFI Filter** : The secondary SPD DS-HF combine a surge protection stage and filter stage in order to achieve an even greater protection level.

**Coordination of Surge Protectors**

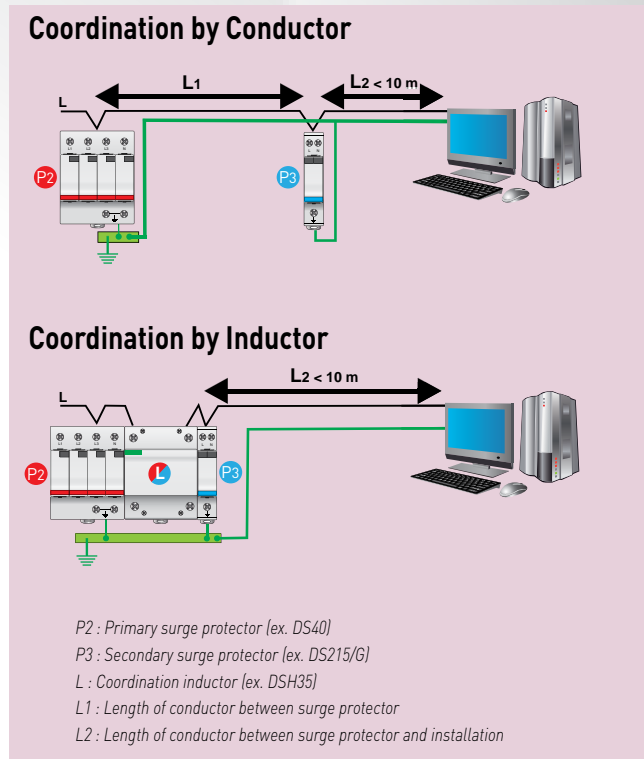
In order to provide maximum protection efficiency, it is necessary to create a coordinated protection scheme which means installation of a primary SPD at the network's service entrance and a secondary SPD close to the sensitive equipment.

Coordination is required in the 2 following cases :

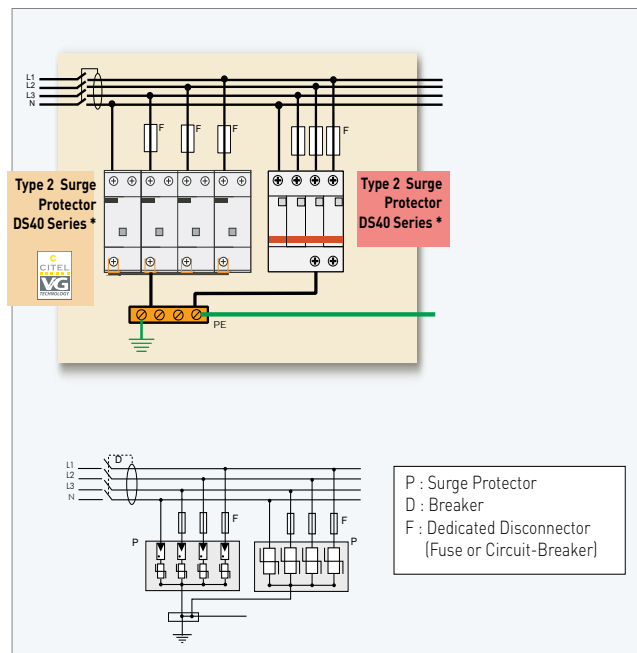
- ➔ High sensitivity equipment :
  - Improvement of protection level.
- ➔ Distances greater than 90 ft (30 m) between equipment being protected and the primary SPD :
  - Reduces ringing voltages created during the surge transmission.

Efficient SPD coordination is performed by including the following between primary and secondary SPDs :

- a minimum length of wire > 30 ft (10 m).
- or
- a coordination inductor (DSH range).



**Example of Coordination on a 3-Phase Network**



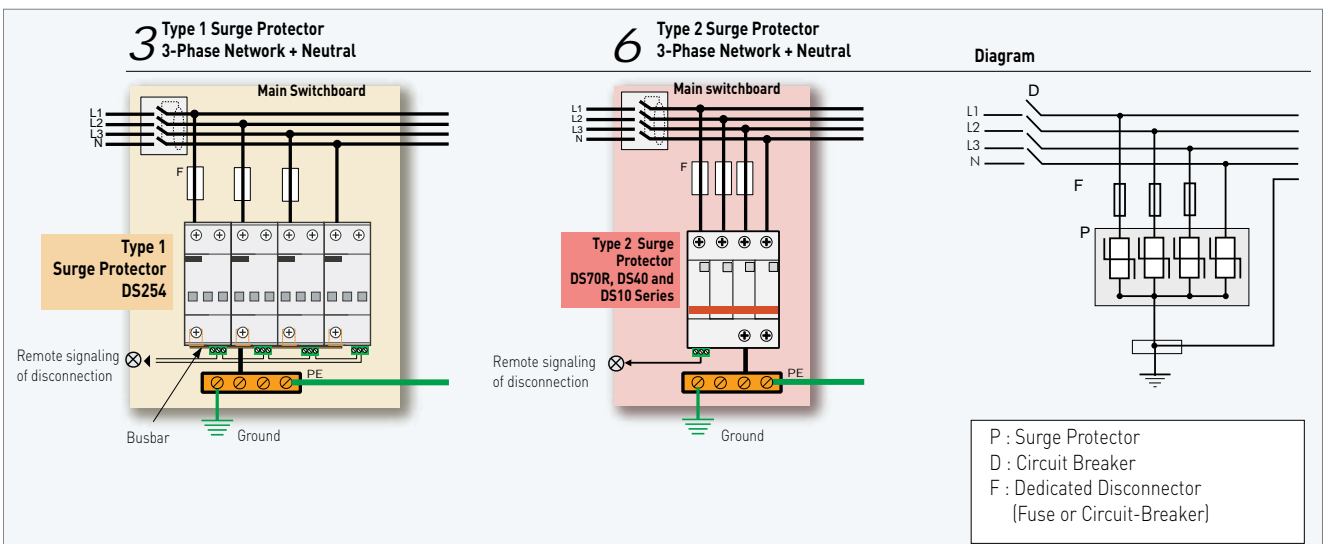
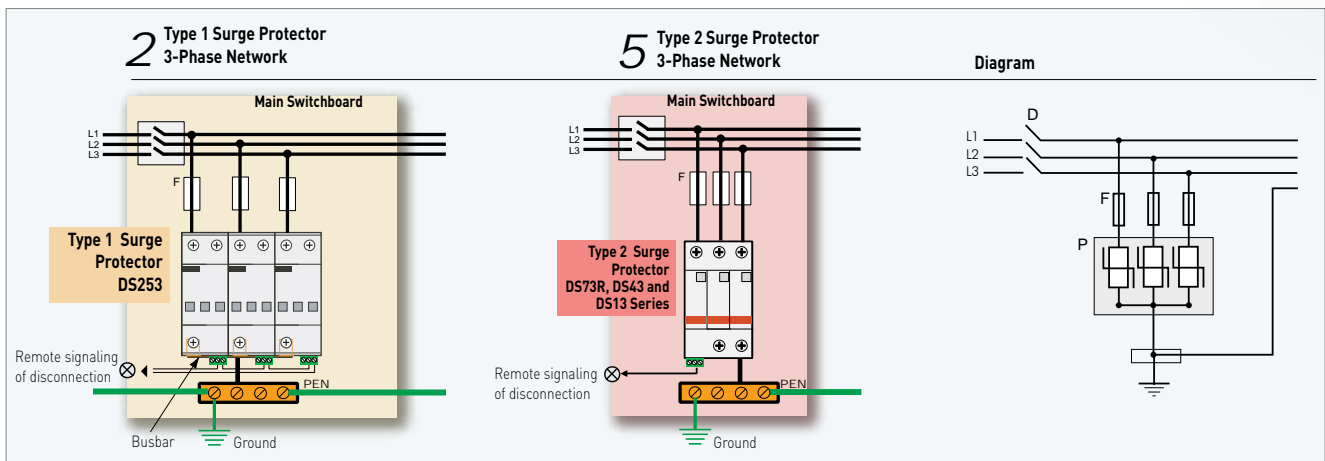
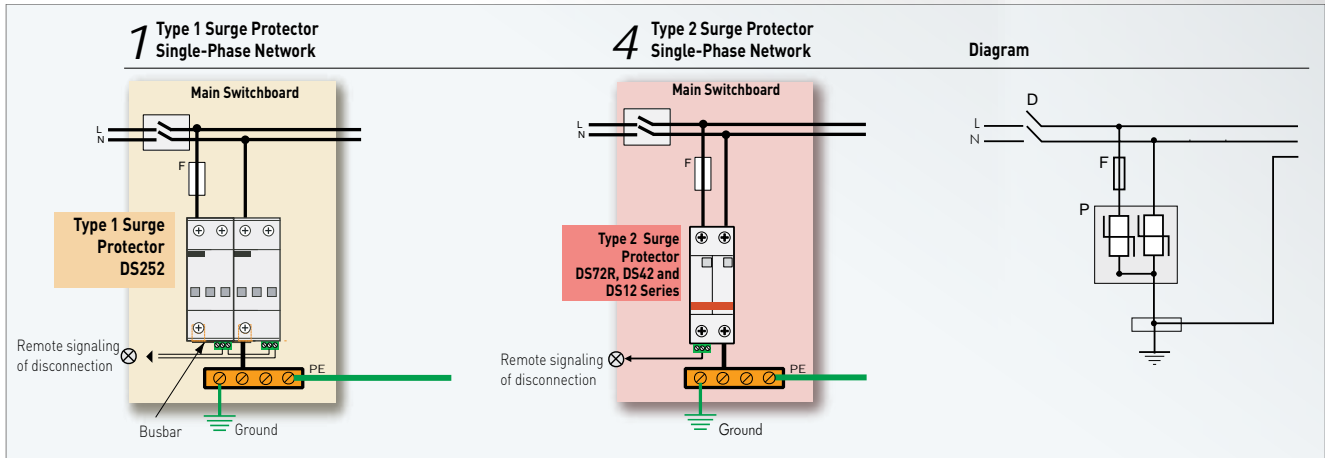
\*optional

# DS Series Surge Protector Wiring

## Common Mode Protection (CT1 Connection)

All DS Series SPD's provide protection for Common Mode (L/PE) on AC networks.

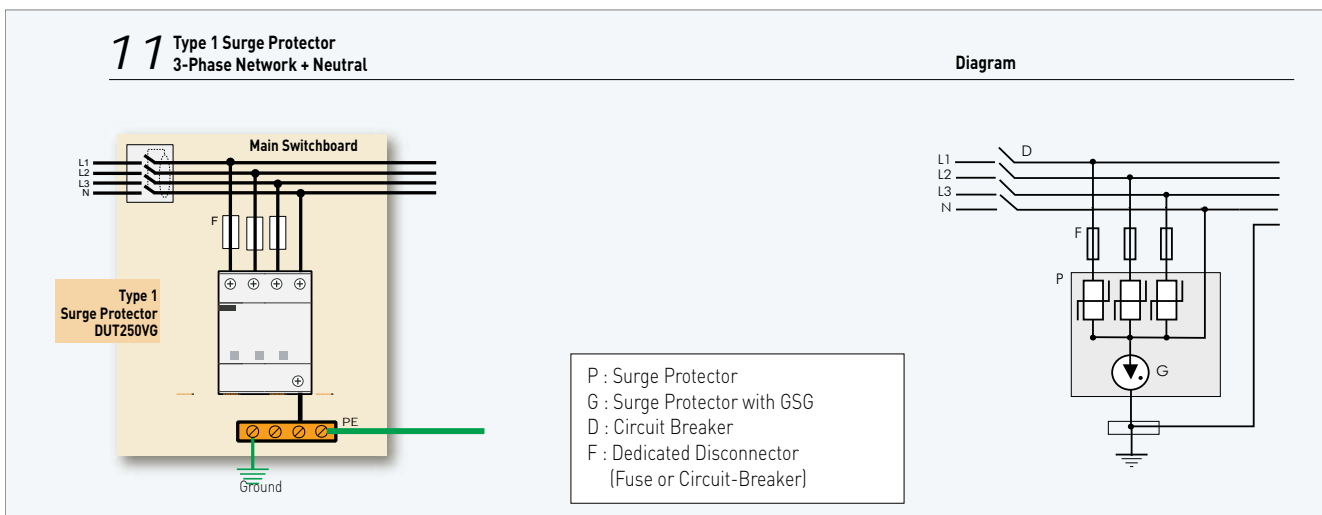
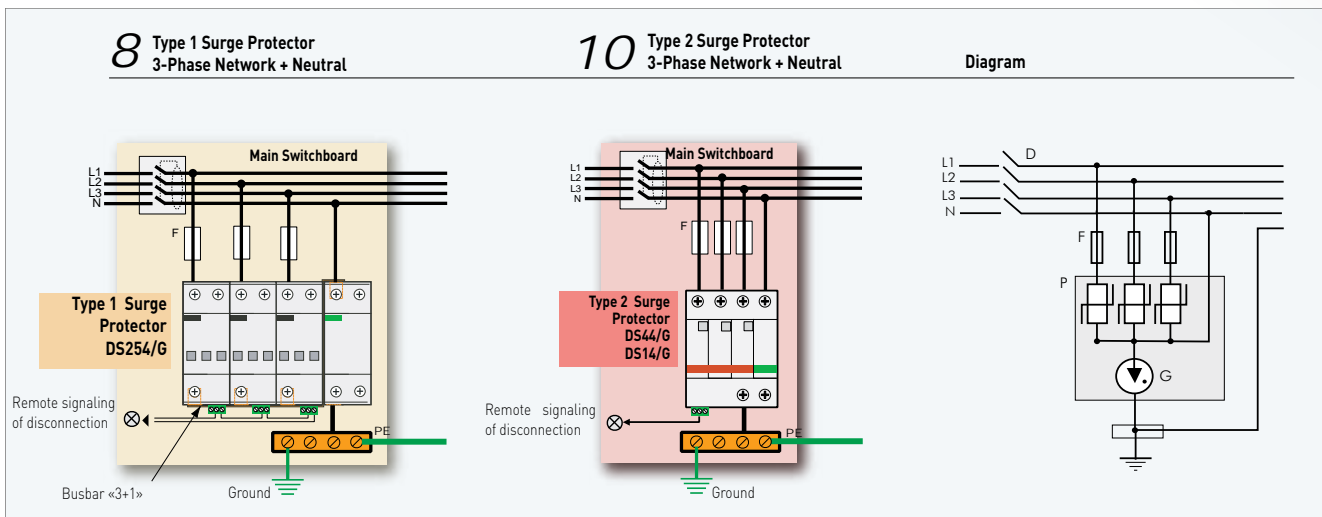
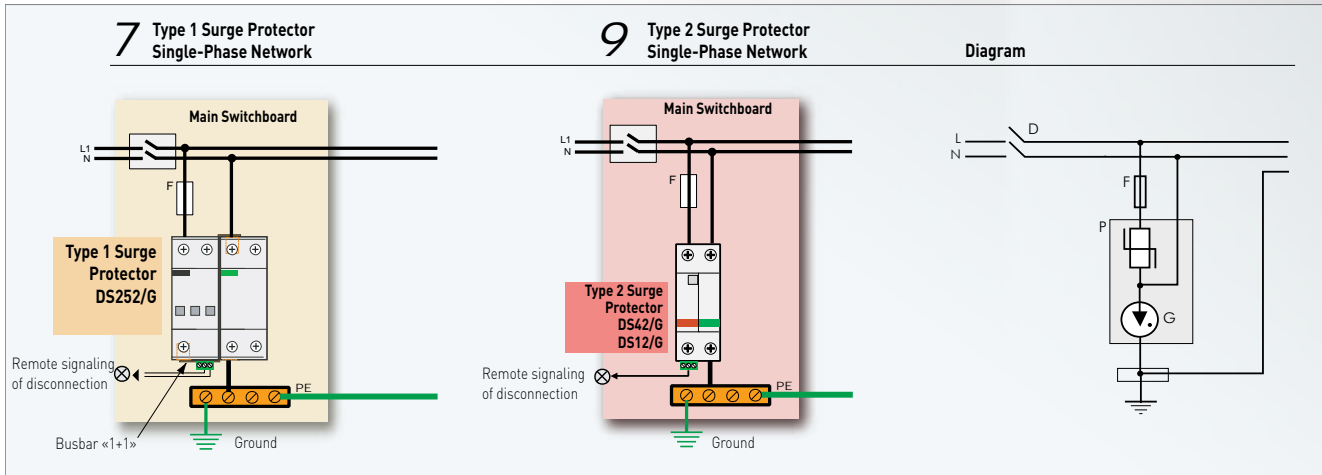
Called CT1 connection type in IEC 60364 standard.



# DS Series Surge Protector Wiring

## Common and Differential Mode Protection (CT2 Connection)

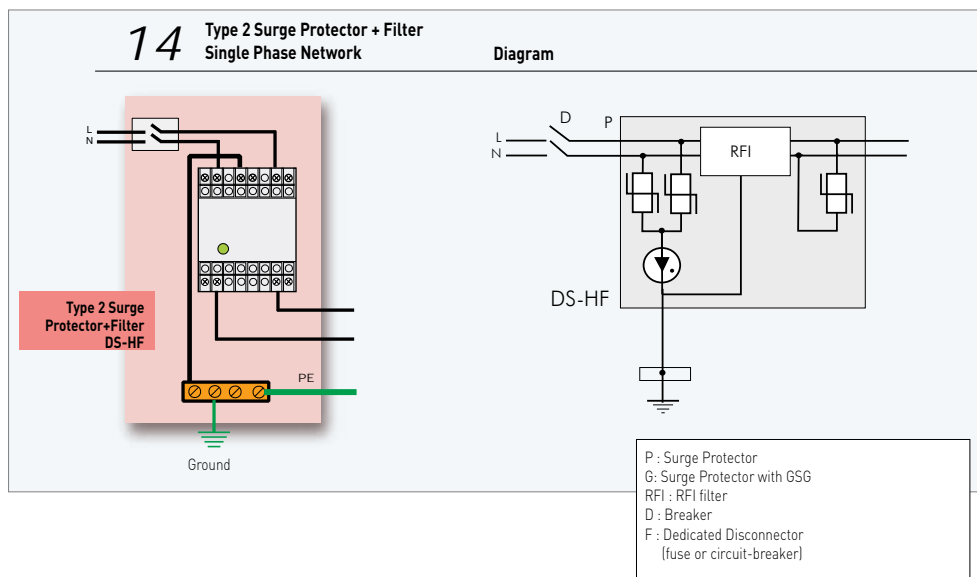
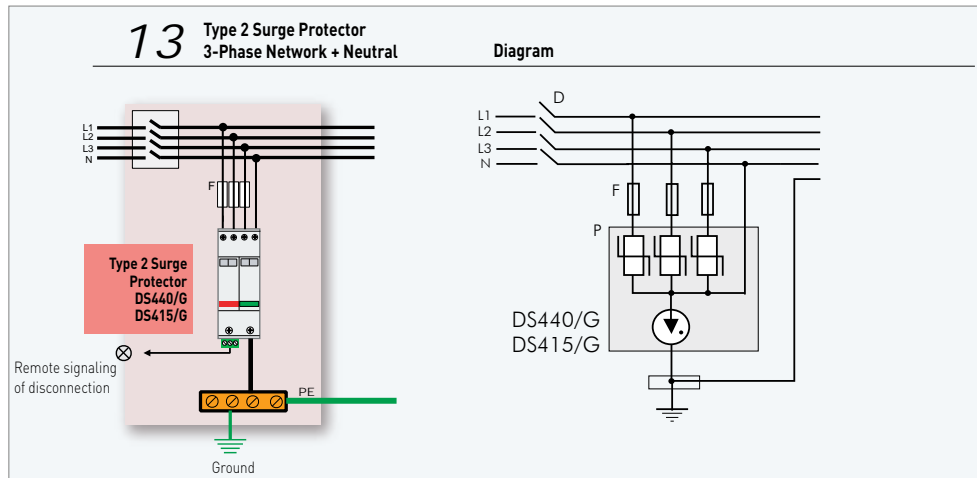
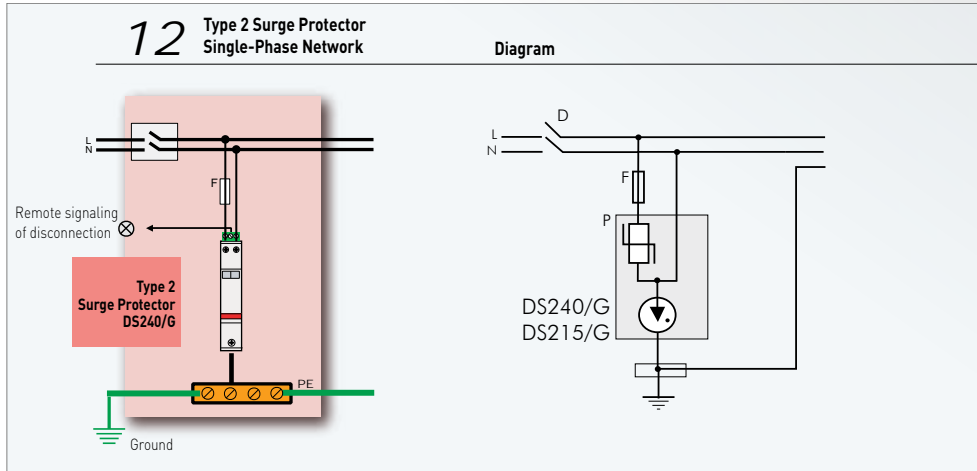
Many DS Series SPD's provide protection for both Common Mode (L/PE) and Differential Mode (L/N) on AC networks. These CT2 configurations (following IEC 60364) are also called "1+1" and "3+1" mounting.



# DS Series Surge Protector Wiring

## Multi-Pole Type 2 Surge Protector Wiring

Wiring instructions for multi-pole Type 2 surge protectors.



# DS Series Surge Protector Wiring

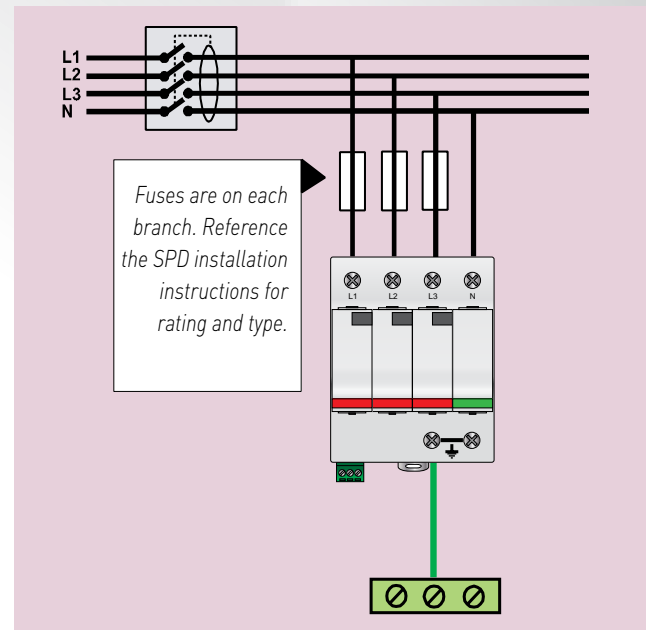
## Dedicated Fuses

To comply with safety standards, the AC surge protectors must be protected against a possible end of life short-circuit scenario. The user must install protection against short circuit current with fuses or a circuit breaker on each SPD branch.

The rating of this overcurrent protection is given by the SPD manufacturer in the product datasheet and installation instructions and is based on 2 criteria :

- Ability to withstand the short-circuit current test in the IEC 61643-1 and UL 1449 3rd edition standards. The fuse must safely cut the short-circuit current before a harsh destruction of the SPD.
- Ability to withstand of the discharge currents ( $I_n$  or  $I_{max}$ ). The fuse must be able to conduct the discharge current of the SPD without opening.

CITEL has selected several fuses and DIN rail holders that are optimal for this SPD range. The fuses are equipped with failure indicators for easy status checks and the holders can be supplied with or without dry



Fuses for SPD		
Rating	Dimensions	Fuse P/N
125 A gG	22x58 mm	6062 0125
100 A gG	22x58 mm	6062 0100
50 A gG	22x58 mm	6062 0050
20 A gG	22x58 mm	6062 0020
Fuse Holders		
Number of Poles	with remote signaling contact	without remote signaling contact
1 pole	5603 5011	5603 5001
2 poles	5603 5012	5603 5002
3 poles	5603 5013	5603 5003
4 poles	5603 5016	5603 5006

# International Standards for AC Surge Protectors

The performance of AC surge protectors is defined by a series of international and national test and standards that ensure efficient and safe use.

National standards are often based on IEC international standards. In the field of AC surge protection, several documents must be taken into consideration.

## Standards in Surge Protection

The relevant standards for test performance, selection and application of low voltage SPDs are:

### General Rules : IEC 60364 Standard

- Section 4-443: *Protection against overvoltages of atmospheric origin or due to switching.* This section of IEC 60364 is intended to describe the means by which transient overvoltages can be limited to reduce the risk of failures in the installation, and in electrical equipment connected to it, to an acceptable level.

- Section 5-534: *Devices for protection against overvoltages.* This section gives the basic requirements for the selection and implementation of the SPD's for electrical installations in buildings to obtain a limitation of transient overvoltages.

### Product Standard : IEC 61643-11

This document addresses performance tests for AC surge protective devices (SPD's) following different classes (Class I , II or III test). It is mainly directed at surge protector manufacturers.

### Selection and Application Guide : IEC 61643-12

This guide addresses the selection and application principles of SPD's in practical situations.

Section 4-443 of IEC 60364 recommends SPD's on electrical installations if they are supplied by overhead lines (partially or totally) and if the local keraunic level is equal to or greater than 25. Some national standards based on IEC require an SPD installation in these types of conditions.

## Recommendations for SPD Installation

Section 5-534 gives the minimum performance required for an SPD installed at the service entrance of facility, the required nominal discharge current is  $I_n \geq 5$  kA for a Type 2 SPD and lightning current  $I_{imp} \geq 12.5$  kA for a Type 1 SPD.

**1** - Installations equipped with lightning rod (LPS):

➔ **Recommendation : Type 1 SPD**, with lightning impulse current  $I_{imp}$  of 12.5 kA minimum, connected at the service entrance.

**2** - Installations connected to an overhead AC network and the lightning density  $N_g \geq 2.5$  (or local keraunic level  $N_k \geq 25$ ) :

➔ **Recommendation : Type 2 SPD**, with nominal discharge current  $I_n \geq 5$  kA, connected at the service entrance.

**3** - Installations connected to an overhead AC network and the local keraunic level  $N_k \leq 25$  (or the lightning density  $N_g \leq 2.5$ ) :

➔ Surge Protector not required.

**4** - Installations connected to an underground AC network

➔ Surge Protector not required.

A more accurate analysis can be done taking into account the type of equipment, sensitivity and cost, or the consequences of a service interruption, downtime costs, and human hazard. The international standard IEC 61662 recommends a comprehensive method for assessing the risk related to surges due to lightning.

**5** - Downtime of the electrical network could have consequences on human safety.

➔ Surge Protector mandatory or risk analysis required.

### Application of AC Surge Protectors Following IEC 60364

Type of Installation	$N_g < 2.5$	$N_g > 2.5$
Installation equipped with direct lightning protection system (LPS)	<b>Mandatory</b> (Type 1)	<b>Mandatory</b> (Type 1)
Connection to overhead AC line	Not mandatory*	<b>Mandatory</b> (Type 2)
Connection to underground AC line	Not mandatory*	Not mandatory*
Electrical supports human safety equipment	Risk analysis required	<b>Mandatory</b>

(\*) Surge protectors are recommended for sensitive equipment or when a redundant protection is required.

## Conclusion

Depending on the country, AC surge protectors are recommended or mandatory in relation with the external conditions. Risk assessment methods are available to determine more accurately the need and type of surge protection. In any case, as electrical installations are full of sensitive devices, installing properly selected surge protectors is becoming more and more critical.



# North-American Standards on Low Voltage Surge Protection Devices

## Standards

The international standard IEC is not recognized in North America. Other national standards and guidelines exist, such as UL, NEC and ANSI/IEEE, which are used to determine your risk to transients in low voltage power networks as well as the use of appropriate protection for each application.

### NEC (National Electrical Code)

The article 280 of NEC defines the use of standalone surge protectors and imposes the compliance with the product standard UL1449 3rd Edition.

The article 285 defines the selection and installation conditions of SPD's.

### Product Standard: UL 1449 3rd Edition

This document, developed for surge protection manufacturers, defines the parameters as well as the test procedure to qualify an SPD. It is important to note that the UL Type designations of surge protective devices, while similar, is not exactly the same as SPD types in IEC61643-11.

### UL 1449 3rd Edition SPD Types

The Type is linked to the installation point of the surge protector in the network and has nominal discharge current (In) requirements :

- **Type 1:** An SPD connected on the line or load side of the main service disconnect, In equal to 10 or 20kA, no additional overcurrent protection is required.
- **Type 2:** An SPD connected on the load of the main service disconnect, In equal to 3, 5, 10 or 20kA.
- **Type 3:** A Point-of-use SPD, directly in front of equipment and further than 30 ft (10 m) from the main service disconnect.
- **Type 4:** An SPD assembly or assembly of surge components including an internal or external thermal disconnect.
- **Type 5:** Surge components, like a gas discharge tube, silicon diode, and metal oxide varistor.

### ANSI/IEEE Guide:

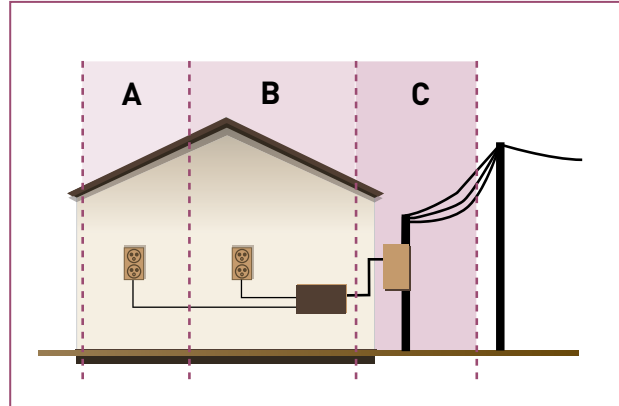
ANSI/IEEE publishes different informative guidelines regarding the risk of transient overvoltages to low voltage networks (IEEE C62.41.1), the surge environment and types of transients (IEEE C62.41.2) as well as the method for testing equipment against transients that are connected to the low voltage network (IEEE C62.45).

Another important guideline detailing the installation of SPD's is called IEEE C62.72

### IEEE C62.41.2 Guide:

IEEE C62.41.2 offers a guideline of performance for surge protectors according to their location in the system.

Categories Depending on the Location Guide IEEE C62.41.2



Selection of Surge Protector Following the Guide IEEE C62.41.2

Location		Minimum recommended Surge Level	
		Voltage 1.2/50 $\mu$ s	Current 8/20 $\mu$ s
A	Indoor installation	6 kV	0.5 kA
B	Entry installation	6 kV	3 kA
C	Outdoor installation low exposure	6 kV	6 kA
C	Outdoor installation high exposure	10 kV	10 kA

# DS Series from CITEL

## Plug-In Design



Example of a DS Series application in a standard electrical cabinet in compliance with international standard.

Most DS Series surge protectors are designed with individual modules that can be plugged into a base. This makes it very easy to replace protectors and check status without impairing or disrupting your protection. The ability to replace single poles makes repair much less expensive as well.

The plug-in module is identified with a color label in relation with the IEC types (black = Type 1; red = Type 2; blue = low power Type 2 or Type 3) and are marked for operating voltage to avoid misapplication.

## DIN Rail Mounting



Slide the top of the surge protector onto the rail, and press the bottom until the unit snaps into place.



To remove, pull the assembly clamp on the bottom, and remove the device.



**DSDT16**  
Optional Terminal for series connection

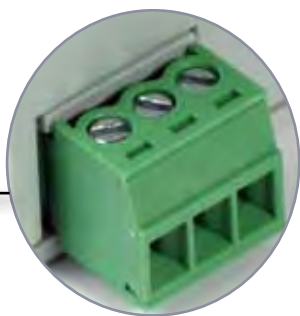


**Plug-In Module**  
All modules are marked with the respective standards





**Connections**  
All connections are clearly labeled to help prevent any installation errors.



**Remote Signaling**  
A single remote connector for multiple modules allows for easy access and less wiring.

### Signaling



Defective modules are identified by a red indicator in the front window.

### Replacement Module



Easy module replacement.  
No tools required!

### Module Codification



Replacement is error free thanks to clear markings identifying the different operating voltages.



# Type 1 + 2 and Type 1 + 2 + 3 Surge Protectors

Type 1+2 and Type 1+2+3 surge protectors are heavy duty devices designed to be installed at the service entrance of an AC installation equipped with a lightning protection system. They are necessary to protect sensitive equipment connected to the AC network from the direct and indirect effects of lightning. Based on different national electrical codes, various types of SPD's are recommended or mandatory.

Several versions are available with different mechanical formats to meet the specific needs of the installation. A surge protector can be several single pole modules assembled together, single monobloc module or a single monobloc with individual plug-in modules.

Multi-pole SPD's are available with 2 different technologies :

- DS250VG, DS130VG, DUT250VG : VG Technology
- DS150E, DS130R : Multi-MOV technology

CITEL surge protectors are available in a wide range of versions for all common and custom configurations :

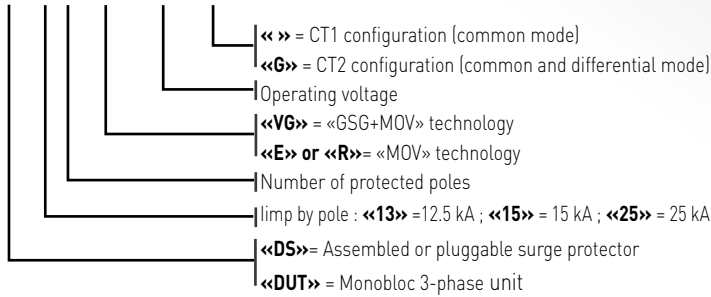
- Iimp by pole : 12.5, 15 and 25 kA (10/350  $\mu$ s)
- Total Iimp : Up to 100 kA
- Single, Split, 3 or 3-Neutral+Phase AC networks
- 120/208V, 120/240V, 240V, 277/480V, 480V AC networks
- Common mode protection (CT1 configuration) or common and differential mode protection (CT2 configuration)









# Type 1 + 2 and Type 1 + 2 + 3 Surge Protectors

## Part Number Information

### DS254 VG-xxx/G



Range		Description	Iimp by Pole (10/350 µs)	Characteristics	Page
DS250VG		 Heavy Duty VG Technology	25 kA	Very High Energy Very Low Clamp	27
DS150E		Enhanced Multi-MOV	15 kA	High Energy Very High I <sub>max</sub>	29
DS130VG		 Plug-In VG Technology	12.5 kA	High Energy Low Clamp	31
DS130R		Plug-In Multi-MOV	12.5 kA	High Energy High I <sub>max</sub>	33

# Type 1 + 2 + 3 AC Surge Protector DS250VG Series

**limp  
25 kA**

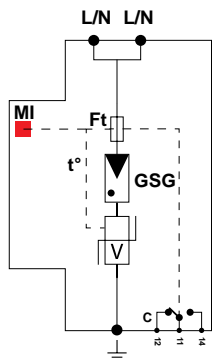
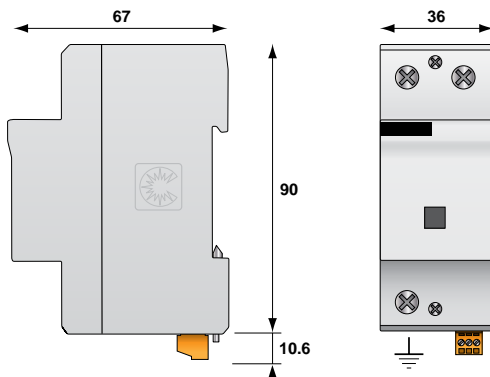


DS250VG-120

- **Type 1 + 2 + 3 AC Power Surge Protector**
- **VG Technology for Maximum Performance**
- **Optimized for TOV Protection**
- **Zero Operating Current**
- **Zero Follow Current**
- **limp : 25 kA at 10/350µs**
- **In : 30 kA at 8/20µs**
- **UL 1449 3rd Edition Recognized**

## Dimensions and Electrical Diagram

(in mm)



V : High energy varistor  
GSG : Gas-Filled Spark Gap  
t° : Thermal disconnection system  
Ft : Thermal fuse  
MI : Disconnection indicator  
C : Remote signaling contact

## Characteristics

CITEL Part Number	DS250VG-300	DS250VG-120
AC network voltage	220-277 V	120-127 V
SPD configuration	1-pole	1-pole
AC system	All	All
Maximum operating voltage	Mcov 330 Vac	150 Vac
TOV withstand	UT 450 Vac	230 Vac
Operating current	Ic none	none
Follow current	If none	none
Nominal discharge current (IEC/UL) 15 x 8/20 µs impulse	In 30 kA / 20 kA	30 kA / 20 kA
Maximum discharge current 8/20 µs withstand	I <sub>max</sub> 70 kA	70 kA
Maximum discharge current 10/350 µs withstand	limp 25 kA	25 kA
Combination waveform test Class III test	Uoc 20 kV	20 kV
Protection level (at In)	Up 1,100 V	700 V
Voltage protection rating	Vpr 1,200 V	1,200 V
Short-circuit current rating	Sccr 100,000 A	100,000 A
<b>Associated Disconnection Devices</b>		
Thermal disconnecter	Internal	
Fuses	Fuse type gG - 125 A max. (see Note 1)	
Installation ground fault breaker	Type «S» or delayed	
<b>Mechanical Characteristics</b>		
Dimensions	See diagram	
Connection	By screw terminals : 6-35 mm <sup>2</sup> / by bus	
Disconnection indicator	1 mechanical indicator	
Remote signaling of disconnection	Output on changeover contact	
Mounting	Symmetrical rail 35 mm	
Operating temperature	-40/+85 °C	
Protection class	IP20	
Housing material	Thermoplastic UL 94-V0	
<b>Standards Compliance</b>		
IEC 61643-11: International	Low Voltage SPD - Test Class I, II and III	
EN 61643-11: Europe	Low Voltage SPD - Test Class I, II and III	
NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe I, II, III	
UL1449 3rd Edition: USA	Type 4, for use in Type 1 applications	
<b>Part Number</b>		
DS250VG-300	2577	
DS250VG-120	2787	

**Note 1:** Rating in compliance with nominal discharge current. In order to increase service continuity, higher rating can be used (up to 250 A). For further information, please consult product instructions.

# Type 1 + 2 + 3 Multi-Pole AC Surge Protector DS252VG, DS253VG, DS254VG

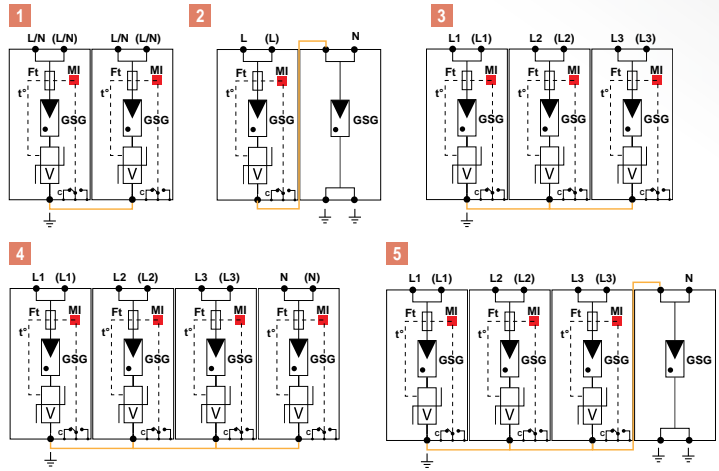


DS253VG-300

## DS25x VG-xxx/G

- « » = CT1 Configuration (common mode)
- «G» = CT2 Configuration (common and differential mode)
- Operating voltage (120, 300)
- «VG» = VG Technology
- Number of protected poles (2, 3, 4)

## Dimensions and Connection Diagram



References	Part Number	Network	AC system	Protection Mode		Iimp Total	Up L/PE	Up L/N	Diagram
				Common	Differential				
DS254VG-300/G	2756	277/480 V 3-phase+N	Wye	●	●	100 kA	1.5 kV	1.5 kV	5
DS254VG-120/G	2757	120/208 V 3-phase+N	Wye	●	●	100 kA	1.5 kV	1 kV	
DS254VG-300	3713	347/600 V 3-phase+N	Wye	●		100 kA	1.5 kV	-	4
DS254VG-120	3722	120/208 V 3-phase+N	Wye	●		100 kA	1 kV	-	
DS253VG-300	3896	240 V 3-phase	Delta	●		75 kA	1.5 kV	-	3
DS253VG-120	3959	120/240 V 2-phase+N	Split phase	●		75 kA	1 kV	-	
DS252VG-300/G	3403	230 V 1-phase+N	Single phase	●	●	50 kA	1.5 kV	1.5 kV	2
DS252VG-120/G	3960	120 V 1-phase+N	Single phase	●	●	50 kA	1.5 kV	1 kV	
DS252VG-300	3469	230 V 1-phase+N, 2-phase	Single/Split phase	●		50 kA	1.5 kV	-	1
DS252VG-120	3950	120 V 1-phase+N, 2-phase	Single/Split phase	●		50 kA	1 kV	-	

# Type 1 + 2 AC Surge Protectors DS150E Series

**limp  
15 kA**

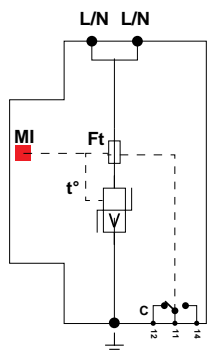
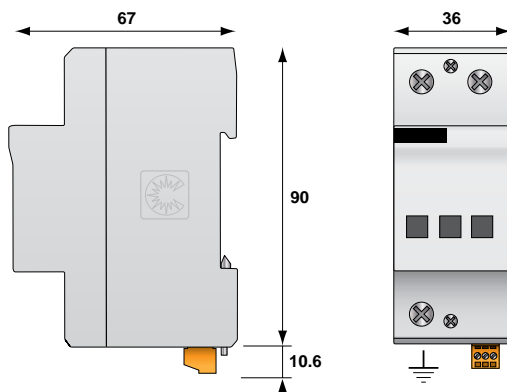


DS150E-120

- **Type 1 + 2 AC Power Surge Protector**
- **Enhanced Multi-MOV Design**
- **Individual Fault Indicator Windows**
- **limp : 15kA at 10/350µs**
- **I<sub>max</sub> : 165kA at 8/20µs**
- **I<sub>n</sub> : 20kA at 8/20µs**
- **UL 1449 3rd Edition Recognized**

## Dimensions and Electrical Diagram

(in mm)



V : High energy varistor network  
t° : Thermal disconnection system  
Ft : Thermal fuse  
MI : Disconnection indicator  
C : Remote signaling contact

## Characteristics

CITEL Part Number	DS150E-480	DS150E-300	DS150E-120
AC network voltage	347V-480 V	220-277 V	120-127 V
SPD configuration	1-pole	1-pole	1-pole
AC system	All	All	All
Maximum operating voltage	U <sub>c</sub> 550 Vac	330 Vac	150 Vac
TOV withstand	U <sub>T</sub> 770 Vac	440 Vac	230 Vac
Operating current	I <sub>c</sub> < 2 mA	< 2 mA	< 2 mA
Follow current	I <sub>f</sub> none	none	none
Nominal discharge current (IEC/UL) 15 x 8/20 µs impulses	I <sub>n</sub> 50 kA / 20 kA	70 kA / 20 kA	70 kA / 20 kA
Maximum discharge current 8/20 µs withstand	I <sub>max</sub> 165 kA	165 kA	165 kA
Maximum discharge current 10/350 µs withstand	limp 15 kA	15 kA	15 kA
Voltage protection rating	V <sub>pr</sub> 1,500 V	1,000 V	600 V
Short-circuit current rating	S <sub>ccr</sub> 100,000 A	100,000 A	100,000 A

### Associated Disconnection Devices

Thermal disconnecter	Internal
Fuses	Fuses type gG - 125 A max. (see Note 1)
Installation ground fault breaker	Type «S» or delayed

### Mechanical Characteristics

Dimensions	See diagram
Connection	By screw terminals : 6-35 mm <sup>2</sup> / by bus
Disconnection indicator	3 mechanical indicators
Remote signaling of disconnection	Output on changeover contact
Mounting	Symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic UL94-V0

### Standards Compliance

IEC 61643-11: International	Low Voltage SPD - Test Class I and II
EN 61643-11: Europe	Low Voltage SPD - Test Class I and II
NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe I et II
UL1449 3rd Edition: USA	Type 4, for use in Type 2 applications

### Part Number

DS150E-480	2322
DS150E-300	1697
DS150E-120	1840

**Note 1:** Rating in compliance with NF C15-100 art. 534.1.3.5. In order to increase service continuity, higher rating can be used (up to 250 A). For further information, please consult product instructions.





# Type 1 + 2 Multi-Pole AC Surge Protectors

## DS152E, DS153E, DS154E

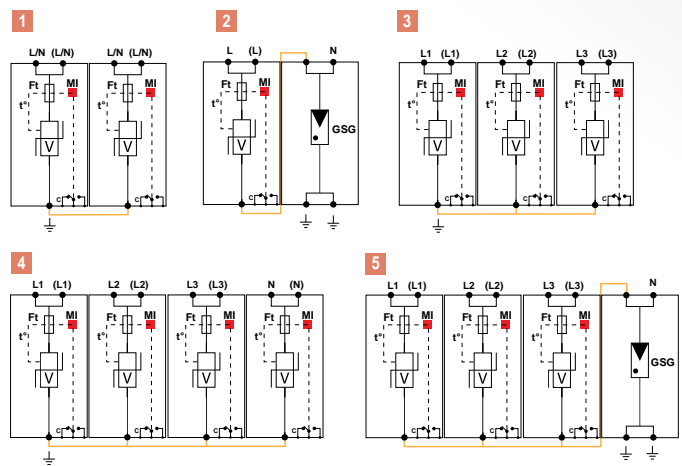
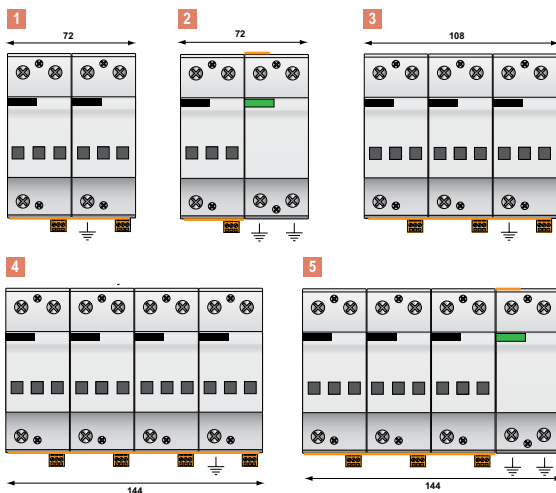


DS153E-300

DS15x E-xxx/G

- « » = Configuration CT1 (common mode)
- «G» = Configuration CT2 (common and differential mode)
- Operating voltage (120, 300, 480)
- «E» = Enhanced «Varistor» technology
- Number of protected poles (2, 3, 4)

### Dimensions and Electrical Diagrams



Reference	Part Number	Network	AC System	Protection Mode		Iimp Total	Up L/PE	Up L/N	Diagram
				Common	Differential				
DS154E-300/G	2758	277/480 V 3-phase+N	Wye	●	●	100 kA	2.5 kV	2.5 kV	5
DS154E-120/G	2759	120/208 V 3-phase+N	Wye	●	●	100 kA	1.5 kV	1 kV	
DS154E-480	3943	347/600 V 3-phase+N	Wye	●		100 kA	2.5 kV	-	4
DS154E-300	3329	277/480 V 3-phase+N	Wye	●		100 kA	2.5 kV	-	
DS154E-120	3322	120/208 V 3-phase+N	Wye	●		100 kA	1 kV	-	3
DS153E-480	3481	480 V 3-phase	Delta	●		75 kA	2.5 kV	-	
DS153E-300	3791	240 V 3-phase	Delta	●		75 kA	2.5 kV	-	
DS153E-120	3408	120/240 V 2-phase+N	Split phase	●		75 kA	1 kV	-	2
DS152E-300/G	3406	277 V 1-phase+N	Single phase	●	●	50 kA	2.5 kV	2.5 kV	
DS152E-120/G	-	120 V 1-phase+N	Single phase	●	●	50 kA	1.5 kV	1 kV	1
DS152E-480	-	277 V 1-phase+N, 2-phase	Single/Split phase	●		50 kA	2.5 kV	-	
DS152E-300	3723	277 V 1-phase+N, 2-phase	Single/Split phase	●		50 kA	2.5 kV	-	
DS152E-120	3790	120 V 1-phase+N, 2-phase	Single/Split phase	●		50 kA	1 kV	-	

# Type 1 + 2 + 3 AC Surge Protector DS130VG Series

**limp  
12.5 kA**



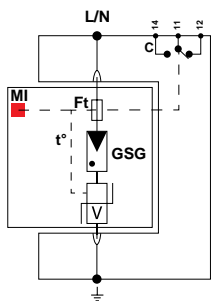
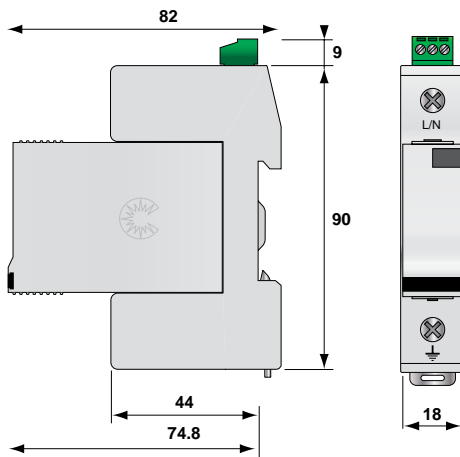
DS132VG-120



- **Type 1 + 2 + 3 AC Power Surge Protector**
- **VG Technology for Maximum Performance**
- **Optimized for TOV Protection**
- **Zero Operating Current**
- **Zero Follow Current**
- **limp : 12.5 kA at 10/350µs**
- **In : 20 kA at 8/20µs**
- **UL 1449 3rd Edition Compliant**

## Dimensions and Electrical Diagram

(in mm)



V : High energy varistor  
GSG : Gas-Filled Spark Gap  
t° : Thermal disconnection system  
Ft : Thermal fuse  
MI : Disconnection indicator  
C : Remote signaling contact

## Characteristics

CITEL Part Number		DS131VG-230	DS131VG-120
AC network voltage		220-240 V	120-127 V
Maximum operating voltage	U <sub>c</sub>	275 Vac	150 Vac
TOV withstand	U <sub>T</sub>	450 Vac	230 Vac
Operating current	I <sub>c</sub>	none	none
Follow current	I <sub>f</sub>	none	none
Nominal discharge current 15 x 8/20 µs impulses	I <sub>n</sub>	20 kA	20 kA
Maximum discharge current 8/20 µs withstand	I <sub>max</sub>	50 kA	50 kA
Maximum discharge current 10/350 µs withstand	I <sub>imp</sub>	12.5 kA	12.5 kA
Combination waveform test Class III test	U <sub>oc</sub>	20 kV	20 kV
Protection level (at I <sub>n</sub> )	U <sub>p</sub>	0.6 kV	0.4 kV
Protection level at 6kV-1.2/50µs	U <sub>p</sub>	1.25 kV	1.25 kV
Admissible short-circuit current	I <sub>scrcr</sub>	25,000 A	25,000 A

Associated Disconnectors	
Thermal disconnector	Internal
Fuses	Fuses type gG - 125 A max. (see Note 1)
Installation ground fault breaker	Type «S» or delayed

Mechanical Characteristics	
Dimensions	See diagram
Connection	By screw terminals : 4-25 mm <sup>2</sup> / by bus
Disconnection indicator	1 mechanical indicator
Remote signaling	Output on changeover contact
Mounting	Symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic UL94-V0

Standards Compliance	
NF EN 61643-11: France	Parafoudre BT - Essai Classe I, II et III
IEC 61643-11: International	Low Voltage SPD - Test Class I, II and III
EN 61643-11: Europe	Low Voltage SPD - Test Class I, II and III
UL1449 3rd Edition: USA	Compliant

Part Number	
DS131VG-230	571551
DS131VG-120	571651

**Note 1:** Rating in compliance with NF C15-100 art. 534.1.5.3. In order to increase service continuity, higher rating can be used. For further information, please consult product instructions.



# Type 1 + 2 + 3 Multi-Pole AC Surge Protector

## DS132VG, DS133VG, DS134VG



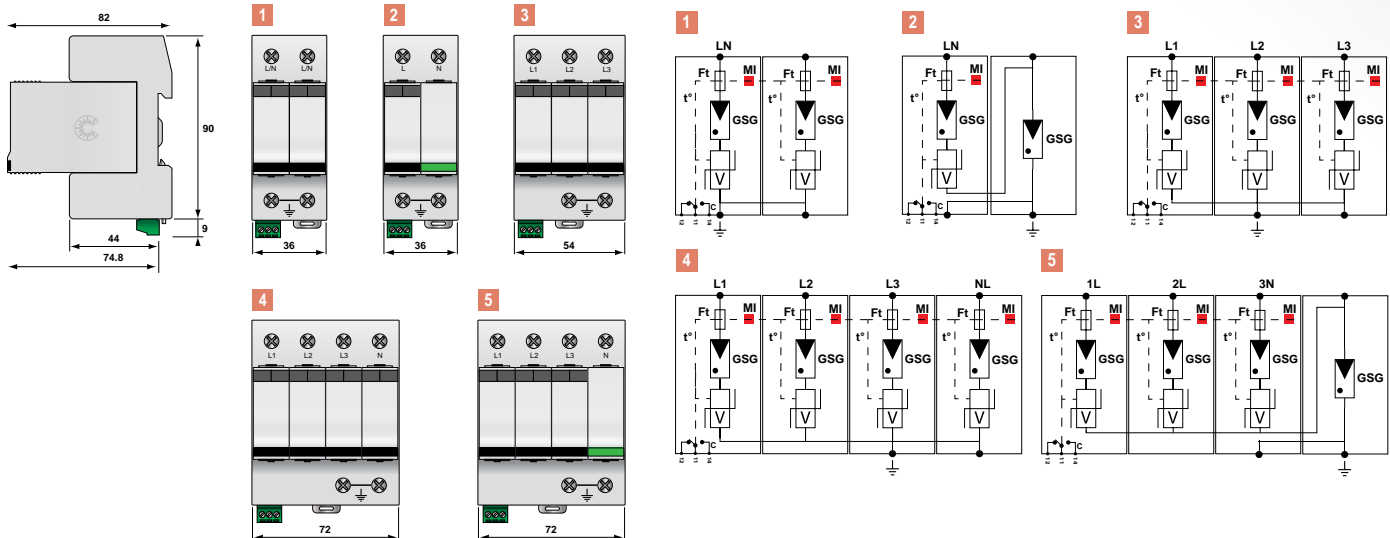
DS134VG-230/G

### DS13x VG S-xxx/G

- «x» = Configuration CT1 (common mode)
- «6» = Configuration CT2 (common and differential mode)
- Operating voltage (120, 230)
- «S» = Remote signal option
- «VG» = VG Technology
- Number of protected poles (2, 3, 4)

## Dimensions and Electrical Diagrams

(in mm)



References	Part Number	Network	AC System	Protection Mode		Iimp Total	Up L/PE	Up L/N	Diagram
				Common	Differential				
DS134VGS-230/G	571584	277/480 V 3-phase+N	Wye	●	●	50 kA	1.5 kV	1.25 kV	5
DS134VGS-120/G	571684	120/208 V 3-phase+N	Wye	●	●	50 kA	1.5 kV	1.25kV	
DS134VGS-230	571574	277/480 V 3-phase+N	Wye	●		50 kA	1.25 kV	-	4
DS134VGS-120	571674	120/208 V 3-phase+N	Wye	●		50 kA	1.25 kV	-	
DS133VGS-230	571583	240 V 3-phase	Delta	●		37.5 kA	1.25 kV	-	3
DS133VGS-120	571683	120/240 V 2-phase+N	Split phase	●		37.5 kA	1.25 kV	-	
DS132VGS-230/G	571572	230 V 1-phase+N	Single phase	●	●	25 kA	1.5 kV	1.25kV	2
DS132VGS-120/G	571672	120 V 1-phase+N	Single phase	●	●	25 kA	1.5 kV	1.25kV	
DS132VGS-230	571582	230 V 1-phase+N, 2-phase	Single/Split phase	●		25 kA	1.25 kV	-	1
DS132VGS-120	571682	120 V 1-phase+N, 2-phase	Single/Split phase	●		25 kA	1.25 kV	-	

# Type 1 + 2 AC Surge Protector DS130R Series

**limp**  
**12.5 kA**

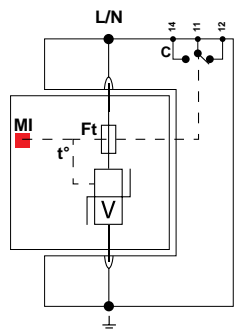
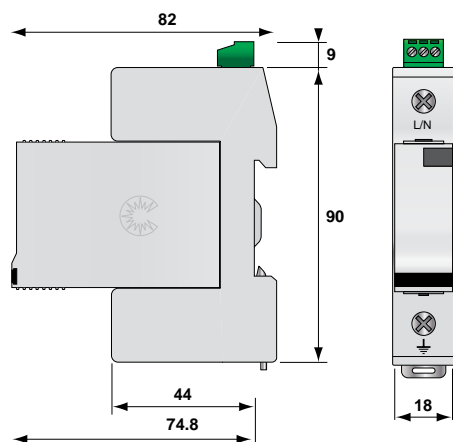


DS131R-400

- Type 1 + 2 AC Power Surge Protector
- Reinforced Multi MOV Design
- Slim 18mm Form Factor
- Pluggable Modules
- Fault Indicator Window
- limp : 12.5 kA at 10/350  $\mu$ s
- In : 20 kA at 8/20  $\mu$ s
- UL 1449 3rd Edition Compliant

## Dimensions and Electrical Diagram

(in mm)



V : High energy varistor  
 $t^{\circ}$  : Thermal disconnection system  
 Ft : Thermal fuse  
 MI : Disconnection indicator  
 C : Remote signaling contact

## Characteristics

CITEL Part Number		DS131R-400	DS131R-230	DS131R-120
AC network voltage		277V-347 V	220-240 V	120-127 V
Maximum operating voltage	Mcov	440 Vac	275 Vac	150 Vac
TOV withstand	$U_T$	770 Vac	440 Vac	230 Vac
Operating current	Ic	< 1 mA	< 1 mA	< 1 mA
Follow on current	If	none	none	none
Nominal discharge current	In	20 kA	20 kA	20 kA
	15 x 8/20 $\mu$ s impulses			
Maximum discharge current	I <sub>max</sub>	50 kA	50 kA	50 kA
	8/20 $\mu$ s withstand			
Maximum discharge current	limp	12.5 kA	12.5 kA	12.5 kA
	10/350 $\mu$ s withstand			
Protection level (at In)	Up	1.2 kV	0.9 kV	0.7 kV
Admissible short-circuit current	I <sub>sc</sub>	25 kA	25 kA	25 kA

### Associated Disconnectors

Thermal disconnector	Internal
Fuses	Fuses type gG - 125 A max. (see Note 1)
Installation ground fault breaker	Type «S» or delayed

### Mechanical Characteristics

Dimensions	See diagram
Connection	By screw terminals : 4-25 mm <sup>2</sup> / by bus
Disconnection indicator	1 mechanical indicator
Remote signaling	Output on changeover contact
Mounting	Symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic PEI UL94-5VA

### Standards Compliance

IEC 61643-11: International	Low Voltage SPD - Test Class I and II
NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe I et II
UL1449 3rd Edition: USA	Compliant

### Part Number

DS131RS-400	571411
DS131RS-230	571511
DS131RS-120	571611

**Note 1:** Rating in compliance with NF C15-100 art. 534.1.5.3. In order to increase service continuity, higher rating can be used (up to 250 A). For further information, please consult product instructions.



# Type 1 + 2 Multi-Pole AC Surge Protector

## DS132R, DS133R, DS134R

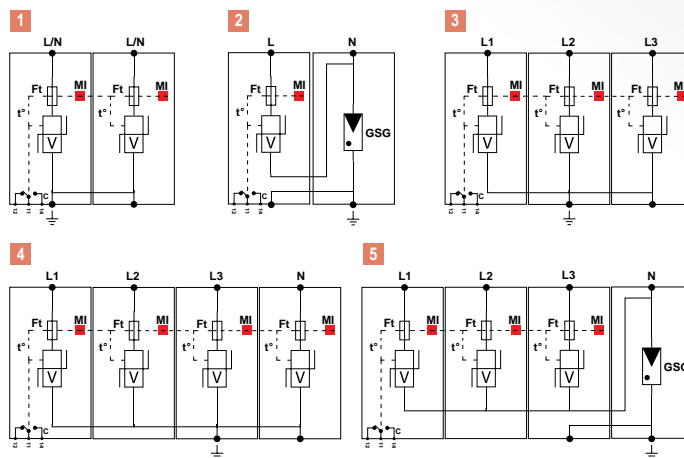
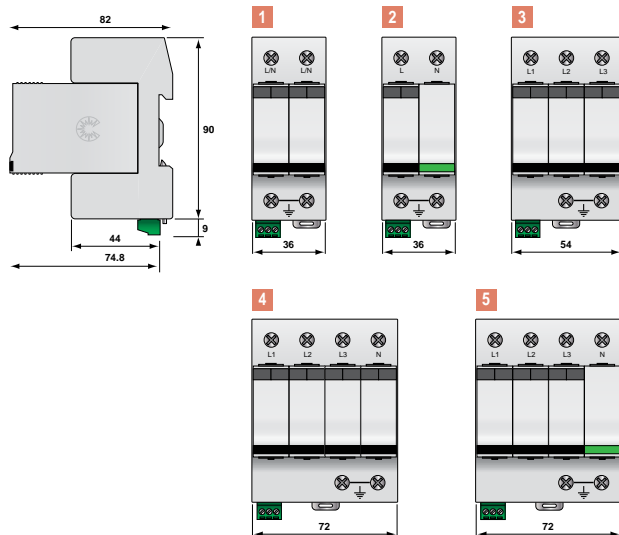


DS134R-230/G

### DS13xRS-xxx/G

- «» = Configuration CT1 (common mode)
- «G» = Configuration CT2 (common and differential mode)
- Operating voltage [120, 230, 400]
- «S» = Remote signal option
- «R» = Reinforced «Varistor» technology
- Number of protected poles [2, 3, 4]

## Dimensions and Electrical Diagrams



References	Part Number	Network	AC System	Protection Mode		Iimp Total	Up L/PE	Up L/N	Diagram
				Common	Differential				
DS134RS-230/G	571534	230/400 V 3-phase+N	Wye	●	●	50 kA	1.5 kV	1.3 kV	5
DS134RS-120/G	571634	120/208 V 3-phase+N	Wye	●	●	50 kA	1.5 kV	0.9 kV	
DS134RS-400	571414	277/480 V 3-phase+N	Wye	●		50 kA	1.7 kV	-	
DS134RS-230	571514	230/400 V 3-phase+N	Wye	●		50 kA	1.3 kV	-	4
DS134RS-120	571614	120/208 V 3-phase+N	Wye	●		50 kA	0.9 kV	-	
DS133RS-400	571413	277 V 3-phase	Delta	●		37.5 kA	1.7 kV	-	
DS133RS-230	571513	240 V 3-phase	Delta	●		37.5 kA	1.3 kV	-	3
DS133RS-120	571613	120/240 V 2-phase+N	Split phase	●		37.5 kA	0.9 kV	-	
DS132RS-230/G	571532	230 V Single phase	Single phase	●	●	25 kA	1.5 kV	1.3 kV	
DS132RS-120/G	571632	120 V Single phase	Single phase	●	●	25 kA	1.5 kV	0.9 kV	2
DS132RS-400	571412	230 V 1-phase+N, 2-phase	Single/Split phase	●		25 kA	1.7 kV	-	
DS132RS-230	571512	230 V 1-phase+N, 2-phase	Single/Split phase	●		25 kA	1.3 kV	-	
DS132RS-120	571612	120 V 1-phase+N, 2-phase	Single/Split phase	●		25 kA	0.9 kV	-	1

## Type 2 and Type 3 Surge Protectors

Surge protectors for Type 2 applications are designed to be installed at the service entrance of a low voltage installation or near sensitive equipment to protect the equipment from transient overvoltages originating from lightning strikes and coupled onto the low voltage power network. These Type 2 surge protectors are necessary and, in some standards, mandatory in applications where the lightning density is above  $N_g > 2.5$  or there are overhead power lines present.

The Type 2 surge protectors undergo rigorous Class II tests based on IEC 61643-11 and are injected with the 8/20 $\mu$ s current waveform.

The Type 2 DS Series surge protectors are available in a variety of configurations for all voltages and network configurations :

- $I_{max}$  by pole : from 10 to 70 kA 8/20  $\mu$ s
- Available for all system voltages from 120 to 690 Vac
- All AC systems including Single, Split-phase, Wye, Delta, Hi-leg
- Common mode protection (CT1 configuration)  
or common and differential mode protection (CT2 configuration)

CITEL surge protectors for Type 2 applications are generally offered with replaceable modules.

Surge protectors tested as Type 3 SPD's are intended to be installed directly in front of sensitive equipment and coordinated with an upstream type 2 surge protector.





*Note: the installation guide UTE C15-443 and Articles 443 and 534 of the NF C15-100 only consider SPD's Type 1 and Type 2.*

CITEL surge protectors for Type 2 applications are mostly based on varistor technology. However, CITEL has introduced the DS40VG Series that incorporates VG Technology.



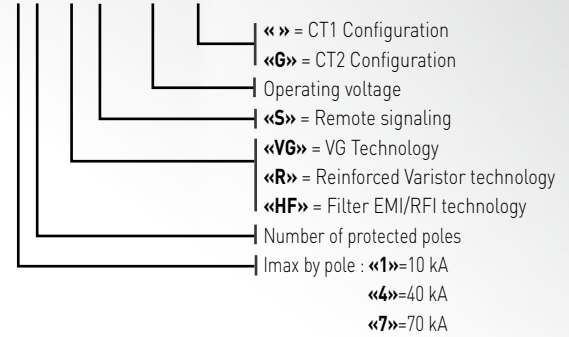
# Type 2 and Type 3 Surge Protectors

## Standard Surge Protectors






Range		Description	I <sub>max</sub> by Pole	Characteristics	Page
DS70R		Reinforced surge protector	70 kA	Type 2 High energy pluggable	37
DS40VG		VG Technology surge protector	40 kA	Type 2 + 3 Very high efficiency pluggable	39
DS40		Standard surge protector	40 kA	Type 2 pluggable	41
DS10		Secondary surge protector	10 kA	Type 2 or 3 pluggable	43

### Part Number Information

**DS44 VG S-230/G**

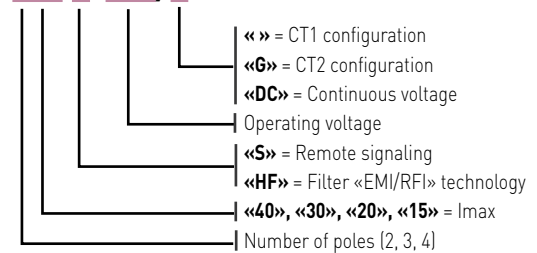


## Compact Surge Protectors

Range		Description	I <sub>max</sub> by Pole	Characteristics	Page
DS240		Single phase surge protector	40 kA	Single phase compact pluggable	45
DS215			15 kA		47
DS440		3-phase+N surge protector	40 kA	3-phase compact pluggable	46
DS415			15 kA		48
DS98		Single phase surge protector	10 kA	Single phase compact monoblock	49
DS40HF		Surge protector with RFI filtering	10 to 40 kA	RFI filter	50
DS-HF					51
DS2x0-DC		DC surge protector	20 to 40 kA	DC network compact pluggable	52

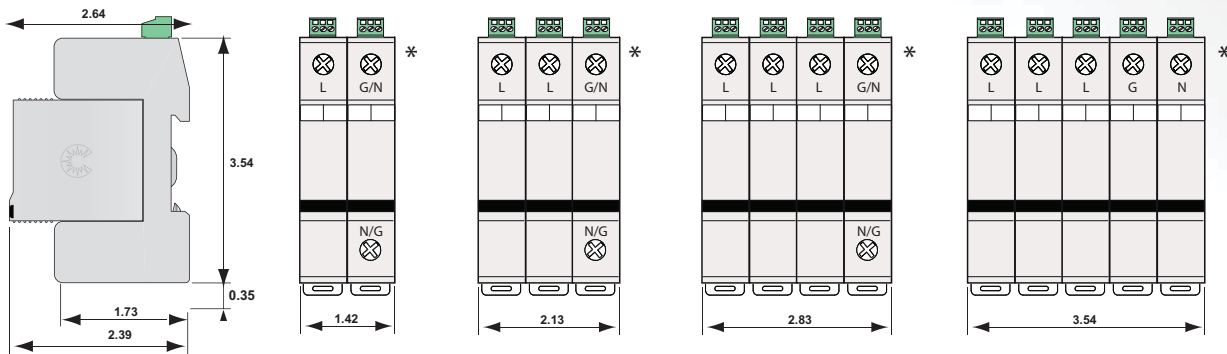
### Part Number Information

**DS240 S-230/G**



# DS70U Range

**Imax  
75 kA**



\* 2 Wiring Options  
See Install Sheet for  
further info

Description		DS72US-120S	DS73US-120T	DS74US-120Y	DS72US-230S	DS74US-230Y	DS74US-240Y	DS74US-240D	DS74US-277Y	DS74US-347Y	DS75US-400Y	DS74US-480D	DS74US-600D
Product Part Number		32274255	32274355	321614551	32194255	321944551	321944552	321614552	32144455	32134455	32144555	32171455	32141455
System voltage		120	120-240	120-208	230	230-400	240-415	240	277-480	347-600	400-690	480	600
System		2W+G (Single)	3W+G (Split Ph)	4W+G (Wye)	2W+G (Single)	4W+G (Wye)	4W+G (Wye)	3W+G (Delta)	4W+G (Wye)	4W+G (Wye)	4W+G (Wye)	3W+G (Delta)	3W+G (Delta)
Maximum Operating Voltage	MCOV [V]	L-G 210 L-N 150 L-L	L-G 210 L-N 150 L-L	L-G 150 L-N 150 L-L	L-G 320 L-N 275 L-L	L-G 320 L-N 275 L-L	L-G 320 L-N 275 L-L	L-G 300 L-N 300 L-L	L-G 420 L-N 320 L-L	L-G 460 L-N 420 L-L	L-G 570 L-N 360 L-L	L-G - L-N - L-L	L-G 840 L-N - L-L
Operating Current	Ic	20	20	20	20	20	20	20	20	20	20	20	20
Follow current	If	None	None	None	None	None	None	None	None	None	None	None	None
Short Circuit Current Rating	SCCR	200	200	200	200	200	200	200	200	200	200	200	200
Maximum Leakage Current	Ipe	1	1	1	1	1	1	1	1	1	1	1	1
Maximum Recommended fuse	Rating, Type	200A, Class J	200A, Class J	200A, Class J	200A, Class J	200A, Class J	200A, Class J	200A, Class J	200A, Class J	200A, Class J	200A, Class J	200A, Class J	200A, Class J
Frequency	f	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60	50 - 60
Nominal discharge current	In (8/20)	20	20	20	20	20	20	20	20	20	20	20	20
Maximum Discharge Current	Imax (8/20 kA)	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75	L-G 75 N-G 75
Impulse Discharge Current per phase	Iimp (10/350)	6	6	6	6	6	6	6	6	6	6	6	6
Total Maximal Discharge Current	Itotal (8/20)	140	210	280	140	280	280	280	280	280	350	280	280
Total Maximal Discharge Current	Itotal (10/350)	12	18	24	12	24	24	24	24	24	30	24	24
Let through Voltage	Ures [V] at 20kA	L-G 2000 L-N 1100 N-G 900 L-L -	L-G 2000 L-N 1100 N-G 900 L-L 2200	L-G 1800 L-N 900 N-G 900 L-L 1800	L-G 2500 L-N 1300 N-G 1200 L-L -	L-G 2500 L-N 1300 N-G 1200 L-L 2600	L-G 2500 L-N 1300 N-G 1200 L-L 2600	L-G 1800 L-N 1000 N-G 1000 L-L 1800	L-G 3000 L-N 1700 N-G 1300 L-L 3400	L-G 3500 L-N 1800 N-G 1700 L-L 3600	L-G 2800 L-N 2600 N-G 2000 L-L 3400	L-G 2400 L-N 1500 N-G - L-L 2400	L-G 3400 L-N 2500 N-G - L-L 3400
Voltage Protection Rating	VPR [V]	L-G 1200 L-N 800 N-G 700 L-L 1200	L-G 1200 L-N 800 N-G 700 L-L 1200	L-G 1200 L-N 800 N-G 700 L-L 1200	L-G 1800 L-N 1000 N-G 900 L-L -	L-G 1800 L-N 1000 N-G 900 L-L -	L-G 1800 L-N 1000 N-G 900 L-L -	L-G 1000 L-N 1000 N-G 1000 L-L 1000	L-G 2500 L-N 1500 N-G 1000 L-L 2500	L-G 1700 L-N 1700 N-G 1400 L-L 2700	L-G 2000 L-N 1800 N-G 1500 L-L 2500	L-G 1500 L-N - N-G - L-L 1500	L-G 2500 L-N - N-G - L-L 2500
Number of poles		2	3	4	2	4	4	4	4	4	5	4	4
Shipping Dimensions	Inches	4 x 2.8 x 1.61	4 x 2.8 x 2.25	4 x 2.8 x 3.05	4 x 2.8 x 1.61	4 x 2.8 x 3.05	4 x 2.8 x 3.05	4 x 2.8 x 3.05	4 x 2.8 x 3.05	4 x 2.8 x 3.05	4 x 2.8 x 3.75	4 x 2.8 x 3.05	4 x 2.8 x 3.05
Shipping Weight	Oz.	9.2	14.2	17.3	10	15.1	17.4	17.4	17.7	17.7	28	17.7	17.7
Standard's Compliance or recognition	UL1449 ed4 IEC 61643-11 ed2	File: E326289 1CA Type 2	1CA Type 2	1CA Type 2	1CA Type 2	1CA Type 2	1CA Type 2	1CA Type 2	1CA Type 2	1CA Type 2	1CA Type 2	1CA Type 2	1CA Type 2
Visual disconnection indicator		2 mechanical indicators per pole											
Remote signalization		1 NO - NC dry contact switch per poles (Optional accessory to reduce to 1 per product)											
Wiring type		Screw terminal											
Wire Minimum and maximum dimension	AWG #	13 - 2 (4 if stranded wire)											
Operating Temperature	°F	-40 +185											
Housing - Enclosure material		Plastic UL 94 rated V0											
Mounting type		DIN RAIL (Omega type)											
Environmental rating	IP	IP20											
	Nema	NEMA 2											
Location Installation		Indoor											

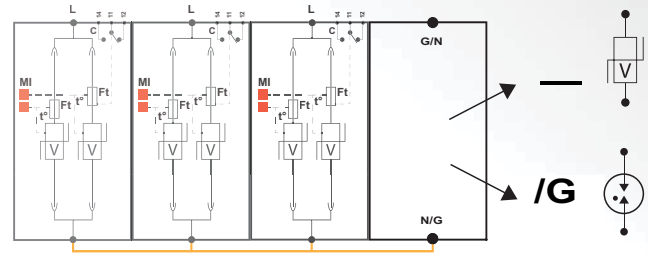
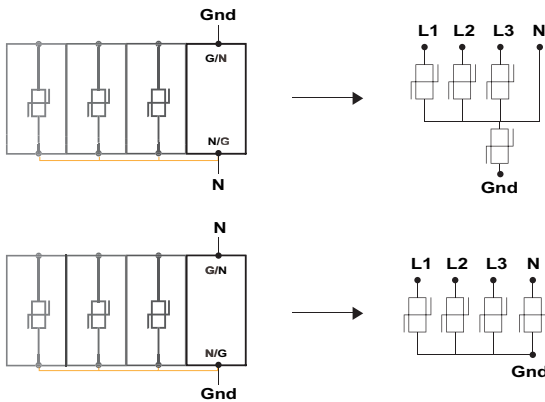


# DS70U Range

**Imax  
75 kA**



- **UL 1449 ed. 4 Type 1CA**
- **75kA I<sub>max</sub> per mode**
- **In 20kA**
- **I<sub>imp</sub> 6kA**
- **Easy to select in regards to power supply system**



Description		DS72US-120S/G	DS73US-120T/G	DS74US-120Y/G	DS72US-230S/G	DS74US-230Y/G	DS74US-240Y/G	DS74US-240D/G	DS74US-277Y/G
Product Part Number		32273255	32273355	32163455	32193255	321934551	321934552	32173455	32143455
System voltage		120	120-240	120-208	230	230-400	240-415	240	277-480
System		2W+G [Single]	3W+G [Split Ph]	4W+G [Wye]	2W+G [Single]	4W+G [Wye]	4W+G [Wye]	3W+G [Delta]	4W+G [Wye]
Maximum Operating Voltage	MCOV [V]								
	L-G	255	255	255	320	320	320	275	420
	L-N	210	210	150	320	320	320	-	420
	N-G	255	255	255	255	255	255	-	320
	L-L	-	420	300	-	640	640	550	840
Operating Current	I <sub>c</sub>	None							
Follow current	I <sub>f</sub>	None							
Short Circuit Current Rating	SCCR	200							
Maximum Leakage Current	I <sub>pe</sub>	None							
Maximum Recommended fuse	Rating, Type	200A, Class J							
Frequency	f	50 - 60							
Nominal discharge current	I <sub>n</sub> (8/20)	20	20	20	20	20	20	20	20
Maximum Discharge Current	I <sub>max</sub> (8/20 kA)	L-G	75	75	75	75	75	75	75
		N-G	100	100	100	100	100	100	-
Impulse Discharge Current per phase	I <sub>imp</sub> (10/350)	L-G	6	6	6	6	6	6	6
		N-G	100	100	100	100	100	100	100
Total Maximal Discharge Current	I <sub>total</sub> (8/20)	15	15	15	15	15	15	15	15
Total Maximal Discharge Current	I <sub>total</sub> (10/350)	15	15	15	15	15	15	15	15
Let through Voltage	U <sub>res</sub> [V] at 20kA								
	L-G	1200	1200	1200	1300	1300	1300	1200	1700
	L-N	1100	1100	900	1300	1300	1300	1300	1700
	N-G	1200	1200	1200	1200	1200	1200	-	1200
	L-L	-	2000	1800	-	2600	2600	2400	3400
Voltage Protection Rating	VPR [V]								
	L-G	1500	1500	1500	1100	1100	1100	1000	1500
	L-N	800	800	700	1000	1000	1000	-	1500
	N-G	1200	1200	1200	1100	1100	1100	-	1200
	L-L	-	1200	1000	-	1800	1800	1500	2500
Number of poles		2	3	4	2	4	4	4	4
Shipping Dimension	Inches	4 x 2.8 x 1.61	4 x 2.8 x 2.25	4 x 2.8 x 3.05	4 x 2.8 x 1.61	4 x 2.8 x 3.05	4 x 2.8 x 3.05	4 x 2.8 x 3.05	4 x 2.8 x 3.05
Shipping Weight	Oz	9.6	14.4	17.3	9.6	17.5	17.5	17.5	17.7
Standard's Compliance or recognition	UL1449 ed4	1CA							
	IEC 61643-11 ed2	Type 2							
Visual disconnection indicator		2 mechanical indicators per pole							
Remote signalization		1 NO - NC dry contact switch per poles (Optional accessory to reduce to 1 per product)							
Wiring type		Screw terminal							
Wire Minimum and maximum dimension	AWG #	13 - 2 (4 if stranded wire)							
Operating Temperature	°F	-40 +185							
Housing - Enclosure material		Plastic UL 94 rated V0							
Mounting type		DIN RAIL (Omega type)							
Environmental rating	IP	IP20							
	Nema	NEMA 2							
Location Installation		Indoor							

# Type 2 + 3 AC Surge Protectors DS40VG Series

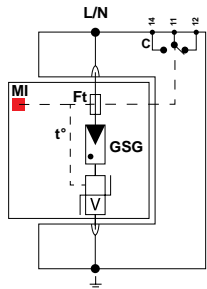
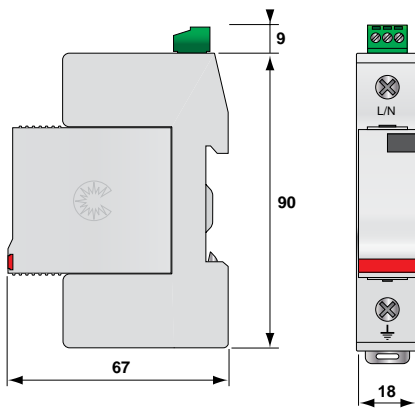


DS41VG-120

- **Type 2 + 3 AC Power Surge Protector**
- **VG Technology for Maximum Performance**
- **Pluggable Module Design**
- **Optimized for TOV**
- **Zero Follow Current**
- **Zero Operating Current**
- **I<sub>max</sub> : 40 kA at 8/20 μs**
- **I<sub>n</sub> : 20 kA at 8/20 μs**
- **UL 1449 3rd Edition Compliant**

## Dimensions and Electrical Diagram

(in mm)



V : High energy varistor  
 GSG : Gas-Filled Spark Gap  
 t\* : Thermal disconnection system  
 Ft : Thermal fuse  
 MI : Disconnection indicator  
 C : Remote signaling contact

## Characteristics

CITEL Part Number	DS41VGS-230	DS41VGS-120
AC network voltage	220-240 V	120-127 V
Max. operating voltage	U <sub>c</sub> 255 Vac	150 Vac
Temporary overvoltage withstand	U <sub>T</sub> 450 Vac	230 Vac
Operating current	I <sub>c</sub> none	none
Follow current	I <sub>f</sub> none	none
Nominal discharge current 15 x 8/20 μs impluse	I <sub>n</sub> 20 kA	20 kA
Maximum discharge current 8/20 μs withstand	I <sub>max</sub> 40 kA	40 kA
Combination waveform test Class III test	U <sub>oc</sub> 10 kV	10 kV
Protection level (at I <sub>n</sub> )	U <sub>p</sub> 0.8 kV	0.6 kV
Protection level at 6 kV-1.2/50 μs	U <sub>p</sub> 1.25 kV	1.25 kV
Admissible short-circuit	I <sub>sccr</sub> 25 kA	25 kA

### Associated Disconnection Devices

Thermal disconnector	Internal
Fuses	Fuses type gG - 50 A max. (See Note 1)
Installation ground fault breaker	Type «S» or delayed

### Mechanical Characteristics

Dimensions	See diagram
Connection	By screw : 4-25 mm <sup>2</sup> / by bus
Disconnection indicator	1 mechanical indicator
Remote signaling	Output on changeover contact
Mounting	Symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic PEI UL94-5VA

### Standards Compliance

NF EN 61643-11: France	Parafoudre BT - Essais Classe II et III
IEC 61643-11: International	Low Voltage SPD - Test Class II and III
UL1449 3rd Edition: USA	Compliant

### Part Number

DS41VGS-230	331771
DS41VGS-120	331671

**Note 1:** Rating in compliance with NF C15-100 art.534.1.3.5. In order to increase service continuity, higher rating can be used (up to 160 A). For further information, please consult product instructions.

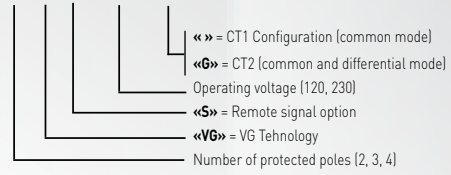


# Type 2 + 3 Multi-Pole AC Surge Protectors DS42VG, DS43VG, DS44VG

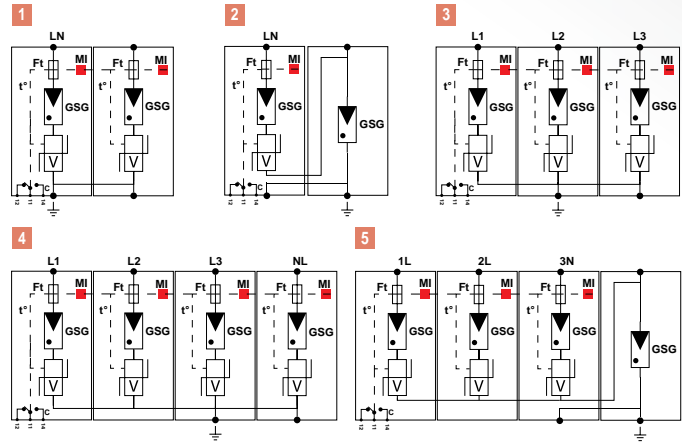
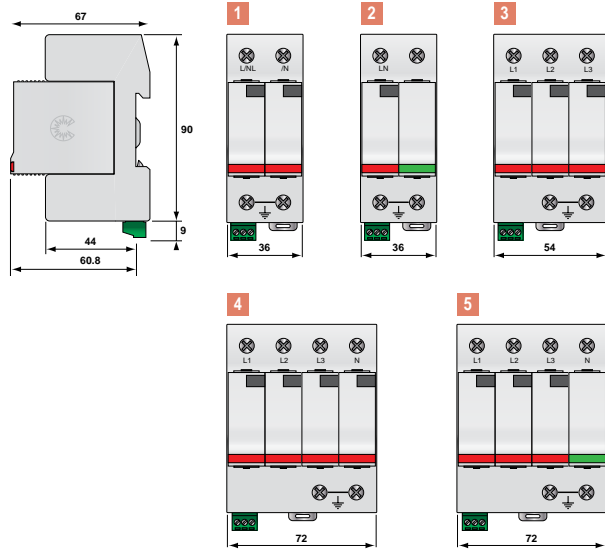


DS44VG-230/G

## DS4x VG x-xxx/G



## Dimensions and Electrical Diagram



References	Part Number	Network	AC System	Protection Mode		Imax Total	Up L/PE	Up L/N	Diagram
				Common	Differential				
DS44VGS-230/G	461582	230/400 V 3-phase+N	Wye	●	●	100 kA	1.5 kV	1.25 kV	5
DS44VGS-120/G	461682	120/208 V 3-phase+N	Wye	●	●	100 kA	1.5 kV	1.25 kV	
DS44VGS-230	461572	230/400 V 3-phase+N	Wye	●		160 kA	1.25 kV	-	4
DS44VGS-120	461672	120/208 V 3-phase+N	Wye	●		160 kA	1.25 kV	-	
DS43VGS-230	461573	240 V 3-phase	Delta	●		120 kA	1.25 kV	-	3
DS43VGS-120	461673	120/240 V 2-phase+N	Split phase	●		120 kA	0.9 kV	-	
DS42VGS-230/G	461581	230 V 1-phase+N	Single phase	●	●	100 kA	1.5 kV	1.25 kV	2
DS42VGS-120/G	461681	120 V 1-phase+N	Single phase	●	●	100 kA	1.5 kV	1.25 kV	
DS42VGS-230	461571	230 V 1-phase, 2-phase	Single/Split phase	●		80 kA	1.25 kV	-	1
DS42VGS-120	461671	120 V 1-phase+N, 2-phase	Single/Split phase	●		80 kA	1.25 kV	-	

# Type 2 AC Surge Protectors DS40 Series

**Imax  
40 kA**



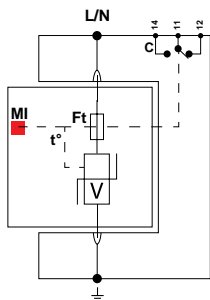
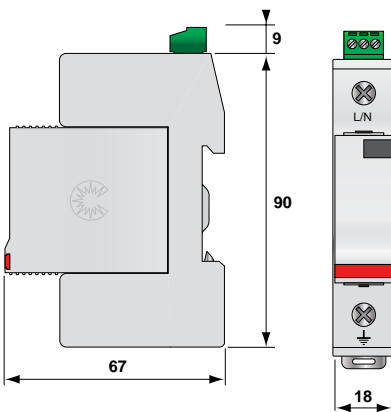
DS41S-230

- **Type 2 AC Power Surge Protector**
- **Slim 18 mm Form Factor**
- **Fault Indicator Window**
- **Remote Signal Contacts**
- **Imax : 40 kA at 8/20  $\mu$ s**
- **In : 20 kA at 8/20  $\mu$ s**
- **UL 1449 3rd Edition Recognized**

## Dimensions and Electrical Diagram

[in mm]

DS41S (1 pole)



V : High energy varistor  
 $t^{\circ}$  : Thermal disconnection system  
 Ft : Thermal fuse  
 MI : Disconnection indicator  
 C : Remote signaling contact

## Characteristics

CITEL Part Number		DS41S-480	DS41S-400	DS41S-320	DS41S-230	DS41S-120
AC network voltage		480 V	277-347 V	220-277 V	220-240 V	120-127 V
Maximum operating voltage	Mcov	550 Vac	420 Vac	320 Vac	275 Vac	150 Vac
Temporary overvoltage withstand	$U_T$	770 Vac	440 Vac	440 Vac	440 Vac	230 Vac
Operating current	$I_c$	< 1 mA	< 1 mA	< 1 mA	< 1 mA	< 1 mA
Follow current	$I_f$	none	none	none	none	none
Nominal discharge current 15 x 8/20 $\mu$ s impulse	$I_n$	20 kA	20 kA	20 kA	20 kA	20 kA
Maximum discharge current 8/20 $\mu$ s withstand	$I_{max}$	40 kA	40 kA	40 kA	40 kA	40 kA
Protection level at $I_n$	$U_p - I_n$	2.0 kV	1.8 kV	1.5 kV	1.25 kV	0.9 kV
Protection level at 10 kA		1.8 kV	1.5 kV	1.3 kV	1.1 kV	0.7 kV
Voltage protection rating	$V_{pr}$	1,800 V	1,500 V	1,200 V	1,000 V	700 V
Short-circuit current Rating	$S_{CCR}$	100 kA	100 kA	100 kA	100 kA	100 kA

### Associated Disconnection Devices

Thermal disconnector	Internal
Fuses	Fuses type gG - 50 A max. (see Note 1)
Installation ground fault breaker	Type «S» or delayed

### Mechanical Characteristics

Dimensions	See diagram
Connection	By screw terminals : 4-25 mm <sup>2</sup> / by bus
Disconnection indicator	1 mechanical indicator
Remote signaling of disconnection	Option DS40S - output on changeover contact
Mounting	Symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic UL94-V0

### Standards Compliance

EN 61643-11: Europe	Low Voltage SPD - Class II Test
IEC 61643-11: International	Low Voltage SPD - Class II Test
NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe II
UL1449 3rd Edition: USA	Type 4, for use in Type 2 applications

### Part Number

DS41S-480	331011
DS41S-400	3314111
DS41S-320	331911
DS41S-230	331705
DS41S-120	331611

**Note 1:** Rating in compliance with NF C15-100 art.534.1.5.3. In order to increase service continuity, higher rating can be used (up to 125 A). For further information, please consult product instructions.



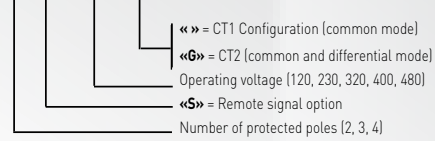
# Type 2 Multi-Pole AC Surge Protectors

## DS42, DS43, DS44

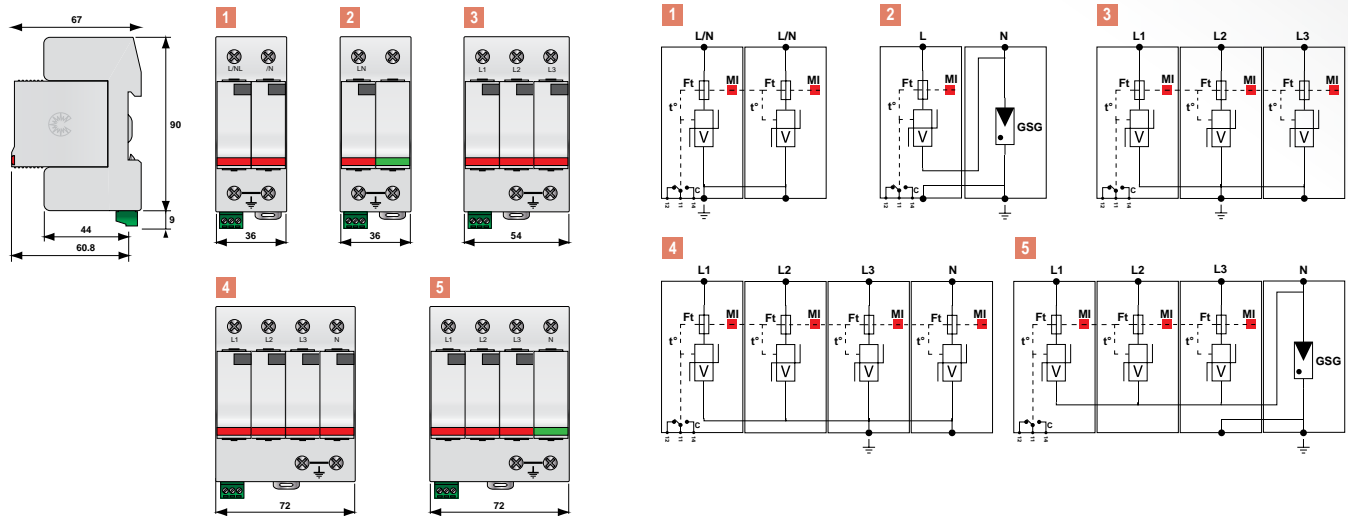


DS44-230/G

### DS4x S-xxx/G



## Dimensions and Electrical Diagrams



Reference	Part Number	Network	AC System	Protection Mode		Imax Total	Up L/PE	Up L/N	Diagram
				Common	Differential				
DS44S-230/G	461532	230/400 V 3-phase+N	Wye	●	●	40 kA	1.5 kV	1.25 kV	5
DS44S-120/G	461632	120/208 V 3-phase+N	Wye	●	●	40 kA	1.5 kV	0.9 kV	
DS44S-400	461422	277/480 V 3-phase+N	Wye	●		160 kA	1.8 kV	-	4
DS44S-230	461522	230/400 V 3-phase+N	Wye	●		160 kA	1.25 kV	-	
DS44S-120	461622	120/208 V 3-phase+N	Wye	●		160 kA	0.9 kV	-	3
DS43S-480	461017	480 V 3-phase	Delta	●		120 kA	2.0 kV	-	
DS43S-230	461523	240 V 3-phase	Delta	●		120 kA	1.25 kV	-	
DS43S-120	461623	120/240 V 2-phase+N	Split phase	●		120 kA	0.9 kV	-	2
DS42S-230/G	461531	230 V 1-phase+N	Single phase	●	●	40 kA	1.5 kV	1.25 kV	
DS42S-120/G	461631	120 V 1-phase+N	Single phase	●	●	40 kA	1.5 kV	0.9 kV	1
DS42S-400	461421	277 V 1-phase+N, 2-phase	Single/Split phase	●		80 kA	1.8 kV	-	
DS42S-230	461521	230 V 1-phase+N, 2-phase	Single/Split phase	●		80 kA	1.25 kV	-	
DS42S-120	461621	120 V 1-phase+N, 2-phase	Single/Split phase	●		80 kA	0.9 kV	-	

\*1) DSx-280x or DS4x-320x (e.g. DS44-320/G) for areas with possible temporary voltages (bad quality AC voltage or supply by AC generator set).

# Type 2 or 3 AC Surge Protectors DS10 Series

**Imax  
10 kA**



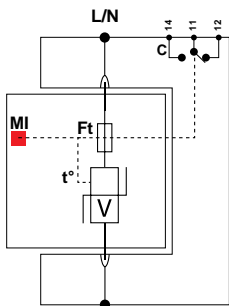
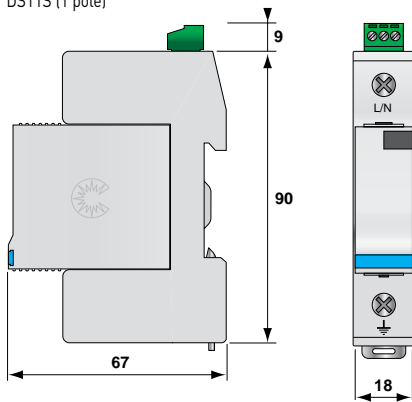
DS11-120

- **Type 2 or 3 AC Power Surge Protector**
- **Slim 18 mm Form Factor**
- **Pluggable Module**
- **Fault Indicator Window**
- **Imax : 10 kA at 8/20  $\mu$ s**
- **In : 5 kA at 8/20  $\mu$ s**
- **UL 1449 3rd Edition Compliant**

## Dimensions and Electrical Diagram

(in mm)

DS11S (1 pole)



V : High energy varistor  
t° : Thermal disconnection system  
Ft : Thermal fuse  
MI : Disconnection indicator  
C : Remote signaling contact

## Characteristics

CITEL Part Number	DS11S-400	DS11S-230	DS11S-120
AC network voltage	277-347 V	220-240 V	120-127 V
Neutral configuration	TT-IT	TN	TN
Maximum operating voltage	Uc 400 Vac	275 Vac	150 Vac
Temporary overvoltage withstand	Ur 770 Vac	440 Vac	230 Vac
Operating current	Ic < 1 mA	< 1 mA	< 1 mA
Follow current	If none	none	none
Nominal discharge current 15 x 8/20 $\mu$ s impulses	In 5 kA	5 kA	5 kA
Maximum discharge current 8/20 $\mu$ s withstand	Imax 10 kA	10 kA	10 kA
Protection level (at In)	Up 1.3 kV	0.9 kV	0.6 kV
Combination waveform test Class III test	Uoc 10 kV	10 kV	10 kV
Admissible short-circuit current	Iscsr 25 kA	25 kA	25 kA
<b>Associated Disconnection Devices</b>			
Thermal disconnector	Internal		
Fuses	Fuses type gG - 20 A max. (see Note 1)		
Installation ground fault breaker	Type «S» or delayed		
<b>Mechanical Characteristics</b>			
Dimensions	See diagram		
Connection	By screw terminals : 4-25 mm <sup>2</sup> / by bus		
Disconnection indicator	1 mechanical indicator by pole		
Remote signaling of disconnection	Option DS10S - output on changeover contact		
Mounting	Symmetrical rail 35 mm		
Operating temperature	-40/+85 °C		
Protection class	IP20		
Housing material	Thermoplastic UL94-V0		
<b>Standards Compliance</b>			
NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe II et III		
IEC 61643-11: International	Low Voltage SPD - Test Class II and III		
EN 61643-11: Europe	Low Voltage SPD - Test Class II and III		
UL1449 3rd Edition: USA	Compliant		
<b>Part Number</b>			
DS11S-400	3414012		
DS11S-230	3414011		
DS11S-120	341611		

**Note 1:** Rating in compliance with NF C15-100 art.534.1.5.3. In order to increase service continuity, higher rating can be used (up to 40 A). For further information, please consult product instructions.

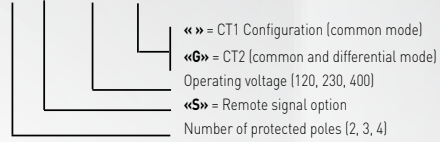


# Type 2 or 3 Multi-Pole AC Surge Protectors DS12, DS13, DS14

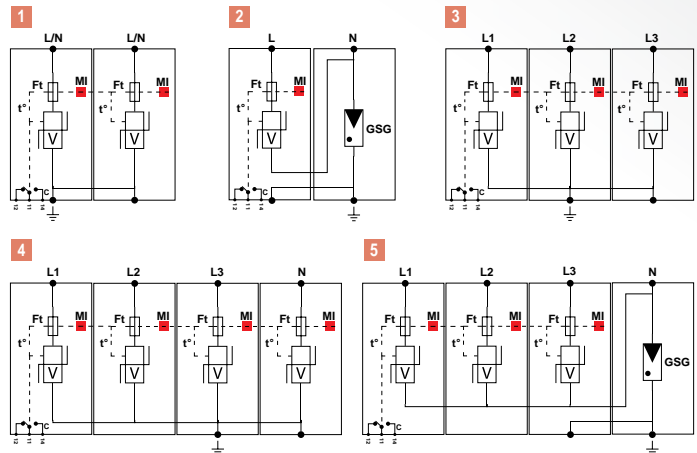
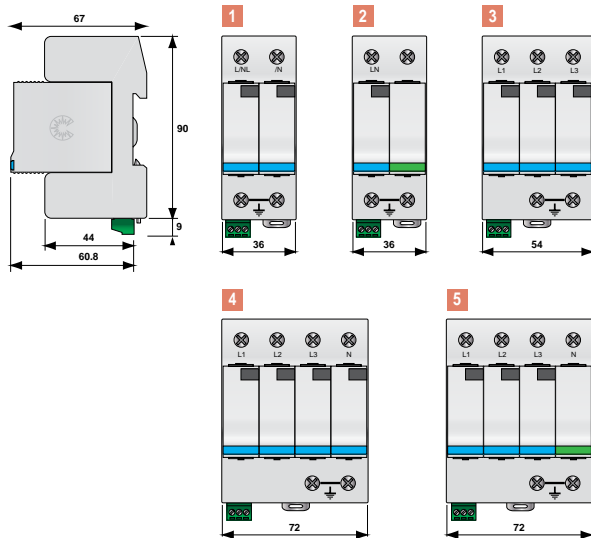


DS14-230/G

**DS1x S-xxx/G**



## Dimensions and Electrical Diagrams



References	Part Number	Network	AC System	Protection Mode		Imax Total	Up L/PE	Up L/N	Diagram
				Common	Differential				
DS14S-230/G	471532	230/400 V 3-phase+N	Wye	●	●	40 kA	1.5 kV	0.9 kV	5
DS14S-120/G	471632	120/208 V 3-phase+N	Wye	●	●	40 kA	1.5 kV	0.6 kV	
DS14S-400	471422	277/480 V 3-phase+N	Wye	●		40 kA	1.3 kV	-	4
DS14S-230	471522	230/400 V 3-phase+N	Wye	●		40 kA	0.9 kV	-	
DS14S-120	471622	120/208 V 3-phase+N	Wye	●		40 kA	0.6 kV	-	
DS13S-400	341423	277 V 3-phase	Delta	●		30 kA	1.3 kV	-	3
DS13S-230	341513	240 V 3-phase	Delta	●		30 kA	0.9 kV	-	
DS13S-120	341613	120/240 V 2-phase+N	Split phase	●		30 kA	0.6 kV	-	
DS12S-230/G	471531	230 V 1-phase+N	Single phase	●	●	20 kA	1.5 kV	0.9 kV	2
DS12S-120/G	471631	120 V 1-phase+N	Single phase	●	●	20 kA	1.5 kV	0.6 kV	
DS12S-400	471421	277 V 1-phase+N, 2-phase	Single/Split phase	●		20 kA	1.3 kV	-	1
DS12S-230	471521	230 V 1-phase+N, 2-phase	Single/Split phase	●		20 kA	0.9 kV	-	
DS12S-120	471621	120 V 1-phase+N, 2-phase	Single/Split phase	●		20 kA	0.6 kV	-	

# Type 2 Multi-Pole AC Surge Protectors

## DS240 Series

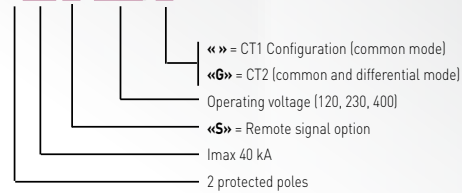
**Imax  
40 kA**



DS240-400

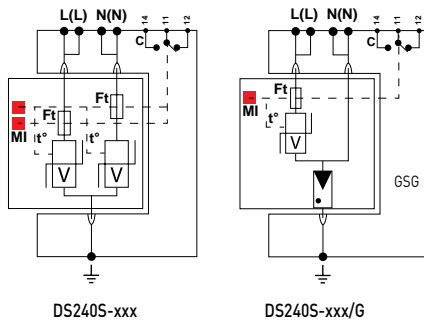
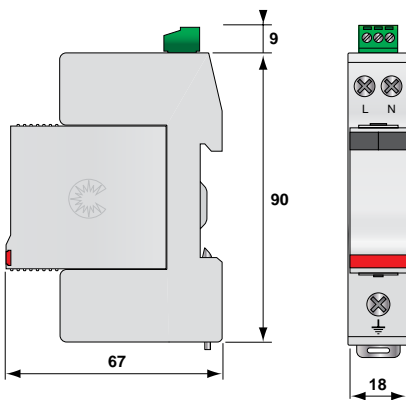
- **Type 2 AC Power Surge Protector**
- **Slim 18 mm Form Factor**
- **Individual Fault Indicator Windows**
- **Pluggable Module**
- **Imax : 40 kA at 8/20  $\mu$ s**
- **In : 20 kA at 8/20  $\mu$ s**
- **UL1449 3rd Edition Recognized**

### DS240 S-xxx/G



## Dimensions and Electrical Diagrams

(in mm)



V : High energy varistor  
 GSG : Gas-Filled Spark Gap  
 Ft : Thermal disconnection system  
 Ft : Thermal fuse  
 MI : Disconnection indicator  
 C : Remote signaling contact

## Characteristics

CITEL Part Number	DS240S-400	DS240S-230/G	DS240S-120/G
Single-phase AC network voltage	220-347V	230-277V	120-127V
Neutral configuration	Single/Split	Single phase	Single phase
Max. operating voltage	Mcov 420 Vac	275 Vac	150 Vac
Temporary overvoltage withstand	Ur 770 Vac	440 Vac	230 Vac
Operating current	Ic < 1 mA	none	none
Protection modes	CM <sup>[2]</sup>	CM/DM <sup>[2]</sup>	CM/DM <sup>[2]</sup>
Nominal discharge current 15 x 8/20 $\mu$ s impulses	In 20 kA	20 kA	20 kA
Maximum discharge current 8/20 $\mu$ s withstand	Imax 40 kA	40 kA	40 kA
Protection level [at In] (CM/DM <sup>[2]</sup> )	Up 1.8 kV	1.5/1.25 kV <sup>[2]</sup>	1.5/0.9 kV <sup>[2]</sup>
Voltage protection rating	Vpr 1500 V	900 V	600 V
Short-circuit current rating	Scrr 100,000 A	100,000 A	100,000 A
<b>Associated Disconnection Devices</b>			
Thermal disconnector	Internal		
Fuses	Fuses type gG - 50 A max. (see Note 1)		
Installation ground fault breaker	Type «S» or delayed		
<b>Mechanical Characteristics</b>			
Dimensions	See diagram		
Connection	by screw terminals : 1.5-10 mm <sup>2</sup> (L/N) or 2.5-25 mm <sup>2</sup> (PE)		
Disconnection indicator	2 (or 1) mechanical indicators		
Remote signaling of disconnection	Option DS240S - output on changeover contact		
Mounting	symmetrical rail 35 mm		
Operating temperature	-40/+85 °C		
Protection class	IP20		
Housing material	Thermoplastic UL94-V0		
<b>Standards Compliance</b>			
NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe II		
IEC 61643-11: International	Low Voltage SPD - Test Class II		
EN 61643-11: Europe	Low Voltage SPD - Test Class II		
UL1449 3rd Edition: USA	Type 4, for use in Type 2 applications		
<b>Part Number</b>			
DS240S-400	311411		
DS240S-230/G	311731		
DS240S-120/G	311631		

**Note 1:** Rating in compliance with NF C15-100 art. 534.1.5.3. An order to increase service continuity, higher rating can be used (up to 125 A). For further information, please consult product instructions.

**Note 2:** CM = Common mode (L/PE ou N/PE) / DM = Differential mode (L/N)





# Type 2 Multi-Pole AC Surge Protectors

## DS440 Series

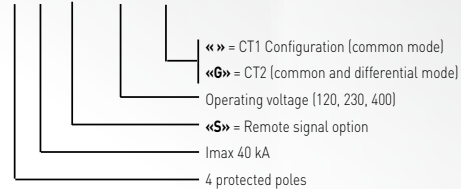
**Imax  
40 kA**



DS440-400

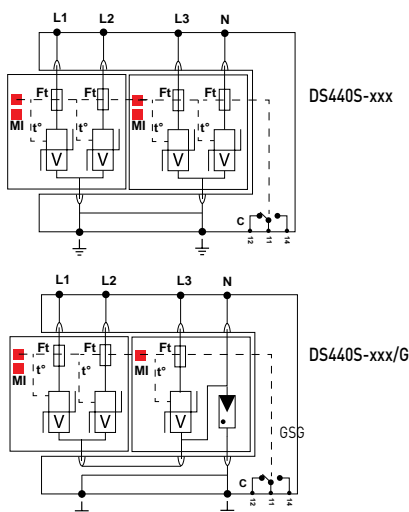
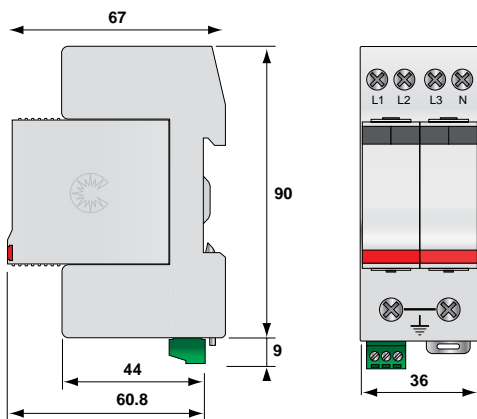
- **Type 2 AC Power Surge Protector**
- **Slim 36 mm Form Factor**
- **MOV Plus GSG Configuration**
- **Individual Fault Indicator Windows**
- **Imax : 40 kA at 8/20 μs**
- **In : 20 kA at 8/20 μs**
- **UL 1449 3rd Edition Compliant**

### DS440 S-xxx/G



## Dimensions and Electrical Diagrams

(in mm)



V : High energy varistor  
GSG : Gas-Filled Spark Gap  
t° : Thermal disconnection system  
Ft : Thermal fuse  
MI : Disconnection indicator  
C : Remote signaling contact

## Characteristics

CITEL Part Number	DS440S-400	DS440S-230/G	DS440S-120/G
Three-phase AC network voltage	277/480 V	230/400 V	120/208 V
Neutral configuration	TT-TN-IT	TN	TN
Maximum operating voltage	Uc 440 Vac	255 Vac	150 Vac
Temporary overvoltage withstand	Ur 770 Vac	440 Vac	230 Vac
Operating current	Ic < 1 mA	none	none
Protection modes	CM [2]	CM/DM [2]	CM/DM [2]
Nominal discharge current 15 x 8/20 μs impulses	In 20 kA	20 kA	20 kA
Maximum discharge current 8/20 μs withstand	Imax 40 kA	40 kA	40 kA
Protection level [at In] [CM/DM [2]]	Up 1.8 kV	1.5/1.25 kV [2]	1.5/0.9 kV [2]
Protection level at 5 kA	1.3 kV	0.9 kV	0.6 kV
Admissible short-circuit current	10 kA	10 kA	10 kA
<b>Associated Disconnection Devices</b>			
Thermal disconnector	Internal		
Fuses	Fuses type gG - 50 A max. [see Note 1]		
Installation ground fault breaker	Type «S» or delayed		
<b>Mechanical Characteristics</b>			
Dimensions	See diagram		
Connection	By screw terminals : 1.5-10 mm <sup>2</sup> (L/N) or 2.5-25 mm <sup>2</sup> (PE)		
Disconnection indicator	2 mechanical indicators		
Remote signaling of disconnection	Option DS440S - output on changeover contact		
Mounting	Symmetrical rail 35 mm		
Operating temperature	-40/+85 °C		
Protection class	IP20		
Housing material	Thermoplastic UL94-V0		
<b>Standards Compliance</b>			
NF EN 61643-11 : France	Parafoudre Basse Tension - Essais Classe II		
IEC 61643-11 : International	Low Voltage SPD - Test Class II		
EN 61643-11 : Europe	Low Voltage SPD - Test Class II		
UL1449 3rd Edition: USA	Compliant		
<b>Part Number</b>			
DS440S-400	311412		
DS440S-230/G	311732		
DS440S-120/G	311632		

**Note 1:** Rating in compliance with NF C15-100 art. 534.1.5.3. An order to increase service continuity, higher rating can be used (up to 125 A). For further information, please consult product instructions.

**Note 2:** MC = Common mode (L/PE ou N/PE) / MD = Differential mode (L/N)



# Type 2 or 3 AC Surge Protectors DS215 Series

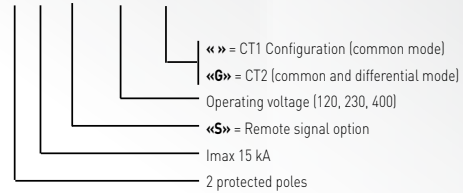
**Imax  
15 kA**



DS215-400

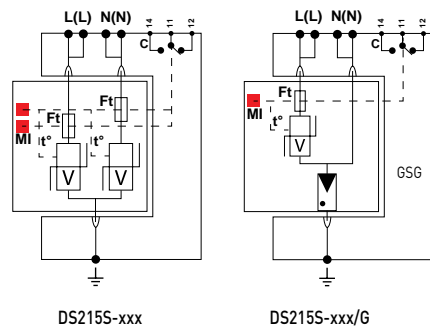
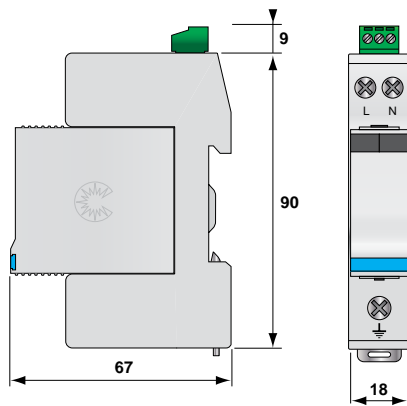
- **Type 2 or 3 Single-Phase Surge Protector**
- **MOV Plus GSG Configuration**
- **Individual Fault Indicator Windows**
- **Pluggable Modules**
- **Imax : 15 kA at 8/20 μs**
- **In : 5 kA at 8/20 μs**
- **UL1449 3rd Edition Recognized**

## DS215 S-xxx/G



## Dimensions and Electrical Diagrams

(in mm)



V : High energy varistor  
 GSG : Gas-Filled Spark Gap  
 t° : Thermal disconnection system  
 Ft : Thermal fuse  
 MI : Disconnection indicator  
 C : Remote signaling contact

## Characteristics

CITEL Part Number	DS215S-400	DS215S-230/G	DS215S-120/G
Single-phase network	277-347 V	230 V	120-127 V
Neutral configuration	Single/Split	Single phase	Single phase
Maximum operating voltage	Uc 420 Vac	275 Vac	150 Vac
Temporary overvoltage withstand	Ur 770 Vac	440 Vac	230 Vac
Operating current	Ic < 1 mA	none	none
Protection modes	CM <sup>(2)</sup>	CM/DM <sup>(2)</sup>	CM/DM <sup>(2)</sup>
Nominal discharge current 15 x 8/20 μs impulses	In 5 kA	5 kA	5 kA
Maximum discharge current 8/20 μs withstand	Imax 15 kA	15 kA	15 kA
Protection level (at In) [CM/DM <sup>(2)</sup> ]	Up 1.3 kV	1.5/0.9 kV	1.5/0.6 kV
Protection level at 5 kA	1.3 kV	0.9 kV	0.6 kV
Admissible short-circuit current	Iscsr 10,000 A	10,000 A	10,000 A
<b>Associated Disconnection Devices</b>			
Thermal disconnector	Internal		
Fuses	Fuses type gG - 20 A max. [see Note 1]		
Installation ground fault breaker	Type «S» or delayed		
<b>Mechanical Characteristics</b>			
Dimensions	See diagram		
Connection	By screw terminals : 1.5-10 mm <sup>2</sup> (L/N) or 2.5-25 mm <sup>2</sup> (PE)		
Disconnection indicator	2 mechanical indicators		
Remote signaling of disconnection	Option DS215S - output on changeover contact		
Mounting	Symmetrical rail 35 mm		
Operating temperature	-40/+85 °C		
Protection class	IP20		
Housing material	Thermoplastic UL94-V0		
<b>Standards compliance</b>			
NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe II		
IEC 61643-11: International	Low Voltage SPD - Test Class II		
EN 61643-11: Europe	Low Voltage SPD - Test Class II		
UL1449 3rd Edition: USA	Type 4, for use in Type 2 applications		
<b>Part number</b>			
DS215-400	451401	DS215S-400	451411
DS215-230/G	451721	DS215S-230/G	451731
DS215-120/G	451621	DS215S-120/G	451631

**Note 1:** Rating in compliance with nominal discharge current. In order to increase service continuity, higher rating can be used (up to 125 A). For further information, please consult product instructions.

**Note 2:** MC = Common mode (L/PE or N/PE) / MD = Differential mode (L/N)



# Type 2 Multi-Pole AC Surge Protectors

## DS415 Series

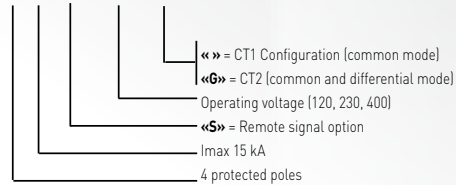
**Imax  
15 kA**



DS415-400

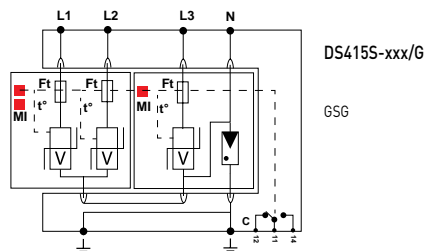
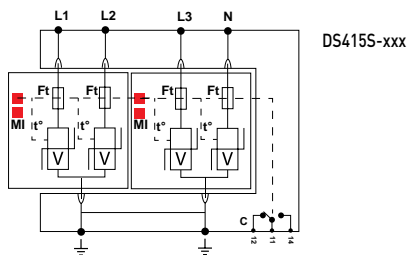
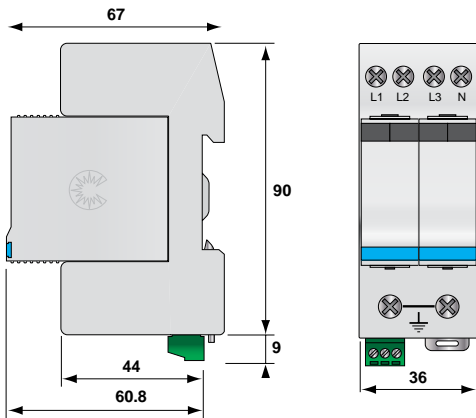
- **Type 2 or 3 AC Power Surge Protector**
- **Slim 36 mm Form Factor**
- **Individual Fault Indicator Windows**
- **Pluggable Modules**
- **Imax : 15 kA at 8/20  $\mu$ s**
- **In : 5 kA at 8/20  $\mu$ s**
- **UL 1449 3rd Edition Compliant**

### DS415 S-xxx/G



## Dimensions and Electrical Diagrams

(in mm)



V : High energy varistor  
 GSG : Gas-Filled Spark Gap  
 t° : Thermal disconnection system  
 Ft : Thermal fuse  
 MI : Disconnection indicator  
 C : Remote signaling contact

## Characteristics

CITEL Part Number	DS415S-400	DS415S-230/G	DS415S-120/G
Single-phase network	277-480 V	230-400 V	120-208 V
Neutral configuration	TT-TN-IT	TN	TN
Maximum operating voltage	Uc 440 Vac	255 Vac	150 Vac
Temporary overvoltage withstand	Ur 770 Vac	440 Vac	230 Vac
Operating current	Ic < 1 mA	none	none
Protection modes	CM <sup>(2)</sup>	CM/DM <sup>(2)</sup>	CM/DM <sup>(2)</sup>
Nominal discharge current 15 x 8/20 $\mu$ s impulses	In 5 kA	5 kA	5 kA
Maximum discharge current 8/20 $\mu$ s withstand	Imax 15 kA	15 kA	15 kA
Protection level (at In) CM/DM <sup>(2)</sup>	Up 1.3 kV	1.5/0.9 kV	1.5/0.6 kV
Residual voltage at 5 kA	1.3 kV	0.9 kV	0.6 kV
Admissible short-circuit current	Iscrc 10 kA	10 kA	10 kA

### Associated Disconnection Devices

Thermal disconnector	Internal
Fuses	Fuses type gG - 20 A max. (see Note 1)
Installation ground fault breaker	Type «S» or delayed

### Mechanical Characteristics

Dimensions	See diagram
Connection	By screw terminals : 1.5-10 mm <sup>2</sup> (L/N) or 2.5-25 mm <sup>2</sup> (PE)
Disconnection indicator	2 mechanical indicators
Remote signaling of disconnection	Option DS415S - output on changeover contact
Mounting	Symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic UL94-V0

### Standards Compliance

NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe II
IEC 61643-11: International	Low Voltage SPD - Test Class II
EN 61643-11: Europe	Low Voltage SPD - Test Class II
UL 1449 3rd Edition: USA	Compliant

### Part Number

DS415S-400	451402	DS415S-400	451412
DS415S-230/G	451722	DS415S-230/G	451732
DS415S-120/G	451622	DS415S-120/G	451632

**Note 1:** Rating in compliance with nominal discharge current. In order to increase service continuity, higher rating can be used (up to 40 A). For further information, please consult product instructions.

**Note 2:** MC = Common mode (L/PE or N/PE) / MD = Differential mode (L/N)



# Type 2 or 3 AC Surge Protectors DS98 Series

**Imax  
10 kA**

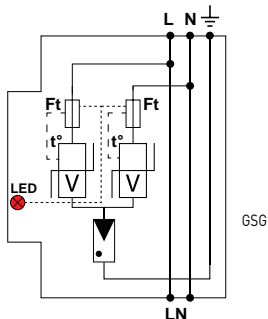
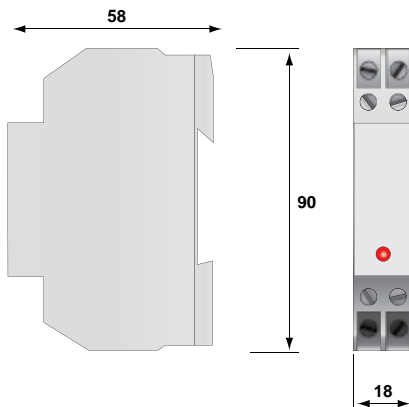


DS98-400

- **Type 2 or 3 AC Power Surge Protector**
- **Series or Parallel Wiring**
- **LED Fault Indicator**
- **MOV plus GSG Design**
- **Zero Operating Current**
- **Zero Follow Current**
- **Imax : 10 kA at 8/20  $\mu$ s**
- **In : 5 kA at 8/20  $\mu$ s**
- **UL 1449 3rd Edition Compliant**

## Dimensions and Electrical Diagram

(in mm)



V : High energy varistor  
GSG : Gas-Filled Spark Gap  
 $t^\circ$  : Thermal disconnection system  
Ft : Thermal fuse  
LED : Visual fault indicator

## Characteristics

CITEL Part Number	DS98-400	DS98-120
Single Phase AC network voltage	220-347 V	120-127 V
AC system	TN - TT - IT	TN - TT
Maximum operating voltage	$U_c$ 275 Vac	150 Vac
Temporary Overvoltage withstand	$U_T$ 440 Vac	230 Vac
Maximum load current in case of series mounting	$I_L$ 16 A	16 A
Operating current	$I_c$ none	none
Follow current	$I_f$ none	none
Nominal discharge current 15 x 8/20 $\mu$ s impulse	$I_n$ 5 kA	5 kA
Maximum discharge current 8/20 $\mu$ s withstand	$I_{max}$ 10 kA	10 kA
Protection level at $I_n$ CM/DM	$U_p$ - $I_n$ 1.5 kV/ 1 kV	0.7 kV/ 0.7 kV
Combination waveform test Class III test	$U_{oc}$ 10 kV	10 kV
Admissible short circuit current	$I_{sccr}$ 10 kA	10 kA
<b>Associated Disconnection Devices</b>		
Thermal disconnector	Internal	
Fuses	Fuse type gG - 20 A max. (see Note 1)	
RDC breaker (if any)	«S» Type or delayed	
<b>Mechanical Characteristics</b>		
Dimensions	See diagram	
Connection to network	By screw terminal : 2.5 mm <sup>2</sup> max	
Disconnection indicator	Red light on	
Mounting	symmetrical rail 35 mm	
Operating temperature	-40/+85 °C	
Protection class	IP20	
Housing material	Thermoplastic UL94-V0	
<b>Standards Compliance</b>		
NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe II et III	
IEC 61643-11: International	Low Voltage SPD - Test Class II and III	
EN 61643-11: Europe	Low Voltage SPD - Test Class II and III	
UL1449 3rd Edition: USA	Compliant	
<b>Part Number</b>		
DS98-400	3509011	
DS98-120	3509012	

**Note 1:** Rating in compliance with nominal discharge current. In order to increase service continuity, higher rating can be used (up to 40 A). For further information, please consult product instructions.

**Note 2:** MC = Common mode (L/PE or N/PE) / MD = Differential mode (L/N)



# Type 2 AC Surge Protectors with EMI/RFI Filter DS40HF Series

**Imax  
40 kA**

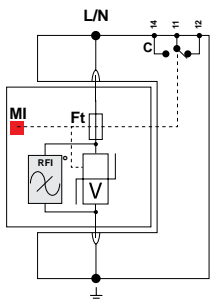
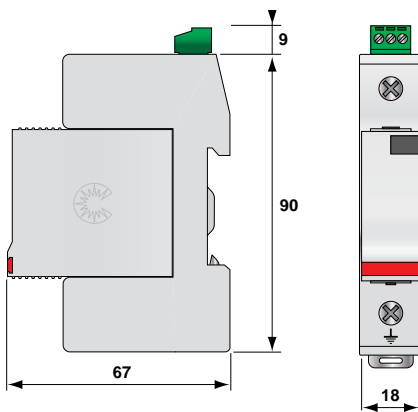


DS41HF-120

- **Type 2 AC Power Surge Protector**
- **Integral EMI/RFI filter**
- **MOV plus RFI or Filter Design**
- **Pluggable Module**
- **Fault Indicator Window**
- **Imax : 40 kA at 8/20 μs**
- **In : 20 kA at 8/20 μs**
- **UL 1449 3rd Edition Compliant**

## Dimensions and Electrical Diagram

(in mm)



V : High energy varistor  
GSG : Gas-Filled Spark Gap  
RFI : EMI/RFI Filter  
t° : Thermal disconnection system  
Ft : Thermal fuse  
MI : Disconnection indicator  
C : Remote signaling contact

## Characteristics

CITEL Part Number	DS41HFS-230	DS41HFS-120
AC network voltage	220-240 V	120-127 V
Nominal voltage	Un 230 V	120 V
Maximum operating voltage	Uc 255 Vac	150 Vac
Operating current	Ic < 1 mA	< 1 mA
Nominal discharge current 15 x 8/20 μs impulses	In 20 kA	20 kA
Maximum discharge current 8/20 μs withstand	Imax 40 kA	40 kA
Protection level (at In)	Up 1.25 kV	0.9 kV
RFI filtering	0.1-30 Mhz	0.1-30 Mhz
Admissible short-circuit current	Iscsr 25 kA	25 kA
<b>Associated Disconnection Devices</b>		
Thermal disconnecter	Internal	
Fuses	Type gG fuse - 50 A	
<b>Mechanical Characteristics</b>		
Dimensions	See diagram	
Connection	By screw terminals : 4 - 25 mm <sup>2</sup>	
Disconnection indicator	Mechanical indicator	
Mounting	Symmetrical rail [EN50022/DIN46277-3]	
Operating temperature	-40/+85 °C	
Housing material	Polycarbonate UL94-V0	
<b>Standards Compliance</b>		
NF EN 61643-11: France	Parafoudre Basse Tension - Essai Classe II	
CEI 61643-11: International	Low Voltage SPD - Test Class II	
EN 61643-11: Europe	Low Voltage SPD - Test Class II	
UL1449 3rd Edition: USA	Compliant	
<b>Part Number</b>		
DS41HFS-120	461690	
DS41HFS-230	461590	

**Note 1:** Rating in compliance with nominal discharge current. In order to increase service continuity, higher rating can be used (up to 125 A). For further information, please consult product instructions.



# Type 2 + 3 AC Surge Protectors with Filtering DS-HF Series

**Imax  
10 kA**

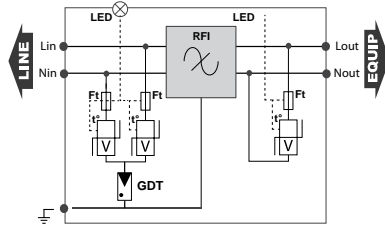
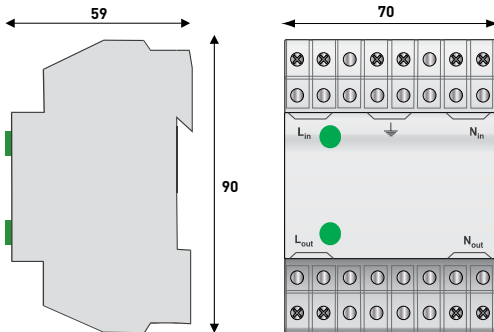


DS-HF

- **Type 2 + 3 AC Power Surge Protector**
- **Integral EMI/RFI Filter**
- **MOV plus GSG Design**
- **Series Wired Applications**
- **LED Fault Indicator**
- **Imax : 10 kA at 8/20 μs**
- **In : 3 kA at 8/20 μs**
- **UL 1449 3rd Edition Compliant**

## Dimensions and Electrical Diagram

(in mm)



V : High energy varistor  
GSG : Gas-Filled Spark Gap  
RFI : EMI/RFI Filter  
t° : Thermal disconnection system  
Ft : Thermal fuse  
LED : Visual fault indicator

## Characteristics

CITEL Part Number	DS-HF	DS-HF-120
Single-phase AC network voltage	220- 240 V	120-127 V
AC system	TN - TT - IT	TN - TT
Maximum operating voltage	Uc 255 Vac	150 Vac
Temporary overvoltage withstand	UT 440 Vac	230 Vac
Operating current	Ic < 1 mA	< 1 mA
Maximum line current	IL 16 A	16 A
Nominal discharge current 15 x 8/20 μs impulses	In 3 kA	3 kA
Maximum discharge current 8/20 μs withstand	Imax 10 kA	10 kA
Protection level CM/DM <sup>(2)</sup>	Up 1 kV/ 0.8 kV	0.6 kV/ 0.5 kV
Combination waveform test	Uoc 6 kV	6 kV
Class III test		
RFI filtering	0.1 - 30 MHz	0.1 - 30 MHz
Admissible short-circuit current	Iscrr 10 kA	10 kA
<b>Associated Disconnection Devices</b>		
Thermal disconnector	Internal	
Fuses	Fuses type gG - 20 A max. (see Note 1)	
Installation ground fault breaker	Type «S» or delayed	
<b>Mechanical Characteristics</b>		
Dimensions	See diagram	
Connection	By screw terminals : 0.75 - 4 mm <sup>2</sup>	
Voltage/operating indicator	Green led(s) on	
Disconnection indicator	Green led off	
Remote signaling of disconnection	None	
Mounting	Symmetrical rail 35 mm	
Operating temperature	-40/+85 °C	
Protection class	IP20	
Housing material	Thermoplastic UL94-V0	
<b>Standards Compliance</b>		
NF EN 61643-11: France	Parafoudre Basse Tension - Essais Classe II et III	
IEC 61643-11: International	Low Voltage SPD - Test Class II et III	
EN 61643-11: Europe	Low Voltage SPD - Test Class II and III	
UL 1449 3rd Edition: USA	Compliant	
<b>Part number</b>		
DS-HF	77945	
DS-HF-120	77948	

**Note 1:** Rating in compliance with NF C15-100 art. 534.1.5.3. In order to increase service continuity, higher rating can be used (up to 40 A). For further information, please consult product instructions.

**Note 2:** MC : common mode (L/PE or N/PE) - MD : differential mode (L/N)



# Multi-Pole DC or AC Power Surge Protectors

## DS2x0-xxDC Series

**Imax**  
**20-40 kA**



DS230-48DC

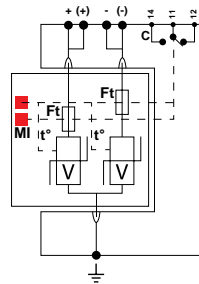
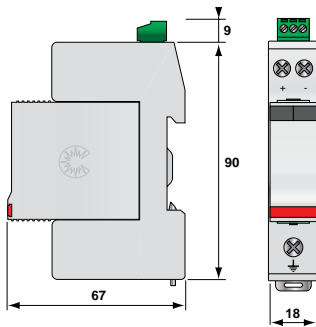
- **Type 2 DC or AC Power Surge Protector**
- **Imax : 20 - 40 kA at 8/20 μs**
- **DC Voltage from 12 to 350 V**
- **AC Voltage from 20-350 V**
- **Slim 18 mm Form Factor**
- **Individual Fault Indicator Windows**
- **UL 1449 3rd Edition Recognized**

**DS2xx S-xxxDC**

— DC operating voltage (12, 24, 48, 75, 95, 110, 130, 220, 280, 350)  
— Remote signal option  
— Maximal discharge current

## Dimensions and Electrical Diagram

(in mm)



C: Remote signaling contact  
V: Varistor  
Ft: Thermal fuse  
t°: Thermal disconnection system

## Characteristics

CITEL Part Number	DS220S-12DC	DS220S-24DC	DS230S-48DC	DS240S-75DC	DS240S-95DC	DS240S-110DC	DS240S-130DC	DS240S-220DC	DS240S-280DC	DS240S-350DC
Nominal DC voltage	Un 12 Vdc	24 Vdc	48 Vdc	75 Vdc	95 Vdc	110 Vdc	130 Vdc	220 Vdc	280 Vdc	350 Vdc
Maximum DC operating voltage	Uc 24 Vdc	38 Vdc	65 Vdc	100 Vdc	125 Vdc	150 Vdc	180 Vdc	275 Vdc	350 Vdc	460 Vdc
Maximum AC operating voltage	Uc 20 Vac	30 Vac	50 Vac	75 Vac	95 Vac	115 Vac	150 Vac	210 Vac	275 Vac	350 Vac
Nominal discharge current	In 10 kA	10 kA	15 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Maximal discharge current	Imax 20 kA	20 kA	30 kA	40 kA	40 kA	40 kA	40 kA	40 kA	40 kA	40 kA
Protection level at In	Up-In 250 V	250 V	300 V	390 V	450 V	500 V	620 V	900 V	1200 V	1400 V
Voltage protection rating	Vpr 330 V	330 V	330 V	400 V	-	-	600 V	-	-	-

### Associated Disconnection Devices

Thermal disconnectors	internal	internal	internal	internal	internal	internal	internal	internal	internal	internal
Fuses (if necessary)	20A gG	20A gG	20A gG	50A gG	50A gG	50A gG	50A gG	50A gG	50A gG	50A gG

### Mechanical Characteristics

Dimensions	See diagram
Wiring to network	By screw terminals 1.5-10mm <sup>2</sup> (active wires) and 2.5-25mm <sup>2</sup> (ground)
Disconnection indicator	2 mechanical indicators
Replacement module	Pluggable module DSM2x0-xxDC
Remote signalling	Option (DS2x0S-xxDC) - output on changeover contact
Mounting	Symmetrical rail
Operating temperature	-40/+85°C
Protection class	IP 20
Housing material	Thermoplastic UL94-V0

### Standards Compliance

IEC 61643-11: International	Low voltage SPD - Test Class II
EN 61643-11 : Europe	Low voltage SPD - Test Class II
UL 1449 3rd Edition: USA	Type 4, for use in Type 2 applications

### Part Number

390111	390511	390411	310611	310311	310711	310811	310211	310511	310911
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# Coordination Inductors DSH Series

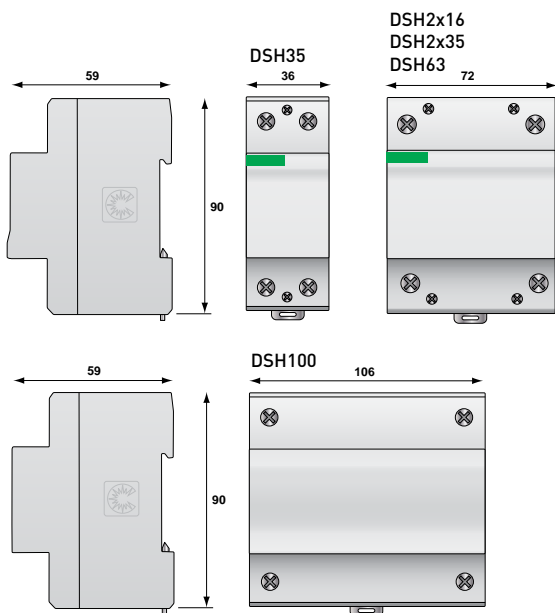


DSH 35

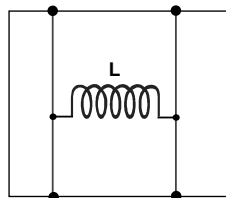
- Coordination Inductors for Surge Protection
- For Use with the DS Series
- 35, 63, 100 A Versions Available
- 2x16 and 2x35 A Double Inductor Versions

## Dimensions and Electrical Diagram

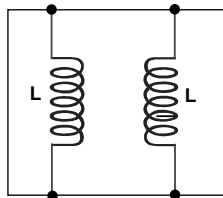
(in mm)



DSH35 - DSH63 - DSH100



DSH2x16 - DSH2x35



L : inductor

## Characteristics

CITEL Part Number	DSH100	DSH63	DSH35	DSH2x35	DSH2x16
Type	Inductor	Inductor	Inductor	Double inductor	Double inductor
Connection mode	1 DSH in series on each active wire	1 DSH in series on each active wire	1 DSH in series on each active wire	1 DSH in series on 2 active wires	1 DSH in series on 2 active wires
Max. operating voltage $U_c$	500 Vac	500 Vac	500 Vac	500 Vac	500 Vac
Max. line current $I_L$	100 A	63 A	35 A	2 x 35 A	2 x 16 A
Line inductance	15 $\mu$ H	15 $\mu$ H	15 $\mu$ H	2 x 15 $\mu$ H	2 x 15 $\mu$ H
<b>Mechanical Characteristics</b>					
Dimensions	See diagram				
Connection	Screw terminals : 6-35 mm <sup>2</sup> (DSH2x16, DSH2x35, DSH35, DSH63) Screw terminals : 4-50 mm <sup>2</sup> (DSH100)				
Mounting	Symmetrical rail 35 mm				
Operating temperature	-40/+85 °C				
Protection class	IP20				
Housing material	Thermoplastic UL94-V0 and UL94-5VA (DSH35-DSH2x16)				
<b>Part Number</b>					
DSH100	465100				
DSH63	360807				
DSH35	360806				
DSH2x35	360808				
DSH2x16	360808				











CITEL



# PHOTOVOLTAIC

Surge Protectors

# Surge Protectors for Photovoltaic Systems



Most photovoltaic module manufacturers guarantee their materials for 20 years or more. The ROI of photovoltaic generation facilities connected to the low voltage network is therefore calculated over this long period of time. These systems are often highly exposed to lightning and power surges, and this can greatly reduce the life of the installation. For this reason, it is important to implement appropriate protection solutions.

Several points must be considered to analyze the risk of lightning and power surges:

- Due to the exposed nature of the PV array, the threat of lightning is more common.
- The risk is multiple:
  - Direct effect: Lightning strike on the panels.
  - Indirect effect: Surge on cells, solar chargers, inverters and data lines.
- The operating loss must be taken into account, especially at sites of high power capacity.
- When the PV system is located on industrial sites, the risk of switching overvoltages must also be taken into account.
- The level of risk is directly related to the lightning density and exposure of local lines.

## Protection of PV Installation

The photovoltaic grid-connected low voltage power lines may be subject to overvoltages on different networks:

- **AC network:** Surge protectors are necessary, and in most cases, mandatory on the AC output of the PV inverter which is connected back to the AC power grid.
- **DC network:** Surge protectors are required or mandatory on the input of the PV inverter or the output of PV modules.
- **Low current network:** If the PV inverter is connected to low voltage signal lines (probes, sensors, monitoring) then SPD devices are highly recommended.

## AC Surge Protectors for PV Installation

CITEL also offers a complete range of solutions to protect the AC portion of the PV system.

### Installations with Lightning Rods

A Type 1 surge protector, specifically designed to handle direct lightning current, is required at the service entrance of the installation. Surge protectors like the DS250 provide high energy surge capacity in a compact size and are easily serviced with pluggable modules.

### Standard Installations

In the absence of a lightning rod, the implementation of a type 2 SPD is generally preferred, and in some cases required, depending on the level of lightning in the area ( $N_g > 2.5$ ). The DS40 type 2 surge protectors range offers a modular solution adapted to these applications. For medium and small size facilities with limited space available, the DS240/DS440 provides a high surge capacity in a reduced footprint.

### Input Protection of PV Inverter

Guide UTE C15-712-1 requires the implementation of an additional SPD on the AC input of the PV inverter, if it is more than 10 m from the surge protector origin. The DS215/DS415 surge protectors provide this protection for these applications and can be installed either directly into the distribution panel or in a dedicated, standalone enclosure solution.

## Surge Protectors for Low Voltage

The PV system can be interconnected to various low-voltage networks including probes, sensors, and monitoring equipment. In these cases, the implementation of suitable surge protectors is highly recommended. The DLA range of surge protectors is designed for this application and is available for many types of telecom or data line connection.




## DC Surge Protectors for PV Installation

An inverter's DC input has to be protected according to the UTE C15-712-1 Guide. CITEL has designed a complete range of Type 1 and Type 2 SPD dedicated to inverter protection.



### Type 1 Surge Protector





When the installation is equipped with non-isolated lightning rods (see UTE C61-740-52), it is mandatory to install SPD's designed for a direct lightning strike (10/350 $\mu$ s). For these cases, CITEL has developed a range of high energy Type 1 surge protectors:

-  **DS60VGPV series** : Type 1 SPD's may withstand up to 12.5 kA 10/350 $\mu$ s per pole and incorporate CITEL's exclusive, patented VG Technology.

### Type 2 Surge Protector

In most installations, the SPD will be necessary or required and will be the Type 2. CITEL offers 2 ranges with pluggable module design:

-  **DS50PV Series** : Based on the use of specific varistors, this version provides protection in common mode or differential plus common mode.
-  **DS50VGPV Series** : This version is based on VG technology, which guarantees zero leakage current and maximum reliability.

Series		Description	Characteristics	Page
DS60VGPV		Type 1+2 surge protector for PV	High energy VG Technology	61
DS50VGPV		Type 2 surge protector for PV	Pluggable VG Technology	62
DS50PV/G		Type 2 surge protector for PV	Pluggable	63
DS50PV		Type 2 surge protector for PV	Pluggable	64

# DS50PV and DS50VGPV Series

**Pluggable Module**  
For simplified maintenance.



**Status Signaling**  
Visual indication of the status of the device.



**Remote Signaling**  
Option to remotely monitor the status of the surge protector. Simplified cabling thanks to a single terminal for monitoring all poles.



**Connectors**  
Significant physical separation of screw terminal blocks guarantees insulation between polarities even for high DC voltages.

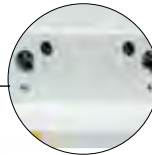


**VG Technology**  
Efficiency and maximum reliability.

**Earthing**  
Double connector for optimized connection to ground network.

# DS60VGPV Series

**Connectors**  
Significant physical separation of screw terminal blocks: guarantees insulation between polarities even for high DC voltages



**VG Technology**  
Efficiency and maximum reliability

**Remote Signaling**  
Standard feature to remotely monitor the status of the surge protector. Simplified cabling thanks to a single terminal for monitoring all poles.



**Status Signaling**  
Visual indication of the status of the device

# Protection of Photovoltaic Installations

## Residential Photovoltaic Installation

The UTE C 15-712-1 guide indicates the minimum level of protection for installations against surges originating from lightning. For small power plants (residential and small commercial), the AC input (connection to the grid) and the DC output should be protected.

The implementation of the SPD may be mandatory for some cases but not for all. However, if the reliability and longevity of the PV system are the primary objective then the implementation of surge protectors is recommended.



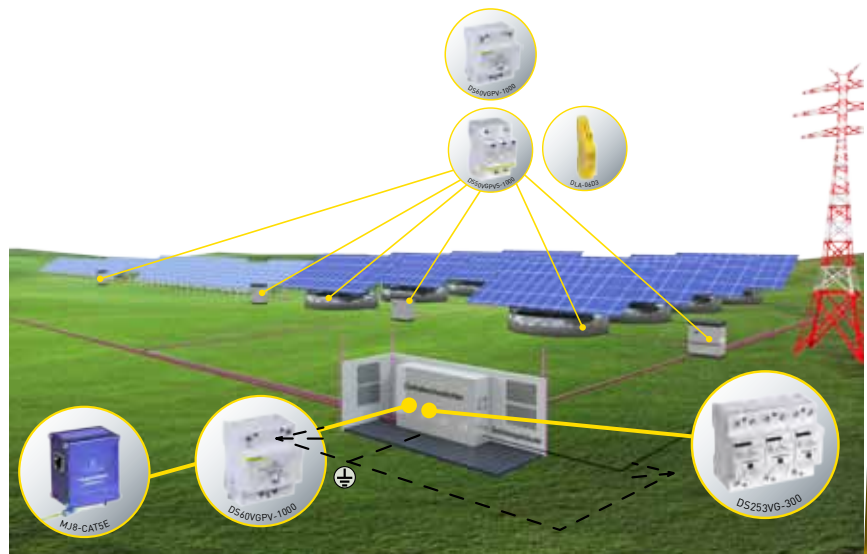
## Industrial Photovoltaic Installation

Commercial or industrial sites can integrate very large photovoltaic systems into their power generation strategy. These applications are vulnerable to lightning and transient surges which can cause significant downtime and losses. The implementation of SPD's at key locations throughout the facility is necessary to ensure the reliable operation of the plant.



## Photovoltaic Power Plant

Photovoltaic power plants have a high risk of lightning strikes due to their large surface area and exposed location. This high-risk setup means that expensive, and highly sensitive equipment is vulnerable to damaging and costly lightning strikes.



# UL Type 1 CA PV Surge Protectors DS60VGPV Series



DS60VGPV-1000

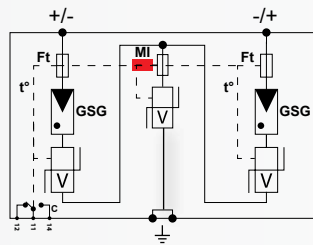
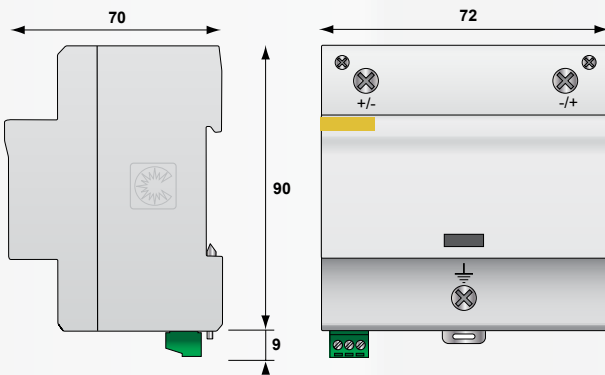
- **UL Type 1 CA DC SPD for PV Systems**
- **VG Technology for Maximum Performance**
- **Zero Leakage Current**
- **Zero Working Current**
- **Iimp : 12.5kA/pole at 10/350µs**
- **In : 20kA/pole at 8/20µs**
- **UL 1449 4th Edition Recognized**

DS60VGPV-xxx

Network Voltage

## Dimensions and Electrical Diagram

(in mm)



GSG : Gas-Filled Spark Gap  
V : High Energy MOV  
MI : Disconnection Indicator  
Ft : Thermal Fuse  
t° : Thermal Disconnection Mechanism  
C : Contact for Remote Signal

## Characteristics

CITEL Part Number		DS60VGPV-500	DS60VGPV-1000	DS60VGPV-1500G/51
Network voltage	Uocstc	500 Vdc	1,000 Vdc	1,250 Vdc
Protection mode *		CM/DM	CM/DM	CM/DM
Maximum operating voltage	Ucpv	600 Vdc	1,200 Vdc	1,500 Vdc
Short-circuit current rating	Sccr	100,000 A	100,000 A	>1,000 A (Iscwpv)
Operating current to the Voltage Ucpv	Icpv	none	none	none
Leakage current to the voltage Ucpv	Ipe	none	none	none
Follow current	If	none	none	none
Nominal discharge current 15 x 8/20 µs Impulses	In	20 kA	20 kA	20 kA
Maximum discharge current 10/350 µs Withstand	Iimp	12.5 kA	12.5 kA	12.5 kA
Maximum discharge current 8/20µs Withstand	Imax	40 kA	40 kA	40 kA
Protection level (at In)	Up	<1,700 V	<2,800 V	<3,400 V

### Disconnecter

Thermal Disconnecter	internal
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### Mechanical Characteristics

Dimensions	see diagram
Connection	Screw terminal for 6-35 mm <sup>2</sup> wire
Disconnection indicator	1 mechanical indicator
Remote signaling	250V/0.5 (AC) - 125V/3A (DC)
Mounting	symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic UL94-V0

### Standards Compliance

UTE C61-740-51: France	PV Surge Protection - Class I and II Testing		
EN 50539-11: Europe	PV Surge Protection - Class I and II Testing		
UL1449 3rd Edition: USA	Type 1 CA	Type 1 CA	-

### Part Number

DS60VGPV-500	3948
DS60VGPV-1000	3947
DS60VGPV-1500G/51	3956

(\* ) CM = Common mode (+/PE or -/PE) - DM = Differential mode (+/-)





# UL Type 1 CA PV Surge Protectors

## DS50VGPV Series



DS50VGPVS-1000

- **UL Type 1 CA DC SPD for PV Systems**
- **VG Technology for Maximum Performance**
- **Zero Leakage Current**
- **Zero Working Current**
- **Imax : 40kA/pole at 8/20µs**
- **In : 20kA/pole at 8/20µs**
- **UL 1449 4th Edition Recognized**

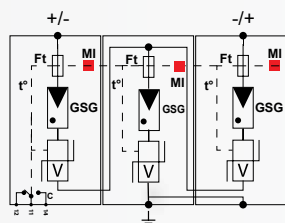
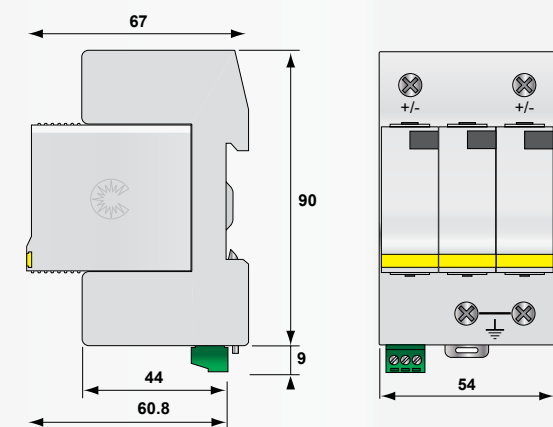
### DS50VGPVS-xxx

Network Voltage

<S> Optional Remote Signaling Status

## Dimensions and Electrical Diagram

(in mm)



GSG: Gas-Filled Spark Gap  
 V: High Energy MOV  
 MI: Disconnection Indicator  
 Ft: Thermal Fuse  
 t°: Thermal Disconnection Mechanism  
 C: Contact for Remote Signal

## Characteristics

CITEL Part Number		DS50VGPVS-500	DS50VGPVS-1000	DS50VGPVS-1500G/51
Network voltage	Uocstc	500 Vdc	1,000 Vdc	1,250 Vdc
Protection mode *		CM/DM	CM/DM	CM/DM
Maximum operating voltage	Ucpv	600 Vdc	1,200 Vdc	1,500 Vdc
Short-circuit current rating	Scrc	100,000 A	100,000 A	> 1,000 A (Iscwpv)
Operating current to the voltage Ucpv	Icpv	none	none	none
Leakage current to the voltage Ucpv	Ipe	none	none	none
Follow current	If	none	none	none
Nominal discharge current 15 x 8/20 µs Impulses	In	20 kA	20 kA	20 kA
Maximum discharge current 8/20µs withstand	Imax	40 kA	40 kA	40 kA
Protection level (at In)	Up	<2,500 V	<3,600 V	<3,400 V
<b>Disconnecter</b>				
Thermal disconnecter		internal		
<b>Mechanical Characteristics</b>				
Dimensions		see diagram		
Connection		Screw terminal for 4-25 mm <sup>2</sup> wire		
Disconnection indicator		1 mechanical indicator		
Remote signaling		Option DS50VGPVS - Output on changeover contact		
Mounting		symmetrical rail 35 mm		
Operating temperature		-40/+85 °C		
Protection class		IP20		
Housing material		Thermoplastic UL94-V0		
<b>Standards Compliance</b>				
UTE C61-740-51: France		PV Surge Protection - Class I and II testing		
EN 50539-11: Europe		PV Surge Protection - Class I and II testing		
UL1449 3rd Edition:USA		Type 1 CA	Type 1 CA	Type 1 CA
<b>Part Number</b>				
DS50VGPVS-500		480161		
DS50VGPVS-1000		480361		
DS50VGPVS-1500G/51		481511		

(\* ) CM = Common mode (+/PE or -/PE) - DM = Differential mode (+/-)



# Type 2 PV Surge Protectors

## DS50PV/G Series



DS50PVS-800/G

- **UL Type 4 CA DC SPD for PV Systems**
- **MOV and GSG Protection Technology**
- **Modular Design for Ease of Maintenance**
- **Integrated Status Indicator Window**
- **Zero Leakage Current**
- **I<sub>max</sub> : 40 kA/pole at 8/20μs**
- **I<sub>n</sub> : 20 kA/pole at 8/20μs**
- **UL 1449 3rd Edition Recognized**

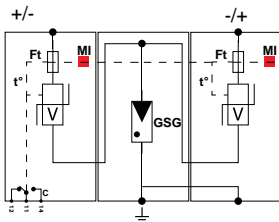
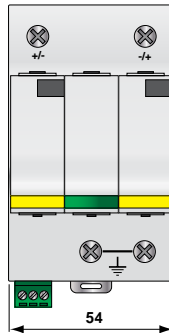
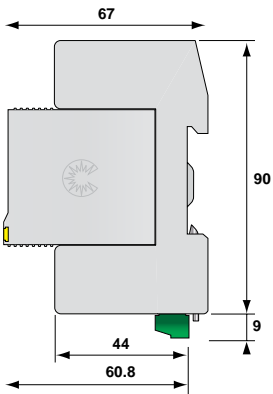
**DS50PVS-xxx/G**

Network Voltage

«S» = Optional Remote Signaling Status

## Dimensions and Electrical Diagram

(in mm)



GSG : Gas-Filled Spark Gap  
 V : High energy MOV  
 MI : Disconnection indicator  
 Ft : Thermal fuse  
 t° : Thermal disconnection mechanism  
 C : Contact for remote signal (option DS50PVS-xxx)

## Characteristics

CITEL Part Number		DS50PVS-500/G	DS50PVS-800/G	DS50PVS-1000/G
Maximum PV voltage	Uocstc	500 Vdc	800 Vdc	1,000 Vdc
Protection mode *		CM/DM	CM/DM	CM/DM
Maximum operating voltage	Ucpv	600 Vdc	960 Vdc	1060 Vdc
Current withstand short-circuit	Iscwpv	>1,000 A	>1,000 A	>1,000 A
Operating current to the voltage Ucpv	Icpv	< 0.1 mA	< 0.1 mA	< 0.1 mA
Leakage current to the voltage Ucpv	Ipe	none	none	none
Nominal discharge current 15 x 8/20 μs Impulses	I <sub>n</sub>	20 kA	20 kA	20 kA
Maximum discharge current 8/20 μs withstand	I <sub>max</sub>	40 kA	40 kA	40 kA
Protection level (at I <sub>n</sub> )	U <sub>p</sub>	<1,800 V	<2,400 V	<3,000 V

### Disconnecter

Thermal disconnecter : internal

### Mechanical Characteristics

Dimensions	see diagram
Connection	by screw terminal : 4-25 mm <sup>2</sup>
End of life mode	disconnection of the SPD from PV line
Disconnection indicator	by mechanical indicator
Remote signaling of disconnection	Option DS50PVS-xxx/G
Mounting	symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic UL94-V0

### Standards Compliance

EN50539- 11: Europe	PV Surge Protection - Class I and II Testing		
UL1449 3rd Edition: USA	Type 4 CA	Type 4 CA	Type 4CA

### Part Number

DS50PVS-500/G	480141
DS50PVS-800/G	480241
DS50PVS-1000/G	480341

(\* ) CM = Common mode (+/PE or -/PE) - DM = Differential mode (+/-)



# Type 2 PV Surge Protectors

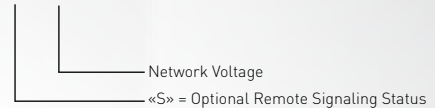
## DS50PV Series



DS50PV-1000

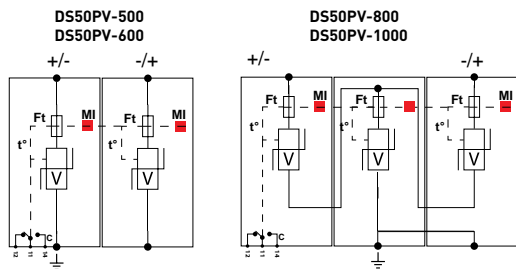
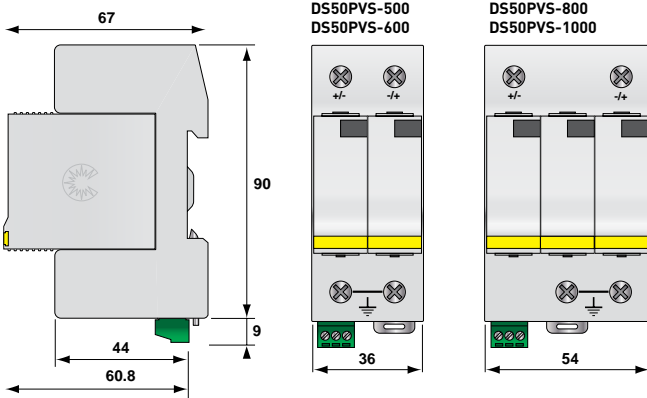
- **UL Type 4 & 1 CA DC SPD's for PV Systems**
- **Designed with High Energy MOV's**
- **Modular Design for Ease of Maintenance**
- **Integrated Status Indicator Window**
- **I<sub>max</sub> : 40 kA /pole at 8/20μs**
- **I<sub>n</sub> : 20 kA /pole at 8/20μs**
- **UL 1449 3rd Edition Recognized**

### DS50PVS-xxx



## Dimensions and Electrical Diagram

(in mm)



GSG: Gas-Filled Spark Gap  
V : High energy MOV  
MI : Disconnection indicator  
Ft : Thermal fuse  
t° : Thermal disconnection mechanism  
C : Contact for remote signal (option DS50PVS-xxx)

## Characteristics

CITEL part number	DS50PVS-500	DS50PVS-600	DS50PVS-800	DS50PVS-1000
Maximum PV voltage	Uocstc 500 Vdc	600 Vdc	800 Vdc	1,000 Vdc
Protection mode *	CM/DM	CM/DM	CM/DM	CM/DM
Maximum operating voltage	Ucpv 530 Vdc	670 Vdc	840 Vdc	1,060 Vdc
Short-circuit current rating	Scrr >1,000 A (Iscwpv)	100,000 A	>1000 A (Iscwpv)	100,000 A
Operating current to the voltage Ucpv	Icpv < 0.1 mA	< 0.1 mA	< 0.1 mA	< 0.1 mA
Leakage current to the voltage Ucpv	Ipe < 0.1 mA	< 0.1 mA	< 0.1 mA	< 0.1 mA
Nominal discharge current 15 x 8/20 μs Impulses	In 20 kA	20 kA	20 kA	20 kA
Maximum discharge current 8/20 μs Withstand	I <sub>max</sub> 40 kA	40 kA	40 kA	40 kA
Protection level (at In)	Up <1,800 V	<2,500 V	<3,000 V	<3,600 V

### Disconnecter

Thermal disconnector internal

### Mechanical Characteristics

Dimensions	see diagram
Connection	by screw terminal : 4-25 mm <sup>2</sup>
End of life mode	disconnection of the SPD from PV line
Disconnection indicator	by mechanical indicator
Remote signaling of disconnection	Option DS50PVS-xxx
Mounting	symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic UL94-V0

### Standards Compliance

prEN50539- 11: Europe	PV Surge Protection - Class I and II Testing			
UL1449 3rd Edition: USA	Type 4 CA	Type 1 CA	Type 4 CA	Type 1 CA

### Part Number

DS50PVS-500	480112
DS50PVS-600	480411
DS50PVS-800	480212
DS50PVS-1000	480312

(\* ) CM = Common mode (+/PE or -/PE) - DM = Differential mode (+/-)



# Surge Protectors for PV Offgrid Locations

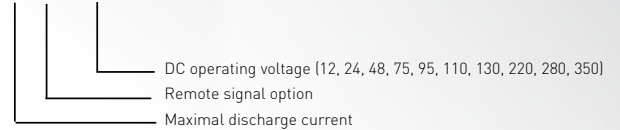
## DS2x0S-xxDC Series



DS230-48DC

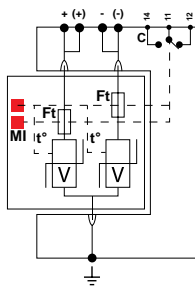
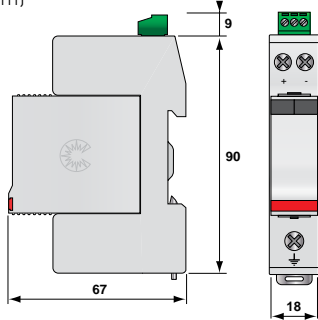
- **Type 2 DC or AC Power Surge Protector**
- **I<sub>max</sub> : 20 - 40 kA at 8/20 μs**
- **DC Voltage from 12 to 350 V**
- **AC Voltage from 20-350 V**
- **Slim 18 mm Form Factor**
- **Individual Fault Indicator Windows**
- **UL 1449 3rd Edition Recognized**

DS2xx S-xxxDC



### Dimensions and Electrical Diagram

(in mm)



C: Remote signaling contact  
 V: Varistor  
 Ft: Thermal fuse  
 t°: Thermal disconnection system

### Characteristics

CITEL Part Number	DS220S-12DC	DS220S-24DC	DS230S-48DC	DS240S-75DC	DS240S-95DC	DS240S-110DC	DS240S-130DC	DS240S-220DC	DS240S-280DC	DS240S-350DC
Nominal DC voltage	Un 12 Vdc	24 Vdc	48 Vdc	75 Vdc	95 Vdc	110 Vdc	130 Vdc	220 Vdc	280 Vdc	350 Vdc
Maximum DC operating voltage	Uc 24 Vdc	38 Vdc	65 Vdc	100 Vdc	125 Vdc	150 Vdc	180 Vdc	275 Vdc	350 Vdc	460 Vdc
Maximum AC operating voltage	Uc 20 Vac	30 Vac	50 Vac	75 Vac	95 Vac	115 Vac	150 Vac	210 Vac	275 Vac	350 Vac
Nominal discharge current	In 10 kA	10 kA	15 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Maximal discharge current	I <sub>max</sub> 20 kA	20 kA	30 kA	40 kA	40 kA	40 kA	40 kA	40 kA	40 kA	40 kA
Protection level at In	Up-In 250 V	250 V	300 V	390 V	450 V	500 V	620 V	900 V	1,200 V	1400 V
Voltage protection rating	V <sub>pr</sub> 330 V	330 V	330 V	400 V	-	-	600 V	-	-	-
<b>Associated Disconnection Devices</b>										
Thermal disconnectors	internal	internal	internal	internal	internal	internal	internal	internal	internal	internal
Fuses (if necessary)	20A gG	20A gG	20A gG	50A gG	50A gG	50A gG	50A gG	50A gG	50A gG	50A gG
<b>Mechanical Characteristics</b>										
Dimensions	See diagram									
Wiring to network	By screw terminals 1.5-10mm <sup>2</sup> (active wires) and 2.5-25mm <sup>2</sup> (ground)									
Disconnection indicator	2 mechanical indicators									
Replacement module	Pluggable module DSM2x0-xxDC									
Remote signalling	Option (DS2x0S-xxDC) - output on changeover contact									
Mounting	Symmetrical rail									
Operating temperature	-40/+85°C									
Protection class	IP 20									
Housing material	Thermoplastic UL94-V0									
<b>Standards Compliance</b>										
IEC 61643-11: International	Low voltage SPD - Test Class II									
EN 61643-11 : Europe	Low voltage SPD - Test Class II									
UL 1449 3rd Edition: USA	Type 4, for use in Type 2 applications									
<b>Part Number</b>										
	390111	390511	390411	310611	310311	310711	310811	310211	310511	310911





CITEL



# AC POWER

Surge Protectors

# AC Surge Protectors Hard-Wired Units and Combiner Boxes

CITEL offers a line of surge protectors for the single and three phase AC networks connected to sensitive equipment. These products are available in various formats including:

- Hard-wired units single-phase (MSB, MLP)
- Hard-wired units in NEMA enclosure (M & MDS series)

## Hard-Wired Surge Protectors

### MSB Series

A family of SPD's Type 2 or 3 provides effective protection for very sensitive equipment and can be combined with upstream protectors to provide coordinated protection. The ideal installation location of an SPD is very close to sensitive equipment and more than 10 meters from an upstream protector. CITEL surge protectors utilize a compact and economical design based on varistors that obtain a high surge capacity compared to other secondary protectors. All SPD's are designed in accordance with the NF EN 61643-11 and UL 1449 3rd edition standard that requires an internal thermal disconnect to safely remove the SPD from the network at its end of life. The operating status of the SPD is indicated by an LED (or buzzer for version MSB6). They are available in screw terminal connectors or hard-wired.

### MLP Series

Compact surge protectors designed for the protection of equipment particularly vulnerable to transient overvoltages. The complete range offers numerous configurations:

- Wire or screw terminal connection
- IP20 or IP65 enclosures
- Series or parallel installation
- Data line protection option
- Status indication

The MLP range is based on a varistor and gas-filled spark gap design that complies with EN 61643-11 and UL 1449 3rd edition. They are equipped with an internal safety disconnect and associated LED indicator. An optional remote signal contact is available. The MLP surge protector range is also available for data line protection.

## AC Enclosures - IEC and NEMA

### MDS Series





The MDS series of surge protectors are devices for single or three phase low voltage electrical installations up to 480VAC. These units are based on the use of modular surge protectors like the DS Series. They are equipped with surge protection and an EMI/RFI filtering option.

### M Series

These standalone NEMA enclosures are AC surge protectors that have been specifically designed for standards, networks and installations in North America.

They are available in single, split or three phase configurations and are equipped with various diagnostic options. Housed in a NEMA 4 metal enclosure, these surge protectors are available in various per phase surge capacities (Imax of 80, 100, 160 and 200 kA).

The protection circuit is based on a combination of high energy varistors and filter capacitors to provide a very high discharge current capability with EMI / RFI filtering. Manufactured in accordance with the UL1449 3rd edition standard. Safe operation is ensured by real-time diagnostics including fault indicators, an audible alarm, and remote signal contacts.

Series		Description	Characteristics	Page
MSB		Hard-wired surge protector Type 2 or 3	Compact design	68
MLP		Hard-wired surge protector Type 2 or 3	Power line and data line protection	69
MDS		UL Listed Type 1 SPD	SPD and fuse in one enclosure	71
M		Surge protectors in NEMA enclosure	80 to 200 kA with EMI filtering	72

# Data Sheet

## Surge Protectors for LED lighting system MLPC series

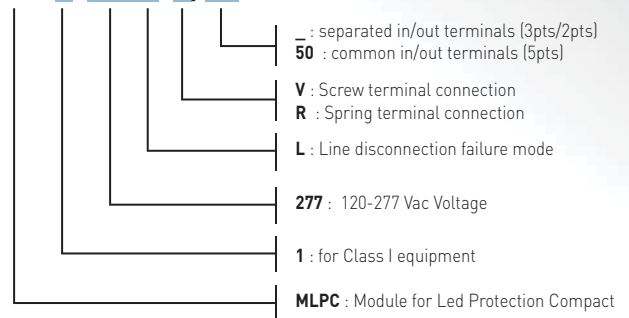


MLPC1-277L-V

MLPC1-277L-R

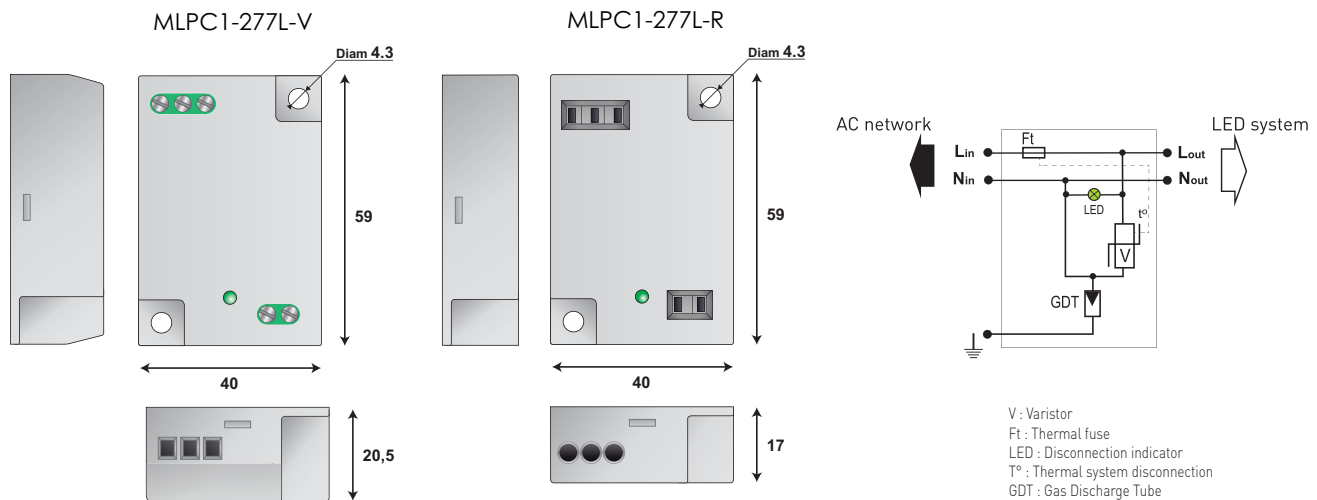
- **UL Type 2CA surge protectors for Led lighting**
- **Very compact**
- **Plate mounting**
- **Screw terminal or spring terminal connection**
- **Status indicator**
- **End of life AC Disconnection**
- **EN 61643-11 certified**
- **UL1449 ed4 (Pending)**

### MLPC1-277L-V/50



## Dimensions and Diagrams

(in mm)



V : Varistor  
Ft : Thermal fuse  
LED : Disconnection indicator  
T° : Thermal system disconnection  
GDT : Gas Discharge Tube



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# Data Sheet

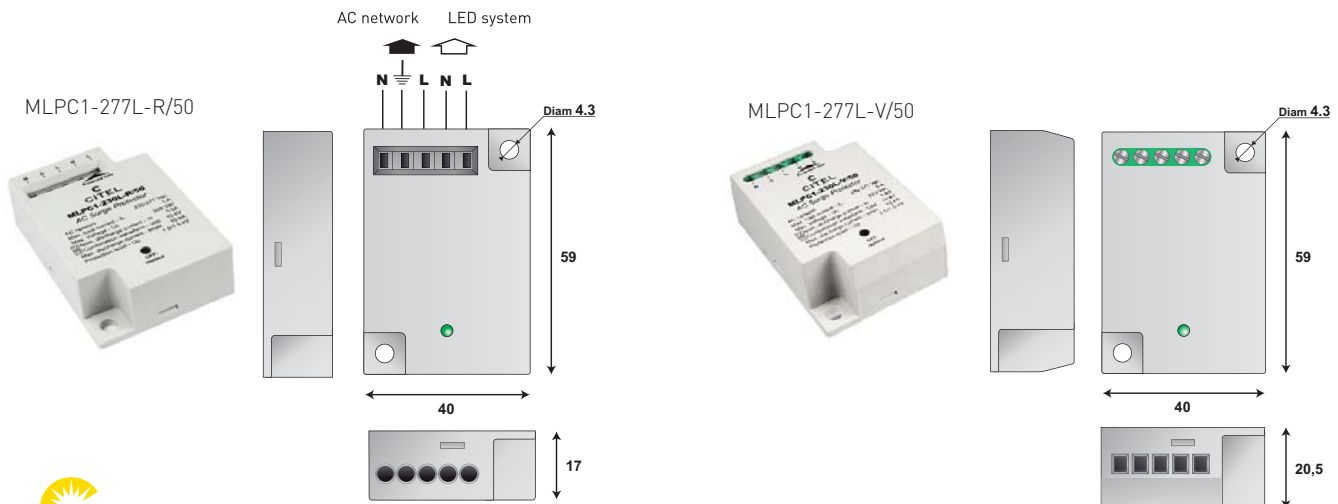
## Surge Protectors for LED lighting system MLPC series

### Characteristics

CITEL part number	MLPC1-277L-xx			
Typical use	120-277 Vac single phase			
Max. load current	IL	5 A		
Max. operating voltage	Uc	385 Vac		
Max. discharge current 1 x 8/20 $\mu$ s impulse	I <sub>max</sub>	10 kA		
Nominal discharge current 15 x 8/20 $\mu$ s impulse	I <sub>n</sub>	5 kA		
Combination waveform (IEC 61643-11) 1.2/50 $\mu$ s - 8/20 $\mu$ s	U <sub>oc</sub>	10 kV / 5 kA		
Surge withstand IEEE C62.41.2 1.2/50 $\mu$ s - 8/20 $\mu$ s		10 kV / 10 kA		
Protection level (at I <sub>n</sub> )	U <sub>p</sub>	1.8 kV		
Admissible short circuit current	I <sub>sc</sub>	10 000 A		
Mechanical characteristics				
Thermal disconnecter	internal			
Dimensions	see diagrams			
Fail safe end of life	Disconnection AC network cut-off Green LED off			
Mounting	On plate			
Operating temperature	-40/+85°C			
Housing material	Thermoplastic UL94V0			
Protection class	IP20			
Connection	Wire 1.5 mm <sup>2</sup> max.			
AC network connection	MLPC1-277L-V 2 screw terminals opposite side	MLPC1-277L-R 2 spring terminals opposite side	MLPC1-277L-V/50 1 screw contact terminal - single side	MLPC1-277L-R/50 1 spring contact terminal - single side
Standards compliance				
NF EN 61643-11	France	Parafoudre Basse Tension - Essai Classe II & III		
IEC 61643-11	International	Low voltage SPD - Test Class II & III		
UL1449 ed4	USA	2CA (Pending)		
Part Number	MLPC1-277L-V	MLPC1-277L-R	MLPC1-277L-V/50	MLPC1-277L-R/50



### Others versions



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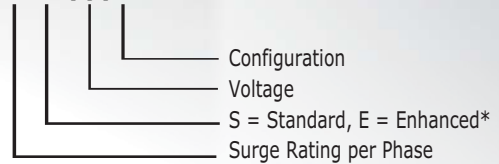
# Data Sheet

## AC Power Panel SPD MDS 750 Series

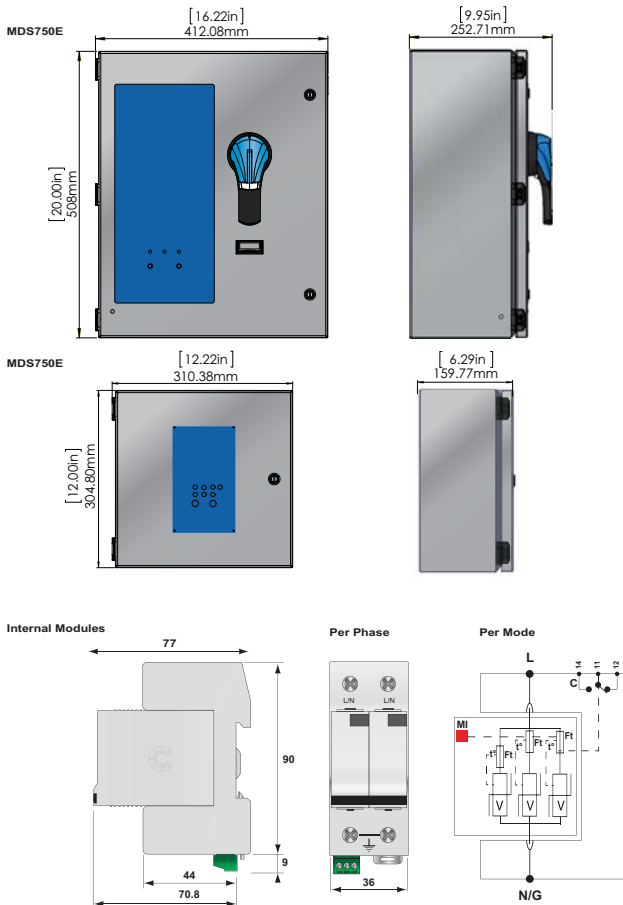


- **UL Type 1 Surge Protection Device (SPD)**
- **Real Time Diagnostics**
- **Optional Integrated Disconnect**
- **I<sub>total</sub> 8/20 μs: 750 kA**
- **I<sub>total</sub> 10/350 μs: 50 kA**
- **Pluggable module for each mode**
- **UL 1449 4th Edition**

### MDS750x-yyyz



## Dimensions and Diagram



## Characteristics

CITEL Part Number	MDS750			
Suffix	-120T -120Y	-220Y -240Y -240D	-277Y -347Y	-480D -600D
AC Network	120/240V 120/208V	220/380V 240/415V 240V	277/480V 347/600V	480V 600V
UL MCOV (L-G)	Uc 600-1000V	275V	420V	840V
TOV Withstand	Ut 175Vac	335Vac	420Vac	840Vac
IEC/UL Nominal Discharge Current 15 impulses 8/20 μs	In 20kA	20kA	20kA	20kA
Max. Surge Current (Total)	I <sub>max</sub> 750kA	750kA	750kA	750kA
Max. Lightning Current (Total) 1 impulse 10/350 μs	I <sub>imp</sub> 55kA	55kA	55kA	55kA
UL Voltage Protection Rating	VPR 700	900	1500	2500
Protection Level at In	Up 900	1300	1700	3000
UL Short-Circuit Current Rating	SCCR 200kA	200kA	200kA	200kA
Follow Current	I <sub>f</sub> none	none	none	none
Sine Wave Tracking	Yes			
Thermal Disconnect	UL 60691			
Max. Recommended Fuse	200A, Class J			
Dimensions	See Dimensions and Diagram			
Connection	by screw terminals, AWG depends on version			
Remote Signal Indicator	250Vac Max, 2A			
Mounting	Wallmount by screws (not supplied)			
Operating Temp	-50°C to +85°C			
Operating Altitude	13,000 ft (4,000m)			
Relative Humidity	5 to 95% non-condensing, up to 100% external			
Enclosure Material	Metal Standard, Stainless Steel option			
Environmental Rating	NEMA 4X			
Weight	MDS200E 25lbs, MDS200S 17lbs			
Standards Compliance				
IEC 61643-1 - INTERNATIONAL	Class I & II			
EN 61643-11 - EUROPE	Class I & II			
NF EN 61643-11 - FRANCE	Class I & II			
UL1449 3rd Edition - USA	Type 1			
UL1449 3rd Edition - CANADA	Type 2			
CSA C22.2 No. 8-M1986	Class 9091 32, Class 9091 92			
RoHS	Directive 2002/95/EC			

- \* Standard:  
60A Internal fusing, LED per phase, remote alarm
- Enhanced:  
60A Internal fusing with external disconnect switch,  
standard diagnostics plus audible alarm and surge counter



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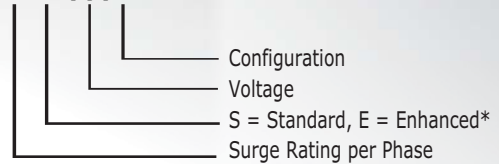
# Data Sheet

## AC Power Panel SPD MDS 600 Series

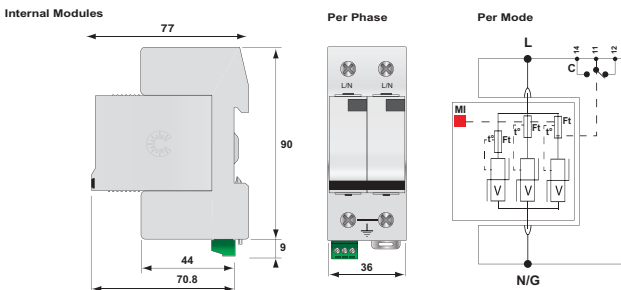
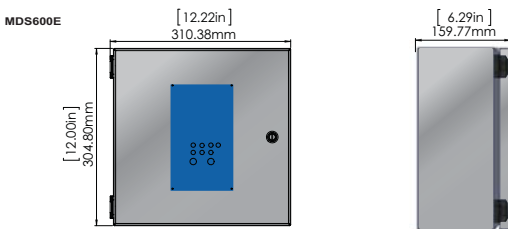
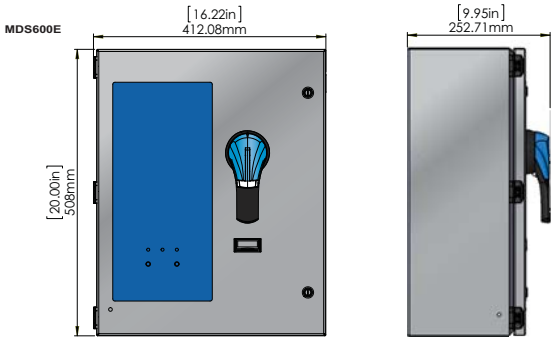


- UL Type 1 Surge Protection Device (SPD)
- Real Time Diagnostics
- Optional Integrated Disconnect
- I<sub>total</sub> 8/20 μs: 600 kA
- I<sub>total</sub> 10/350 μs: 50 kA
- Pluggable module for each mode
- UL 1449 4th Edition

### MDS600x-yyyzz



## Dimensions and Diagram



## Characteristics

CITEL Part Number	MDS600			
Suffix	-120T -120Y	-220Y -240Y -240D	-277Y -347Y	-480D
AC Network	120/240V 120/208V	220/380V 240/415V 240V	277/480V 347/600V	480V 600V
UL MCOV (L-G)	Uc 150-210V	300-420V	420-460V	550V
TOV Withstand	Ut 175Vac	335Vac	420Vac	840Vac
IEC/UL Nominal Discharge Current 15 impulses 8/20 μs	In 20kA	20kA	20kA	20kA
Max. Surge Current (Total)	I <sub>max</sub> 600kA	600kA	600kA	600kA
Max. Lightning Current (Total) 1 impulse 10/350 μs	I <sub>imp</sub> 44kA	44kA	44kA	44kA
UL Voltage Protection Rating	VPR 600-1000V	1000-1700V	1400-1900V	2000-2400V
Protection Level at In	Up 700-1300V	1200-2200V	1700-2400V	2400-3000V
UL Short-Circuit Current Rating	SCCR 200kA	200kA	200kA	200kA
Follow Current	If none	none	none	none
Sine Wave Tracking	Yes			
	UL 60691			
Max. Recommended Fuse	200A, Class J (Basic only)			
Dimensions	See Dimensions and Diagram			
Connection	by screw terminals, AWG depends on version			
Remote Signal Indicator	250Vac Max, 2A			
Mounting	Wallmount by screws (not supplied)			
Operating Temp	-50°C to +85°C			
Operating Altitude	13,000 ft (4,000m)			
Relative Humidity	5 to 95% non-condensing, up to 100% external			
Enclosure Material	Metal Standard, Stainless Steel option			
Environmental Rating	NEMA 4X			
Weight	MDS200E 25lbs, MDS200S 17lbs			
<b>Standards Compliance</b>				
IEC 61643-1 - INTERNATIONAL	Class I & II			
EN 61643-11 - EUROPE	Class I & II			
NF EN 61643-11 - FRANCE	Class I & II			
UL1449 3rd Edition - USA	Type 1			
UL1449 3rd Edition - CANADA	Type 2			
CSA C22.2 No. 8-M1986	Class 9091 32, Class 9091 92			
RoHS	Directive 2002/95/EC			

\* Standard:  
60A Internal fusing, LED per phase, remote alarm

Enhanced:  
60A Internal fusing with external disconnect switch,  
standard diagnostics plus audible alarm and surge counter



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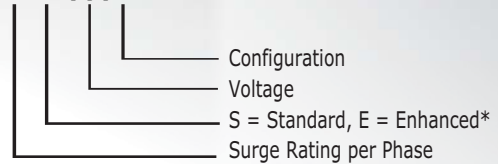
# Data Sheet

## AC Power Panel SPD MDS 300 Series



- UL Type 1 Surge Protection Device (SPD)
- Real Time Diagnostics
- Optional Integrated Disconnect
- I<sub>total</sub> 8/20 μs: 300 kA
- I<sub>total</sub> 10/350 μs: 50 kA
- Pluggable module for each mode
- UL 1449 4th Edition

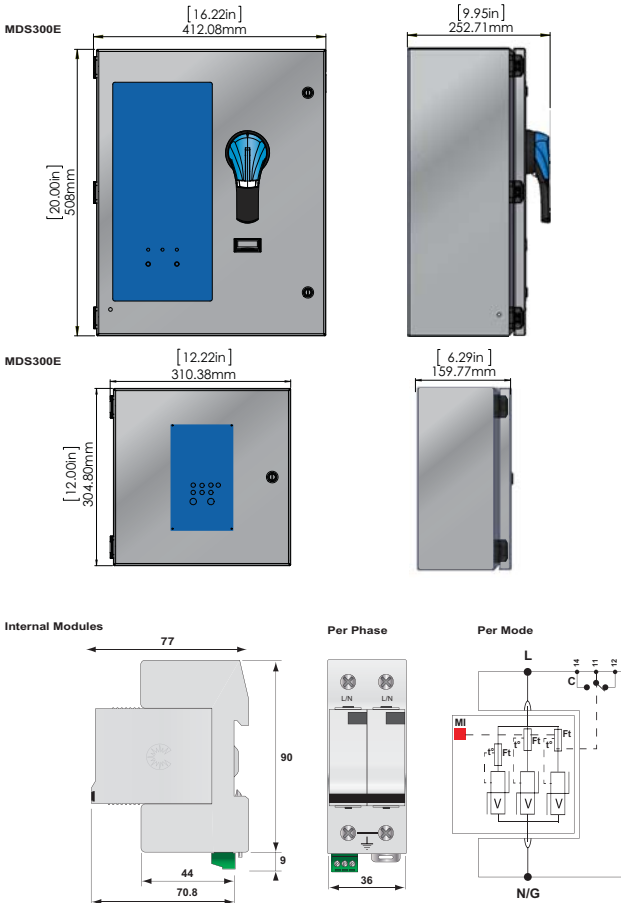
### MDS300x-yyyzz



## Characteristics

CITEL Part Number	MDS300			
Suffix	-120T -120Y	-220Y -240Y -240D	-277Y -347Y	-480D -600D
AC Network	120/240V 120/208V	220/380V 240/415V 240V	277/480V 347/600V	480V 600V
UL MCOV (L-G)	Uc 600-1000V	275V	420V	840V
TOV Withstand	Ut 175Vac	335Vac	420Vac	840Vac
IEC/UL Nominal Discharge Current 15 impulses 8/20 μs	In 20kA	20kA	20kA	20kA
Max. Surge Current (Total)	I <sub>max</sub> 300kA	300kA	300kA	300kA
Max. Lightning Current (Total) 1 impulse 10/350 μs	I <sub>imp</sub> 22kA	22kA	22kA	22kA
UL Voltage Protection Rating	VPR 700	900	1500	2500
Protection Level at In	Up 900	1300	1700	3000
UL Short-Circuit Current Rating	SCCR 200kA	200kA	200kA	200kA
Follow Current	If none	none	none	none
Sine Wave Tracking	Yes			
Thermal Disconnect	UL 60691			
Max. Recommended Fuse	200A, Class J			
Dimensions	See Dimensions and Diagram			
Connection	by screw terminals, AWG depends on version			
Remote Signal Indicator	250Vac Max, 2A			
Mounting	Wallmount by screws (not supplied)			
Operating Temp	-50°C to +85°C			
Operating Altitude	13,000 ft (4,000m)			
Relative Humidity	5 to 95% non-condensing, up to 100% external			
Enclosure Material	Metal Standard, Stainless Steel option			
Environmental Rating	NEMA 4X			
Weight	MDS200E 25lbs, MDS200S 17lbs			
Standards Compliance				
IEC 61643-1 - INTERNATIONAL	Class I & II			
EN 61643-11 - EUROPE	Class I & II			
NF EN 61643-11 - FRANCE	Class I & II			
UL1449 3rd Edition - USA	Type 1			
UL1449 3rd Edition - CANADA	Type 2			
CSA C22.2 No. 8-M1986	Class 9091 32, Class 9091 92			
RoHS	Directive 2002/95/EC			

## Dimensions and Diagram



\* Standard:  
60A Internal fusing, LED per phase, remote alarm

Enhanced:  
60A Internal fusing with external disconnect switch,  
standard diagnostics plus audible alarm and surge counter



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# Data Sheet

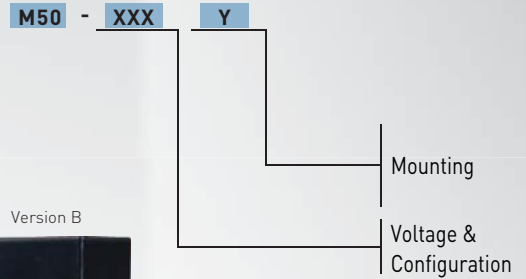
## Type 1 Surge Protective Device M50 Series



Version A



Version B



### Application

- Industrial
- Commercial
- Residential

### Features

- I<sub>max</sub> 50kA 8/20μs
- All single and three phase configurations from 120 to 600Vac
- Hybrid Technology for enhanced TOV protection with no leakage current
- Real-time diagnostics include an LED per phase and audible alarm
- Indoor/Outdoor IP66/NEMA6 rated enclosure (NEMA6 exceeds NEMA4 or 4X)
- Panel mount via M22 or 1/2" NPT
- Mounting is available on side, back or din rail
- Hardwired connection #12 AWG 36" leads
- 10-year free replacement warranty

### UL

- Listed for standalone or integrated applications
- UL Type 1 SPD - Installed on line or load side of the main disconnect
- In 20kA (All models)
- SCCR 200kA (All models)
- VPR L-N is 700V for 120V, 120/240V, 120/208V (See page 2 for full table)
- VPR L-N is 1200V for 220V, 220/380V, 230/400V, 240/415V, 277/480V (See page 2 for full table)
- Meets requirements of UL96A Lightning Protection Master Label
- UL Type 2 SPD with UL1283 EMI/RFI Filter option available (M50F Series)
- File # VZCA.E326289 (www.ul.com)



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# Data Sheet

## Type 1 Surge Protective Device M50 Series

### Technical Data

Description	M50-120Y-X	M50-120T-X	M50-120S-X	M50-230S-X	M50-240T-X	M50-240D-X	M50-277Y-X	M50-347Y-X	M50-480D-X	M50-600D-X
Product Part Number - A version	751101	751102	751103	751303	751402	751404	751501	751601	751704	751804
Product Part Number - B version	751111	751112	751113	751313	751412	751414	751511	751611	751714	751814
System voltage	120-208	120-240	120	230	240-480	240	277-480	347-600	480	600
System	4W+G (Wye)	3W+G (Split Ph)	2W+G (single)	2W+G (single)	3W+G (Split Ph)	3W+G (Delta)	4W+G (Wye)	4W+G (Wye)	3W+G (Delta)	3W+G (Delta)
Maximum Operating Voltage	L-G 140	140	140	270	280	280	320	400	550	690
	L-N 140	140	140	270	280	/	320	400	/	/
	N-G 120	120	120	230	240	/	280	350	/	/
	L-L 240	280	/	/	480	280	560	690	560	690
Operating Current	Ic	mA								
Follow current	If	A								
Short Circuit Current Rating	SCCR	kA								
Maximum Leakage Current	Ipe	mA								
Maximum Recommended fuse	Rating, Type	200A, Class J								
Frequency	F	Hz								
Nominal discharge current	In (8-20)	kA								
Maximum Discharge Current	L-G	50								
	N-G	100								
Impulse Discharge Current per phase	Iimp (10-350)	kA								
Total Maximal Discharge Current	Itotal (8-20)	kA								
Total Maximal Discharge Current	Itotal (10-350)	kA								
Let through Voltage	Ures (V) at 20kA	15	12	8	8	12	12	15	15	12
	L-G	1500	1500	1500	1900	1900	1500	1900	2500	1900
	L-N	900	900	900	1500	1500	N/A	1500	1800	N/A
	N-G	1500	1500	1500	1500	1500	N/A	1500	1800	N/A
	L-L	1500	1500	N/A	N/A	3100	1500	3100	3300	3100
Voltage Protection Level	L-G	1200	1200	1200	1500	1500	1200	1500	2000	1500
	L-N	700	700	700	1200	1200	N/A	1200	1400	N/A
	N-G	1200	1200	1200	1200	1200	N/A	1200	1800	N/A
	L-L	1200	1200	N/A	N/A	2500	1200	2500	2600	2500
Shipping Dimensions	Inches	8x3.75x4.25								
Shipping Weight	Ibs	2.4								
Standard's Compliance or recognition	UL1449 ed4	File: E326289								
	IEC 61643-11 ed2	Type 1								
Visual disconnection indicator		LED								
Sound disconnection indicator		Continuous Buzzer								
Wiring type		AWG 12 wires								
Maximum altitude	ft	6500								
Operating Temperature	°F	-40 +185								
Housing - Enclosure material		Aluminum cast								
Mounting type		Side or back nipple (Version A or B) Threaded (M22) . NPT 1/2 adaptor available								
Environmental rating	IP	IP66								
	Nema	NEMA 6								
Location Installation		Indoor / Outdoor								

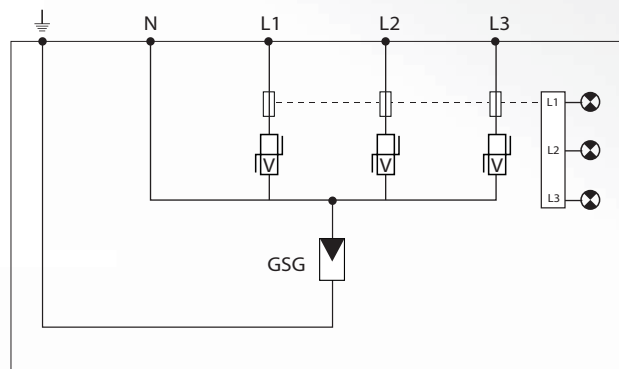


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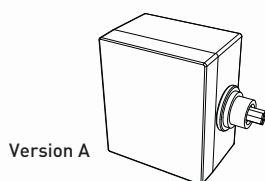
# Data Sheet

## Type 1 Surge Protective Device *M50 Series*

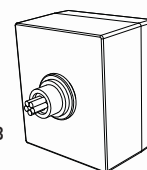
### Electrical Diagram



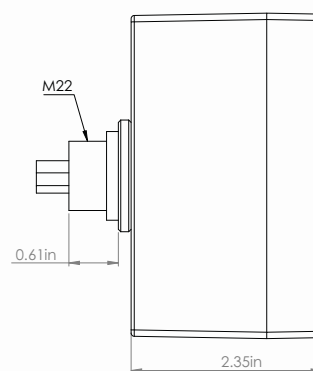
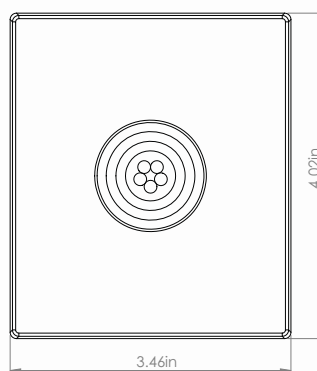
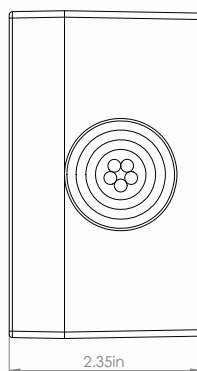
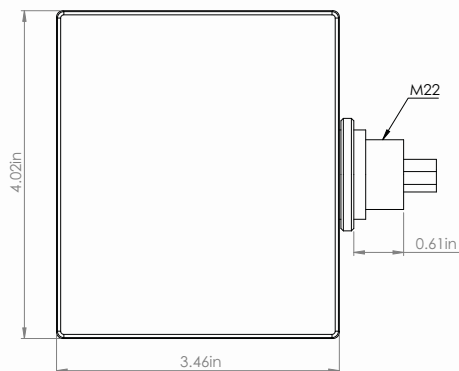
### Dimensions



Version A



Version B



\*NPT 1/2 adaptor available in both versions

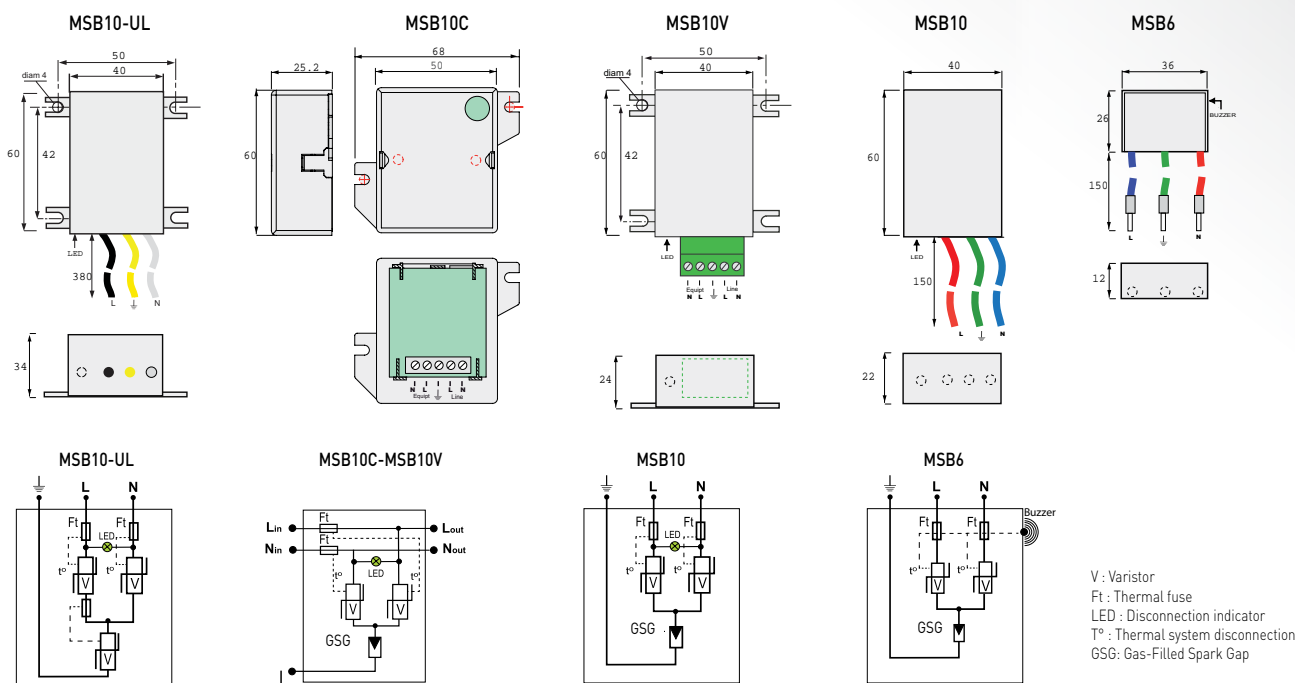
# Hard-Wired AC Surge Protectors

## MSB Series



- Type 2 and 3 AC Power Surge Protector
- MOV plus GSG Design
- Compact Form Factor
- LED Fault Indicator
- Parallel or Series Installation Options
- IP20, 65 and 66 Enclosures
- UL1449 3rd Edition Recognized

### Dimensions and Electrical Diagrams (in mm)



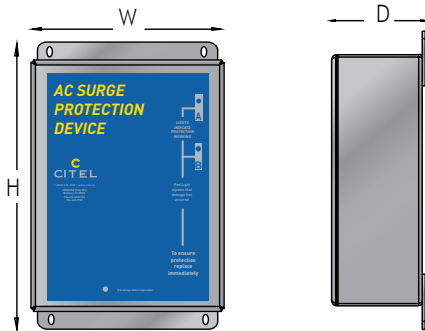
CITEL Part Number	MSB10-UL		MSB10		MSB10V		MSB10C	MSB6		
	MSB10-400 (UL)	MSB10-480 (UL)	MSB10-400	MSB10-120	MSB10V-400	MSB10V-120	MSB10C-400	MSB6-400	MSB6-24/LD	
Network	Un	230-277 Vac	347-480 Vac	230 Vac	110-130 Vac	230 Vac	110-130 Vac	230 Vac	230 Vac	24 Vac
Maximum operating voltage	Uc	300 Vac	550 Vac	255 Vac	150 Vac	255 Vac	150 Vac	255 Vac	255 Vac	30 Vac
Maximum line current	$I_L$	-	-	-	16 A	16 A	16 A	-	-	-
Protection level	Up	1.2 kV	1.8 kV	1.5 kV	1 kV	1.5 kV	1.5 kV	1.5 kV	1.5 kV	0.22 kV
Maximum discharge current 8/20 $\mu$ s withstand	$I_{max}$	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	6 kA	2 kA
Nominal discharge current 15 x 8/20 $\mu$ s impluse	$I_n$	3 kA	3 kA	3 kA	3 kA	3 kA	3 kA	3 kA	3 kA	0.8 kA
Combination waveform test Class III test	Uoc	6 kV	6 kV	6 kV	6 kV	6 kV	6 kV	6 kV	6 kV	6 kV
<b>Mechanical characteristics</b>										
Fail-safe end of life	Disconnection	Disconnection	Disconnection	Disconnection	Disconnection AC line cut-off	Disconnection AC line cut-off	Disconnection AC line cut-off	Disconnection	Disconnection	Disconnection
Disconnection signaling	Green light off	Green light off	Green light off	Green light off	Green light off	Green light off	Green light off	Alarm	Alarm	Alarm
Wiring	Leads	Leads	Leads	Leads	Screw terminal	Screw terminal	Screw terminal	Leads	Leads	Leads
Mounting	Wall or plate	Wall or plate	Wall or plate	Wall or plate	Wall or plate	Wall or plate	Wall or plate	Wall or Plate	Wall or Plate	Wall or Plate
Enclosure ratings	IP66	IP66	IP65	IP65	IP20	IP20	IP20	IP65	IP65	IP65
<b>Standard compliance</b>										
N EN 61643-11	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant
UL 1449 3rd Edition: USA	Recognized	Recognized	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant	Compliant
<b>Part number</b>	560501	561801	521201	561601	561101	561602	561301	561302	561313	561313

# AC Surge Protectors M Series



- **Type 2 AC Power Surge Protector**
- **I<sub>max</sub>: 80-200kA per phase**
- **Protects All Modes**
- **On Board Diagnostics: LED indicators, Audible Alarm, and Remote Contacts**
- **EMI/RFI Noise Filtering**
- **Sinewave Tracking**
- **UL 1449 3rd Edition Listed**
- **Optional Surge Counter**

## Dimensions



Model	Dimensions (mm)			
	H	W	D	
M200	8	6	4	
M160				
M100				
M80				

## Characteristics

Series	M80	M100	M160	M200
Maximum discharge current I <sub>max</sub>	80 kA	100 kA	160 kA	200 kA
Type of network				
120/240 Vac Split Phase 3Ph+N+G	M80-120T	M100-120T	M160-120T	M200-120T
120/208 Vac Wye 3Ph/N+G	M80-120Y	M100-120Y	M160-120Y	M200-120Y
220/380 Vac Wye 3Ph/N+G	M80-220Y	M100-220Y	M160-220Y	M200-220Y
277/480 Vac Wye 3Ph/N+G	M80-277Y	M100-277Y	M160-277Y	M200-277Y
240/415 Vac Wye 3Ph/N+G	M80-240Y	M100-240Y	M160-240Y	M200-240Y
120/120/240 Vac Hi-Leg Delta 3Ph/N G	M80-240DCT	M100-240DCT	M160-240DCT	M200-240DCT
240 Vac Delta 3Ph+G	M80-240D	M100-240D	M160-240D	M200-240D
347/600 Vac Wye 3Ph/N+G	M80-347Y	M100-347Y	M160-347Y	M200-347Y
480 Vac Delta 3Ph+G	M80-480D	M100-480D	M160-480D	M200-480D
Protection modes	L/N - L/G - N/G - L/L			
UL short-circuit current rating	200 kA			
RFI filtering	- 40 dB			
Standards compliance	UL1449 3rd Edition and IEC 61643-1, Type 2 (Type 1 pending)			
<b>Safety</b>				
Thermal disconnecter	Internal to each component			
Electrical disconnecter	Internal to each surge protector			
Failure indicators	LED, audible alarm, and remote signaling			
<b>Mechanical Characteristics</b>				
Housing material	Steel - NEMA 4/12			
Operating temperature	-40/+85 °C			
Mounting	Wall mounting by screws (not supplied)			
Connection to AC network	Hard-Wired			
Dimensions (H x L x D)	95 x 63.1 x 35 mm			
<b>Specific features</b>				
Disconnection switch	No			



Model	Description	MCOV	Voltage Protection Rating (VPR)			
			L-N	L-G	N-G	L-L
Mxxx-120T	120/240 Vac Split Phase 2Ph+N+G	150 Vac	800	900	800	1800
Mxxx-120Y	120/208 Vac Wye 3Ph+N+G	150 Vac	800	900	800	1800
Mxxx-220Y	220/380 Vac Wye 3Ph+N+G	320 Vac	1500	1200	1200	2000
Mxxx-240Y	240/415 Vac Wye 3Ph+N+G	320 Vac	1500	1200	1200	2000
Mxxx-240DCT	120/120/240 Vac Hi-Leg Delta 3Ph+N+G	150/320 Vac	1500	1200	1200	1800
Mxxx-240D	240 Vac Delta 3Ph+G	320 Vac	-	1200	-	2000
Mxxx-277Y	277/480 Vac Wye 3Ph+N+G	320 Vac	1500	1200	1200	2000
Mxxx-347Y	347/600 Vac Wye 3Ph+N+G	550 Vac	1800	1800	1800	3000
Mxxx-480D	480 Vac Delta 3Ph+G	550 Vac	-	1800	-	3000

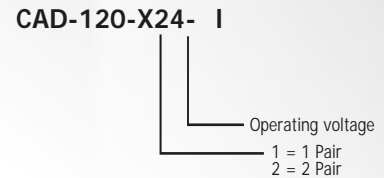


# Water/Wastewater Surge Protector

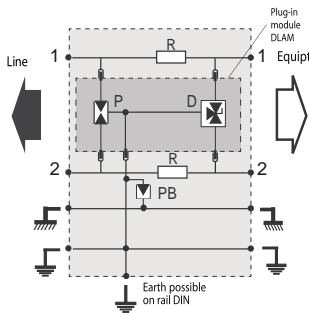
## CAD-120-X24-I



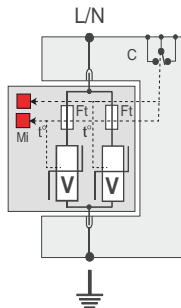
- **AC Power and Dataline Surge Protector**
- **AC I<sub>max</sub>: 200 kA 8x20 μs**
- **DC I<sub>max</sub>: 20 kA 8x20 μs**
- **Replaceable modules for fast and easy maintenance**
- **Remote signalization**
- **Visual fault indication**
- **Nema 4X enclosure**
- **UL 1449 3rd Edition Listed**



### Dimensions and Diagram



- P : 3-electrode gas tube  
 PB : 2-electrode gas tube  
 R : Resistance  
 D : Clamping diode



- V : High energy varistor  
 Ft : Thermal Fuse  
 C : Remote signaling contact  
 t : Thermal disconnection system  
 Mi : Disconnection Indicator



### Characteristics

CITEL Characteristics		Dataline
Network Voltage	(Un)	<b>24V</b>
Max. Line voltage	(Uc)	<b>28V</b>
Max. Line current		<b>300mA</b>
Protection Level	(Up)	<b>40V</b>
8/20μs impulse - 5kA		
Nominal discharge current	(In)	<b>10kA</b>
8/20μs impulse - 10 times		
Max. discharge current	(Imax)	<b>20kA</b>
8/20μs impulse - 1 times		
Configuration		<b>1 pair+shield/2 pair+shield</b>
End of Life		<b>Short-circuit</b>
<b>AC Power</b>		
AC Network		<b>120/208V 120/240V</b>
UL Max. Operating Voltage	(MCOV)	<b>150Vac</b>
TOV Withstand	(UT)	<b>150Vac</b>
IEC/UL Nominal Discharge Current	(In)	<b>30/20kA</b>
15 impulses 8/20μs		
IEC/UL Nominal Discharge Current	(Imax)	<b>100kA</b>
1 impulses 8/20μs		
Imax Total	(ITotal)	<b>200kA</b>
UL Voltage Protection Rating	(VPR)	<b>600V</b>
Protection Level at In	(Up)	<b>1.0kV</b>
UL Short-circuit Current Rating	(SCCR)	<b>100kAIC</b>
Leakage Current at MCOV	(Ic)	<b>&lt;1mA</b>
Connection Mode		<b>L-N, L-G, N-G, L-L (where applicable)</b>
Resonse Time		<b>&lt;5 nanoseconds</b>
Overcurrent Protection		<b>Time delay - 125A Max.</b>
Operating Temp		<b>-50 °C to +85 °C</b>

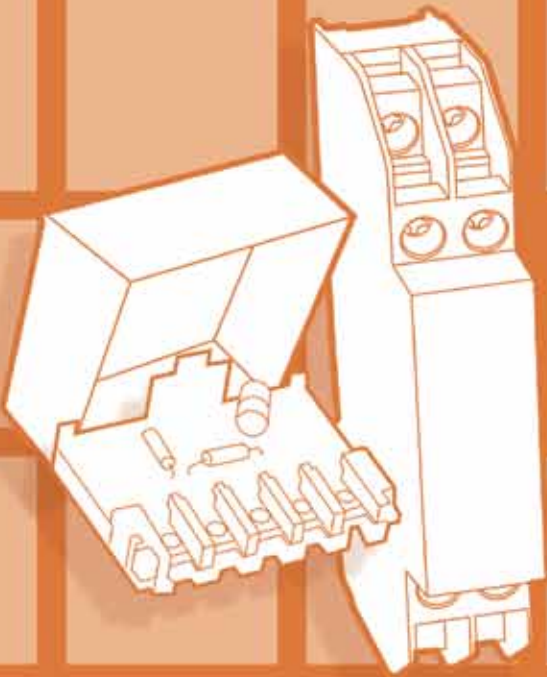




CITEL

# TELECOM

Surge Protectors



# Telecom Surge Protectors

## Introduction

Telecom devices are becoming more complex and sensitive, and also share a common grounding connection with other pieces of equipment on the network. This situation increases the risk for these sensitive devices being stressed by destructive surges induced by lightning or by electrical switching operations.

In addition, these devices are installed at all levels of every installation (industrial, commercial and residential buildings), making these possible disturbances very costly.

To increase the reliability of telecom equipment, the installation of a dedicated surge protector is highly recommended.

Surge protectors for telecom devices are divided into 3 types :

- Surge protectors for telecom networks
- Surge protectors for industrial networks
- Surge protectors for Local Area Networks (LAN's)

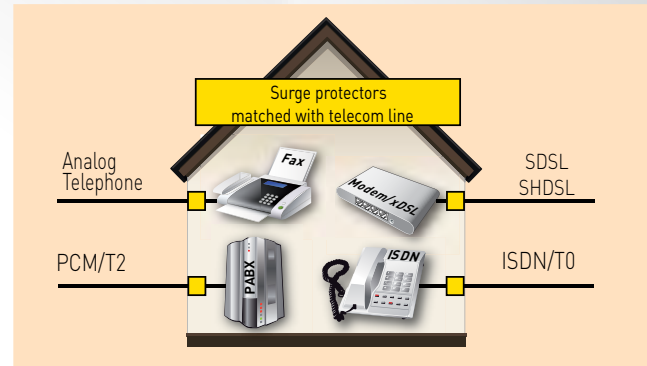
CITEL SPD's electrical designs and mechanical configurations are customized to the needs of each type of network.

Reminder:

Devices connected to telecom networks are also connected to the AC distribution network. In order to ensure a coordinated protection, surge protectors must be installed on each of these inter-connected networks.

## Protecting Telecom Equipment

CITEL offers a range of surge protectors dedicated to the protection of telecom networks :



Lines	Voltage		Diagram
	Nominal	Residual	
Switched telephone /ADSL	170 V	210 V	Standard protection
Leased lines	24 V	35 V	Enhanced protection
ISDN, T2 primary access	6 V	15 V	Enhanced protection Low capacitance
ISDN, T0 primary access	170 V	210 V	Enhanced protection

### Mechanical Configurations

Surge protectors for telecom networks are designed to fit into existing installations. CITEL surge protectors are available with many different mounting options:

- Mounting on a telecom MDF
- Mounting on a DIN rail
- Insertion to connection strips
- Wall mounting
- Plug-in on termination outlets

The decision whether or not to use surge protection should be determined by taking a simple risk assessment (see risk analysis paragraph), or by detailed risk assessment (part of the IEC 61643-22 standard), or by analyzing the specific installation conditions per the table below:

Conditions	Recommendation
External telecom lines	Systematic protection
Lines downstream to PBX	Protection in long or inter-building lines
Existing AC surge protector	Systematic protection

# Telecom Surge Protectors

## Protecting Industrial Networks

Industrial installations like businesses and smart buildings are packed with an ever increasing quantity of measurement, control and supervisory equipment. These systems are built with controller cards, probes, sensors and sensitive electronic components. It is vital to guarantee a high level of reliability to these systems; this reliability can be accomplished by installing a telecom surge protector.

### Equipment To Be Protected

Industrial installations are equipped with many different types of sensitive terminals which must be protected against surges:

- Industrial process equipment
- SCADA systems (Supervisory Control And Data Acquisition)
- Transmission systems
- I/O cards
- Interfaces and converters
- Probes
- Actuators
- Access control system
- Fire detection system

Many types of telecom transmissions exist on the market. The table below provides the relevant CITELE surge protector models in relation to the type of transmission.

Network	Wiring	DLU	DLA
4-20 mA	1 pair	DLU-24D3	DLA-24D3
Profibus-FMS	1 pair+Shield	DLU-12D3	DLA-12D3
Profibus-PA	1 pair+Shield	DLU-48D3	DLA-48D3
Profibus-DP	1 pair+Shield	DLU-12DBC	DLA-12DBC
Interbus	1 pair+Shield	DLU-12D3	DLA-12D3
Foundation Fieldbus-H1	1 pair+Shield	DLU-12D3	DLA-12D3
Foundation Fieldbus-H2	1 pair+Shield	DLU-48DBC	DLA-48DBC
WorldFIP	1 pair+Shield	DLU-48DBC	DLA-48DBC
Fipway	1 pair+Shield	DLU-48DBC	DLA-48DBC
LONworks	1 pair+Shield	DLU-48DBC	DLA-12DBC
Batibus	1 pair+Shield	DLU-12D3	DLA-12D3
RS485	1 pair+Shield	DLU-12D3	DLA-12D3
RS422	2 pairs	DLU2-06D3	2 x DLA-06D3
RS232	4 wires	DLU2-12D3	2 x DLA-12D3

DLA series : Din rail pluggable module

DLU series : Din rail monoblock

### Mechanical Configuration

CITEL surge protectors for industrial telecom networks are designed to fit onto symmetrical DIN rail. The surge protectors are available in various configurations :

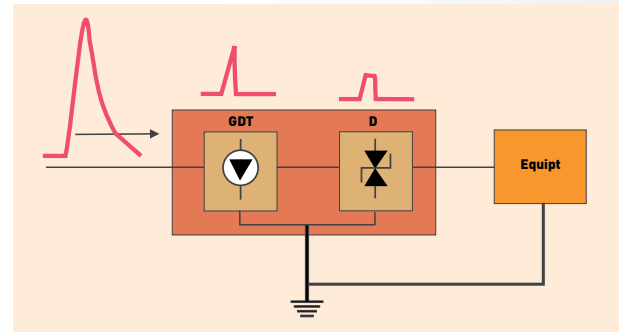
- Number of protected wires : From 1 wire to 2 pairs
- Shielded wire: Protection or unprotected
- Plug-in modules: Removable module for easy maintenance

## Technology Used in Surge Protectors

All of CITELE's telecom surge protectors are based on a reliable multi-stage hybrid design that combines the benefits of high discharge current capacity with fast response time.

CITEL's telecom surge protector uses a combination of a 3-electrode gas discharge tube and fast clamping diodes which provide:

- A nominal discharge current greater than 5 kA at 8/20  $\mu$ s impulse
- An ultrafast response time < 1 ns
- Safe operation in end of life scenarios
- Low insertion loss



The systematic use of 3-electrode gas discharge tubes provides optimum protection through simultaneous sparkover. This set of characteristics is critical for optimum reliability in any incident or disturbance. Various protection configurations are available and customized to the type of network being protected:

- Standard Protection: Used mainly for the analog telecom network (PSTN)
- Enhanced Protection: For very low voltage transmission lines
- Line + Shield Protection: Transmission and protection for the shield wire
- K20 Protection: Complying with the ITU-T K20 International recommendation
- Low Capacitance Protection: For high bit rate links (> 1 Mbit/s)
- Cat 5 or Cat 6 Protection: Designed for very high bit rate LAN (up to 1000 Mbit/s).

See list of configurations on page 82.

## Standards

Test procedures and installation recommendations for telecom surge protectors must comply with the following standards:

International:

-IEC 61643-21 : Testing surge protectors for telecom lines

-IEC 61643-22 : Installation/selection of surge protectors for telecom lines

North American:

-UL 497A/B

# Telecom Surge Protectors

modules

## Use of Surge Protectors

In areas where standards are lacking or non-existent, the decision to use surge protectors on telecom lines can be assessed by the following:

- The recommendation of the equipment manufacturer
- Preventative action following equipment damage due to transients
- A simplified risk assessment

### Risk Assessment

In order to quickly determine the probability of the lightning surges and their consequences, a simplified risk analysis can be performed following the table below.

Parameters	Low Risk	High Risk
Lightning density (Ng)	< 2.5	> 2.5
Site configuration	Single building	Multiple buildings
Transmission length	Short	Long
External lines distribution	Underground	Overhead
Electrical disturbances	Low	High
Existing lightning rod	No	Yes
Lightning events	Never	Already
Equipment sensitivity	Low	High
Equipment costs	Low	High
Downtime costs	Low or acceptable	Expensive or unacceptable

The recommendation to use surge protectors increases with the number of parameters classified as high risk on the table.

A more detailed risk analysis is available on the IEC 61643-22 standard.

## Surge Protection Parameters

In choosing surge protection for your installation, keep the following in mind :

### The type of line:

- There is an appropriate level of protection and a protection configuration for each type of line

### The site configuration:

- Number of lines to be protected

### The requested type of installation:

- Installation in wall-mounted box, plug mounting, on distribution frame
- various types of connection (wrapping, IDC, screw terminals)

Features:

Some surge protectors are equipped with pluggable and replaceable

## Installation

To be effective, surge protectors must be installed in accordance with the following principles :

- The grounding point of the surge protector and of the protected equipment must be inter-connected.
- The protection is installed at the network entrance to divert impulse currents as early as possible.

The protected equipment must be located near the surge protector (less than 10m). If this rule cannot be followed, secondary protection

- must be installed near the equipment for coordinated surge protection.

The grounding conductor between the ground output of the protector and the installation bonding circuit must be as short as possible (less than 50 cm) and have a cross-section area of at least 2.5 mm<sup>2</sup>.

- The ground resistance must comply with the standards of the local electrical code.

Protected and unprotected wires must be kept apart to limit the potential for coupling.

## Maintenance

CITEL's telecom surge protectors are designed to withstand repeated and large impulse currents without damage nor destruction. However a controlled fail-safe mode (short circuit to ground) is built in, in case of surges exceeding the parameters of the surge protectors:

Protective short-circuit occurs in the following cases :

- Sustained contact between the telecom line and a power line.
- Exceptionally large lightning impulse current.

In these rare cases, the surge protectors will purposely go into a short-circuit, cutting the signal. This feature is to ensure the protection of the terminal equipment and signals its failure to the user. To reactivate the line the surge protector must be replaced.

The basic parameters of the surge protector for telecom can be controlled with dedicated testers.

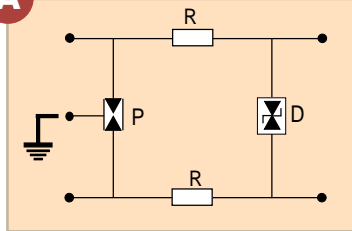
## Special Conditions : Lightning Rod

If the protected installation is equipped with a lightning rod the surge protector must be able to conduct 10/350µs surge current with a minimum rating of 2.5 kA (D1 category test in IEC 61643-21 standard).

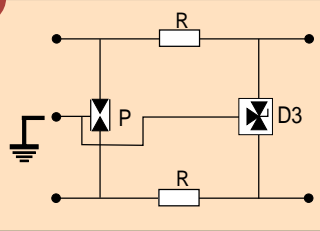
# Telecom Surge Protectors

## Standard Configurations

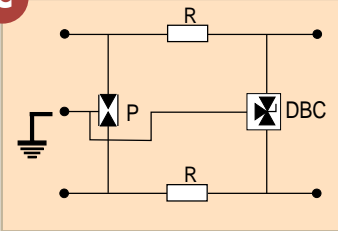
**A** Standard Protection



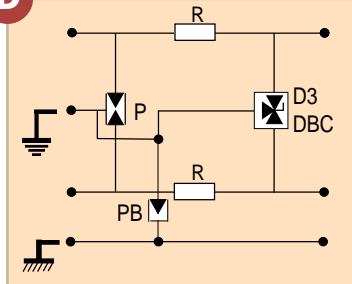
**B** Reinforced Protection



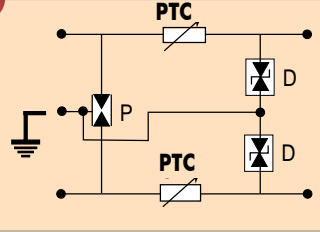
**C** Low Capacitance Protection



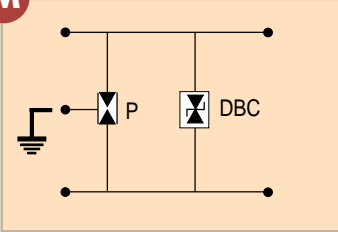
**D** Protection + Shield



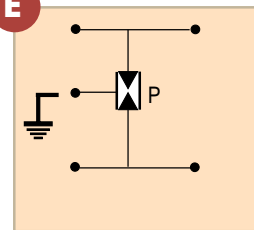
**K1** K20 Protection



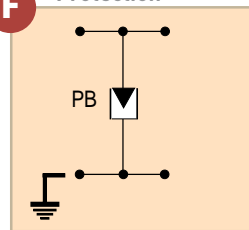
**M** High Bit-Rate Protection



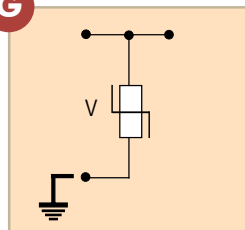
**E** 3-Electrode GDT Protection



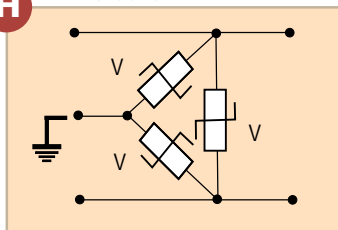
**F** 2-Electrode GDT Protection



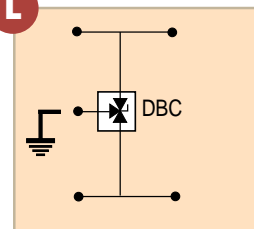
**G** 2-Pole MOV Protection



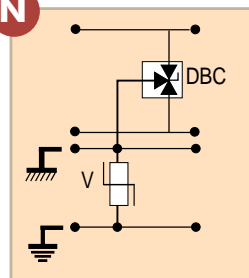
**H** 3-Pole MOV Protection



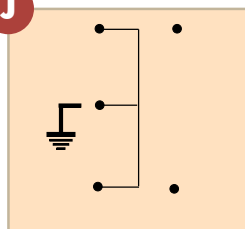
**L** Low Capacitance 3-Pole Diode



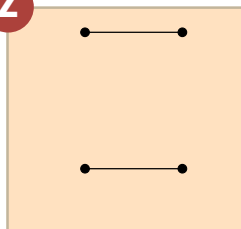
**N** CAT6 Protection



**J** Grounding



**Z** Line Continuity



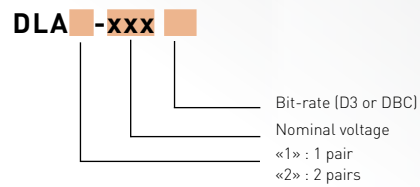
P : 3-pole gas discharge tube  
 PB : 2-pole gas discharge tube  
 R : Line resistor  
 D : Fast clamping diode  
 D3 : 3-pole clamping diode  
 DBC : Low capacitance clamping diode  
 V : MOV  
 PTC : Resettable thermistor

# DIN Rail Plug-In Surge Protectors for Telecom

## DLA, DLA2 Series

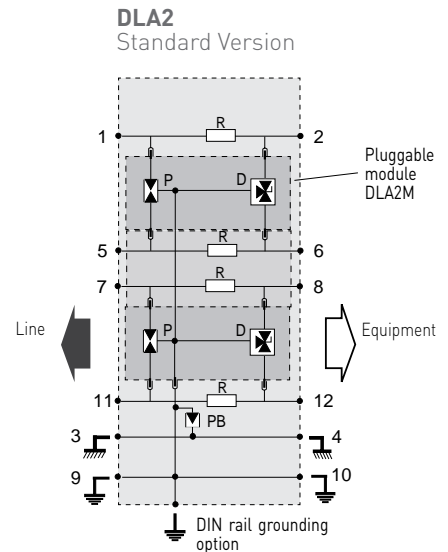
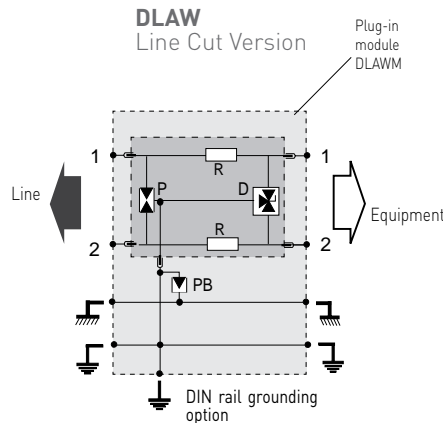
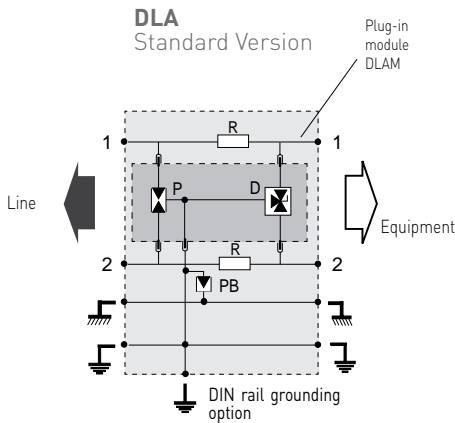
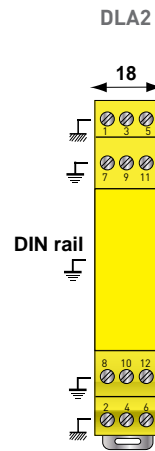
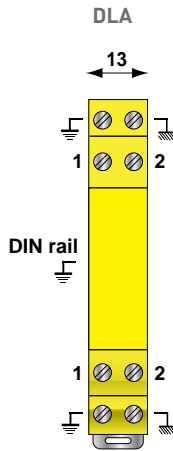
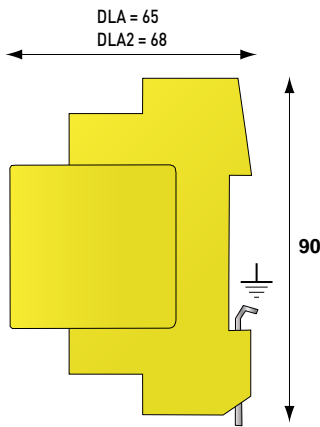


- DIN Rail Mounted Pluggable Surge Protector
- Removable Module for Easy Maintenance
- Multiple Configurations for All Applications
- Shielded Wire Protection
- With or Without Line Cut Capabilities
- 2- Pair Versions Available (DLA2)
- Multiple Grounding Options
- UL 497B Listed



### Dimensions and Electrical Diagrams

(in mm)



P : 3-electrode gas discharge tube  
Pb : 2-electrode gas discharge tube  
R : Resistor  
D : 3-pole clamping diode



# DIN Rail Plug-In Surge Protector for Telecom

## DLA, DLA2 Series

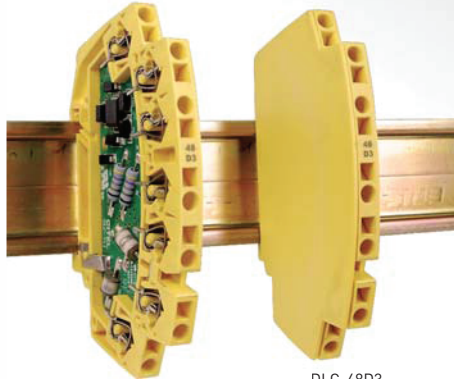
### Characteristics

Configuration	CITEL Part Number						
	DLA-170 DLA2-170	DLA-48D3 DLA2-48D3	DLA-48DBC DLA2-48DBC	DLA-24D3 DLA2-24D3	DLA-12D3 DLA2-12D3	DLA-06D3 DLA2-06D3	DLA-06DBC DLA2-06DBC
Application	Telephone line ADSL SDSL-SHDSDL	ISDN-T0 48V line	Fipway - WorldFIP Fieldbus-H2	Leased Line 4-20mA	RS232 RS485	RS422	MIC/T2 10BaseT
Nominal Line Voltage (Un)	150V	48V	48V	24V	12V	6V	6V
Maximum Line Voltage (Uc)	170V	53V	53V	28V	15V	8V	8V
Maximum Line Current	300mA	300mA	300mA	300mA	300mA	300mA	300mA
Maximum Frequency	> 10MHz	> 3MHz	> 20MHz	> 3MHz	> 3MHz	> 3MHz	> 20MHz
Protection Level (Up) 8/20µs impulse - 5 kA	220V	70V	75V	40V	30V	20V	25V
Nominal Discharge Current (In) 8/20µs impulse - 10 times	10kA	10kA	10kA	10kA	10kA	10kA	10kA
Maximum Discharge Current (Imax) 8/20µs impulse - 1 time	20kA	20kA	20kA	20kA	20kA	20kA	20kA
Impulse Current (Iimp) 10/350µs impulse - 2 times	5kA	5kA	5kA	5kA	5kA	5kA	5kA
End of Life	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit
<b>Mechanical Characteristics</b>							
Configuration	DLA = 1 pair + shield DLA2 = 2 pairs + shield						
Mounting	Symmetrical DIN rail						
Dimensions	See drawing						
Wiring	Connection by screw - min/max. cross section 0.4/1.5 mm <sup>2</sup>						
Housing Material	Thermoplastic UL94-V0						
Earth Connection	Via DIN rail and screw terminal						
Replacement Module	DLA : DLAM-xxx DLA2 : DLA2M-xxx						
Versions	DLA-xxx : standard version (line continuity after removal of plug-in module) DLAW-xxx : specific version (line cut-off after removal of plug-in module) DLAH-xxx : remote supply version (maximum line current = 2.4 A) DLA2-xxx: standard version (line continuity in case of removal of plug-in modules)						
<b>Standard Compliance</b>							
NF EN 64643-21 (France) UL497B (USA)	Surge protectors for communication circuits - Test categories C2 and D1 Surge protectors for communication circuits						
<b>Part Number</b>							
DLA	6406011	6403021	640421	6403011	6402011	6401011	640121
DLA2	640611	640312	640431	640311	640211	640111	640131



# Datasheet

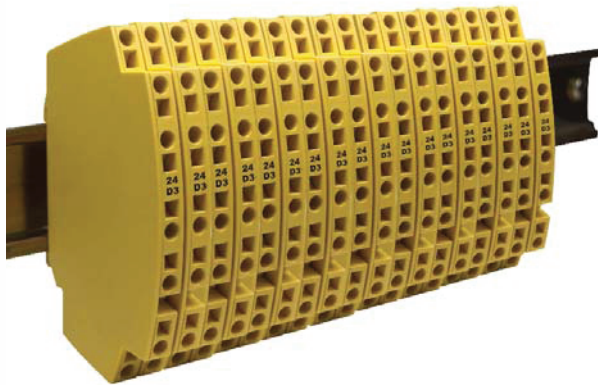
## 1-pair DIN rail Surge Protector for dataline/telecom *DLC series*



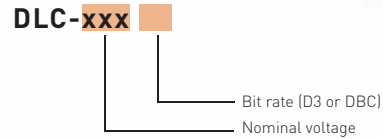
DLC-48D3  
(open)

DLC-48D3

- **Din Rail Mounted Pluggable Surge Protector**
- **Ultra Compact Stackable Design**
- **Multiple Configuration for All Applications**
- **Shielded Wire Protection**
- **Multipile Grounding Options**
- **UL497B Listed**

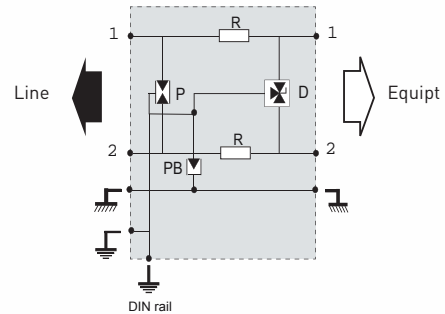
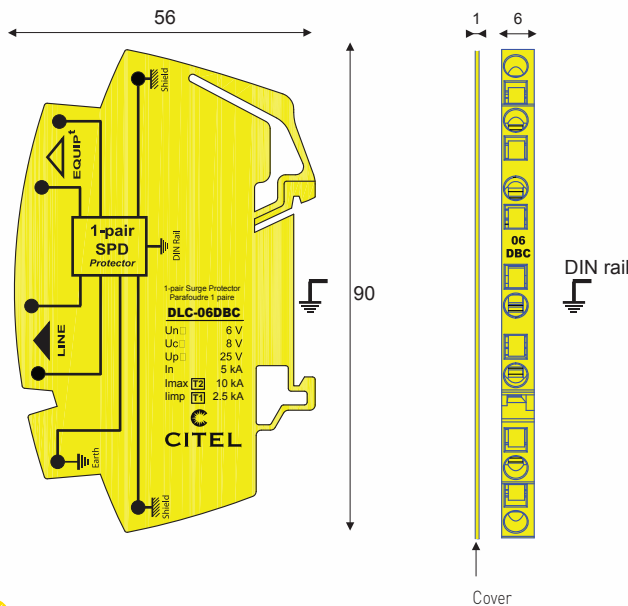


Assembled DLC-24D3



### Dimensions - Electrical Diagrams

(in mm)



P : 3-electrode gas tube  
PB : 2-electrode gas tube  
R : Resistor  
D : Clamping diode

# Datasheet

## 1-pair DIN rail Surge Protector for dataline/telecom DLC

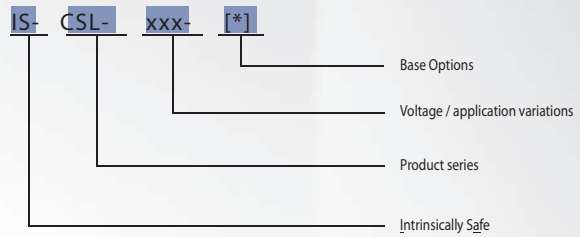
### Characteristics

CITEL part number		DLC-170	DLC-06D3	DLC-06DBC	DLC-12D3	DLC-12DBC	DLC-24D3	DLC-24DBC	DCL-48D3	DLC-48DBC
Typical Application		Telephone line ADSL SDSL - SHDSL	RS422	MIC/T2 10BaseT	RS232 RS485	RS232 RS435	LS 4-20mA	LS 4-100mA	RNIS-T0 Line 48 V	Fipway WorldFIP Fieldbus-H2
Nominal line voltage	Un	150 V	6 V	6 V	12 V	12 V	24 V	24 V	48 V	48 V
Max. line voltage	Uc	170 V	8 V	8 V	15 V	15 V	28 V	28 V	53 V	53 V
Max. line current	IL	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA
Max. Frequency		> 10 MHz	> 3 MHz	> 20 MHz	> 3 MHz	> 3 MHz	> 3 MHz	> 20 MHz	> 3 MHz	> 20 MHz
Protection level 8/20µs impulse - 5 kA	Up	220 V	25 V	25 V	30 V	30 V	40 V	40 V	70 V	70 V
Nominal discharge current 8/20µs impulse - 10 times	In	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Max. discharge current 8/20µs impulse - 1 time	I <sub>max</sub>	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA
Impulse current 10/350µs impulse - 2 times	I <sub>imp</sub>	2.5 kA	2.5 kA	2.5 kA	2.5 kA	2.5 kA	2.5 kA	2.5 kA	2.5 kA	2.5 kA
End of life		Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit
<b>Mechanical characteristics</b>										
Configuration		1 pair + shield								
Mounting		Symmetrical DIN rail								
Dimensions		see drawing								
Wiring		Connection by spring - max. cross section 1.5 mm <sup>2</sup>								
Housing material		Thermoplastic UL94-V0								
Earth Connection		Via DIN rail or spring terminals								
<b>Standard compliance</b>										
NF EN 61643-21 (France) UL497B (USA)		Parafoudre pour réseau de communication - Test catégories C2 et D1 Surge protectors for communication circuits								
<b>Part number</b>										
		641105	641101	641111	641102	641112	641103	641113	641104	641114

## Intrinsically Safe Surge Protectors for Signal Lines IS-CSL-xxx Serie



IS-CSL-485




### Information

The intrinsically safe IS-CSL series is specifically designed to protect intrinsically safe analog and digital interfaces with low currents to 250mA against lightning and surges. To protect the variety of analog and digital interfaces and protocols, such as RS-485, Profibus, RTD, etc., the IS-CSL series is available in different voltage variants. In addition, versions with cut-off frequencies of up to 20MHz are available.

The two or three staged protection circuit of the IS-CSL series is based on a powerful gas discharge tube in combination with either a diode network or a MOV network. Installation and grounding is easily accessible via DIN-rail. For this purpose, two different bases offer two ways of grounding via rail - a direct earthing or an over a gas arrester earthing isolated.

For applications with higher currents up to 6A CITELE also offers the IS-CSSP6A series.

### Features

- Intrinsically safe
- Slim line, just 7mm width
- Pluggable protection module
- Earthing via DIN-rail or screw contact
-  II 1 G Ex ia IIC T4 Ga
- Compliant with EN 61643-21, VDE 0845-3-1, EN 60079-0, EN 60079-11 and Directive 94/9/EC

## Intrinsically Safe Surge Protectors for Signal Lines IS-CSLxxx Serie

### Characteristics

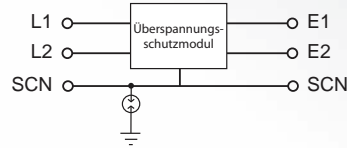
		IS-CSL7v5	IS-CSL18	IS-CSL36	IS-CSL485	IS-CSL-DH	IS-CSL-RTD	IS-CSL420i
<b>Electrical Specifications</b>								
Application		0-5 V analog, 5 V digital	0-10 V analog, 12 V digital	4-20 mA analog, 24V digital	RS 485, RS 422, Profibus DP, CAN	Data Highway, RS232, HART	RTD Applications	0-20mA, 4-20 mA analog
Maximum continuous voltage (DC)	Uc	7 V	16 V	34 V	8 V	34 V	7 V	34 V
Maximum continuous voltage (AC)	Uc	5 V	11 V	24 V	6 V	24 V	5 V	-
Modes of protection		CM/DM						
Maximum discharge current (8/20µs)	I <sub>max</sub>	5 kA per line, 10 kA total						
D1 Maximum discharge current (10/350µs)	I <sub>imp</sub>	1 kA per line, 2 kA total						
Maximum load current	I <sub>L</sub>	250 mA			250 mA			30 mA
L-L Voltage protection level @ 1kV/µs	U <sub>p</sub>	10 V	20 V	40 V	30 V	60 V	20 V	40 V
L-L Voltage protection level @ 3kA 8/20µs	U <sub>p</sub>	20 V	30 V	50 V	35 V	65 V	25 V	50 V
L-PE Voltage protection level @ 1kV/µs		170 V	170 V	170 V	400 V	400 V	400 V	40 V
L-PE Voltage protection level @ 3kA 8/20µs		210 V	210 V	210 V	450 V	450 V	450 V	50 V
C2 Nominal discharge current (10 x 8/20µs)		5 kA total						
AC durability		5 x 1 s, 1 Arms						
Overstressed fault mode		Mode 3						
Response time	t <sub>A</sub>	<5 ns						
Line resistance		8.2 Ω			3.9 Ω			7 Ω
Line inductance		72.6 µH			72.6 µH			-
Insertion loss @ 150Ω		0.5 dB			0.2 dB			0.4 dB
3dB Frequency @ 50Ω	f <sub>c</sub>	250 kHz			20 MHz		250 kHz	10 MHz
<b>Safety Parameters</b>								
	U <sub>i</sub>	30 V						34 V
	I <sub>i</sub>	-						
	P <sub>i</sub>	1.3 W						
	C <sub>i</sub>	0						
	L <sub>i</sub>	0						
<b>Mechanical Specifications</b>								
Connection Type		Series						
Mounting		TS35 DIN rail						
Earthing		- Direct earth connection via DIN rail and screw terminals with the IS-CSL-DIN-G Base - 90V isolation between DIN rail earth and shield/protection with the IS-CSL-DIN-EC90 Base						
Operating temperature range @ I <sub>L</sub>		-20°C / +40°C						
Operating humidity		5 - 95 %						
Wiring		0.5-2.5 mm <sup>2</sup>						
Terminal screw torque		0.5 Nm						
UL 94 flammability rating		V-0						
Environmental		IP 20						
Weight		35 g						
Dimensions		see Dimensions-Diagram						
<b>Standards</b>								
Directive 94/9/EC		Equipment and protective systems intended for use in potentially explosive atmospheres						
EN 60079-0		Explosive atmospheres - Part 0: Equipment - General requirements						
EN 60079-11		Explosive atmospheres - Part 11: Equipment protection by intrinsic safety 'i'						
EN 61643-21		Surge protective devices connected to telecommunications and signalling networks						
<b>Accreditation</b>								
TUV 14 ATEX 7584 X		Ex II 1 G Ex ia IIC T4 Ga						
<b>Part Number</b>								
Module		159001	159002	159003	159006	159007	159008	159005
Base IS-CSL-DIN-G		159021			-	159021		
Base IS-CSL-DIN-EC90		159022						
Earthing Comb: CSL-Comb		159031						



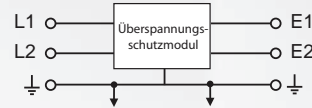
## Intrinsically Safe Surge Protectors for Signal Line IS-CSL-xxx Serie

### Electrical diagram

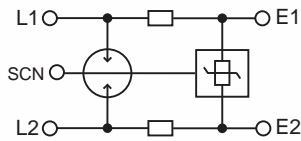
IS-CSLDIN-EC90



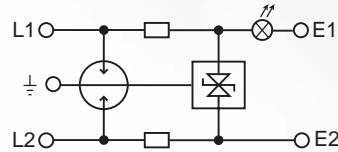
IS-CSLDIN-G



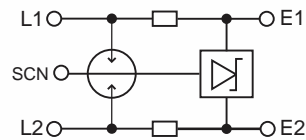
IS-CSL-485  
IS-CSL-DH



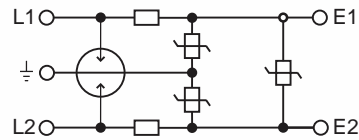
IS-CSL-420i



IS-CSL-RTD

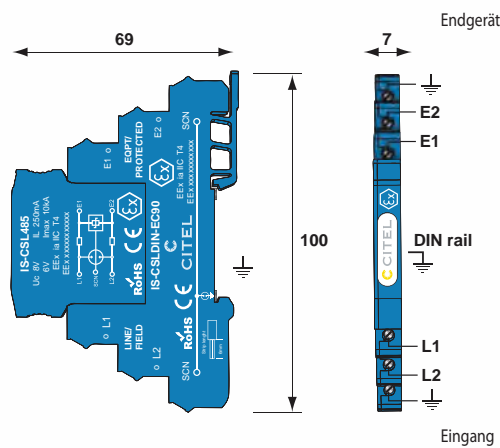


IS-CSL7V5  
IS-CSL18  
IS-CSL36



### Dimensions

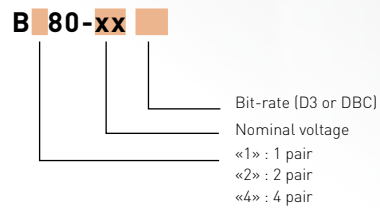
Bsp.: IS-CSL485-EC90



# 1,2 and 4-pair Surge Protectors B180, B280, B480 Series

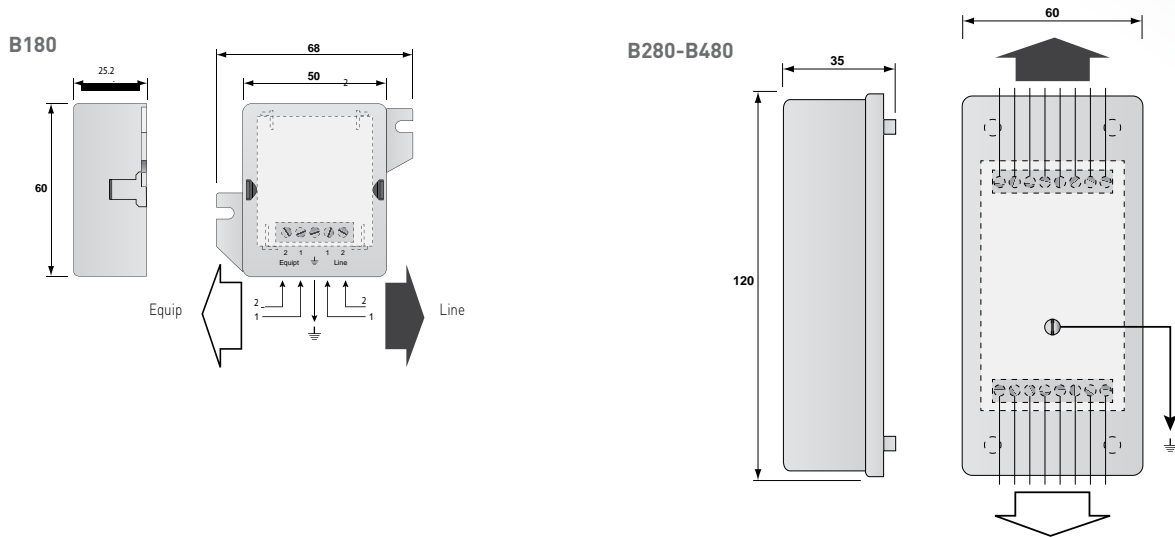


- 1 to 4-pair Telecom Surge Protector
- Multiple Configurations for All Applications
- Hybrid GDT and Diode Technology
- Removable Protection Circuit
- Line Current Up to 300mA
- Iimp : 5kA at 10/350µs
- UL497B Listed

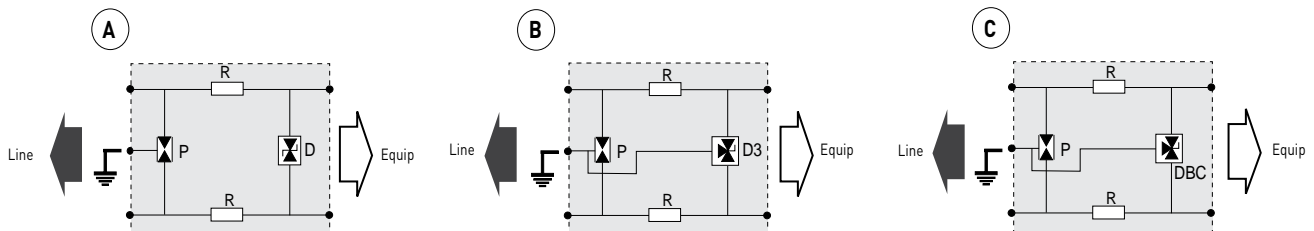


## Dimensions and Electrical Diagrams

(in mm)



### 1-Pair Version



P : 3-electrode gas discharge tube  
 R : Resistor  
 D : Clamping diode  
 D3 : 3-pole clamping diode  
 DBC : 3-pole low capacitance diode

# 1,2 and 4-pair Surge Protectors B180, B280, B480 Series

## Characteristics

Configuration	CITEL Part Number					
	B180-T	B180-48D3	B180-24D3	B180-12D3	B180-06D3	B280-06DBC
1-pair unit	B180-T	B180-48D3	B180-24D3	B180-12D3	B180-06D3	B280-06DBC
2-pair unit	B280-T	B280-48D3	B280-24D3	B280-12D3	B280-06D3	B280-06DBC
4-pair unit	B480-T	B480-48D3	B480-24D3	B480-12D3	B480-06D3	B480-06DBC
Application	Telephone line ADSL SDSL - HSDSL	ISDN-T0 48 V line	Leased line 4-20 mA	RS232 RS485	RS422	T2 - T1 10BaseT
Configuration - B180... - B280... - B480...	1 pair 2 pairs 4 pairs	- 1 channel 2 channels	LS 2 wires / 1 pair LS 4 wires / 2 pairs 2 LS 4 wires/2x2pairs	2 wires 4 wires 8 wires	1 pair 2 pairs 4 pairs/ 2x2 pairs	- 1 channel 2 channels
Nominal Line Voltage (Un)	150V	48V	24V	12V	6V	6V
Maximum Line Voltage (Uc)	170V	53V	28V	15V	8V	8V
Maximum Line Current (IL)	300mA	300mA	300mA	300mA	300mA	300mA
Maximum Frequency	> 10MHz	> 3MHz	> 3MHz	> MHz	> 3MHz	> 20MHz
Protection Level (Up) 8/20µs impulse - 5 kA	220V	70V	40V	30 V	20V	25V
Nominal Discharge Current (In) 8/20µs impulse - 10 times	5kA	5kA	5kA	5kA	5kA	5kA
Max. Discharge Current (Imax) 8/20µs impulse - 1 time	20kA	20kA	20kA	20kA	20kA	20kA
Lightning Current (Iimp) 10/350µs impulse - 2 times	5kA	5kA	5kA	5kA	5kA	5kA
Type of Diagram	A	B	B	B	B	C
End of Life	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit
<b>Mechanical Characteristics</b>						
Mounting	wall mount					
Dimensions	See diagrams					
Wiring	screw terminal - mini/maxi cross section : 0.4/1.5 mm <sup>2</sup>					
Housing material	Thermoplastic UL94-V0					
Spare circuit	B180-xx = S180-xx / B280-xx = S280-xx / B480-xx = S480-xxx					
<b>Standard compliance</b>						
NF EN 61643-21 (France) UL497B (USA)	Parafoudre pour réseau de communication - Test catégories C2 et D1 Surge protectors for communication circuits					
<b>Part Number</b>						
1-pair unit B180	510602	510402	510302	510202	510102	B280-06DBC
2-pair unit B280	72726	72774	72773	72772	72771	72751
4-pair unit B480	72746	72794	72793	72792	72791	72798





# 2-Pair Plug-In Surge Protectors

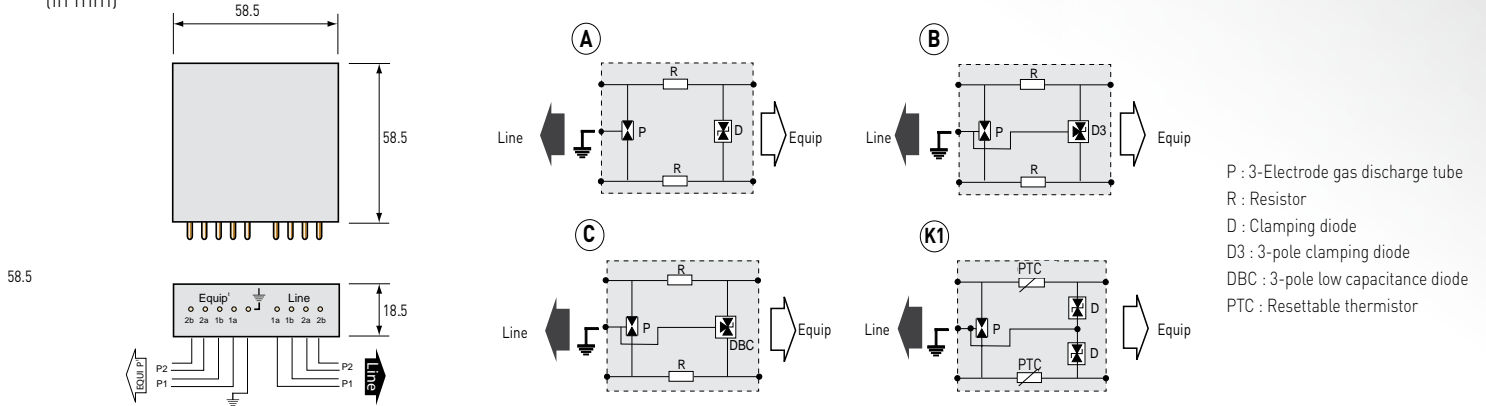
## E280 Series



- **2-Pair Plug-In Module Design**
- **Multiple Configurations for All Applications**
- **Hybrid GDT and Diode Technology**
- **Optimized for Maintenance**
- **Line Current Up to 300mA**
- **Iimp : 2.5kA at 10/350µs**
- **In : 5kA at 8/20µs**
- **UL497B Listed**

### Dimensions and Electrical Diagrams

(in mm)

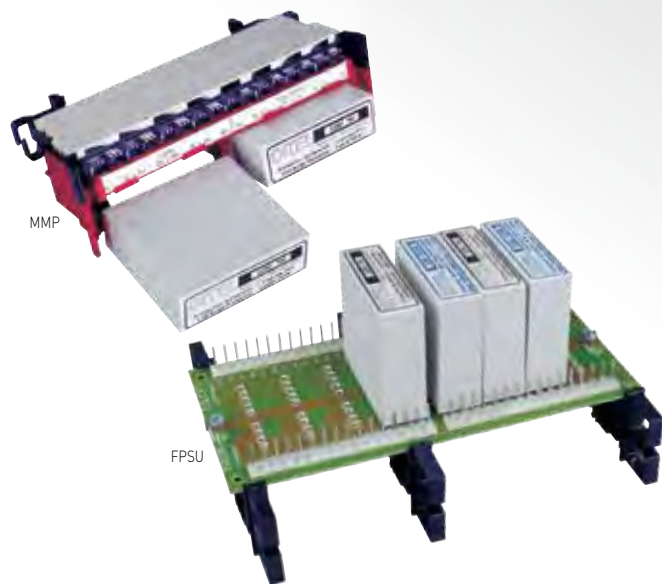


### Characteristics

CITEL Part number	E280-TM	E280-K20	E280-48D3M	E280-24D3M	E280-12D3M	E280-06D3M	E280-06DBC
Application	Telephone line ADSL, SDSL, SHDSL	Telephone line K20 std	ISDN-T0 Telex	Leased line 4-20mA	RS232 RS485	RS422	T2 - T1 10BaseT
Nominal Line Voltage (Un)	150V	150V	48V	24V	12V	6V	6V
Maximum Line Voltage (Uc)	170V	190V	53V	28V	15V	8V	8V
Maximum Line Current (IL)	300 A	150mA	300mA	300mA	300mA	300mA	300mA
Maximum Frequency	> 10MHz	> 3Mhz	> 3MHz	>3MHz	> 3MHz	> 3MHz	> 20MHz
Protection Level (Up) 8/20µs impulse - 5kA	220V	260V	70V	40V	30V	20V	25V
Nominal Discharge Current (In) 8/20µs impulse - 10 times	5kA	5kA	5kA	5kA	5kA	5kA	5kA
Maximum Discharge Current (Imax) 8/20µs impulse - 1 time	10kA	10kA	10kA	10kA	10kA	10kA	10kA
Lightning Current (Iimp) 10/350µs impulse - 2 times	2.5kA	2.5kA	2.5kA	2.5kA	2.5kA	2.5kA	2.5kA
Type of Diagram	A	K1	B	B	B	B	C
End of Life	Short-circuit	Cut-off and reset	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit
<b>Mechanical Characteristics</b>							
Mounting	On support type BN, FPSU, MMP						
Dimensions	See drawing						
Connection	Brass male pin						
Housing Material	Thermoplastic UL94-V0						
<b>Standards Compliance</b>							
NF EN 61643-21 (France) UL497B (USA)	Surge protectors for communication circuits - Test categories C2 and D1 Surge protectors for communication circuits						
<b>Part Number</b>							
E280	71186	71192	71184	71183	71182	71181	71171

# Accessories for E280 Plug-In Modules

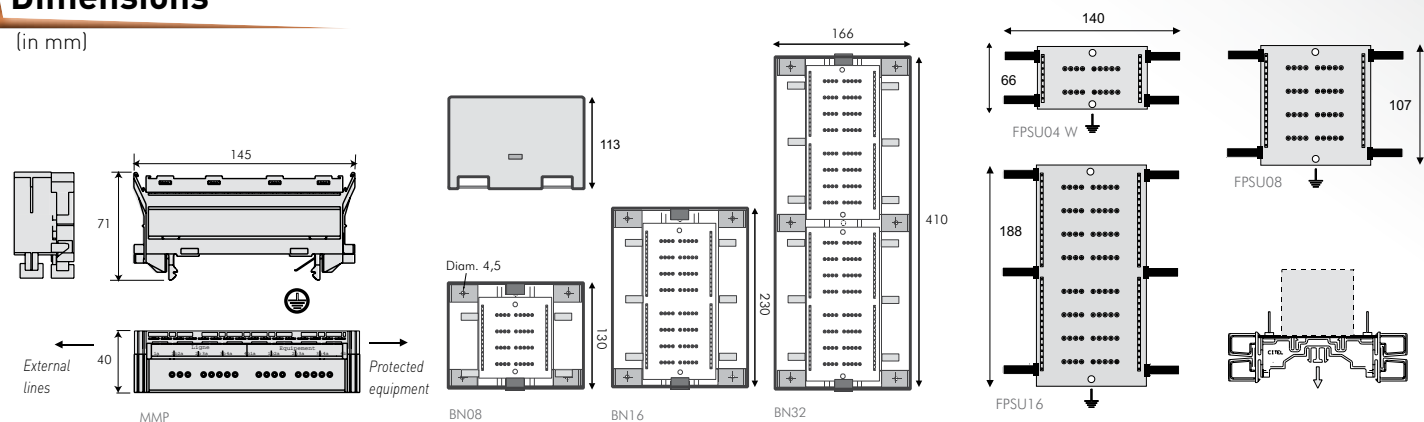
## BN , FPSU , MMP



- **BN series : 8, 16 or 32 pair**  
Metal enclosures for E280
- **FPSU series : 4, 8 or 16 pair**  
For MDF or DIN rail mounting
- **FP series : 10 or 25 pair**  
Wall mounting plate
- **MMP module : 4 pair**  
Connector strip for 2 E280

## Dimensions

(in mm)



## Characteristics

Form Factor	Metal Enclosures			Brackets and Boards					Strip
CITEL Part Number	BN08	BN16	BN32	FPSU04	FPSU08	FPSU16	FP10	FP25	MMP
Maximum Number of Pairs	8	16	32	4	8	16	10	25	4
Maximum Number of E280s	4	8	16	2	4	8	5	13	2
I/O Connection :									
Screw Terminals	BN08V	BN16V	BN32V	FPSU04V	FPSU08V	FPSU16V	-	-	-
Quick Connect 66 (USA)	-	-	-	-	-	-	FP10QC66	FP25QC66	MMP
ATT110 (USA)	-	-	-	-	-	-	FP10-110	-	-
Mounting System	Wall	Wall	Wall	MDF* DIN rail	MDF* DIN rail	MDF* DIN rail	Wall	Wall	MDF*
Ground Connection	2 nuts with M4 screws			2 nuts with M4 screws					Earth pin
<b>Part Number</b>									
Screw Terminals	71347	71356	71377	71442	71462	71472	-	-	-
Quick Connect	-	-	-	-	-	-	71435	71475	71480
ATT110	-	-	-	-	-	-	-	-	-

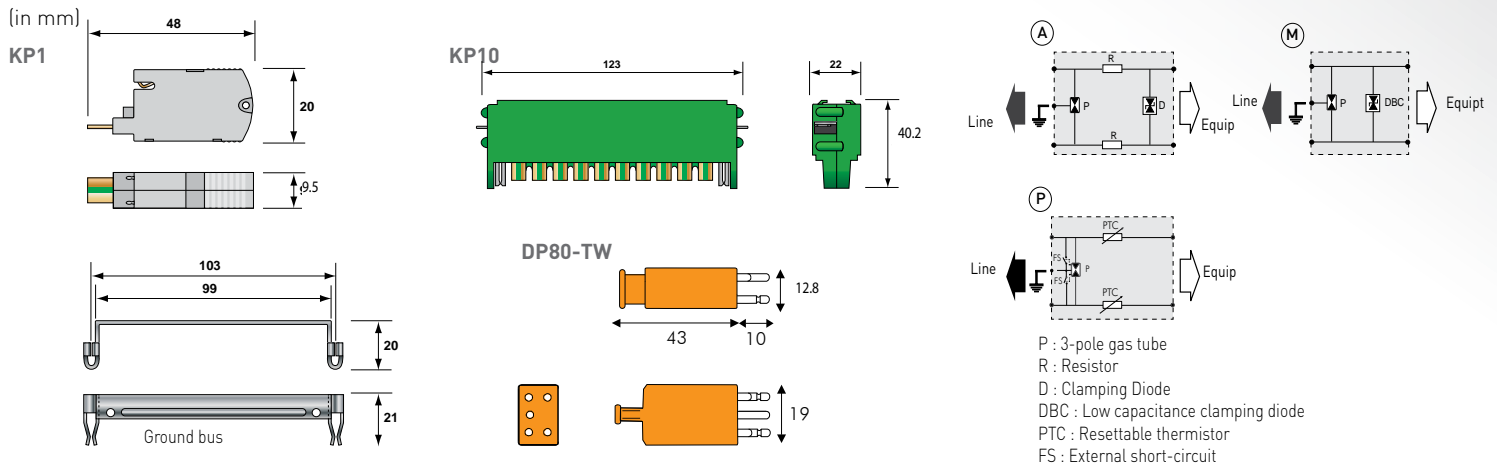
\*] Compatible with MDF profile : PA015001 (Infra+), HPU (3M-Pouyet), 09649 (Alcatel) and CITEL profile

# 1 and 10-Pair Plug-In Surge Protectors KP1, KP10 and DP80-TW



- Surge Protectors for LSA+ Connection Strip
- “5-pin” Configuration (DP80)
- Fast Installation, No Wiring Necessary
- Easy Maintenance
- For Both Analog and High Speed Lines

## Dimensions and Electrical Diagrams

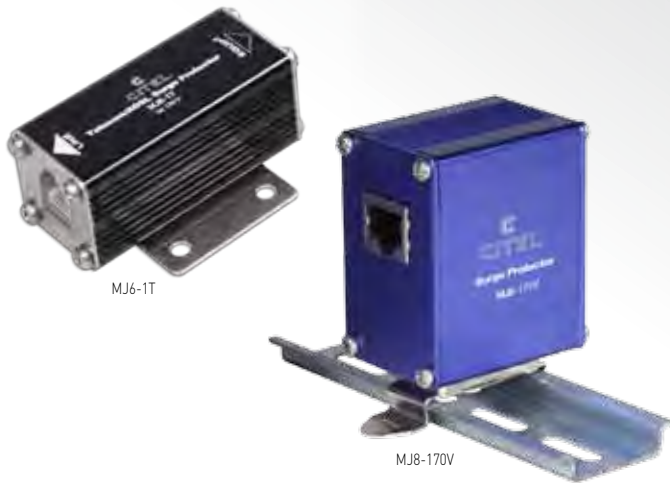


## Characteristics

CITEL Part Number	KP1-T	KP1-06DBC	KP10-T	KP10-06DBC	DP80-TW
Application	Analog line ADSL	T2 - T1 10BaseT	Analog line ADSL	T2 - T1 10BaseT	Analog line ADSL
Configuration	1 pair	1 pair	10 pairs	10 pairs	1 pair
Nominal Line Voltage (Un)	150V	6V	150V	6V	150V
Maximum Line Voltage (Uc)	170V	8V	170V	8V	170V
Maximum Line Current (IL)	300mA	300mA	300mA	300mA	100mA
Maximum Frequency	> 10MHz	> 20MHz	> 10MHz	> 20MHz	> 3MHz
Protection Level (Up) 8/20µs impulse - 5kA	230V	25V	230V	25V	< 700V
Maximum Discharge Current (Imax) 8/20µs impulse - 1 time	5kA	5kA	5kA	5kA	10 A
End of Life	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit on heavy surge and line cut-off+reset on overcurrent
Type of Diagram	A	M	A	M	P
<b>Mechanical Characteristics</b>					
Mounting	LSA+ connection strip		LSA+ connection strip		5-pin connector block
Dimensions	See drawing		See drawing		See drawing
Contact	Tinned copper		Tinned copper		Brass gold plated 0.5µ
Housing Material	Thermoplastic UL94-V0		Thermoplastic UL94-V0		-
Part Number	85186	85259	-	-	85126

# Telecom Surge Protectors

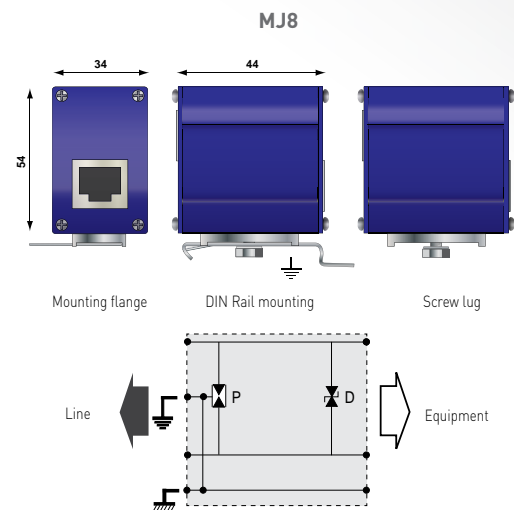
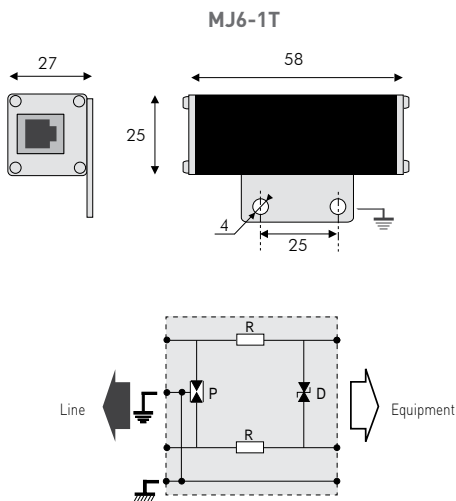
## MJ8, MJ6-1T



- **Single Telecom Line Surge Protector**
- **Hybrid GDT and Diode Technology**
- **Line Current Up to 300mA**
- **RJ11 or RJ45 Connectors**
- **Multiple Mounting Options**
- **UL497B Listed**

### Dimensions and Electrical Diagrams

(in mm)



P : 3-pole gas discharge tube  
R : Resistor  
D : Clamping Diode

### Characteristics

CITEL Part Number	MJ6-1T	MJ8-ISDN	MJ8-170V
Application	PSTN or ADSL 1-pair	ISDN	PSTN/ADSL
Maximum Operating Voltage (Uc)	170Vdc	60Vdc	170Vdc
Maximum Line Current (IL)	300mA	300mA	300mA
Maximum Frequency	> 10 MHz	> 10 MHz	> 10MHz
Pin Outs	1 pair (1-3)	2 pairs (3-6) (4-5)	2 pairs (1-2) (3-6) (4-5) (7-8)
Nominal Discharge Currents (at 8/20µs)			
- Line/Line	2500A	500A	500A
- Line/Ground	2500A	2000A	2000A
Connections:			
- Input	RJ11	Shielded RJ45	Shielded RJ45
- Output	RJ11	Shielded RJ45	Shielded RJ45
Ground Connection	Mounting flange, Ground wire	Screw lug, DIN rail clip or mounting flange	
Enclosure	Metal	Metal	Metal
<b>Standard Compliance</b>			
NF EN 61643-21 ( France)	Surge protectors for communication circuits - Test categories C2 and D1		
UL497B (USA)	Surge protectors for communication circuits		
<b>Part Number</b>			
	560402	560209	560203



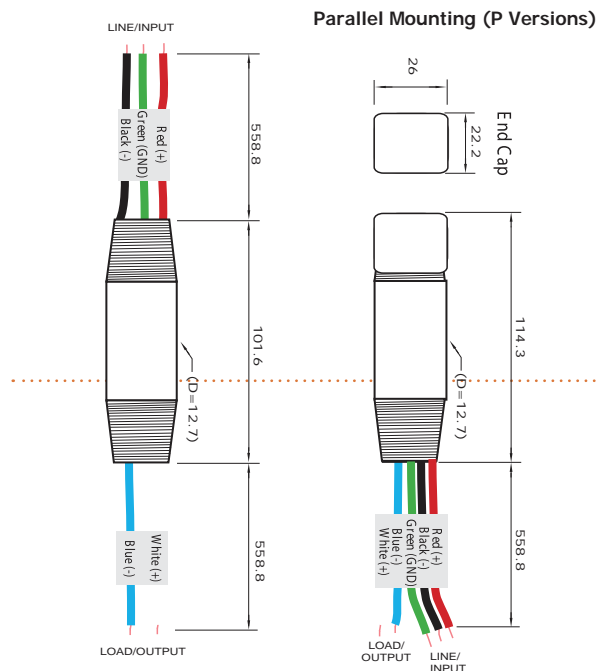
# DC Signal Line Surge Protector TSP15M Series



- **1 Pair Protection**
- **Modes of Protection L-L,L-G**
- **Conduit Mounting**
- **Direct Transducer Mount**
- **Parallel or Series Connection Options**

## Dimensions and Electrical Diagrams

(in mm)



Series Mounting (S Versions)

## Characteristics

CITEL Number	TSP15M-P-24D3	TSP15M-S-24D3	TSP15M-P-48D3	TSP15M-S-48D3
Application	Leased Line 4-20mA	Leased Line 4-20mA	ISDN-T0 48V Line	ISDN-T0 48V Line
Configuration	Parallel	Series	Parallel	Series
Nominal line voltage (Un)	24 Vdc	24Vdc	48Vdc	48Vdc
Max. line voltage (Uc)	32 Vdc	32Vdc	54Vdc	54Vdc
Max. line current	300 mA	300 mA	300 mA	300 mA
Protection level (Up)	38 Vdc	38 Vdc	82 Vdc	82 Vdc
Nominal discharge current (In)	5 kA	5 kA	5 kA	5 kA
Max. discharge current (Imax)	15 kA	15 kA	15 kA	15 kA
End of Life	Short-Circuit	Short-Circuit	Short-Circuit	Short-Circuit
Mechanical specifications	Conduit mounting Temperature : -55°C to 85°C Connection by #16 AWG Tinned Copper wires Housing material : Stainless Steel type 316L Earth connection via #16 AWG ground wire Weight : 363g (0.8lbs)			



# CITEL



## **DATALINE** Surge Protectors

# Dataline Surge Protectors

## Protecting Data-Processing Networks

For industrial sites or secondary buildings integrating a linked communication network, any single issue at one of these linked systems can cause issues to the safety and productivity of the entire system.

It is now increasingly crucial to reinforce the level of reliability for these systems. This can be achieved by using a coordinated surge protection strategy.

The installation of surge protectors on data-processing networks is highly recommended, especially in the following cases :

- Inter-building networks
- Wide area networks
- Areas of high electromagnetic disturbances

CITEL surge protectors for Local Area Networks (LAN's) are based on the combination of 3-pole gas tubes and fast clamping diodes to ensure protection against lightning surges.

When specifying a SPD, two key parameters need to be taken into consideration, the voltage level and the data transmission speed of the application. The CITEL surge protectors for data networks are specifically designed for both of these requirements.

### Mechanical Configuration

Surge protectors for data-processing networks are designed to fit into an existing installation. As such, the surge protectors are equipped with standard connectors and are available in either a single enclosure to protect terminal equipment or in a 19" rack to protect at the distribution level.



MJ8 Surge protector for Category 5E network

### Performance

Ethernet network surge protectors are designed for networks with very fast data transfer speeds, up to 1 Gbit/s for Category 6 networks. In order to support the many various types of networking applications, CITEL offers a complete range of surge protectors.

- Category 5 and 5E
- Category 6
- PoE mode A & B

### Standard

Surge protectors for data-processing network are compliant with NF EN 61643-21 as well as UL497A and UL497B.

## Protecting Video Transmissions

Video transmission lines are regularly exposed to transient surges due to the nature of their distributed installation. In order to ensure the integrity of these networks, the application of dedicated SPD's at the remote equipment level as well as at the local digital recording devices is absolutely necessary.

### Configuration

CITEL Surge protectors for video transmission are designed to support these many configurations:

#### ● Analog Camera:

The MSP-VM-2P combines analog video and power supply protection into a single unit. The CNP series is a coaxial protector with integrated DC pass capabilities.



MSP-VM-2P



CNP

#### ● IP Camera:

The MSP-VM/R combines Ethernet and power supply protection in a single unit.



MSP-VM/R

#### ● Power Over Ethernet Video:

The MJ8-POE is specifically designed for power over Ethernet applications. For outdoor installations the CMJ8-POE comes in an IP rated enclosure.



MJ8-POE

### Standards

Video transmission network surge protectors must be compliant with IEC 61643-21 as well as UL497A and UL497B.



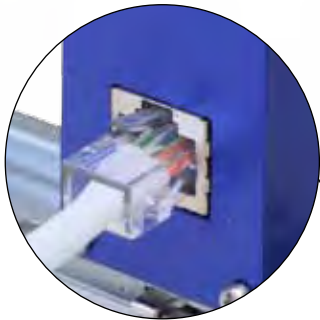
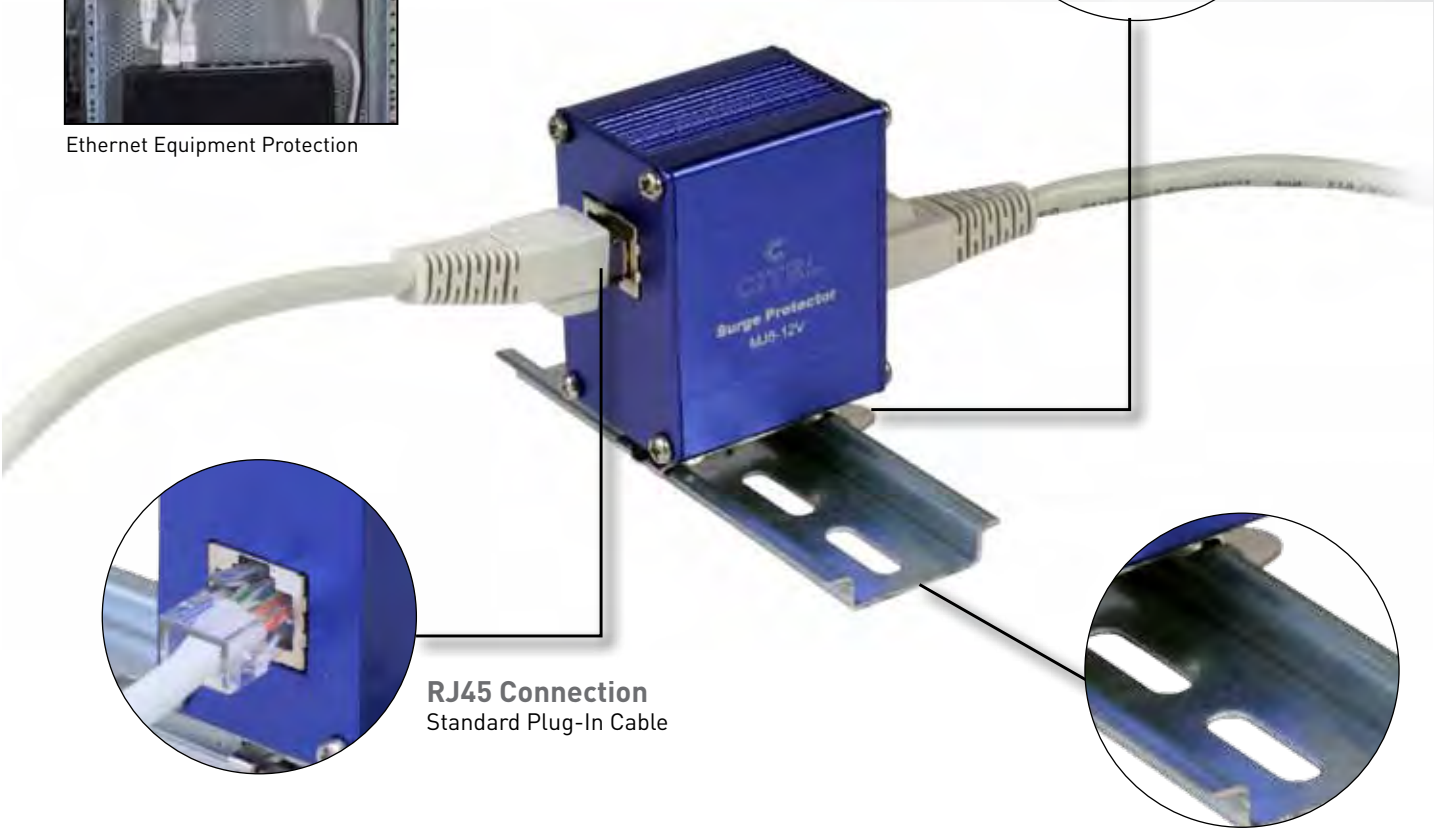
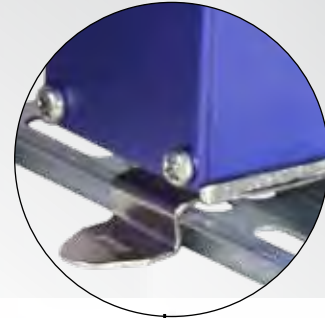
# CITEL MJ8 Series

## Installation

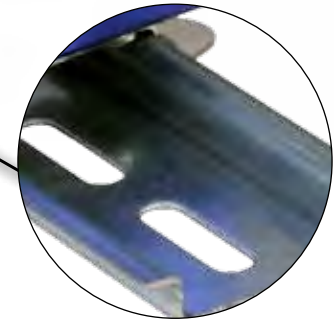


Ethernet Equipment Protection

**Mounting**  
On DIN Rail  
or by Mounting Flange

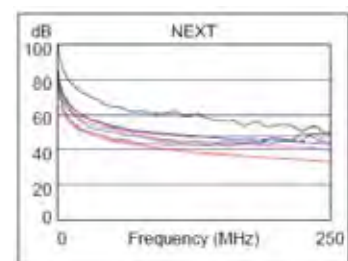
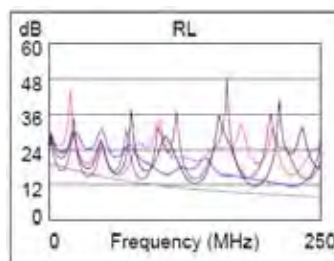
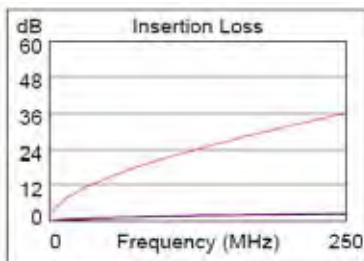


**RJ45 Connection**  
Standard Plug-In Cable



**Ground Connection**  
Via DIN Rail

## Performance Characteristics





# Dataline Surge Protectors

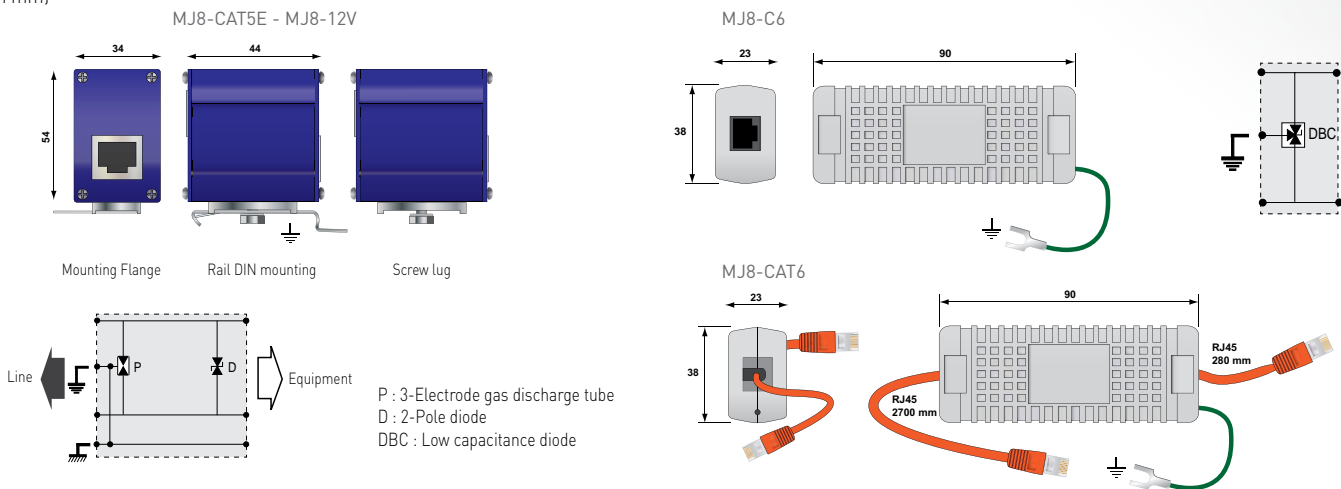
## MJ8 Series



- **Cat.5, 5E, and Cat.6 Surge Protector**
- **Hybrid GDT and Diode Technology**
- **10/100/1000 Mbps Compatible**
- **Bi-Directional Protection**
- **Shielded Connector Configurations**
- **DIN Rail, Screw Lug, and Flange Mounting**
- **UL497B Listed**

### Dimensions and Electrical Diagrams

(in mm)



### Characteristics

CITEL Part Number	MJ8-CAT5E	MJ8-CAT6	MJ8-C6	MJ8-12V
Application	Ethernet Cat.5 or Cat.5E	Ethernet Cat.6	Ethernet Cat.6	12 V signal
Maximum Data Rate	1000Mbps	1000Mbps	1000Mbps	30Mbps
Maximum DC Signal	8Vdc 1A	7.5Vdc 1A	7.5Vdc 1A	18Vdc 1A
Pin Outs	[1-2] [3-6] [4-5] [7-8]	[1-2] [3-6] [4-5] [7-8]	[1-2] [3-6] [4-5] [7-8]	[3-6] [4-5]
Nominal Discharge Currents:				
- Line/Line	<500A at 8/20 μs	< 132A at 10/1000 μs	<100A at 8/20 μs	< 500A
- Line/Ground (per line)	2000A at 8/20 μs	132A at 10/1000 μs	100A at 8/20 μs	2000A
<b>Mechanical Characteristics</b>				
Connections:				
- Input	Shielded RJ45 Connectors	RJ45 Connectors	RJ45 Connectors	Shielded RJ45 connectors
- Output	Shielded RJ45 Connectors	RJ45 Connectors	RJ45 Connectors	Shielded RJ45 connectors
Pin Out	4 pairs + shielding + ground	4 pairs + ground	4 pairs + ground	2 pairs
Enclosure	Metal	Plastic	Plastic	Metal
Ground Connection	Screw Lug, Din Rail Clip or Mounting Flange	Ground wire	Ground wire	Screw Lug, Din rail clip or mounting flange
Standard Compliance	IEEE 802-3af and 3av (transmission) - IEC 61643-21 (surge withstand) UL497B			
<b>Part Number</b>				
	560201	6149	6184	560205



# Dataline Surge Protectors

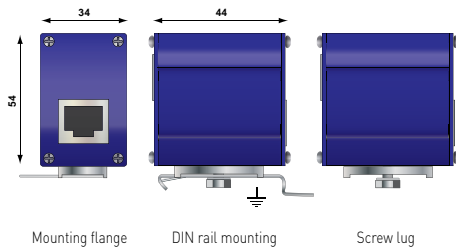
## MJ8-POE Series



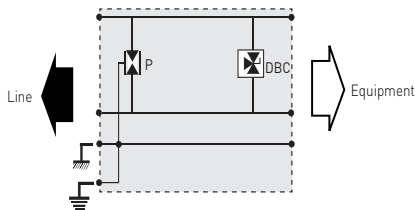
- **Power Over Ethernet Surge Protector**
- **Hybrid GDT and Diode Technology**
- **10/100/1000 Mbps Compatible**
- **Bi-Directional Protection**
- **Shielded Enclosure and Connectors**
- **DIN Rail Screw Lug and Flange Mounting**
- **UL497B Listed**

### Dimensions and Electrical Diagram

(in mm)



Mounting flange    DIN rail mounting    Screw lug



P : 3-Electrode gas discharge tube  
DBC : 3-Pole low capacitance diode

### Characteristics

CITEL Part Number	MJ8-POE-A	MJ8-POE-B
Application	PoE Networks	
Maximum data rate	1000Mbps	1000Mbps
Maximum DC Power Supply	60 Vdc - 650mA	7.5 Vdc (1,2,3,6) - 650mA 60 Vdc (4,5,7,8) - 650mA
Pin outs	(1-2) (3-6) (4-5) (7-8)	
Nominal discharge currents:		
- Line/Line	<500A at 8/20 $\mu$ s	
- Line/Ground per line	2500A at 8/20 $\mu$ s	
<b>Mechanical Characteristics</b>		
Connections:		
- Input	RJ45 shielded	
- Output	RJ45 shielded	
Pinout	8 wires + shielding	
Enclosure	Metal	
Ground Connection	Screw lug, DIN rail clip or mounting flange	
Standard Compliance	UL497B, IEEE 802-3af, IEC 61000-4-5	
<b>Part Number</b>		
	581519	51518



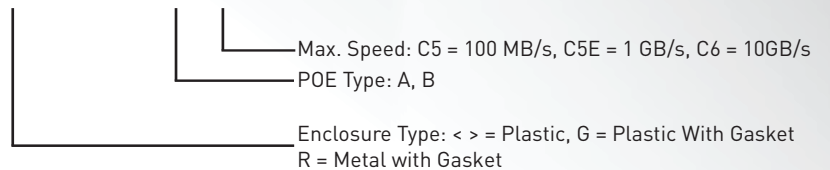
# Dataline Surge Protectors

## CMJ8-POE Series



- **Outdoor Power Over Ethernet Surge Protective Device**
- **IP Rated Enclosures**
- **Hybrid GDT and Diode Technology**
- **Supports Up To 10 Gb/s Data Transmission Speeds**
- **Shielded Connectors**
- **High POE**
- **Bi-Directional Protection**
- **UL497B Listed**

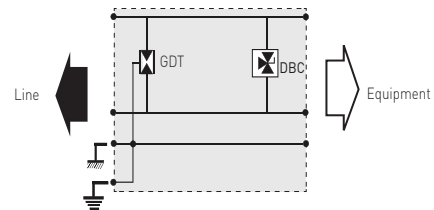
CXMJ8-POE-X-XXX



### Enclosure Characteristics

Enclosure	CMJ8	CGMJ8	CRMJ8
Dimensions	4.5 x 3.5 x 2.5 in	4.5 x 3.5 x 2.5 in	5.9 x 4.3 x 3.9
Gasket	None	Yes	Yes
Mounting	Attached pole mount brackets for surface or pole mounting		
Protection Class	IP65	IP66	IP67
Connections:	- Input: RJ45 Shielded - Output: RJ45 Shielded		
Pinout	8 wires + shielding		
Enclosure	IP Rated Plastic		
Connection to Bonding Network	Round Screw Terminal		
Standard Compliance	UL497B, IEEE 802-3t, IEC 61000-4-5		

### Electrical Diagram Principle



GDT : 3-Electrode gas discharge tube  
DBC : 3-Pole low capacitance diode

### Performance Characteristics

Board Type	POE-A-C5	POE-B-C5	POE-A-C5E	POE-B-C5E	POE-C6
Maximum Data Rate	100 Mbp/s CAT5	100 Mbp/s CAT5	1 Gb/s CAT5E	1 Gb/s CAT5E	10 Gb/s CAT6
Max Voltage on Pins (POE & Data)	(1-2) (3-6) 60V (4-5) (7-8)	7.5V 60V	60V	7.5V 60V	60V
Max Current High POE	(1-2) (3-6) 1.2A (4-5) (7-8) NA	NA 1.2A	1.2A NA	NA 1.2A	1.2A NA
Nominal Discharge Currents (at 8/20 μs)	- Line/Lines: 500A - Line/Ground (Per Line): 2,000A - Lines/Ground (Total): 16,000A				
Clamping Voltage Between Lines	(1-2) (3-6) 70V (4-5) (7-8)	10V 70V	70V	10V 70V	10V 70V
DC Sparkover Voltage Between Lines and Ground	71-108V	71-108V	71-108V	71-108V	71-108V

### Part Numbers

CITEL Part Name	Part Number
CMJ8-POE-A-C5	6211
CMJ8-POE-B-C5	6212
CGMJ8-POE-A-C5	892000
CGMJ8-POE-B-C5	892001
CMJ8-POE-A-C5E	892002
CMJ8-POE-B-C5E	892003
CGMJ8-POE-A-C5E	892004
CGMJ8-POE-B-C5E	892005
CRMJ8-POE-C6	581529

# Dataline Surge Protectors

## DDP Series



- **Multi-Connector Surge Protector**
- **Supports All Network Types**
- **Hybrid Diode Technology**
- **Available with 4,8, or 12 RJ-45 Connectors**
- **Available with RJ21 Connectors**
- **Bi-Directional Protection**
- **UL497A and UL497B Listed**

## Dimensions and Electrical Diagram

(in mm)

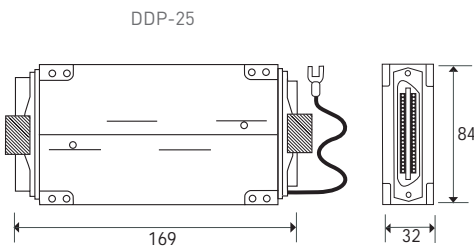


Fig.A

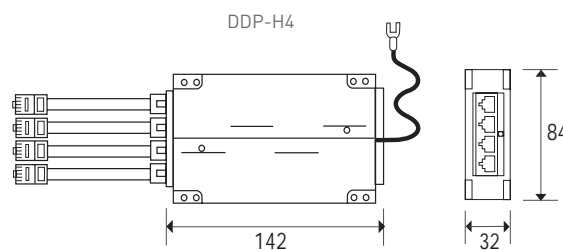
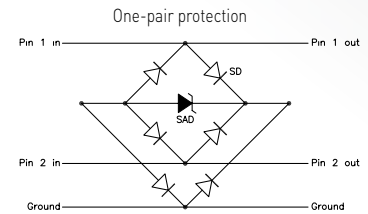


Fig.B



SD : Steering diode  
SAD : Silicon avalanche diode

## Characteristics

CITEL Part Number	DDP-xx-E	DDP-xx-E-C5	DDP-xx-T	DDP-xx-B	DDP-xx-G
Application	10BaseT, RS422, RS485, RS423, Ethernet	100 BaseT	RS232	CSU /DSU Non span T1	Dial-up Modem Fax
Maximum Data Rate	40Mbps	100Mbps	40Mbps	40Mbps	40Mbps
Maximum Supply Voltage	7.5Vdc	7.5Vdc	18Vdc	60Vdc	240Vdc
Maximum Supply Current	750mA	750mA	750mA	750mA	750mA
Nominal Discharge Current (at 10/1000µs)	132A	132A	60A	50A	75A
Maximum Shunt Capacitance	< 40 pF	< 40 pF	< 40 pF	< 75 pF	< 95 pF
<b>Mechanical Characteristics</b>					
Configuration available (xx)	25, H4, H8 or H12	H4, H8 or H12	25, H4, H8 or H12	25, H4, H8 or H12	25, H4, H8 or H12
Connections Depending on Configurations (xx)	xx = 25 (fig.A) : RJ21/Telco male (25 pairs) to RJ21/Telco female (25 pairs) xx = H4 (fig.B) : 4 positions RJ45 Male (RJ11 available) Hub protector to 4 positions RJ45 Female (RJ11 available) xx = H8 (shown) : 8 positions RJ45 Male (RJ11 available) Hub protector to 4 positions RJ45 Female (RJ11 available) xx = H12 : 12 positions RJ45 Male (RJ11 available) Hub protector to 12 positions RJ45 Female (RJ11 available)				
Pin Out	8 pins (for XX = H4, H8 or H12) or 25 pins (for xx = 25) per connector				
Installation	Surface mount (velcro)				
Ground Connection	14 AWG ground wire (10" long) with #8 fork lug				
Standard Compliance	IEEE 802-3af (transmission) UL497A & B				



# Dataline Surge Protectors

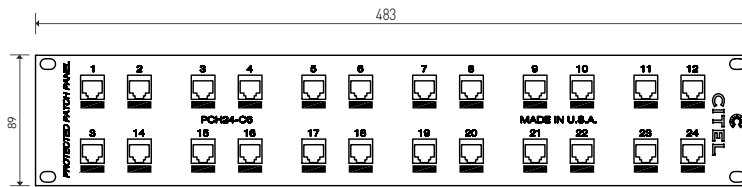
## PCH Series



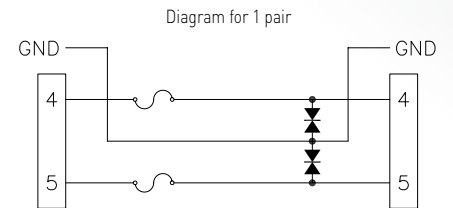
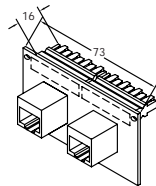
- **19" Rack Mounted Sure Protection Panel**
- **12, 24 or 48 Port Configurations**
- **Supports All Network Types**
- **RJ45 on Front and 110 Block on Rear**
- **Designed for Individual Port Replacement**
- **UL497B Listed**

## Dimensions and Electrical Diagram

(in mm)



Surge protector circuit 1 port



## Characteristics

CITEL Part Number	PCHxx-C6	PCHxx-POE-A	PCHxx-POE-B	PCH12-RJ45-B	PCH12-RJ45-G
Application	100/1000BaseT CAT5/5E/6 Ethernet	POE mode A	POE mode B	ISDN-T1 DDN	RTC ADSL
Maximum Data Rate	1000Mbps	1000Mbps	100Mbps	40Mbps	40Mbps
Maximum Supply Voltage	7.5Vdc	60Vdc	Pin 1,2,3,6 : 7.5Vdc Pin 4,5,7,8 : 60Vdc	60Vdc	240Vdc
Maximum Supply Current	750mA	750mA	750mA	750mA	750mA
Nominal Discharge Current <i>(at 10/1000µs waveform)</i>	100A	50A	Pin 1,2,3,6 : 132A Pin 4,5,7,8 : 50A	50A	75A
Maximum Shunt Capacitance	<8 pF	<8 pF (Ethernet lines only)	<8 pF (Ethernet lines only)	<75 pF	<95 pF
Number of Ports (xx)	12, 24 or 48	12, 24 or 48	12, 24 or 48	12	12
Connection : - Input - Output	110 block RJ45 female				
Pin Out	8 wires per connector				
Installation	Flush mount				
Ground Connection	Screw lug or mounting flange				
Standard Compliance	UL497B IEEE 802-3af (transmission)				



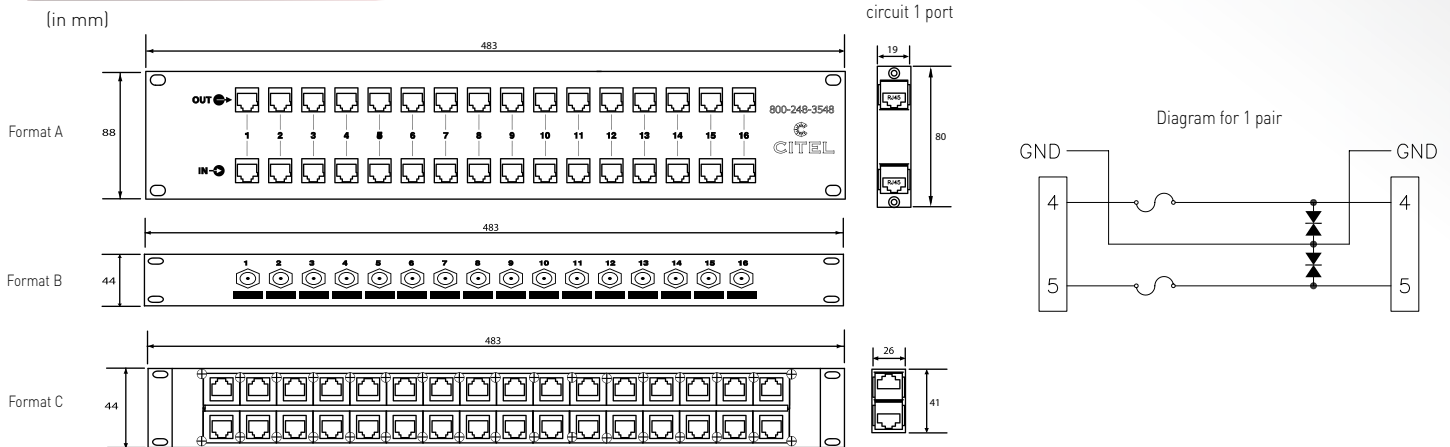
# Dataline Surge Protectors

## RAK Series



- **19" Rack Mounted Sure Protection Panel**
- **12, 24 or 48 Port Configurations**
- **Supports All Network Types**
- **RJ45, BNC, or F Type Connectors**
- **Designed for Individual Port Replacement**
- **UL497B Listed**

### Dimensions and Electrical Diagram



### Characteristics



CITEL Part Number	RAKxx-E-C5E RAKxx-E-C6	RAKxx-E-C6-60V	RAKxx-T	RAKxx-B	RAKxx-G	RAKxx-POE-A	RAKxx-POE-B	RAK16-BNC	RAK16-CMS
Application	100/1000BaseT RS422, RS485, RS423, Ethernet	High voltage Ethernet	RS232	RNIS	RTC ADSL	POE mode A	POE mode B	CCTV	Cable TV Satellite
Maximum Data Rate	1000Mbps	1000Mbps	100Mbps	40Mbps	40Mbps	100Mbps	1000Mbps	1000Mbps	1000Mbps
Maximum Supply Voltage	7.5Vdc	60Vdc	18Vdc	60Vdc	240Vdc	60 Vdc	Pin 1,2,3,6 : 7.5Vdc Pin 4,5,7,8 : 60 Vdc	7.5Vdc	90Vdc
Maximum Supply Current	750mA	750mA	750mA	750mA	750mA	750mA	750mA	750mA	750mA
Nominal Discharge Current <i>(at 10/1000µs waveform)</i>	132A (-C5E) 100A (-C6)	45A	60A	50A	75A	50A	Pin 1,2,3,6 : 132A Pin 4,5,7,8 : 50A	132A	20kA (8/20µs waveform)
Maximum Shunt Capacitance	<40 pF (-C5E) <8 pF (-C6)	<15 pF	<40 pF	<75 pF	<95 pF	<25 pF (Ethernet lines only)	<25 pF (Ethernet lines only)	<30 pF	<1 pF
Number of Ports (xx)	16 or 32	16 or 32	16 or 32	16 or 32	16 or 32	16 or 32	16 or 32	16	16
Stand-Off Option (for 16 ports)	yes	yes	yes	yes	yes	yes	yes	no	no
Diagram	A	A	A	A or C	A	A	A	B	B
Connection : - Input - Output	RJ45 female RJ45 female							BNC (female) BNC (female)	F (female) F (female)
Pin Out	8 wires per connector							N/A	N/A
Installation	Flush mount or stand off								
Ground Connection	Screw lug or Mounting flange								
Standard Compliance	UL497B IEEE 802-3af (transmission)								

# Dataline Surge Protectors DD Series

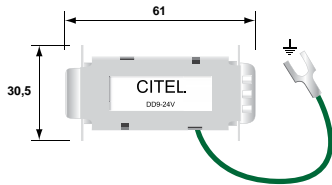


- **Data Line Surge Protector for RS Networks**
- **9, 15 and 25-Pin D-Sub Connectors**
- **Supports Data Rates Up to 40Mbps**
- **Fast and Easy Installation**
- **Ideal for Equipment Level Protection**
- **UL497B Listed**

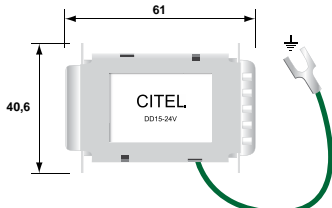
## Dimensions and Electrical Diagram

(in mm)

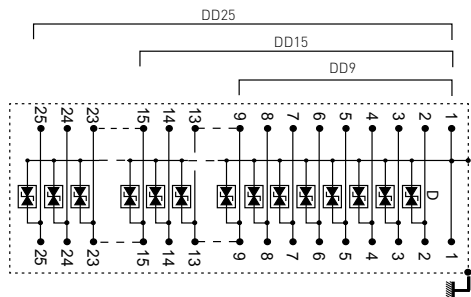
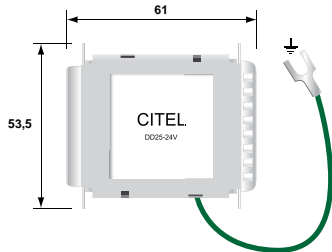
DD9-24V



DD15-24V



DD25-24V



## Characteristics

CITEL Part Number	DDxx-6V	DDxx-24V
Application	RS422, RS485	RS232, 4-20mA
Connector D-Sub 25	DD25ESD-6V	DD25ESD-24V
Connector D-Sub 15	DD15-6V	DD15-24V
Connector D-Sub 9	DD9-6V	DD9-24V
Maximum Line Voltage	Uc 6V	15V
Capacitance	<30 pF	<30 pF
Maximum Data Rate	<40Mbps	<40Mbps
Clamping Voltage	Up 7.5V	18V
Nominal Discharge Current	In 400A	300A
Mechanical Characteristics		
Connector Wiring	All wires transmitted and protected	All wires transmitted and protected
Mounting	On D-sub connector	On D-sub connector
Ground Connection	By wire	by wire
Housing Material	Thermoplastic	Thermoplastic
Dimensions	See drawings	See drawings



# Dataline Surge Protectors for Security Systems

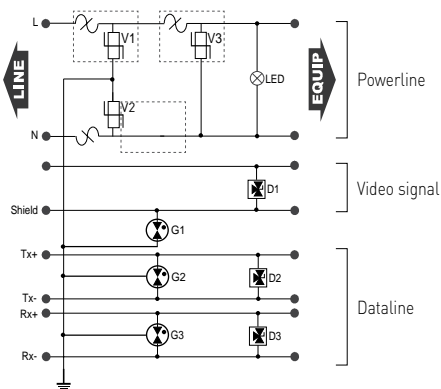
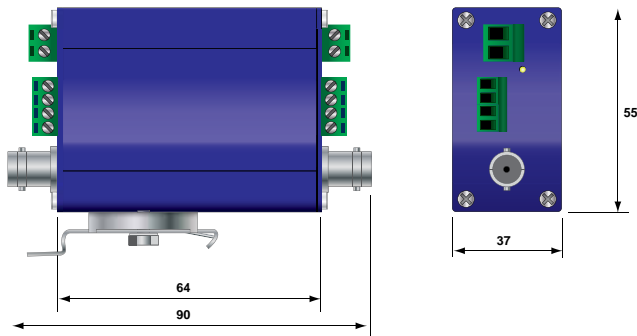
## MSP-VM-2P Series



- Security Camera Surge Protector
- Power, Data and Video in a Single Unit
- Hybrid GDT and Diode Technology
- 24, 120, 230V Configurations
- Compact Aluminium Housing
- DIN Rail and Plate Mounting
- Options for 1 or 2 Pair or Cat.5

### Dimensions and Electrical Diagram

(in mm)



V : Varistor  
 LED : status indicator  
 D : Clamping diode network  
 G : Gas discharge tube

### Characteristics

CITEL Part Number		MSP-VM24-2P	MSP-VM-120-2P	MSP-VM-230-2P
<b>Power</b>				
Nominal Voltage	$U_n$	24Vdc	120Vdc	230Vdc
Maximum Voltage	$U_c$	30Vdc	150Vdc	255Vdc
Line Current	$I_L$	5A	5A	5A
Nominal Discharge Current	$I_n$	5kA	5kA	5kA
Maximum Discharge Current	$I_{max}$	10kA	10kA	10kA
Protection Level	$U_p$	0.3kV	0.8kV	1.2kV
Connection		Screw terminal : maximum 2.5 mm <sup>2</sup>		
Failure Mode		Power failure and green led off		
<b>Data 2 Pair</b>				
Maximum Voltage	$U_c$	8Vdc	8Vdc	8Vdc
Nominal Discharge Current	$I_n$	2.5kA	2.5kA	2.5kA
Maximum Discharge Current	$I_{max}$	5kA	5kA	5kA
Protection Level	$U_p$	20kV	20kV	20kV
Connection		Screw terminal : maximum 1.5 mm <sup>2</sup>		
Failure Mode		Short-circuit status (transmission fault)		
<b>Video</b>				
Maximum Voltage	$U_c$	6Vdc	6Vdc	6Vdc
Nominal Discharge Current	$I_n$	5kA	5kA	5kA
Maximum Discharge Current	$I_{max}$	10kA	10kA	10kA
Protection Level	$U_p$	20V	20V	20V
Connection		BNC female coaxial connector		
Failure Mode		Short-circuit status (transmission fault)		
<b>Mechanical Characteristics</b>				
Dimensions		See diagram		
Housing Material		Anodized aluminum		
Mounting		DIN rail or on plate (flange)		
Ground Network Connection		DIN rail or flange		

### Other versions

	Power Supply		
	24 Vac/dc	120 Vac	230 Vac
Data 1 pair + Video BNC	MSP-VM24	MSP-VM120	MSP-VM230
Ethernet Cat.5 by RJ45 connector	MSP-VM24/R	MSP-VM120/R	MSP-VM230/R



# Dataline Surge Protectors CXC and CNP Series

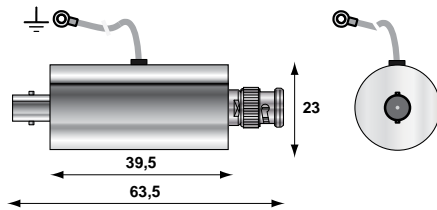


- **Coaxial Surge Protector for Video**
- **Hybrid GDT and Diode Technology**
- **Multiple Connector Options**
- **IP Rated for Outdoor Use**
- **Low Insertion Loss**
- **Fast and Easy Installation**

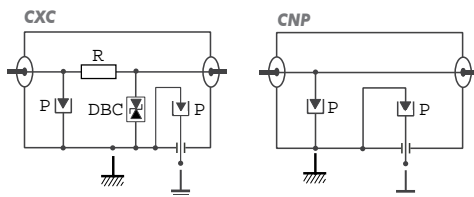
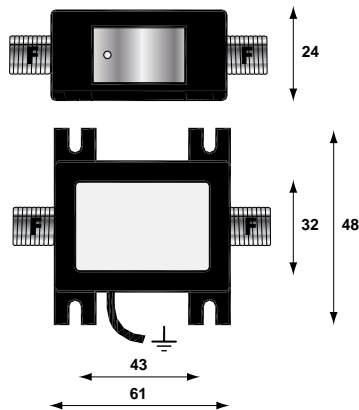
## Dimensions and Electrical Diagrams

(in mm)

CXC...-B/FM



CNP



P : 2-Electrode gas discharge tube  
 DBC : Low capacitance diode  
 R : Resistor

## Characteristics

CITEL Part Number	CXC06	CNP06
Frequency Range	DC-70MHz	DC-100MHz
Technology	Hybrid DC pass	Hybrid DC pass
Insertion Loss	<0.6 dB	<0.5 dB
Return Loss	>20 dB	>20 dB
VSWR	<1.2:1	< 1.2:1
Max. Discharge Current at (8/20 μs)	10kA	20kA
Maximum Power	5V	5V
Maximum Current	6W	4W
Impedance	50 ohms	50/75 ohms

Mechanical Characteristics		
Connectors	BNC, F	BNC, TNC
Grounding	Ground wire	Ground wire
Environmental Rating	IP65	IP20
Housing Material	Metal	Metal + plastic
Mounting	Cable mount	Surface mount
Part Number		
Cxx06-B/FM	6301341	64270
Cxx06-B/MF	630134	632611



# Dataline Surge Protectors DIN series

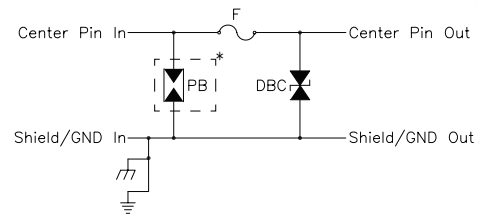
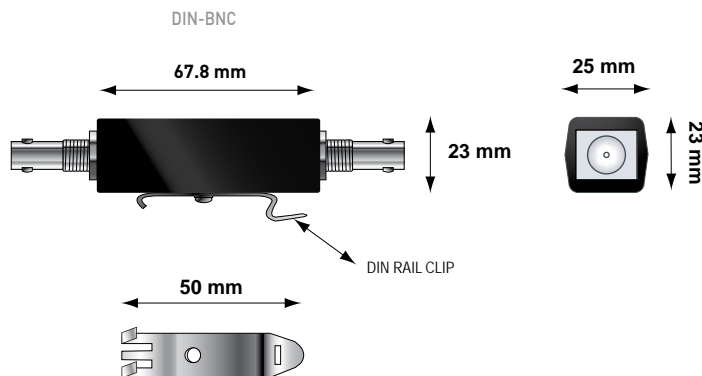


DIN-BNC

- Surge Protector for BNC or RJ Connections
- Configurations to Support All Networks
- Hybrid GDT and Diode Technology
- Integrated DIN Rail Mount and Ground
- 19" Rack Mount Option
- UL 497B Listed

## Dimensions and Electrical Diagram

(in mm)



F : Fuse  
PB : 2-Electrode gas discharge tube (\*for DIN-BNC-HD)  
DBC : 3-Pole low capacitance diode

## Characteristics

CITEL Part Number	DIN-C6	DIN-T	DIN- B	DIN-G	DIN-BNC	DIN-BNC-HD
Application	10/100/1000 BaseT RS422, RS423	RS232 RS485	RNIS	RTC ADSL	Video signal	Video signal
Maximum Data Rate	1000Mbps	100Mbps	40Mbps	40Mbps	1000Mbps	1000Mbps
Maximum Supply Voltage	7.5Vdc	18Vdc	60Vdc	240Vdc	2.7Vdc	7.5Vdc
Maximum Supply Current	750mA	750mA	750mA	750mA	750mA	750mA
Nominal Discharge Current (at 10/1000µs)	100A	60A	50A	75A	132A	25kA (at 8/20µs)
Maximum Shunt Capacitance	< 40 pF	< 40 pF	< 75 pF	< 95 pF	< 25 pF	< 25 pF
<b>Mechanical Characteristics</b>						
Connectors	RJ45	RJ45	RJ45	RJ45 or RJ11	BNC (75 ohms)	BNC (75 ohms)
Pins Protected	all	all	all	4 center	N/A	N/A
Connections :						
- Input	RJ45 (or RJ11) female				BNC female	BNC female
- Output	RJ45 (or RJ11) female				BNC female	BNC female
Pin Out	8 pins for RJ45 connectors : 6 pins for RJ11 connectors				N/A	N/A
Installation	DIN-rail mounted					
Ground Connection	DIN-rail grounded					
Standard Compliance	UL497B IEEE 802-3af (Transmission)					







CITEL



# COAXIAL

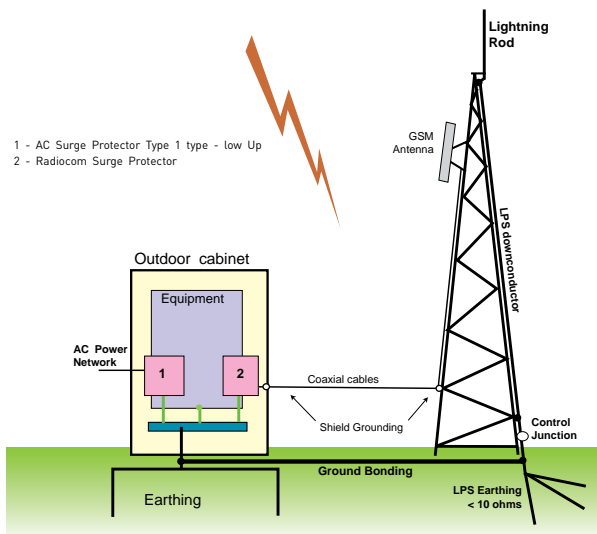
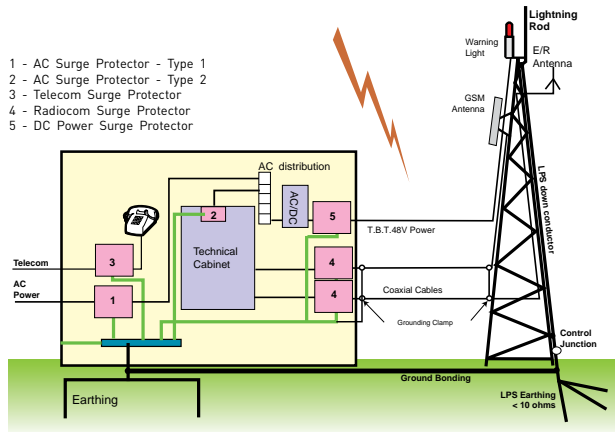
Surge Protectors

# Coaxial Surge Protection

## Protection of Radio Communication Equipment

Radio communication systems connected to an antenna are extremely susceptible to lightning strikes.

Owners and operators of radio communications equipment installations, such as GSM/UMTS or TETRA base stations, must provide protection from this risk in order to ensure service continuity. CITEL offers a full range of surge protection technologies for radio communication applications designed specifically for the different operational requirements of today's service providers.



## RF Surge Protection Technology

### ● P8AX Series (Gas Tube Protection)

The Gas Discharge Tube (GDT) is the only surge protection component usable on very high frequency transmission lines (several GHz) due to its very low capacitance. In a coaxial surge protector, the GDT is connected in parallel between the central conductor and the external shield. The sparkover voltage depends on the magnitude of the surge event. The higher the  $dV/dt$  of the overvoltage is, the higher the sparkover voltage of the surge protector will be.

When the overvoltage disappears, the gas discharge tube returns to its original condition of high isolation and is ready to operate again.

In the unlikely event of damage to the SPD, the high energy GDT's are field replaceable, making maintenance quick and easy.

The greatest advantage of this technology is its very wide bandwidth from DC to 6GHz.

#### Main Characteristics of P8AX :

- Insertion Loss < 0.2 dB
- VSWR < 1.2
- $I_{max}$  : 20 kA at 8/20 $\mu$ s
- Bandwidth : 0 to 7.9GHz
- Connectors : N, BNC, TNC, 7/16, F, SMA, UHF
- Waterproof Design

#### Main Characteristics of VG option :

- $I_{max}$  : 10 kA at 8/20 $\mu$ s
- N Type Connector Options
- Prevents the short-circuit of the transmitter and the receiver during an event.

### ● CNP/CXP Series (GDT Protection) and CXP-DCB Series (DC Block Protection)

CXP protectors are based on GDT technology and provide high discharge current capability without destruction. This type of product can also be installed in ungrounded systems. In this case, the CXP isolates the shield from the earth ground. This is typically found in applications including wireless radio terminals and TV monitors.

CXP-DBC configurations are hybrid designs that include a filter stage and a GDT. This configuration has the advantage of reducing low frequency disturbances (DC and lightning voltages) while providing a high discharge current capability.

#### Main characteristics (CXP) :

- Isolated Ground Through the Use of a GDT
- Insertion Loss < 0.5 dB
- VSWR < 1.3
- $I_{max}$  : 20 kA at 8/20 $\mu$ s
- Bandwidth : DC - 1000 MHz
- Connectors : F, BNC, N, UHF

# RF Surge Protection

## Main Characteristics (CXP-DBC) :

- "DC Block" Feature
- Insertion Loss < 0.15 dB
- VSWR < 1.2
- I<sub>max</sub> : 10 kA at 8/20μs
- Bandwidth : 125 - 1000 MHz
- Connectors : N, UHF

## ● PRC Series (Quarter-Wave Protection)

Another way to protect antenna lines is to create a short circuit scenario for all frequencies outside the operating frequency. This short-circuit is tuned to one quarter of the wavelength, giving it its name "quarter-wave protection". This tuned short-circuit between the conducting core and the external ground acts as a band-pass filter.

The filter may be selective (narrow band) or wide-band, according to the calculation of the various mechanical elements.

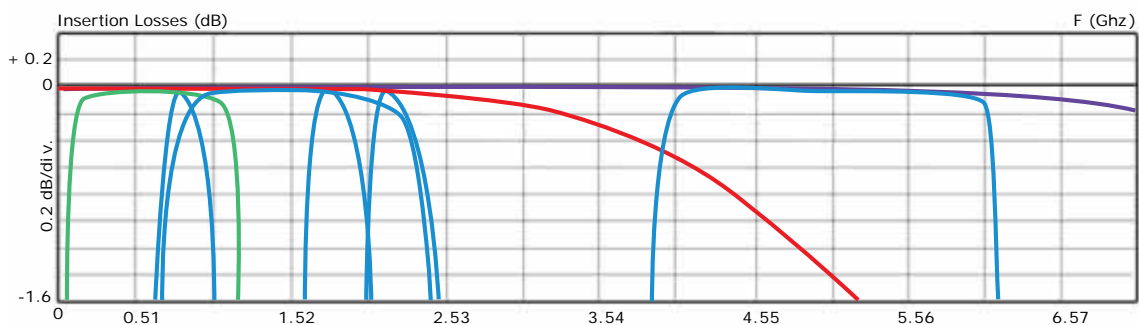
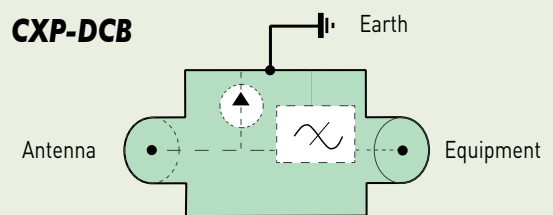
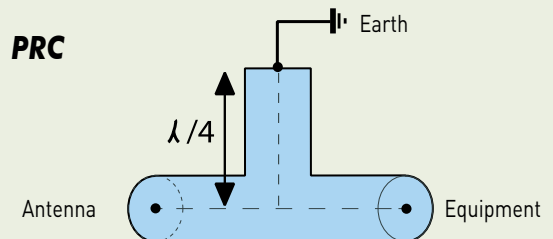
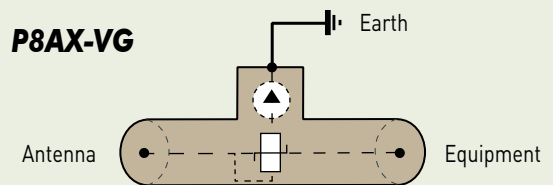
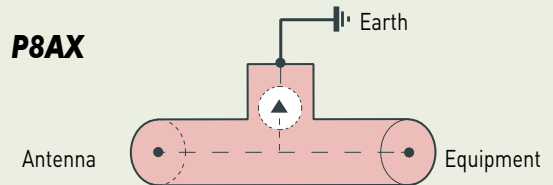
Since lightning has a low-frequency spectrum (from a few hundred kHz to a few MHz), it will be filtered out from the operating frequencies.

The typical application of this type of protection is radio lines which do not have a source voltage.

## Main characteristics :

- Insertion Loss < 0.2 dB
- VSWR < 1.2
- Bandwidth :
  - 800-2200 MHz
  - 870-960 MHz
  - 1700-1950 MHz
  - 1800-2400 MHz
  - 4500-6000 MHz
- I<sub>max</sub> : Up to 100 kA at 8/20μs
- Connectors : 7/16, N, TNC

## RF Surge Protectors Diagrams






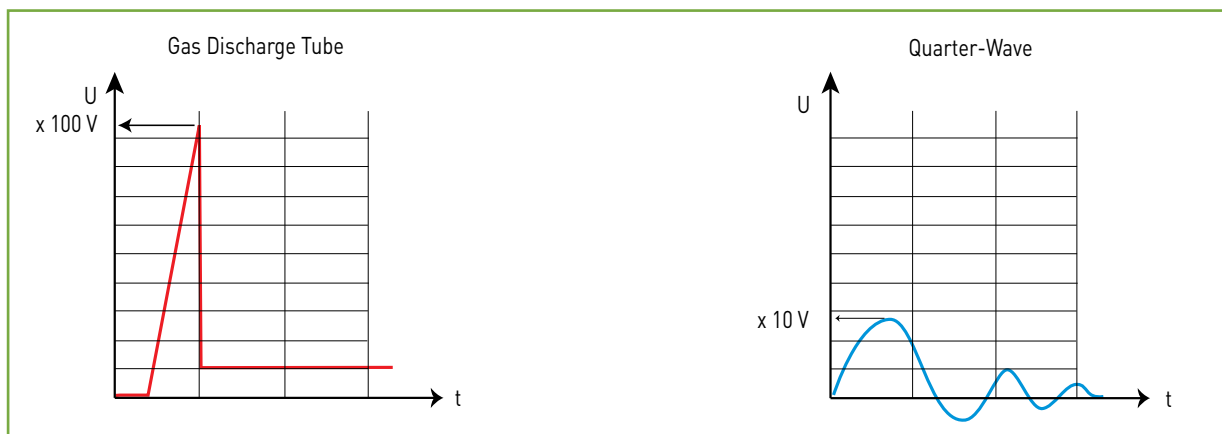
- CXP-DCB
- PRC
- P8AX
- P8AX-6G

# RF Surge Protection

## Comparison

The table below provides a comparison of the 3 most commonly used surge protection technologies:

Technology	Gas Discharge Tube	DC Block	Quarter-Wave
<i>CITEL Series</i>	<i>P8AX</i>	<i>CXP-DCB</i>	<i>PRC</i>
			
<b>Technology</b>	Sparkover	Sparkover + Filtering	Adapted Short-circuit/Band-pass Filter
<b>Protection Level</b>	From 70V to 600V depending the dV/dt,	< 100V	< 20V
<b>Bandwidth</b>	DC to 6GHz (depending on the coaxial connector and its impedance)	125-1000 MHz	Narrow band (GSM, DCS1800, PCS, DECT, GPS)
<b>DC injection</b>	Compatible	Not compatible	Not compatible
<b>8/20µs Discharge Current Capability</b>	20 kA	10 kA	Function of the connector : 100 kA for the 7/16, 50 kA for the N
<b>Life Expectancy</b>	Linked to the GDT stress	Linked to the GDT stress	Unlimited
<b>Connectors</b>	N, BNC, TNC, UHF, SMA, 7/16,F VG Models : only N	N, UHF	7/16, N, TNC



## Radio Frequency Bands

LF : Low Frequency	30-300kHz
MF : Medium Frequency	300-3000kHz
HF : High Frequency	3-30MHz
VHF : Very High Frequency	30-300MHz
UHF : Ultra High Frequency	300-3000MHz
SHF : Super High Frequency	3-30GHz

## Microwave Applications

Tetra, Tetrapol	380-512 MHz
GSM850	824-894MHz
Tetra	870-925MHz
GSM 900	880-960MHz
GPS	1,575MHz
GSM 1800	1,710-1,785MHz
GSM 1900	1,850-1,990MHz
DECT	1,880-1,900MHz
WCDMA/TD-SCDMA	1,850-2,025MHz
UMTS (IMT-2000)	1,885-2,200MHz
WLL (WiMax)	2,400-5,825MHz

# Coaxial Surge Protection

## Installation

The performance of coaxial protectors is highly dependent on proper installation, in particular the connection to the grounding network of the installation.

The following installation rules must be strictly observed to ensure the performance of the surge protector:

- **Equipotential bonding network:** All the bonding conductors of the installation must be inter-connected and connected to the installation grounding network.
- **Optimized connection of the protector to the bonding network:** To reduce the residual voltages during lightning discharge currents, the connection of the protector to the bonding network must be as short as possible (less than 50 cm) and have an acceptable cross section (at least 4 mm<sup>2</sup>). The feedthrough mounting versions are optimized for these requirements.

Tip: For the best contact carefully remove all paint and insulation coatings.

- **Location of the protectors:** SPD's should be placed at the entrance of the installation to limit the propagation of lightning currents and also near sensitive equipment to enhance overall protection.

## Types of Mounting

### ● Feedthrough Mounting

Direct mounting of the surge protector on the grounded frame at the installation entrance is the recommended mounting:

- Perfect connection to the bonding network
- Best location (conduction of the surge currents at the entrance of the installation)
- The most secure placement; able to withstand movement, vibration, and stress

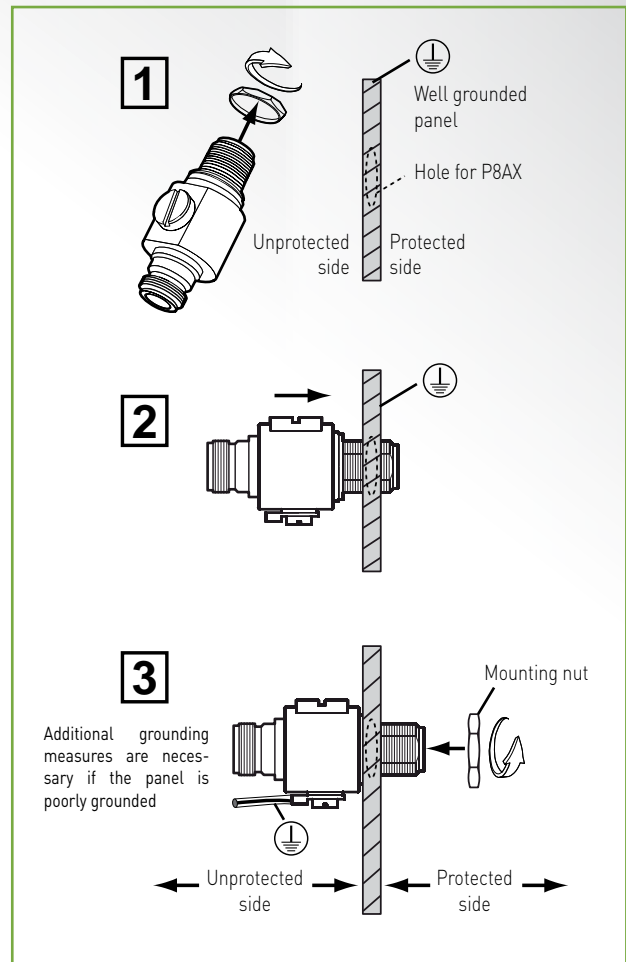
### ● Alternative Mounting

- Connection to the bonding network by wire (4 mm<sup>2</sup> minimum and shortest length possible).

## Standards for RF Surge Protectors

IEC 61643-21  
UL 497E

## Mounting Feedthrough Coaxial Surge Protectors



## Reference System

CITEL Part Number	Maximum Peak Power
P8AX09	25 W
P8AX15	70W
P8AX25	190 W
P8AX35	380 W
P8AX50	780 W

CITEL Part Number	Connectors
P8AX -N	N
P8AX -B	BNC
P8AX -T	TNC
P8AX -716	7/16
P8AX -F	F
P8AX -SMA	SMA
P8AX-U	UHF



# Coaxial Surge Protectors - 4GHz

## P8AX Series



P8AX09-N/MF

- **4GHz Bi-Directional Coaxial Surge Protector**
- **High Energy GDT Technology**
- **Low Insertion Loss**
- **Field Replaceable GDT**
- **Waterproof Design**
- **DC Pass Configuration**
- **UL497E Listed**

P8AX- - -

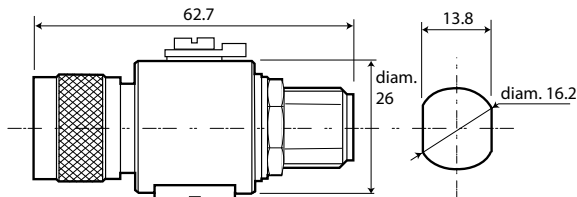
Type : MF = Male/Female  
FF = Female/Female

Connectors (see reference system page 112)

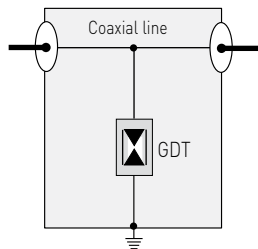
Voltage (see reference system page 112)

## Dimensions and Electrical Diagram

(in mm)



Dimensions vary by connector, N connector shown



GDT: 2-electrode gas discharge tube

## Characteristics

CITEL Part Number	P8AX09	P8AX25	P8AX50
Frequency range	DC-4GHz <sup>1</sup>	DC-4GHz <sup>1</sup>	DC-4GHz
Technology	GDT	GDT	GDT
Insertion loss	≤0.2db	≤0.2db	≤0.2db
Return Loss	≥20 db	≥20 db	≥20 db
VSWR	<1.2:1	<1.2:1	<1.2:1
Discharge Current (8/20 μs)	20 kA	20 kA	20 kA
Protection Level	<600 V	<600 V	<1000 V
Maximum Power	25 W	190 W	780 W
Maximum Current	10 A	10 A	10 A
Impedance	50 ohms <sup>2</sup>	50 ohms <sup>2</sup>	50 ohms <sup>2</sup>
Connection Method	Series (bi-directional)		
Mechanical characteristics			
Connectors	N, TNC, SMA, F, BNC, 7/16, UHF		
Grounding	M6 Screw, Bulkhead, Bracket		
Environmental Rating	IP65		
Operating Temperature	-40°C to +85°C		
Operating Altitude	4,000 m		
Relative Humidity	Up to 5 to 95% non-condensing, up to 100%		

<sup>1</sup> Maximum frequency type F : 2GHz

<sup>2</sup> Impedance for F type connector is 75 ohms

## Material

Component	Body	Male Contacts	Female Contacts	Insulators
Material	Brass	Bronze	Bronze	PTFE
Surface Plating	Cu Zn Sn	Gold/Silver	Gold/Silver	N/A



# Coaxial Surge Protectors - 6GHz

## P8AX-6G Series



P8AX09-6G-N/MF

- **6GHz Bi-Directional Coaxial Surge Protector**
- **Low Insertion Loss**
- **High Energy GDT Technology**
- **Field Replaceable GDT**
- **Waterproof Design**
- **DC Pass Configuration**
- **Bi-Directional Protection**

P8AX-6G-

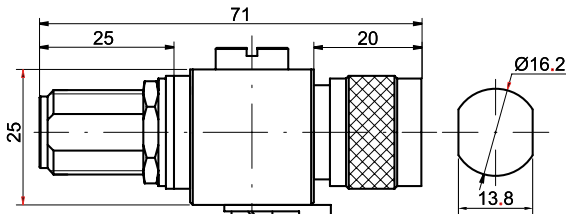
Type : MF = Male/Female  
FF = Female/Female

Connectors (see reference system page 112)

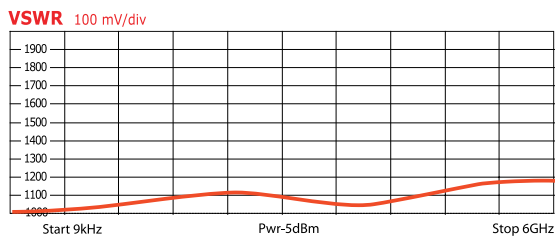
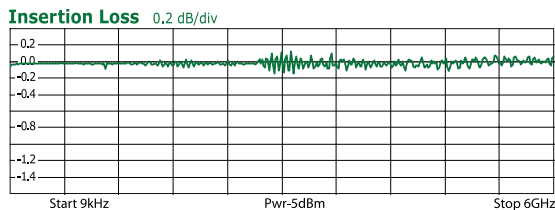
Voltage (see reference system page 112)

### Dimensions

(in mm)



Dimensions vary by connector, N connector shown



### Characteristics

CITEP Part Number	P8AX09-6G	P8AX25-6G
Frequency	DC-6GHz	DC-6GHz
Technology	Gas discharge tube	Gas discharge tube
Insertion Loss	<0.2db	<0.2db
Return Loss	>19 db	>19 db
VSWR	<1.25:1	<1.25:1
Discharge Current (8/20 µs)	20 kA	20 kA
Protection Level	< 700 V	< 700 V
Maximum Power	70 W	240 W
Maximum Current	10 A	10 A
Impedance	50 ohms	50 ohms
Connection Method	Series (bi-directional)	
<b>Mechanical Characteristics</b>		
Connectors	N, TNC, SMA	
Grounding	M6 Screw, Bulkhead, Bracket	
Environmental Rating	IP65	
Operating Temperature	-40°C to +85°C	
Operating Altitude	4,000m	
Relative Humidity	Up to 5 to 95% non-condensing, up to 100%	

### Material

Component	Body	Male Contacts	Female Contacts	Insulators
Material	Brass	Bronze	Bronze	PTFE
Surface Plating	Cu Zn Sn	Gold/Silver	Gold/Silver	N/A

# Coaxial Surge Protector - 6GHz

## P8AX-6VG Series



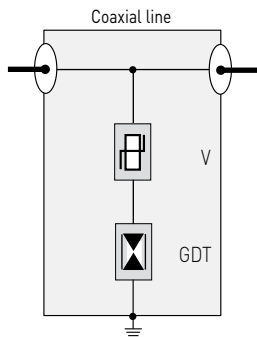
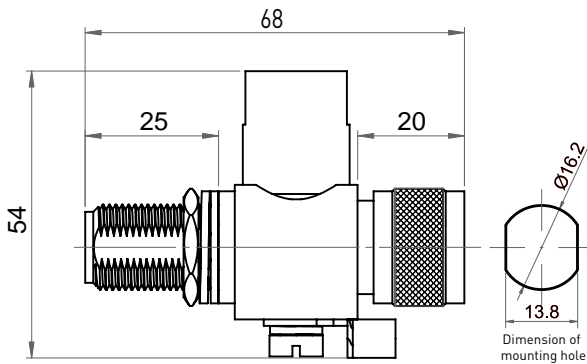
P8AX09-VG-N/MF



- **Coaxial Surge Protector from DC-6GHz**
- **Hybrid Design for Maximum Performance**
- **Bi-Directional Protection**
- **Feedthrough Mounting**
- **DC Pass Configuration**
- **Waterproof Design**
- **I<sub>max</sub> : 6kA**
- **Insertion Loss ≤ 0.2 dB**

### Dimensions and Electrical Diagram

(in mm)



V: Varistor  
GDT: 2-electrode gas tube

### Characteristics

CITEL Part Number	P8AX09-6VG-N/MF
Frequency Range	DC to 6 GHz
Impedance	50 Ω
VSWR	≤ 1.25
Insertion Loss	≤ 0.2 dB
Maximum Input Power	70 W
User Current	6A
User Voltage	90 Vdc
Maximum Discharge Current (8/20μs)	6 kA
Protection Level (1.2/50μs, 4kV)	Up 600 V
Insulation Resistance (50 Vac)	10 GΩ
Mechanical Characteristics	
Dimensions	See drawing
Connectors	N Male to N Bulkhead Female
Grounding	M6 screw, bulkhead, bracket
Operating Temperature	-40°C to +85°C
Classification	IP65

### Material

Component	Body	Male Contacts	Female Contacts	Insulators
Material	Brass	Bronze	Bronze	PTFE
Surface Plating	Cu Zn Sn	Gold	Gold	N/A

# Quarter-Wave Coaxial Protectors

## PRC Series

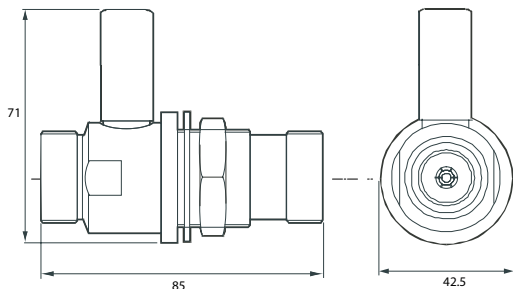


PRC1800-7/16MF

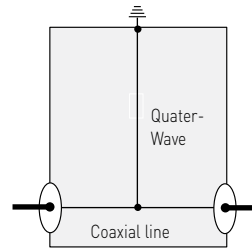
- **Quarter-Wave Surge Protector up to 6GHz**
- **Maintenance Free Design**
- **Low Insertion Loss**
- **Narrow and Wide-Band Application**
- **Imax > 50kA**
- **IP65 Classification**

## Dimensions and Electrical Diagram

(in mm)



Dimensions vary by connector



## Characteristics

CITEP	PRC822	PRC900	PRC1800	PRC2100	PRC5800
Frequency Range	800-2200MHz	870-960MHz	1700-1950MHz	1800-2400MHz	4500-6000MHz
Technology	1/4 wave	1/4 wave	1/4 wave	1/4 wave	1/4 wave
Insertion Loss	< 0.2 db	< 0.2 db	< 0.2 db	< 0.2 db	< 0.2 db
Return Loss	> 20 db	> 20 db	> 20 db	> 20 db	> 20 db
VSWR	<1.2:1	<1.2:1	<1.2:1	<1.2:1	<1.2:1
Max Discharge current at 8/20µs	100 kA (50 kA = N&TNC)	100kA (50 kA = N&TNC)	100kA (50 kA = N&TNC)	50 kA	50 kA
Maximum Power	2500 W (1500 W = N & TNC)	2500 W (1500 W = N & TNC)	2500 W (1500 W = N & TNC)	1500 W	1500 W
Maximum Current	N/A	N/A	N/A	N/A	N/A
Impedance	50 ohms	50 ohms	50 ohms	50 ohms	50 ohms
<b>Mechanical Characteristics</b>					
Connection Method	Series				
Connectors	7/16, N, TNC	7/16, N, TNC	7/16, N, TNC	N	N
Grounding	M6 Screw, Bulkhead, Bracket				
Environmental Rating	IP65				
Operating Temperature	-40°C to +85°C				
Operating Altitude	4,000 m				
Relative Humidity	up to 5 to 95% non-condensing, up to 100%				

## Material

Component	Body	F/M Contacts	Insulators
Material	Brass	Bronze	PTFE
Surface Plating	Cu Zn Sn	Gold/Silver	-

# Coaxial Surge Protector CNP and CXP Series

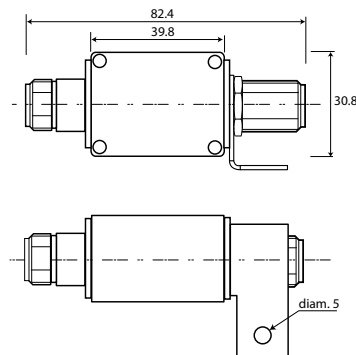


- **Low Frequency Coaxial Surge Protector**
- **High Energy GDT Technology**
- **Bi-Directional Protection**
- **IP20 or IP65 Classification**
- **RoHS 6 Compliant**
- **Waterproof Design**
- **Bi-Directional Protection**

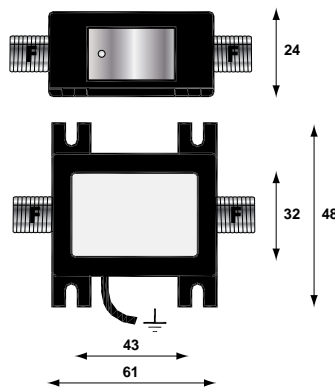
## Dimensions and Electrical Diagrams

(in mm)

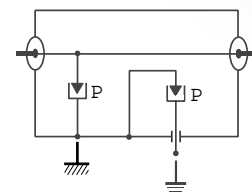
CXP09-NW/FF-DCB



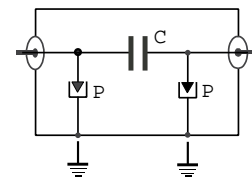
CNP



CNP  
CXP



CXP-DCB



## Characteristics

CITEC PART NUMBER	CNP90TV	CNP230TV	CXP	CXP-DCB
Frequency Range	DC-1GHz	DC-1GHz	DC-1GHz	125 - 1000MHz
Technology	Gas Discharge Tube	Gas Discharge Tube	Gas Discharge Tube	Gas Discharge Tube and Filter
Insertion Loss	≤ 0.6 dB	≤ 0.6 dB	≤ 0.5 dB	≤ 1 dB
Return Loss	> 20 dB	> 20 dB	>18 dB	>20 dB
VSWR	< 1.35:1	< 1.35:1	< 1.3:1	< 1.3:1
Max. Discharge Current at 8/20 μs	20 kA	20 kA	20 kA	20 kA
Maximum Power	25 W	190 W	25 and 190 W	25 and 190 W
Maximum Current	0.5 A	0.5 A	0.5 A	N/A
Impedance	75 ohms	75 ohms	50 ohms	50 ohms
<b>Mechanical characteristics</b>				
Connectors	BNC, F, TNC, TV (SE)	BNC, F, TNC, TV (SE)	N	N
Grounding	Ground wire		Mounting Flange	
Environmental Rating	IP20		IP65	
Operating Temperature	-40°C to +85°C			
Operating Altitude	4,000 m			
Relative Humidity	Up to 5 to 95% non-condensing, up to 100%			



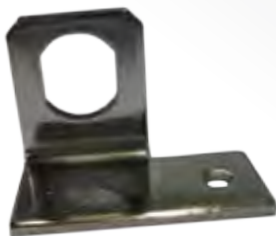
# Accessories for Mounting Coaxial Surge Protectors

## Brackets for Coaxial Surge Protectors

- Screw Mounting
- Grounding
- Requires a Feedthrough Connector



BK-T  
Bracket for TNC connector

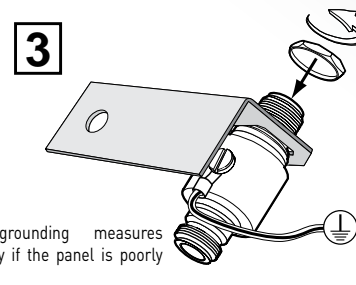
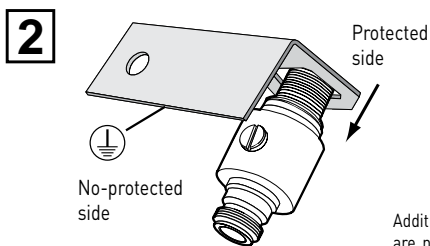
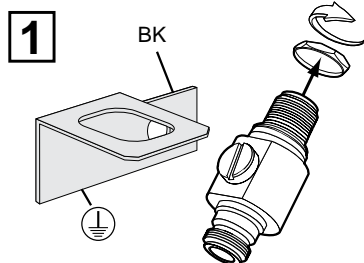


BK-N  
Bracket for N connector



BK-SMA  
Bracket for SMA connector

## Mounting Bracket



## Standard Brackets

CITEL	Part Number	Connection
BK-D	66001	7/16
BK-F	66002	F
BK-N	66003	N
BK-SMA	66006	SMA
BK-T/BK-B	66007	BNC and TNC

## Gas Discharge Tubes

CITEL Part Number	Code	Packaging	P8AX reference
BBHF 90/20	927000107	10 Units	P8AX09-xxx
BBHF 150/20	927000207	10 Units	P8AX15-xxx
BBHF 250/20	927005907	10 Units	P8AX25-xxx
BBHF 350/15	927006507	10 Units	P8AX35-xxx
BBHF 500/20	927002207	10 Units	P8AX50-xxx
BAHF 90/20	927100107	10 Units	P8AX09-6G
BAHF 150/20	927100207	10 Units	P8AX 25-6G





CITEL

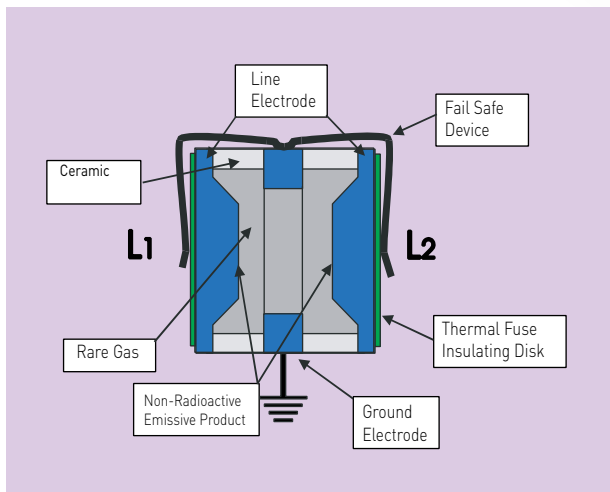


# GAS DISCHARGE TUBES



# Gas Discharge Tubes

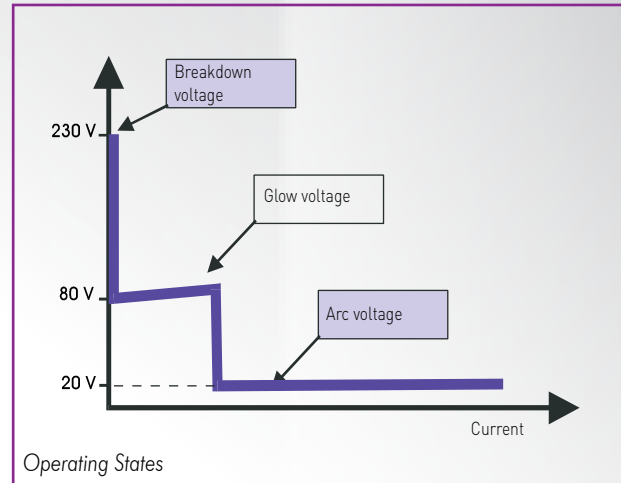
Gas Discharge Tubes (GDT's) are a highly effective surge protection technology. GDT's are comprised of two to three electrodes in a ceramic enclosure which is filled with a non-radioactive rare gas at a specific pressure. GDT's are most prevalent in telecom protection, however they also have benefits in other applications.



## Operation

The gas discharge tube operates like an extremely fast switch having conduction properties that can change rapidly. This happens when a breakdown occurs from open-circuit to quasi-short circuit. There are four operating states in the behavior of a gas discharge tube:

- **Passive State:** This is characterized by practically infinite insulation resistance across the electrodes.
- **Glow State:** At the breakdown point the conductance increases suddenly across the electrodes. If the current drained off by the gas tube is less than 0.5A the glow voltage across the terminals will be in the 80-100V range.
- **Arc State:** As the current increases the gas discharge tube shifts from the glow voltage to the arc voltage. It is in this state that the gas discharge tube is most effective because the current discharged can reach several thousand amperes without the arc voltage across the electrodes increasing.
- **Extinction:** At a bias voltage roughly equal to the glow voltage the gas tube recovers its initial insulating properties.



## Electrical Characteristics

The main electrical characteristics defining a gas discharge tube are:

- DC sparkover voltage (Volts)
- Impulse sparkover voltage (Volts)
- Discharge current capacity (kA)
- Insulation resistance (Gohms)
- Capacitance (pF).

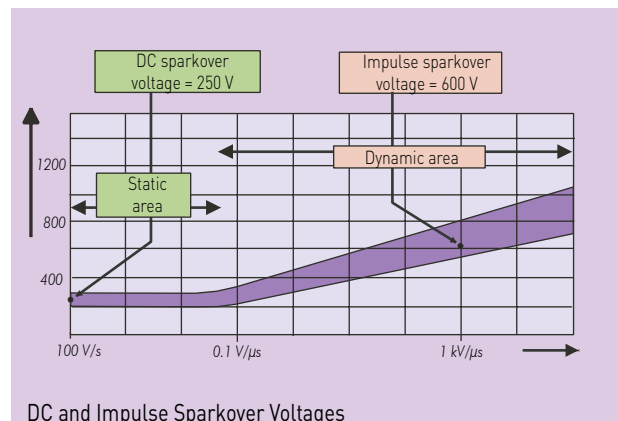
### DC Sparkover Voltage

This is the main characteristic defining the gas discharge tube. It is the voltage at which breakdown will occur between the electrodes when a slowly increasing voltage ( $dV/dt = 100 \text{ V/s}$ ) is applied. This voltage will be based on: the electrode spacing, the pressure of the gas, and the properties of the gas mixture and of the emissive substance.

Range of DC sparkover voltages available:

- minimum 75V
- average 230V
- high volt 500V
- very high volt 1000 to 3500V

The tolerance on the breakdown voltage is generally  $\pm 20\%$ .



# Gas Discharge Tubes

## Discharge Current

The discharge current is dependent on the properties of the gas, the volume of gas, and the material and treatment of the electrodes. Typical values vary between 5 and 20kA with an 8/20 $\mu$ s impulse for standard components. This is the value the device can withstand repeatedly (usually for ten impulses) without destruction or a change in its basic specifications.

## Impulse Sparkover Voltage

This is defined as the sparkover voltage in the presence of a steep rise ( $dV/dt = 1kV/\mu s$ ). The impulse sparkover voltage increases with increasing  $dV/dt$ .

## Insulation Resistance and Capacitance

These characteristics make the gas discharge tube appear invisible on the line. Typically insulation resistance is very high (>10 Gohm) and capacitance is very low (<1 pF).

## 3-Electrode Configuration

Protecting a two-wire line with two 2-electrode gas discharge tubes (connected between the wires and ground) may cause the following problem:

The line is subjected to an overvoltage in common mode because of the dispersion of the sparkover voltages ( $\pm 20\%$ ), one of the gas discharge tubes can spark over a very short time before the other. The wire connected to the gas discharge tube is therefore grounded, turning the common-mode overvoltage into a differential-mode overvoltage. This is very dangerous for the terminal equipment. This risk would disappear when the second gas discharge tube arcs over a few microseconds later.

3-electrode geometry eliminates this drawback. The sparkover of one pole causes a general breakdown of the device almost instantaneously because there is only one gas-filled enclosure.

## End of life

Gas discharge tubes are designed to withstand several impulses without destruction or loss of the initial characteristics (typical impulse tests: 10 times at 5 kA impulses on each polarity).

A sustained strong current, for example a 10 A rms for 15 seconds, simulating the fall of a AC power line onto a telecommunication line, can cause an end of life scenario.

If a fail-safe end of life is desired, CITELE offers gas discharge tube with the fail-safe feature of an external short-circuit.

## Standards

CITELE gas discharge tubes comply with specifications of the main telecom operators (AT&T, France Telecom, and British Telecom) and with the ITU-T K12 international recommendations and standards IEC 61643-31x as well as UL497B.

## GDT Product Line

CITELE offers a full line of gas discharge tubes to meet the configuration needs and specifications of the global market :

- 2- and 3-electrode gas discharge tubes
- Sparkover voltages from 75 to 3500 V
- Discharge capacities from 5 to 150 kA (at 8/20 $\mu$ s)
- Optional external short-circuit feature
- Installation by through hole or surface mounting


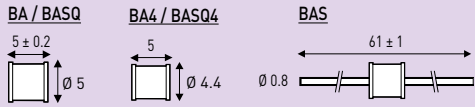

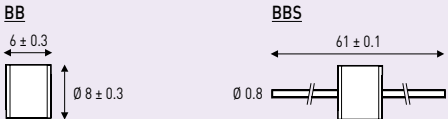

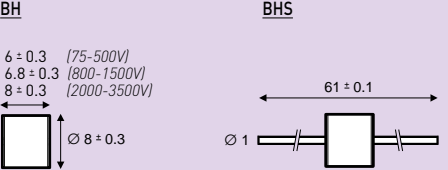
## GSG Series

CITELE has developed a specific technology known as GSG (Gas-Filled Spark Gap). GSG's are designed to be used on DC or AC power networks. GSG's have an increased extinction capability and a higher current discharge capability with both a 8/20 $\mu$ s and 10/350 $\mu$ s waveform.

The GSG component is the heart of the VG technology which provides industry leading performance.


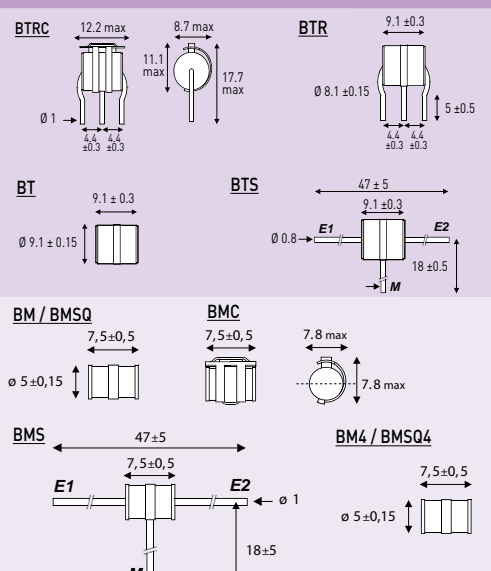

# GDT Selection Guide

## 2-ELECTRODE

Range	CITEL part number	DC sparkover voltage (100V/s)	Impulse sparkover voltage (1kV/ $\mu$ s)	Insulation resistance (100V/dc)	Capacitance	Holdover voltage (R = 300 ohms in series R = 150 ohms; 100nF in parallel)	AC discharge current (50Hz)	Maximum discharge current (8/20 $\mu$ s ; 1 time)	Nominal discharge current (8/20 $\mu$ s ; 10 times)	Mechanical
<b>BA</b> 	BA90	72-108 V	<640 V	>10G $\Omega$	<0.3 pF	>60 V	10 A	25 kA	10 kA	 <p>Options : Lead termination : BAS External fail-safe : BAC SMD version : BA CMS in 90V/20, 230V/20, 350V/20 Tape : Taped and reeled</p>
	BA150	120-180V	<700 V	>10G $\Omega$	<0.3 pF	>80 V	10 A	25 kA	10 kA	
	BA230	184-276 V	<700 V	>10G $\Omega$	<0.3 pF	>80 V	10 A	25 kA	10 kA	
	BA300	240-360 V	<900 V	>10G $\Omega$	<0.3 pF	>80 V	10 A	25 kA	10 kA	
	BA350	280-420 V	<900 V	>10G $\Omega$	<0.3 pF	>80 V	10 A	25 kA	10 kA	
	BA550	440-660 V	<1200 V	>10G $\Omega$	<0.3 pF	>80 V	10 A	25 kA	10 kA	
<b>BB</b> 	BB75	60-90 V	<640 V	>10G $\Omega$	<0.8 pF	>60 V	10 A	25 kA	10 kA	 <p>Options : Lead termination : BBS External fail-safe : BBC</p>
	BB90	72-18 V	<640 V	>10G $\Omega$	<0.8 pF	>60 V	10 A	25 kA	10 kA	
	BB150	120-180 V	<640 V	>10G $\Omega$	<0.8 pF	>75 V	10 A	25 kA	10 kA	
	BB230	184-276 V	<700 V	>10G $\Omega$	<0.8 pF	>80 V	10 A	25 kA	10 kA	
	BB350	280-420 V	<850 V	>10G $\Omega$	<0.8 pF	>80 V	10 A	25 kA	10 kA	
	BB500	400-600 V	<1200 V	>10G $\Omega$	<0.8 pF	>80 V	10 A	25 kA	10 kA	
<b>BH</b> 	BH75	60-90 V	<640 V	>10G $\Omega$	<0.8 pF	>60 V	15 A	30 kA	15 kA	 <p>Options : Lead termination (<math>\varnothing</math> 1 or 0.8 mm) : BHS External short-circuit : BHC (from 90 to 600 V)</p>
	BH90	72-108 V	<640 V	>10G $\Omega$	<0.8 pF	>80 V	20 A	40 kA	20 kA	
	BH230	184-276 V	<700 V	>10G $\Omega$	<0.8 pF	>80 V	20 A	40 kA	20 kA	
	BH350	280-420 V	<850 V	>10G $\Omega$	<0.8 pF	>80 V	20 A	40 kA	20 kA	
	BH470	376-564 V	<1100 V	>10G $\Omega$	<0.8 pF	>80 V	20 A	40 kA	20 kA	
	BH500	400-600 V	<1200 V	>10G $\Omega$	<0.8 pF	>80 V	20 A	40 kA	20 kA	
	BH600	480-720 V	<1200 V	>10G $\Omega$	<0.8 pF	>80 V	20 A	40 kA	20 kA	
	BH800	640-690 V	<1400 V	>10G $\Omega$	<0.8 pF	>80 V	10 A	25 kA	10 kA	
	BH1400	1120-1680 V	<2000 V	>10G $\Omega$	<0.8 pF	>120 V	10 A	25 kA	10 kA	
	BH2500	2000-3000 V	<3800 V	>10G $\Omega$	<0.8 pF	>120 V	10 A	25 kA	10 kA	
BH3500	2800-4200 V	<4600 V	>10G $\Omega$	<0.8 pF	>120 V	10 A	25 kA	10 kA		


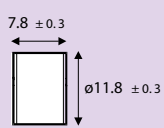

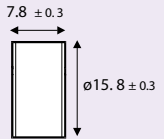
# GDT and GSG Selection Guide

## 3-ELECTRODE

Range	CITEL part number	DC sparkover voltage (100V/s)	Impulse sparkover voltage (1kV/ $\mu$ s)	Insulation resistance (100Vdc)	Capacitance	Holdover voltage (R = 300 ohms in series; R = 150 ohms; 100nF in parallel)	AC discharge current (50Hz)	Maximum discharge current (8/20 $\mu$ s; 1 time)	Nominal discharge current (8/20 $\mu$ s; 10 times)	Mechanical
<b>BT</b> 	BT90	72-108 V	<640 V	>10G $\Omega$	<0,9 pF	>70 V	20 A	25 kA	20 kA	
	BT150	120-180 V	<640 V	>10G $\Omega$	<0,9 pF	>80 V	20 A	25 kA	20 kA	
	BT230	184-276 V	<750 V	>10G $\Omega$	<0,9 pF	>80 V	20 A	25 kA	20 kA	
	BT350	280-420 V	<900 V	>10G $\Omega$	<0,9 pF	>80 V	20 A	25 kA	20 kA	
	BT500	400-600 V	<1100 V	>10G $\Omega$	<0,9 pF	>80 V	20 A	25 kA	20 kA	
<b>BM</b> 	BM90	72-108 V	<640 V	>10G $\Omega$	<0,5 pF	>60 V	10 A	25 kA	10 kA	
	BM150	120-180 V	<700 V	>10G $\Omega$	<0,5 pF	>80 V	10 A	25 kA	10 kA	
	BM230	184-276 V	<800 V	>10G $\Omega$	<0,5 pF	>80 V	10 A	25 kA	10 kA	
	BM350	280-420 V	<1000 V	>10G $\Omega$	<0,5 pF	>80 V	10 A	25 kA	10 kA	
	BM500	400-600 V	<1200 V	>10G $\Omega$	<0,5 pF	>80 V	10 A	25 kA	10 kA	



## GSG (IEC 61643-11)

Range	CITEL part number	DC sparkover voltage (100V/s)	Impulse sparkover voltage (1,2/50 $\mu$ s / 6kV)	Insulation resistance (100Vdc)	Follow current interrupting capability (Ifi) (under voltage AC)	Nominal discharge current (In) (8/20 $\mu$ s, following IEC 61643-11)	Maximum discharge current (Imax) (8/20 $\mu$ s; following IEC 61643-11)	Maximum impulse current (Iimp) (10/350 $\mu$ s; following IEC 61643-11)	Mechanical
<b>BG</b> 	BG600	450V	<1500 V	>10G $\Omega$	> 100 A	60 kA	100 kA	15 kA	
	BG800	650 V	<1500 V	>10G $\Omega$	> 100 A	60 kA	100 kA	15 kA	
	BG1000	850 V	<1800 V	>10G $\Omega$	> 100 A	60 kA	100 kA	15 kA	
	BG1300	1100 V	<2000V	>10G $\Omega$	> 100 A	60 kA	100 kA	15 kA	
<b>BF</b> 	BF800	650-1000 V	<1500 V	>10G $\Omega$	> 100 A	80 kA	140 kA	40 kA	

# GSG Selection Guide

## GSG (IEC 61643-11)

Range	CITEL part number	DC sparkover voltage (100V/s)	Impulse sparkover voltage (1.2/50µs / 6kV)	Insulation resistance (100Vdc)	Nominal discharge current (In) 8/20µs, following IEC 61643-11)	Maximum discharge current (Imax) (8/20µs ; following IEC 61643-11°)	Maximum impulse current (Iimp) (10/350µs ; following IEC 61643-11)	Mechanical
<b>BF P100</b>	BFP100-230	184-276 V	<900 V	>10GΩ	100 kA	150 kA	40 kA	
	BFP100-250	200-300 V	<900 V	>10GΩ	100 kA	150 kA	40 kA	
	BFP100-350	280-420 V	<1000 V	>10GΩ	100 kA	150 kA	40 kA	
	BFP100-500	400-600 V	<1200 V	>10GΩ	100 kA	150 kA	40 kA	
	BFP100-600	480-720 V	<1300 V	>10GΩ	100 kA	150 kA	40 kA	
	BFP100-750	600-900 V	<1500 V	>10GΩ	100 kA	150 kA	40 kA	
	BFP100-800	640-940 V	<1500 V	>10GΩ	100 kA	150 kA	40 kA	





# CITEL

■■■ Reliability in Surge Protection ■■■



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