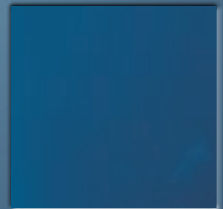
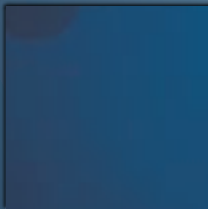
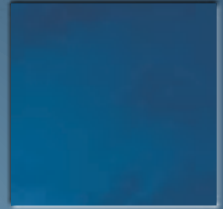
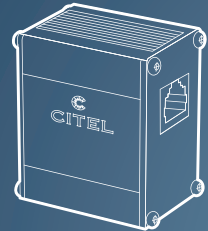
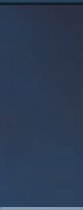
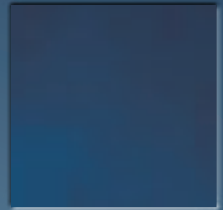
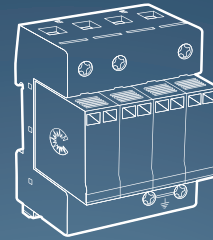
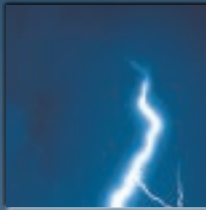
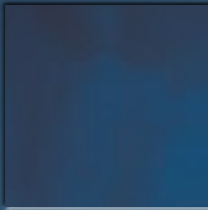




# CITEL

9<sup>th</sup> edition

# Surge Protection



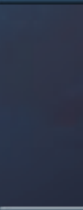
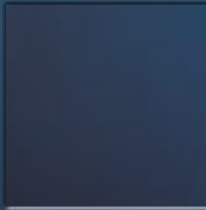
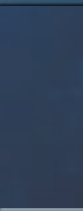
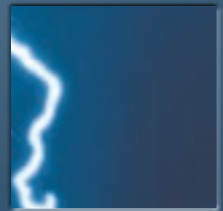
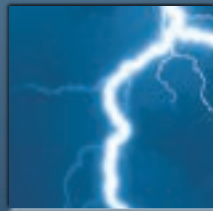
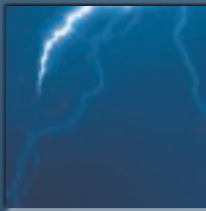
Electrical Installations

Photovoltaic

Telecom

Data

Radiocommunication





# CITEL

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**DIN RAIL AC POWER SURGE PROTECTORS**

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**PHOTOVOLTAIC SURGE PROTECTORS**

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**AC POWER SURGE PROTECTORS**

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**TELEPHONE LINE SURGE PROTECTORS**

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**DATA LINE SURGE PROTECTORS**

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**HIGH FREQUENCY COAXIAL SURGE PROTECTORS**

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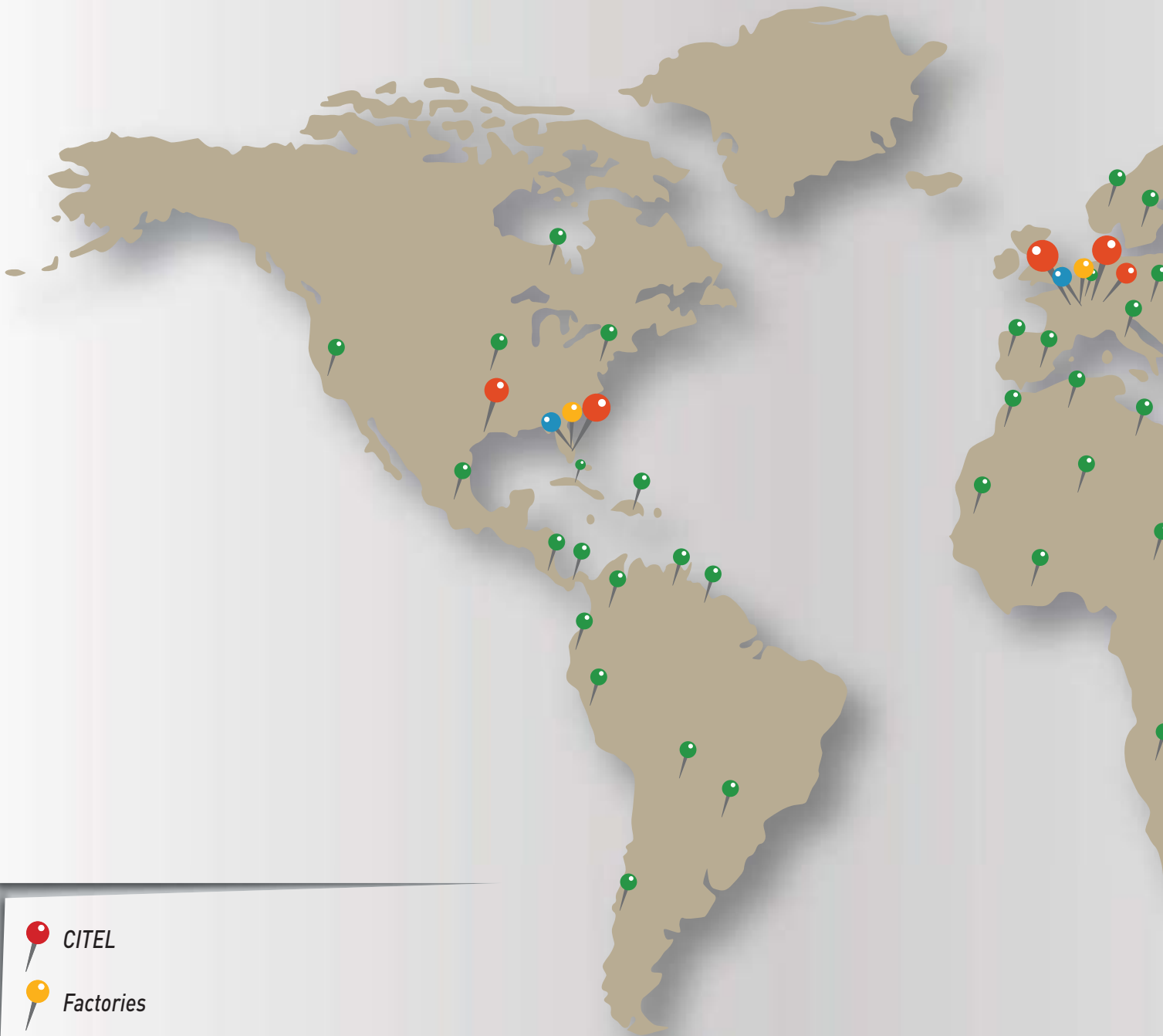
**GAS DISCHARGE TUBE**

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**MISCELLANEOUS**



# CITEL



-  CITEL
-  Factories
-  Test Laboratories
-  Distributors

## An international network

### France

- Sèvres :**
- Headquarters
  - General management
  - Administrative and Financial Department
  - Sales division : France and Export
  - Research and Development

**Reims** - Production and Shipment

### Subsidiaries

**Citel Electronics GmbH** - Bochum (Germany)

**Citel Inc.** - Miramar (USA)

**Shanghai Citel Electronics Co., Ltd** - Shanghai (China)

**Citel Russia** - Moscow (Russia)

**Citel India** - New Delhi (India)

**Citel Electronics** - Praha (Czech Republic)

*Distributors in more than 50 countries*





# CITEL

## A long history.....

- 1937** CITEL founded.  
Manufacture of tubular light bulbs.
- 1944** Manufacture of the first Surge Arrester.
- 1976** CITEL acquired by the present Management.  
Light bulb manufacturing discontinued.
- 1985** CITEL America founded in Miami.
- 1988** CITEL Electronics GmbH founded in Düsseldorf.
- 1992** Acquisition of CLAUDE gas tube line from GTE Sylvania at Reims, and OBSTA.
- 1996** Establishment of Shanghai CITEL Electronics Co., Ltd.
- 2000** New technology for AC surge protectors (VG series).
- 2005** New JV for coaxial surge protectors production CITEL Tong Da.
- 2007** AC surge protectors become the best-selling range
- 2010** CITEL Russia founded in Moscow
- 2012** CITEL India founded in New Delhi



## Testing labs.....

In order to test its products internally for standards compliance and to evolve toward greater reliability CITEL has several test sites (France, USA, China) equipped with:

- Wave generators current 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 hybrid wave generators up to 10 kV/10 kA
- 400 Vac three phase low voltage network-lcc 1.5 kA / phase for coupling with pulsed current
- HT Digital Oscilloscopes fast
- Materials for test environment (damp heat, climate, shock)

The G100K test generator in Reims (France) can produce exceptionally high impulse current 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 only business is to protect networks and equipment from transient overvoltages, in particular those induced by lightning. For this, CITEL manufactures two complementary products lines:

- **Gas discharge tubes** (or GDTs) are the basic passive components used to protect telephone exchanges and equipment from voltage surges; they are generally installed on telephone networks by telecommunication operators.

- **Surge Protection Devices** (or SPDs) are units combining several protection components. They may be used by the installer or by the end customer. They are designed to be incorporated in an installation to protect all electric, electronic, and data-processing equipment from transient overvoltages.

# Transient overvoltages

*The users of electronic equipment and telephone and data-processing systems must face the problem of keeping this equipment in operation in spite of the transient overvoltages induced by lightning.*

*There are several reasons:*

- *Integration of electronic components makes the equipment more vulnerable.*
- *Interruptions of service are unacceptable.*
- *Data transmission networks cover large areas and are exposed to more 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 industrial overvoltages have been with us for a long time, but ESD and NEMP disturbances are much more specific and arise from recent technological developments (massive use of semiconductors for the former, thermonuclear weapons for the latter).

## Lightning

Lightning, investigated since Benjamin Franklin's first research in 1749, has paradoxically 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 ranges from 1,000 to 200,000 Ampere peak, with a rise time of about few microseconds. This direct effect may be considered as a small factor in damaging electric and electronic systems, because it is highly localized.

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



## Indirect effects

There are three types of indirect electrical effects :

### Impact on overhead lines

Such lines are very exposed and may be struck directly by lightning, which will first partially or completely destroy the cables, then cause high surge voltages that travel naturally along the conductors to line-connected equipment. The extent of the damage depends on the distance between the strike and the equipment.

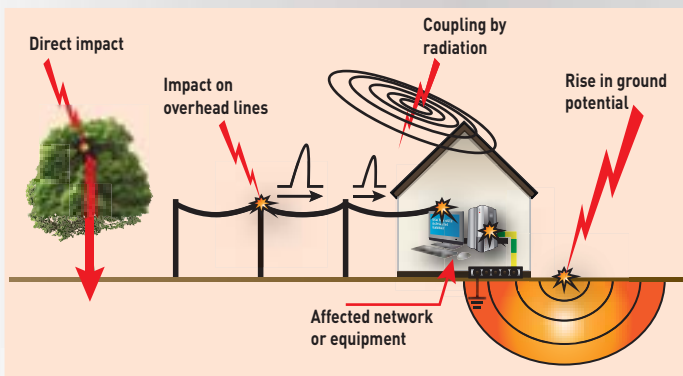
### Rise in ground potential

The flow of lightning in the ground causes earth potential increases that vary according to the current intensity 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 regarded as an antenna several miles high carrying an impulse current of several tenth of kilo-amperes, radiating intense electromagnetic fields (several kV/m at more than 1 km).

These fields induce strong voltages and currents in lines near or on equipment. The values depend on the distance from the flash and the properties of the link.



## Industrial surges

This term covers 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 generate transients of several kV with rise times in the order of a few microseconds, disturbing equipment in networks to which the source of disturbance is connected.

### 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 touch some conducting object and be discharged in a few nanoseconds, with a current of about ten Amperes. All integrated circuits (CMOS, etc.) are quite vulnerable to this kind of disturbance, which is generally eliminated by shielding and grounding.

### NEMP phenomena

(Nuclear ElectroMagnetic Pulses)

A high-altitude nuclear explosion, above the atmosphere, creates an intense electromagnetic field (up to 50 kV/m in 10ns), radiated to a ground area up to 1200 kilometers in radius.

In the ground, the field induces very large transient overvoltages in power and transmission lines, antennas, etc., destroying the terminal equipment (power circuit, computer terminals, telephone equipment, etc.).

The field rise 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 protection adapted to NEMP.

## Effects of overvoltages

Overvoltages have many types of effects on electronic equipment; in order of decreasing importance:

### Destruction

- Voltage breakdown of semiconductor junctions
- Destruction of bonding of components
- Destruction of tracks of PCBs 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 ageing

Components exposed to overvoltages have a shorter life.

## Surge Protection devices

The Surge Protection Devices (or SPD : this is a generic name for any device to protect from voltage surges) is a recognized and effective solution for the overvoltage problem. For greatest effectiveness, however, it must be chosen according to the risk and installed in accordance with the applicable 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 and a series of standardized waves created (1.2/50 $\mu$ s voltage wave and 8/20 $\mu$ s and 10/350 $\mu$ s current waveforms), then a number of standards defining surge arrester performance were issued, among them :

Surge Protectors for Low-Voltage installations :

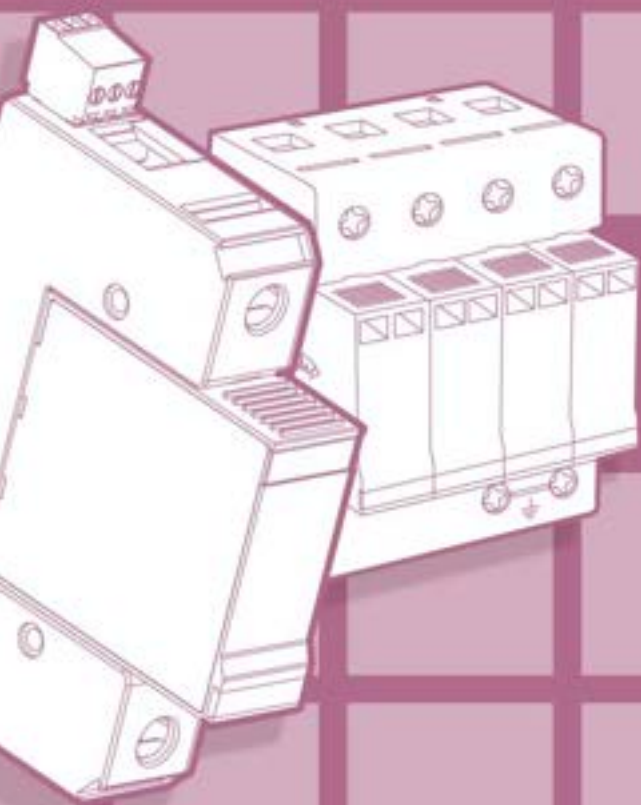
- NF EN 61643-11 (France)
- VDE 0675-6-11 (Germany)
- EN 61643-11 (Europe)
- UL 1449 (USA)
- IEC 61643-11 (International)

Surge Protectors for Telecom equipment :

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



CITEL



## DIN RAIL AC Surge Protectors

# DIN Rail AC power Surge Protectors

CITEL DS AC power Surge Protective Devices (SPD) 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 cabinets. The SPDs are equipped with a thermal disconnection device and provide real-time fault indicators thus allowing complete operational safety.

DS surge protectors are available with several protection circuits to comply with even the most demanding installations and standards compliance requirements.

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



## Standards

To ensure efficient and reliable performances, all CITEL's AC power surge protectors comply with the leading standards.

Relevant standards in the AC surge protection field could be split into 3 types of documents:

### «Product» standards :

These documents address the type of tests the SPD manufacturer must apply on its devices :

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

### «Installation» standards :

These documents give the main information about AC power surge protectors and its proper installation:

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

### «Selection» standards :

They define the basic rules to select the surge protector in accordance with the general electrical code :

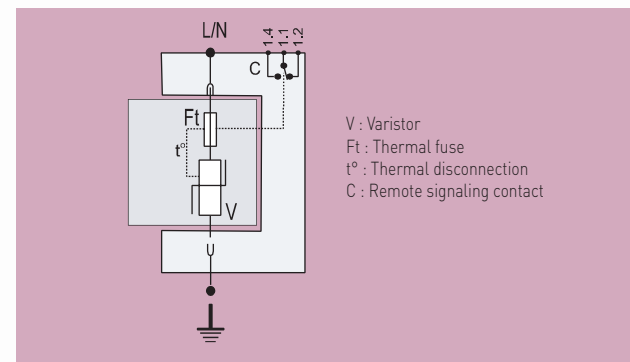
- Germany : DIN VDE 0100 part 443 and 534
- International : IEC 60364-4-433 and 5-534
- France : NF C 15-100 sect. 443 and 534

## Operating principle

DS surge protectors are based on zinc metal-oxide varistors (MOV), the best compromise between a fast response time (<25 ns) and a high discharge current capacity, which are the main parameters to provide efficient protection.

Nevertheless the end of life of these varistors must be absolutely monitored thus requiring the systematic use of built-in thermal disconnection devices (see «Disconnection devices»).

### DS40 surge protector diagram



### VG technology by CITEL

In order to improve the surge protection efficiency, CITEL has developed a patented technology which combines a high energy varistor (MOV) network and a specific gas tube (GSG). This specialized circuit incorporated in the «VG» Type "1+2+3" surge protectors (DS150VG, DS250VG, DUT250VG) or Type "2+3" (DS40VG) can achieve better performance of:

- Protection level,
- Life duration (due to the suppression of leakage current),
- Continuous operation and power quality (no follow current)
- End of life behavior.

For instance, these features allow it to reach, even with a single stage of surge protection, the same protection efficiency as a double stage association (Type 1, Type 2 and Type 3 SPDs) (see page 13).





## Surge protectors parameters

Surge protectors are defined by a serie of electrical specifications which will help the user to select the right protection specific to their installation:

### **Operating voltage - $U_c$**

The maximum continuous operating voltage (MCOV)  $U_c$  is the maximum r.m.s voltage which may be applied continuously to the SPD.

### **Temporary overvoltage - $U_T$**

The temporary overvoltage  $U_T$  (TOV) is the maximum r.m.s. value the surge protector can withstand during 5 seconds, without failure. In many cases , this parameter  $U_T$  is equal or superior to  $U_c$ .

### **Discharge current - $I_n$ and $I_{max}$**

The maximum discharge current ( $I_{max}$ ), applicable to Type 2 SPD, is the maximum impulse current 8/20  $\mu$ s a surge protector can withstand without destruction .

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.

### **Impulse current - $I_{imp}$**

The impulse current ( $I_{imp}$ ), used in Class I test applicable to Type 1 SPDs, is the maximum impulse 10/350  $\mu$ s current a surge protector can withstand without destruction. This test simulates the effect, on AC power surge protectors, of a direct lightning strike on an installation.

### **Open circuit voltage - $U_{oc}$**

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

### **Level of protection - $U_p$**

Maximum residual voltage of the surge protector during an 8/20 $\mu$ s current waveform shot (at the maximum of the  $I_n$  or  $I_{imp}$  declared current) or during a 1,2/50 $\mu$ s @ 6kV voltage waveform shot test (if required)..

### **Residual Voltage - $U_{p-in}$**

Residual voltage of the surge protector during an 8/20 $\mu$ s current waveform shot at a determined value ( $I_n$  or  $I_{imp}$ ). This value is lower than the  $U_p$  Protection level for all the VG type surge protector.

### **Short circuits capability - $I_{sc}$**

The surge protection and its associated disconnector (Fuse) are tested at a maximal short circuit current value (ex: 25kA) : This  $I_{sc}$  value needs to be higher than the short circuit value of the network at the installation point.

### **Follow on current extinction capability - $I_{fi}$**

This criteria is only devoted to surge protection using the "air gap" technology:once they have fired, these surge protectors conduct part of the network current (follow on current) and need to interrupt it. This behavior does not concern low voltage surge protector using Metal Oxide Varistor technology.

# DIN Rail AC power Surge Protectors

## Type of surge protectors

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

### **Type 1 surge protectors**

Type 1 surge protectors are designed to be installed where a direct lightning strike risk is high, especially when the building is equipped with 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 10/350  $\mu$ s impulse current in order to simulate the direct lightning strike consequence. Therefore these Type 1 surge protectors must be especially powerful to conduct this high energy impulse current.

### **Type 2 surge protectors**

Type 2 surge protectors are designed to be installed at the entrance of the installation, in the main switchboard, or close to sensitive terminals, on installations without LPS (lightning rods). These

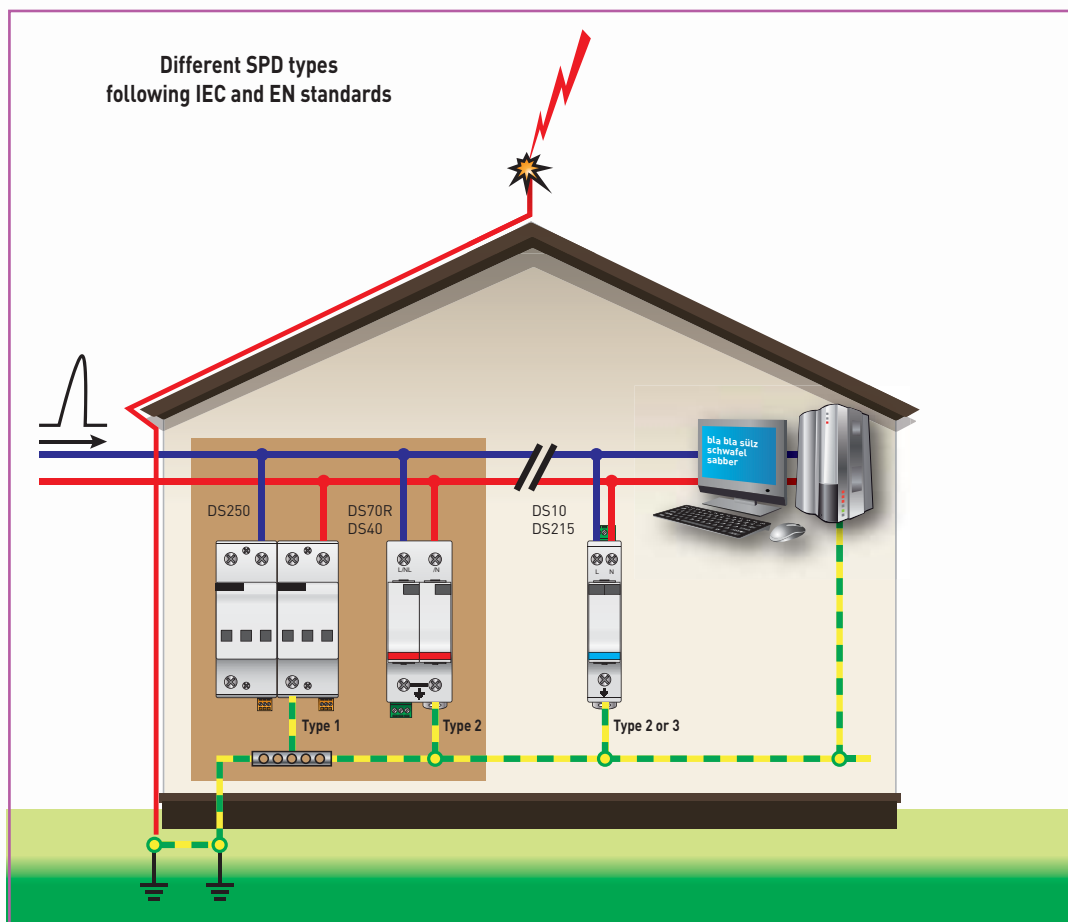
protectors are tested following the Class II test from IEC61643-11 or EN61643-11 standards and based on 8/20  $\mu$ s impulse current injection.

### **Type 3 surge protectors**

In case of very sensitive or remote equipment, secondary stage of surge protectors is required : these low energy SPDs could be Type 2 or Type 3. Type 3 SPDs are tested with a combination waveform (1,2/50  $\mu$ s - 8/20  $\mu$ s) following Class III test

### **Surge protector combination**

Surge Protectors incorporating VG technology provide protection equivalent to a coordination of a type 1 + type 2 + type 3 surge protector. Advantages: reduces the cost and time of installation. Simplifies selection (no calculation of coordination) (see page 13-14).



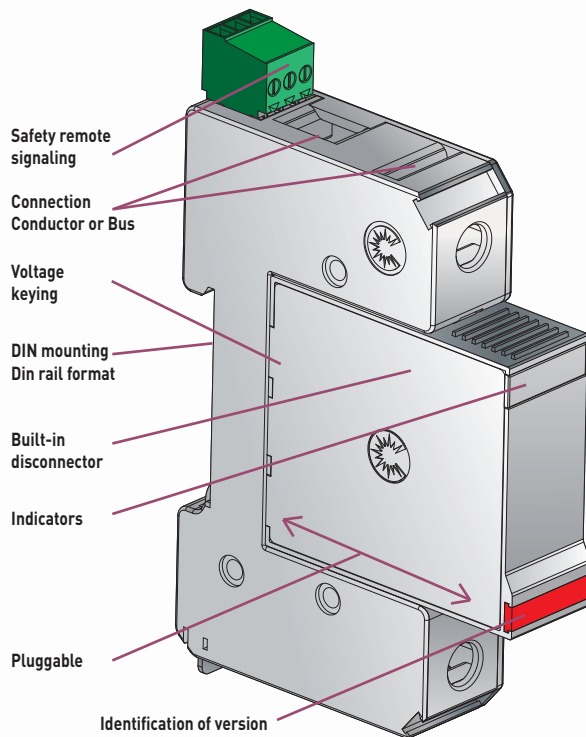
## Disconnection devices

In compliance with the standards, the AC power surge protectors are equipped with external and internal disconnection devices in order to provide total safety in case of failure.

2 types of devices are necessary :

- **Internal thermal security** which will disconnect the surge protector from the AC network in case of thermal runaway. In such a case, the user will be warned about the trouble by an indicator (mechanical or light) in front of the protector and will carry out the replacement of the defective SPD.
- **External electrical disconnection** (fuses or breaker) to disconnect the surge protector from the AC network in case of internal short circuit, e.g. due to an excessive impulse current. The rating of the external fuses (or breaker) are in relation with the 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 breaker) are mentioned in the SPD instructions by the manufacturer.

Note : even if standards require safety devices, the risk of disconnection of the surge protectors is very low.



AC power Surge Protector DS41

## Maintenance

DS surge protectors are designed for repetitive operation and do not require specific maintenance. Nevertheless, in case of an extreme event, a controlled end of life could occur (see above) and a maintenance operation must be performed .

### Pluggable design

The design of some DS surge protectors (DS10, DS40, DS240, DS70R, DS130R) is based on the use of a pluggable module that plugs into a matching receptacle. This makes replacement, and checking very easy without impairing the protection function. On multipolar surge protectors, the possibility of replacing a single pole makes rehabilitating a surge protector less expensive.

The plug-in module is identified with a color label in relation with the type (Black = Type 1 ; Red = Type 2 ; Blue = Type 2 low power or Type 3) and are keyed for operating voltage, in order to avoid misapplications.

### Signaling

DS surge protectors are equipped with a failure indicator (mechanical or light) linked to the internal thermal disconnector : in case of safety disconnection, the indicator will switch on and the SPD must be replaced.

### Remote Signaling

Most DS surge protectors are available in «remote signaling» versions. This feature, which allows remote checking of the status of the surge protector, is especially important when the products are hard to reach or unsupervised.

The system consists of an auxiliary changeover contact that is activated if the surge protector module changes status.

This lets the user monitor :

- the good operation of the SPD
- the presence of the plug-in modules (if any)
- the end of life (disconnection) of the surge protector.

The remote signaling version allows the choice of signaling system appropriate to the installation (light, buzzer, automation, modem transmission...).

# DIN Rail AC power Surge Protectors

## Surge protection installation

### Location

DS surge protectors are installed as follows, according to their types :

- **Type 1 or «Heavy duty»** : at the origin of the installation, in a separate box or on the main electrical panel, for efficient discharge of partial lightning currents.
- **Type 2 or «Primary»** : at the origin of the installation, on the main electrical panel, in order to eliminate impulses currents as fast as possible and thereby avoid coupling.
- **Type 2 (or Type 3) or «Secondary»** : on the secondary panel, near the sensitive equipment, to limit ringing and improve the level of protection.

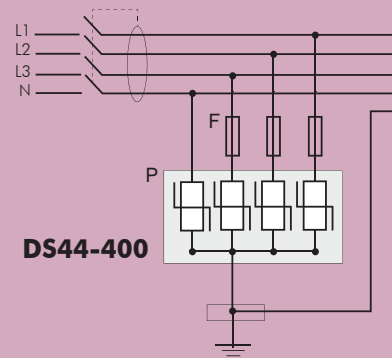
### Wiring

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

Some recommendations call for additional differential-mode protection (between phase and neutral). For these applications, CITELE offers specific versions, using a gas tube base module for the Neutral to Ground (common mode) protection: this type of installation is called a «CT2 connection» in IEC 60364 standard, is used in surge protectors such as DS44-230/G.

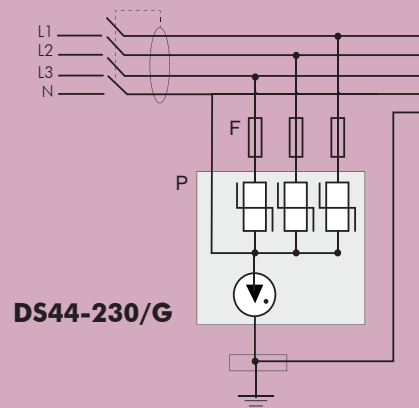
### Common mode protection

CT1 Connection



### Common and differential mode protection

CT2 Connection



### Installation

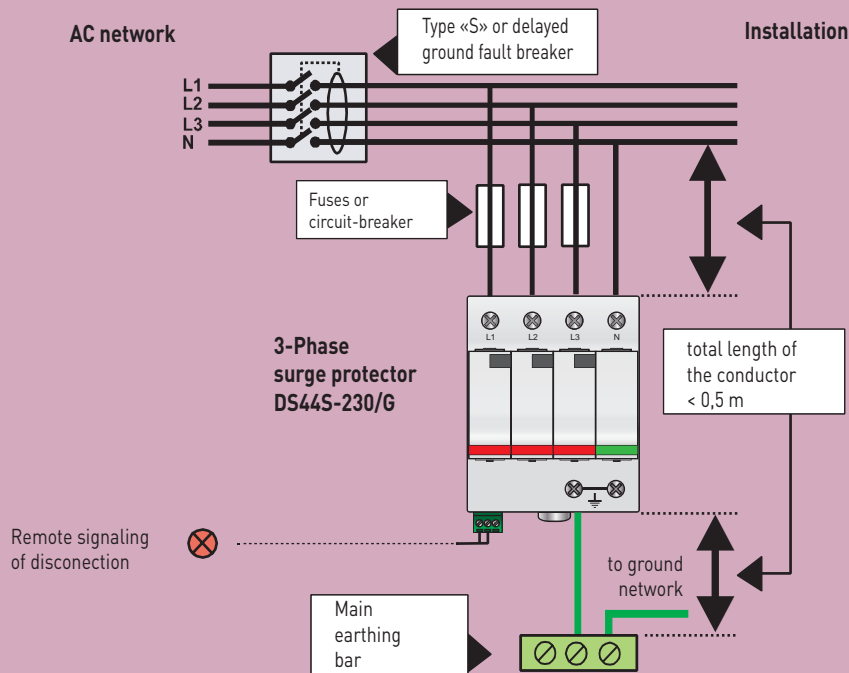
DS surge protectors are connected in parallel on the AC network and must be equipped with external fuses (or breakers) for short-circuit protection (see paragraph «Disconnection devices»).

- The total length of connection wires to AC network must be lower than 0.5 m in order not to increase the protection level (Up) provided by the SPD.
- Wiring is made by screw connections. On some models, a distribution bus can be used.
- The protection wire coming from the SPD must be connected to the bonding bar of the electrical panel. Paralleling the protection wire with phases conductors must be avoided.

- The cross sectional wire must be 6 mm<sup>2</sup> minimum for Type 2 SPD's and 16 mm<sup>2</sup> for Type 1.
- Local earthing resistance must be in compliance with the electrical rules.

Further information can be found in 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 exist on the market for surge protection on power network:

- 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 based on the use of specific types of Gas tubes: GSG. These components, the result of over 75 years of experience in the gas discharge tube field, have a behavior adapted to the power network and provide robustness and working stability: their association with varistors combines the advantages of both technologies.

CITELE originally developed the "VG" technology for low voltage Type 1 surge protectors and has then extended it to Type 2 surge protectors and to Photovoltaic applications.

CITELE range using the "VG" technology:

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

## Advantages of VG Technology

versus other technologies (specifically the triggered spark gap)



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

CITELE VG surge protectors are using specific gas discharge tubes: GSG. These essential components are the result of over 75 years of experience in the gas discharge tube field, are meant for power network and ensure a perfect electrical stability.



→ Increase reliability



### 2. Very low clamping level and high surge current capability

GSG are able to conduct very high surge currents ( $I_{imp}$ ,  $I_{max}$ ) with a very low residual voltage (Up). 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 handle very high TOV levels (Temporary over Voltage) up to 450Vac without any degradation to the level of protection.



→ Increased reliability for areas with unstable power networks



#### 4. No follow current

Unlike to "Air Gap" technologies, "VG" Technology does not create any follow on current.

VG -> Increased service continuity (No tripping of the upstream overcurrent protection device (OCP) during surge events)

 → *Improvement of the network quality (no power line disturbances)*

→ *Easy selection*



#### 5. Robustness and reliability

All the components of the VG surge protector are designed to handle high impulse discharge currents without any assistance from auxiliary systems. On the contrary, the "Triggered Air Gap" technology includes a control circuit, using very low power components, which handle parts of the surge current. During some low amplitude, low voltage transients this weak circuit will handle the full amount of current and will eventually fail.

 → *Increase reliability*

→ *Better life expectancy*



#### 6. Safe disconnection and Device status signalization

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

 → *Safe and efficient maintenance*



#### 7. No ageing

During normal operation, in addition to transient events, varistors are always conducting a small amount of current. This current is the result of working current ( $I_c$ ) and leakage current ( $I_{pe}$ ) and is due to the varistors connection to the grounding system. This type of conduction can be stressful to the varistor over time, especially in dc power systems, and cause the varistor to age prematurely.

 → *Maximum life*



#### 8. Easier surge protection coordination

In the case of coordinated installations, the surge protector downstream a VG surge protector does not need any special consideration, such as a sufficient distance between locations, in order 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 protector

 → *Easier to use*

### Conclusion :

CITEL Surge Protectors based on VG technology offer the best level of efficiency and reliability, conditions essential for achieving the maximum performance of your protection system.

# DIN Rail Low Voltage Surge Protectors

## Choosing Surge Protectors

CITEL's line of AC power surge protectors is designed to cover all possible configurations in low voltage installations.

They are available in many versions, which differ in :

- Type or test class (1, 2 or 3)
- Operating voltage (Uc)
- AC network configuration (Single/3-Phase)
- Discharge currents (Iimp, I<sub>max</sub>, I<sub>n</sub>)
- Protection level (Up)
- Protection technology (varistors, VG technology, filter)
- Features (differential mode, plug-in, remote signaling...).

The surge protection selection must be done following the local electrical code requirements (e.g. : minimum rating for I<sub>n</sub>) and specific conditions (e.g. : high lightning density).

### Choosing the Type of surge protectors

The type of surge protector is based on its location and the constraints of the installation to be protected.

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

### Choosing the operating voltage Uc

The SPD U<sub>c</sub> voltage (maximum continuous operating voltage) depends on:

- Nominal voltage of the AC network (U<sub>0</sub>)
- Type of AC system (TN, TT, IT).

The level of resistance to temporary overvoltages (U<sub>T</sub>) is related to the U<sub>c</sub> voltage.

### Operating voltage Uc (Line/Ground)

AC Network	230/400V			120/208V
	TT	TN	IT	TN
<b>Voltage U<sub>c</sub></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 surge protectors are available for single, 3-Phase and 3-Phase + neutral AC networks.

### Choosing Iimp

The impulse current I<sub>imp</sub> is defined for Type 1 SPD. The minimum rating for I<sub>imp</sub> is 12.5 kA by pole, following IEC 60364-5-534. This level is adapted to the real phenomenon.

CITEL proposes, in its Type 1 SPD range, 2 levels of I<sub>imp</sub> current : 12.5 and 25 kA.

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

### Choosing I<sub>n</sub> and I<sub>max</sub> currents

The relevant nominal discharge current I<sub>n</sub> for the SPD is in relation with the lightning risk in the installation area.

The minimum rating of I<sub>n</sub> for a SPD connected at the installation entrance is 5 kA (8/20 μs waveform), required by standard.

Nevertheless higher ratings are advised in case of high lightning density. Moreover higher values of I<sub>n</sub> current will increase the SPD lifetime.

I<sub>max</sub> (max. discharge current) rating is linked to I<sub>n</sub>.

Conditions	I <sub>n</sub>	CITEL
Very high lightning density	<b>&gt; 20 kA</b>	DS70R
High or medium lightning density	<b>10-20 kA</b>	DS40, DS40VG DS240, DS440
Low lightning density or secondary SPD	<b>5 kA</b>	DS10 DS215, DS415

### Choosing the protection level Up

The user must select a surge protector with a protection level Up adapted to the withstand level of terminal equipment. In every case, the lower the protection level Up, the better the protection.

IEC 60364 standard calls for the minimum protection level of 2.5 kV for a SPD connected at the entrance of a 230/400 V network : this level is in compliance with the withstand of robust devices (electromechanical type).

Electronic-based terminals have lower impulse withstand and require a better protection : so, surge protectors with 1.5 kV protection are necessary to provide efficient protection.

Conditions	Recommended Up	
	230/400 V AC network	120/208 V AC network
SPD at the installation 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>

A relevant choice of the SPD technology, as well as the use of coordination diagram can help to improve the protection level.

### Choosing the SPD technology

DS surge protectors are based on Varistor (MOV) technology. Some versions use different electrical diagrams :

- **«VG» technology** : this Gas tube-Varistor hybrid association, used in Type 1 SPD (DS130VG, DS250VG, DUT250VG, DS40VG), improves the reliability and the efficiency (see page 13-14)..

- **Association with RFI filter** : The Surge protection panel CBB and secondary SPD DS-HF combine surge protection stage and filter stage in order to improve the protection level.

### Coordination of Surge Protectors

In order to provide maximum protection efficiency, it is necessary to create a «coordination» diagram, that means installation of a «primary» SPD at the network entrance and a «secondary» close to sensitive equipment.

This association is required in the 2 following cases :

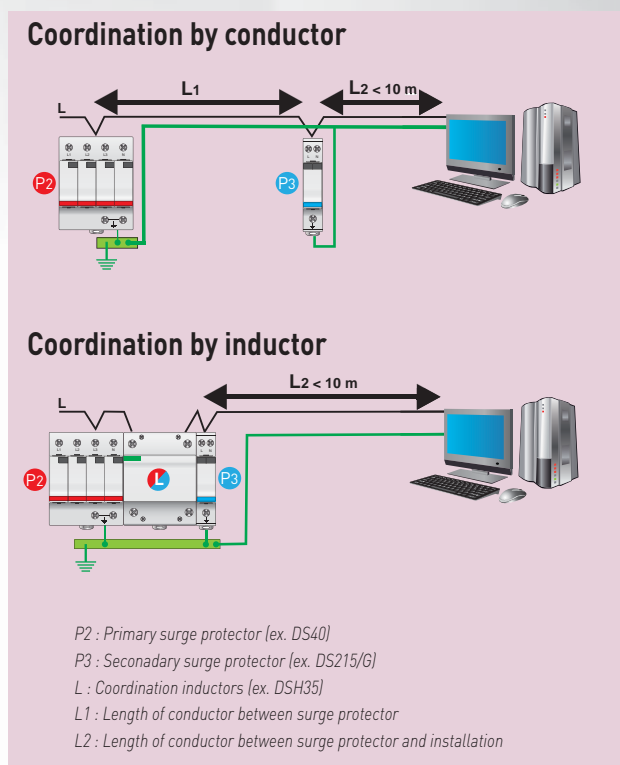
- High sensitivity equipment :  
 ➔ Improvement of protection level.
- Long distance (greater than 30 m) of wire between equipment to be protected and primary SPD :  
 ➔ Reduction of ringing voltages created during the surge transmission.

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

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

### Coordination with VG Surge Protector

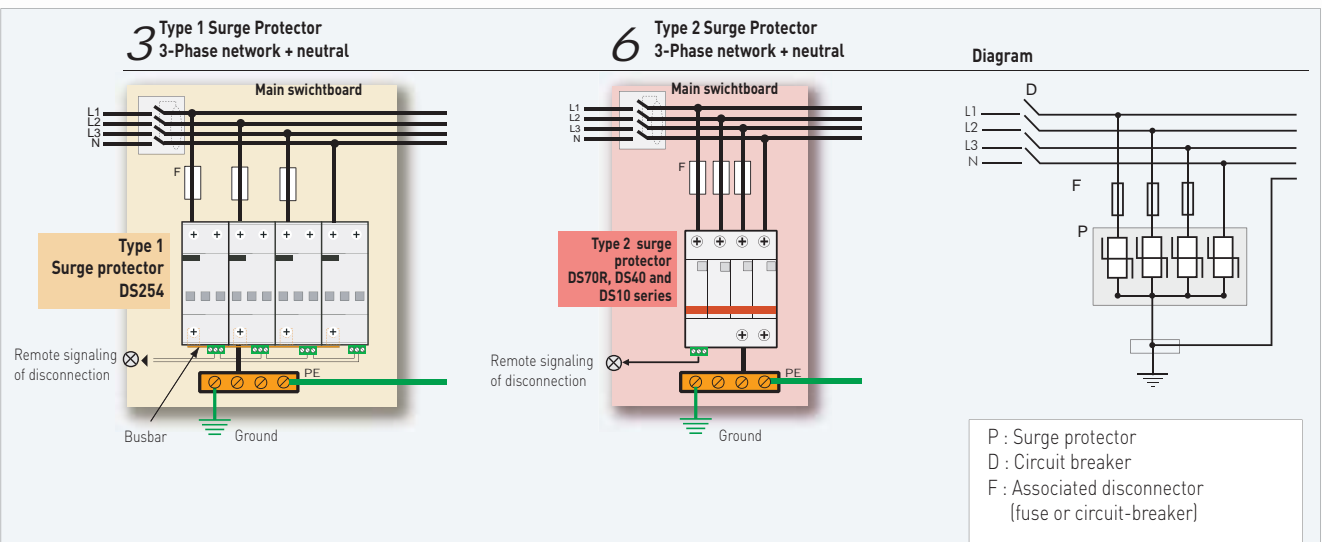
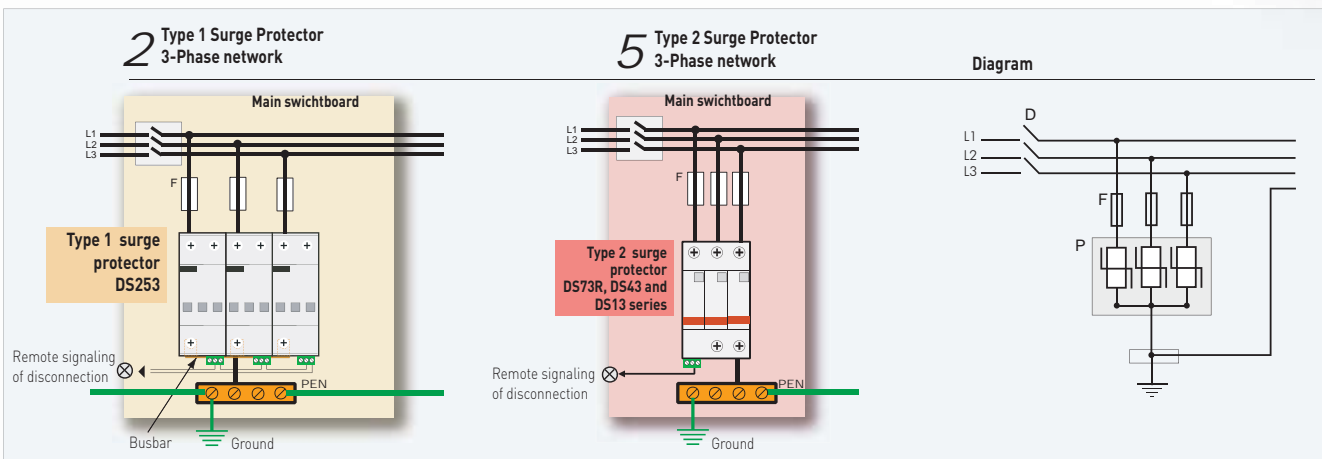
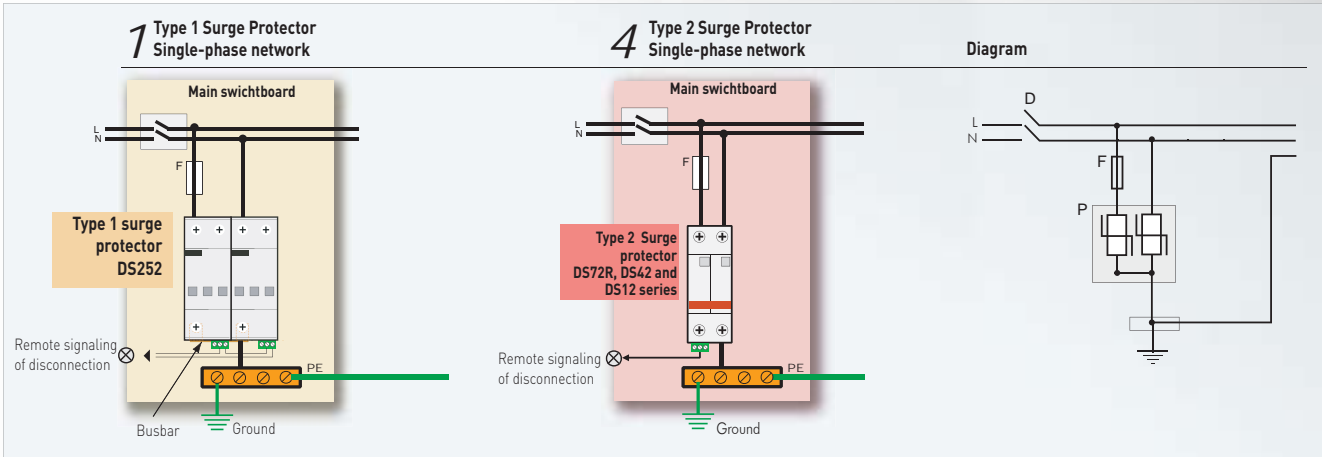
With VG technology there is no consideration of the cable length or to use inductance (see page 22).



# DS surge protectors wiring

## Common mode protection (CT1 connection)

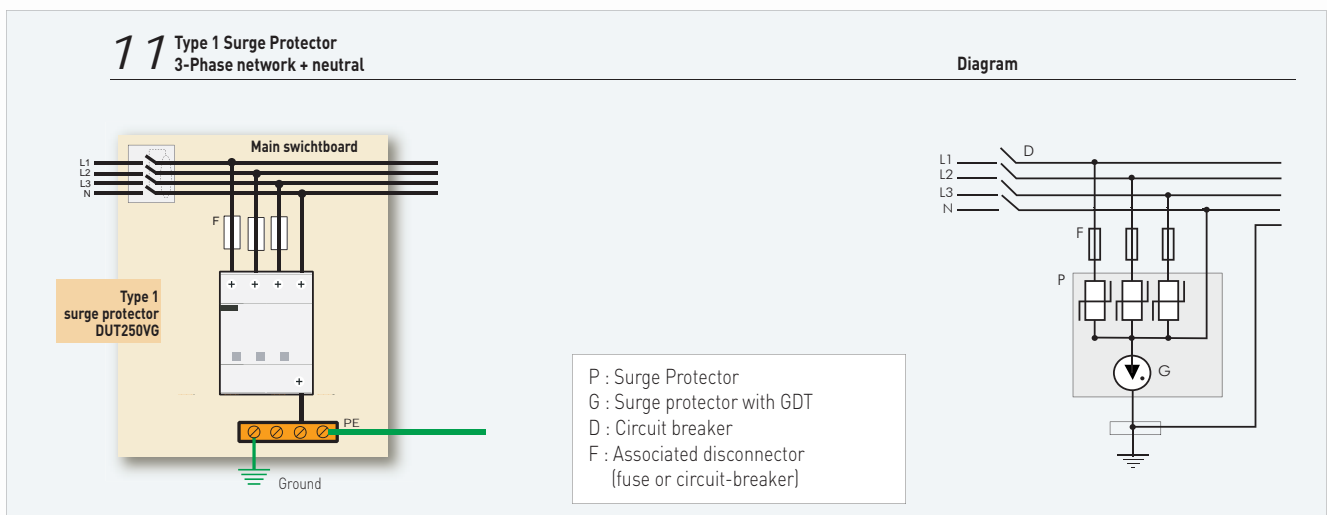
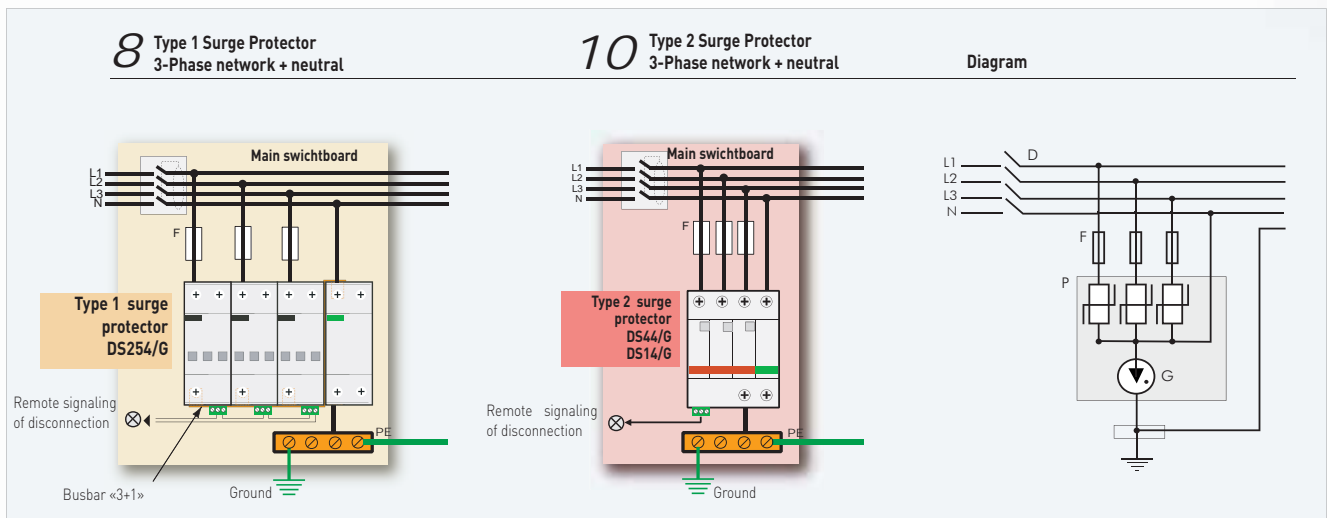
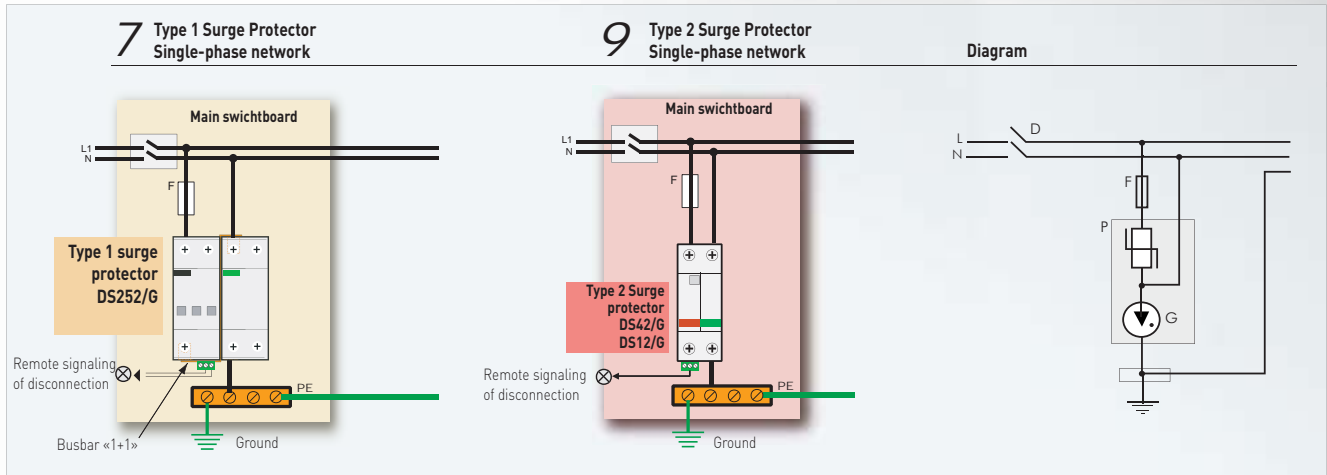
Common mode (L/PE) protection provided by DS surge protectors in relation with the different types of AC network. Called CT1 connection type in IEC 60364 std.



# DS surge protectors wiring

## Common and Differential mode protection (CT2 connection)

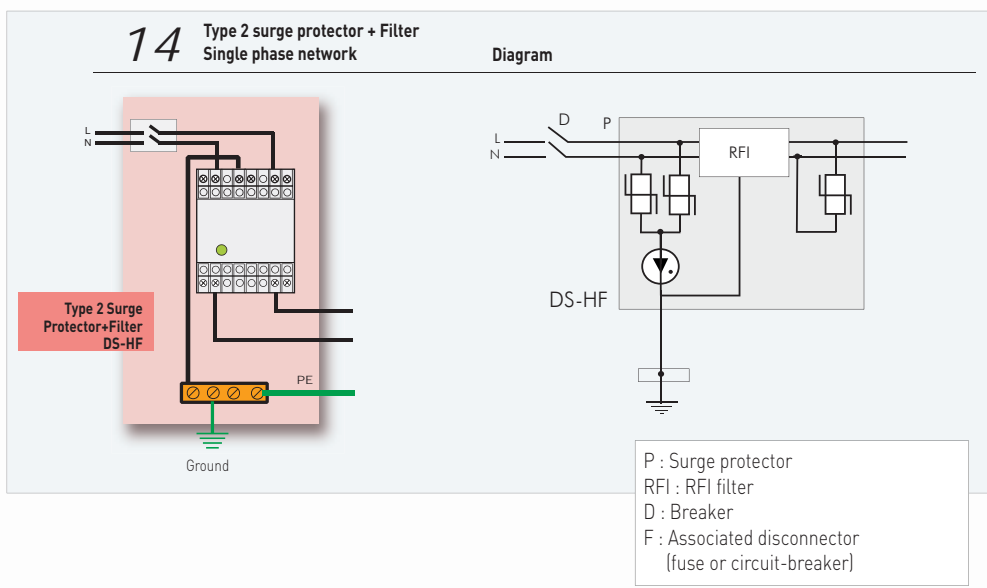
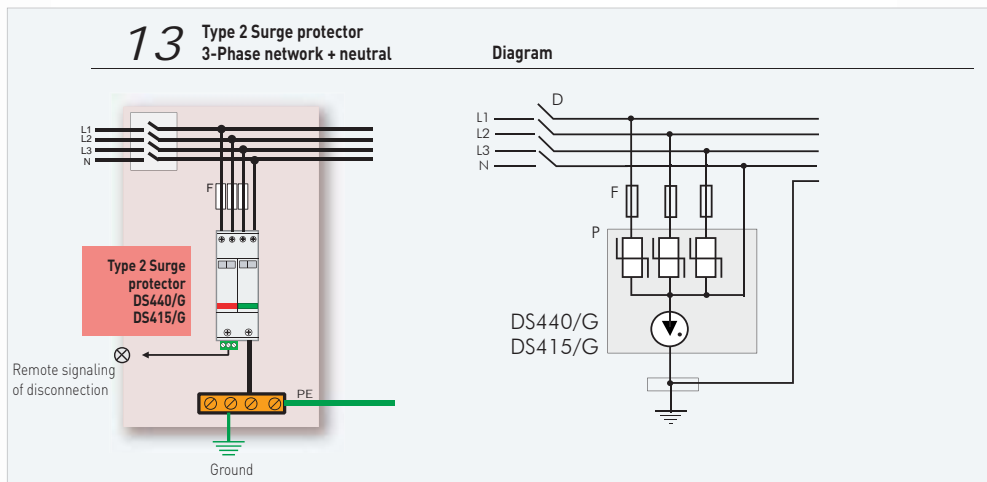
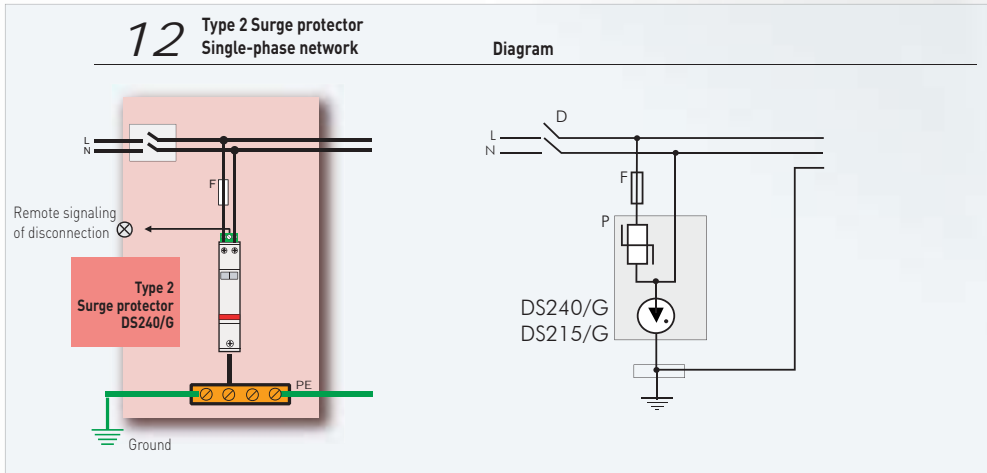
Common mode (L/PE) and differential mode (L/N) protection provided by DS surge protectors in relation to the different types of AC network. These configurations CT2 (following IEC 60364) are also called "1+1" and "3+1" mounting.



# DS surge protectors wiring

## Multipole Type 2 surge protectors wiring

Wiring instructions for Multipole Type 2 surge protectors.



# DS surge protectors wiring

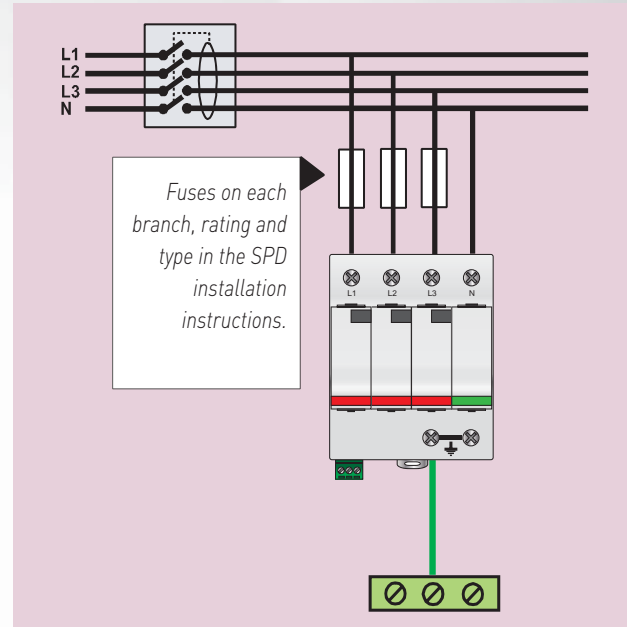
## Associated fuses

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

The rating of this fuse is given by the SPD manufacturer in the product datasheet and installation instructions. The choice of this rating depends of 2 criteria:

- Withstand of the short-circuit current test in the IEC 61643-1 standard : the fuse must cut safely the short-circuit current before a harsh destruction of the SPD.
- Withstand of the discharge currents ( $I_n$  or  $I_{max}$ ) : the fuse must be able to conduct the discharge current of the SPD without blowing.

CITEL has selected some fuses and DIN rail holders to fit with his SPD range. The fuses are equipped with failure indicators to check easily their opening and the holders can be supplied with or without contact for remote signal of fuse status.



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	withou 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

# DS surge protectors wiring

## Coordination of Surge Protector

In order to provide maximum protection efficiency, it is necessary to create a «coordination» diagram: that means installation of a «primary» SPD at the network entrance and a «secondary» close to sensitive equipment.

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

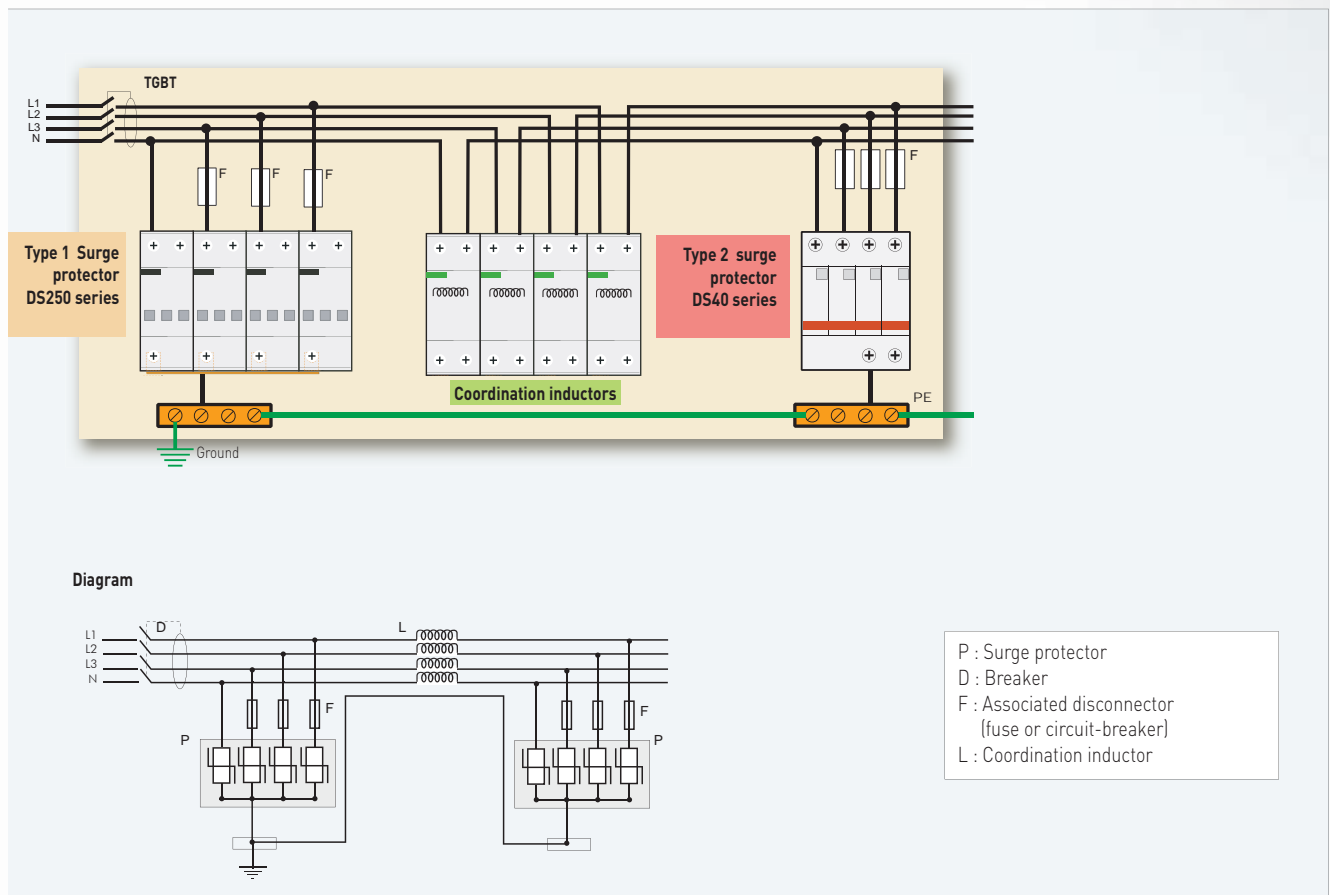
- a minimum length of wire (> 10 m).

or

- coordination inductors (DSH range: see below).

Futher information is available in installation instruction sheet.

Example of coordination on 3-Phase network.



# DS surge protectors wiring

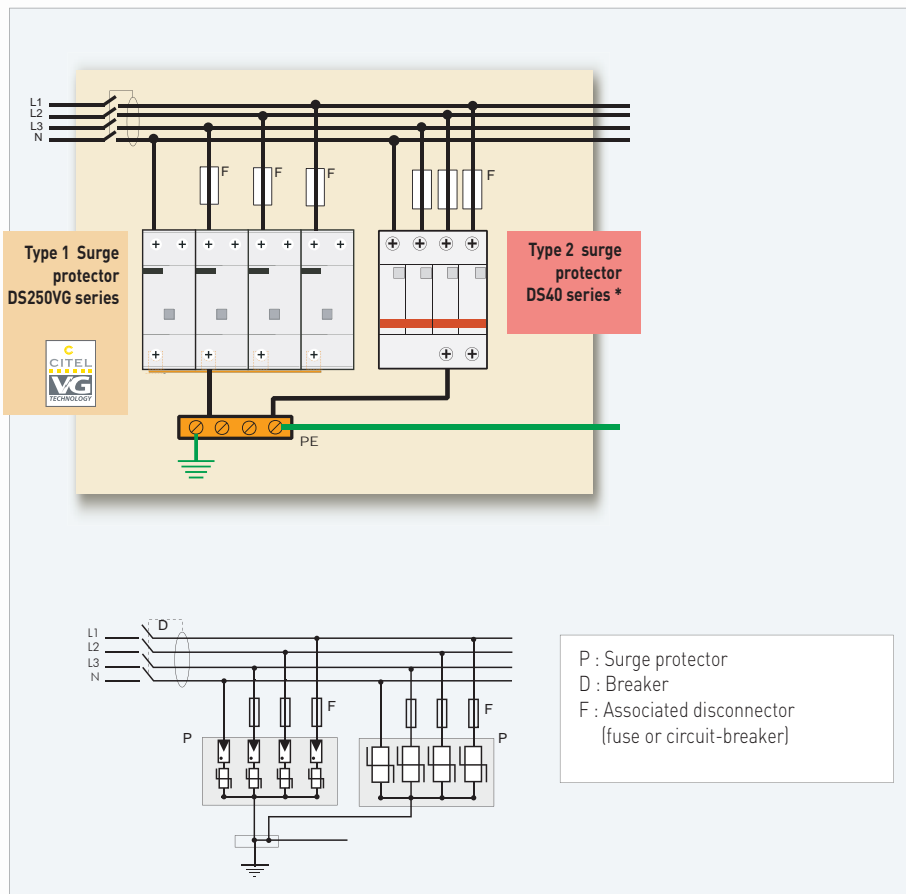
## Direct coordination with VG surge protector



An additional benefit of the VG technology is to ensure effective coordination with secondary surge arrester without special precautions (no decoupling length required). It is therefore possible to directly connect the output of the surge arrester head VG secondary.

*Note: However, because of the very high lightning discharge capacity and low residual clamping of the VG SPD, the addition of a secondary surge protector is not necessary.*

Example of coordination on 3-Phase network.



\*optional

# International Standards for AC surge protectors

The performance, selection and application of AC surge protectors are defined by standards, to ensure an efficient and secure 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

Related 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 SPDs for electrical installation of buildings to obtain a limitation of transient overvoltages.

### Product standard : IEC 61643-11 :

This document addresses performance tests for AC surge protective devices (SPDs) following different classes (Class I , II or III test). It is mainly dedicated to surge protector manufacturers

### Selection and application guide : IEC 61643-12 :

This guide addresses the selection and application principles of SPDs in practical situations.

The section 4-443 of IEC 60364 recommends SPDs on electrical installations if they are supplied by overhead lines (partially or totally) and if the local keraunic level is equal or greater than 25. Some national standards based on IEC make the SPD installation mandatory in these conditions.

## Recommendations for SPD installation

Section 5-534 gives the minimum performance required for SPD installed at the entrance of installation, as nominal discharge current  $I_n \geq 5$  kA for Type 2 SPD and Lightning current  $I_{imp} \geq 12.5$  kA for Type 1 SPD.

**1** - The installation equipped with lightning rod (LPS):  
➡ **Recommendation : Type 1 SPD**, with Lightning impulse current lim of 12,5 kA minimum, connected at the origin of the installation.

**2** - The installation is 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 origin of the installation.

**3** - The installation is 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** - The installation is connected to an underground AC network

➡ Surge Protector not required.

Nevertheless, in the two last cases, a more accurate analysis could be done, taking into account the type of equipment (sensitivity, cost..) or the consequences of a service interruption (downtime costs, human hazards...) : IEC 61662 international standard proposes a method for assessing the risk related to surges due to lightning.

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

➡ Surge Protector mandatory or risk analysis required.

### Application of the 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	No mandatory*	<b>Mandatory</b> (Type 2)
Connection to underground AC line	Non mandatory*	Non mandatory*
The unavailability of the electrical network could have consequences on human safety	Risk analysis required	<b>Mandatory</b>

(\* ) Surge protectors are recommended in case of sensitive equipment or when a reinforced reliability is required.

## Conclusion

Depending on the countries, AC surge protectors could be recommended or mandatory in relation with the external conditions (type of network and lightning threat). Risk assessment methods are also available to determine more accurately the need of surge protection. In any case, all the present electrical installations are crowded with sensitive devices, installing properly selected surge protectors is becoming more and more critical.

# North-American regulation on low voltage Surge Protection Devices

## Standard Status

In North America, the international standard IEC does not apply. 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 protector for each application.

### NEC (National Electrical Code) :

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

The article 285 defines the selection and installation conditions of SPDs.

### Product Standard: UL1449, 3rd Ed.:

This document, devoted to 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.

### SPD type according to UL 1449 3rd Ed.:

Type is linked to the installation point of the surge protector in the network :

- **Type 1:** SPD connected on the line or load side of the main service disconnect, no additional overcurrent protection (OCP) is required.
- **Type 2:** SPD connected on the load of the main service disconnect.
- **Type 3:** Point-of-Use SPD, directly in front of equipment and further than 33ft (10m) from the main service disconnect.
- **Type 4:** SPD Assembly, assembly of surge components (Type5) including an internal or external thermal disconnect.
- **Type 5:** Surge components, i.e. Gas discharge tube, Silicon Diode, Metal Oxide Varistor (MOV).

### ANSI/IEEE Guide:

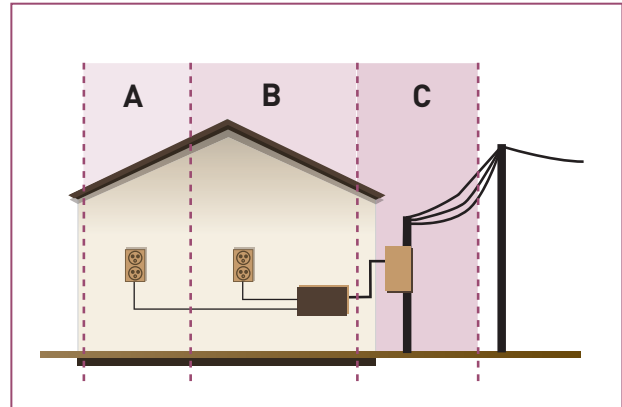
ANSI/IEEE publishes different informative guides regarding the risk of transient overvoltages to low voltage networks (IEEE C62.41.1), the surge environment and types of transients (IEEE C62.41.2) as well as the method for testing equipment against transients that are connected to the low voltage network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

Another important guideline detailing the installation of SPDs is called IEEE C62.72

### IEEE C62.41.2 Guide:

IEEE C62.41.2 Guide offers a selection of performance surge arresters 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

Catégories of location		Held mininale recommended arresters	
		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 range from CITELE

## Application field



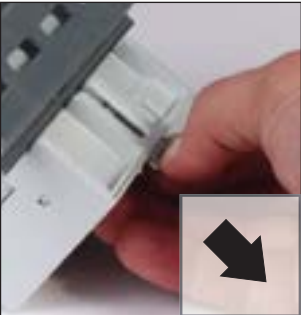
Application in standard electrical cabinets in compliance with international standard.

## DIN Rail mounting



Slide the surge protector into the rail, and press until the unit fits and snaps.

## Application field



Pull the assembly clamp, and remove the device.

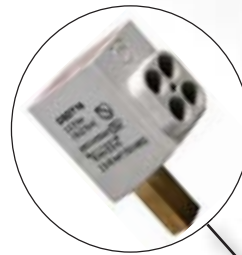
## A pluggable design

The design of most DS surge protectors is based on the use of a module to be plugged into a matching base.

This makes replacement and checking very easy without impairing your protection.

For multipole surge protectors, the possibility of replacing a single pole makes repairing a surge protector less expensive.

The plug-in module is identified with a color label in relation with the type (black = Type 1 ; red = Type 2 ; blue = low power Type 2 or Type 3) and are keyed for operating voltage, in order to avoid misapplications



### DSDT16

Option for mounting in series



### Plug-in module

All modules are marked with characteristics for major approval stamps.





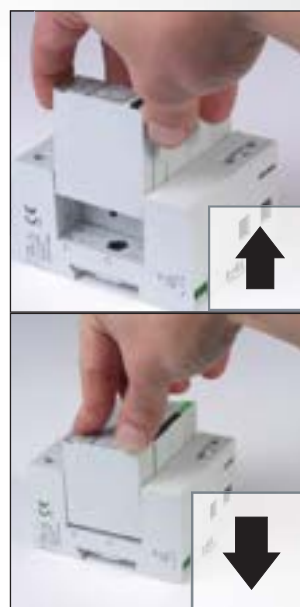
**Identified connections**  
All connections are identified to avoid an error (free installation).

### Signaling



Defective modules are identified by red indicator in the front window. It is then necessary to replace them

### Spare module



Easy module replacement, requiring no tools, thanks to the pluggable modules.

### Module codification



Mistake-free replacement thanks to an explicit and mechanical codification for the different operating voltages.

**Remote signaling**  
Less wiring thanks to a single remote signaling connector for all poles

# 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 origin of the AC installations equipped with LPS (Lightning Protection System). They are necessary to protect sensitive equipment connected to AC network against direct and indirect effects of lightning. Following the different national electrical codes, these SPDs can be recommended or mandatory.

Several mechanical formats are available to meet the needs of the user: Enclosures unipolar assembled, monobloc or equipped with pluggable modules.

These multipolar SPDs are using 2 different technologies :

- DS250VG, DS130VG, DUT250VG : «VG» technology,
- DS250E, DS130R : «MultiMOV» technology.

These surge protectors are available in a wide range of versions to be adaptable to all configurations :

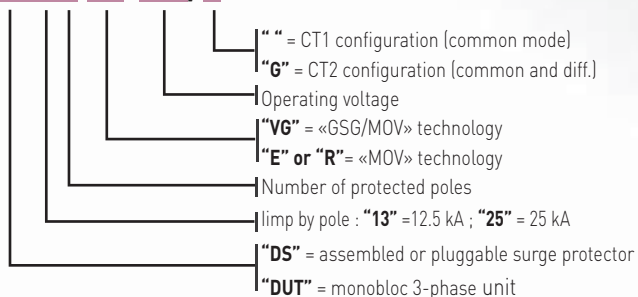
- Iimp by pole : 12.5, 15 and 25 kA (10/350  $\mu$ s)
- Total Iimp : up to 100 kA
- Single, 3 or 3-Phase+Neutral AC network
- 230/400V or 120/208V AC network
- All AC system types
- Common mode protection (CT1 configuration) or Common and Differential mode protection (CT2 configuration)








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

## Part number information

### DS254 VG-xxx/G



Range		Description	limp by pole (10/350 μs)	Characteristics	Page
DS250VG		1-pole reinforced surge protector - VG Technology	25 kA	Very high energy Very high efficiency	29
DS250E		1-pole reinforced surge protector - VG Technology	25 kA	Very high energy	31
DUT250VG		3-phase surge protector VG Technology	25 kA	Compact Very high energy	34
DS130VG		Pluggable surge protector VG Technology	12,5 kA	Compact Pluggable	35
DS130R		Pluggable surge protector	12,5 kA	Compact Pluggable	37

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

**limp  
25 kA**

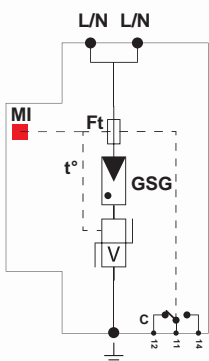
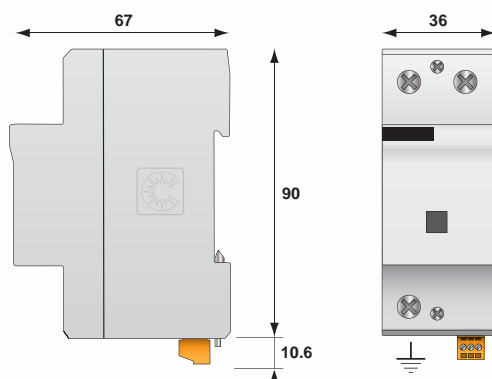


DS250VG-300

- **Type 1 + 2 + 3 Surge protector**
- **25 kA on 10/350 µs impulse**
- **Low voltage Up**
- **Internal disconnection, status indicator and remote signaling**
- **Optimized to TOV**
- **IEC 61643-11 and EN 61643-11 compliance**
- **UL 1449 ed. 3 recognition**
- **VDE approved**

## Dimensions - Electrical Diagram

(in mm)



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

## Characteristics

CITEL part number		DS250VG-300	DS250VG-120
AC Network		230/400V	120/208V
Connection mode		L/N, L/PE	L/N, L/PE
AC system		TT, TN	TT, TN
Max operating voltage	Uc	255 Vac	150 Vac
TOV withstand	UT	450 vac	230 Vac
Operating current	Ic	none	none
Leakage current at Uc			
Follow current	If	none	none
Nominal discharge current	In	30kA	30 kA
15 x 8/20 µs impulses			
Maximal discharge current	I <sub>max</sub>	70 kA	70 kA
max. withstand @ 8/20 µs			
Max. lightning current by pole	limp	25 kA	25 kA
max. withstand @ 10/350 µs			
Combination waveform test	Uoc	20 kV	20 kV
Class III test			
Residual voltage (at In)	Up-in	1.1 kV	0.7 kV
Protection level (at 6kV - 1,2/50µs)	Up	1.5 kV	1 kV
Admissible short-circuit current	I <sub>sc</sub>	50000 A	50000 A
<b>Associated disconnection devices</b>			
Thermal disconnector		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 ed.3	USA	Low Voltage TVSS	
<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.

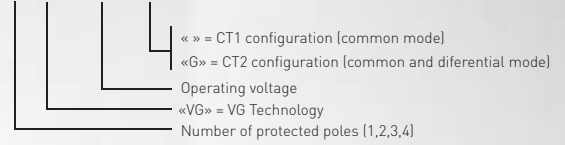


# Type 1 + 2 + 3 Multipolar Surge Protector DS252VG, DS253VG, DS254VG

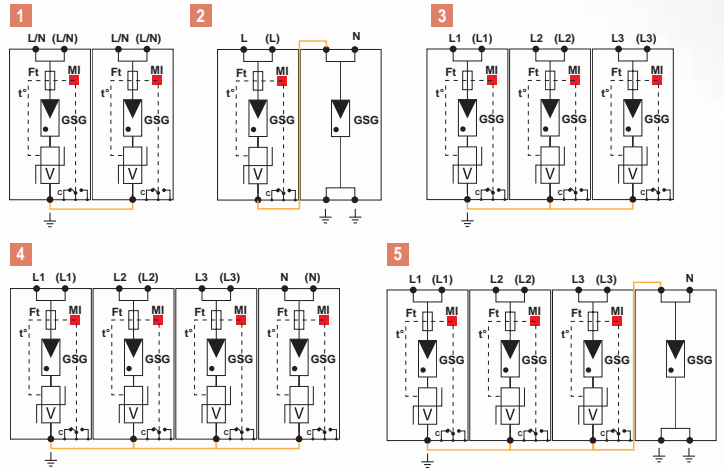
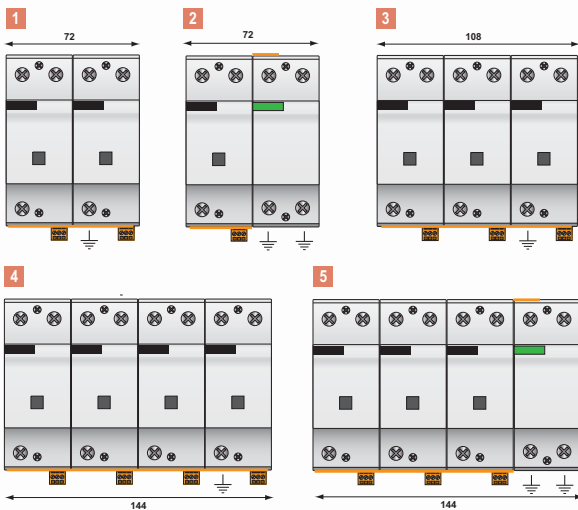


DS253VG-300

**DS25x VG-xxx/G**



## Dimensions - Diagram



References	Part number	Network	AC system	Protection mode		Iimp total	Up L/PE	Up L/N	Diagram
				common	differential				
DS254VG-300/G	2756	230/400 V 3-phase+N	TT-TN	●	●	100 kA	1.5 kV	1.5 kV	5
DS254VG-120/G	2757	120/208 V 3-phase+N	TT-TN	●	●	100 kA	1.5 kV	1 kV	
DS254VG-300	3713	230/400 V 3-phase+N	TT-TN	●		100 kA	1.5 kV	-	4
DS254VG-120	3722	120/208 V 3-phase+N	TT-TN	●		100 kA	1 kV	-	
DS253VG-300	3896	400 V 3-phase	TNC	●		75 kA	1.5 kV	-	3
DS253VG-120	3959	208 V 3-phase	TNC	●		75 kA	1 kV	-	
DS252VG-300/G	3403	230 V single phase	TN	●	●	50 kA	1.5 kV	1.5 kV	2
DS252VG-120/G	3960	120 V single phase	TN	●	●	50 kA	1.5 kV	1 kV	
DS252VG-300	3469	230 V single phase	TN	●		50 kA	1.5 kV	-	1
DS252VG-120	3950	120 V single phase	TN	●		50 kA	1 kV	-	

# Type 1 + 2 Surge Protector DS250E series

**limp**  
**25 kA**

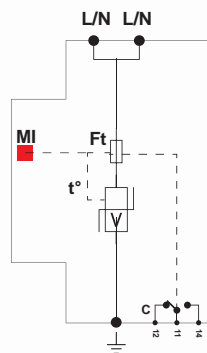
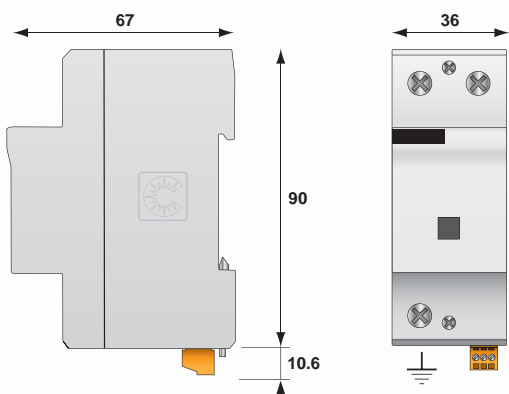


DS250E-300

- **Type 1 + 2 unipolar Surge Protector**
- **limp : 25 kA on 10/350  $\mu$ s impulse**
- **I<sub>max</sub> : 140 kA on 8/20  $\mu$ s impulse**
- **Internal disconnections, status indicators and remote signaling**
- **IEC 61643-11, EN 61643-11 and UL1449 ed.3 compliance**

## Dimensions - Electrical Diagram

(in mm)



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

## Characteristics

CITEL part number	DS250E-400	DS250E-300	DS250E-120
Network	230/400V	230/400V	120/208V
Connection mode	L/PE	L/N	L/N, L/PE
AC system	IT, TT	TT, TN	TT, TN
Max. operating voltage	Uc 440 Vac	330 Vac	150 Vac
TOV withstand	Ur 770 Vac	440 Vac	230 Vac
Operating current	Ic < 2 mA	< 2 mA	< 2 mA
Leakage current at Uc			
Follow current	If none	none	none
Nominal discharge current 15 x 8/20 $\mu$ s impulses	In 50 kA	70 kA	70 kA
Maximal discharge current max. withstand @ 8/20 $\mu$ s	I <sub>max</sub> 140 kA	140 kA	140 kA
Max. lightning current by pole max. withstand @ 10/350 $\mu$ s	limp 25 kA	25 kA	25 kA
Protection level (at In)	Up 2.5 kV	2.5 kV	1 kV
Admissible short-circuit current	50000 A	50000 A	50000 A

### Associated disconnection devices

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 : 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 ed.3	USA	Low Voltage TVSS

### Part Number

DS250E-400	3731
DS250E-300	2730
DS250E-120	3106

**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 Multipolar Surge Protector DS252E, DS253E, DS254E

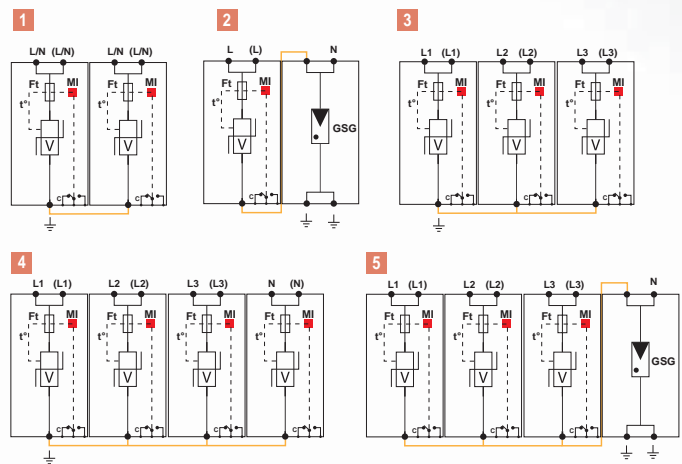
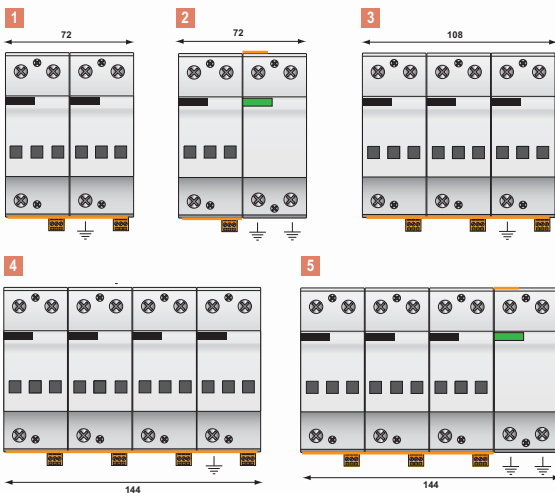


DS25x E-xxx/G

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

DS254E-300/G

## Dimensions - Diagram



Reference	Part number	Network	AC system	Protection mode		Iimp total	Up L/PE	Up L/N	Diagram
				common	differential				
DS254E-300/G	3411	230/400 V 3-phase+N	TT-TN	●	●	100 kA	2.5 kV	2.5 kV	5
DS254E-120/G	3831	120/208 V 3-phase+N	TT-TN	●	●	100 kA	1.5 kV	1 kV	
DS254E-400	3732	230/400 V 3-phase+N	IT	●		100 kA	2.5 kV	-	4
DS254E-300	3371	230/400 V 3-phase+N	TT-TN	●		100 kA	2.5 kV	-	
DS254E-120	3961	120/208 V 3-phase+N	TT-TN	●		100 kA	1 kV	-	3
DS253E-400	3939	400 V 3-phase	IT-TT	●		75 kA	2.5 kV	-	
DS1253E-300	3350	400 V 3-phase	TNC	●		75 kA	2.5 kV	-	
DS253E-120	3887	208 V 3-phase	TNC	●		75 kA	1 kV	-	2
DS252E-300/G	3404	230 V single phase	TN	●	●	50 kA	2.5 kV	2.5 kV	
DS252E-120/G	3409	120 V single phase	TN	●	●	50 kA	1.5 kV	1 kV	1
DS252E-400	3952	230 V single phase	TT-IT	●		50 kA	2.5 kV	-	
DS252E-300	3962	230 V single phase	TN	●		50 kA	2.5 kV	-	
DS252E-120	3951	120 V single phase	TN	●		50 kA	1 kV	-	

# Type 1 + 2 + 3 Surge Protector for 690 Vac network DS250VG-690 series

**limp  
25 kA**



DS250VG-690



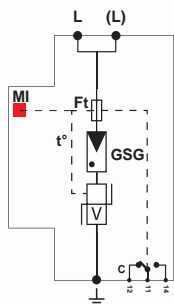
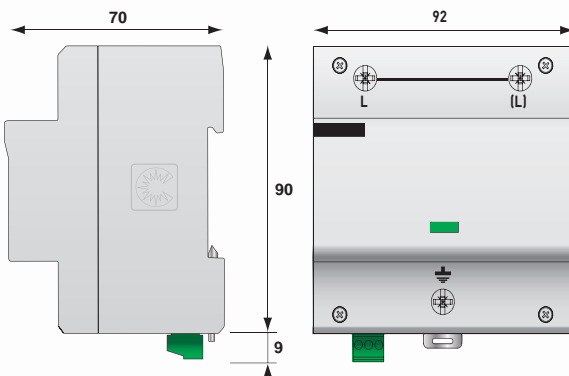
DS253VG-690

- **Type 1 + 2 + 3 surge protector**
- **In : 30 kA**
- **limp : 25 kA**
- **Low voltage Up**
- **Internal disconnection, status indicator and remote signaling**
- **EN 61643-11 and IEC 61643-11 compliance**

## Dimensions - Diagram

(in mm)

DS250VG-690



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

## Characteristics

CITEL part number	DS250VG-690	DS253VG-690
AC network	400/690 V	400/690 V
SPD configuration	1-Pole	3-phase
Maximal operating voltage	Uc 760 Vac	760 Vac
TOV withstand	U <sub>T</sub> 1350 Vac	1350 Vac
Operating voltage Leakage current at U <sub>c</sub>	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> 30 kA	30 kA
Maximal discharge current max. withstand @ 8/20 μs	I <sub>max</sub> 100 kA	100 kA
Max. lighting current by pole max. withstand @ 10/350 μs	I <sub>imp</sub> 25 kA	25 kA
Total lighting current max. withstand @ 10/350 μs	I <sub>total</sub> -	75 kA
Protection level (at I <sub>n</sub> )	U <sub>p</sub> 4 kV	4 kV
Admissible short-circuit current	I <sub>scrc</sub> 50000 A	50000 A
<b>Associated disconnection devices</b>		
Thermal disconnector	internal	
Fuses	Fuses type gG - 125 A max. (see Note 1)	
Installation ground fault breaker (if any)	Type «S» or delayed	
<b>Mechanical characteristics</b>		
Dimensions	See diagram	
Connection	by screw terminal : 4-35 mm <sup>2</sup> (50mm <sup>2</sup> flexible)	
Disconnection indicator	1 mechanical indicator/pole	
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	
<b>Standard compliance</b>		
IEC 61643-11	International	Low Voltage SPD - Test Class I and II
EN 61643-11	Europe	Low Voltage SPD - Test Class I and II
<b>Part number</b>		
DS250VG-690	--	
DS253VG-690	3957	

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



# Type 1 + 2 + 3 AC Surge Protector DUT250VG-300/G

**limp  
25 kA**

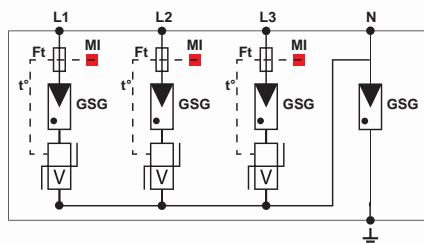
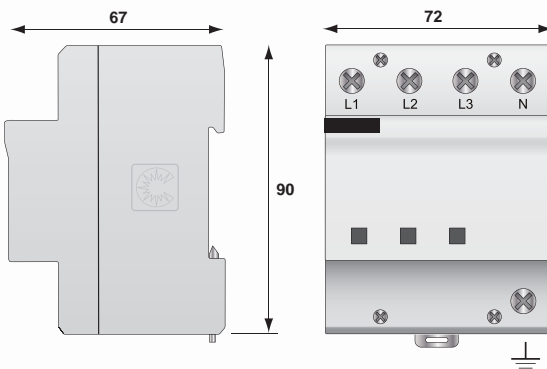


DUT250VG-300G

- **Type 1 + 2 + 3, 3-phase surge protector**
- **Common and Differential mode**
- **Very compact monobloc enclosure**
- **limp by pole/total : 25 kA/50 kA**
- **Low voltage Up**
- **No Follow current**
- **EN 61643-11 and IEC 61643-11 compliance**

## Dimensions - Electrical Diagram

(in mm)



V : High-energy varistor network  
G : Heavy duty GDT  
GN : Heavy duty N/PE GDT  
Ft : Thermal fuse  
MI : Disconnection indicator

## Characteristics

CITEL part number	DUT250VG-300/G	
AC Network	3-Phase 230/400V	
AC system	TT, TN	
Protection modes	L/N and N/PE	
Max. operating voltage	Uc	255 Vac
Temporary overvoltage withstand	Ur	450 Vac
Operating current	Ic	none
Leakage current at Uc		
Follow current	If	none
Nominal discharge current 15 impulses - 8/20µs	In	40 kA
Max. discharge current max. withstand 8/20µs	I <sub>max</sub>	100 kA
Combination waveform test Class III test	Uoc	20 kV
Max. lightning current by pole max. withstand 10/350 µs	limp	25 kA
Total lightning current max. withstand 10/350 µs	I <sub>total</sub>	50 kA
Residual voltage (at In)	Up-in	1.1 kV
Protection level (at 6 kV - 1.2/50µs)	Up	1.5 kV
Admissible short circuit current	50000 A	
<b>Associated disconnection devices</b>		
Thermal disconnector	internal	
Required external fuses	Fuses 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>	
Disconnection indicator	red light indicators	
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>		
IEC 61643-11	International	Low Voltage SPD - Test Class I, II, III
NF EN 61643-11	France	Parafoudre Basse Tension - Essais Classe I, II, III
EN 61643-11	Europe	Low Voltage SPD - Test Class I, II, III
<b>Part number</b>		
DUT250VG-300/G	3414	

**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 AC Surge Protector DS130VG series

**limp**  
**12.5 kA**



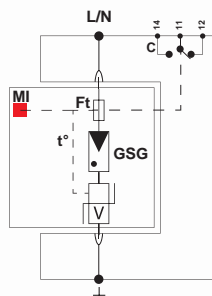
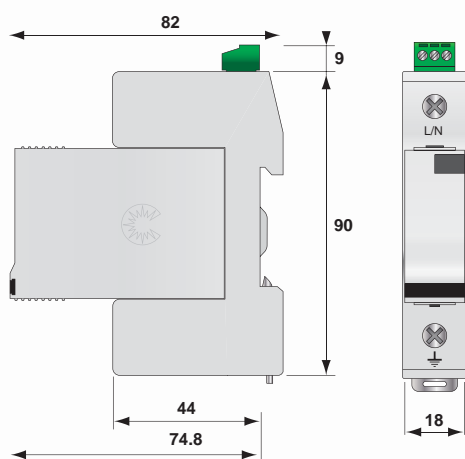
DS132VG-120



- **Type 1 + 2 + 3 AC surge protector**
- **In : 20 kA**
- **limp : 12,5 kA**
- **Pluggable module**
- **Remote signaling (option)**
- **Optimized to TOV**
- **EN 61643-11 and IEC 61643-11 compliance**

## Dimensions - Electrical Diagram

(in mm)



V : High energy MOV  
Mi : Disconnection indicator  
Ft : Thermal fuse  
t° : Thermal disconnection mechanism  
C : contac for remote signal

## Characteristics

CITEL part number		DS131VG-230	DS131VG-120
AC network		230/400V	120/208V
Max. operating voltage	Uc	255 Vac	150 Vac
TOV withstand	UT	450 Vac	230 Vac
Operating current	Ic	none	none
Leakage current at Uc			
Follow current	If	none	none
Nominal discharge current 15 x 8/20 µs impulse	In	20 kA	20 kA
Max. discharge current max. withstand at 8/20 µs	I <sub>max</sub>	50 kA	50 kA
Max. lightning current by pole max. withstand at 10/350 µs	I <sub>limp</sub>	12.5 kA	12.5 kA
Combination waveform test Class III test	Uoc	20 kV	20 kV
Residual voltage (at limp)	Up-in	0.6 kV	0.4 kV
Protection level (at 6kV-1.2/50µs)	Up	1.25 kV	1.25 kV
Admissible short-circuit current	I <sub>sc</sub>	25000 A	25000 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

### Standard 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 ed.3	USA	Low voltage SPD

### 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 AC Multipolar Surge Protector DS132VG, DS133VG, DS134VG



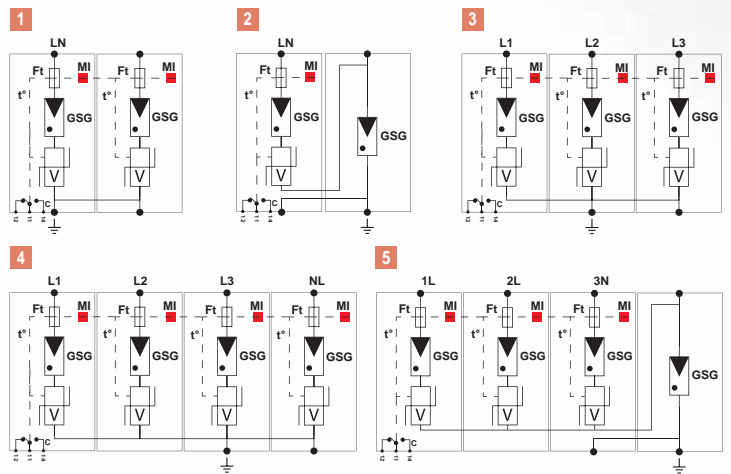
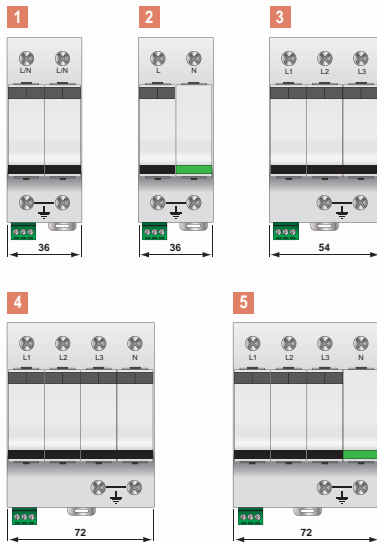
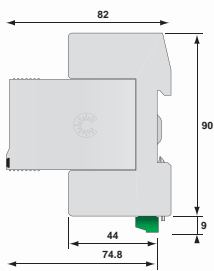
DS13x VGS-xxx/G

- «» = Configuration CT1 (common mode)
- «G» = Configuration CT2 (common and differential mode)
- Operating voltage
- «S» = Remote signal option
- Number of protected poles (2, 3 or 4)

DS134VG-230/G

## Dimensions - Electrical Diagram

(in mm)



References	Part number	Network	AC system	Protection mode		Iimp total	Up L/PE	Up L/N	Diagram
				common	differential				
DS134VG-230/G	571564	230/400 V 3-phase+N	TT-TN	●	●	50 kA	1.5 kV	1.25 kV	5
DS134VG-120/G	571664	120/208 V 3-phase+N	TT-TN	●	●	50 kA	1.5 kV	1.25kV	
DS134VG-230	571554	230/400 V 3-phase+N	TT-TN	●		50 kA	1.25 kV	-	4
DS134VG-120	571654	120/208 V 3-phase+N	TT-TN	●		50 kA	1.25 kV	-	
DS133VG-230	571563	400 V 3-phase	TNC	●		37,5 kA	1.25 kV	-	3
DS133VG-120	571663	208 V 3-phase	TNC	●		37,5 kA	1.25 kV	-	
DS132VG-230/G	571552	230 V single phase	TN	●	●	25 kA	1.5 kV	1.25kV	2
DS132VG-120/G	571652	120 V single phase	TN	●	●	25 kA	1.5 kV	1.25kV	
DS132VG-230	571562	230 V single phase	TN	●		25 kA	1.25 kV	-	1
DS132VG-120	571662	120 V single phase	TN	●		25 kA	1.25 kV	-	

# Type 1 + 2 AC Surge Protector DS130R series

**limp  
12.5 kA**

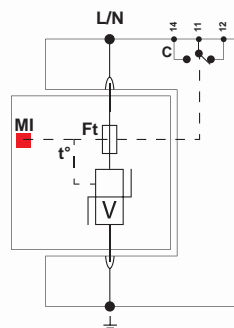
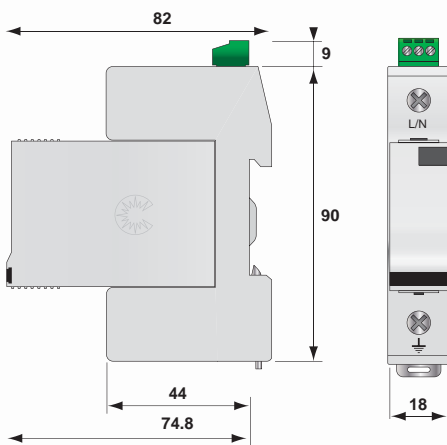


DS131R-400

- **Type 1 + 2 AC power surge protector**
- **In : 20 kA**
- **limp : 12,5 kA**
- **Pluggable module for each phase**
- **Remote signaling (option)**
- **EN 61643-11 and IEC 61643-11 compliance**

## Dimensions - Electrical Diagram

(in mm)



V : High energy MOV  
Mi : Disconnection indicator  
Ft : Thermal fuse  
t° : Thermal disconnection mechanism  
C : contac for remote signal

## Characteristics

CITEL part number	DS131R-400	DS131R-230	DS131R-120
AC network	230/400V	230/400V	120/208V
Max. operating voltage	Uc 440 Vac	255 Vac	150 Vac
TOV withstand	UT 770 Vac	440 Vac	230 Vac
Operating current	Ic < 1 mA	< 1 mA	< 1 mA
Leakage current at Uc			
Follow current	If none	none	none
Nominal discharge current 15 x 8/20 µs impulse	In 20 kA	20 kA	20 kA
Max. discharge current max. withstand at 8/20 µs	Imax 50 kA	50 kA	50 kA
Max. lightning current by pole max. withstand at 10/350 µs	limp 12,5 kA	12,5 kA	12,5 kA
Protection level (at In)	Up 1,7 kV	1,3 kV	0,9 kV
Admissible short-circuit current	Isc 25000 A	25000 A	25000 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 PEI UL94-5VA

### Standard compliance

IEC 61643-11	International	Low Voltage SPD - Test Class I and II
EN 61643-11	Europe	Parafoudre Basse Tension - Essais Classe I et II
NF EN 61643-11	France	Parafoudre Basse Tension - Essais Classe I et II

### Part number

DS131R-400	571401
DS131R-230	571501
DS131R-120	571601

**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.

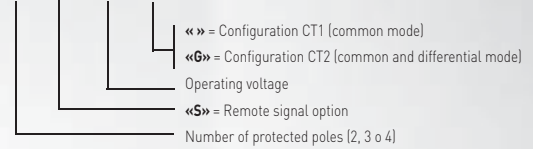


# Type 1 + 2 AC Multipolar Surge Protector DS132R, DS133R, DS134R

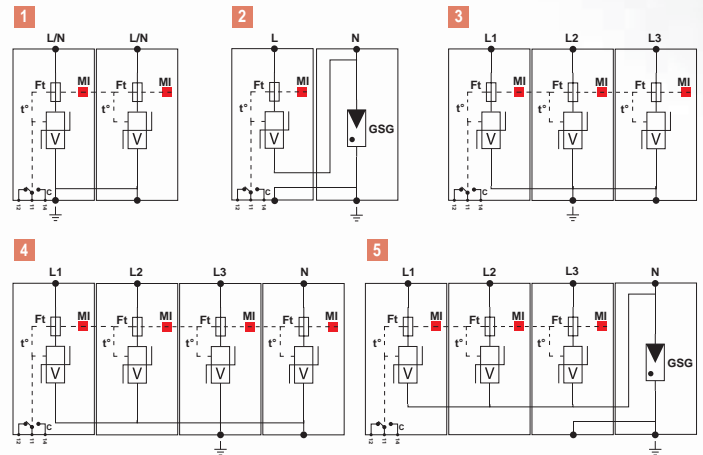


DS134R-230/G

## DS13x RS-xxx/G



## Dimensions - Diagram



References	Part number	Network	AC system	Protection mode		Iimp total	Up L/PE	Up L/N	Diagram
				common	differential				
DS134R-230/G	571524	230/400 V 3-phase+N	TT-TN	●	●	50 kA	1.5 kV	1.3 kV	5
DS134R-120/G	571624	120/208 V 3-phase+N	TT-TN	●	●	50 kA	1.5 kV	0.9 kV	
DS134R-400	571404	230/400 V 3-phase+N	IT	●		50 kA	1.7 kV	-	4
DS134R-230	571504	230/400 V 3-phase+N	TT-TN	●		50 kA	1.3 kV	-	
DS134R-120	571604	120/208 V 3-phase+N	TT-TN	●		50 kA	0.9 kV	-	3
DS133R-400	57143	400 V 3-phase	IT-TT	●		37,5 kA	1.7 kV	-	
DS133R-230	571503	400 V 3-phase	TNC	●		37,5 kA	1.3 kV	-	
DS133R-120	571603	208 V 3-phase	TNC	●		37,5 kA	0.9 kV	-	2
DS132R-230/G	571522	230 V Single phase	TN	●	●	25 kA	1.5 kV	1.3 kV	
DS132R-120/G	571622	120 V Single phase	TN	●	●	25 kA	1.5 kV	0.9 kV	
DS132R-400	571402	230 V Single phase	TT-IT	●		25 kA	1.7 kV	-	1
DS132R-230	571502	230 V Single phase	TN	●		25 kA	1.3 kV	-	
DS132R-120	571602	120 V Single phase	TN	●		25 kA	0.9 kV	-	

## Type 2 and Type 3 surge protectors

Type 2 Surge Protectors are designed to be installed at the origin of the Low Voltage system or close to sensitive equipment to protect against transient voltages coupled into the Low Voltage network. Surge Protectors are recommended or, in some cases, mandatory for some systems, especially when these systems are located in a high lightning area ( $N_g > 2.5$ ) or when supplied by overhead power lines. These Surge Protectors undergo NF EN 61643-11 Class II 8/20  $\mu$ s discharge current tests.

These surge protectors are available in a wide range of versions to be adaptable to all configurations :

$I_{max}$  by pole : 10 up to 70 kA

Single, 3 or 3-Phase+Neutral AC network

- 230/400V or 120/208V AC network
- All AC system types
- Common mode protection (CT1 configuration)
- or Common and Differential mode protection (CT2 configuration)
- 

CITEL surge arresters Type 2 are offered mainly in pluggable version. Monobloc solutions are also available.

Arresters tested and found Type 3 are intended to be installed near sensitive equipment, in coordination with type 2 arrester installation head.





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

CITEL surge arresters Type 2 are based on the use of varistors. Version DS-40VG uses «VG» technology.



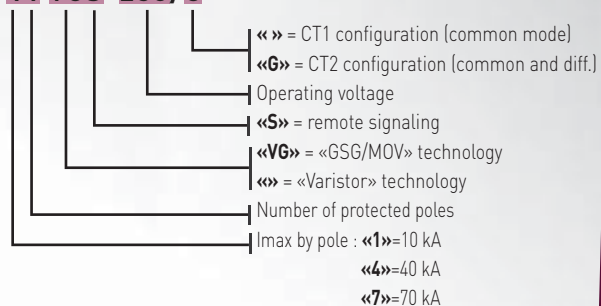
# Type 2 and Type 3 surge protectors

## Standard surge protectors









Range		Description	<i>I<sub>max</sub></i> by pole	Characteristics	Page
DS70R		Reinforced surge protector	<b>70 kA</b>	Type 2 High energy pluggable	41
DS40VG		Surge protector VG Technology	<b>40 kA</b>	Type 2 + 3 Very high efficiency pluggable	43
DS40		Standard surge protector	<b>40 kA</b>	Type 2 pluggable	45
DS10		Secondary surge protector	<b>10 kA</b>	Type 2 or 3 pluggable	47

### Part number information

**DS44 VGS-230/G**

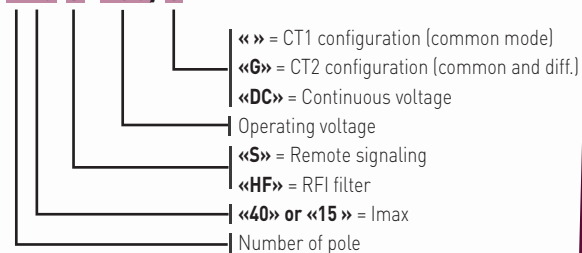


## Compact surge protectors

Range		Description	<i>I<sub>max</sub></i> by pole	Characteristics	Page
DS240		Single phase surge protector	<b>40 kA</b>	Single phase	49
DS215		Compact surge protector	<b>15 kA</b>	Compact Pluggable	51
DS440		3-phase+N surge protector	<b>40 kA</b>	3-phase	50
DS415		Compact surge protector	<b>15 kA</b>	Compact Pluggable	52
DS98		Single phase surge protector	<b>10 kA</b>	Single phase Compact Monobloc	53
DS40HF		RFI filter surge protector	<b>10 to 40 kA</b>	RFI filter	54
DS-HF		RFI filter surge protector	<b>10 to 40 kA</b>	RFI filter	55
DS2x0-DC		DC surge protector	<b>20 to 40 kA</b>	DC network Compact Pluggable	56-57

### Part number information

**DS240 S-230/G**



# Type 2 AC Surge Protector DS70R series

**Imax  
70 kA**

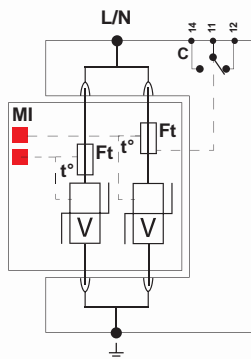
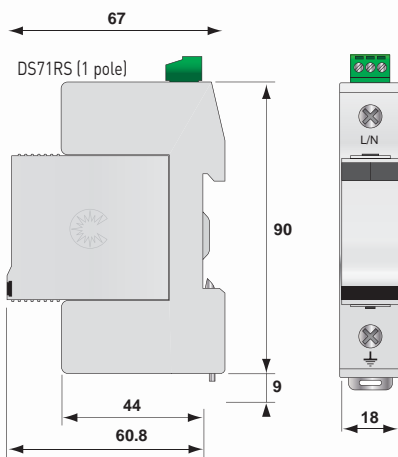


DS71R-400

- **Re-inforced Type 2 Surge Protector**
- **In : 30 kA**
- **Imax : 70 kA**
- **Pluggable module by phase**
- **Remote Signaling option**
- **IEC 61643-11 and EN 61643-11 compliance**
- **UL1449 ed.3**

## Dimensions - Electrical diagram

(in mm)



V : High energy varistor  
Ft : Thermal Fuse  
C : Remote signaling contact  
t : Thermal disconnection system

## Characteristics

CITEL part number	DS71R-400	DS71R-230	DS71R-120
Network	230/400V	230/400V	120/208V
Max. operating voltage	Uc 440 Vac	255 Vac	150 Vac
Temporary overvoltage withstand	Ur 770 Vac	440 Vac	230 Vac
Operating current	Ic < 1 mA	< 1 mA	< 1 mA
Leakage current at Uc			
Follow current	If none	none	none
Nominal discharge current	In 30 kA	30 kA	30 kA
15 x 8/20 µs impulses			
Maximum discharge current	Imax 70 kA	70 kA	70 kA
max. withstand 8/20 µs			
Protection level (at In)	Up 1.8 kV	1.4 kV	1 kV
Residual voltage at 10 kA	1.4 kV	1 kV	0.7 kV
Residual voltage at 5 kA	1.2 kV	0.9 kV	0.6 kV
Admissible short-circuit current	25000 A	25000 A	25000 A
<b>Associated disconnection devices</b>			
Thermal disconnector	internal		
Fuses	Fuses type gG - 100 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	2 mechanical indicators by pole		
Remote signaling of disconnection	Option DS70RS - 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>			
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 ed.3	USA	Low Voltage TVSS	
<b>Part number</b>			
DS71R-400	321401		
DS71R-230	3214011		
DS71R-120	321601		

**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 AC Multipolar Surge Protector DS72R, DS73R, DS74R

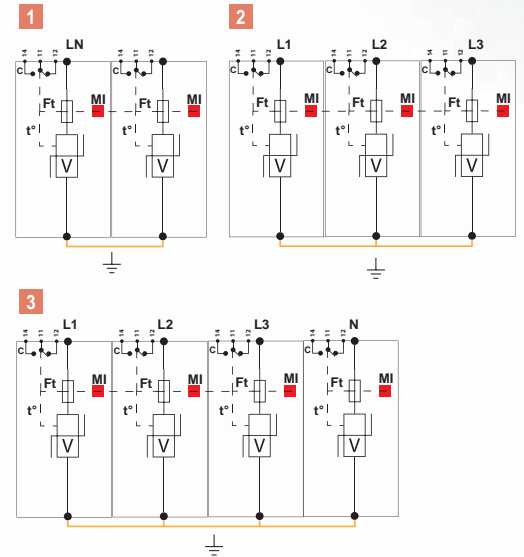
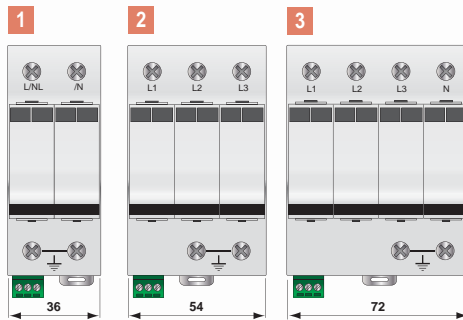
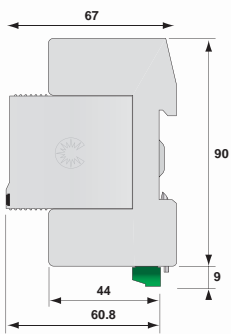


DS74R-230

DS7xRS-xxx/G

- «x» = CT1 configuration (common mode)
- «G» = CT2 (common and differential mode)
- Operating voltage
- «S» = Remote signal option
- Number of protected poles (2, 3 or 4)

## Dimensions - Diagram



References	Part number	Network	AC System	Protection mode		I <sub>max</sub> total	U <sub>p</sub> L/PE	Diagram
				common	differential			
DS74R-400	491402	230/400 V 3-phase+N	IT-TT	●		280 kA	1.8 kV	3
DS74R-230	491502	230/400 V 3-phase+N	TT-TN	●		280 kA	1.4 kV	
DS74R-120	491602	120/208 V 3-phase+N	TN	●		280 kA	1 kV	
DS73R-400	491403	400 V 3-phase	IT	●		210 kA	1.8 kV	2
DS73R-230	491503	400 V 3-phase	TNC	●		210 kA	1.4 kV	
DS73R-120	491603	208 V 3-phase	TNC	●		210 kA	1 kV	
DS72R-400	491401	230 V Single phase	IT	●		140 kA	1.8 kV	1
DS72R-230	491501	230 V Single phase	TT-TN	●		140 kA	1.4 kV	
DS72R-120	491601	120 V Single phase	TN	●		140 kA	1 kV	

# Type 2 + 3 Surge Protector DS40VG series

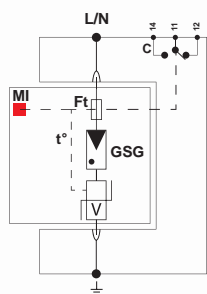
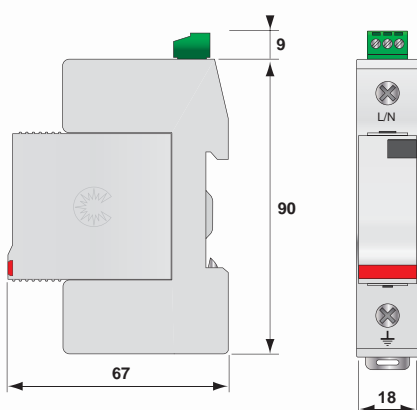


DS41VG-120

- Type 2 + 3 surge protector
- In 20 kA
- I<sub>max</sub> 40 kA
- Pluggable module
- Follow and operating current : none
- No ageing
- Optional remote signaling state
- Optimized to TOV
- EN 61643-11 and IEC 61643-11 compliance

## Dimensions - Electrical diagram

(in mm)



GSG: Specific GDT  
V: Varistor  
Ft: Thermal fuse  
C: Remote signaling contact  
t°: Disconnection system  
Mi : Mechanical indicator

## Characteristics

Référence CITEL	DS41VG-230	DS41VG-120
Network	230/400V	120/208V
Max. operating voltage	U <sub>c</sub> 255 Vac	150 Vac
TOV withstand	U <sub>T</sub> 450 Vac	230 Vac
Operating current	I <sub>c</sub> none	none
Follow current at U <sub>c</sub>		
Follow current	I <sub>f</sub> none	none
Nominal discharge current 15 impulses - 8/20 μs	I <sub>n</sub> 20 kA	20 kA
Max. discharge current max. withstand 8/20 μs	I <sub>max</sub> 40 kA	40 kA
Combination waveform test Class III test	U <sub>oc</sub> 10 kV	10 kV
Residual voltage (at I <sub>n</sub> )	U <sub>p-in</sub> 0.8 kV	0.6 kV
Protection level (at 6kV-1.2/50μs)	U <sub>p</sub> 1.25 kV	1.25 kV
Admissible short-circuit	I <sub>sc</sub> 25000 A	25000 A
<b>Associated disconnection devices</b>		
Thermal disconnecter	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 : 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	
<b>Standard compliance</b>		
NF EN 61643-11	France	Parafoudre BT - Essais Classe II et III
IEC 61643-11	International	Low Voltage SPD - Test Class II and III
EN 61643-11	Europe	Parafoudre BT - Essais Classe II et III
<b>Part number</b>		
DS41VG-230	331751	
DS41VG-120	331651	

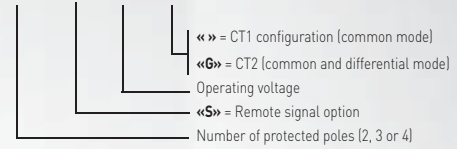
**Note 1:** Rating in compliance with NF C15-100 art.534.1.3.5. In order to increase service continuity, higher rating can be used (up to 160 A). For further information, please consult product instructions.



# Type 2 + 3 AC Multipolar Surge Protector DS42VG, DS43VG, DS44VG

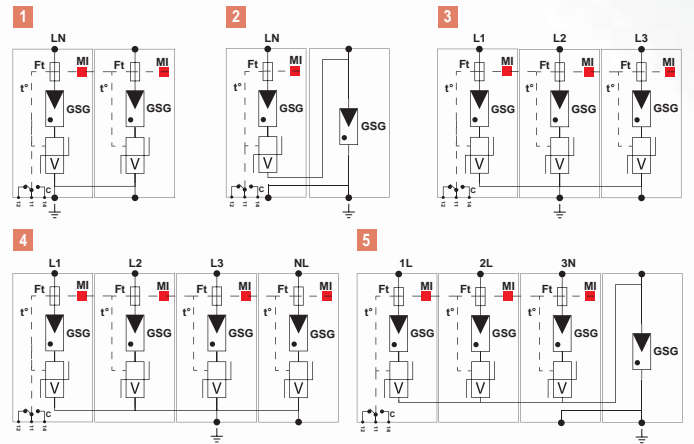
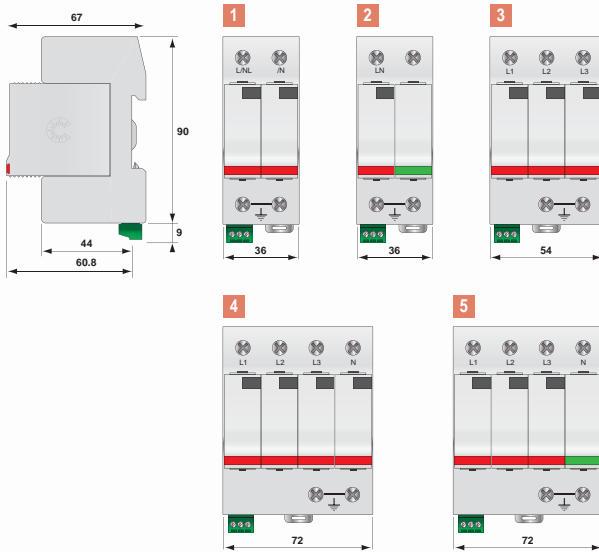


**DS4x VGx-xxx/G**



DS44VG-230/G

## Dimensions - Diagram



References	Part number	Network	AC system	Protection mode		I <sub>max</sub> total	U <sub>p</sub> L/PE	U <sub>p</sub> L/N	Diagram
				common	differential				
DS44VG-230/G	461562	230/400 V 3-phase+N	TT-TN	●	●	100 kA	1.5 kV	1.25 kV	5
DS44VG-120/G	461662	120/208 V 3-phase+N	TT-TN	●	●	100 kA	1.5 kV	1.25 kV	
DS44VG-230	461552	230/400 V 3-phase+N	TN	●		160 kA	1.25 kV	-	4
DS44VG-120	461652	120/208 V 3-phase+N	TN	●		160 kA	1.25 kV	-	
DS43VG-230	461553	400 V 3-phase	TNC	●		120 kA	1.25 kV	-	3
DS43VG-120	461653	208 V 3-phase	TNC	●		120 kA	0.9 kV	-	
DS42VG-230/G	461561	230 V single phase	TT-TN	●	●	100 kA	1.5 kV	1.25 kV	2
DS42VG-120/G	461661	120 V single phase	TN	●	●	100 kA	1.5 kV	1.25 kV	
DS42VG-230	461551	230 V single phase	TN	●		80 kA	1.25 kV	-	1
DS42VG-120	461651	120 V single phase	TN	●		80 kA	1.25 kV	-	

# Type 2 AC Surge Protector DS40 series

**Imax  
40 kA**

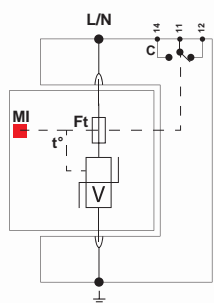
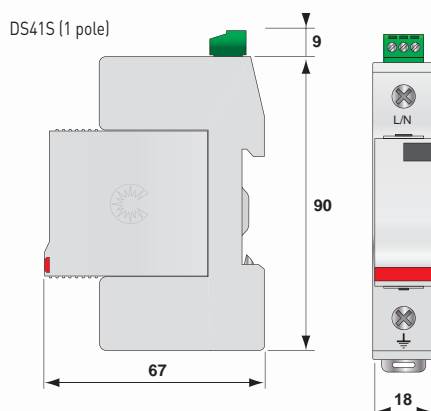


DS41-230

- **Type 2 AC Surge Protector**
- **In : 20 kA**
- **Imax : 40 kA**
- **Pluggable module for each phase**
- **Remote signaling option**
- **IEC 61643-11 and EN 61643-11 compliance**

## Dimensions - Electrical diagram

(in mm)



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

## Characteristics

CITEL part number		DS41-400	DS41-320	DS41-280	DS41-230	DS41-120
Network		230/400V	230/400 V	230/400 V	230/400V	120/208V
Max. operating voltage	Uc	440 Vac	320 Vac	280 Vac	255 Vac	150 Vac
Temporary overvoltage withstand	UT	770 Vac	440 Vac	440 Vac	440 Vac	230 Vac
Operating current	Ic	< 1 mA	< 1 mA	< 1 mA	< 1 mA	< 1 mA
Leakage current at Uc						
Follow current	If	none	none	none	none	none
Nominal discharge current	In	20 kA	20 kA	20 kA	20 kA	20 kA
15 x 8/20 µs impulse						
Maximum discharge current	Imax	40 kA	40 kA	40 kA	40 kA	40 kA
max. withstand 8/20 µs						
Protection level (at In)	Up	1.8 kV	1.5 kV	1.3 kV	1.25 kV	0.9 kV
Residual voltage at 10 kA		1.5 kV	1.3 kV	1.2 kV	1.1 kV	0.7 kV
Residual voltage at 5 kA		1.3 kV	1.2 kV	1 kV	0.9 kV	0.6 kV
Admissible short-circuit current	Iscsr	25000 A	25000 A	25000 A	25000 A	25000 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 : 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				
<b>Standards compliance</b>						
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 ed.3	USA	Low Voltage TVSS				
<b>Part Number</b>						
DS41-400		3314011				
DS41-230		331901				
DS41-280		3311011				
DS41-230		3317011				
DS41-120		3316011				

**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 Multipolar Surge Protector DS42, DS43, DS44

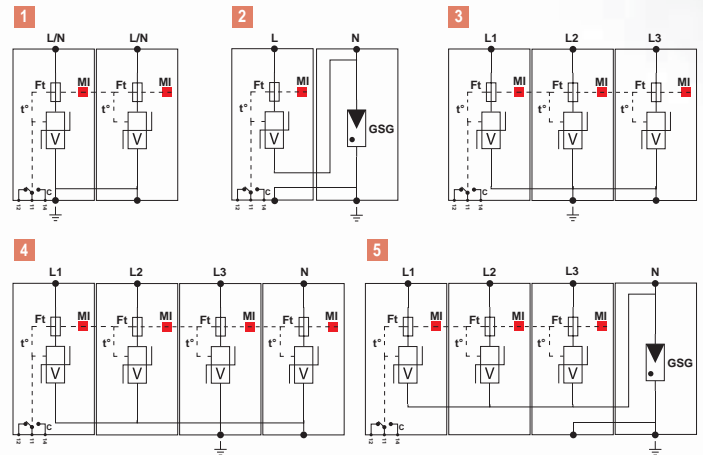
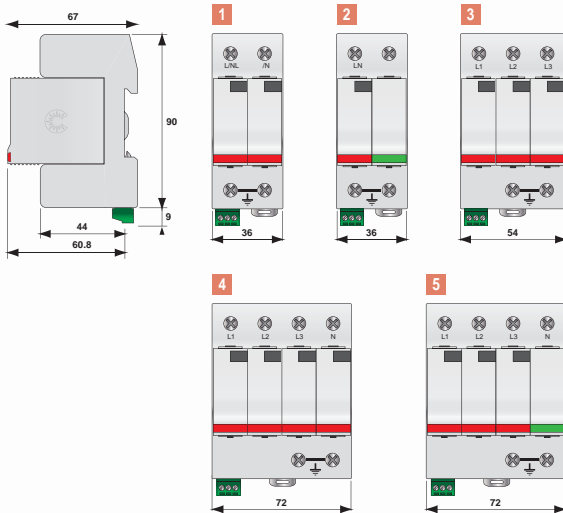


DS44-230/G

**DS4x S-xxx/G**

- « » = CT1 configuration (common mode)
- «G» = CT2 (common and differential mode)
- Operating voltage
- «S» = Remote signal option
- Number of protected poles (2, 3 or 4)

## Dimensions - Diagram



Reference	Part number	Network	AC system	Protection mode		I <sub>max</sub> total	U <sub>p</sub> L/PE	U <sub>p</sub> L/N	Diagram
				common	differential				
DS44-230/G	461512	230/400 V 3-phase+N	TT-TN	●	●	40 kA	1.5 kV	1.25 kV	5
DS44-120/G	461612	120/208 V 3-phase+N	TT-TN	●	●	40 kA	1.5 kV	0.9 kV	
DS44-400	461402	230/400 V 3-phase+N	IT	●		160 kA	1.8 kV	-	4
DS44-230	461502	230/400 V 3-phase+N	TN	●		160 kA	1.25 kV	-	
DS44-120	461602	120/208 V 3-phase+N	TN	●		160 kA	0.9 kV	-	3
DS43-400	461403	400 V 3-phase	IT-TT-TNC	●		120 kA	1.8 kV	-	
DS43-230	461503	400 V 3-phase	TNC	●		120 kA	1.25 kV	-	
DS43-120	461603	208 V 3-phase	TNC	●		120 kA	0.9 kV	-	2
DS42-230/G	461511	230 V Single phase	TT-TN	●	●	40 kA	1.5 kV	1.25 kV	
DS42-120/G	461611	120 V Single phase	TN	●	●	40 kA	1.5 kV	0.9 kV	
DS42-400	461401	230 V Single phase	IT	●		80 kA	1.8 kV	-	1
DS42-230	461501	230 V Single phase	TN	●		80 kA	1.25 kV	-	
DS42-120	461601	120 V Single phase	TN	●		80 kA	0.9 kV	-	

\*] DSx-280x or DS4x-320x (e.g.: DS44-320/G) in case of possible temporary voltages (bad quality AC voltage or supply by AC generator set).

# Type 2 (or 3) AC Surge Protector DS10 series

**Imax  
10 kA**

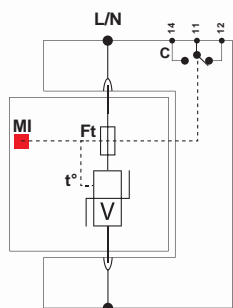
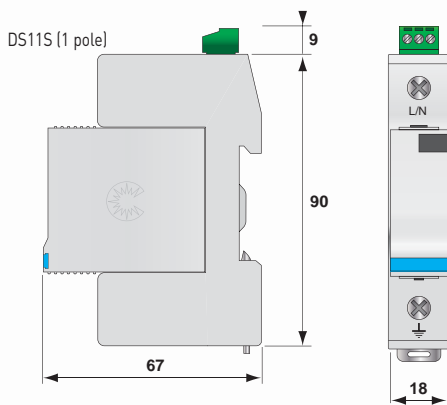


DS11-120

- **Type 2 (or 3) Surge Protector**
- **In : 5 kA**
- **Imax : 10 kA**
- **Pluggable module by phase**
- **Remote signaling option**
- **IEC 61643-11 and EN 61643-11 compliance**

## Dimensions - Electrical diagram

(in mm)



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

## Characteristics

CITEL part number	DS11-400	DS11-230	DS11-120
Single phase network	230/400V	230/400V	120/208V
Neutral configuration	TT-IT	TN	TN
Max. operating voltage	Uc 440 Vac	255 Vac	150 Vac
Temporary overvoltage withstand	Ur 770 Vac	440 Vac	230 Vac
Operating current	Ic < 1 mA	< 1 mA	< 1 mA
Leakage current at Uc			
Follow current	If none	none	none
Nominal discharge current	In 5 kA	5 kA	5 kA
15 x 8/20 µs impulses			
Maximum discharge current	Imax 10 kA	10 kA	10 kA
max. withstand 8/20 µs			
Protection level (at In)	Up 1.3 kV	0.9 kV	0.6 kV
Combination waveform test	Uoc 10 kV	10 kV	10 kV
Class III test			
Admissible short-circuit current	Isc 25000 A	25000 A	25000 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 : 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 ed.3	USA	Low Voltage TVSS	
<b>Part number</b>			
DS11-400	341401		
DS11-230	341501		
DS11-120	341601		

**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.

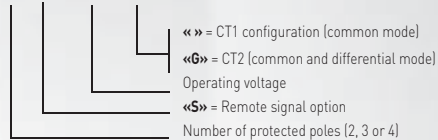


# Type 2 (or 3) Multipolar Surge Protector DS12, DS13, DS14

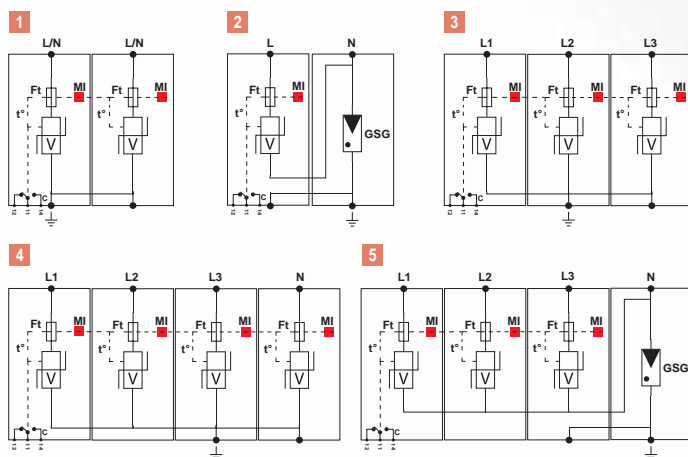
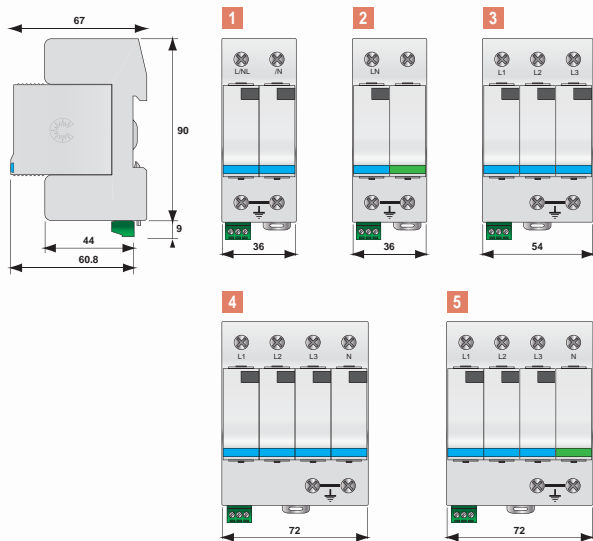


DS14-230/G

DS1x S-xxx/G



## Dimensions - Diagrams



References	Part number	Network	AC system	Protection mode		I <sub>max</sub> total	U <sub>p</sub> L/PE	U <sub>p</sub> L/N	Diagram
				common	differential				
DS14-230/G	471512	230/400 V 3-phase+N	TT-TN	●	●	40 kA	1.5 kV	0.9 kV	5
DS14-120/G	471612	120/208 V 3-phase+N	TT-TN	●	●	40 kA	1.5 kV	0.6 kV	
DS14-400	471402	230/400 V 3-phase+N	IT	●		40 kA	1.3 kV	-	4
DS14-230	471502	230/400 V 3-phase+N	TN	●		40 kA	0.9 kV	-	
DS14-120	471602	120/208 V 3-phase+N	TT-TN	●		40 kA	0.6 kV	-	
DS13-400	341403	400 V 3-phase	IT-TT	●		30 kA	1.3 kV	-	3
DS13-230	341503	400 V 3-phase	TNC	●		30 kA	0.9 kV	-	
DS13-120	341603	208 V 3-phase	TNC	●		30 kA	0.6 kV	-	
DS12-230/G	471511	230 V Single phase	TT-TN	●	●	20 kA	1.5 kV	0.9 kV	2
DS12-120/G	471611	120 V Single phase	TN	●	●	20 kA	1.5 kV	0.6 kV	
DS12-400	471401	230 V Single phase	IT	●		20 kA	1.3 kV	-	1
DS12-230	471501	230 V Single phase	TN	●		20 kA	0.9 kV	-	
DS12-120	471601	120 V Single phase	TN	●		20 kA	0.6 kV	-	

# 1-phase Type 2 Surge Protector DS240 series

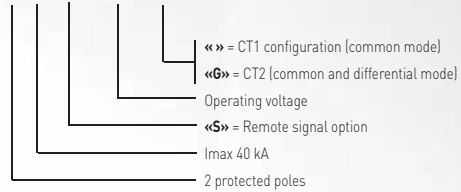
**Imax  
40 kA**



DS240-400

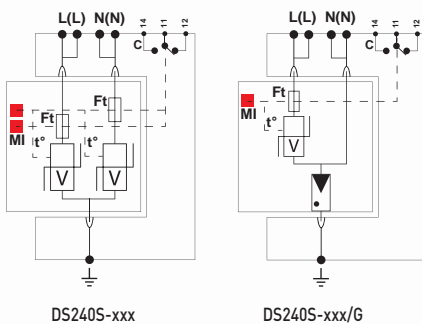
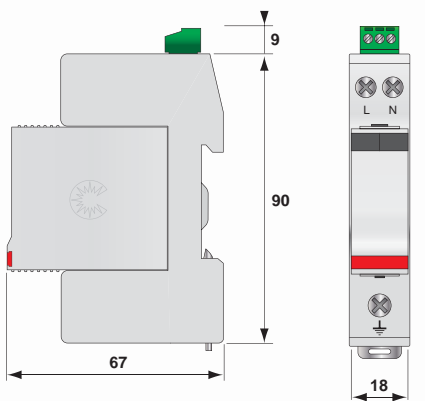
- **Compact single-phase Type 2**
- **In : 20 kA**
- **Imax : 40 kA**
- **Common/Differential mode**
- **Pluggable module**
- **Remote signaling contact (option)**
- **Complies with EN 61643-11 and IEC 61643-11**

## DS240 S-xxx/G



## Dimensions - Electrical diagram

(in mm)



V : High energy varistor  
 GDT : High energy Gas tube  
 Ft : Thermal fuse  
 C : Remote signaling contact  
 t° : Thermal disconnection system

## Characteristics

CITEL part number	DS240-400	DS240-230/G	DS240-120/G
Single-phase network	230 V	230 V	120 V
Neutral configuration	TT-TN-IT	TN	TN
Max. 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
Leakage current at Uc			
Protection mode(s)	CM <sup>(2)</sup>	CM/DM <sup>(2)</sup>	CM/DM <sup>(2)</sup>
Nominal discharge current	In 20 kA	20 kA	20 kA
15 x 8/20 µs impulses			
Maximum discharge current	Imax 40 kA	40 kA	40 kA
max. withstand 8/20 µs			
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>
Residual voltage at 5 kA	1.3 kV	0.9 kV	0.6 kV
Admissible short-circuit current	10000 A	10000 A	10000 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 ed.3	USA	Low Voltage TVSS	
<b>Part number</b>			
DS240-400	311401		
DS240-230/G	311721		
DS240-120/G	3116+21		

**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)



# 3-phase Type 2 Surge Protector DS440 series

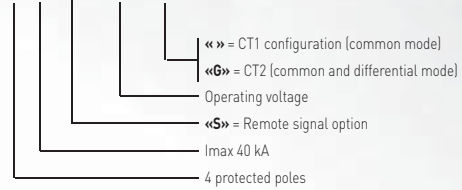
**Imax  
40 kA**



DS440-400

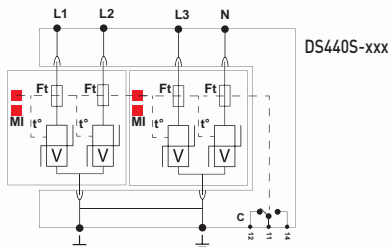
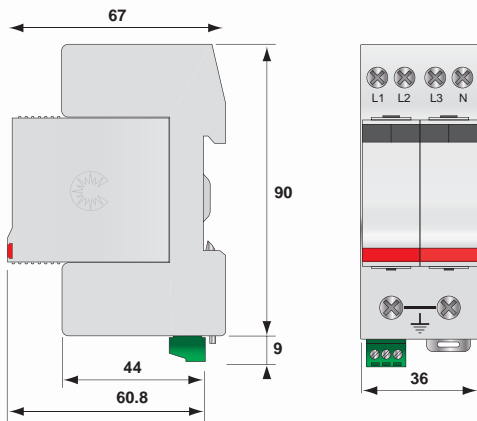
- Compact 3-phase Type 2
- In : 20 kA
- I<sub>max</sub> : 40 kA
- Common/Differential mode
- Pluggable module
- Remote signaling contact (option)
- Complies with EN 61643-11 and IEC 61643-11

### DS440 S-xxx/G

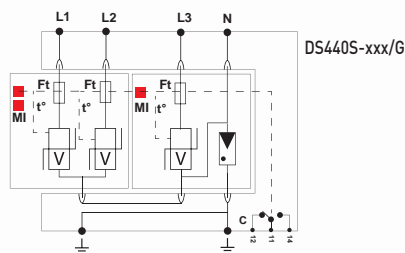


## Dimensions - Electrical diagram

(in mm)



DS440S-xxx



DS440S-xxx/G

- V : High energy varistor
- GDT : High energy Gas tube
- Ft : Thermal fuse
- C : Remote signaling contact
- t° : Thermal disconnection system

## Characteristics

CITEL part number	DS440-400	DS440-230/G	DS440-120/G
Single-phase network	230 V	230 V	120 V
Neutral configuration	TT-TN-IT	TN	TN
Max. operating voltage	U <sub>c</sub> 440 Vac	255 Vac	150 Vac
Temporary overvoltage withstand	U <sub>T</sub> 770 Vac	440 Vac	230 Vac
Operating current	I <sub>c</sub> < 1 mA	none	none
Leakage current at U <sub>c</sub>			
Protection mode(s)	CM <sup>(2)</sup>	CM/DM <sup>(2)</sup>	CM/DM <sup>(2)</sup>
Nominal discharge current	I <sub>n</sub> 20 kA	20 kA	20 kA
15 x 8/20 μs impulses			
Maximum discharge current	I <sub>max</sub> 40 kA	40 kA	40 kA
max. withstand 8/20 μs			
Protection level [at I <sub>n</sub> ] CM/DM <sup>(2)</sup>	U <sub>p</sub> 1.8 kV	1.5/1.25 kV <sup>(2)</sup>	1.5/0.9 kV <sup>(2)</sup>
Residual voltage at 5 kA	1.3 kV	0.9 kV	0.6 kV
Admissible short-circuit current	10000 A	10000 A	10000 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 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 ed.3	USA	Low Voltage TVSS	
<b>Part number</b>			
DS440-400	311402		
DS440-230/G	311722		
DS440-120/G	311622		

**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)



# 1-phase Type 2 Surge Protector DS215 series

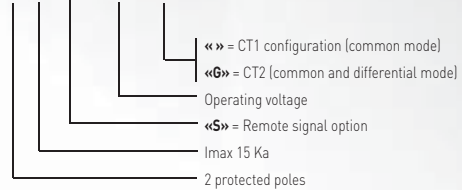
**Imax  
15 kA**



DS215-400

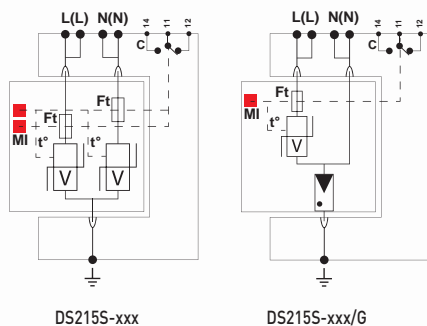
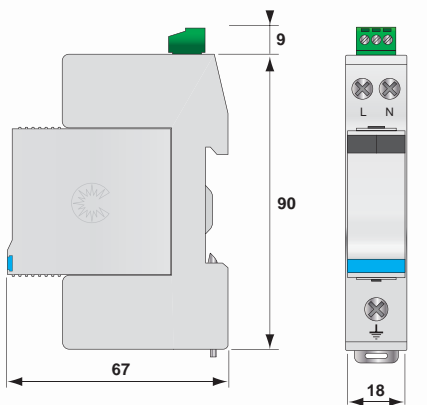
- **Compact single-phase Type 2 (or 3) SPD**
- **In : 5 kA**
- **Imax : 15 kA**
- **Common/Differential mode**
- **Pluggable module**
- **Remote signaling contact (option)**
- **IEC 61643-11 and EN 61643-11 compliance**

## DS215 S-xxx/G



## Dimensions - Electrical diagram

(in mm)



V : High energy varistor  
Ft : Thermal fuse  
C : Remote signaling contact  
t° : Thermal disconnection system  
GDT : Gas discharge tube N/PE  
MI : Disconnection indicator

## Characteristics

CITEL part number	DS215-400	DS215-230/G	DS215-120/G
Single-phase network	230 V	230 V	120 V
Neutral configuration	TT-TN-IT	TN	TN
Max. 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
Leakage current at Uc			
Protection mode(s)	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 max. withstand 8/20 µs	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	Iscrr 10000 A	10000 A	10000 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 ed.3	USA	Low Voltage TVSS	
<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)



# 3-phase Type 2 Surge Protector DS415 series

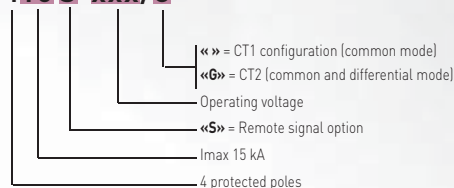
**I<sub>max</sub>  
15 kA**



DS415-400

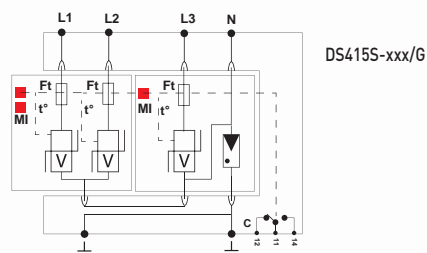
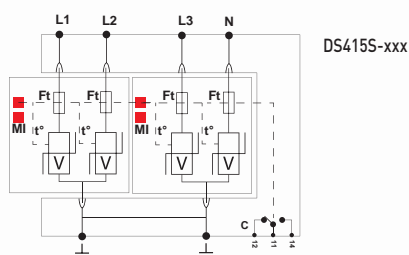
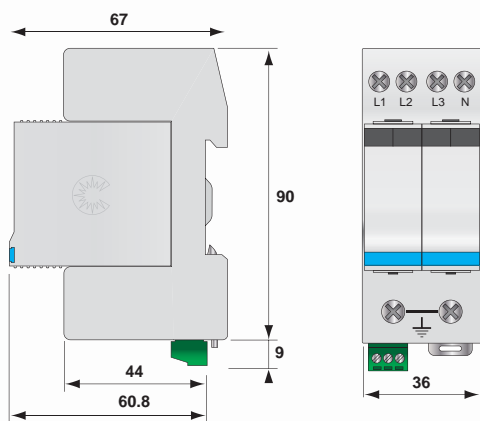
- **Compact 3-phase Type 2 (or 3) SPD**
- **I<sub>n</sub> : 5 kA**
- **I<sub>max</sub> : 15 kA**
- **Common/Differential mode**
- **Pluggable module**
- **Remote signaling contact (option)**
- **IEC 61643-11 and EN 61643-11 compliance**

## DS415 S-xxx/G



## Dimensions - Electrical diagram

(in mm)



V : High energy varistor  
 Ft : Thermal fuse  
 C : Remote signaling contact  
 t° : Thermal disconnection system  
 GDT : Gas discharge tube N/PE  
 MI : Disconnection indicator

## Characteristics

CITEL part number	DS415-400	DS415-230/G	DS415-120/G
Single-phase network	230 V	230 V	120 V
Neutral configuration	TT-TN-IT	TN	TN
Max. operating voltage	U <sub>c</sub> 440 Vac	255 Vac	150 Vac
Temporary overvoltage withstand	U <sub>tr</sub> 770 Vac	440 Vac	230 Vac
Operating current	I <sub>c</sub> < 1 mA	none	none
Leakage current at U <sub>c</sub>			
Protection mode(s)	CM <sup>[2]</sup>	CM/DM <sup>[2]</sup>	CM/DM <sup>[2]</sup>
Nominal discharge current 15 x 8/20 μs impulses	I <sub>n</sub> 5 kA	5 kA	5 kA
Maximum discharge current max. withstand 8/20 μs	I <sub>max</sub> 15 kA	15 kA	15 kA
Protection level (at I <sub>n</sub> ) CM/DM <sup>[2]</sup>	U <sub>p</sub> 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	I <sub>scrr</sub> 10000 A	10000 A	10000 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 DS415S - 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 ed.3	USA	Low Voltage TVSS	
<b>Part number</b>			
DS415-400	451402	DS415S-400	451412
DS415-230/G	451722	DS415S-230/G	451732
DS415-120/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)



# 1-phase Type 2 (or 3) Surge Protector DS98 series

**Imax  
10 kA**

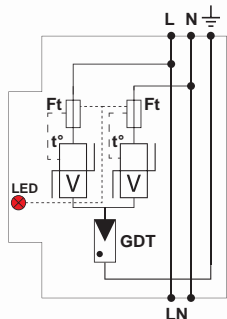
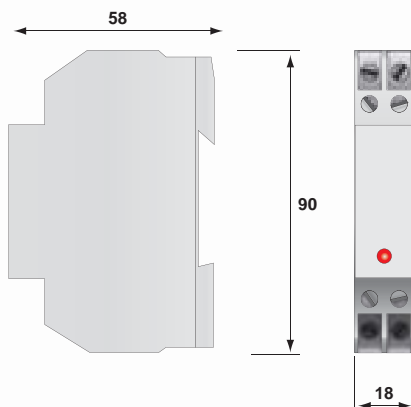


DS98-400

- **Cost effective Single phase Surge Protector**
- **Type 2 (or 3) monobloc**
- **In: 5 kA**
- **Imax: 10 kA**
- **Common/Differential mode**
- **Series or parallel wiring**
- **IEC 61643-11 and EN 61643-11 compliance**

## Dimensions - Electrical diagram

(in mm)



V : MOV  
GDT : Gas tube  
Ft : Thermal fuse  
t° : Thermal disconnection mechanism

## Characteristics

CITEL part Number	DS98-400	DS98-120
Single Phase AC network	230 V	120 V
AC system	TN - TT - IT	TN - TT
Max. operating voltage	Uc 275 Vac	150 Vac
TOV withstand	UT 440 Vac	230 Vac
Max. load current in case of series mounting	IL 16 A	16 A
Leakage current	Ic none	none
Leakage current at Uc		
Follow current	If without	without
Nominal discharge current 15 x 8/20 µs current impulse	In 5 kA	5 kA
Maximal discharge current max. withstand in 8/20 µs impulse	Imax 10 kA	10 kA
Protection level (at In) CM/DM (2)	Up 1.5 kV/ 1 kV	0.7 kV/ 0.7 kV
Tenue en onde combinée Test de classe III	Uoc 10 kV	10 kV
Admissible short circuit current	Iscrr 10000 A	10000 A
<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>Caractéristiques mécaniques</b>		
Dimensions	see diagram	
Connection to network	by screw terminal : 2,5 mm <sup>2</sup> max	
Disconnection indicatort	Red light on	
Mounting	symmetrical rail 35 mm	
Operating temperature	-40/+85 °C	
Protection class	IP20	
housing material	Thermoplastic UL94-V0	
<b>Standard 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 ed.3	USA	Low Voltage TVSS
<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 Protector + RFI Filtering DS40HF series

**Imax  
40 kA**

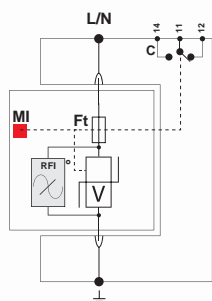
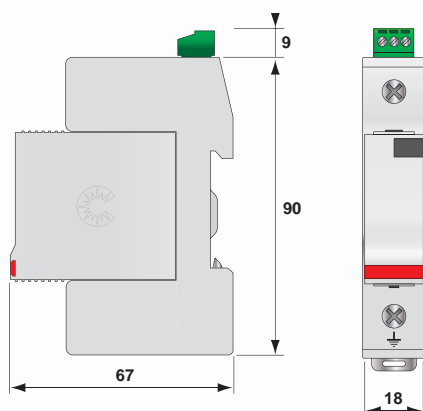


DS41HF-120

- **Type 2 AC surge protector**
- **RFI Filtering**
- **In: 20 kA**
- **Imax: 40 kA**
- **Pluggable module**
- **Remote signaling option**
- **IEC 61643-11 and EN 61643-11 compliance**

## Dimensions - Electrical diagram

(in mm)



V : MOV  
GDT : Gas tube  
Ft : Thermal fuse  
MI : Thermal disconnection mechanism

## Characteristics

CITEL Part number	DS41HF-230	DS41HF-120
Typical use	230/400 V	120/208 V
Nominal voltage	Un 230 V	120 V
Max. operating voltage	Uc 255 Vac	150 Vac
Operating current	Ic < 1 mA	< 1 mA
Leakage voltage at Un		
Nominal discharge current 15 x 8/20 $\mu$ s impulse	In 20 kA	20 kA
Max. discharge current 1 x 8/20 $\mu$ s impulse	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	Iscrc 25000 A	25000 A
<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 3ed.	USA	Low Voltage SPD
<b>Codes articles</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 Single-phase Surge Protector and Filter Gamme DS-HF

**Imax  
10 kA**

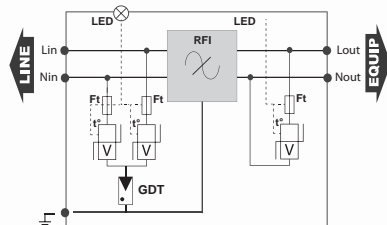
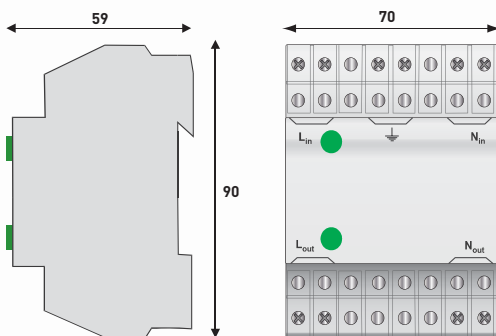


DS-HF

- Surge protector with RFI filtering
- In : 3kA
- I<sub>max</sub> : 10 kA
- Common and differential mode protection
- Low protection level
- Operating/disconnection indicators
- IEC 61643-11 and EN 61643-11 compliance

## Dimensions - Electrical diagram

(in mm)



V: Varistor  
GDT: Gas discharge tube  
Ft: Thermal fuse  
t°: Thermal disconnection system

## Characteristics

CITEL part number	DS-HF	DS-HF-120
Single-phase network	230 V	120 V
AC system	TN - TT - IT	TN - TT
Max. operating voltage	Uc 255 Vac	150 Vac
Temporary overvoltage withstand	UT 440 Vac	230 Vac
Operating current	Ic < 1 mA	< 1 mA
leakage current at Uc		
Max. line current	IL 16 A	16 A
Nominal discharge current	In 3 kA	3 kA
15 x 8/20 µs impulses		
Maximum discharge current	I <sub>max</sub> 10 kA	10 kA
Max. withstand 8/20 µs		
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	I <sub>sc</sub> 10000 A	10000 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 : 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
UL1449 ed.3	USA	Low Voltage TVSS
<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)



# DC power surge protector DS2x0-xxDC series

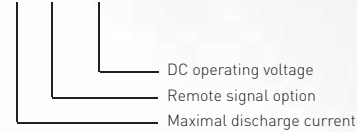
**Imax  
20-40 kA**



DS230-48DC

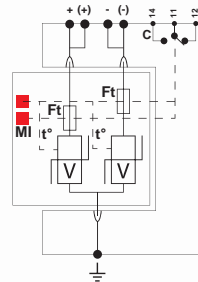
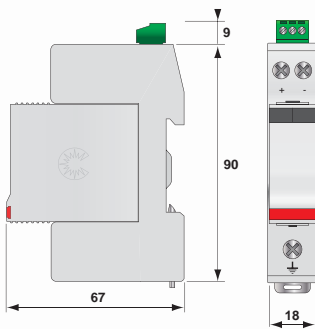
- From 12 to 350 Vdc
- Very low Up protection level
- Compact design
- I<sub>max</sub>: 20 to 40 kA
- Pluggable module
- Remote signaling (option)

**DS2xx S-xxxDC**



## Dimensions - Electrical diagram

(in mm)



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

## Characteristics

CITEL part number		DS220-12DC	DS220-24DC	DS230-48DC	DS240-75DC	DS240-95DC	DS240-110DC	DS240-130DC	DS240-220DC	DS240-280DC	DS240-350DC
Nominal DC voltage	U <sub>n</sub>	12 Vdc	24 Vdc	48 Vdc	75 Vdc	95 Vdc	110 Vdc	130 Vdc	220 Vdc	280 Vdc	350 Vdc
Max. operating voltage	U <sub>c</sub>	24 Vdc	38 Vdc	65 Vdc	100 Vdc	125 Vdc	150 Vdc	180 Vdc	275 Vdc	350 Vdc	460 Vdc
Nominal discharge current	I <sub>n</sub>	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 @ I <sub>n</sub>	U <sub>p</sub>	250 V	250 V	300 V	390 V	450 V	500 V	620 V	900 V	1200 V	1400 V
Residual voltage @ 3kA		195 V	195 V	230 V	280 V	310 V	370 V	510 V	690 V	920 V	1000 V

### Associated disconnection devices

Thermal disconnectors	internal	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	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

International	IEC 61643-11	Low voltage SPD - Test Class II
Europe	EN 61643-11	Low voltage SPD - Test Class II
USA - Canada	UL1449 3rd Edition	Type 4, Type 2 Location

### Part number

	390101	390501	390401	310601	310301	310701	310801	310201	310501	310901
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# DC power surge protector DS210-xxDC series

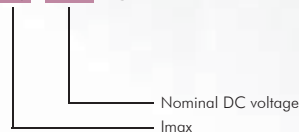
**Imax  
2-6 kA**



DS210-24DC

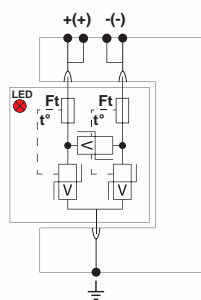
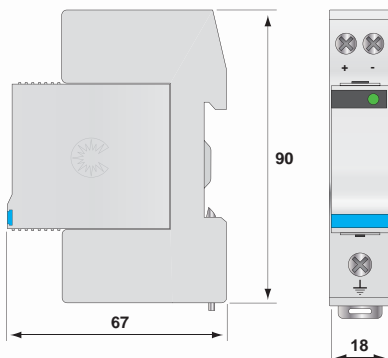
- Surge protector for DC supplies
- From 12 to 130V
- Discharge currents : I<sub>max</sub> : 2 to 6 kA
- Disconnection indicator
- Pluggable module

**DS210-xxxDC**



## Dimensions - Electrical diagram

(in mm)



V: Varistor  
Ft: Thermal fuse  
t°: Thermal disconnection system  
LED : Disconnection indicator

## Characteristics

CITEL part number		DS210-12DC	DS210-24DC	DS210-48DC	DS210-75DC	DS210-95DC	DS210-110DC	DS210-130DC
Nominal DC voltage	Un-dc	12 Vdc	24 Vdc	48 Vdc	75 Vdc	95 Vdc	110 Vdc	130 Vdc
Maximal AC voltage	Uc	10 Vac	15 Vac	40 Vac	60 Vac	75 Vac	95 Vac	115 Vac
Maximal DC voltage	Uc-dc	15 Vdc	30 Vdc	56 Vdc	85 Vdc	100 Vdc	125 Vdc	150 Vdc
Nominal discharge current 15 x 8/20 μs impulses	In	1 kA	1 kA	1 kA	2 kA	2 kA	2 kA	2 kA
Maximum discharge current Max. withstand 8/20 μs	I <sub>max</sub>	2 kA	2 kA	2 kA	6 kA	6 kA	6 kA	6 kA
Protection level (at In)	Up	85 V	105 V	180 V	250 V	300 V	350 V	400 V
<b>Associated disconnection devices</b>								
Thermal disconnector		internal						
Fuses (if necessary)		Fuses type gG - 10 A						
<b>Mechanical characteristics</b>								
Dimensions		see diagram						
Connection		by screw terminals : 1,5-10 mm <sup>2</sup> (active wires) - 2,5-25 mm <sup>2</sup> (Ground)						
Disconnection indicator		Green led off						
Mounting		symmetrical rail 35 mm						
Operating temperature		-40/+85 °C						
Protection class		IP20						
Housing material		Thermoplastic UL94-V0						
<b>Part number</b>								
		440201	440301	440401	440601	441001	440901	440602



# Coordination inductors DSH series

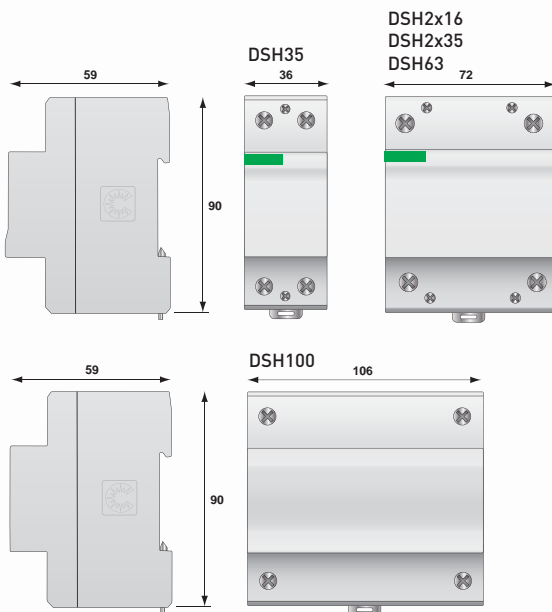


DSH 35

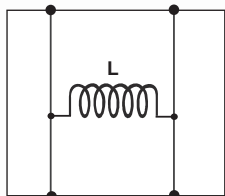
- Coordination inductors for Surge Protectors
- For use with the DS series
- 35A, 63A, 100A versions
- 2x16A and 2x35A double inductor versions

## Dimensions - Electrical diagram

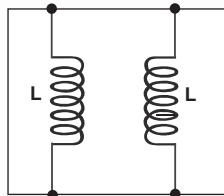
(in mm)



DSH35 - DSH63 - DSH100



DSH2x16 - DSH2x35



L : inductor

## Characteristics

CITEL part number	DSH100	DSH63	DSH35	DSH2x35	DSH2x16
Type	inductor	inductor	inductor	double inductor	double inductor
Connexion 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	Uc	500 Vac	500 Vac	500 Vac	500 Vac
Max. line current	I <sub>L</sub>	100 A	63 A	35 A	2 x 16 A
Line inductance		15 µH	15 µH	2 x 15 µH	2 x 15 µH
<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	2690				







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. But these systems are often highly exposed to lightning and power surges, which can greatly reduce the required operating time. Implementation of appropriate protection solutions is strongly recommended.

Several points must be considered to analyze the risk «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) and indirect (surge on cells, solar chargers / inverters), on other lines (data).
- 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 input PV modules.
- **Low current network:** if the PV inverter is connected to low voltage signal lines (probes, sensors, monitoring) then SPD devices are recommended.

## AC surge protectors for PV installation

Depending on the type of networks, the presence of lightning rod or primary surge protectors existing, CITEC 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 dimensioned to handle direct lightning current is required at the service entrance of the installation (main switchboard). Arresters like the DS130R provide a high energy surge capacity in a compact size and are easily serviced with pluggable modules.

### Standard installation

In the absence of lightning rod, the implementation of a type 2 SPD is generally preferred, but, in some cases, it is compulsory depending on the level of lightning in the area ( $I_{Ng} > 2.5$ ). The DS40 type 2 arrester 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 current

The PV system can be interconnected to various low-current networks including probes, sensors, and monitoring equipment. In these cases, the implementation of suitable surge protector is highly recommended: The DLA range performs this function and surge protector is available for any type of telecom or data line connections

## DC surge protectors for PV installation

The DC input of the PV inverter has to be protected according to the recommendation of the UTE C15-712-1 Guide. CITELE has designed a complete range of Type 1 and Type 2 surge protectors for these applications that are compliant with the rigorous UTE C61740-51 product standard (or future NF EN50539-11).

### 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 dimensioned for a direct lightning wave form (10/350 $\mu$ s). In these cases, CITELE has developed a range of high energy Type 1 surge protectors:

- **DS60VGPV series** : Type 1 SPDs may withstand up to 12.5 kA 10/350 $\mu$ s, it incorporates CITELE's exclusive, patented «VG Technology».

### Type 2 surge protector

In most installations, the SPD will be necessary or obligatory and will be of type 2. CITELE offers 2 ranges with pluggable module design:

- **DS50PV/51 series** : based on the use of specific varistors, providing a protection in common mode or differential and common mode.
- **DS50VGPV series** : This version is based on VG technology, guarantying a total absence of leakage current and maximum reliability.

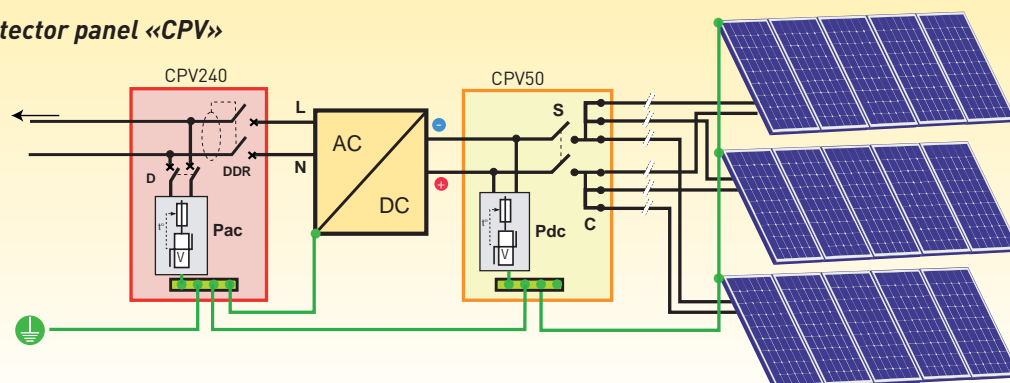
Series		Description	Characteristics	Page
DS60VGPV		Type 1+2 surge protector for PV	High energy VG Technology	65
DS50VGPV		Type 2 surge protector for PV	Pluggable VG Technology	66
DS50PV		Type 2 surge protector for PV	Pluggable	67
CPV		Surge protector panel for PV	Many configurations	68

## Surge protectors panels for PV installation

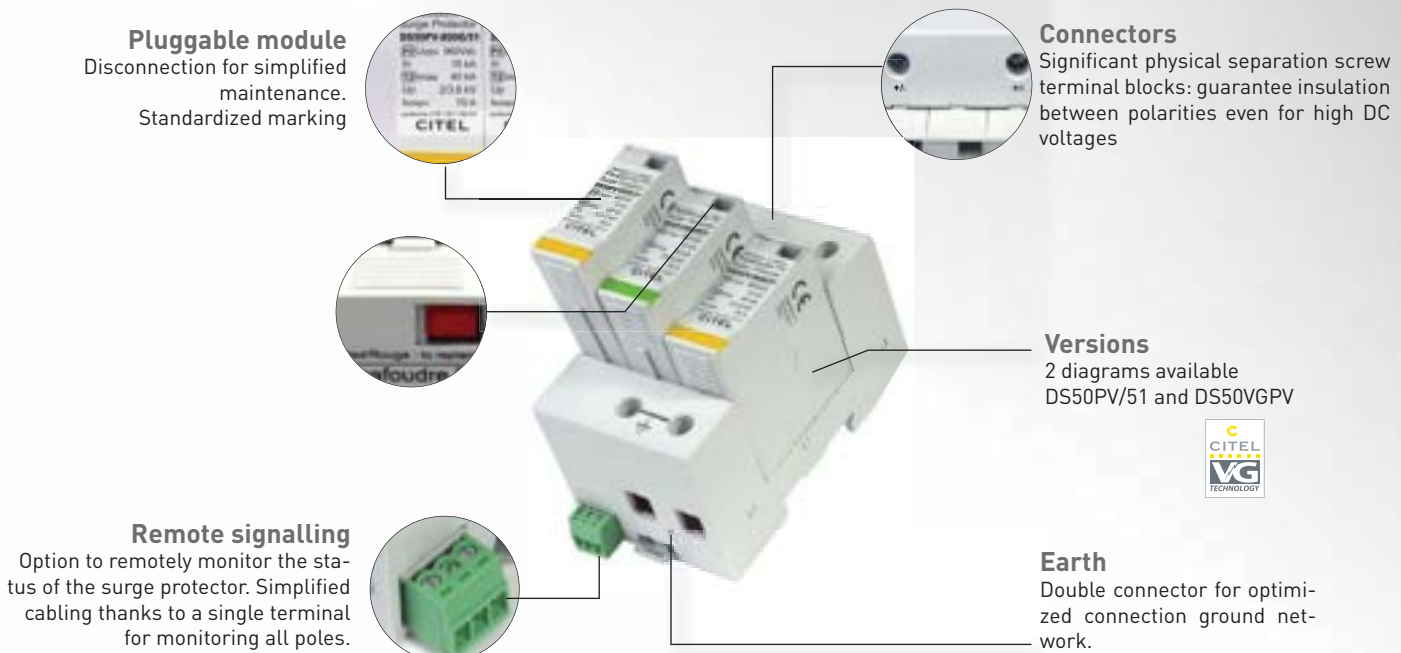
To complete its offer and meet the needs of users, CITELE offers a range of surge enclosures for PV applications. The CPV range of enclosures are intended for installation at the AC output or DC input of the PV inverters and can include Type 1 or Type 2 surge protection, circuit breakers for array strings and a single disconnection device. Many configurations are available.

### Protection by surge protector panel «CPV»

- Pac** AC surge protector
- Pdc** DC surge protector
- DDR** Differential circuit breaker
- D** Disconnection SPD
- S** DC isolator
- C** Connector PV



## DS50PV/51 and DS50VGPV/51 series



### Pluggable module

Disconnection for simplified maintenance. Standardized marking

### Connectors

Significant physical separation screw terminal blocks: guarantee insulation between polarities even for high DC voltages

### Versions

2 diagrams available  
DS50PV/51 and DS50VGPV



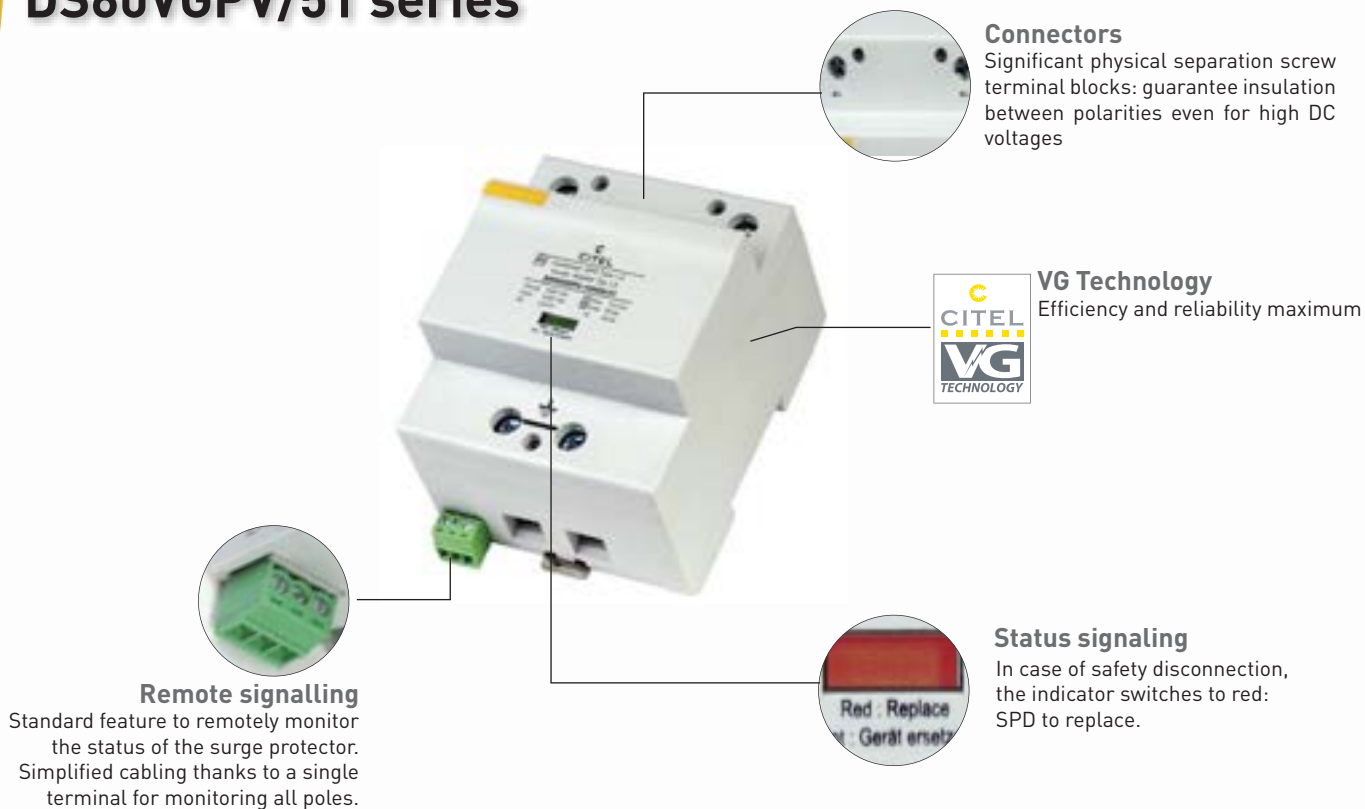
### Earth

Double connector for optimized connection ground network.

### Remote signalling

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

## DS60VGPV/51 series



### Connectors

Significant physical separation screw terminal blocks: guarantee insulation between polarities even for high DC voltages



### VG Technology

Efficiency and reliability maximum

### Remote signalling

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

### Status signaling

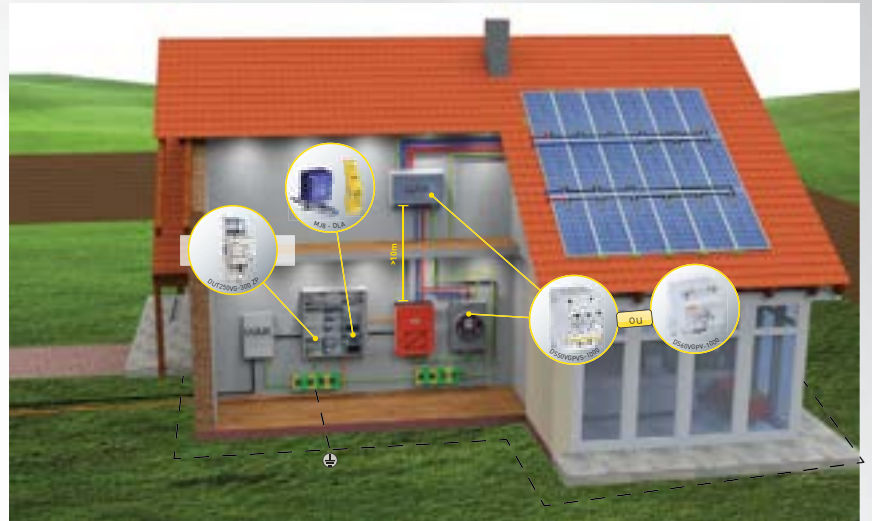
In case of safety disconnection, the indicator switches to red: SPD to replace.

# 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), AC input (connection to the grid) and DC out 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.



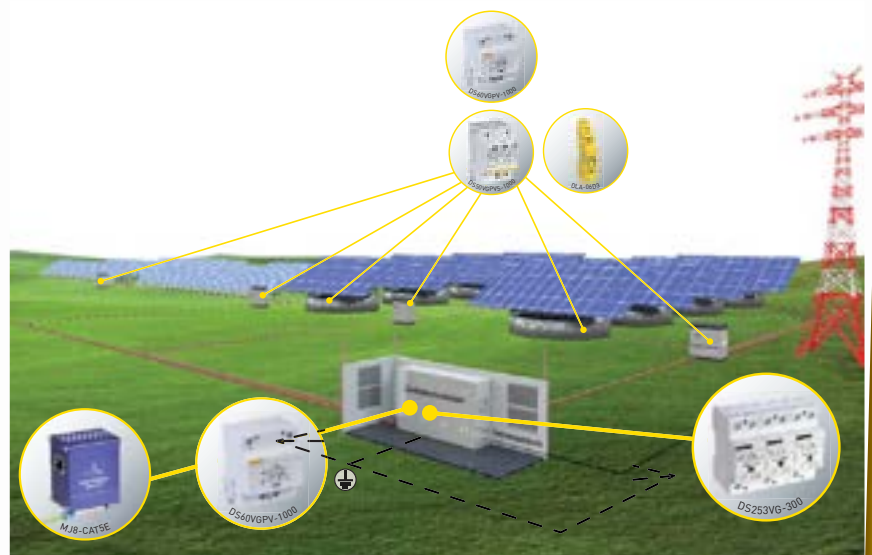
## Tertiary/Industrial Photovoltaic installation

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 SPDs 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 means expensive, sensitive equipment is vulnerable to lightning strikes resulting in direct replacement costs and operation downtime losses.



# Type 1+2 PV Surge Protector DS60VGPV/51 series



DS60VGPV-1500G/51

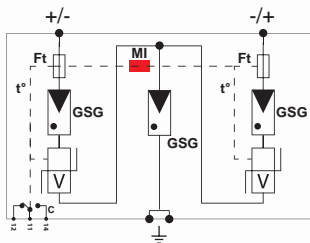
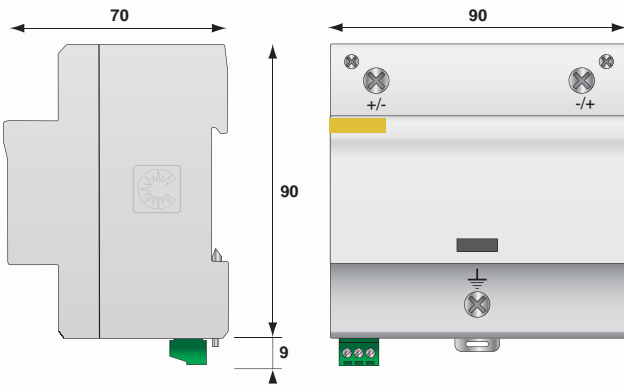
- **Type 1+2 Surge Protector for Photovoltaic**
- **VG-Technology**
- **No leakage, no operating currents**
- **Improved life expectancy**
- **Impulse currents  $I_{imp}$  12.5 kA/pole @ 10/350 $\mu$ s**
- **Common and Differential mode protection**
- **Remote Signaling**
- **UTE C61-740-51 and prEN 50539-11 compliance**

DS60VGPV-xxxG/51

Network voltage

## Dimensions - 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-600G/51	DS60VGPV-1000G/51	DS60VGPV-1500G/51
Network voltage	Uocstc	600 Vdc	1000 Vdc	1250 Vdc
Protection mode *		CM/DM	CM/DM	CM/DM
Max. operating voltage	Ucpv	720 Vdc	1200 Vdc	1500 Vdc
Current withstand short circuit	Iscwp	>1000 A	>1000 A	>1000 A
Operating current to the voltage Ucpv	Icpv	none	none	none
Leakage current to the voltage Ucpv	Ipe	none	non	none
Follow current	If	none	none	none
Nominal discharge current 15 x 8/20 $\mu$ s impulses	In	20 kA	20 kA	20 kA
Maximum discharge current 10/350 $\mu$ s withstand	Iimp	12.5 kA	12.5 kA	12.5 kA
Max. Lightning current by pole 8/20 $\mu$ s withstand	I <sub>max</sub>	40 kA	40 kA	40 kA
Protection level CM/DM* (at In)	Up	2.2/2.8 kV	3.4/4.9 kV	3.4/6 kV

### Disconnecter

Thermal Disconnecter: internal

### Mechanical characteristics

Dimensions	see diagram
Connection	Screw terminal for 6-35 mm <sup>2</sup> wire
Disconnection indicator	1 mechanical indicator
Remote signaling (DS60VGPVS)	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	Parafoudre pour réseau PV - Essai de Classe I et II
prEN 50539-11	Europe	Parafoudre pour réseau PV - Essai de Classe I et II
UL1449 ed.3	USA	Type 4, Type 2 location - Pending

### Part Number

DS60VGPV-600G/51	--
DS60VGPV-1000G/51	3958
DS60VGPV-1500G/51	3956

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



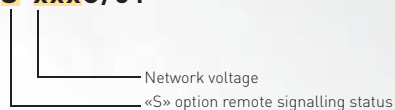
# Type 2 PV Surge Protector DS50VGPV-G/51 series



DS50VGPV-1500G/51

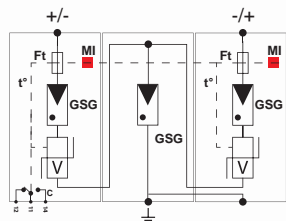
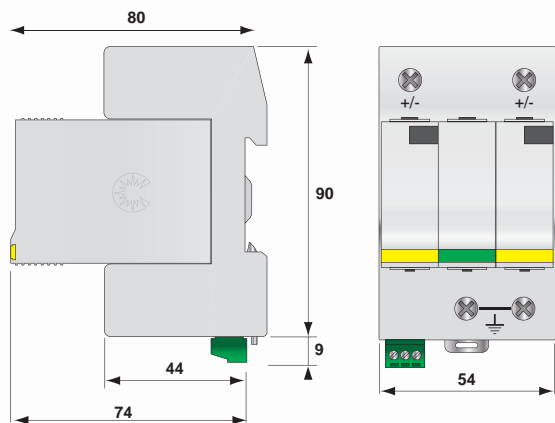
- **Type 2 Surge Protector for Photovoltaic**
- **VG-Technology**
- **No leakage, no operating currents**
- **Improved life expectancy**
- **Impulse currents  $I_n/I_{max}$  : 15/40 kA**
- **Common Mode and Differential protection**
- **Remote Signaling (option)**
- **UTE C61-740-51 and prEN 50539-11 compliance**

DS50VGPV**S**-xxxG/51



## Dimensions - Electrical diagram

(in mm)



GSG: Gas-filled spark gap  
V : High energy MOV  
Ft : Thermal fuse  
t° : Thermal disconnection mechanism  
C : Contact for remote signal

## Characteristics

CITEL part number	DS50VGPV-600G/51	DS50VGPV-1000G/51	DS50VGPV-1500G/51
Network voltage	Uocstc 600 Vdc	1000 Vdc	1250 Vdc
Protection mode *	CM/DM	CM/DM	CM/DM
Max. operating voltage	Ucpv 720 Vdc	1200 Vdc	1500 Vdc
Current withstand short-circuit	Iscwpv >1000 A	>1000 A	>1000 A
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 $\mu$ s impulses	$I_n$ 15 kA	15 kA	15 kA
Max. Lightning current by pole 8/20 $\mu$ s withstand	$I_{max}$ 40 kA	40 kA	40 kA
Protection level CM/DM* (at $I_n$ )	$U_p$ 2.2/3.4 kV	3.5/6 kV	3.4/6.8 kV
<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 DS50VGPV - 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	Parafoudre pour réseau PV - Essai de Classe I et II	
prE?50539-11	Europe	Parafoudre pour réseau PV - Essai de Classe I et II	
UL1449 ed.3	USA	Type 4, Type 2 location - Pending	

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

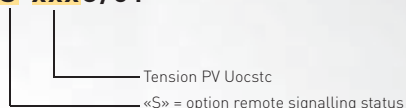


# Type 2 PV Surge Protector DS50PV/51 series



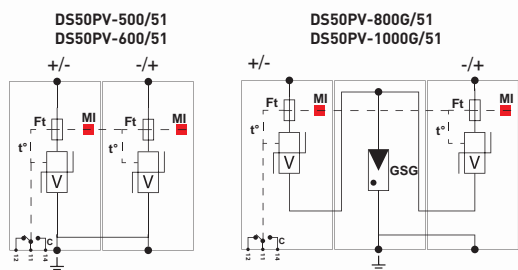
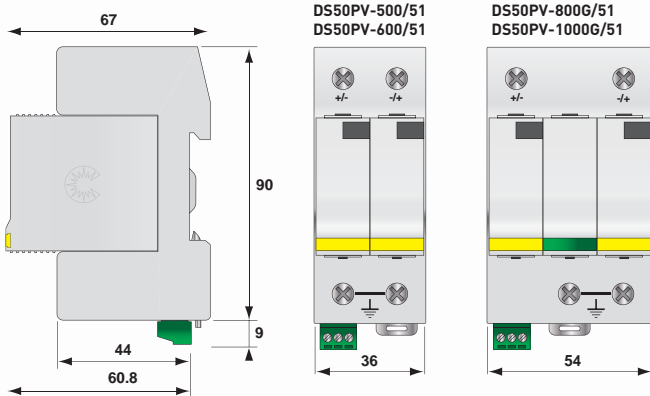
- **Type 2 Surge Protector for Photovoltaic**
- **In : 15 kA**
- **Imax : 40 kA**
- **Pluggable module**
- **Remote Signaling (option)**
- **UTE C61740-51 compliant**

**DS50PVS-xxxG/51**



## Dimensions - 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/51)

## Characteristics

CITEL part number	DS50PV-500/51	DS50PV-600/51	DS50PV-800G/51	DS50PV-1000G/51
Maximum PV voltage	Uocstc 500 Vdc	600 Vdc	800 Vdc	1000 Vdc
Protection mode *	MC	MC	CM/DM	CM/DM
Max. operating voltage	Ucpv 600 Vdc	720 Vdc	960 Vdc	1200 Vdc
Current withstand short-circuit	Iscwpv >1000 A	>1000 A	>1000 A	>1000 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	none	none
Nominal discharge current 15 x 8/20 µs impulses	In 15 kA	15 kA	15 kA	15 kA
Max. discharge current max. withstand 8/20 µs	Imax 40 kA	40 kA	40 kA	40 kA
Protection level CM/DM* (at In)	Up 2.2 kV	2.8 kV	2 / 3.6 kV	2.2 / 4.4 kV

### 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/51 - output on changeover contact
Mounting	symmetrical rail 35 mm
Operating temperature	-40/+85 °C
Protection class	IP20
Housing material	Thermoplastic UL94-V0

### Standards compliance

prEN50539-11	Parafoudre pour réseau PV - Essai de Classe II
Guide UTE C61-740-51	Parafoudre pour réseau PV - Essai de Classe II

### Part number

DS50PV-500/51	480121
DS50PV-600/51	480421
DS50PV-800G/51	480281
DS50PV-1000G/51	480381

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



# PV Surge protector panels

## PV surge protector panel - AC side **CPV240 series**



- Photovoltaic surge protector panel
- UTE C15-712-1 compliance
- AC network connection
- Line and differential circuit-breaker

## PV surge protector panel - DC side **CPV50-xxx-xxA-xST series**



- 3 string surge protector panel
- 500, 600 and 800 Vdc
- Max. current : 25 A
- Sectionnement

## PV surge protector panel - AC/DC side **CPV240-50 series**



- AC/DC combined surge protector panel
- Differential circuit breakers
- Disconnection and connection of PV modules

CITEL part number	CPV240-230-xxx-DDR	
Network tension	Un	230 V mono
Maximum current		16 A - 25 A - 32 A
Network connection (input/output)		6 mm <sup>2</sup> max.
<b>Security</b>		
Thermal disconnector		internal
Visualization of disconnection		indicator lightning
Surge protector		branch circuit breaker in surge protector
Overcurrent protection		by line circuit breaker (calibre 16 or 32 A)
Protection against indirect contacts		by differential circuit breaker 30mA
<b>Type 2 surge protector</b>		
<b>DS240-230/G</b>		
Max. operating voltage	Uc	255 Vac
Nominal discharge current	In	20 kA
Max. discharge current	Imax	40 kA
Protection level (CM/DM)	Up	1,5/1,25 kV
<b>Characteristics case</b>		
Protection level		IP 55
Dimensions (H x L x P) mm		198 x 255 x 108
Enclosure material		Polycarbonate UL 94V0
Access equipment		Transparente door
Shift cable		by cable glands

CITEL part number	CPV50-500-40A-3ST	CPV50-600-40A-3ST	CPV50-800-40A-3ST
Number of strings	3	3	3
Max. PV voltage	Uocstc	500 Vdc	600 Vdc
Max. PV current	Impstc	25 A	25 A
Max. PV current	Impstc	25 A	25 A
Network connection (input/output)		terminal 6,5/10 mm <sup>2</sup>	terminal 6,5/10 mm <sup>2</sup>
DC switch		yes	yes
Fuses protection by strings		option	option
<b>Type 2 surge protector</b>			
<b>DS50PV-500/51 DS50PV-600/51 DS50PV-800/51</b>			
Max. PV voltage	Ucpv	600 Vdc	720 Vdc
Nom. discharge current	In	15 kA	15 kA
Max. discharge current	Imax	40 kA	40 kA
Protection level	Up	2,2 kV	2,8 kV
Protection level		2,2 kV	2,8 kV
Protection level		2,2 kV	2,8 kV
<b>Characteristics case</b>			
Protection level		IP65	
Dimensions (HxLxP)		305 x 225 x 125 mm	
Enclosure material		ABS PC	
Type of handle		external lockable	

CITEL part number	CPV240-50-230-xx-DDR	
Network	AC single phase network	2 strings - DC network
Network voltage	Un/Uocstc	230 V mono
Max. current (xx)		600 Vdc
Max. current (xx)		25A
Connection (inverter/network)		6 mm <sup>2</sup> max. in screw terminal
Connection (inverter/network)		6mm <sup>2</sup> max in terminal resort type MC connector
<b>Security</b>		
Thermal disconnector	internal surge protector	internal surge protector
Visualization of disconnection	surge protector indicator	surge protector indicator
Surge protector	SPD's breaker	not necessary
Overcurrent protection	by line circuit breaker	without
Protection against indirect contacts	by diff. circuit breaker 30 mA	without
<b>Type 2 surge protector</b>		
<b>DS240-230/G DS50PV-600/51</b>		
Tension de régime permanent max.	Ucpv	255 Vac
Nominal discharge current	In	20 kA
Max. discharge current	Imax	40 kA
Protection level	Up	1,5/1,25 kV
Protection level		2,8 kV
<b>Characteristics case</b>		
Dimensions (H x L x P)		420 x 298 x 140 mm
Enclosure material		Polycarbonate UL94 VD
Protection level		IP55
Access equipment		Transparent door
Shift cable		by cable glands

# Surge protector for PV Offgrid site

## DS2x0-xxDC series



- **Surge protector for PV offgrid site**
- **12 at 350 Vdc**
- **Compact**
- **Imax: 10 at 40 kA**
- **Pluggable module**
- **Remote signalling (option)**

for additional information, see page 56

## Characteristics

CITEL part number		DS220-12DC	DS220-24DC	DS230-48DC	DS240-75DC	DS240-95DC	DS240-110DC	DS240-130DC	DS240-220DC	DS240-280DC	DS240-350DC
DC nominal voltage	Un	12 Vdc	24 Vdc	48Vdc	75 Vdc	95 Vdc	110 Vdc	130 Vdc	220 Vdc	280 Vdc	350 Vdc
Max. operating voltage	Uc	24 Vdc	38 Vdc	65 Vdc	100 Vdc	125 Vdc	150 Vdc	180 Vdc	275 Vdc	350 Vdc	460 Vdc
Nominal discharge current	In	10kA	10 kA	15 kA	20 kA	20kA	20 kA	20 kA	20 kA	20 kA	20 kA
Max. 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	250 V	250 V	300 V	390 V	450 V	500 V	620 V	900 V	1200 V	1400 V
Protection level (at 3kA)		195 V	195 V	230 V	280 V	310 V	370 V	510 V	690 V	920 V	1000 V
Dimension (width)		18 mm	18 mm	18 mm	18 mm	18 mm	18 mm	18 mm	18 mm	18 mm	18 mm

## Protection of Isolated (offgrid) PV systems

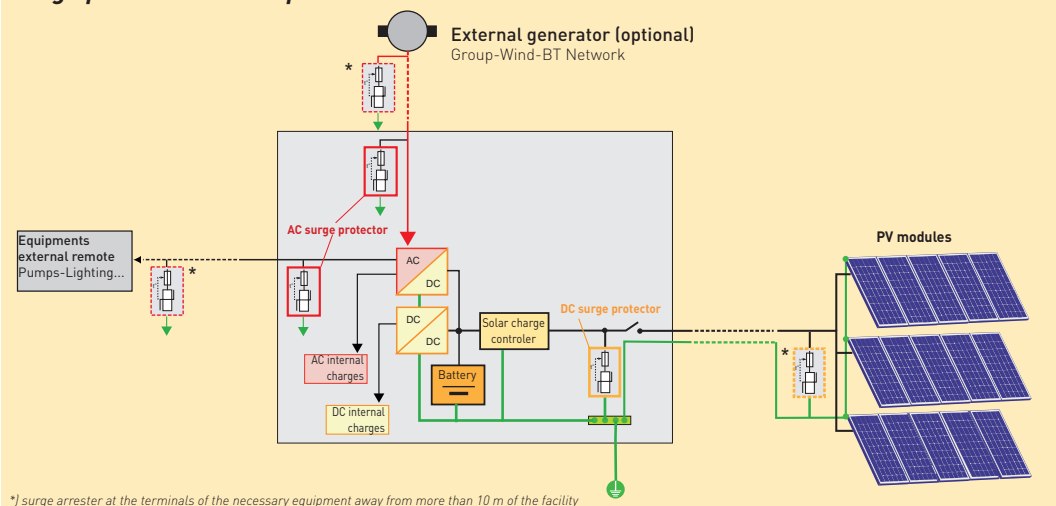
The exposure and location of remote sites powered by isolated PV systems not connected to the AC network are at a very high risk of failure due to transient surges.

Unlike the sites connected to the distribution network, PV equipment failure at a remote site will result in a total operating loss: thus, the implementation of appropriate surge protection is strongly recommended.

The selection and installation of surge protectors for isolated sites in the future will be defined in the UTE C15-712-2 guide.

CITEL surge protectors for remote sites are available in voltages from 12 to 350Vdc.

## Surge protection for PV powered remote site





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:

- Hard-wired units single-phase (MSB, MLP)
- Surge protector combiner box (CBC series)
- Hard-wired units and combiner box for US market (M serie)

## Hard-wired surge protector

### MSB series

SPDs Type 2 or 3 for effective protection of sensitive equipment, in addition to the surge protector installation (coordination surge protector). Recommended installation near a sensitive equipment away from the surge protector (> 10 m). These surge protectors utilize a compact and economical scheme based varistors, to obtain a power flow relevant for secondary protection. They are more in accordance with NF EN 61643-11, equipped with internal security which will disconnect the product of their networks for end of life. The operating condition of the arrester is signaled by light (or buzzer for version MSB6). Available in screw terminal connectors or son.

### MLP series

Surge protector compact, designed for the protection of equipment particularly vulnerable to transient overvoltages This complete range offers numerous configurations:

- Wire or terminal connection
- IP20 or IP65
- Disconnection security line or parallel
- Function «surge protection for data» Additional optional.
- Optional status signaling

Like the range MSB, these surge arresters are based on a varistor scheme, complies with EN 61643-11, equipped with internal safety disconnection and associated indicator. An optional remote signaling state by auxiliary contact is available. To complete the AC protective function, the MLP surge protector range is optionally fitted with protection for data lines RS485 or DALI.

## Combiner box surge protector

### CBC series




CBC boxes surge protectors are devices for low voltage electrical installations 230/400V or 120/208V (Single or Three Phase). These kits are based on the use of modular surge protectors (DS Series): The implementation of these kits require no additional devices, are equipped with standard surge protectors and the corresponding overcurrent protection fuses. Many configurations are available.

### M series

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

They are available in all single, dual or three phase configurations and are equipped with various diagnostic options. Housed in a NEMA 4 metal enclosures, these surge protectors are available in various per phase surge capacities (Imax = 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 standard, the safe operation is ensured by real-time diagnostics including fault indicators (LEDs), an audible alarm, and remote signal contacts.

Series		Description	Characteristics	Page
MSB		Hard-wired surge protector Type 2 or 3	compact	72
MLP		Hard-wired surge protector Type 2 or 3	Signaling and Data (option)	73
CBC		Surge protector combiner boxes Type 1 and Type 2	Many configurations	75
Série M		Surge protector combiner boxes US market	Compliance UL1449 80 to 200 kA	76

# Hard-wired AC Surge Protectors

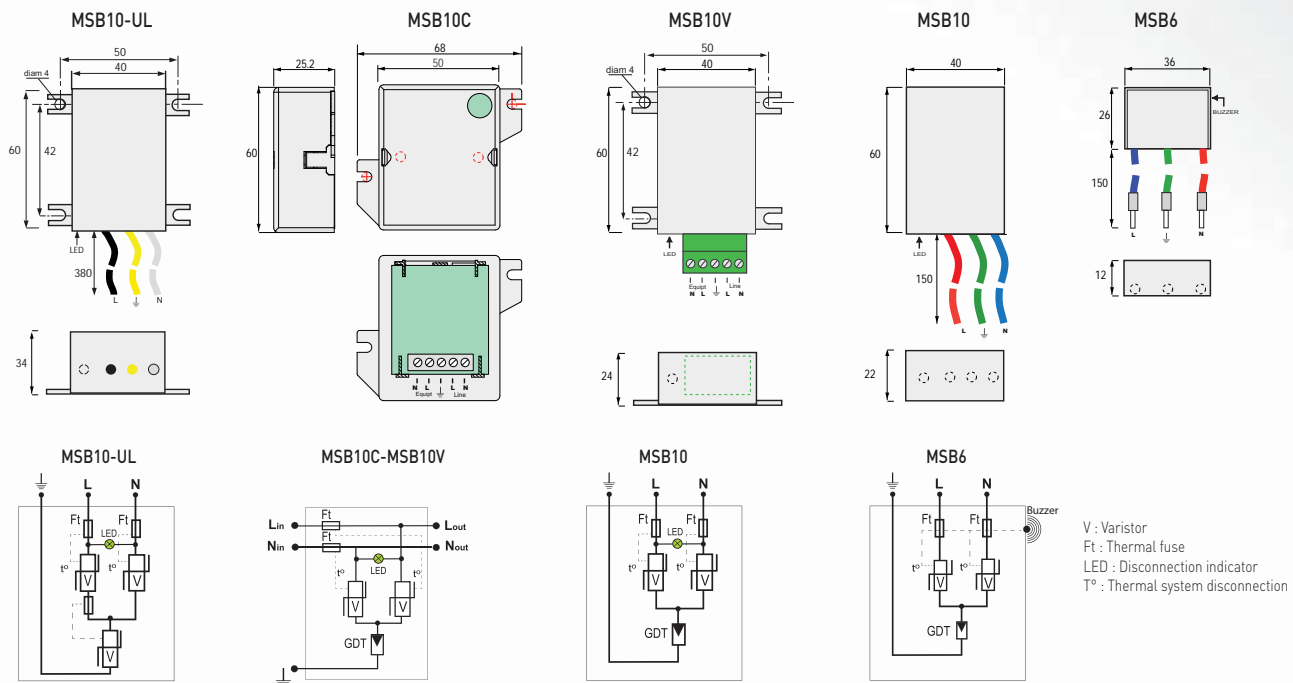
## MSB series



- Compact Type 2 and 3 surge protectors
- Wall mounting and hard wired connection
- UL1449 3ed and IP66 (MSB10-400)
- Status indicators
- 24 V AC or DC version available
- EN 61643-11 and IEC 61643-11 compliance

### Dimensions - Diagrams - Characteristics

(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	
Network	Un	230-277 Vac	230 Vac	110-130 Vac	230 Vac	110-130 Vac	230 Vac	230 Vac	24 Vac	
Max. operating voltage	Uc	300 Vac	550 Vac	255 Vac	150 Vac	255 Vac	150 Vac	255 Vac	30 Vac	
Max. 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	0.22 kV	
Max. discharge current 1 impulse @ 8/20 $\mu$ s	$I_{max}$	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	6 kA	
Nominal discharge current 15 impulses @ 8/20 $\mu$ s	$I_n$	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	-	
<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 signaling		green light off	green light off	green light off	green light off	green light off	green light off	green light off	buzzer	buzzer
Wiring		wires	wires	wires	wires	screw terminal	screw terminal	screw terminal	wires	wires
Mounting		wall or plate	wall or plate	wall or plate	wall or plate	wall or plate	wall or plate	wall or plate	AC outlet or	AC outlet or
Protection Class		IP66	IP66	IP65	IP65	IP20	IP20	IP20	IP65	IP65
<b>Standard compliance</b>										
N EN 61643-11		compliance	compliance	compliance	compliance	compliance	compliance	compliance	compliance	compliance
UL 1449 ed.3		listed	listed	-	-	-	-	-	-	-
<b>Part number</b>		560501	-	521201	561601	561101	561602	561301	561302	-

# Hard-wired AC Surge Protectors

## MLP series

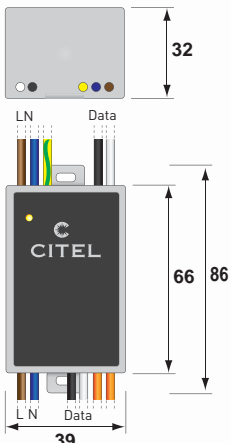


- Type 2 or 3 surge protector
- Class I or Class II configurations
- Comprehensive range for all configurations
- Very compact dimensions
- IP65 version
- Combined AC/Dateline version
- Wire or Screw connection
- Max. discharge current 10 kA
- Remote signaling IEC 61643-11 and EN 61643-11 compliance

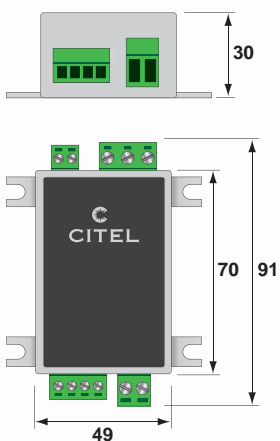
### Dimensions - Diagrams

(in mm)

MLP1-xxx-W/xx

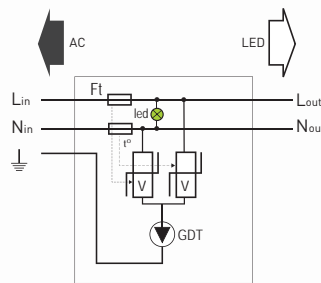


MLP2-xxx-P/xx

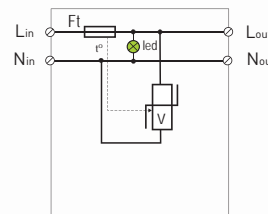


### MLP1 - 230 - L - W / RS

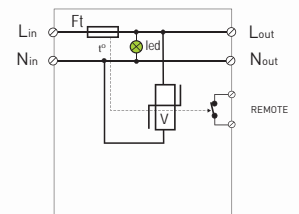
- : No dataline surge protection
- RS : RS485 dataline surge protection
- DL : Dali transmission surge protection
- W : Wire connection
- P : Pluggable screw terminal connection
- L : Line disconnection failure mode without remote signal
- LS : Line disconnection failure mode with remote signal
- S : Parallel disconnection failure mode with remote signal
- : Parallel disconnection failure mode without remote signal
- 230 : 230-277 Vac voltage
- 120 : 110-120 Vac voltage
- 1 : Class I equipment
- 2 : Class II equipment



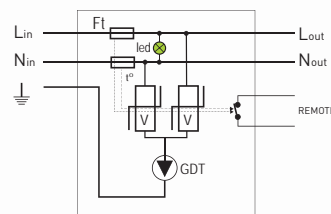
MLP1-230L-W



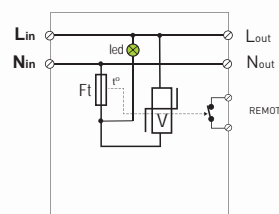
MLP2-230L-P



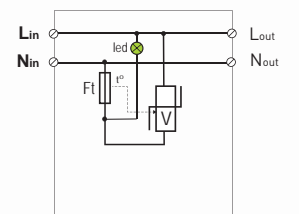
MLP2-230LS-P



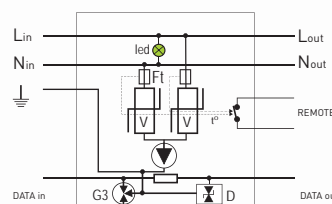
MLP1-230LS-W



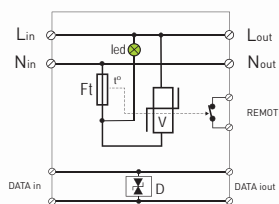
MLP2-230S-P



MLP2-230-P



MLP1-230S-W/RS



MLP2-230S-P/RS

- F : Thermal fuse
- Led : Status indicator
- V : MOV
- GDT : Gas Tube
- G3 : 3-pole Gas Tube
- D : Clamping diode network
- Remote : Dry contact for remote signalling

# MLP series

## Characteristics

CITEL part number		MLPx-120-x	MLPx-230-x	MLP-x-x/RS	MLP-x-x/DL
Typical use		110-120 Vac	230-277 Vac	RS485	DALI
Max. load current	IL	2,5 A	2,5 A	300 mA	300 mA
Max. operating voltage	Uc	180 Vac	305 Vac	7 Vdc	28 Vdc
Leakage current for Class I version	Ipe	none	none	none	none
Nominal discharge current 15 x 8/20 µs impulse	In	5 kA	5 kA	5 kA (MLP1-xx) 100 A (MLP2-xx)	5 kA (MLP1-xx) 100 A (MLP2-xx)
Max. discharge current 1 x 8/20 µs impulse	I <sub>max</sub>	10 kA	10 kA	10 kA (MLP1-xx) 200 A (MLP2-xx)	10 kA (MLP1-xx) 200 A (MLP2-xx)
Combinaison waveform 1.2/50µs - 8/20µs		10 kV / 10 kA	10 kV / 10 kA	-	-
Protection level (at In)	Up	1 kV	1,5 kV	20 V	40 V
Admissible short-circuit current		10000 A	10000 A	-	-
<b>Mechanical characteristics</b>					
Thermal disconnector		internal		-	
Dimensions		see diagram		-	
Connection for MLPx-x-W		wire 1,5 mm <sup>2</sup>		1,5 mm <sup>2</sup>	
Connection for MLPx-x-P		screw terminal 1,5 mm <sup>2</sup> max.		screw 1,5 mm <sup>2</sup>	
Disconnection indicator		LED indicator		Line short-circuit	
Remote signaling of disconnection		dry contact		Transmission cut-off	
IP rating		IP65 (MLPx-x-W) - IP20 (MLPx-x-P)			
Housing material		Polycarbonate UL94-V0			
Operating temperature		-40/+85 °C			
Mounting		wall or plate			
Insulation Class		Class I (MLP1-x) - Class II (MLP2-x)			
<b>Standards compliance</b>					
IEC 61643-11	International	Low Voltage SPD (class II & III test)		-	
EN 61643-11	Europe	low Voltage SPD (Classe II & III test)		-	
IEC 61643-21	International	-		C2 category	



## Characteristics for version type

CITEL part number		MLP1-230L-W	MLP2-230L-P	MLP2-230-P	MLP2-230-P/RS
<b>AC surge protector</b>					
Nominal voltage		230-277 Vac	230-277 Vac	230/277 Vac	230-277 Vac
Max. Load current	IL	2,5 A	2,5 A	2,5 A	2,5 A
Max. operating voltage	Uc	305 Vac	305 Vac	305 Vac	305 Vac
Leakage current	Ipe	none	non relevant	non relevant	non relevant
Nominal discharge current 15 x 8/20 µs impulses	In	5 kA	5 kA	5 kA	5 kA
Max. discharge current 1 x 8/20 µs impulse	I <sub>max</sub>	10 kA	10 kA	10 kA	10 kA
Combination waveform 1.2/50µs - 8/20µs	Uoc	10 kV / 10 kA	10 kV / 10 kA	10 kV / 10 kA	10 kV / 10 kA
Protection level (at In)	Up	1,5 kV	1,5 kV	1,5 kV	1,5 kV
Admissible short-circuit current		10000 A	10000 A	10000 A	10000 A
<b>Dataline surge protector</b>					
Dataline		without	without	without	RS485
Max. operating voltage		-	-	-	7 Vac
Max. line current		-	-	-	300 mA
Nominal discharge current		-	-	-	100 A
Max. discharge current		-	-	-	200 A
Protection level		-	-	-	20 V
<b>Mechanical characteristics</b>					
Thermal disconnector		internal	internal	internal	internal
Dimensions		see diagram	see diagram	see diagram	see diagram
Connection to AC line		wire 1,5 mm <sup>2</sup> max	screw 1,5 mm <sup>2</sup> max	screw 1,5 mm <sup>2</sup> max	screw 1,5 mm <sup>2</sup> max
Connection for Dataline		wire 1 mm <sup>2</sup> max	screw 1 mm <sup>2</sup> max	screw 1 mm <sup>2</sup> max	screw 1 mm <sup>2</sup> max
Failsafe behavior		AC network cutoff and LED off	AC network cutoff and LED off	AC network cutoff and LED off	AC network cutoff and LED off
Remote signalling of disconnection		none	none	dry contact 230Vac - 30 Vdc - 3 A	dry contact 230Vac - 30 Vdc - 3 A
IP rating		IP65	IP20	IP20	IP20
Housing material		PA66 UL94V0	PA66 UL94V0	PA66 UL94V0	PA66 UL94V0
Operating temperature		-40/+85 °C	-40/+85 °C	-40/+85 °C	-40/+85 °C
Mounting		wall or plate	wall or plate	wall or plate	wall or plate
Insulation Class		Class I	Class II	Class II	Class II
<b>Standards compliance</b>					
CEI 61643-11	International (AC SPD)	Class II & III test	Class II & III test	Class II & III test	Class II & III test
EN 61643-11	Europe (AC SPD)	Classe II & III test	Classe II & III test	Classe II & III test	Classe II & III test
IEC 61643-21	International (SPD)	-	-	-	C2 category



# AC surge protector panel *CBC series*

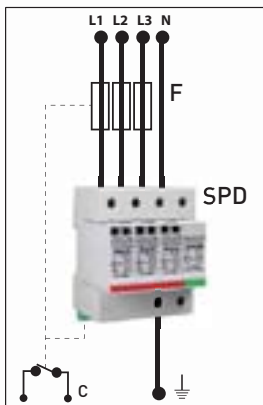


CBC154-230

- **Single and 3-Phase surge protector panels**
- **Type 1 and Type 2**
- **Common mode and differential mode**
- **Disconnection indicator and remote signaling of thermal and electrical disconnection**
- **IEC 61643-11 and EN 61643-11 compliance**
- **Specific versions on request**

## Dimensions and Diagram

(in mm)



SPD : Surge protector

F : Fuse

C : Remote signaling contact

230V single phase network	120V single phase network	Dimension (L x h x p - in mm)	Weight
CBC152-230	CBC152-120	215 x 210 x 100	1,7 kg
CBC72-230	CBC72-120		1,5 kg
CBC42-230	CBC42-120		1,4 kg
230/400V 3-phase network	120/208V 3-phase network		
CBC153-400	CBC153-120	410 x 285 x 140	3,8 kg
CBC73-400	CBC73-120	298 x 260 x 140	2,6 kg
CBC43-400	CBC43-120		2,4 kg
230/400V 3-phase + N network	120/208V 3-phase + N network		
CBC154-230	CBC154-120	410 x 285 x 140	4,2 kg
CBC74-230	CBC74-120	298 x 260 x 140	3 kg
CBC44-230	CBC44-120		2,8 kg

## Characteristics

CITEL part number	CBC		
Configuration	AC Surge protector panel with fuses		
Type of protection	Type 1	Type 2	Type 2
Network voltage*	230/400V	230/400V	230/400V
Single phase network (TT, TN)	CBC152-230	CBC72-230	CBC42-230
3-Phase network (TNC, IT)	CBC153-400	CBC73-400	CBC43-400
3-Phase + neutral network (TT, TNS)	CBC154-230	CBC74-230	CBC44-230
Common and differential mode protection	yes	yes	yes
Max. line current $I_L$	-	-	-
Maximum Power	-	-	-
Operating current $I_c$	none	none	none
Leakage current at $U_c$			
Follow current $I_f$	none	none	none
Nominal discharge current $I_n$ 15 x 8/20 $\mu$ s impulses	20 kA	30 kA	20 kA
Maximum discharge current $I_{max}$ Max. withstand 8/20 $\mu$ s	-	70 kA	40 kA
Max. lightning current $I_{imp}$ Max. withstand. 10/350 $\mu$ s	15 kA	-	-
Admissible short-circuit current	25000 A	25000 A	25000 A
Safety			
Thermal disconnectors	internal to each surge protector		
Electrical disconnectors	internal to each panel		
Installation ground fault breaker	Type «S» or delayed (if required)		
Mechanical characteristics			
Dimensions	See table «Part number»		
Weight	See table «Part number»		
Protection class	IP65		
Housing material	ABS UL94-V0		
Operating temperature	-40/+85 °C		
Mounting	Wall mounted by screws (not supplied)		
Wiring access	Transparency hinged front door		
Connection	by screws : 2,5-25 mm <sup>2</sup> and 6-35 mm <sup>2</sup> (CBC15x)		
Disconnection indication	Mechanical indicators on surge protectors and fuses		
Remote signaling of disconnection	Auxiliary contacts on surge protectors and fuses		
Standards compliance			
IEC 61643-1	International	Low Voltage SPD	
NF EN 61643-11	France	Parafoudre Basse Tension	
EN 61643-11	Europe	Low Voltage SPD	



# Specific AC Surge Protection Panels

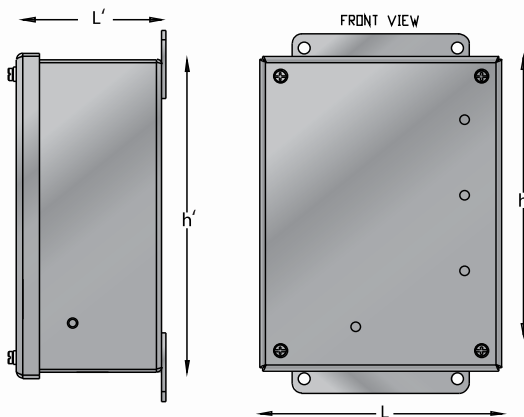
## Series M



- **I<sub>max</sub> from 80 to 200 kA (8/20μs)**
- **All mode of protection**
- **200 kA short-circuit fault current rated**
- **Multi-redundant protection circuit per phase**
- **Full on-board diagnostics - LED indicators, remote and audible alarms**
- **EMI/RFI noise filtering**
- **NEMA 4/12 enclosure**
- **UL 1449 3ed. compliant**
- **Lightning counter (option)**

### Dimensions

(in cm)



Model	Dimensions (cm)			
	L	h	L'	h'
M200	16	18.6	9	20.3
M160				
M100				
M80				

### Characteristics

Series	M80	M100	M160	M200
Max. discharge current by phase I <sub>max</sub>	80 kA	100 kA	160 kA	200 kA
Type of Network	M80-120T	M100-120T	M160-120T	M200-120T
120/240 Vac Split Phase 3Ph+PE	M80-120Y	M100-120Y	M160-120Y	M200-120Y
120/208 Vac Wye 3Ph/N+PE	M80-220Y	M100-220Y	M160-220Y	M200-220Y
220/380 Vac Wye 3Ph/N+PE	M80-277Y	M100-277Y	M160-277Y	M200-277Y
277/480 Vac Wye 3Ph/N+PE	M80-240Y	M100-240Y	M160-240Y	M200-240Y
240/415 Vac Wye 3Ph/N+PE	M80-240DCT	M100-240DCT	M160-240DCT	M200-240DCT
120/120/240 Vac Hi-Leg Delta 3Ph/N PE	M80-240D	M100-240D	M160-2s40D	M200-240D
240 Vac Delta 3Ph+PE	-	-	M160-347Y	M200-347Y
347/600 Vac Wye 3Ph/N+PE	-	-	M160-480D	M200-480D
480 Vac Delta 3Ph+PE				
Protection modes	L/N - L/PE - N/PE - L/L			
Admissible short-circuit current	200 kA			
RFI filtering	- 40 dB			
Standards compliance	UL1449 3rd edition -IEC 61643-1			
<b>Safety</b>				
Thermal disconnecter	internal to each surge protector			
Electrical disconnecter	internal to each panel			
Failure indicators	by Led			
Failure indicators in option	audible alarm and remote signaling			
<b>Mechanical characteristics</b>				
Housing material	Metal - NEMA 4/2			
Operating temperature	-40/+85 °C			
Mounting	Wall mounting by screws (not supplied)			
Connection to AC network	on screw terminal			
Dimensions (H x L x D)	203 x 152 x 89 mm (8" x 6" x 3.5")			
<b>Specific features</b>				
Disconnection switch	no			



Version	Réseau	Tension max. (Uc)	Tension résiduelle (V) suivant UL1449@500A			
			L-N	L-PE	N-PE	L-L
Mxxx-120T	120/240 Vac Split Phase 3Ph+PE	150Vac	400	400	500	800
Mxxx-120Y	120/208 Vac Wye 3Ph/N+PE	150Vac	400	400	500	800
Mxxx-220Y	220/380 Vac Wye 3Ph/N+PE	320Vac	1000	1000	1000	1800
Mxxx-277Y	277/480 Vac Wye 3Ph/N+PE	320Vac	1000	1000	1000	1800
Mxxx-240Y	240/415 Vac Wye 3Ph/N+PE	320Vac	1000	1000	1000	1800
Mxxx-240DCT	120/120/240 Vac Hi-Leg Delta 3Ph/N PE	150/320Vac	1000	1000	1000	1000
Mxxx-240D	240 Vac Delta 3Ph+PE	320Vac	-	1000	-	1800
Mxxx-347Y	347/600 Vac Wye 3Ph/N+PE	550Vac	1500	1500	1500	3000
Mxxx-480D	480 Vac Delta 3Ph+PE	500Vac	-	1500	-	3000

# Hard-wire AC surge protector M15 series



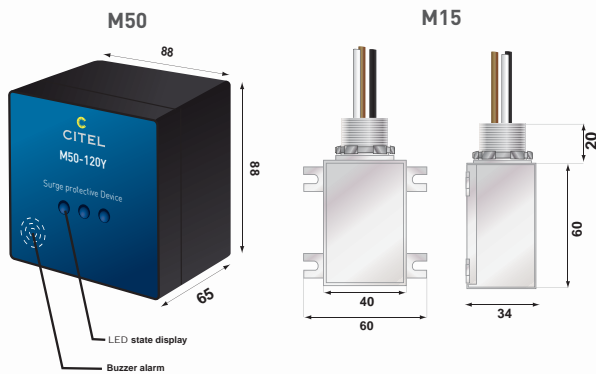
M50-120Y

M15-230N

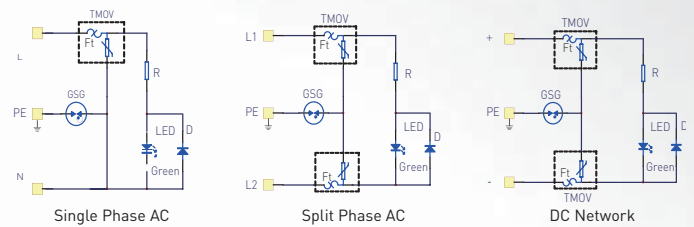
- For AC Single Phase network (M15)
- For 120 V network up to 3-phase+N (M50)
- In : 5 kA (M15) / 20 kA (M50)
- Imax : 15 kA / 50 kA (M50)
- No leakage current
- LED visual indicator (+ audible Alarm : M50)
- UL 1449 3ed. compliant

## Dimensions and Diagram

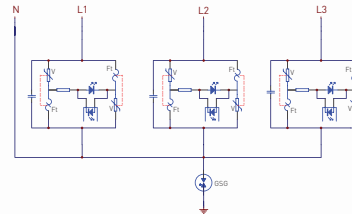
(in mm)



### M15



### M50



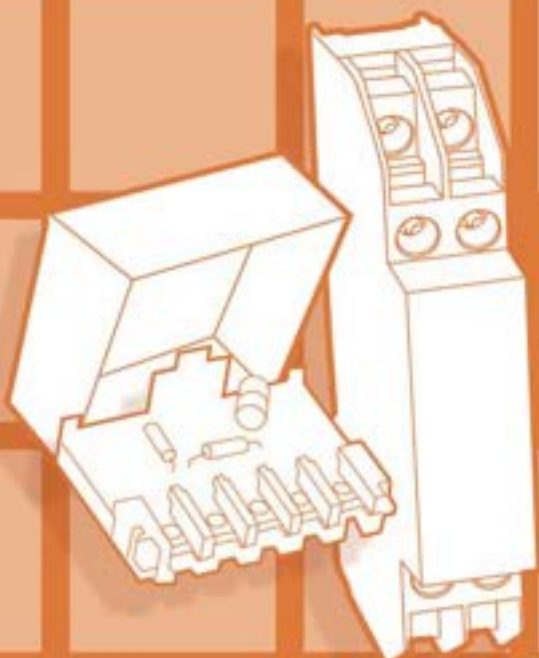
TMOV : Thermally protected high energy MOV  
LED : Disconnection indicator  
Ft : Thermal fuse  
GSG : Gas-filled Spark Gap

## Characteristics

CITEL part number		M15-120N	M15-230N	M15-480N	M15-120SP	M15-600DC	M50-120Y
Network type		Single phase	Single phase	Single phase	Split phase	DC	3-phase
Network voltage		120 Vac	230 Vac	480 Vac	120 Vac	600 Vdc	120 Vac
Max. operating voltage	MCOV	150 Vac	275 Vac	550 Vac	150 Vac	800 Vdc	150 Vac
TOV withstand	U <sub>T</sub>	150 Vac	275 Vac	550 Vac	150 Vac	800 Vdc	150 Vac
Operating current leakage current at Uc	I <sub>c</sub>	None	None	None	None	None	None
Follow current	I <sub>f</sub>	None	None	None	None	None	None
Nominal discharge current 15 x 8/20 μs impulse	I <sub>n</sub>	5 kA	5 kA	5 kA	5 kA	5 kA	20 kA
Max. discharge current max. withstand @ 8/20 μs	I <sub>max</sub>	15 kA	15 kA	15 kA	15 kA	15 kA	50 kA
Voltage protection rating @ 3 kA	VPR	600 V	1000 V	1800 V	1400 V	2300 V	700 Vac
Protection level @ I <sub>n</sub>	U <sub>p</sub>	800 V	1200 V	2000 V	1600 V	2500 V	1200 Vac
Admissible short-circuit current	I <sub>sc</sub>	25 kA	25 kA	25 kA	25 kA	25 kA	100 kA
<b>Associated disconnectors</b>							
Thermal disconnector		internal					
Fuses		40 A					
Installation ground fault breaker, if any		Type «S» or delayed					
<b>Mechanical characteristics</b>							
Dimensions		see diagram					see diagram
Connection		wire 15 AWG (1,5 mm <sup>2</sup> ), 24° leads					wire 15 AWG (1,5 mm <sup>2</sup> ), Long. 600 mm
Disconnection indicator		LED off					LED off and audible alarm
Mounting		Bulkhead (3/4") or Wall mount					Bulkhead (3/4«)
Operating temperature		-40/+85 °C					-40/+85°C
Environmental rating		IP66					IP66
Housing material		Thermoplastic UL94-V0					Stainless Steel
<b>Standard Compliance</b>							
CEI 61643-1	International	Low voltage SPD - Class II test					
EN 61643-11	Europe	Low voltage SPD - Class II test					
UL 1449 3rd Edition	USA	Low voltage SPD - Type 2 (pending)					



CITEL



# TELEPHONE LINE

Surge protectors

# Telephone-Data surge protectors

## Introduction

Telecommunication and data transmission devices (PBX, modems, data terminals etc..) are becoming increasingly vulnerable to lightning-induced voltage surges.

These devices are becoming more complex, sensitive and share a common grounding connection with other networks. This situation increases the risk for these sensitive devices to be stressed by destructive surge voltages, induced by lightning or by electrical switching operations.

Moreover, these devices are nowadays installed at every level of every installation (industrial, commercial and residential buildings), making these possible disturbances unacceptable and/or costly.

To make this telecom or data equipment sufficiently reliable, the installation of a dedicated surge protector, against transient overvoltages, is highly recommended.

Surge protectors for telecom and data transmission terminals could be divided in 3 types :

- Surge protectors for telecom networks
- Surge protectors for industrial networks
- Surge protectors for Local Area Networks (LANs)

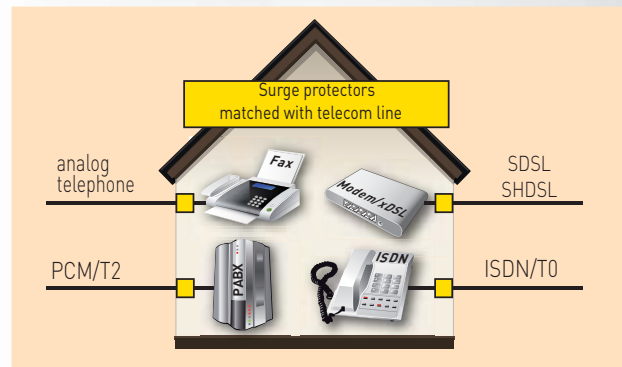
CITEL products differ by their electrical diagrams and their mechanical configurations, adapted to the need of each type of network.

Reminder:

Devices connected to telecom or data networks, are also connected to the AC distribution network : in order to ensure a coordinated protection, surge protectors must be installed on each inter-connected networks.

## Protecting telecommunication equipment

Telecom devices (PBX, Modems, Terminals..) are especially exposed to lightning surges. CITEL offers a range of surge protectors dedicated to the protecting of these types of telecommunication networks :



Lines	Voltage		Diagram
	Nominal	Residual	
Switched telephone /ADSL	170 V	210 V	Standard protection
ISDN, T0 primary access	48 V	35 V	Enhanced protection
ISDN, T2 primary access	6 V	15 V	Enhanced Protection Low capacitance
SDSL, SHDSL	170 V	210 V	Enhanced protection

### Mechanical configurations

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

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

The decision whether or not to use surge protection would be determined by taking a simplified risk assessment (see «Risk analysis» paragraph), or by detailed risk assessment (as the one included in IEC 61643-22 standard), or by specific installation conditions as :

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

# Telephone-Data surge protectors

## Protecting industrial networks

Industrial installations, businesses or smart buildings are packed with an increasing quantity of measurement, control and supervisory equipment.

These systems are built with controller cards, probes, sensors and various sensitive electronic components: downtime on the operation on this equipment can be costly.

Thus, it is increasingly vital to guarantee a relevant level of reliability to these systems: this can be obtained by installing dataline surge protection.

### Equipment to be protected

Industrial or business installations are equipped with many different types of sensitive terminals, which must be protected against transient voltages, such as:

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

Many data transmissions (or fieldbus) exist on the market. The table below provides relevant CITELE surge protector model (DLA series : Din rail pluggable module, and DLU series : Din rail monobloc module) in relation to the type of data 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

### Mechanical configuration

CITELE surge protectors for industrial data networks are designed to fit on symmetrical DIN rail. In order to offer a large range of solutions, the surge protectors are available in various configurations :

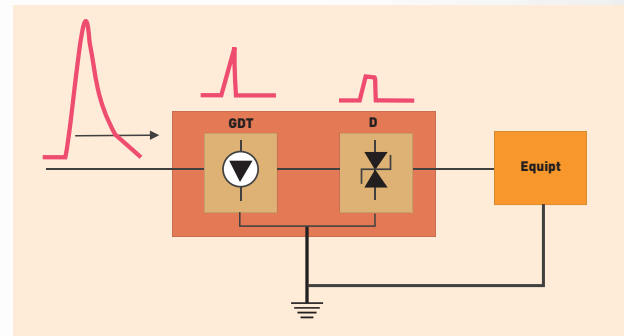
- Number of protected wires : from 1 wire to 2 pairs.
- Transmission and protection of the shield wire
- Plug-in modules : Version with removable module to ease the maintenance process.

## Technology of surge protectors

All Citel telephone and data line surge protectors are based on reliable multistage hybrid design that combines a high discharge current capacity with fast response time.

All Citel telephone and data line surge protectors use a combination of a 3-electrode gas discharge tube and fast clamping diodes, in order to provide:

- A nominal discharge current (repeated without destruction) greater than 5 kA @ 8/20  $\mu$ s impulse
- An ultrafast response time < 1 ns
- Safety operation in end of life (Fail-safe behaviour)
- Low insertion losses to not disturb the transmission signal.



The systematic use of 3-electrode discharge tubes provides optimum protection through simultaneous sparkover.

This set of characteristics is essential for optimum reliability of the protected equipment whatever the incident or disturbance.

Various protection diagrams are available according to requirements and the type of network to be 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» surge protection : designed for very high bitrate LAN (up to 1000 Mbit/s).

See list of diagrams, page 82.

## Standards

Tests procedures and installation recommendations for communication line surge protectors must comply the following standards:

- International:
  - IEC 61643-21 : Tests of surge protectors for communication lines.
  - IEC 61643-22 : Choice/installation of surge protectors for communication lines.
- France:
  - NF EN 61643-21 : Essais applicables aux parafoudres de communication.
  - Guide UTE C 15-443 : Choice/installation of surge protectors

# Telephone surge protectors

## Use of surge protectors

In areas where standards are lacking or non-existent, the decision to use surge protectors on telecom and data lines can be taken 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 assess quickly the probability of the lightning surges and their consequences, a simplified risk analysis could 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 level of recommendation (from «no recommendation» to «highly recommended») of using surge protectors increase 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, bear the following in mind :

- The type of line :
  - There is an appropriate level of protection and protection diagram for each type of line.
- The site configuration :
  - Number of lines to be protected.
- The requested type of installation :

The CITELE line provides the following possibilities :

  - 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 modules (E280, DLA).

## Installation

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

- The earth point of the surge protector and of the protected equipment must be interconnected.
- The protection is installed on the network entrance, to divert impulse currents as fast as possible.
- The protected equipment must be nearby (protector/equipment distance less than 10 m long). If this rule cannot be followed, «secondary» protection must be installed near the equipment (coordinated surge protection).
- The grounding conductor (between the earth output of the protector and the installation bonding circuit) must be as short as possible (less than 0.50 m) and have a cross-sectional area of at least 2.5 mm<sup>2</sup>.
- The earth resistance must comply with the standards in force (no special earthing requested).
- Protected and unprotected cables must be kept well apart to limit coupling.

## Maintenance

CITELE data line surge protectors require no maintenance or replacement. They are designed to withstand repeated and heavy impulse currents without damage.

Nevertheless a controlled fail-safe mode (short circuit to earth) is planned 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 heavy lightning impulse current.

In these rare cases, the surge protectors will go definitively in short-circuit. By this way, it protects the terminal equipment and warns about its failure. To reactive the line, the surge protector must be replaced.

The basic parameters of the surge protector for datalines could be controlled with dedicated testers.

## Special conditions : Lightning rod

If the installation to be protected is equipped with LPS (lightning rod), the surge protectors for telecom or datalines, connected on external lines must be able to conduct 10/350  $\mu$ s surge current with a rating of 2.5 kA minimum (D1 category test in IEC 61643-21 standard).

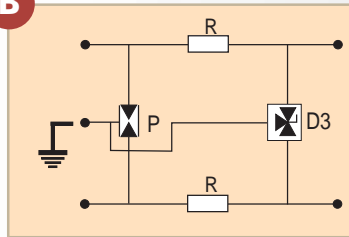
# Telephone surge protectors

## Typical diagrams

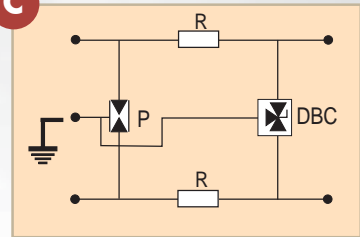
**A** Standard Protection



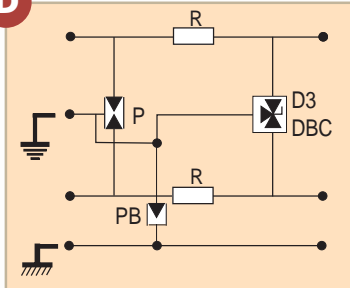
**B** Reinforced Protection



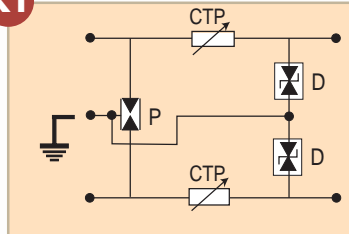
**C** Low capacitance Protection



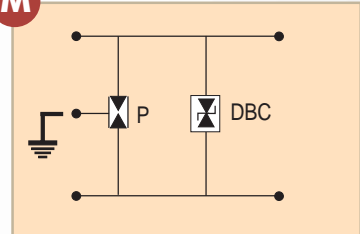
**D** Protection + Shield



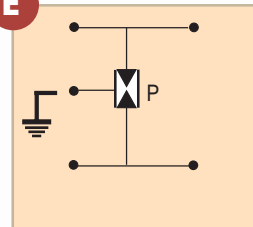
**K1** «K20» type Protection



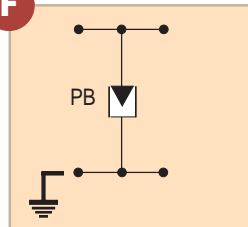
**M** High bitrate Protection



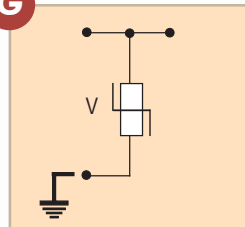
**E** 3-electrode GDT Protection



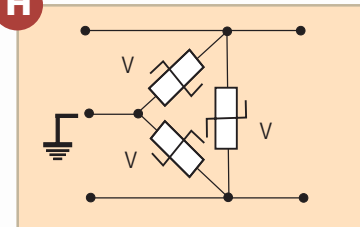
**F** 2-electrode GDT Protection



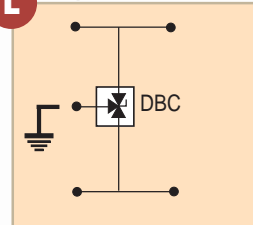
**G** 2-pole MOV Protection



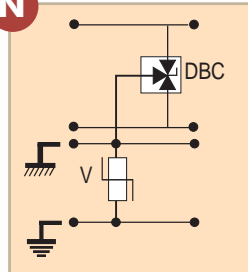
**H** 3-pole MOV Protection



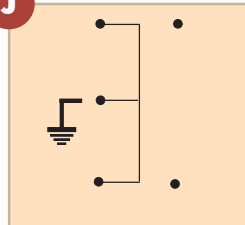
**L** Low capacitance 3-pole diode



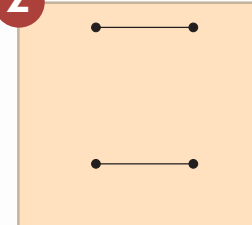
**N** «CAT6» Protection



**J** Grounding



**Z** Line continuity



P : 3-pole gas tube  
 PB : 2-pole gas tube  
 R : Line resistor  
 D : Fast Clamping Diode  
 D3 : 3-pole Clamping Diode  
 DBC : Low capacitance clamping diode  
 V : MOV  
 CTP : PTC

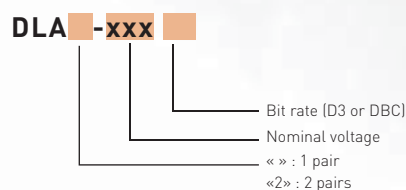
# DIN rail plug-in Surge Protector for dataline/telecom DLA, DLA2 series



DLA-170

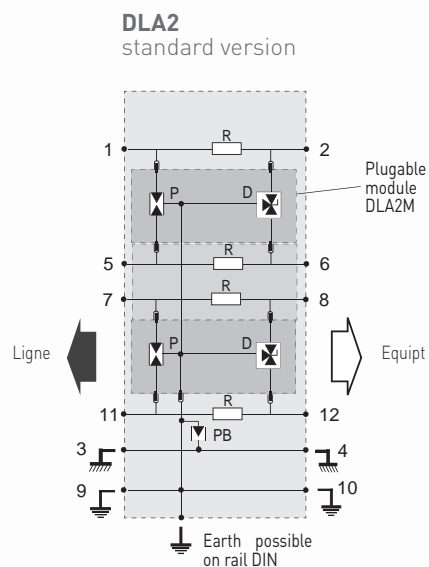
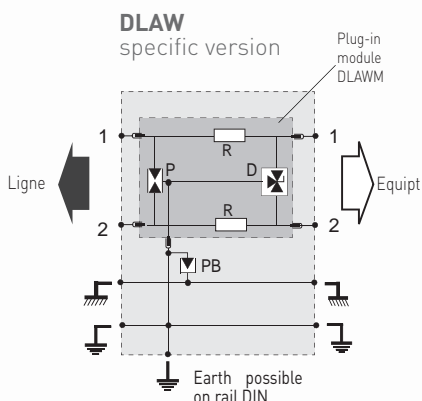
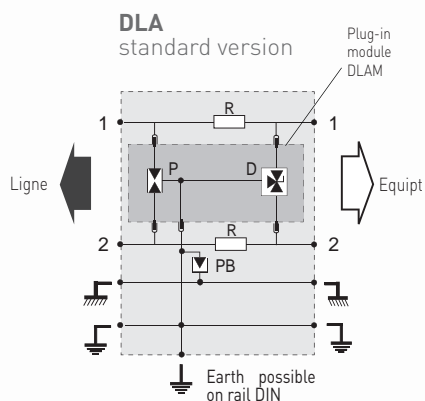
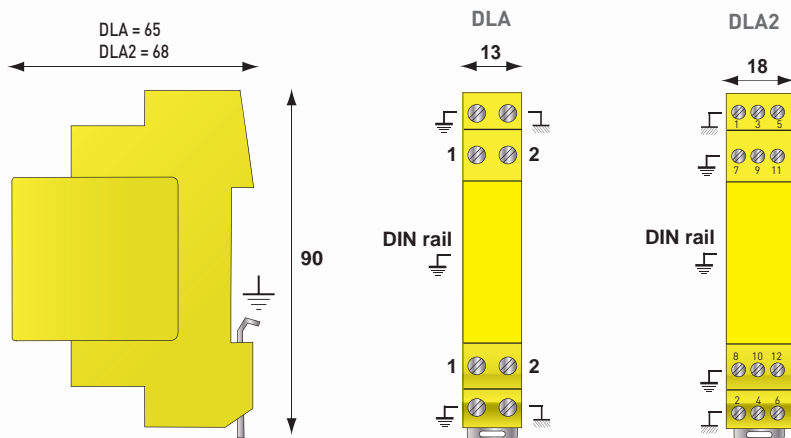
DLA2-2403

- Pluggable surge protection for «DIN» mounting
- All types of Telephone and Data Lines
- Shield wire protection
- Without line cut-off (DLA) or with (DLAW)
- 2- pair version (DLA2)
- IEC 61643-21 compliance



## Dimensions - Electrical diagrams

(in mm)



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

# DIN rail plug-in Surge Protector for dataline/telecom *DLA, DLA2 series*

## Characteristics

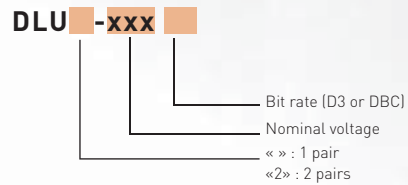
Configuration	CITEL part number						
	DLA-170 DLA2-170	DLA-48D3 DLA2-48D3	DLA-24D3 DLA2-24D3	DLA-48DBC DLA2-48DBC	DLA-12D3 DLA2-12D3	DLA-06D3 DLA2-06D3	DLA-06DBC DLA2-06DBC
Utilisations type	Telephone line ADSL SDSL-SHDLSL	ISDN-T0 48 V line	Leased line 4-20 mA	Fipway - WorldFIP Fieldbus-H2	RS232 RS485	RS422	MIC/T2 10BaseT
Nominal line voltage (Un)	150 V	48 V	24 V	48 V	12 V	6 V	6 V
Max. line voltage (Uc)	170 V	53 V	28 V	53 V	15 V	8 V	8 V
Max. line current	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA
Max. frequency	> 10 MHz	> 3 MHz	> 3 MHz	> 20 MHz	> 3 MHz	> 3 MHz	> 20 MHz
Protection level (Up) 8/20µs impulse - 5 kA	220 V	70 V	40 V	75 V	30 V	20 V	25 V
Nominal discharge current (In) 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Max. discharge current (Imax) 8/20µs impulse - 1 time	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Impulse current (Iimp) 10/350µs impulse - 2 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
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						
Spare module	DLA : DLAM-xxx DLA2 : DLA2M-xxx						
Versions	DLA-xxx : standard version (line continuity in case of removal of plug-in module) DLAW-xxx : specific version (line cut-off in case of removal of plug-in module) DLAH-xxx : «remote supply» version (max. 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) UL497A&B (USA)	Parafoudre pour réseau communication - Test catégories C2 et D1 Surge protectors for communication circuits						
<b>Part number</b>							
DLA	6406011	6403021	6403011	640421	6402011	6401011	640121
DLA2	640611	640312	640311		640211	640111	640131



# DIN rail Surge Protector for dataline/telecom *DLU, DLU2 series*

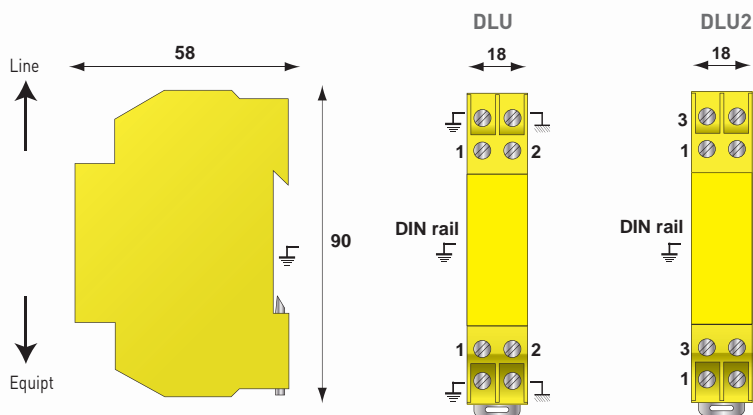


- For «DIN» rail mounting
- All types of Telephone and Data lines
- Monobloc housing
- 2-pair version (DLU2)
- Transmission and protection of shield wire (DLU)
- IEC 61643-21 compliance

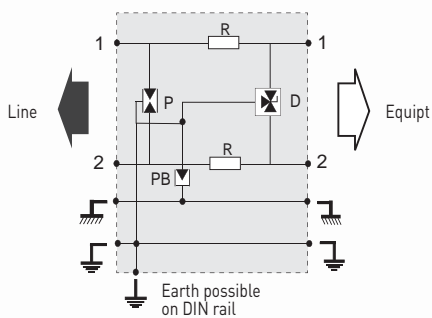


## Dimensions - Electrical Diagrams

(in mm)

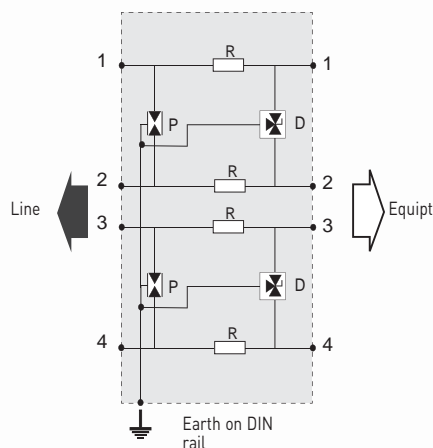


**DLU**  
1-pair version



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

**DLU2**  
2-pair version



# DIN rail Surge Protector for dataline/telecom

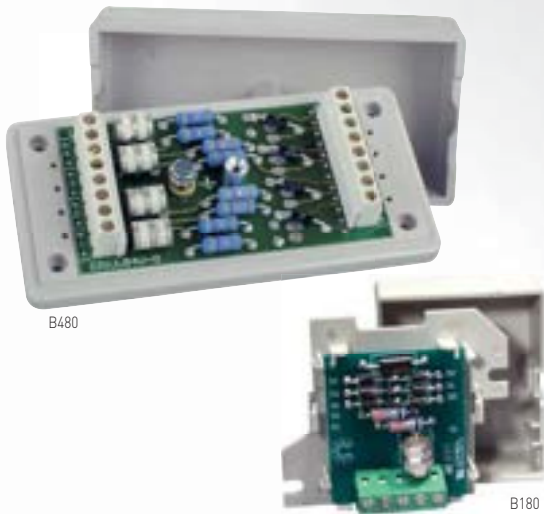
## DLU, DLU2 series

### Characteristics

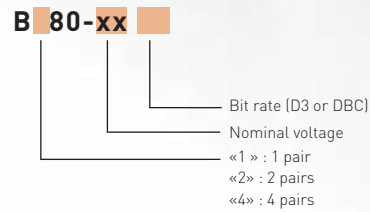
Configuration	CITEL part number						
	DLU-170 DLU2-170	DLU-48D3 DLU2-48D3	DLU-48DBC DLU2-48DBC	DLU-24D3 DLU2-24D3	DLU-12D3 DLU2-12D3	DLU-06D3 DLU2-06D3	DLU-06DBC DLU2-06DBC
Typical Application	Telephone line ADSL SDSL - SHDSL	48 V line	Fipway WorldFIP Fieldbus-H2	4-20 mA 24 V line	Profibus-FMS Interbus Fieldbus-H1 Batibus RS232, RS485	RS422	6 V line high bitrate T2 - T1 10BaseT
Nominal line voltage (Un)	150 V	48 V	48 V	24 V	12 V	6 V	6 V
Max. line voltage (Uc)	170 V	53 V	53 V	28 V	15 V	10 V	10 V
Max. line current (IL)	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
Protection level (Up) 8/20µs impulse - 5 kA	220 V	70 V	75 V	40 V	30 V	20 V	25 V
Nominal discharge current (In) 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Max. discharge current (Imax) 8/20µs impulse - 1 time	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Impulse current (Iimp) 10/350µs impulse - 2 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
End of life	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit	Short-circuit
<b>Mechanical characteristics</b>							
Configuration	DLU = 1 pair + shield DLU2 = 2 pairs						
Mounting	Symmetrical DIN rail						
Dimensions	see drawing						
Wiring	Connection by screw - max. cross section 1.5 mm <sup>2</sup>						
Housing material	Thermoplastic UL94-V0						
Connection	Earth connection via DIN rail (DLU, dlu2) and screw terminal (DLU)						
<b>Standard compliance</b>							
NF EN 61643-21 (France) UL497A&B (USA)	Parafoudre pour réseau de communication - Test catégories C2 et D1 Surge protectors for communication circuits						
<b>Part number</b>							
DLU	640505	640504	640514	640503	640502	640501	640511
DLU2	640405	640404	640434	640401	640403	640402	640431



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

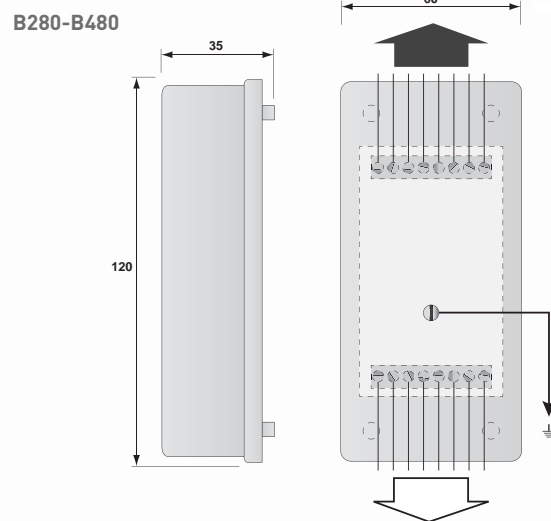
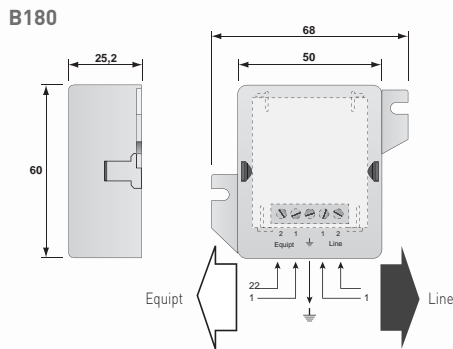


- 1 to 4-pair surge protection units
- All types of telephone and data lines
- Removable protection circuit
- Wall mounting and screw connection

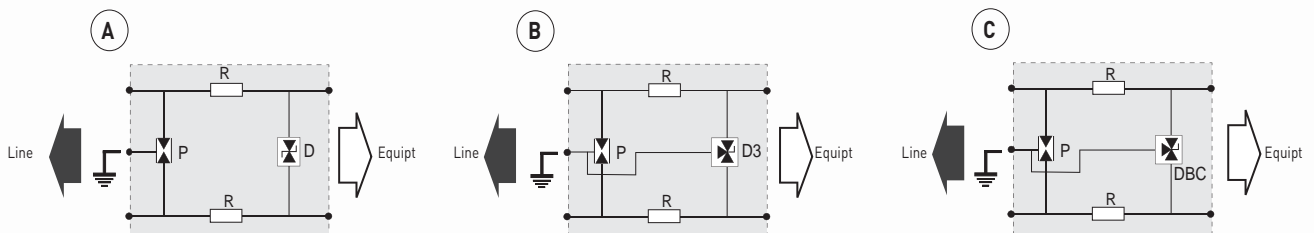


## Dimensions - Electrical diagrams

(in mm)



1-pair version



P : 3-electrode gas 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 B280-T B480-T	- B280-48D3 B480-48D3	B180-24D3 B280-24D3 B480-24D3	B180-12D3 B280-12D3 B480-12D3	B180-06D3 B280-06D3 B480-06D3	- B280-06DBC 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 protected - 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)	150 V	48 V	24 V	12 V	6 V	6 V
Maximum line voltage (Uc)	170 V	53 V	28 V	15 V	8 V	8 V
Max. line current (IL)	300 mA	300 mA	300 mA	300 mA	300 mA	300 mA
Max. frequency	> 10 MHz	> 3 MHz	> 3 MHz	> 3 MHz	> 3 MHz	> 20 MHz
Protection level (Up) 8/20µs impulse - 5 kA	220 V	70 V	40 V	30 V	20 V	25 V
Nominal discharge current (In) 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Max. discharge current (Imax) 8/20µs impulse - 1 time	20 kA	20 kA	20 kA	20 kA	20 kA	20 kA
Lightning current (Iimp) 10/350µs impulse - 2 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
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 (screws non included)					
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) UL497A (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	-	510302	510202	510102	-
2-pair unit B280	72726	72774	72773	72772	72771	72751
4-pair unit B480	72746	72794	72793	72792	72791	72798

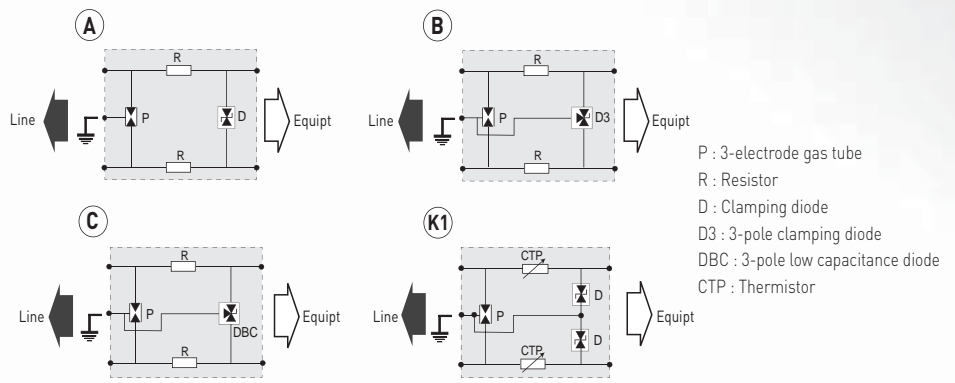
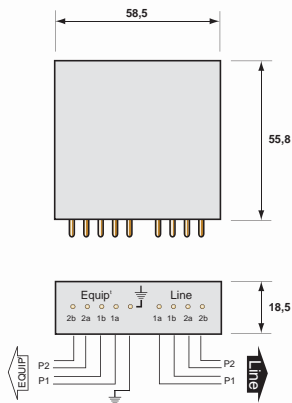
# 2-pair plug-in Surge Protector E280 series



- 2 pairs plug-in module
- Optimized modularity and maintenance
- Can be adapted to all types of line
- Gas tube / diode combination

## Dimensions - Electrical Diagrams

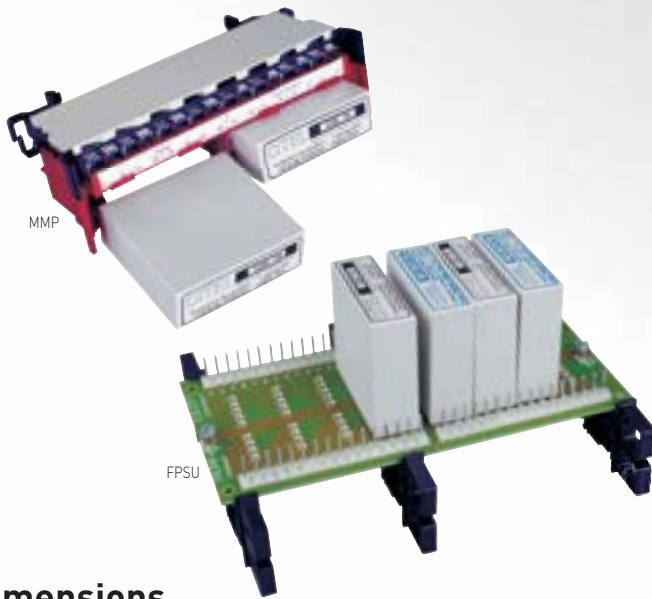
(in mm)



## 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 4-20 mA	RS232 RS485	RS422	T2 - T1 10BaseT
Nominal line voltage (Un)	150 V	150 V	48 V	24 V	12 V	6 V	6 V
Max. line voltage (Uc)	170 V	190 V	53 V	28 V	15 V	8 V	8 V
Max. line current (IL)	300 mA	150 mA	300 mA	300 mA	300 mA	300 mA	300 mA
Max. frequency	> 10 MHz	> 3 Mhz	> 3 MHz	> 3 MHz	> 3 MHz	> 3 MHz	> 20 MHz
Protection level (Up) 8/20µs impulse - 5kA	220 V	260 V	70 V	40 V	30 V	20 V	25 V
Nominal discharge current (In) 8/20µs impulse - 10 times	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA	5 kA
Max. discharge current (Imax) 8/20µs impulse - 1 time	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA	10 kA
Lightning current (Iimp) 10/350µs impulse - 2 times	2.5 kA	2.5 kA	2.5 kA	2.5 kA	2.5 kA	2.5 kA	2.5 kA
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						
Connectique	contact mâle laiton doré 0.5µ						
Housing material	Thermoplastic UL94-V0						
<b>Standards compliance</b>							
NF EN 61643-21 (France) UL497A (USA)	Parafoudre pour réseau de communication - Test catégories C2 et D1 Surge protectors for communication circuits						
<b>Part Number</b>							
E280	71186	71192	71184	71183	71182	71181	71171

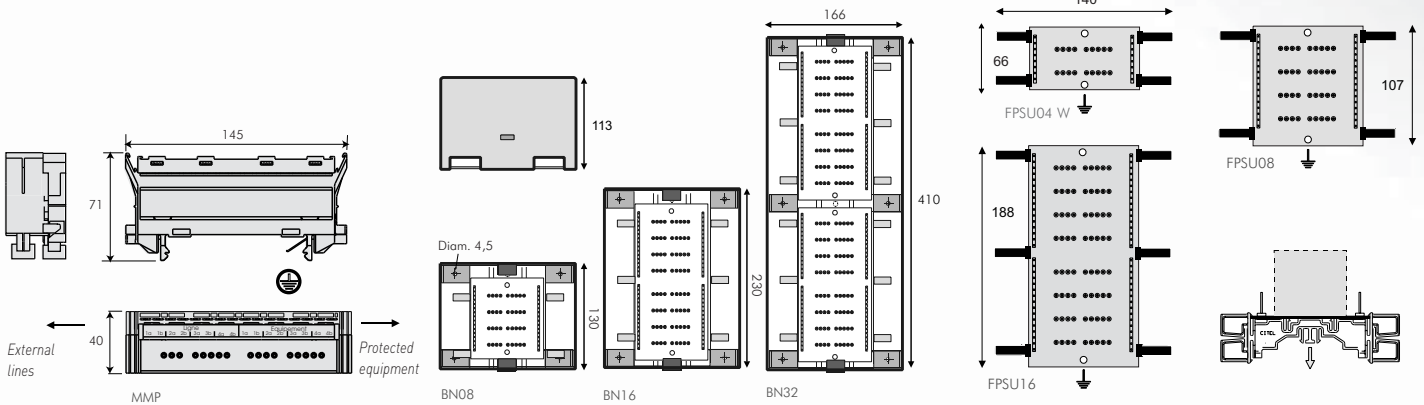
# Support for E280 plug-in modules **BN , FPSU , MMP**



- **BN series : 8, 16 or 32 pairs**  
Metal enclosures for E280
- **FPSU series : 4, 8 or 16 pairs**  
for MDF or DIN rail mounting
- **FP series : 10 or 25 pairs**  
Wall mounting plate
- **MMP module : 4 pairs**  
Connector strip for 2 E280
- **Connection : IDC, Screw, Wrapping, Punchdown**

## Dimensions

(in mm)



## Characteristics

Format	Metal enclosures			Brackets/boards					Strip
CITEL part number	BN08	BN16	BN32	FPSU04	FPSU08	FPSU16	FP10	FP25	MMP
Max. number of pairs	8	16	32	4	8	16	10	25	4
Max. 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*
Earth 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	-	-	-	-	-	-	-	-	71480
ATT110	-	-	-	-	-	-	-	-	-

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

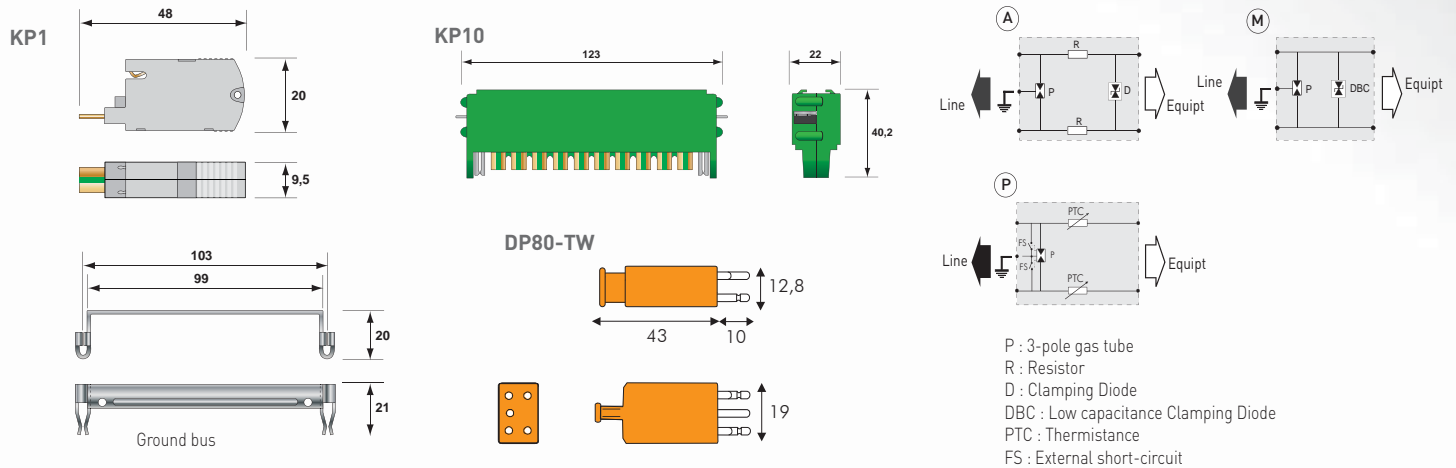
# 1 and 10-pair plug-in Surge Protectors KP1, KP10 and DP80-TW



- Surge protectors for LSA+ connection strip
- “5-pin” configuration (DP80)
- Fast installation with no wiring
- modification
- Fast Maintenance
- For analog or high speed telecom lines

## Dimensions and Diagram

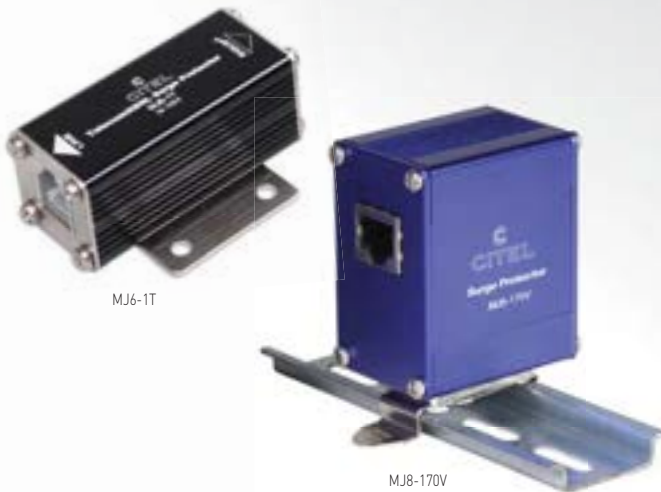
(in mm)



## 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)	150 V	6 V	150 V	6 V	150 V
Max. line voltage (Uc)	170 V	8 V	170 V	8 V	170 V
Max. line current (I <sub>L</sub> )	300 mA	300 mA	300 mA	300 mA	100 mA
Max. frequency	> 10 MHz	> 20 MHz	> 10 MHz	> 20 MHz	> 3 MHz
Protection level (Up) 8/20μS impulse - 5kA	230 V	25 V	230 V	25 V	< 700 V
Max. discharge current (Imax) 8/20μs impulse - 1 time	5 kA	5 kA	5 kA	5 kA	10 kA
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	on LSA+ connection strip		on LSA+ connection strip		on «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		-
<b>Part Number</b>	85186	85259	-	-	85126

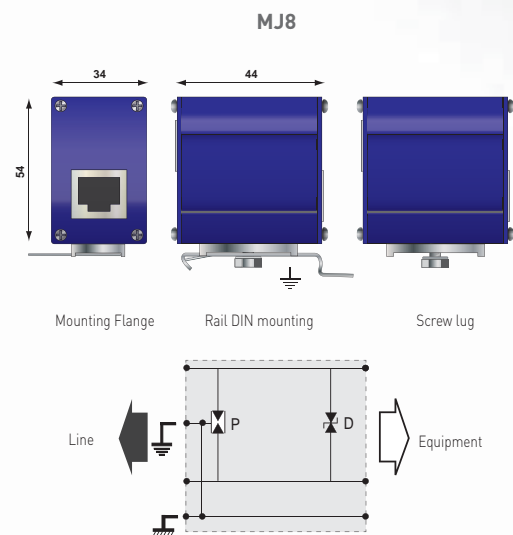
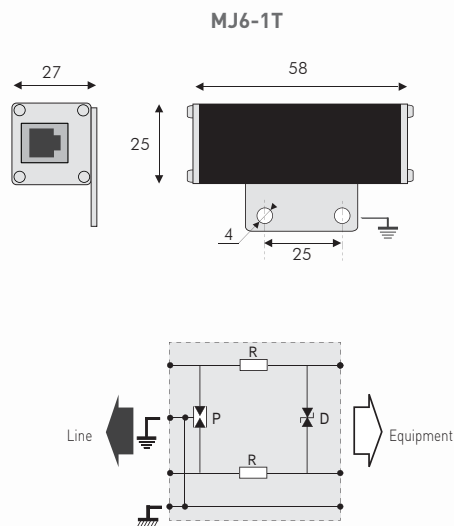
# Telecom Surge Protectors MJ8, MJ6-1T



- Protection for one telephone line
- For PSTN, ISDN, ADSL lines
- Quick installation
- RJ11 or RJ45 connectors

## Dimensions and Diagram

(in mm)



## Characteristics

CITEL part number	MJ6-1T	MJ8-ISDN	MJ8-170V
Application	PSTN or ADSL 1-pair	ISDN	PSTN/ADSL
Max. operating voltage (Uc)	170 Vdc	60 Vdc	170 Vdc
Max. line current (IL)	300 mA	300 mA	300 mA
Max. frequency	> 10 MHz	> 10 MHz	> 10 MHz
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 (I <sub>DB</sub> /20μs)			
- Line/Line	2500 A	500 A	500 A
- Line/Ground	2500 A	2000 A	2000 A
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)	Parafoudre pour réseau de communication - Test catégories C2 et D1		
UL497A (USA)	Surge protectors for communication circuits		
<b>Part number</b>			
	560402	560209	560203







CITEL



# DATA LINE

Surge Protectors

# Data Surge Protectors

## Protecting data-processing networks

For industrial sites or secondary buildings integrating a linked computer network, any single issue at one of these systems will create consequences, more or less, to the safety and productivity of the entire system.

It is now more and more crucial to reinforce the level of reliability for these systems: this can be achieved by using a proper surge protection strategy for these sensitive networks.

As is the case in telecom or industrial networks, the installation of surge protectors on data-processing networks is necessary, especially in the following cases :

- Inter-building networks
- Wide networks
- High Electromagnetic disturbance density

As for the other types of transmission lines, CITEL surge protectors for Local Area Networks (LANs) are based on association 3-pole gas tubes and fast clamping diodes to ensure efficiency on lightning surges.

In addition, two additional parameters need to be taken into account: the voltage level of the application and the data transmission speed. CITEL surge protectors for data-processing networks are designed for both of these requirements.

### Mechanical configuration

The surge protectors for data-processing networks are designed to fit with the existing installation. In consequence, the surge protectors are equipped with standard connectors (e.g. : RJ45) and are available in a single enclosure to protect a terminal equipment, or in 19" rack unit format to protect at the hub level.



MJ8 Surge protector for Category 5E network

### Performances

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

- Category 5 and 5E
- Category 6
- PoE network

### Standard

Surge protectors for data network are in compliance with IEC 61643-21.

## Protecting Video Data Transmission

Video transmission lines (surveillance cameras) are regularly subjected to transient surges due to the nature of their distributed application. In order to insure the integrity of these installations, the application of dedicated SPDs at the equipment level (cameras) as well as at the Digital Recording Devices (DVRs) is absolutely necessary.

### Configuration

CITEL Surge protector for video transmission can be adapted to the different configurations:

- **Analog camera:**  
CITEL Surge protector for video transmission can be adapted to the different configurations.



MSP-VM-2P



CNP

- **IP camera:**  
The MSP-VM/R combines ETHERNET and Power Supply protection.



MSP-VM/R

- **PoE video:** A POE compatible surge protector (MJ8-POE) needs to be installed at the terminal.  
For outdoor installation, use the CMJ8-POE.



MJ8-POE

### Standards

Video -transmission network surge protectors are in compliance with IEC 61643-21.

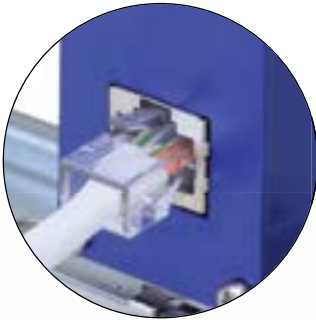
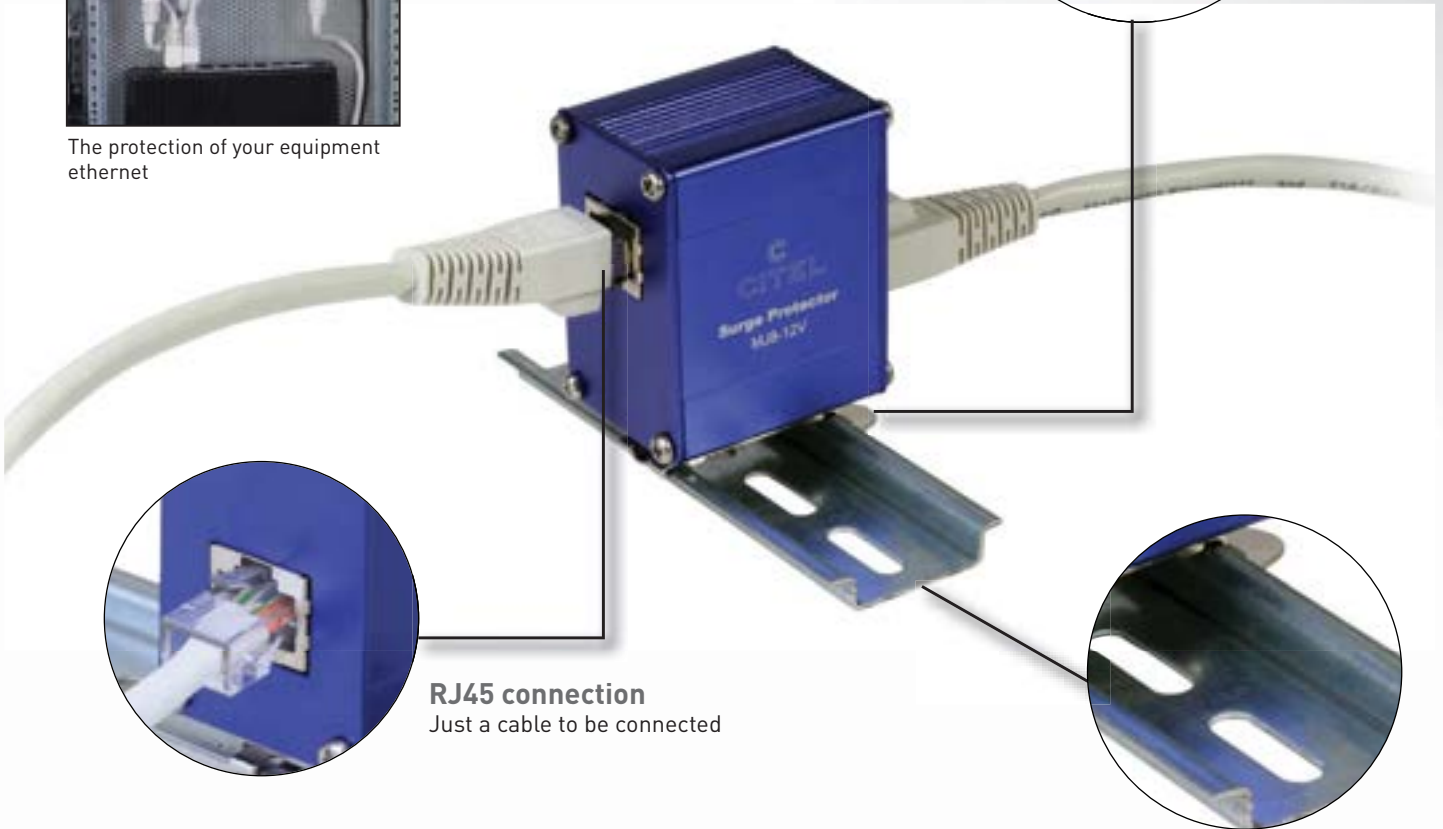
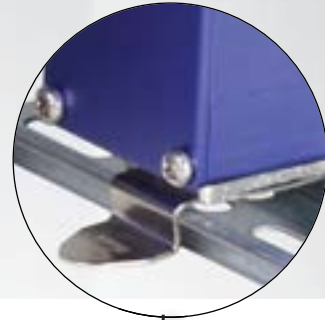
# Citel MJ8 series

## Installation

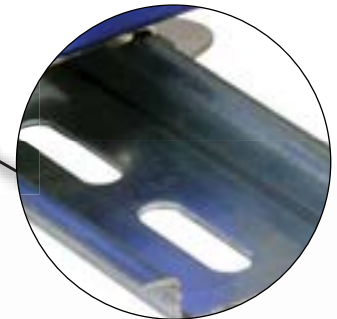


The protection of your equipment ethernet

**Mounting**  
On Rail  
or by flange

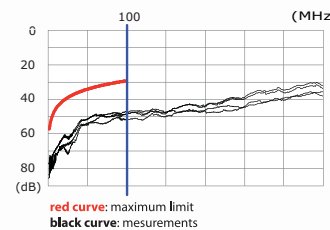
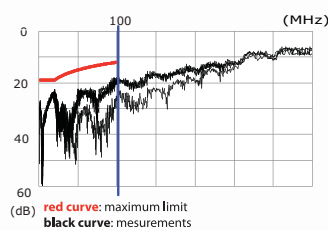
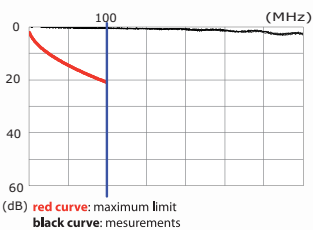


**RJ45 connection**  
Just a cable to be connected



**Ground connection**  
via DIN Rail

## Performances characteristics



# Data Surge Protectors

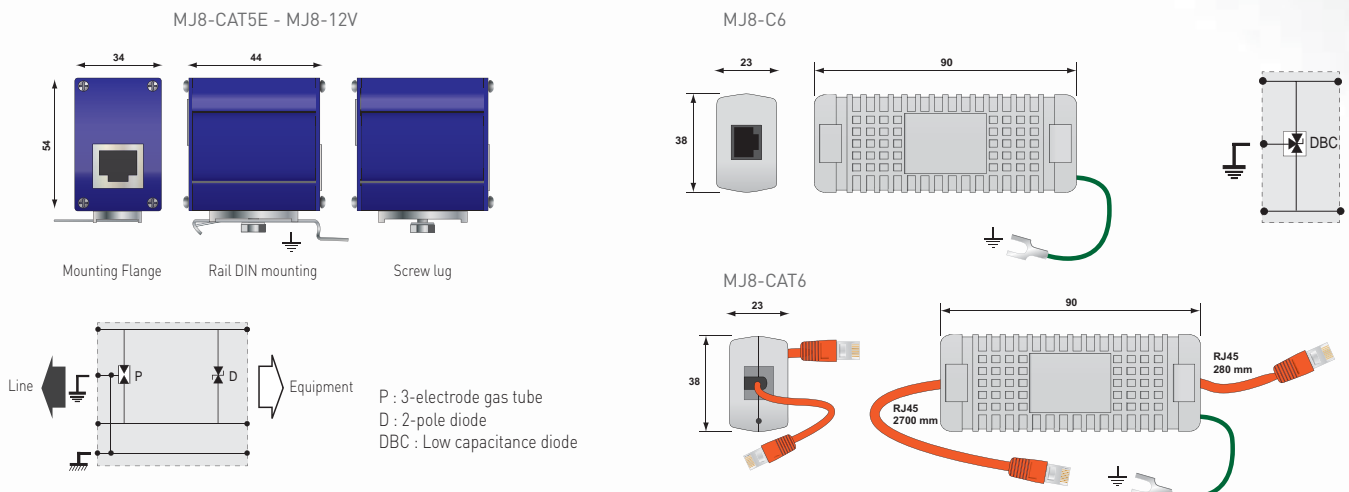
## MJ8 series



- 10/100/1000 Base T compatible
- Shielded enclosure
- RJ45 connectors
- Bi-directional

### Dimensions - Electrical Diagram

(in mm)



### Characteristics

CITEL part number	MJ8-CAT5E	MJ8-CAT6	MJ8-C6	MJ8-12V
Application	Ethernet	Ethernet Cat.6	Ethernet Cat.6	12 V signal
Max. data rate	1000 Mbps	1000 Mbps	1000 Mbps	30 Mbps
Max. DC Signal	8 Vdc 1 A	7.5 Vdc 1 A	6 Vdc 1 A	60 Vdc 1 A
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	<500 A @ 8/20 μs	< 132 A @ 10/1000 μs	<100 A @ 8/20 μs	< 500 A
- Line/Ground	2000 A @ 8/20 μs	132 A @ 10/1000 μs	100 A @ 8/20 μs	2000 A
<b>13132Mechanical 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]			IEC 61643-21
<b>Part number</b>				
	560201	6149	6184	560205

# Gigabit POE Surge Protectors

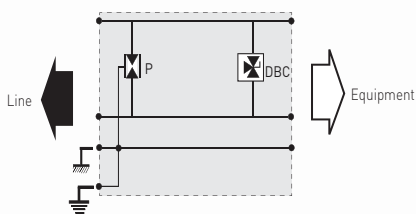
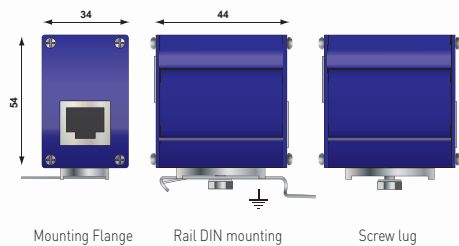
## MJ8-POE



- **POE compatible**
- **Shielded enclosure and connectors**
- **2.5 kA discharge capability**
- **UL497A**

### Dimensions - Electrical Diagram

(in mm)



P : 3-electrode gas tube  
 DBC : 3-pole Low capacitance diode

### Characteristics

CITEL part number	MJ8-POE-A	MJ8-POE-B
Application	PoE and Gigabit Ethernet Networks	
Max. data rate	1000 Mbps	1000 Mbps
Max. DC Power Supply	60 Vdc - 650 mA	7.5 Vdc (1,2,3,6) - 650 mA 60 Vdc (4,5,7,8) - 650 mA
Pin outs	(1-2) (3-6) (4-5) (7-8)	
Nominal discharge currents:		
- Line/Line	<500 A @ 8/20 μs	
- Line/Ground	2000 A @ 8/20 μs	
<b>Mechanical characteristics</b>		
Connexions:		
- Input	RJ45 shielded	
- Output	RJ45 shielded	
Pinout	8 wires + shielding	
Enclosure	Metal	
Ground Connection	Screw Lug, Din Rail Clip or Mounting Flange	
Standard Compliance	IEEE 802-3af (transmission) IEC 61000-4-5 (surge withstand)	
<b>Part number</b>		
	581519	51518



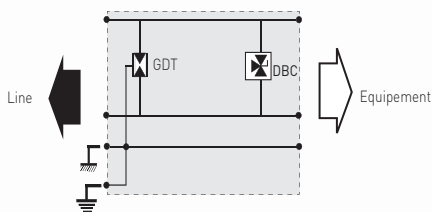
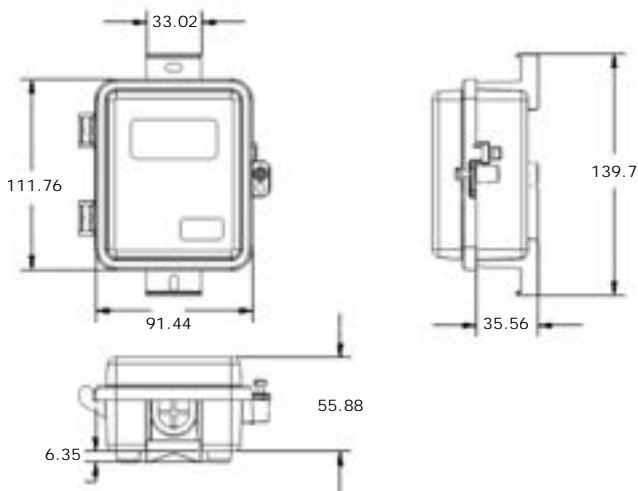
# Outdoor gigabit POE surge protector **CMJ8-POE**



- **POE compatible**
- **Outdoor application**
- **Shielded RJ45 connectors**
- **2 kA discharge capability**
- **UL497A**

## Dimensions - Electrical diagram

(in mm)



GDT : 3-electrode gas tube  
DBC : 3-pole low capacitance diode

## Characteristics

CITEL part number	CMJ8-POE-A	CMJ8-POE-B
Application	PoE and Gigabit Ethernet Networks	
Max. data rate	1000 Mbps - CAT5E	1000 Mbps - CAT5E
Max. DC Power Supply	60 Vdc - 650 mA	7.5 Vdc (1,2,3,6) - 650 mA 60 Vdc (4,5,7,8) - 650 mA
Pin outs	(1-2) (3-6) (4-5) (7-8)	
Nominal discharge currents:		
- Line/Line	<500 A @ 8/20 $\mu$ s	<500 A @ 8/20 $\mu$ s
- Line/Ground	2000 A @ 8/20 $\mu$ s	2000 A @ 8/20 $\mu$ s
<b>Mechanical characteristics</b>		
Connections:		
- Input	RJ45 shielded	
- Output	RJ45 shielded	
Pinout	8 wires + shielding	
Protection class	IP65	
Connection to bonding network	Screw terminal	
Protection class	IP55 IP65 (C2MJ8-POE version)	
Standard Compliance	IEEE 802-3af (transmission) IEC 61000-4-5 (surge withstand)	
<b>Part number</b>		
	6211	6212



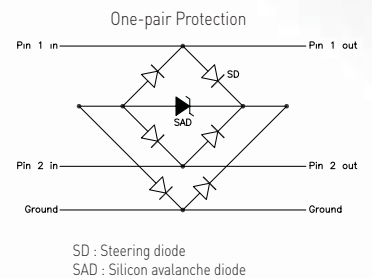
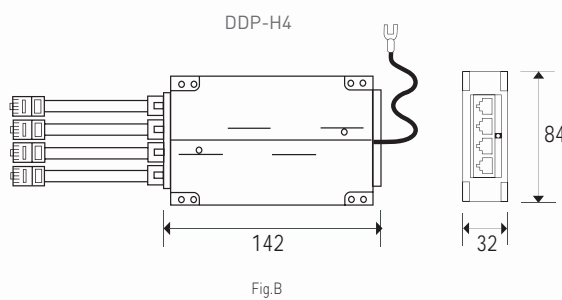
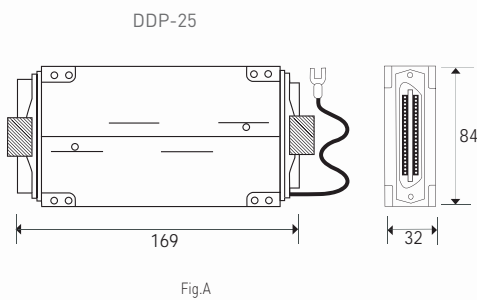
# DC signal line surge protectors **DDP series**



- **Dataline surge protectors**
- **Multiples connectors**
- **Low insertion loss**
- **Easy mounting**

## Dimensions - Electrical diagrams

(in mm)



## 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
Max. data rate	40 Mbps	100 Mbps	40 Mbps	40 Mbps	40 Mbps
Max. supply voltage	7.5 Vdc	7.5 Vdc	18 Vdc	60 Vdc	240 Vdc
Max. supply current	750 mA	750 mA	750 mA	750 mA	750 mA
Nominal discharge current (at 10/1000µs)	132 A	132 A	60 A	50 A	75 A
Max. 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 of 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 (not show) : 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)				
Pinout	8 pins (for XX = H4, H8 or H12) or 25 pins (for xx = 25) per connector				
Installation	Velcro retainer				
Ground connection	14 AWG ground wire (10» long) with #8 fork lug				
Standard compliance	IEEE 802-3af (Transmission) UL497B				

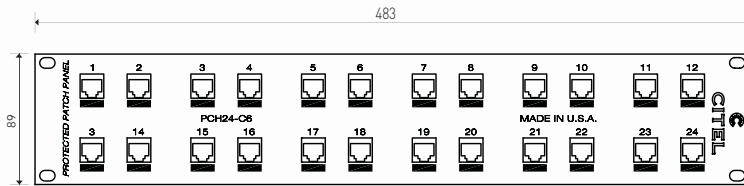
# 19" patch panel surge protector for Data-Telecom lines *PCH series*



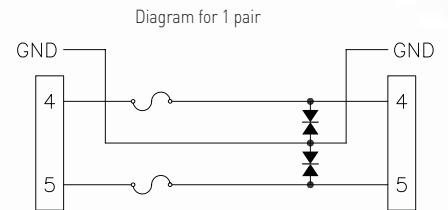
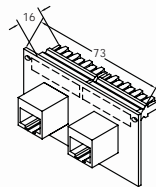
- **19" Rack mounted**
- **12, 24 et 48 ports**
- **In/out : Connector type 110 back  
RJ45 front**
- **Available for Ethernet network and Telecom**
- **Maintenance possible per port**
- **In compliance with UL497B**

## Dimensions - Electrical diagrams

(in mm)



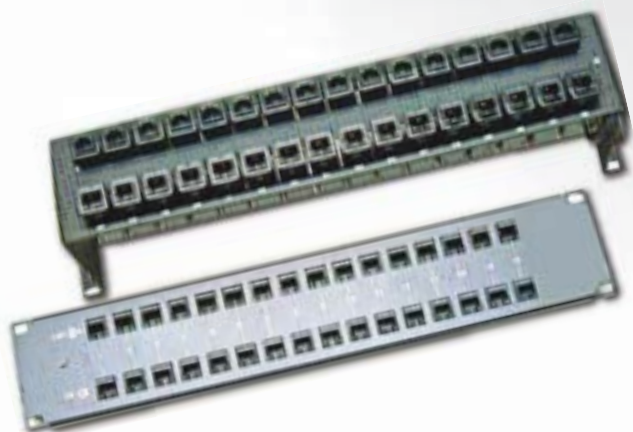
Surge protector circuit 1 port



## Characteristics

CITEL part number	PCHxxx-C6	PCHxxx-POE-A	PCHxxx-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
Max. data rate	1000 Mbps	1000 Mbps	100 Mbps	40 Mbps	40 Mbps
Max. supply voltage	7,5 Vdc	60 Vdc	Pin 1,2,3,6 : 7,5 Vdc Pin 4,5,7,8 : 60 Vdc	60 Vdc	240 Vdc
Max. supply current	750 mA	750 mA	750 mA	750 mA	750 mA
Nominal discharge current (@ 10/1000µs waveform)	100 A	50 A	Pin 1,2,3,6 : 132 A Pin 4,5,7,8 : 50 A	50 A	75 A
Max. 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				
Pinout	8 wires per connector				
Installation	Flush mount				
Ground connection	Screw lug or Mounting flange				
Standard compliance	UL497B IEEE 802-3af (transmission)				

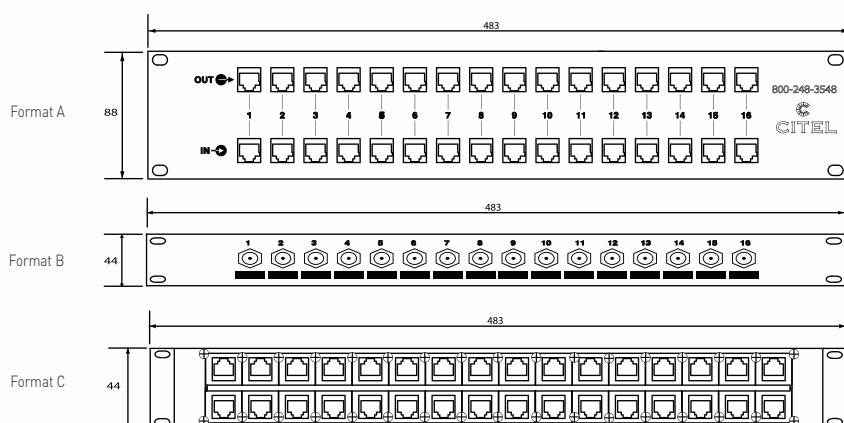
# 19" patch panel surge protector for high-speed network *RAK series*



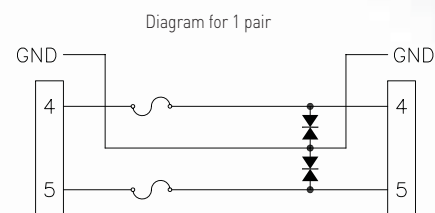
- 19" Rack mounted
- 16 or 32 ports
- In/out front : RJ45, BNC or F
- Possible maintenance per port
- In compliance with UL497B

## Dimensions

(in mm)



Surge protector circuit 1 port



## 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
Max. Data rate	1000 Mbps	1000 Mbps	100 Mbps	40 Mbps	40 Mbps	100 Mbps	1000 Mbps	1000 Mbps	1000 Mbps
Max. supply voltage	7,5 Vdc	60 Vdc	18 Vdc	60 Vdc	240 Vdc	60 Vdc	Pin 1,2,3,6 : 7.5Vdc Pin 4,5,7,8 : 60 Vdc	7,5 Vdc	90 Vdc
Max. supply current	750 mA	750 mA	750 mA	750 mA	750 mA	750 mA	750 mA	750 mA	750 mA
Nominal discharge current (10/1000µs waveform)	132 A (-C5E) 100 A (-C6)	45 A	60 A	50 A	75 A	50 A	Pin 1,2,3,6 : 132 A Pin 4,5,7,8 : 50 A	132 A	20 kA (8/20µs waveform)
Max. 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 r 32	16	16
Stand-off option (for 16 ports)	yes	yes	yes	yes	yes	yes	yes	no	no
Diagram	A	A	A	A ou C	A	A	A	B	B
Connection : - input - output	RJ45 Female RJ45 Female							BNC (Female) BNC (Female)	F (Female) F (Female)
Pinout	8 fils par connecteur							N/A	N/A
Installation	Flush mount or Stand off								
Ground Connection	Screw lug or Mounting flange								
Standard compliance	UL497B IEEE 802-3af (transmission)								

# D-Sub Dataline Surge Protector

## DD series

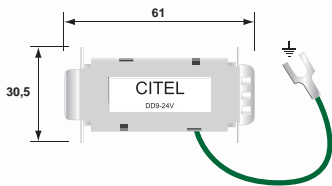


- “D-Sub” surge protectors
- For RS232, RS422, RS485 communication lines
- Fast and easy installation
- 9, 15 and 25-pin connectors
- Secondary protection

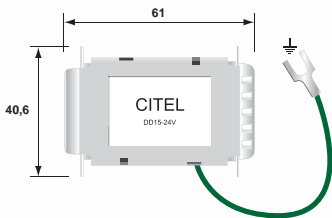
### Dimensions - Electrical Diagram

(in mm)

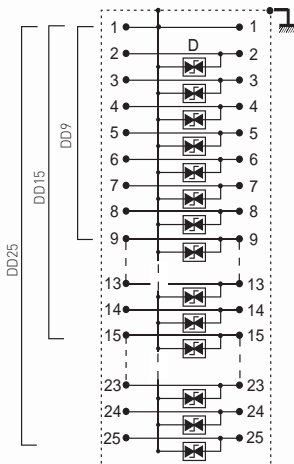
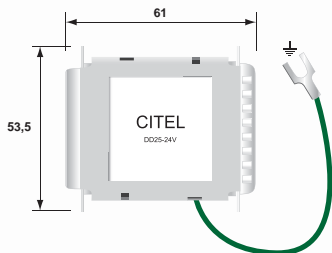
DD9-24V



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
Max. line voltage	Uc 6 V	15 V
Capacitance	<30 pF	<30 pF
Maximum data rate	<40 Mbps	<40 Mbps
Clamping voltage	Up 7.5 V	18 V
Nominal discharge current	In 400 A	300 A
Mechanical characteristics		
Connector wiring	all wires transmitted and protected	all wires transmitted and protected
Mounting	on D-sub connector	on D-sub connector
Earthing	by wire	by wire
Housing material	thermoplastic	thermoplastic
Dimensions	see drawings	see drawings
Part Number		
DD25ESD-xxV	6146	6145
DD15ESD-xxV	6215	6214
DD9ESD-xxV	6148	6147

# Surge protector for Video Survey Camera

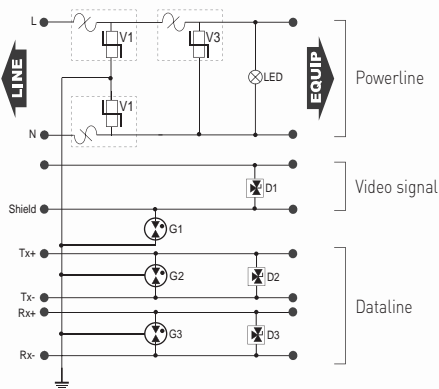
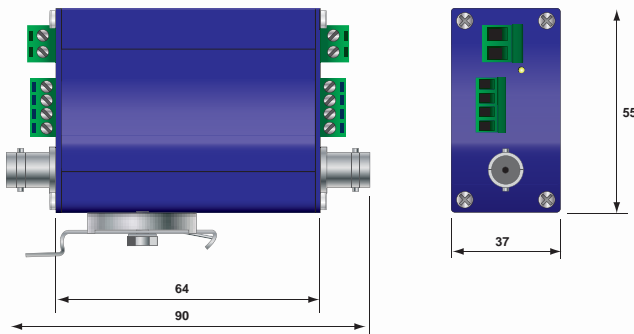
## MSP-VM-2P series



- Security camera Surge Protector
- AC, Data and Video in single unit
- Compact aluminium housing
- Rail DIN mounting or plate mounting
- Other versions :
  - Data 1 pair : MSP-VM..
  - Cat.5 - RJ45 : MSP-VM../R

### Dimensions - Electrical Diagram

(in mm)



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

### Characteristics

CITEL part number		MSP-VM24-2P	MSP-VM-120-2P	MSP-VM-230-2P
<b>Power</b>				
Nominal voltage	Un	24 Vdc	120 Vdc	230 Vdc
Maximum voltage	Uc	30 Vdc	150 Vdc	255 Vdc
Line current	IL	5 A	5 A	5 A
Nominal discharge current	In	5 kA	5 kA	5 kA
Maximum discharge current	Imax	10 kA	10 kA	10 kA
Protection level	Up	0.3 kV	0.8 kV	1.2 kV
Connection		Screw terminal : Max. 2.5 mm <sup>2</sup>		
Failure mode		Power failure and led green off		
<b>Data 2 pairs</b>				
Maximum voltage	Uc	8 Vdc	8 Vdc	8 Vdc
Nominal discharge current	In	2.5 kA	2.5 kA	2.5 kA
Maximum discharge current	Imax	5 kA	5 kA	5 kA
Protection level	Up	20 kV	20 kV	20 kV
Connection		Screw terminal : Max. 1.5 mm <sup>2</sup>		
Failure mode		Short-circuit status (transmission fault)		
<b>Video</b>				
Maximum voltage	Uc	6 Vdc	6 Vdc	6 Vdc
Nominal discharge current	In	5 kA	5 kA	5 kA
Maximum discharge current	Imax	10 kA	10 kA	10 kA
Protection level	Up	20 V	20 V	20 V
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

	Alimentation		
	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

# Coaxial surge protector for video transmission networks *CXC and CNP*

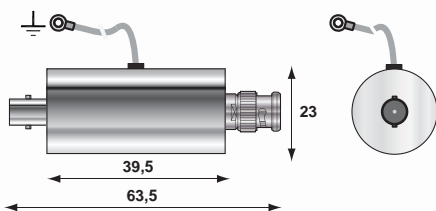


- **Coaxial surge protector**
- **Multiples connectors**
- **Low insertion loss**
- **Easy installation**

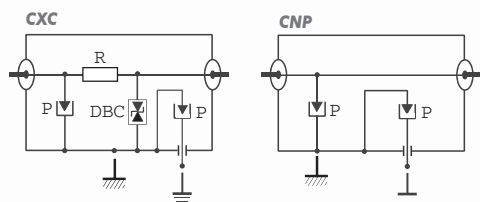
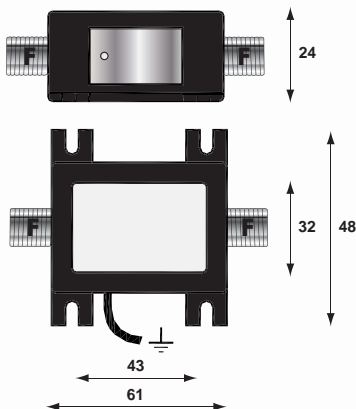
## Dimensions - Electrical diagrams

(in mm)

CXC...-B/FM



CNP



P : 2-electrode gas 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 (8/20 μs)	10 kA	20 kA
Max Power	5 V	5 V
Max Current	6 W	4 W
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 + plastic
Mounting		
Part number		
Cxx06-B/FM	6301341	64270
Cxx06-B/MF	630134	632611

# Surge protector for coaxial line and RJ

## DIN-BNC series

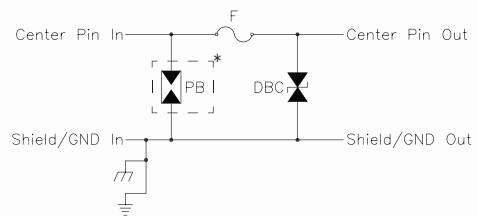
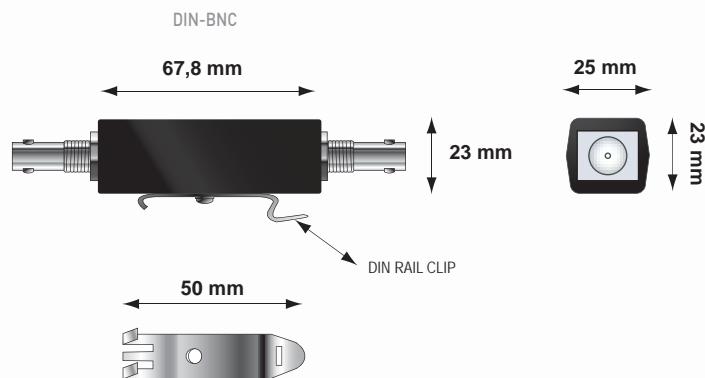


DIN-BNC

- Surge protector BNC or RJ
- Adaptable on rack 19"
- Mounting on DIN rail

## Dimensions - Electrical diagrams

(in mm)



F : Fuse  
 PB : 2-electrode gaz 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
Max. data rate	1000 Mbps	100 Mbps	40 Mbps	40 Mbps	1000 Mbps	1000 Mbps
Max. supply voltage	7.5 Vdc	18 Vdc	60 Vdc	240 Vdc	2.7 Vdc	7.5 Vdc
Max. supply current	750 mA	750 mA	750 mA	750 mA	750 mA	750 mA
Nominal discharge current (@ 10/1000µs)	100 A	60 A	50 A	75 A	132 A	25 kA (8/20µs)
Max. 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
Pinout	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 802-3a (Transmission)					





CITEL



# COAXIAL RF

Surge Protectors

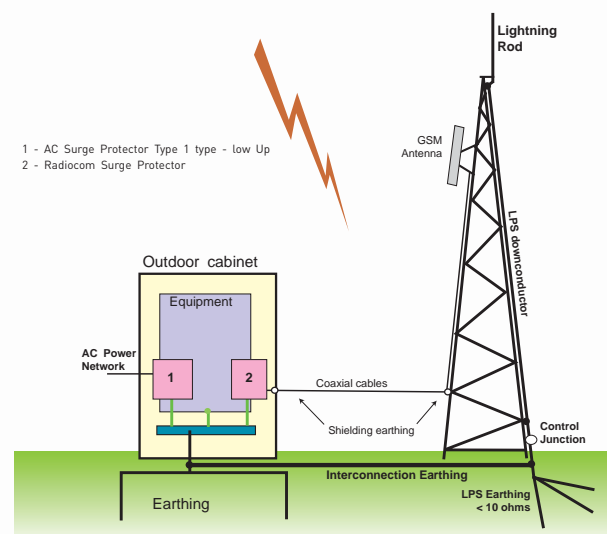
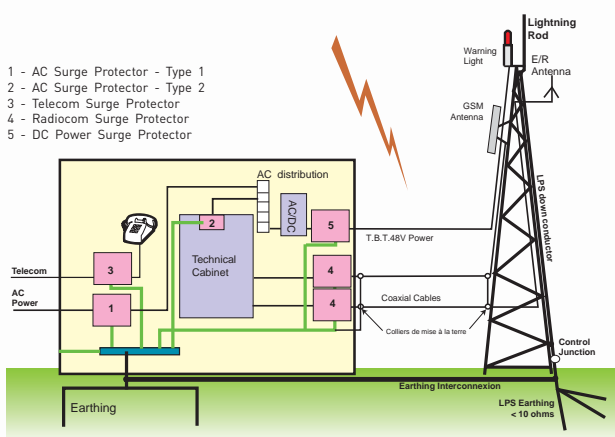
# RF Surge Protection

## Protection of radiocommunication equipment

Radiocommunication systems, connected to antennae, are especially exposed to lightning phenomena, the maximum risk being a direct strike on the antenna pole.

Equipment, as GSM/UMTS or TETRA base stations, must consider this risk in order to insure a relevant service continuity.

CITEL offers several surge protection technologies for RF lines to comply to the different operation requirements.



## 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 (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 ; when its sparkover voltage is reached, during an overvoltage, the line is briefly shorted (arc voltage). The sparkover voltage depends on the rise front of the overvoltage. The higher the  $dV/dt$  of the overvoltage, the higher the sparkover voltage of the surge protector.

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

The gas tube is removable, making maintenance rapid in the end-of-life scenario.

The greater advantage of this technology is its very wide bandwidth : from DC (so, compatible with DC voltage injection) to several GHz.

#### Main characteristics :

- Insertion losses < 0,2 dB
- VSWR < 1,2
- $I_{max}$  : 20 kA (8/20 $\mu$ s)
- Bandwidth : 0 to several GHz
- Connectors : N, BNC, TNC, 7/16, F, SMA, UHF,
- Waterproof

#### Main characteristics VG option :

- $I_{max}$  : 10 kA (8/20 $\mu$ s)
- Connector : N
- Prevents the short-circuit of the transmitter (output) and the receiver (input) during a disturbance

### ● CNP/CXP series (GDT protection) and CXP-DCB series (DC Blocked Protection)

CXP protectors are based on GDT to provide high discharge current capability without destruction. This type of products allows for installation in ungrounded systems. In these cases, the CXP isolates the shield from the earth ground and is typically found in applications including wireless radio terminals and TV monitors (antenna, cable or satellite).

CXP-DBC version is a relevant hybrid association between a filter stage and a gas tube : this configuration has the advantage of reducing low frequency disturbances (DC and lightning voltages) while providing a high discharge current capability.

# RF Surge Protection

## Main characteristics (CXP) :

- isolated ground through GDT
- Insertion losses < 0.5 dB
- VSWR < 1.3
- I<sub>max</sub> : 20 kA (8/20μs)
- Bandwidth : DC - 1000 MHz
- Connectors : F, BNC, SE, N...

## Main characteristics (CXP-DBC) :

- "DC Block" feature
- Insertion losses < 0.15 dB
- VSWR < 1.2
- I<sub>max</sub> : 10 kA (8/20μs)
- Bandwidth : 125 - 1000 MHz
- Connectors : N, BNC

## ● PRC series (Quarter Wave Protection)

The other way to protect antenna lines is relevant replacement of the gas tube by a proper short-circuit chosen according to the operating frequency band. This short-circuit is tuned to one quarter of the wavelength, giving its name to «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 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.

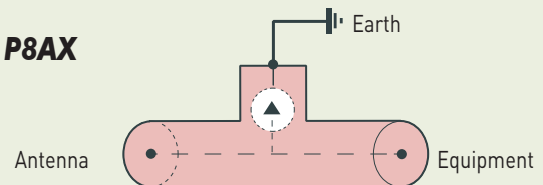
The typical application is the protection of radio lines that do not have a source voltage.

## Main characteristics :

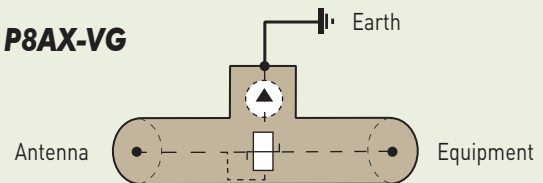
- Insertion losses < 0.2 dB
- VSWR < 1.2
- Bandwidth :
  - 400-500 MHz
  - 870-950 MHz
  - 1700-1950 MHz
  - 1700-2200 MHz
  - 870-220 MHz
- I<sub>max</sub> : up to 100 kA (8/20μs)
- Connectors : 7/16, N, BNC, TNC, 7/8 câble

## RF Surge Protectors diagrams

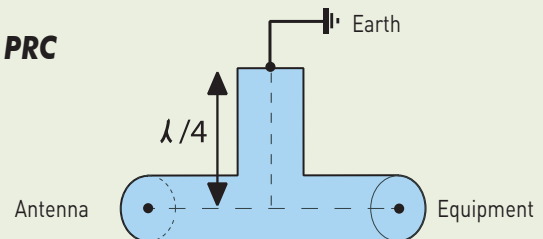
### P8AX



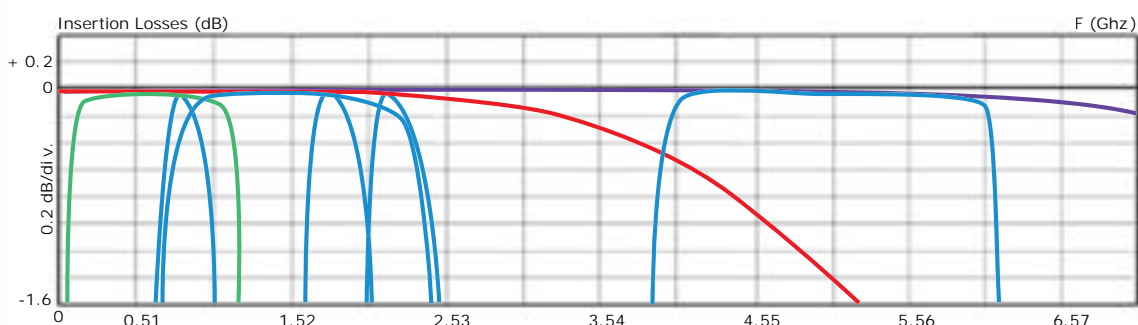
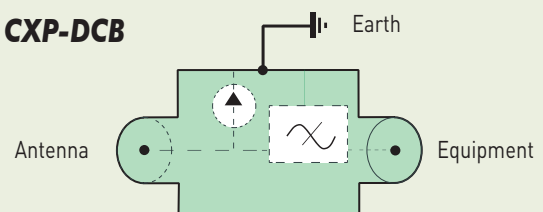
### P8AX-VG



### PRC



### CXP-DCB






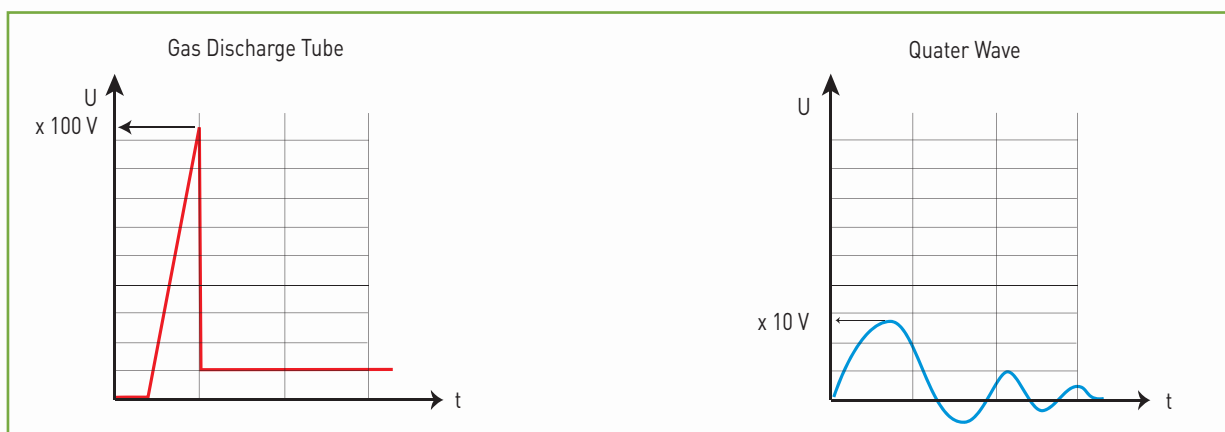
- CXP-DCB
- PRC
- P8AX
- P8AX-6G

# RF Surge Protection

## Comparison

Table below allows comparison between the 3 technologies of RF coaxial surge protectors, in order to select the right solution regarding the application and the requirements.

Technology	Gas tube	DC Block	Quarter wave
<i>CITEL series</i>	<i>P8AX</i>	<i>CXP-DCB</i>	<i>PRC</i>
			
<b>Principle</b>	Sparkover	Sparkover + Filtering	Adapted short-circuit/selective band filter
<b>Residual voltage</b>	from 70V to 600 V in relation with the $dV/dt$ , then arc regime (short-circuit of the line in the full bandwidth). RF signal disturbed during the protection operation. Except for the option VG	< 100 V Short-circuit of the line in the full bandwidth : RF signal disturbed during the protection operation.	< 20 V RF signal not disturbed during the protection operation.
<b>Bandwidth</b>	DC to 3GHz (dependent on the coaxial connector and the impedance)	125-1000 MHz	Narrow band (GSM, DCS1800, PCS, DECT, GPS)
<b>DC injection</b>	Compatible	Not compatible	Not compatible
<b>8/20<math>\mu</math>s 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 option VG : only N	N, BNC, TNC.	7/16, N, TNC....



## Radio Frequency bands

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

## A few Microwave applications

Tetra, Tetrapol	380-512 MHz
GSM850	824-894 MHz
Tetra	870-925 MHz
GSM 900	880-960 MHz
GPS	1575 MHz
GSM 1800	1710-1785 MHz
GSM 1900	1850-1990 MHz
DECT	1880-1900 MHz
WCDMA/TD-SCDMA	1850-2025 MHz
UMTS (IMT-2000)	1885-2200 MHz
WLL (WiMax)	2400-5825 MHz

# RF Surge Protection

## Installation

The efficiency of coaxial protectors is highly dependent on proper installation, in particular their connection to the earthing network of the installation.

The following installations rules must be strictly observed to ensure the efficiency :

- **Equipotential bonding network** : all the bonding conductors of the installation must be interconnected and connected to the installation earthing 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 has a proper cross section (at least 4 mm<sup>2</sup>).  
The «feedthrough mounting» versions meet perfectly all these requirements.  
Warning : for good contact, remove carefully all paintings or insulating coatings.
- **Location of the protectors** : they should preferably be placed at the entrance of the installation (to limit the penetration of lightning currents) and also near sensitive equipment (to enhance protection).

## 2 types of mounting

### ● Feedthrough mounting

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

- perfect connection to the bonding network
- best location (conduction of the surge currents at the entrance of the installation)
- good mechanical withstand.

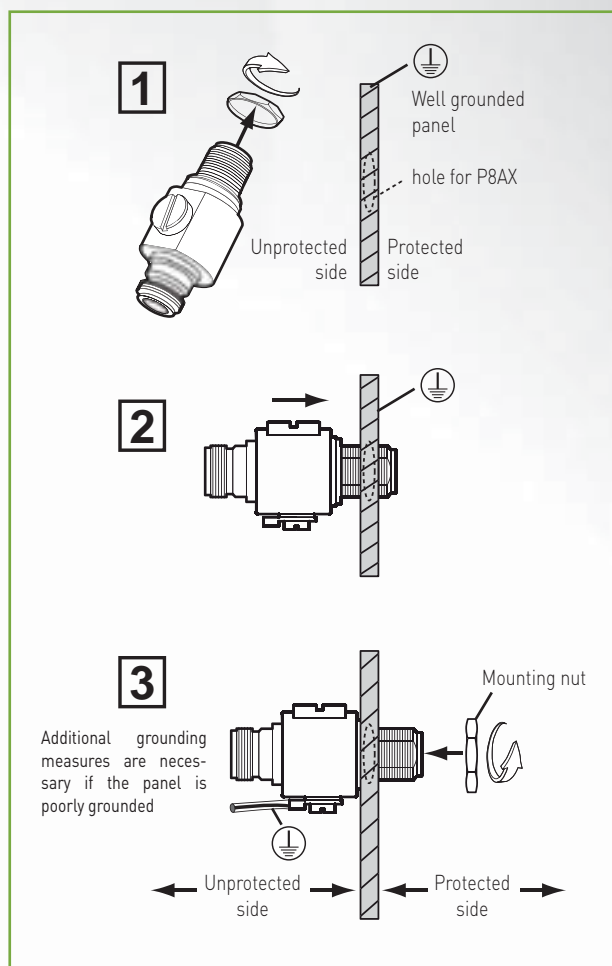
### ● Alternative mounting

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

## Standards

IEC 61643-21  
UL497C  
UL497E

## Mounting coaxial surge protectors in feedthrough



## Reference system

CITEL part number	Max. 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

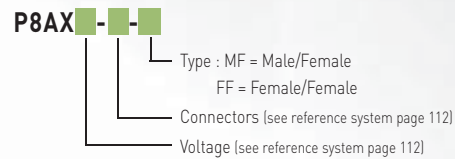
# RF Coaxial Protectors - 4 GHz

## P8AX series



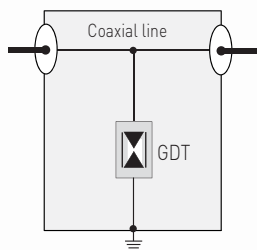
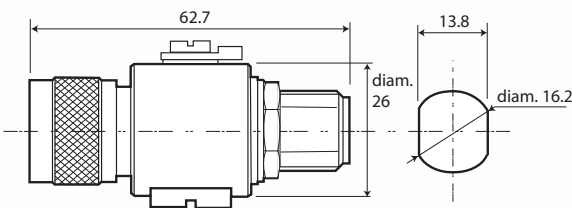
P8AX09-N/MF

- **Coaxial surge protector 4 GHz**
- **Low insertion losses**
- **Waterproof**
- **Removable GDT**
- **DC-pass**
- **Bi-directional protection**



### Dimensions - Electrical diagrams

(in mm)



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
Max Power	25 W	190 W	780 W
Max 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)		
<b>Mechanical characteristics</b>			
Connectors	N, TNC, SMA, F, BNC, 7/16		
Grounding	M6 Screw, Bulkhead, Bracket		
Environmental Rating	IP65		
Operating Temp	-50°C to +85°C		
Operating Altitude	4,000 m		
Relative Humidity	up to 5 to 95% non-condensing, up to 100%		

<sup>1</sup>Max. frequency type F : 2 GHz

<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

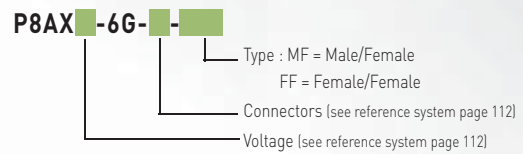
# RF Coaxial Protectors - 6 GHz

## P8AX-6G series



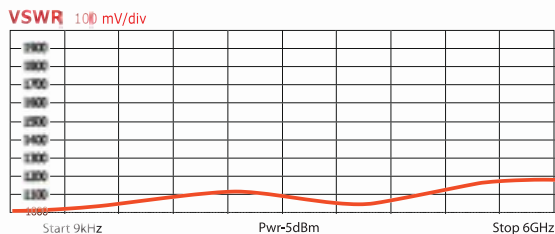
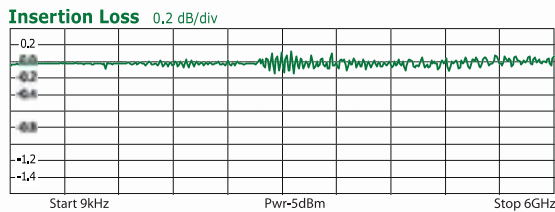
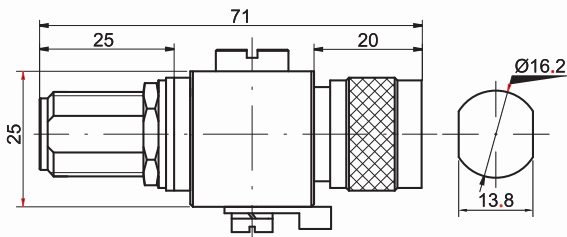
P8AX09-6G-N/MF

- **Coaxial surge protector 6 GHz**
- **Low insertion losses**
- **Waterproof**
- **Removable GDT**
- **DC-pass**
- **Bi-directional protection**



### Dimensions - Electrical diagrams

(in mm)



### Characteristics

CITEL 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
Max Power	70 W	240 W
Max 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 Temp	-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

# RF Coaxial Protectors - 6 GHz

## P8AX-6VG-N/MF



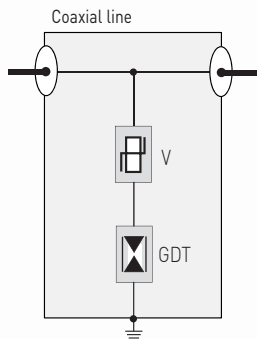
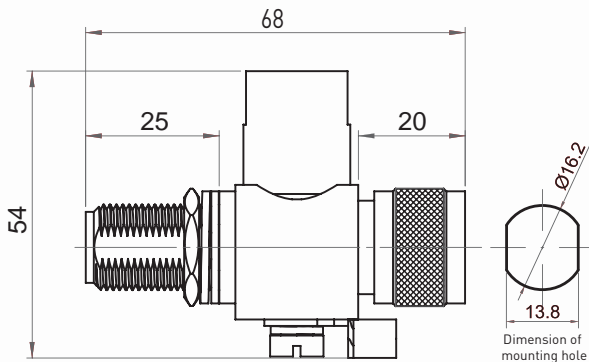
P8AX09-VG-N/MF



- **DC to 6 GHz**
- **I<sub>max</sub> : 6 kA**
- **VSWR ≤ 1.25**
- **Insertion Loss ≤ 0.2 dB**
- **Feedthrough mounting**
- **Bi-Directional protection**
- **Multiple strike capability**
- **DC pass**
- **Waterproof**

### Dimensions - Electrical diagrams

(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
Max. input power	70 W
User current	6 A
User voltage	90 Vdc
Max. discharge current (8/20μs)	6 kA
Protection level (1.2/50μs, 4kV)	U <sub>p</sub> 600 V
Insulation resistance (50 Vac)	10 GΩ
Mechanical specifications	
Dimensions	See drawing
Connectors	N Male to N Bulkhead Female
Mounting	On feedthrough or cable
Operating temperature	-40°C to +85°C
Waterproof degree	IP65 Min.

### 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

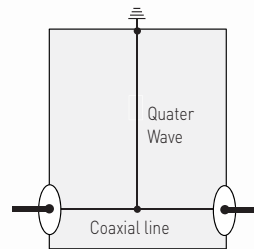
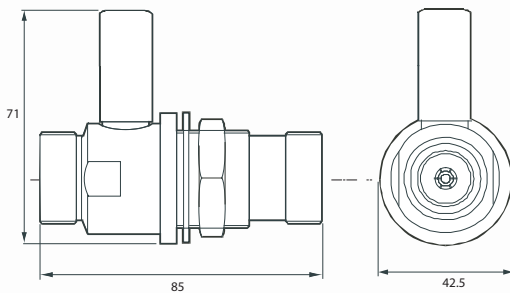


PRC1800-7/16MF

- **Low insertion losses**
- **$I_{max} > 50 \text{ kA}$**
- **Available for wide-band application**
- **No maintenance**

### Dimensions - Electrical diagrams

(in mm)



### Characteristics

Référence CITEP	PRC822	PRC900	PRC1800	PRC2100	PRC5800
Frequency Range	800-2200MHz	870-960MHz	1700-1950MHz	1800-2400MHz	4500-6000MHz
Technology	1/4 d'onde	1/4 d'onde	1/4 d'onde	1/4 d'onde	1/4 d'onde
Insertion Loss	$\leq 0.2 \text{ db}$	$\leq 0.2 \text{ db}$	$\leq 0.2 \text{ db}$	$\leq 0.2 \text{ db}$	$\leq 0.2 \text{ db}$
Return Loss	$\geq 20 \text{ db}$	$\geq 20 \text{ db}$	$\geq 20 \text{ db}$	$\geq 20 \text{ db}$	$\geq 20 \text{ db}$
VSWR	$< 1.2:1$	$< 1.2:1$	$< 1.2:1$	$< 1.2:1$	$< 1.2:1$
Max. Discharge current (8/20 $\mu\text{s}$ )	100 kA (50 kA = N&TNC)	100kA (50 kA = N&TNC)	100kA (50 kA = N&TNC)	50 kA	50 kA
Max Power	2500 W (1500 W = N & TNC)	2500 W (1500 W = N & TNC)	2500 W (1500 W = N & TNC)	1500 W	1500 W
Max Current	N/A	N/A	N/A	N/A	N/A
Impedance	50 ohms	50 ohms	50 ohms	50 ohms	50 ohms
Caractéristiques mécaniques					
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 Temp	-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

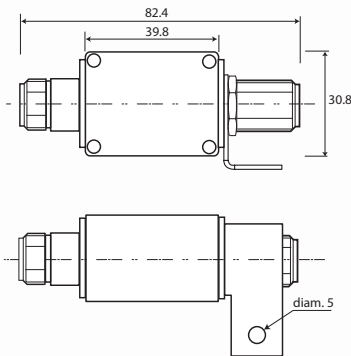


- Coaxial surge protector low frequency
- RoHS 6 compliance
- Waterproof
- Bi-directional

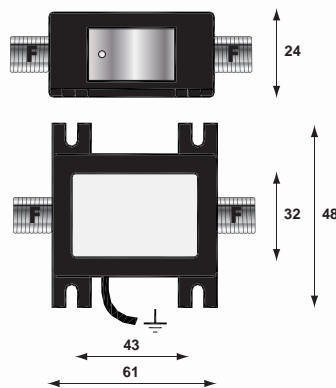
## Dimensions - Electrical diagrams

[in mm]

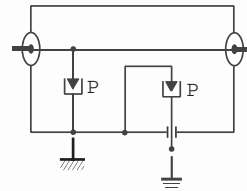
CXP09-NW/FF-DCB



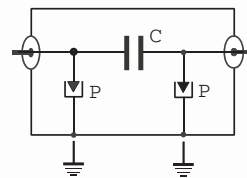
CNP



CNP  
CXP



CXP-DCB



## Characteristics

CITEL PART NUMBER	CNP90TV	CNP230TV	CXP	CXP-DCB
Frequency Range	DC-1GHz	DC-1GHz	DC-1GHz	125 - 1000 MHz
Technology	Gas Discharge Tube	Gas Discharge Tube	Gas discharge tube	GDT + 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 (8/20 μs)	20 kA	20 kA	20 kA	20 kA
Max Power	25 W	190 W	25 and 190 W	25 and 190 W
Max Current	0.5 A	0.5 A	0.5 A	Na
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 Temp	-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

## Bracket for coaxial surge protector

- **Screw fixing**
- **Grounding**
- **requires a feedthrough connector**



BK-T  
bracket for TNC connector

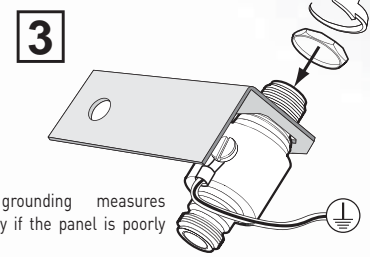
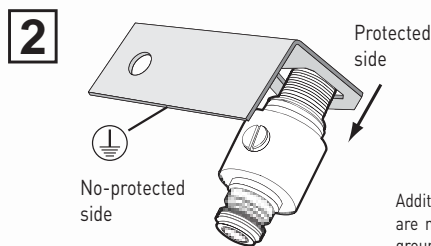
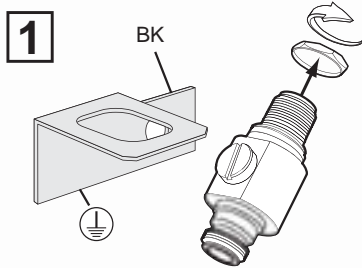


BK-N  
bracket for N connector



BK-SMA  
bracket for SMA connector

## Mounting bracket



## Reference standard bracket

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 tube

CITEL P/N	part number	Packaging	P8AX reference
BBHF 90/20	927000107	Packing*10	P8AX09-xxx
BBHF 150/20	927000207	Packing*10	P8AX15-xxx
BBHF 250/20	927005907	Packing*10	P8AX25-xxx
BBHF 350/15	927006507	Packing*10	P8AX35-xxx
BBHF 500/20	927002207	Packing*10	P8AX50-xxx
BA HF 90/20	927100107	Packing*10	P8AX09-6G
BAHF 150/20	927100207	Packing*10	P8AX 25-6G





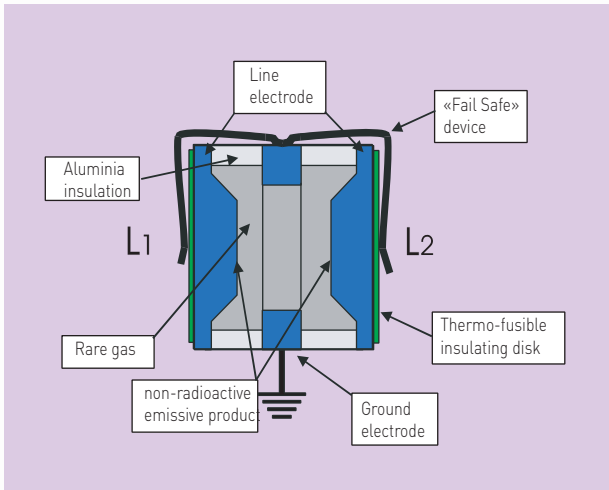
CITEL



# GAS DISCHARGE TUBE

# Gas Discharge Tubes

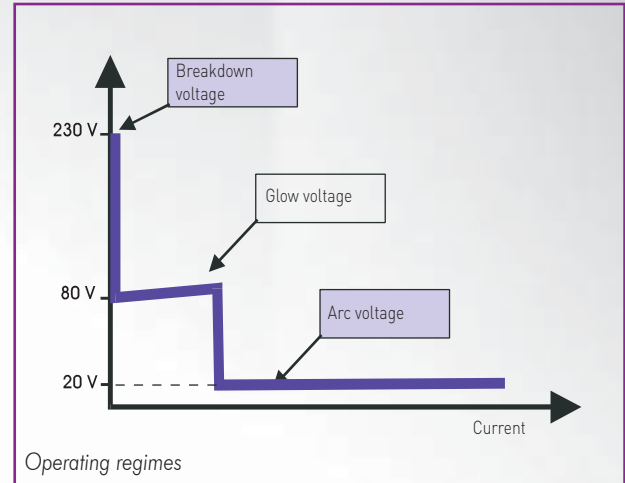
These components are made of two or three electrodes in an enclosure filled with a (non-radioactive) rare gas at a controlled pressure. The enclosure is a ceramic tube with its ends closed off by metal caps that also serve as electrodes. Their main use is to protect telecommunications lines, but other uses are possible.



## Operation

The gas discharge tube may be regarded as a sort of very fast switch having conductance properties that change very rapidly, when breakdown occurs, from open-circuit to quasi-short circuit (arc voltage about 20V). There are accordingly four operating domains in the behavior of a gas discharge tube:

- **Non-operating domain**, characterized by practically infinite insulation resistance;
- **Glow domain** : At breakdown, the conductance increases suddenly; if the current drained off by the gas tube is less than about 0.5A (this is a rough value that differs according to the type of component), the glow voltage across the terminals will be in the 80-100V range;
- **Arc regime** : as the current increases, the gas discharge tube shifts from the glow voltage to the arc voltage (20V). It is in this domain that the gas discharge tube is most effective, because the current discharged can reach several thousand amperes without the arc voltage across its terminals 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).

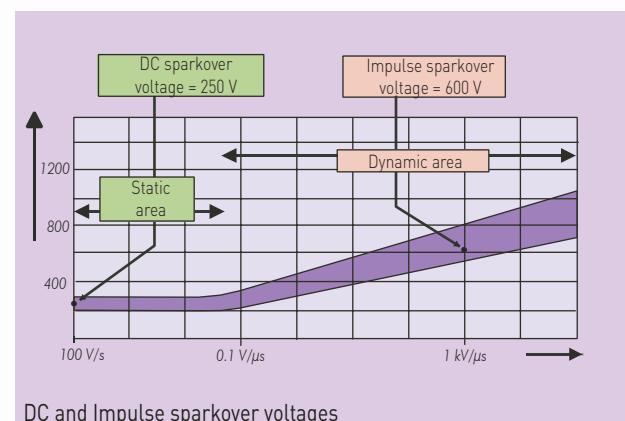
### DC sparkover voltage

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 to the component; it depends on the electrode spacing, the pressure, and the properties of the gas mixture and of the emissive substance.

Range of DC sparkover voltages available:

- minimum 75V
- average 230V
- high voltage 500V
- very high voltage 1000 to 3000V

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



DC and Impulse sparkover voltages

# Gas Discharge Tubes

## Discharge current

This depends on the properties of the gas, the volume, and the material and treatment of the electrodes. It is the major characteristic of the GDT and the one that distinguishes it from other protection devices (Varistor, Zener diode, etc.): 5 to 20kA with an 8/20 $\mu$ s impulse for the standard components. This is the value the device can withstand repeatedly (say for ten impulses) without destruction or alteration of its basic specifications.

## Impulse sparkover voltage

Sparkover voltage in the presence of a steep rise front ( $dV/dt = 1kV/\mu s$ ): the impulse sparkover voltage increases with increasing  $dV/dt$ .

## Insulation resistance and capacitance

These characteristics make the gas discharge tube practically «invisible» in a line in a steady-state context: insulation resistance very high (>10 Gohm), capacitance very low (<1 pF).

## 3-electrode configuration

Protecting a two-wire line (for example a telephone pair) 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 sparks over a very short time before the other (a few microseconds); the wire that has sparked over is therefore grounded (neglecting the arc voltages), turning the common-mode overvoltage into a differential-mode overvoltage, very dangerous for the terminal equipment. This risk disappears 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 (a few nanoseconds) 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 5 kA impulses of each polarity).

On the other hand, a sustained strong current (e.g. 10 A rms for 15 seconds, simulating the fall of a AC power line onto a telecommunication line) will put the device out of service definitively.

If a fail-safe end of life is desired (i.e. a short-circuit that will report the fault to the user when the line fault is detected), gas discharge tubes with the fail-safe feature (external short-circuit) should be chosen.

## Standards

CITEL gas discharge tubes comply with the specifications of main telecom operators (France Telecom, British Telecom, etc.) and with the ITU-T K12 international recommendation and standards IEC 61643-31x.

## The CITEL line

CITEL proposes a full line of gas discharge tubes to meet most configuration needs and specifications found on the market :

- 2- and 3-electrode gas discharge tubes
- Sparkover voltages from 75 to 3500 V
- Discharge capacities from 5 to 150 kA (8/20 $\mu$ s)
- Optional external short-circuit device
- Installation on support, on printed circuit, or surface-mounted devices.

## GSG series




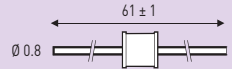

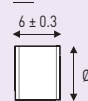
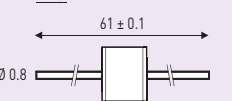

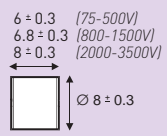
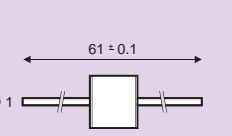
Thanks to our inherent knowledge and experience in the field of gas discharge tubes, CITEL has developed a specific technology: GSG (Gas-filled Spark Gap).

These components are designed to be used on an AC network: they have an increased extinction capability and a higher current discharge capability with either a 8/20 $\mu$ s or 10/350 $\mu$ s waveform.

The GSG components are the heart of the VG technology which insures matching performance with allair gap technologies without any of downside.


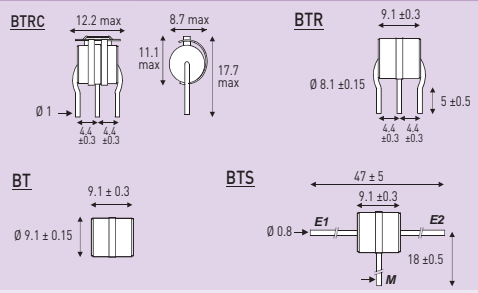

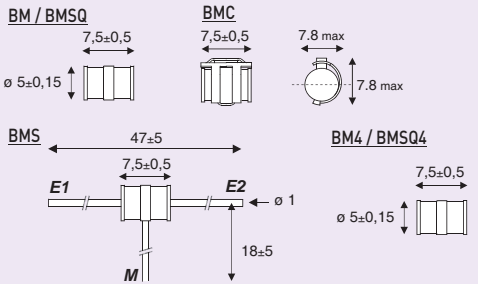
# Selection guide

## 2-ELECTRODE


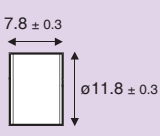

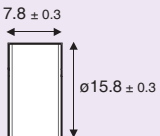
Range	CITEL part number	DC sparkover voltage (100V/s)	Impulse sparkover voltage (1kV/ $\mu$ s)	Insulation resistance (100Vdc)	Capacitance	Holdover voltage (R = 300 ohms in serie R = 150 ohms; 100nF in parrallel)	AC discharge current (50Hz)	Max. discharge current (8/20 $\mu$ s ; 1 time)	Nominal discharge 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	<b>BA / BASQ</b>  <b>BA4 / BASQ4</b>  <b>BAS</b>   Options :    Lead termination : BAS External fail-safe : BAC SMD version : BA CMS in 90V/20, 230V/20, 350V/20 Tape : Taped and reeled
	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	<b>BB</b>  <b>BBS</b>   Options :    Lead termination : BBS External fail-safe : BBC
	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	<b>BH</b>  <b>BHS</b>   Options :    Lead termination (Ø 1 or 0.8 mm) : BHS External short-circuit : BHC (from 90 to 600 V)
	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		

# Selection guide

## 3-ELECTRODE

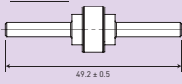
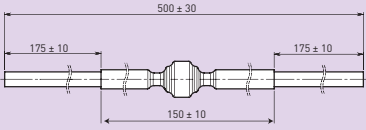
Range	CITEL part number	DC sparkover voltage (100V/s)	Impulse sparkover voltage (1kV/μs)	Insulation resistance (100Vdc)	Capacitance	Holdover voltage (R = 300 ohms in serie R = 150 ohms; 100nF in parallel)	AC discharge current (50Hz)	Max. discharge current (8/20μs ; 1 time)	Nominal discharge current (8/20μs ; 10 times)	Mechanical
<b>BT</b> 	BT90	72-108 V	<640 V	>10GΩ	<0.9 pF	>70 V	20 A	25 kA	20 kA	
	BT150	120-180 V	<640 V	>10GΩ	<0.9 pF	>80 V	20 A	25 kA	20 kA	
	BT230	184-276 V	<750 V	>10GΩ	<0.9 pF	>80 V	20 A	25 kA	20 kA	
	BT350	280-420 V	<900 V	>10GΩ	<0.9 pF	>80 V	20 A	25 kA	20 kA	
	BT500	400-600 V	<1100 V	>10GΩ	<0.9 pF	>80 V	20 A	25 kA	20 kA	
<b>BM</b> 	BM90	72-108 V	<640 V	>10GΩ	<0.5 pF	>60 V	10 A	25 kA	10 kA	
	BM150	120-180 V	<700 V	>10GΩ	<0.5 pF	>80 V	10 A	25 kA	10 kA	
	BM230	184-276 V	<800 V	>10GΩ	<0.5 pF	>80 V	10 A	25 kA	10 kA	
	BM350	280-420 V	<1000 V	>10GΩ	<0.5 pF	>80 V	10 A	25 kA	10 kA	
	BM500	400-600 V	<1200 V	>10GΩ	<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 (1.2/50μs / 6kV)	Insulation resistance (100Vdc)	Follow current interrupting capability (Ifi) (under voltage AC)	Nominal discharge current (In) (8/20μs, following IEC 61643-11)	Max. discharge current (Imax) (8/20μs; following IEC 61643-11*)	Max. impulse current (Iimp) (10/350μs; following IEC 61643-11)	Mechanical
<b>BG</b> 	BG600	450V	<1500 V	>10GΩ	> 100 A	60 kA	100 kA	15 kA	
	BG800	650 V	<1500 V	>10GΩ	> 100 A	60 kA	100 kA	15 kA	
	BG1000	850 V	<1800 V	>10GΩ	> 100 A	60 kA	100 kA	15 kA	
	BG1300	1100 V	<2000V	>10GΩ	> 100 A	60 kA	100 kA	15 kA	
<b>BF</b> 	BF800	650-1000 V	<1500 V	>10GΩ	> 100 a	80 kA	140 kA	40 kA	

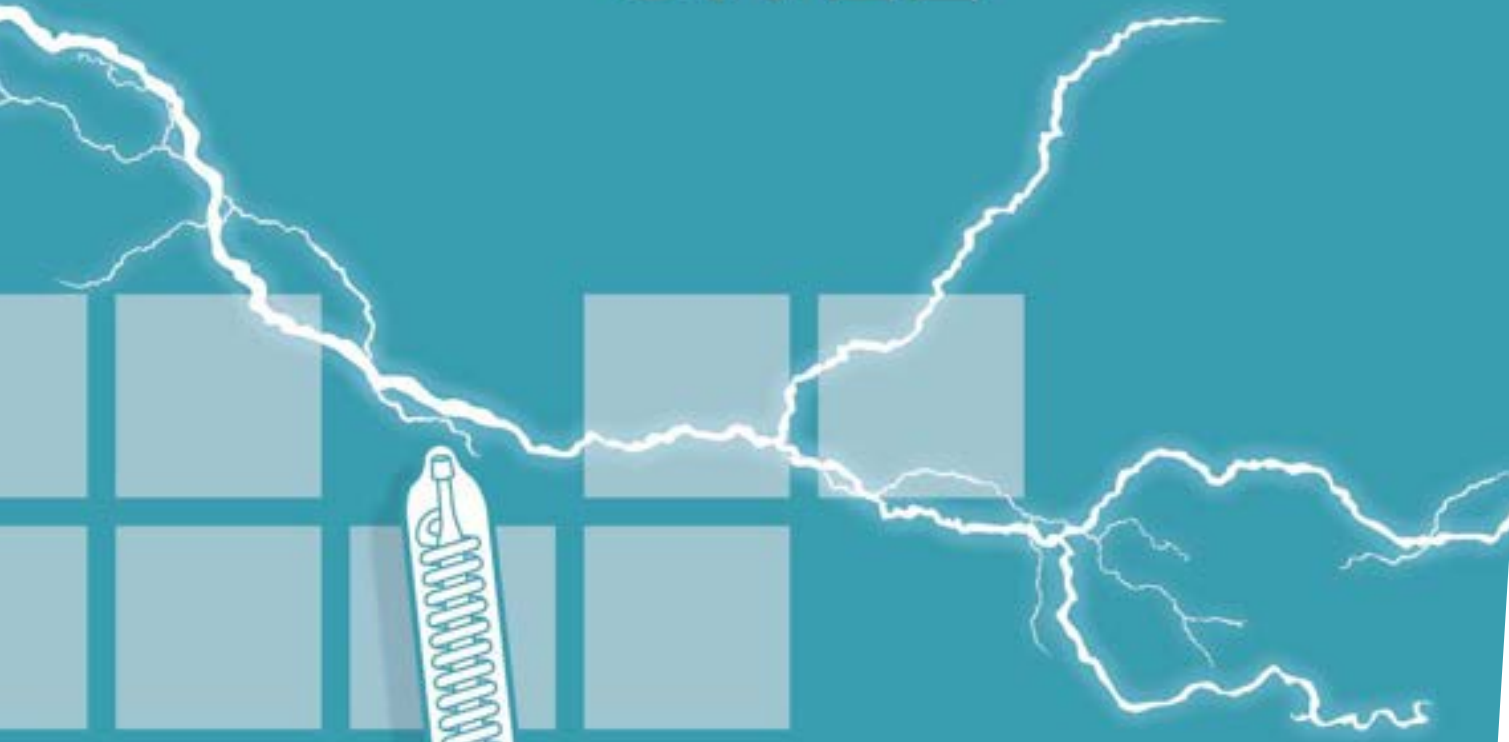
# Selection guide

## 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, suivant IEC 61643-11)	Max. discharge current (Imax) 8/20µs ; suivant IEC 61643-11°)	Max. impulse current (Iimp) (10/350µs ; suivant 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**



## **MISCELLANEOUS OBSTRUCTIONS LIGHTS**

# Isolating Spark Gaps BF P100 and SGP

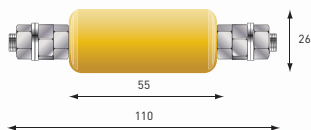


- Isolating Spark gaps
- Outdoor or indoor application
- Discharge currents up to 150 kA

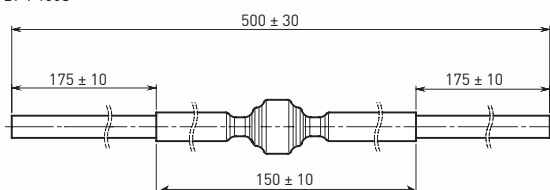
## Dimensions and Electrical diagram

(in mm)

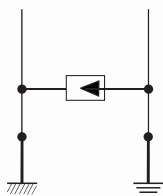
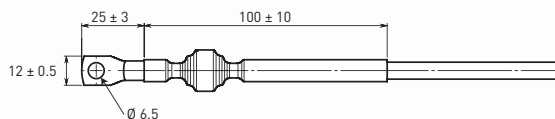
SGP



BF P100S



BF P100C



## Characteristics

CITEL part number	BF P100	SGP70	SGP40
Technology	Gas tube	Gas tube	Gas tube
DC sparkover	280-420 V	400 Vac	400 Vac
Impulse sparkover (1 kV/μs)	< 1000 V	< 1500 V	< 1500 V
Insulation resistance	> 1 GΩhm	> 1 GΩhm	> 1 GΩhm
Max. discharge current (8/20 μs)	150 kA	70 kA	40 kA
Max. lightning current (10/350 μs)	60 kA	25 kA	10 kA
Dimensions	see drawing	see drawing	see drawing
Connection	wires (P100S) wire terminal (P100C)	threaded rod M10	threaded rod M10
Outdoor application	Yes	Yes	Yes
<b>Part number</b>	consult us	690103	690102

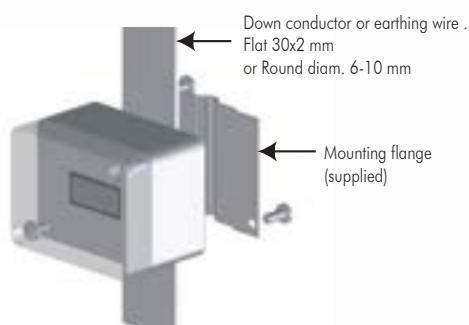
# Lightning counter CF-01



CF-01

- **Lightning current counter**
- **For LPS and SPD**
- **Outdoor or indoor application**
- **Compliance with NF C17-106 std.**

## Installation



## Characteristics

CITEL part number	CF-01
Description	Lightning counters outdoors and indoor
Minimum current sensibility	0.3 kA
Max. admissible impulse current	100 kA
Maximum numbers of events	999999
Display	LCD
Dimensions	65x50x45 mm
Weight	0.15 kg
Enclosure	Polycarbonate IP54
Power supply	internal by battery
Life expectancy (before battery replacement)	> 10 years
Mounting	by flange on round ( $\varnothing$ 6 to 10) or flat (30x2) conductor
Compliance	NFC 17-106

# LED OBSTA Flash



- **Medium intensity is a white, red or dual color flashing obstruction light**
- **Versions 48 VDC and 230 VAC**
- **Very long lifetime expectancy**
- **40 flashes per minute**
- **6 LED projectors**
- **Surge protector included**



## Characteristics

Part number	13720	13721	13722	13723	13724	13725
Characteristics	White only	Red only	Bi-color	White only	Red only	Bi-color
Power supply	48 Vdc	48 Vdc	48 Vdc	120/230 Vac	120/230 Vac	120/230 Vac
Luminous intensity	Day : 20 000 Cd Night : 2000 Cd	Day : -- Night : 2000 Cd	Day : 20 000 Cd Night : 2000 Cd	Day : 20 000 Cd Night : 2000 Cd	Day : -- Night : 2000 Cd	Day : 20 000 Cd Night : 2000 Cd
Consumption max	< 100 W	< 30 W	< 100 W	< 100 W	< 30 W	< 100 W
Beam spread	Vertical : 3 ° Horizontal : 360 °					
Flashes per minute	40					
Surge protector	yes					

# Dual Color OBSTA Flash



- **Dual color, white flashing during the day and red flashing at night**
- **Versions 24 VDC and 230 VAC**
- **Very long lifetime expectancy**
- **20 to 60 flashes per minute**
- **Surge protector included**
- **Easy maintenance**

## Characteristics

OBSTA	Balise 230 Vac	Balise 24 Vdc
Part number	13812	13822
Power supply	230 Vac	24 Vdc
Power consumption max. <i>40 flashes/minute - 20 000 candelas</i>	< 150 W	< 140 W
Peak V.A	< 6000 VA	< 600 VA
Luminous intensity	Day : 20 000 Cd Night : 2000 Cd	
Color	Day : white Night : red	
Flashes/minute	20, 40 or 60	
Beam spread	Vertical : 3° Horizontal : 360°	



# NAVILITE with led technology

- **Compliant with ICAO and FAA regulations**
- **Perfect waterproofing**
- **Good heat dissipation**
- **Resistant to shock and vibration**
- **Lasts years longer than an incandescent lamp**
- **Low power consumption**

## Characteristics

	NAVILITE 48 VDC	NAVILITE 24 VDC	NAVILITE 12 VDC	NAVILITE 240 VAC
Part	13900	13901	13902	13910 + 13900
Input voltage	48 VDC	24 VDC	12 VDC	240 V AC
Luminous intensity	> 10 candelas	> 10 candelas	> 10 candelas	> 10 candelas
Current drawn	125 mA	250 mA	500 mA	70 mA
Power consumption	6 W	6 W	6 W	6 W
Lifetime	100 000 h.*	100 000 h.*	100 000 h.*	100 000 h.*
Regulations	ICAO	ICAO	ICAO	ICAO

(\*): estimated lifetime (MTBF) given by LED manufacturer under certain conditions.

Options : Fixing bracket ; Box for one main and one back-up light with photocell and alarm indicator available in 48VDC and 240 VAC; Outdoor cable; Solar station.

Please consult OBSTA catalogue for further information.



# OBSTA HI STI, STI y STIF obstruction lights

- **Available in 12, 24 or 48 V DC ; 120 and 240 V AC**
- **Compliant with ICAO and FAA regulations**
- **Inherent generation of «aviation» red**
- **Neon is not sensitive to high temperature and EMC**
- **Perfect waterproofing**
- **Alarm indicator included**
- **Surge Protector included**
- **Very long lifetime expectancy**

## Characteristics

OBSTA	HI STI	STI 48V	STI 24 V	STIF
Part number	13110	13200	13300	13410
Characteristics				
Input voltage	110 V AC to 240 V AC	48 VDC	24 VDC	12 VDC
Surge protection	Yes	Yes	Yes	Yes
Alarm indicator	Yes	Yes	Yes	Yes
Luminous intensity	> 35 candélas	> 10 candelas	>10 candelas	> 10 candelas
Current drawn	370 up to 730 mA	250 mA	500 mA	500 mA
Power consumption	45 W	12 W	12 W	6 W
Life time	100 000 h.*	100 000 h.*	100 000 h.*	100 000 h.*
Regulations	ICAO and FAA	ICAO	ICAO	ICAO and FAA

(\*): lifetime based on 50 years experience in this technology.

Options : Fixing brackets ; Junction box and monitoring box ; Shielded cable ; Photocell 24V CC, 48V CC or 240V AC ; Battery cabinet; Solar station.







# CITEL

■■■ Reliability in Surge Protection ■■■



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