



# CITEL

## SURGE PROTECTORS

FOR

## Photovoltaic systems

[citel.fr](http://citel.fr)

# EFFICIENT SURGE PROTECTION OF YOUR SOLAR INSTALLATIONS

*A professional approach to lightning and surge protection will guarantee your photovoltaic systems a long life*

## ROOF TOP INSTALLATIONS

For low power PV applications, i.e. residences and small offices, it is necessary to consider surge protecting the AC output of the Inverter that connects directly into the electric power grid as well as the DC input side of the Inverter fed by the PV modules.



**SPD location:** The diagram below shows the pertinent locations for surge protectors as described in the CLC/TS61643-12 guide.

**Additional Surge Protector:** If the equipment to be protected (inverter or PV modules) is located more than 10 meters away from the initial surge protector, the guide imposes the insertion of a complimentary surge protector to improve the level of protection.

### PV network



#### PV Type 2 surge protector

Depending on the lightning rating of the installation area, a Type 2 surge protector on the DC network may be required.

### 1 AC network



#### AC Surge protector

to protect all loads connected to the facility's main distribution panel against transients originating from the AC utility grid.

### 2 AC network



#### Additional AC Surge protector

If the length of conductor between the PV inverter and the primary SPD in the main board exceeds 10 m, an additional SPD is necessary at the input of the inverter.

## OFF-GRID SITE

Grid-isolated sites powered by solar panels are, due to their isolated location and exposure to lightning, especially prone to transient surges. A failure will result in a total loss of power: therefore, the use of suitable surge protectors is strongly recommended.



### 1 DC network

#### Type 2 DC Surge protector

Depending on the lightning rating of the installation area, a Type 2 surge protector on the DC network may be required. An additional SPD in the junction box is necessary if its distance to the inverter exceeds 10m.

### 2 AC network

#### AC SPD with integrated fuse

A Type 2 SPD on the AC side of the inverter is required. An additional protection is necessary at the input of the building if the distance exceeds 10 m.



# INDUSTRIAL / PUBLIC BUILDINGS

**Medium to large power PV systems** can be installed on **industrial** and **service facilities**. In order to avoid very costly downtime and lost productivity resulting from a direct or indirect lightning strike, it is critical, and in some cases mandatory, to install surge protection at key points within your facility and its vital power and communication networks.

The installation of **solar panel car park shades on private and public areas** take part of the green electricity development. Like all photovoltaic installations, solar carports must be protected against transient overvoltages, both on the AC and DC sides.

## Type 2 surge protector

If the building is not equipped with a lightning rod system then a Type 2 surge protector is necessary or compulsory on the AC and DC inputs of the inverter. On the PV side, for cable lengths greater than 10 meters it is mandatory to install additional surge protectors at each end of the cable run.

## Type 1 surge protector

If the installation is equipped with lightning rod systems, Type 1 surge protectors are compulsory at the AC input. The same on the DC side, Type 1 surge protectors are compulsory in case of not isolated lightning rod installation. Depending on the level of protection of the lightning rod, the total discharge current ( $I_{total}$ ) required can reach 20 kA. (See guide CLC / TS50539-12).

### 1 PV network



#### PV Type 2 SPD

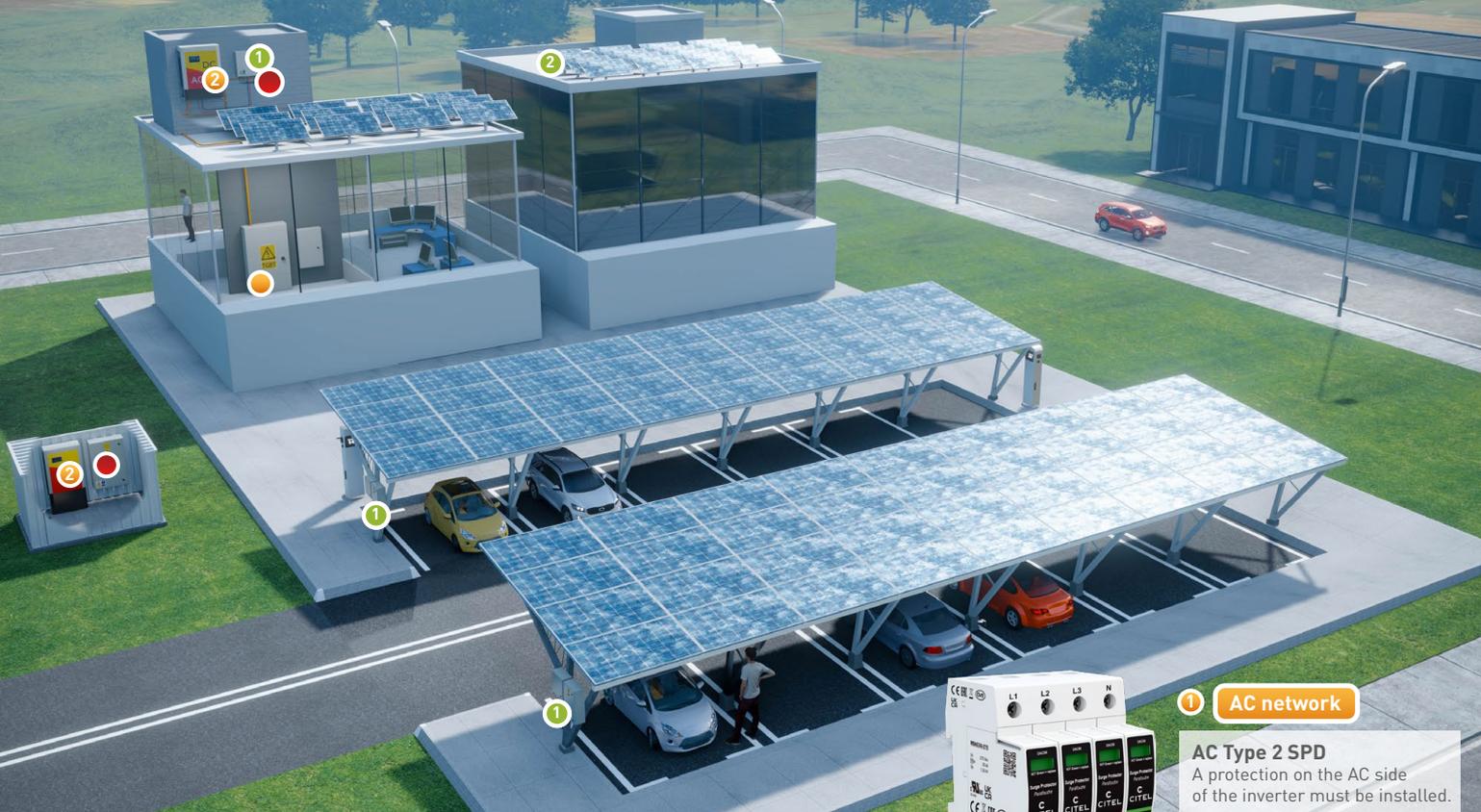
Depending on the lightning rating of the installation area, a Type 2 surge protector on the DC network at the inverter input may be required. Additional protection in the junction box will be necessary if its distance to the inverter exceeds 10m.

### 2 PV network



#### Additional PV Surge Protector

Due to the long length of strings deployment, additional surge protectors are required near the PV modules. Installed generally in connection boxes.



### DATA network



#### Dataline SPD

For inverters connected to data networks (monitoring, control) or probes (luminous flux, temperature...), installation of relevant surge protectors is highly recommended.

### 1 AC network



#### AC Type 2 SPD

A protection on the AC side of the inverter must be installed.

### 2 AC network



#### Additional AC SPD

If the length of conductor between the PV inverter and the arrester in the MLVS exceeds 10 m, an additional SPD is necessary at the input of the inverter.

# PHOTOVOLTAIC OR AGRIVOLTAIC POWER PLANTS

**Photovoltaic or agrivoltaic power plants** present a high risk of direct lightning impact and surges due to the large exposed area and the long lengths of the electric conductors. In order to avoid problems leading to costly damage and downtime, it is compulsory to install surge protectors at key points in the PV system.



## 1 PV network

### Type 1 DC Surge Protector panel

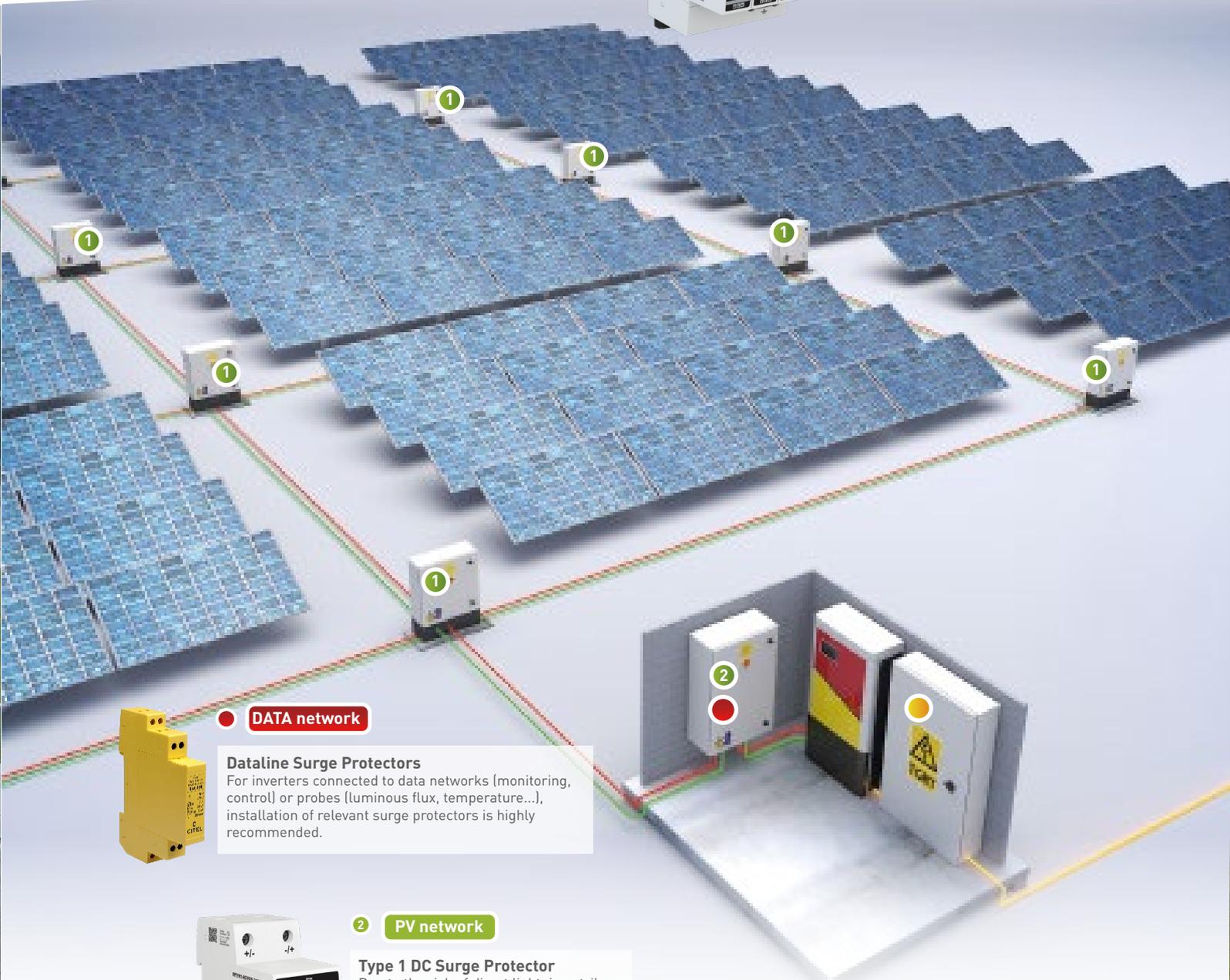
Due to the long length of wires (>> 10 m), additional Type 1 SPDs are required at the input of PV modules. They are usually installed inside combiner boxes.



## ● AC network

### AC Surge Protector

Type 1 surge protector is required at the AC network entrance whenever a lightning rod is installed on the premises.



## ● DATA network

### Dataline Surge Protectors

For inverters connected to data networks (monitoring, control) or probes (luminous flux, temperature...), installation of relevant surge protectors is highly recommended.



## 2 PV network

### Type 1 DC Surge Protector

Due to the risk of direct lightning strikes, Type 1 surge protector must be applied.



## Type 1 surge protector

If the PV field is equipped with lightning rod systems (rods, open air wiring...) Type 1 surge protectors are compulsory at the AC input. On the DC side, Type 1 surge protectors are compulsory at the inverters DC output as defined by CLC/TS 50539-12. Due to the long lengths of cabling required to connect numerous strings running throughout the PV farm, additional surge protectors are required at the input of the PV modules as well.

### 1 PV network

#### PV Type 2 surge protector

Depending on the level of lightning strike in the installation area, a Type 2 SPD on the DC network at the inverter input may be required. In the presence of non-isolated lightning rod, a Type 1 SPD is required.

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### AC network

#### Type 2 AC Surge protector

If the length of conductor between the surge protector in the main panel and the PV inverter exceeds 10 m, a Type 2 surge protector must be installed on the AC side of the inverter.

# DC SURGE PROTECTORS FOR CONNECTED PV SITES



## DS60VGPV | Type 1 PV Surge Protector «I<sub>total</sub> 25 kA»

compliance EN 61643-31 and EN 50539-11

CITEL model		DS60VGPV-600G/51	DS60VGPV-1000G/51	DS60VGPV-1500G/51
Maximum DC operating voltage	U <sub>cpv</sub>	720 Vdc	1200 Vdc	1500 Vdc
Nom. discharge current (8/20μs)	I <sub>n</sub>	20 kA	20 kA	20 kA
Lightning current (10/350μs)	I <sub>imp</sub>	12.5 kA	12.5 kA	12.5 kA
Total Lightning current (10/350μs)	I <sub>total</sub>	25 kA	25 kA	25 kA
Protection level	U <sub>p</sub>	2.2/2.8 kV*	4.7/5.4 kV*	4.7/5.4 kV*
Remote signalling		Yes	Yes	Yes

- \*) Common Mode (+/PE or -/PE)/Differential Mode (+/-)



## DPVN1-6CVGS | Type 1 PV Surge Protector «I<sub>total</sub> 12.5 kA»

EN 61643-31 and EN 50539-11 compliance

CITEL model		DPVN1-6CVGS-21Y-600	DPVN1-6CVGS-21Y-1200	DPVN1-6CVGS-21Y-1500
Maximum DC operating voltage	U <sub>cpv</sub>	600 Vdc	1200 Vdc	1500 Vdc
Nom. discharger current (8/20μs)	I <sub>n</sub>	20 kA	20 kA	20 kA
Lightning current (10/350μs)	I <sub>imp</sub>	6.25 kA	6.25 kA	6.25 kA
Total lightning current (10/350μs)	I <sub>total</sub>	12.5 kA	12.5 kA	12.5 kA
Protection level	U <sub>p</sub>	2,3 kV	4,3 kV	4,8 kV
Remote signalling		Yes	Yes	Yes
Thermal disconnection		CTC technology (Central Control Thermal)		



## DPVN40CS | Type 2 PV Surge Protector

EN 61643-31 and EN 50539-11 compliance

CITEL model		DPVN40CS-21Y-600	DPVN40CS-21Y-1200	DPVN40CS-21Y-1500
Maximum DC operating voltage	U <sub>cpv</sub>	600 Vdc	720 Vdc	960 Vdc
Nom. discharge current (8/20μs)	I <sub>n</sub>	15 kA	15 kA	15 kA
Max. discharge current	I <sub>max</sub>	40 kA	40 kA	40 kA
Protection level	U <sub>p</sub>	2,3 kV	4,3 kV	4,8 kV
Remote signalling		Yes	Yes	Yes
Thermal disconnection		CTC technology (Central Control Thermal)		

# DC SURGE PROTECTORS FOR PV OFF-GRID SITE



## DDC30CS DDC40CS | Type 2 Pluggable Surge Protector for PV Off-grid site

CITEL model		DDC30CS-20-65	DDC40CS-20-100	DDC40CS-20-180	DDC40CS-20-275	DDC40CS-20-460
Network		48 Vdc	75 Vdc	130 Vdc	220 Vdc	350 Vdc
Max. operating voltage	U <sub>c</sub>	65 Vdc	100 Vdc	180 Vdc	275 Vdc	460 Vdc
Nominal discharge current (8/20μs)	I <sub>n</sub>	15 kA	20 kA	20 kA	20 kA	20 kA
Protection level	U <sub>p</sub>	300 V	390 V	620 V	900 V	1400 V
Remote signalling		Yes	Yes	Yes	Yes	Yes

# SURGE PROTECTORS FOR AC NETWORK



DAC1-13S-31-275



DAC50S-11-275

## DAC1-13S DAC50S

Type 1 and Type 2 Surge Protectors for AC power supply with high discharge capacity

IEC 61643-11 compliance

CITEL range		DAC1-13S-31-275	DAC1-13S-11-275	DAC50S-31-275	DAC50S-11-275
Surge protector		Type 1+2	Type 1+2	Type 2	Type 2
AC network	Un	230/400 Vac 3-phase + N	230 Vac Single phase	230/400 Vac 3-phase + N	230 Vac Single phase
Max. AC operating voltage	Uc	275 Vac	275 Vac	275 Vac	275 Vac
Nom. discharge current (8/20µs)	In	20 kA	20 kA	20 kA	20 kA
Max. discharge current (8/20µs)	Imax	50 kA	50 kA	50 kA	50 kA
Max. lightning current (10/350µs)	Iimp	12.5 kA	12.5 kA	-	-
Protection level	Up	1,5/1,3 kV*	1,5/1,3 kV*	1,5/1,25 kV*	1,5/1,25 kV*
Remote signaling		Yes	Yes	Yes	Yes

- \*) Common mode (L/PE or N/PE)/Differential mode (L/N)

- **Specific version DAC1-13VGS and DAC50VGS available:** suppression of operating and leakage currents.



DACF15S-11-275



DAC40CS-31-275

## DAC40CS DACF15S DACF25S

Type 2 Surge Protectors for AC power supply

IEC 61643-11 compliance



CITEL range		DACF15S-11-275	DACF25S-11-275	DAC40CS-31-275	DAC40CS-11-275
Surge protector		Type 2 (or 3)	Type 2	Type 2	Type 2
AC network	Un	230 Vac Single phase	230 Vac Single phase	230/400 Vac 3-phase + N	230 Vac Single phase
Max. AC operating voltage	Uc	275 Vac	275 Vac	275 Vac	275 Vac
Nom. discharge current (8/20µs)	In	5 kA	15 kA	20 kA	20 kA
Max. discharge current (8/20µs)	Imax	15 kA	25 kA	40 kA	40 kA
Protection level	Up	1,5 kV / 1 kV	1,5 kV / 1,25 k	1,5/1,25 kV*	1,5/1,25 kV*
Fuse		Internal (AC rating équivalent : 25A, Type gG)	Internal (AC rating équivalent : 25A, Type gG)	External	External
Remote signaling		Yes	Yes	Yes	Yes

# SURGE PROTECTORS FOR DATA LINES



DLA-24D3

**DLA** | Pluggable Surge Protectors for Data lines - IEC 61643-21 compliance

Citel model		DLA-48D3	DLA-24D3	DLA-06D3
Type of line		PT100	4-20 mA	RS485
DC nominal operating voltage	Un	48 Vdc	24 Vdc	06 Vdc
Nom. discharge current (8/20µs)	In	5 kA	5 kA	5 kA
Max. discharge current (8/20µs)	Imax	20 kA	20 kA	20 kA
Protection level	Up	70 V	40 V	20 V

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