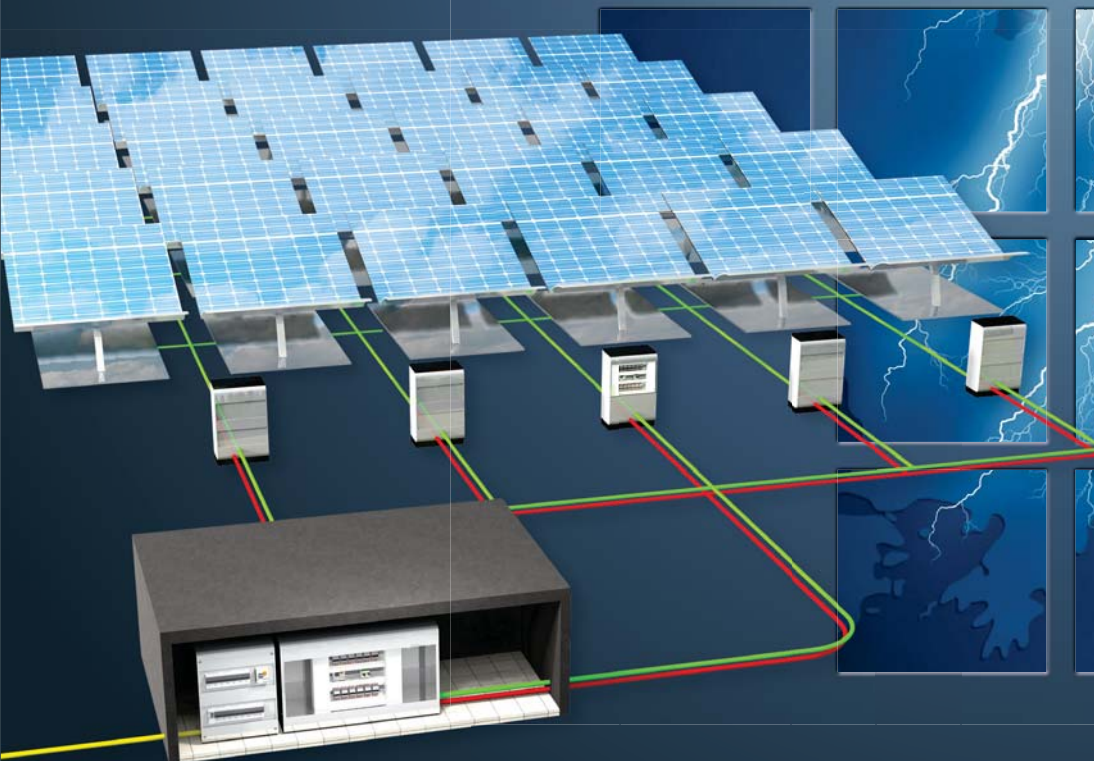




CITEL

■■■ Reliability in Surge Protection ■■■

Surge Protection for Photovoltaic Systems



CITEL - The Worldwide Leader in Surge Protection

Founded in 1937, CITEL manufactures a complete line of Surge Protective Devices (SPD's) to protect sensitive equipment from the harmful effects of lightning strikes and other line disturbances.

Continually innovating in the photovoltaic surge protection market, CITEL proudly offers products to support 500V to 1500V systems. CITEL's patented VG Technology is the ideal solution for your photovoltaic installation.



CITEL's VG Technology

VG surge protective devices offer unique hybrid technology and multiple benefits not found in traditional surge protection solutions. The patented design incorporates a combination of MOV and Gas-Filled-Spark-Gap (GSG) technology to maximize the SPD's performance level and reliability. VG technology is optimized for robustness and network stability, providing the highest level of protection available.

Benefits of VG Technology



1. Gas-Filled Spark Gap (GSG)

 → Increased Reliability



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

 → Maximum Efficiency
→ Compact Design



3. Increased TOV Withstand

 → Increased Reliability for Unstable Power Networks



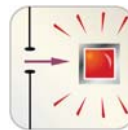
4. No Follow Current

 → Increased Network Uptime



5. Robust Energy Handling and Reliability

 → Increased Reliability
→ Better Life Expectancy



6. Safe Disconnection and Real-Time Status Indication

 → Safe and Efficient Maintenance



7. Will Not Degrade: No Leakage Current

 → Maximum Life



8. Easier Surge Protection Coordination

 → Easier to Configure and Install

Protecting Building Based Photovoltaic Installations

Many of today's economical and ecological building owners are installing photovoltaic (PV) power systems at their facilities. These installations can range from small supplemental power systems to large primary power sources. In many cases, the replacement cost of equipment and the cost of system downtime caused by power surges necessitates a robust surge protection scheme.

PV systems must be protected in two directions. First, the building must be protected from the surges that originate at or are enhanced by the PV system. Second, but equally important, the PV system must be protected from surges that are produced or propagated by the building's electrical system. For these reasons, surge protection is recommended at a minimum of five points within a building based PV system. Remember that critical equipment connected by over 30 feet of cabling should have an SPD on both ends of the line.

2. AC Protection at the Output of the Inverter

To protect the inverter from surges originating in the facility, an SPD is highly recommended on the output or AC side of the inverter.



1. DC Protection at the Input to the Inverter

The inverter is one of the most expensive and fragile components of a PV system, and it must be protected from electrical surges originating at the solar panels or from within the feeder cables. If the combiner box and inverter are more than 30 feet apart than an SPD is recommended at both ends of the run.



3. Service Entrance Protection

A high percentage of surges originate from utility power. To protect the entire facility and the PV system, a service entrance SPD is essential. Per UL1449 3rd Edition, this SPD should be a UL Type 1 listed device installed on the line side of the main disconnect.



4. Secondary and Point of Use SPD's

Under normal operation, motors, pumps, and fluorescent lights can cause electrical disturbances that can damage the building's electrical infrastructure. Prudent building managers use point-of-use SPD's to keep these locally generated disturbances from harming other devices attached to the system. A Type 2 SPD is the ideal solution for this application.



MJ8 Series
Ethernet



CMJ8-POE-A



DLA Series
Twisted Pair



5. Dataline Protection

Power surges can travel along datalines as easily as power lines, therefore datalines must be protected from transmitting damaging surges by using the appropriate SPD. This can include traditional serial based and ethernet based datalines.

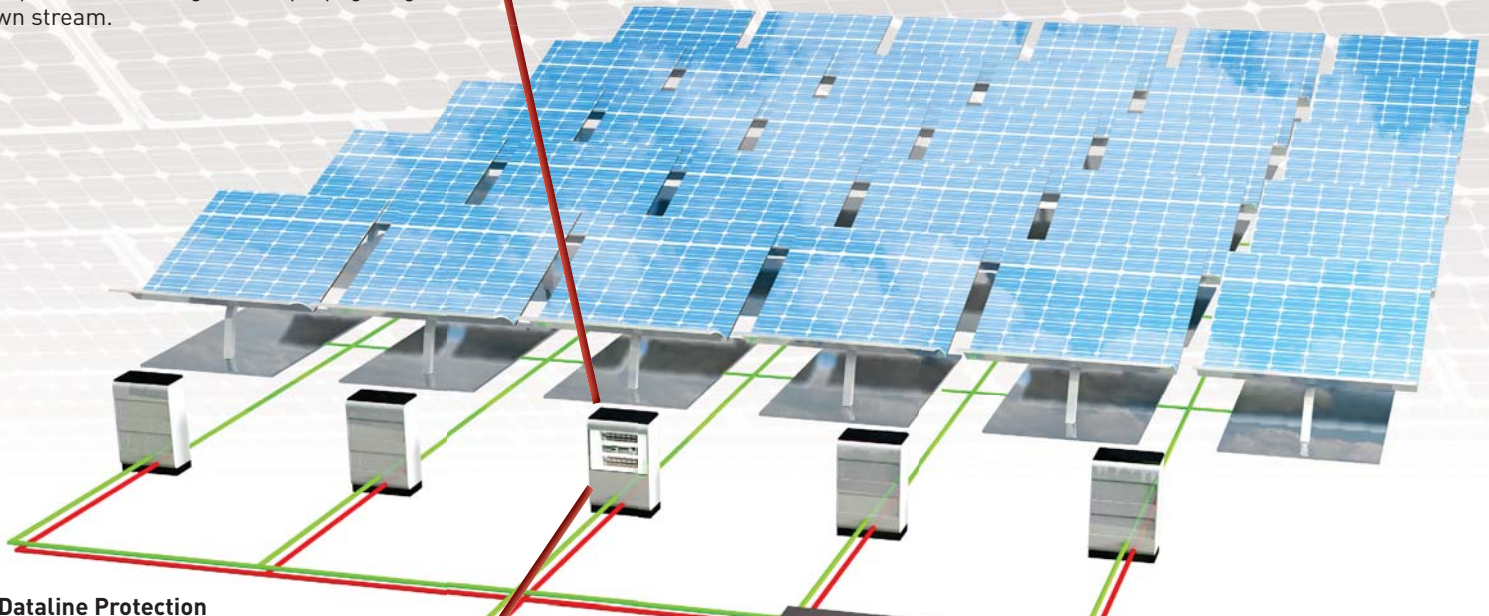
Utility-Scale Solar Power Plants

Photovoltaic power generation fields are rapidly being deployed throughout the landscape. In many cases, the excess power they produce is fed back onto the local power grid. Whether tied to the grid or a standalone system, surge protection must be considered as part of a well designed installation. Due to their remote nature, PV power generation fields are both more exposed to lightning induced surges and are typically unmanned which requires a more robust and low maintenance design.

A well designed scheme includes protection for the solar panels, the input and the output of the inverter, the connection to the grid, and all of the networking that supports the system's operation.

1. DC Protection at the Combiner Box

The combiner box is the ideal location for the first tier of protection. A correctly sized SPD can divert surges before they impact the switching function of the combiner box and prevent the surge from propagating down stream.



2. Dataline Protection

Power surges can travel along datalines as easily as power lines, therefore datalines must be protected from transmitting damaging surges by using the appropriate SPD. This includes traditional serial based and ethernet based datalines.



MJ8 Series
Ethernet

DLA Series
Twisted Pair



3. DC Protection for the Input to the Inverter

PV fields utilize long cable runs to connect the panel sections to the main inverter. These cable runs are susceptible to ground based surges and direct lightning strikes, and can also transmit surges from the panel structures in the field. A robust SPD will protect the expensive and fragile components of the inverter system.



DS60VGPV



DS70RS

4. AC Protection for the Output of the Inverter

This is the first line of defense for your solar field. A robust SPD is essential to protect the inverter from surges originating from the grid or power storage system and protect the grid from surges originating in the field.

CITEL's Family of Surge Protectors for PV Applications

DS60VGPV

PV Surge Protector with VG Technology

UL1449 4th Edition Type 1 CA



DS60VGPV-1000

CITEL Product Number		DS60VGPV-500	DS60VGPV-1000	DS60VGPV-1500G/51 <small>UL Pending</small>
Max. Operating Voltage MCOV		600 Vdc	1200 Vdc	1500 Vdc
Nom. Discharge Current (8/20µs) In		20 kA	20 kA	20 kA
Lightning Current (10/350µs) Iimp		12.5 kA	12.5 kA	12.5 kA
Max. Discharge Current (8/20µs) Imax		40kA	40kA	40kA
Voltage Protection Rating VPR		1.8kV	3kV	Up: 3.4 kV

DS50PV

PV Surge Protectors with Pluggable Modules

DS50VGPV

UL1449 4th Edition Type 1 CA



DS50VGPV-1000

CITEL Product Number		DS50PVS-600	DS50PVS-1000	DS50VGPVS-500	DS50VGPVS-1000	DS50VGPV-1500G/51 <small>UL Pending</small>
Max. Operating Voltage MCOV		670 Vdc	1060 Vdc	600 Vdc	1200 Vdc	1500 Vdc
Nom. Discharge Current In (8/20µs)		20 kA	20 kA	20 kA	20 kA	20 kA
Voltage Protection Rating VPR		2kV	3kV	1.5kV	4kV	Up: 3.4kV

DS70R DS40

AC Surge Protectors

UL1449 4th Edition Type 1CA or Type 4CA



DS74RS-120



DS43S-480

CITEL Family		DS70RS	DS40S
AC Network	Un	120-600 Vac	120-480 Vac
Nom. Discharge Current (8/20µs) In		20 kA	20 kA
Max. Discharge Current Imax		20 kA	40 kA

DLA MJ8

Dataline Surge Protectors

UL497B Listed



DLA2-24D3



MJ8-CAT5E

Family	DLA	MJ8	CMJ8
Network	4-20mA, RS, DSL	10,100,1000 Ethernet (POE A,B)	POE A, B
Location	Din Rail	Din Rail, Flange, Lug	Flange

MDS M Series

AC Hardwired Enclosure Surge Protectors

UL 1449 4th Edition Type 1 Listed Devices



M80



MDS

Family		M Series	MDS Series
Max. Discharge Current IMAX (8/20µs)		80kA , 100 kA, 160 kA , 200kA	280 kA , 560kA, 700kA
Replaceable Modules		Fixed	Field Replaceable
Features		LED's, Audible Alarm, Remote Contacts, Sine Wave Tracking	LED's, Audible Alarm, Surge Counter Remote Contacts, Sine Wave Tracking



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