Lightning & overvoltage protection
Photovoltaic systems
ABB Lightning Protection Group, established in the South West of France, benefiting from acquired experience during the last decades, makes the most of its masterly skills in lightning and overvoltage protection technology. In addition to its present expertise concerning the global supply for lightning protection (both external and internal protection), Soulé henceforth proposes a range of lightning arresters against overvoltages, dedicated to photovoltaic installations, both standalone and connected facilities.

Moreover, ABB Lightning Protection Group benefits from a laboratory including various generators enabling arresters to be tested under real conditions with shock currents of different amplitudes, and this in order to optimize protection solutions specific to the customer as regards photovoltaic installations.
Providing power with photovoltaic solar panels is tremendously interesting in the context of renewable energy sources, as regards economical LV photovoltaic systems connected to the public electricity network, and also for standalone photovoltaic systems in isolated sites.

Because of their exposition, frequently in isolated sites and of the extended surface of photovoltaic systems (PV), lightning strikes are a major component in the risk to be assumed, both for the direct effect of lightning on the structure, and of the surge overvoltages on the installation.

Risk analysis on photovoltaic installations leads us to the following criteria: the extent, structure and exposition of the photovoltaic system as well as lightning strike density at the relevant site.

The consequences of lightning on the photovoltaic generator have repercussions on the entire equipment, because of the interconnection between the photovoltaic system and the electrical installation of the building. Moreover, the risk of financial losses should be taken into account, when considering the investment in solar panels at a photovoltaic site.
Protection of connected systems

Example of a typical installation *

Example of a 600 V installation diagram

*: OVR T1 mandatory in the presence of a lightning rod.

External boundary of the protection area of the lightning rod

Limit of equipotentiality of any conducting portion of the building

Module's chassis

CONNECTED
Conclusión de la configuración de los arresteros de sobrecorriente del conjunto de instalación

<table>
<thead>
<tr>
<th>Surge arrester location</th>
<th>Role</th>
<th>Options</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Single unit protection per solar panel (cell + connections)</td>
<td>Installation is recommended if distance L1 is larger than 10 m, or if coupling risks exist between different cables.</td>
<td>Connection to the chassis should be as short and rectilinear as possible.</td>
</tr>
<tr>
<td>B</td>
<td>Protects the DC power supply head connection (building entrance)</td>
<td>Routine installation</td>
<td>The earthing bar should be as short and rectilinear as possible.</td>
</tr>
<tr>
<td>C</td>
<td>Fine protection of the converter input on the DC side</td>
<td>Installation is recommended if distance L2 is larger than 10 m</td>
<td>Connection to the earthing bar and to the ground of the converter on the DC side should be as short and rectilinear as possible.</td>
</tr>
<tr>
<td>D</td>
<td>Fine protection of the converter output on the AC side</td>
<td>Routine installation</td>
<td>Connection to the earthing bar and to the ground of the converter on the AC side should be as short and rectilinear as possible.</td>
</tr>
<tr>
<td>E</td>
<td>AC head protection at the entrance of the building</td>
<td>Routine installation</td>
<td>Connection to the earthing bar should be as short and rectilinear as possible.</td>
</tr>
</tbody>
</table>

Selection of surge arresters, DC portion

<table>
<thead>
<tr>
<th>Surge arrester locations</th>
<th>Converter U max.</th>
<th>Risk</th>
<th>Current flow capacity</th>
<th>Designation / Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B C</td>
<td>500 and 600 V</td>
<td>High</td>
<td>70 kA</td>
<td>OVR PV 70 600 s P TS/2CTB803953R5200</td>
</tr>
<tr>
<td>A B C</td>
<td>500 and 600 V</td>
<td>Low</td>
<td>40 kA</td>
<td>OVR PV 40 600 P TS/2CTB803953R5100</td>
</tr>
<tr>
<td>A B C</td>
<td>1000 V</td>
<td>High</td>
<td>70 kA</td>
<td>OVR PV 70 1000 s P TS/2CTB803953R5300</td>
</tr>
<tr>
<td>A B C</td>
<td>1000 V</td>
<td>Low</td>
<td>40 kA</td>
<td>OVR PV 40 1000 P TS/2CTB803953R5400</td>
</tr>
</tbody>
</table>

*: without remote signaling (TS) – OVR PV 40 600 P / Part No. 2CTB803953R5000
**: without remote signaling (TS) – OVR PV 40 1000 P / Part No. 2CTB803953R6100

Selection of lightning arresters, AC portion

<table>
<thead>
<tr>
<th>Surge arrester location</th>
<th>Lightning rod presence</th>
<th>Distance between D and E</th>
<th>Designation / Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>No</td>
<td>Between 1 and 5 m</td>
<td>OVR T2 1N 15 275 P / 2CTB803952R1200</td>
</tr>
<tr>
<td>D</td>
<td>No</td>
<td>&gt; 5 m</td>
<td>OVR T2 1N 40 275 P / 2CTB803952R1100</td>
</tr>
<tr>
<td>E</td>
<td>Yes</td>
<td>/</td>
<td>OVR T1 3N 25 255 TS / 2CTB815101R0700*</td>
</tr>
<tr>
<td>E</td>
<td>No</td>
<td>/</td>
<td>OVR T2 1N 70 275 s P / 2CTB803952R5200</td>
</tr>
</tbody>
</table>

*: for Iimp = 15 kA (10/350), there are products based on varistor technology (please consult us)

OVR PV surge arresters for protecting photovoltaic systems are particularly suitable:

- Modular systems with pluggable cartridges for easy maintenance (without breaking the circuit),
- Mechanical surge arrester status indicator with safety reserve (6).
- Fitted with remote signaling contacts for monitoring the operating status (TS),
- No follow current
- No risk of + and - inversion.

OVR PV surge arresters (A, B or C)

Dimensions

L. 42.5mm X H. 85mm X P. 63mm

Cartridges for maintenance in 600 V

2 x OVR T2 40 275 C 2CTB803854R1000
+ 1 x OVR T2 70 N C 2CTB803854R0000

Cartridges for maintenance in 1000 V

2 x OVR T2 70 275 s C 2CTB803854R0700
+ 1 x OVR T2 70 N C 2CTB803854R0000

Cartridges for maintenance in 1000 V

3 x OVR T2 40 440 C 2CTB803854R0400
3 x OVR T2 70 440 s C 2CTB803854R0100
STANDALONE

Protection of standalone systems

Example of typical installation

External boundary of the protection area of the lightning rod

Module’s chassis

Limit of equipotentiality of any conducting portion of the building

Charger

Converter

MSB (Main Switch Board)

Battery

OVR PV surge arrester

Lightning rod

P

A

B

C

G

A

B

C

A

B

C

A

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Configuration of the surge arresters on the whole installation

<table>
<thead>
<tr>
<th>Surge arrester location</th>
<th>Role</th>
<th>Option</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Single unit protection per solar cell (cell + connections)</td>
<td>Installation is recommended if distance L1 is larger than 10 m, or if coupling risks exist between the different cables</td>
<td>Connection to the chassis should be as short and rectilinear as possible. The lightning arrester depending on the environment should be installed in a leak-proof casing.</td>
</tr>
<tr>
<td>B</td>
<td>Protects the DC power supply head (building entrance)</td>
<td>Routine installation</td>
<td>Connection to the earthing bar should be as short and rectilinear as possible.</td>
</tr>
<tr>
<td>C</td>
<td>Fine protection of the charger (DC power supply input)</td>
<td>Installation is recommended if distance L2 is larger than 10 m.</td>
<td>Connection to the earthing bar and to the converter's ground should be as short and rectilinear as possible.</td>
</tr>
</tbody>
</table>

Selection of low voltage surge arresters

<table>
<thead>
<tr>
<th>Surge arrester location</th>
<th>Converter U max.</th>
<th>Risk</th>
<th>Current flow capacity</th>
<th>Designation Part number</th>
</tr>
</thead>
<tbody>
<tr>
<td>A B C</td>
<td>106V D.C.</td>
<td>High</td>
<td>65kA</td>
<td>OVR PV 65 75 s PTS 2CTB803953R3200</td>
</tr>
<tr>
<td>A B C</td>
<td>106V D.C.</td>
<td>Low</td>
<td>30kA</td>
<td>OVR PV 30 75 PTS 2CTB803953R3100</td>
</tr>
</tbody>
</table>

PVD surge arresters for protecting photovoltaic systems are particularly suitable:
- Modular systems with pluggable cartridges for easy maintenance (without breaking the circuit),
- Mechanical lightning arrester status indicator with safety reserve (s),
- Fitted with remote signaling contacts for monitoring the operating status (TS),
- No follow current,
- No risk of + and - inversion.

Dimensions

L 35mm x H 85mm x D 63mm

Cartridges for maintenance

69kA: 2x OVR T2 65/75 s C 2CTB83854F1300
30kA: 2x OVR T2 30/75 C 2CTB83854F1500