Solar systems from Schweizer

Leaflet Solrif photovoltaic in-roof system
Lightning and surge protection, potential equalisation

Introduction

The need for lightning and surge protection depends on the protection requirements of the building. This requirement is in turn derived from the size of the building, the intended use and the probability of a lightning strike. The determination of the protective measures for the building must be agreed with the fire protection authorities and the building insurance company.

Standards and guidelines

Local and national standards and directives must be observed.
This recommendation is based on:

- DIN EN 62305-3 Supplement 5 (Part 3: Protection of structures and persons - Supplement 5 Lightning and
- Surge protection for PV power supply systems), status 05/2014.
- DGS Photovoltaic Systems 5th edition.
- SNR 464022:2008 (electrosuisse), status 06/2019
- Low-voltage installation standard (NIN) 2025
- Swissolar: 06/2017 / State of the art paper solar systems n° 22001.
- ESTI: No. 233.0710.
- Heinrich Häberlin, photovoltaics, electricity from sunlight for integrated grids and stand-alone systems.
- E DIN VDE 0100-712 (VDE 0100-712):2022-10

Design of the protective measure

In principle, integrated PV systems do not change the probability of lightning strikes. This means that the installation of a Solrif system does not change the lightning protection obligation or the lightning protection class of a building. If there is an existing lightning protection system in the building, the lightning protection concept of the PV system must be taken into account. Due to the design of the Solrif system, surge protection must be considered separately from lightning protection. This additional measure is necessary due to capacitive leakage currents that can be caused by inverters that are not electrically isolated.

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According to the following decision diagram, the design of lightning and surge protection (SPD: Surge Potential Device) is recommended:

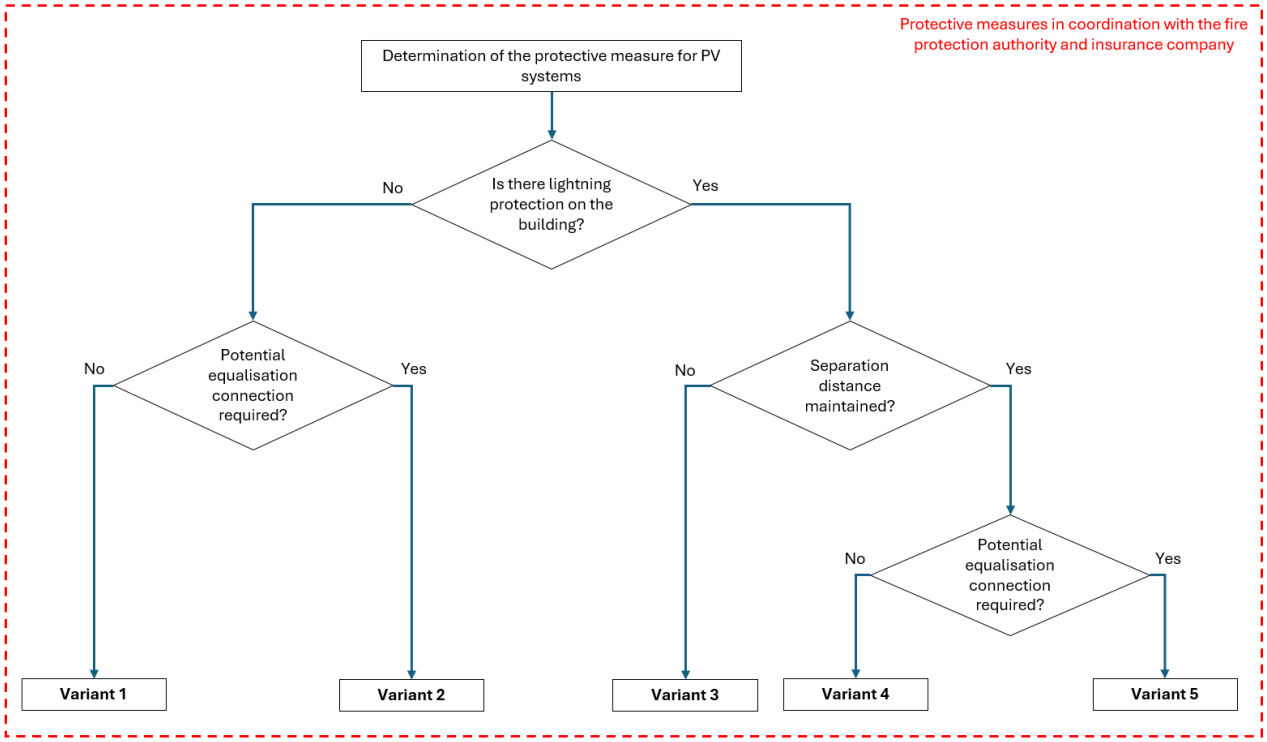

Figure 1: Decision diagram for the protective measures

Potential equalisation and notes on the variants
In Switzerland, cables with a minimum copper cross-section of 6 mm^{2}are required for potential equalisation (PA) between the PV modules. The main cable, which is routed to the earthing busbar, should have a copper cross-section of at least 10 mm^2. With variants 2 - 4, the module arrays can be earthed via the protective conduit. For other countries, the relevant regulations must be clarified and complied with.

Variant 1
This variant is used under the following conditions:
- Modules of protection class II.
- Galvanically isolated inverter (see separate DGS definition in chapter 4).

A PA can be dispensed with. With this variant, no additional SPD is required before entry in the roof is necessary.

Variant 2
With transformerless inverters, a PA is required via a protective tube. For painted/anodised Solrif frames, the PA must also be carried out via each module with an earthing cable.

Variant 3
The module array is connected to the external lightning protection. With transformerless inverters, a PA is required via a protective tube. With painted/anodised Solrif frames, the PA must also be provided via each module with an earthing cable (most common protection concept in Switzerland).

Variant 4
A PA can be dispensed with. Lightning protection due to maintained separation distance.

Variant 5
A PA via a protective conduit is required. Lightning protection through maintained separation distance.

Lightning protection system on a Solrif® system under direct strike
Damage to PV modules caused by direct lightning strikes can only be prevented with an external, separate lightning protection system. A separation distance of at least 0.5 m must be maintained between the lightning conductor and the module array (variants 4 and 5).
If the separation distance is not maintained (variant 3), lightning discharge is ensured by the overlapping and interlocking of the mounting system (IEC 61024-1). However, lightning currents conducted to frame parts can destroy the bypass diodes. This and other consequential damage can result in a loss of performance.

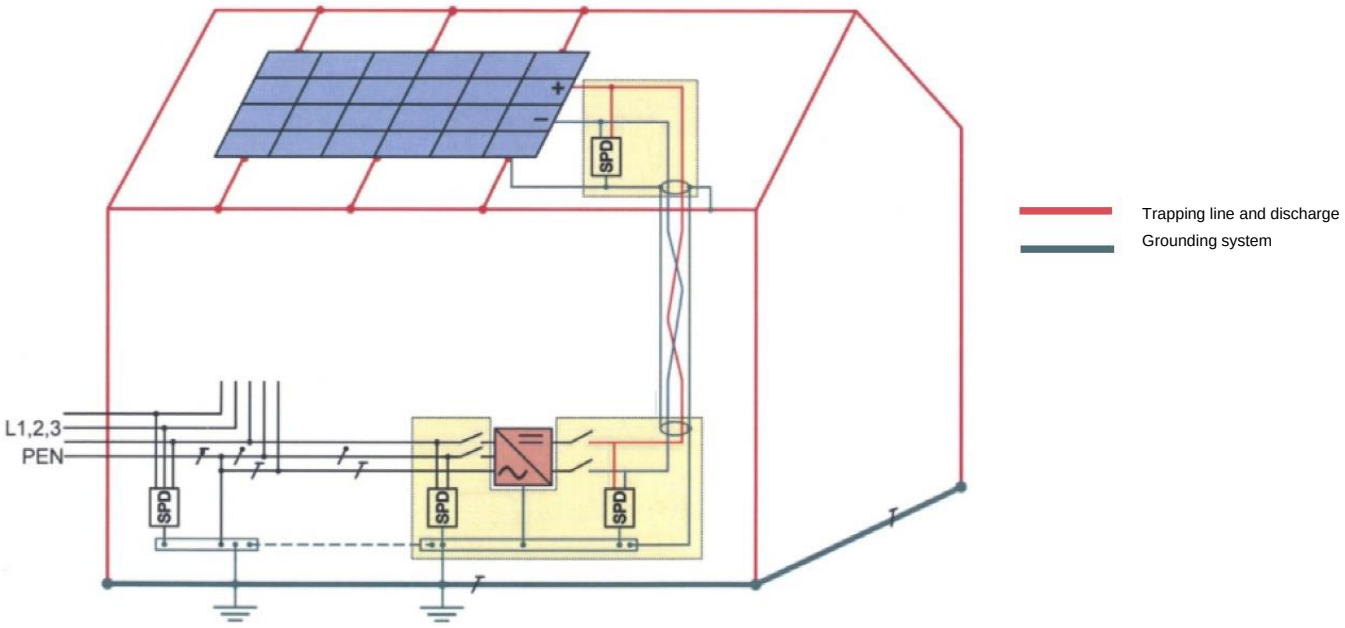

Figure 2: Lightning conductor with Solrif modules without maintaining the separation distance (variant 3).

Definition of transformerless inverters according to DGS

Only inverters in which a sinusoidal alternating current component equal to half the AC voltage is superimposed on the DC voltage are considered transformerless inverters within the meaning of the DGS. Transformerless devices with a static potential to earth and only small AC voltage superimpositions can be treated as inverters with transformers.

Supplementary information on guidelines

The recommendation for handling the Solrif mounting system must also be checked against the country-specific guidelines, including their current status.

Specific information for Switzerland

Protective equipotential bonding can only be dispensed with if the system fulfils the requirements of protection class II and the inverter is equipped with galvanic isolation (ESTI No. 233.0710). For Switzerland and ESTI, the PA must always be provided for transformerless inverters.

Technical support

Contact for technical support: solrif@ernstschweizer.com