

# Solar systems from Schweizer: Factsheet – Lightning and surge protection with Solrif®

## Introduction

The need for protection against lightning and overvoltage will depend on the requirements of the specific building. These requirements in turn are dependent on the size of the building, the purpose for which it is used and the likelihood of a lightning strike. The choice of protective measures for the building needs to be discussed with the fire protection authorities and the insurers.

## Design of the protective system

Fundamentally speaking, integrated PV systems do not affect the probability of lightning strikes. Thus the fitting of a Solrif® system does not affect either the mandatory lightning protection requirements or the lightning protection class of a building. In view of the way the Solrif® system is designed, surge protection and lightning protection need to be considered separately. When the building already has a lightning protection system, the lightning protection strategy of the PV installation must be taken into account as well. Because of the way the Solrif® system is designed, surge protection needs to be considered independently of the lightning protection. This additional measure is necessary in view of capacitive discharge currents which may arise as a result of inverters that are not galvanically isolated.

The following decision tree shows the recommended design for lightning and surge protection systems:

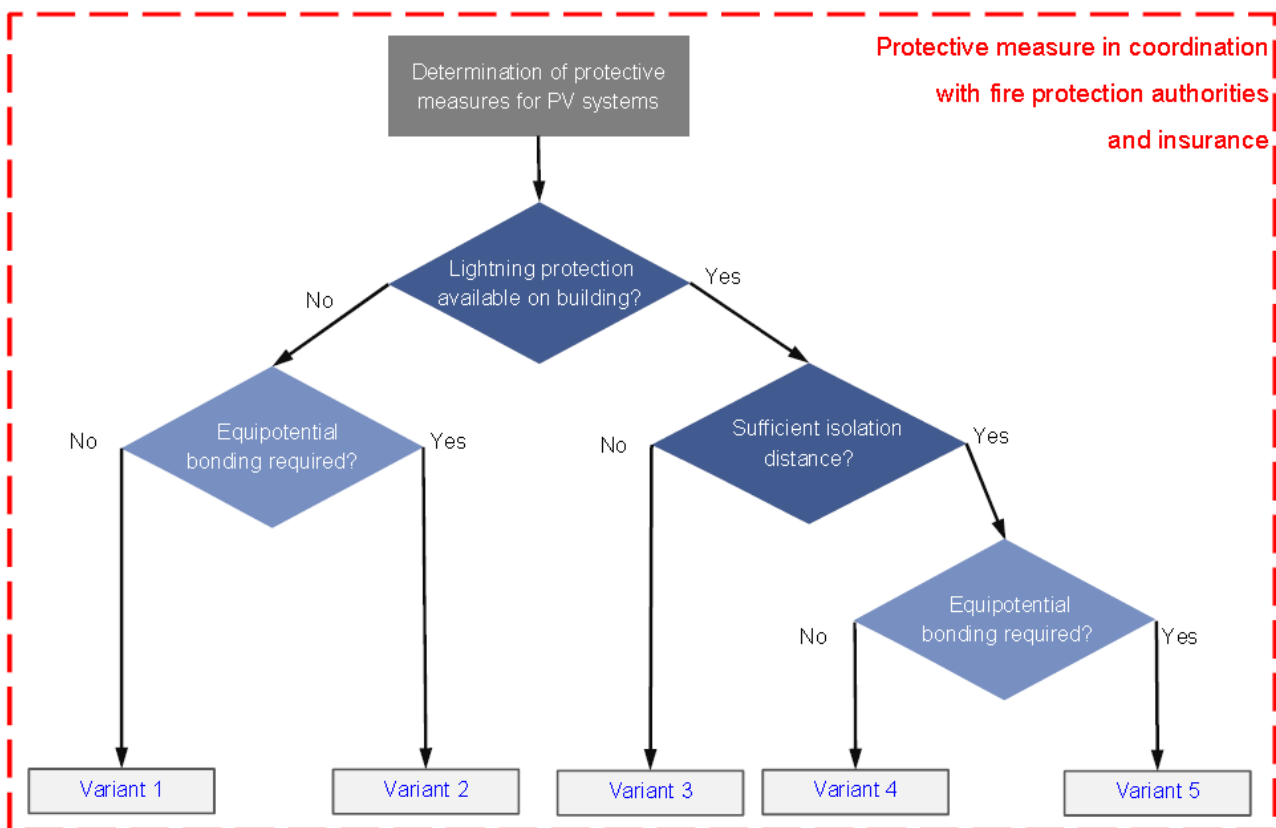


Figure 1: Decision tree for protective systems

## Notes on the possible variants

For the purpose of equipotential bonding, in Switzerland cables with at least 10 mm<sup>2</sup> Cu cross section are mandatory. In the case of variants 2 to 4, the module fields can be earthed by way of the protective tube. For other countries, the applicable standards must be studied and complied with.

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### Variant 1

This variant will be used under the following conditions:

- Modules of Protection Class II
- Galvanically isolated inverters (see separate DGS definition in section 4)

Equipotential bonding may be dispensed with. For this variant, no additional surge protection device is needed before the roof entry point.

### Variant 2

With transformerless inverters, equipotential bonding based on a protective tube is required. When the Solrif® frame is painted or anodised, the equipotential bonding system needs to be boosted with an earthing cable for each module.

### Variant 3

The module field is linked to the external lightning protection system. With transformerless inverters, equipotential bonding based on a protective tube is required. When the Solrif® frame is painted or anodised, the equipotential bonding system needs to be boosted with an earthing cable for each module (this is the commonest protection strategy used in Switzerland).

### Variant 4

Equipotential bonding may be dispensed with. Lightning protection is provided when the isolation distances are adhered to.

### Variant 5

Equipotential bonding based on a protective tube is required. Lightning protection is provided when the isolation distances are adhered to.

### Lightning protection systems on a Solrif® installation when directly struck by lightning

Damage to PV modules from direct lightning strikes can only be prevented by means of an external and separate lightning protection system. Here an isolation distance of at least 0.5 m between the lightning discharge cable and module field must be observed (variants 4 and 5).

In case of non-compliance with the isolation distance (variant 3), lightning discharge can still be provided through the overlapping or interleaving of the installation system (IEC 61024-1). Discharged lightning currents on frame components may however destroy the bypass diodes. These and other consequential damages may result in impaired performance.

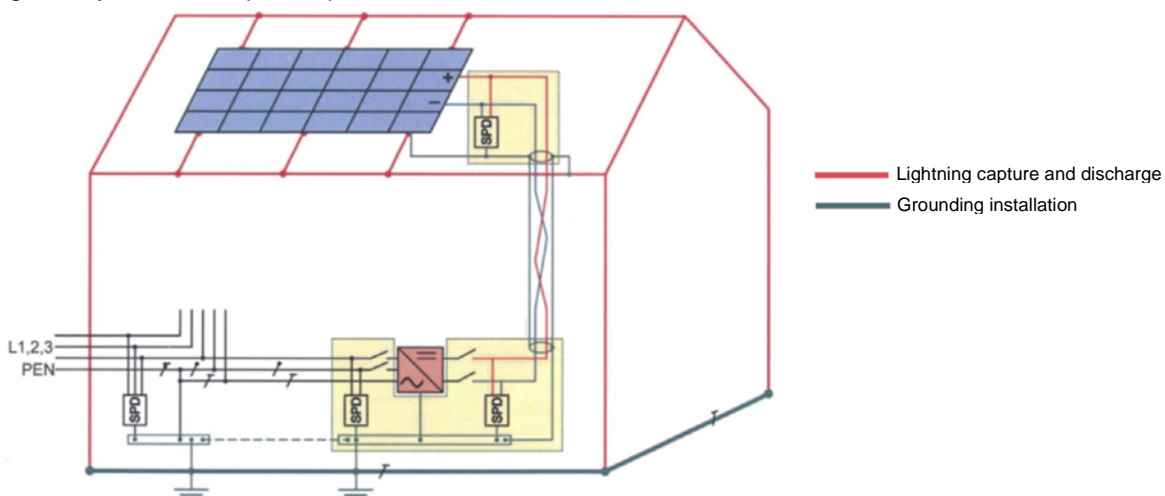


Figure 2: Lightning discharge cable with Solrif® modules where the isolation distance is not observed (variant 3)

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### Definition of transformerless inverters based on DGS standards

Only inverters where a sinusoid alternating current percentage amounting to half the AC voltage overlaps with the DC voltage are considered to be transformerless inverters as understood by the DGS. Transformerless devices with dormant potential to earth and just small AC overlaps can be treated in the same way as inverters with transformers.

### Standards and guidelines

Recommendations are based on the following authorities and standards:

- DIN EN 62305-3 Supplement 5 (Part 3: Physical damage to structures and life hazard – Supplement 5: Lightning and overvoltage protection for photovoltaic power supply systems), status as at 05/2014
- DGS Photovoltaic Systems, 5th edition
- SNR 464022:2008 (Electrosuisse), status as at 06/2019
- NIN COMPACT NIBT 2015, Folder A5 (D) (Low-voltage installation standard)
- Swissolar: 06/2017 / State-of-the-art paper on solar systems n° 22001
- ESTI: No. 233.0710
- Heinrich Häberlin, Photovoltaik, Strom aus Sonnenlicht für Verbundnetz und Inselanlagen [Photovoltaic systems – power from sunlight for integrated networks and home systems]

### Supplementary notes in addition to the official guidelines

Recommendations for installing a Solrif® fitting system must also be scrutinised in the light of the country-specific guidelines, in the most up-to-date version of the latter.

### Notes specific to Switzerland

Protective equipotential bonding can only be dispensed with when the system meets the requirements of Protection Class II and the inverter comes with galvanic isolation (ESTI no. 233.0710). For Swiss or ESTI purposes, the equipotential bonding system must always be installed with transformerless inverters.

### Technical support

Contact details for technical support: [SOLAR@ernstschweizer.ch](mailto:SOLAR@ernstschweizer.ch)