

PV Fact Sheet

02 | Protection against lightning strikes

How do you protect PV installations against lightning strikes?

This fact sheet focuses on photovoltaic installations within the European Union. One essential part of such an installation is the PV combiner box. These boxes are used to combine several strings, to protect against overvoltage and many more functions.

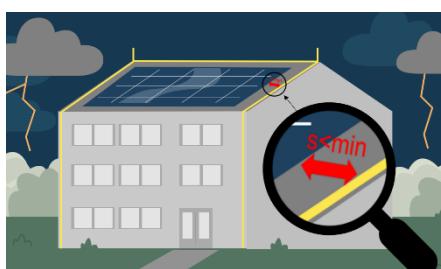
In the event of a lightning strike, overvoltage occurs within a radius of approx. 2 km, which can affect and destroy all electrical equipment - including a PV system. For this reason, the following rules must be considered within the EU (all CENELEC members) for the commissioning of a PV system. These requirements are defined in the EN* 51643-32:2020.



1. Building without outside lightning protection require a DC SPD** **Type II** (according EN* 61643-31) with **6 mm²** earthing cables.



2. Building with outside lightning protection with a safety distance of $s \geq 0.7 \text{ m}^{***}$ require a DC SPD **Type II** (according EN* 61643-31) with **6 mm²** earthing cables.



3. Building with outside lightning protection with a safety distance of $s < 0.7 \text{ m}^{***}$ require a DC SPD **Type I+II** (according EN* 61643-31) with **16 mm²** earthing cables.

*EN = European regulation **SPD = surge protection device

***Depending on the configuration of the lightning protection. Accurate calculation is defined in IEC 62305-3.

PV Fact Sheet

02 | Protection against lightning strikes

Which advantages does surge protection offer?

Surge protection products are used to shield devices against the high voltages created, for instance, by lightning strikes. This is achieved by means of varistors, which lower their resistance with rising voltage. If a sudden surge occurs, the varistors lose drastically reduce their resistance and thereby redirect the overload into the earth connector.

According to EN 51643-32:2020, at least one type I+II or type II surge protector (1) must be installed to protect the inverter on the DC side. Ideally, this should be installed at the **entry of the string cables into the building** (zone transition) to keep the overvoltage away from the inside of the building.

The maximum distance between the inverter and the last PV modules (string from the last module) must not exceed **10 meters cable length**, otherwise an additional surge protection device (2) must be installed. If this is not done, the DC-SPD can no longer fulfill its safety purpose, which can then lead to damage to the equipment to be protected. To ensure this protection, the integration of an SPD into a combiner box is the most cost-effective solution. If EN 51643-32:2020 is not taken into account in the PV installation, insurance companies will not cover the damage incurred in the event of a claim.

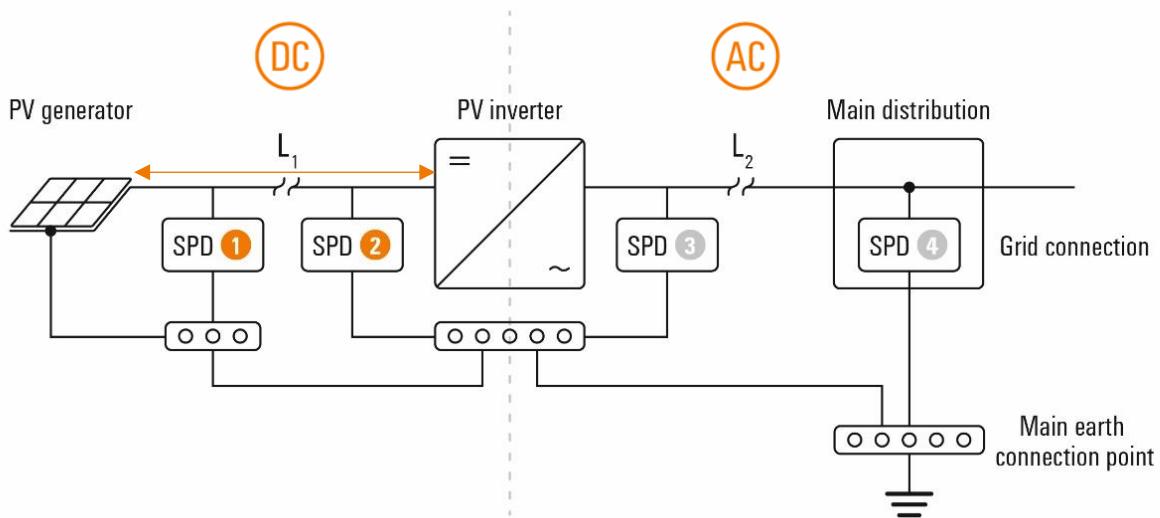


Figure 1: Source: EN 51643-32:2020 — Installation of SPDs on the AC and DC side

PV Fact Sheet

02 | Protection against lightning strikes

Question 1: External lightning protection system present?	Question 2: Separation distance maintained?*	Question 3: Cable length L_1 larger than 10 m?	Question 4: Cable length L_2 larger than 10 m?	DC		AC	
				SPD 1	SPD 2	SPD 3	SPD 4
no	-	yes	yes	Type II DC	Type II DC	Type II AC	Type II AC
no	-	no	yes	-	Type II DC	Type II AC	Type II AC
no	-	yes	no	Type II DC	Type II DC	-	Type II AC
no	-	no	no	-	Type II DC	-	Type II AC
yes	yes	yes	yes	Type II DC	Type II DC	Type I AC	Type I AC
yes	yes	no	yes	-	Type II DC	Type I AC	Type I AC
yes	yes	yes	no	Type II DC	Type II DC	-	Type I AC
yes	yes	no	no	-	Type II DC	-	Type I AC
yes	no	yes	yes	Type I DC	Type I DC	Type I AC**	Type I AC
yes	no	no	yes	-	Type I DC	Type I AC**	Type I AC
yes	no	yes	no	Type I DC	Type I DC	-	Type I AC
yes	no	no	no	-	Type I DC	-	Type I AC

*Between PV installation and external lightning protection, according to standard EN 51643-32.

**If the inverter and the main distribution board are connected to the same grounding busbar via a grounding cable whose length does not exceed 0.5 m, no SPD is required at installation location "3".

Table 1: The following table can be used to easily find the right SPD on the AC and DC side.

PV Fact Sheet

02 | Protection against lightning strikes

Advantages of Weidmüller products

PV Next combiner boxes and overvoltage protection boxes (OVP Boxes) are small enough to be placed at the entry point of the cables into the building. This means that they can safeguard against thermal damages to the building/house in the event of a lightning strike. The voltage protection units (VPUs) can be replaced very easily and quickly thanks to their design as plug-in elements. In addition, the failure of a VPU can be easily detected using the remote contact or the signal fields.



Figure 2: Weidmüller PV Next combiner box



Pascal Niggemann

**Head of PV Systems Home & Business,
Weidmüller Interface GmbH & Co. KG, Germany**
Pascal.Niggemann@weidmueller.com | www.weidmueller.com/pv-rooftop