PV Fact Sheet

07 | Utilization categories of load break switches

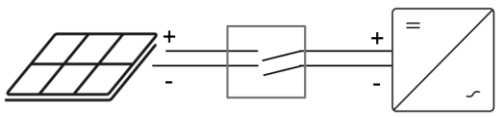
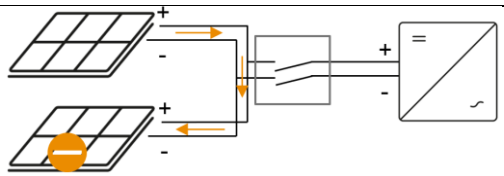
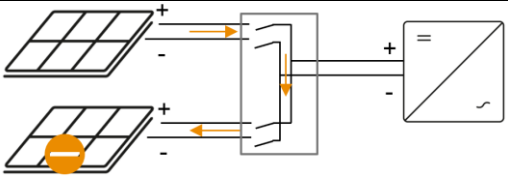
What are the requirements for load break switches in PV systems?

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

Photovoltaic installations require a DC load break switch. This is defined in IEC 60364-7-712. These switches can be integrated in string inverters, combiner boxes, fireman switches or similar devices.

Until 2018, DIN EN-60947-3 considered only DC switches for 24 V or lower power ratings. Due to the growing number of PV installations, it became relevant to define additional categories for higher loads. As a result, PV specific utilization categories were defined in 2018 - DC-PVX. The following explains these in detail.

The table shows the category, its definition according to the regulation and a related use case:

Category	Definition	Use case
DC-PV0	Opening and closing a PV circuit to disconnect when no current is flowing.	
DC-PV1	Switching on and off individual PV strings where neither reverse current nor significant overcurrent can occur.	 In case of a defective PV module, the reverse current is not flowing through the switch. This is indicated by the orange arrows. So, the switch is not at risk to be damaged.
DC-PV2	Switching on and off a PV circuit where significant overcurrents can occur and the current can flow in both directions; for example, with several strings connected in parallel to one inverter, or one string or several strings with one battery.	 In case of a defective PV module, the reverse current is flowing through the switch. This is indicated by the orange arrows. So, the switch has to withstand the higher currents.

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Obviously, each category is characterised by the current and voltage levels. To understand this a little better, let's take PV Next article no. 2890480000 as an example. This combiner box has a 4-pole load break switch integrated and is following utilization category DC-PV1. This category is used because the strings are combined before the switch. Thus, the switch can handle 30 A at 1500 V. This works well because up to 15 A can be used per string today. If we use the same switch and connect just one string to each pole, the switching current per pole is reduced to 12 A. For this configuration, the DC-PV2 category must be observed.

Category	Number of poles	Switching Current	Explanation
DC-PV1	4-pole	30 A / pole	Can deal with higher currents per pole because the strings are combined before the switch.
DC-PV2	4-pole	12 A / pole	Can deal with lower currents per pole because the strings one by one go in and out of the switch.

Advantages of Weidmüller products

PV Next is a global combiner box and fireman switch portfolio made by Weidmüller. These products are based on a modular concept. The aim is to cover as many variants as possible with the lowest number of final products. These products are available with and without DC load break switches.

Figure 1: Weidmüller PV Next with load break switch

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