PV Fact Sheet
11 | Fireman Switch for Photovoltaic installations

The need to shut down PV systems in case of fire

This fact sheet focuses on photovoltaic installations on top of buildings within the European Union. One component of such systems are so-called fireman switches. These are intended to automatically switch off parts of the PV system in the event of a fire.

In tenders for PV systems, it is now very common to find the requirement to switch off parts of the system in the event of a fire. These requirements come, for example, from building insurers, the local fire brigade or the plant fire brigade. All stakeholders have an interest in saving people and extinguishing the fire quickly, thus keeping the damage to the building to a minimum. To achieve this, it is required to disconnect the DC lines of the PV system in the building or in certain zones on the roof so that the fire brigade can work safely.

Automatic shutdown in case of fire

As of today there is no European regulation on how and when to use a fireman switch. In the countries itself we see guidelines and local regulations, which gives an orientation. Additionally the requirements of the building insures gives an orientation. Requirements often look like this: "When the mains voltage is removed, switching or disconnecting must take place automatically outside the building or in front of the area to be protected in the direction of the inverter."

The shutdown must be "**automatic**". What is meant by this? Regardless of whether the building has a PV system or not, the fire brigade attempts to de-energise the building or the affected areas. This is done by flipping the main switch, the corresponding equipment in the sub-distribution or at the grid connection point outside the building. In other words, the AC power grid is switched off in the building. And so that the fire brigade can also work as usual in a building with a PV system, the disconnection of the PV system or the area to be protected should take place automatically when the AC grid is switched off. For this to happen, the AC power line must be routed into the emergency shutdown device or also called fireman switch.
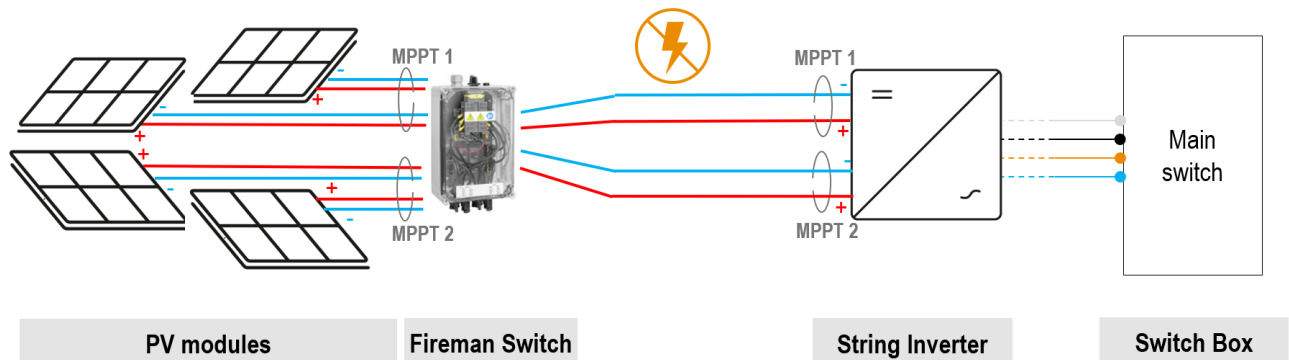

PV modules	Fireman Switch		String Inverter	Switch Box

Figure 1: Example system with a fireman switch

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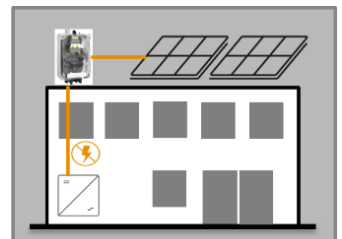## 11 | Fireman Switch for Photovoltaic installations

As soon as the mains voltage drops at the fireman switch, a load-break switch disconnects the lines between the fireman switch and the inverter. The fire brigade can therefore work safely in this area. The lines between the fireman switch and the PV modules do not carry current, but voltage is still present. String optimizers or microinverters can be used to disconnect these lines as well.

Installation locations for the emergency shutdown devices

At first glance, it seems logical to disconnect the string lines as close as possible to the modules, so that as long a distance as possible is voltage-free. However, since this is not possible for every building, various concepts are listed below.
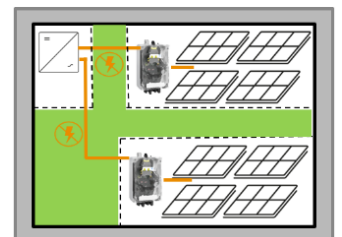
Case A: Fireman switch at building entry (inverter in the building)

If it is the requirement to disconnect the DC lines of the PV system in the building before the inverter, it makes sense to install the fireman switch at the latest when entering the building. Installation in the building makes little sense, as this is the critical area for the fire brigade.

Case B: Fire brigade switch per module field

For PV systems on factory buildings or similar facilities, there may be specifications that safety routes for the fire brigade on the roof must be de-energised in the event of fire. In this case, one fireman switch per module field / safety area must be provided.

Case C: Fireman switch with integrated surge protection

If it is necessary to combine a surge protection with the fireman switch in order to save time and space during installation, these combined products should be installed at the building entrance at the latest. The surge protection has the function of dissipating the overvoltage, e. g. caused by a lightning strike in the vicinity. In order not to conduct this overvoltage into the building, an installation in a radius of max. 5m around the entry point is advisable. In this combined solution, the overvoltage protection must be installed before the motorised switch-disconnector to prevent an overvoltage from destroying the motor and the control electronics.

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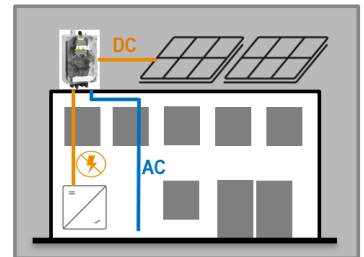## 11 | Fireman Switch for Photovoltaic installations

Case D: Fireman switch and surge protection in separate boxes

If individual fireman switch and surge protection products are used, make sure that the surge protection is installed before the fireman switch to protect it against overvoltages.

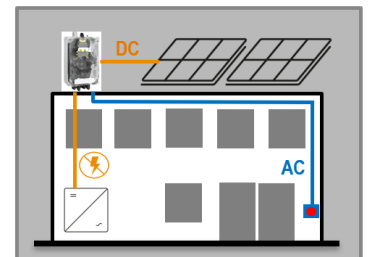**Activation of the fireman switch**

Case 1: Fireman switch integrated into the power grid
A fireman switch can be integrated directly into the building's power grid, e.g. with a standard AC cable. This cable can be connected at any point in the grid. If the building's voltage drops from 230V / 110V to 0V, the fireman switch disconnects the strings to the inverter. If the voltage is present again, it switches the strings back on.

Case 2: Fireman switch with additional emergency stop switch
If there is a requirement to install a manual emergency stop switch in addition to the automatic fireman switch, this can also be realised with correspondingly more effort during installation. The emergency stop switch is integrated into the AC supply cable to the fireman switch. This means that the area to be protected can be switched off both automatically and manually. In addition to an emergency stop switch, a key switch or an emergency stop switch with a glass pane can also be used.

Case 3: Connecting the fireman switch to a building automation system
If there is a requirement to connect the fireman switch to a fire alarm system or a building automation system such as Loxone or KNX, this is also possible using the 110V / 230V AC supply cable. If the system works with 24V, for example, a relay must be connected in between to address the fire switch.

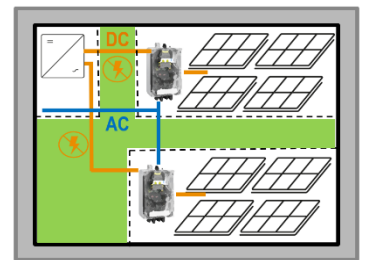**Case 4: Fireman switch as a service switch**
A fireman switch can also be used as a service switch. A service switch must be integrated into the AC supply line for this purpose. In the event of maintenance, the system can be disconnected up to the fireman switch. This eliminates the need for a combiner box with service switch, for example.

Case 5: Connecting several fireman switches in parallel
If several fireman switches are installed in the system, it is not necessary to lay a separate AC cable to each box. For reasons of efficiency, it makes sense to run an AC supply line to the first box and supply the other boxes from there. The maximum number of fireman switches per supply line depends on the cable lengths and the maximum consumption of the fireman switches during switch-on time.

Automatic restart

Since the fireman switches are often installed in areas that are difficult to access, it is recommended that these products also switch back on automatically. This prevents yield losses if the fireman switches are forgotten to be switched on again manually after a power failure.

Weidmüller products

PV Next is a portfolio of combiner boxes and fireman switches designed especially for PV rooftop systems. These products are based on a modular concept. The focus is on making installation easy, fast and safe. In other words, to make the installer's work easier and safer on the product side.

Figure 2: Weidmüller fireman switch with overvoltage protection

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