

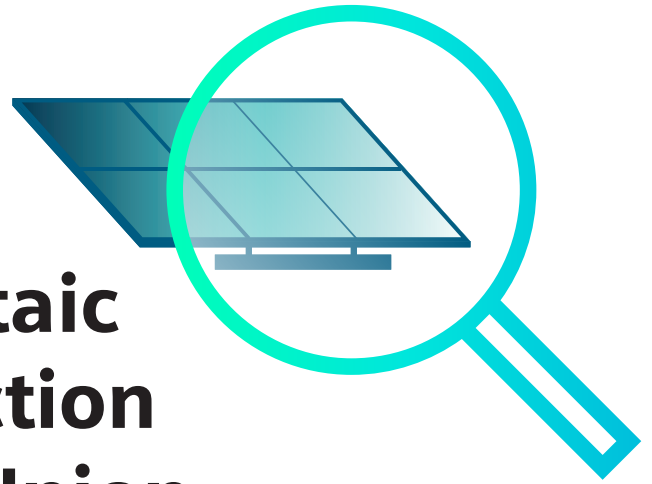


Protection devices for photovoltaic installations in residential applications

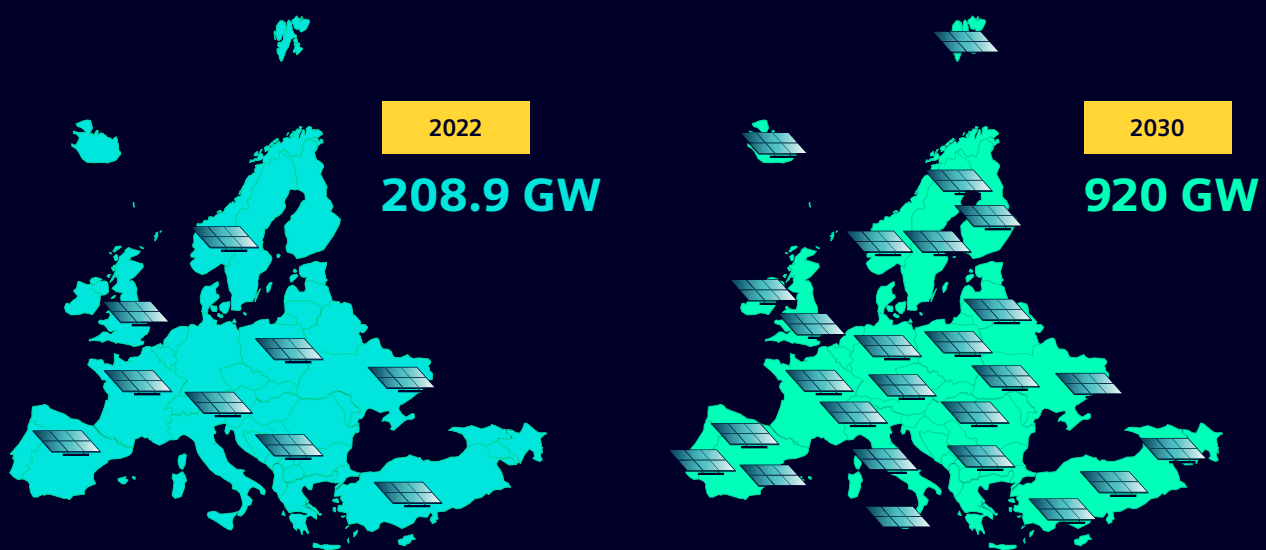
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Continuously growing **photovoltaic electricity production** in the **European Union**



EU solar power breaks records in 2022, surpassing expectations with 41.4 GW of new capacity connected to grids



Source: European Market Outlook for Solar Power 2022-2026; <https://www.solarpowereurope.org/press-releases/new-report-reveals-eu-solar-power-soars-by-almost-50-in-2022>

In 2022, solar power capacity in the 27 EU member states increased by 47% with 41.4 GW of new solar PV capacity being added to grids. This increase was driven by record high energy prices and geopolitical tensions. Germany remained Europe's largest solar market with 7.9 GW of newly installed capacity, followed by Spain, Poland, the Netherlands, and France. The total solar capacity across the EU has exceeded 200 GW, with 208.9 GW of solar power generation capacity. By the end of 2022, the Netherlands led the way with more than 1,000 watts of installed solar power per inhabitant. The period from 2023 to 2026 is expected to see continuous, two-digit annual growth rates for solar power.

This increase is driven primarily by Germany and Spain, who are expected to add 62.6 GW and 51.2 GW more solar respectively over the next four years.

The total solar fleet in the EU is projected to reach 920 GW under a medium scenario and 1,184 GW under a high scenario by the period 2027-2030.

The European Commission has proposed a solar rooftop mandate for all commercial and public buildings by 2027, and for new residential buildings from 2029, as part of its Rooftop Solar Initiative. Recently, the German state of Baden-Wurtemberg implemented the first rooftop solar mandate in 2022. Making solar mandates a standard for new buildings, should support the deployment of building-integrated photovoltaic (BIPV) in Europe.

Standards



IEC 60364-7-712 is a specific part of the **IEC 60364** series that covers electrical installations in buildings with PV power supply systems. It provides guidance on the design, installation, and maintenance of PV power supply systems in buildings, including both grid-connected and off-grid systems. It covers all aspects of the PV system, including the PV modules, inverters, batteries, and associated electrical components.

Key requirements on protective devices for the electrical installation

Protection on the DC side

“Overcurrent and short-circuit protection

The overcurrent protective devices of the DC side shall be either gPV fuses in accordance with IEC 60269-6 or another device in accordance with IEC 60947 (all parts) or IEC 60898 (all parts).

Where circuit-breakers are used as devices for overload protection, IEC 60364 (all parts) also permits these to fulfil the role of a disconnecting means as required by 712.536.2.101 to 712.536.2.103.”

“Disconnection

Disconnecting means with isolation function shall be provided for the inverter, on both the DC side and the AC side. Disconnecting means with isolation function shall be provided in PV array to isolate circuits and equipment.”

“Protection against transient overvoltage

Where protection against transient overvoltage is required by IEC 60364-4-44:2007, Clause 443, such protection shall also be applied to the DC side of the PV installation. Depending on the distance between the PCE and the origin of the installation, further protection against transient overvoltage may be required on the AC side.”

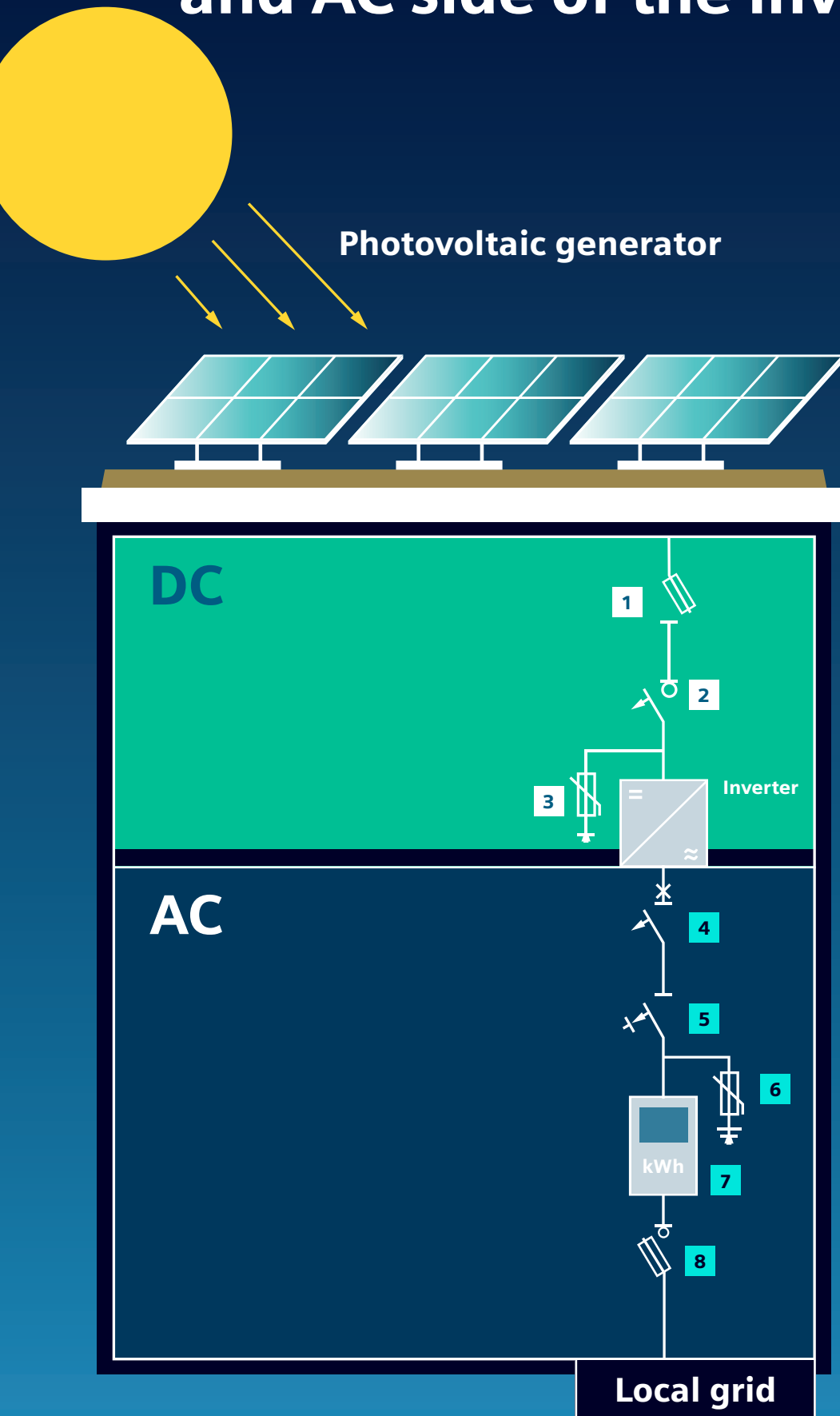
“Due to the very specific electrical setup of PV installations on the DC side, only SPDs especially dedicated to PV installations shall be used to protect the DC side of such installations.”

“Protection on the AC side

Where an RCD is used for protection of the PV AC supply circuit, the RCD shall be of type B in accordance with IEC 62423.”

The PV AC supply cable shall be protected from the effects of short-circuit by an overcurrent protective device installed at the connection to the designated distribution board of the electrical installation.

Electrical installation on DC and AC side of the inverter



1 3NW6 + 3NW7
Fuse holder +
PV fuse



2 5SL5
DC isolator



3 5SD7
Overvoltage
protection DC



4 5SL3/6
MCB



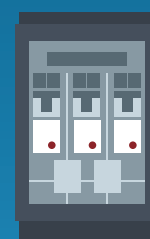
5 5SV3
RCCB



6 5SD7
Overvoltage
protection AC



7 7KT16
Infeed meter



8 3NP1
Fuse switch
disconnecter

Ordering information

DC side of the inverter

1) PV fuse + fuse holder

<u>3NW6 + 3NW7</u>	- Protects the photovoltaic DC lines and the photovoltaic modules reliably against short circuits and overloads in particular in the event of return currents - Very compact design (1MW) - Rated operational voltage 1000 V DC - Characteristic gPV - Rated short-circuit strength 30 kA
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2) DC isolator

<u>5SL5432-7RC</u>	- High ambient temperature range: -40 ... +70°C - Rated Voltage: 880V DC - Maximum operational voltage: 1000V DC - High endurance cycles: up to 10,000 mechanical operations
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3) Surge arresters Uc DC=1000 V / 600 V

<u>5SD7483-0KK02/01</u>	- Max. continuous voltage 1000 V DC - Highly suitable for larger systems - Match current portfolio - Matching in SPD portfolio in terms of system gradation
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AC side of the inverter

4) Miniature circuit breaker

<u>5SL3/6</u>	- Tripping characteristics: B, C - Rated switching capacity: 4.5/6 kA - Comprehensive range of accessories (e. g. remote-controlled operating mechanism) - Removal from the busbar-mounted assembly requires no tools
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5) Residual current-operated circuit breaker Type B

<u>5SV3...-4</u>	- Detection of sinusoidal AC residual currents and pulsating DC residual currents, as well as smooth DC residual currents (in deviation from type A RCCBs). - Reliable protection for users against electrical accidents. - Available for applications with rated currents between 25 and 80 A. - Super-resistant and short-time delayed, resulting in a reduction of unwanted tripping and ensuring high system availability.
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Ordering information

AC side of the inverter

6) Surge arrester

<u>5SD7</u>	• Protection of the AC installation against overvoltages caused by lightning or switching activity from the mains. • Rated voltage 240/415 V AC • Rated discharge current 20 – 100 kA • Max. discharge current 40 kA • Combination surge arresters type1/2 available
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7) Energy meter

<u>7KT16</u>	• Measuring of energy data for billing purposes thanks to MID certification • 35 mm DIN rail housing, 4 MW (72 mm wide) • Voltage measurement: direct measurement 230 V N-L/400 V L-L, CAT III • Current input: 80 A direct connection
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8) Fuse switch disconnecter

<u>3NP1</u>	• Protection against short-circuit and overload • Safe separation and restarting of load systems (e. g. feeding into the public grid) • Switching under load possible (specialist required) • Locking and sealing possibilities
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