

Compact high current DC EMC/EMI filter



- Reduces conducted emissions towards the solar panel
- Reduces the probability of EMI radiation off the solar panel
- Helps to prevent premature panel aging
- Helps to meet international EMC regulations
- Most compact standard solution in the industry
- FN 2210 without Cy capacitors to ground



Performance indicators

Attenuation performance



Rated current [A]



Technical specifications

| | |
|--|---|
| Maximum continuous operating voltage | 1000 VDC |
| Rated currents | 250 to 2300 A @ 50°C |
| High potential test voltage | P -> E 4800 VDC for 2 sec P -> P 3600 VDC for 2 sec |
| Protection category | IP 00 |
| Overload capability | 4x rated current at switch on, max. 8 sec 1.5x rated current for 1 minute, once per hour |
| Temperature range (operation and storage) | -40°C to +100°C |
| Climatic category | 40/100/21 acc. to IEC 60068-1 |
| Terminals/Housing | Ni plated cu bars/Metal |
| Flammability corresponding to | UL 94V-0 |
| Design corresponding to | UL 1283, CSA 22.2 No. 8 1986, IEC/EN 60939, EN 60721-3, EN 62109 |

Approvals



The FN 2211/FN 2210 series are the most compact dedicated high current DC filters for PV inverters in the industry and therefore are an optimum fit with most modern PV inverter generation. In addition the filters can be configured in a very flexible way to fulfil customized application requirements.

All FN 2211/FN 2210 come in unsymmetrical housings, which help to prevent inverse installation and wrong electrical connection. Along with grid-side installed Schaffner AC EMC/EMI filters FN 3311/FN 3310, the DC filters FN 2211/FN 2210 are key to meet the stringent international standards for electromagnetic compatibility and help to ensure a reliable and fault-free operation of the entire PV system.

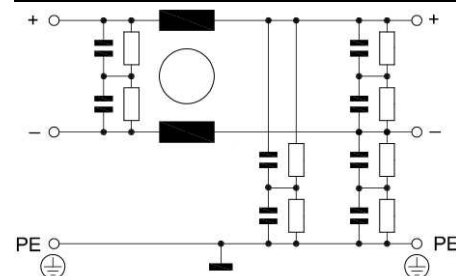
Features and benefits

Installed between the PV inverter and the solar panel, the FN 2211 and FN 2210 DC filters are used to influence positively the conducted emissions on the panel side of the system. Therefore the DC filters significantly reduce the potential for high-frequency (HF) interference radiation of the panel. The filter also helps to prevent premature panel aging because of HF stray and leakage currents.

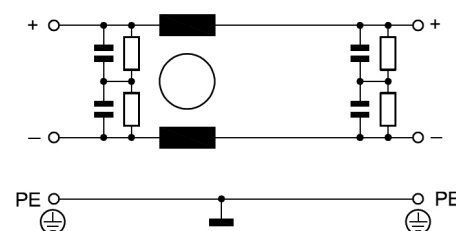
Typical applications

The FN 2211/FN 2210 series are primarily designed for PV inverter applications between 250 and 2300 A. However, they can potentially also be applied in other DC applications within published specifications, like UPS, DC motor drives, energy/battery storage systems, or DC charger installations.

Typical electrical schematic FN 2211



Typical electrical schematic FN 2210



Filter selection table

| Filters * | Rated current @ 50°C [A] | Power loss @ 25°C/DC [W] | Weight [kg] |
|--------------------------------|--------------------------------|--------------------------------|----------------|
| FN 2211 with Cy caps | | | |
| FN 2211-250-99-C30-R55 | 250 | 15 | 3.0 |
| FN 2211-400-99-C30-R55 | 400 | 24 | 4.0 |
| FN 2211-600-99-C30-R55 | 600 | 25 | 4.6 |
| FN 2211-1000-99-C30-R55 | 1000 | 55 | 6.8 |
| FN 2211-1500-99-C30-R55 | 1500 | 84 | 11.5 |
| FN 2211-2300-99-C30-R55 | 2300 | 116 | 17.5 |
| FN 2210 without Cy caps | | | |
| FN 2210-250-99-R5 | 250 | 15 | 2.4 |
| FN 2210-400-99-R5 | 400 | 24 | 3.1 |
| FN 2210-600-99-R5 | 600 | 25 | 3.8 |
| FN 2210-1000-99-R5 | 1000 | 55 | 6.2 |
| FN 2210-1500-99-R5 | 1500 | 84 | 11.3 |
| FN 2210-2300-99-R5 | 2300 | 116 | 17.5 |

* Filters with reduced Cy capacitance to ground for high asymmetrical currents and higher voltages available upon request.

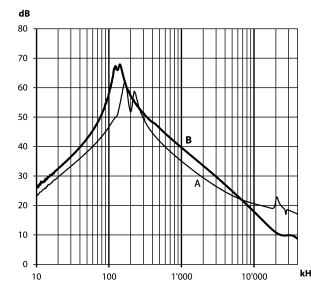
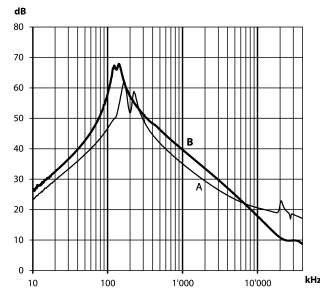
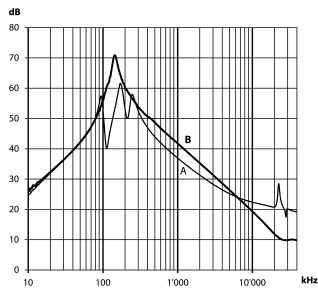
Typical filter attenuation FN 2211-xxx-99-C30-R55

Per CISPR 17; A=50 Ω/50 Ω sym; B=50 Ω/50 Ω asym

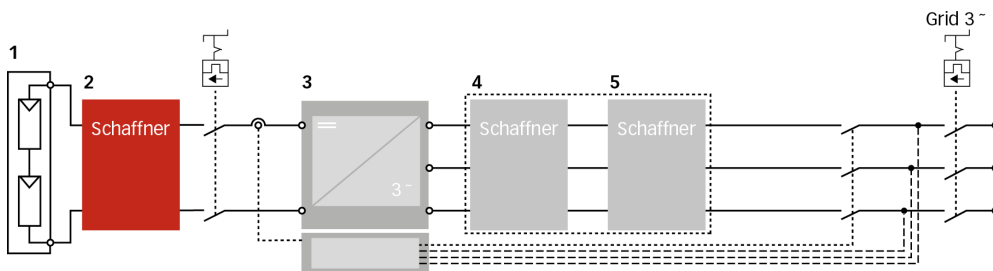
250/400/600 A types

1000 A types

1'500/2'300 A types



Typical block schematic



1 PV modules

2 Schaffner DC filter FN 22xx

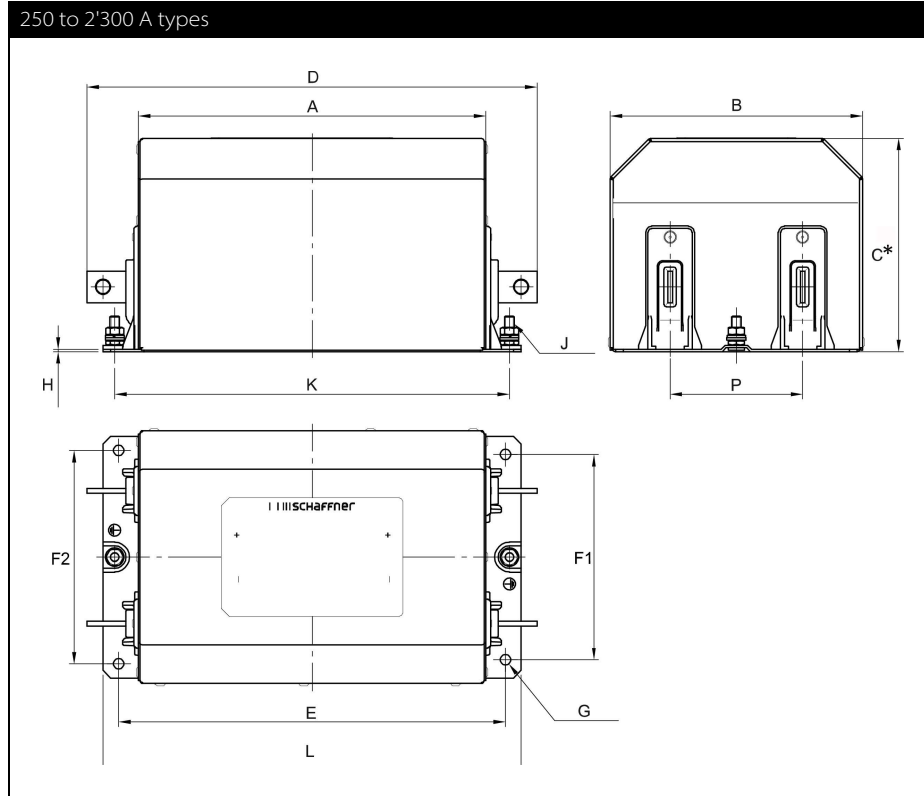
3 Central Inverter

4 Schaffner magnetic components

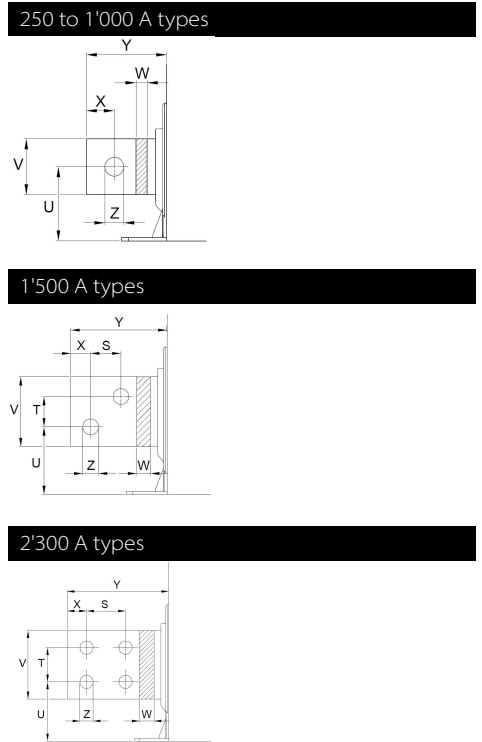
5 Schaffner AC EMC/EMI filter FN 3xxx

Important note: depending on the grounding scheme of the solar power system, including the solar panel and the grid side transformer, the appropriate DC- and AC EMC/EMI filter version need to be selected. For support, please contact your local Schaffner sales office or partner.

Mechanical data



Busbar connections



Note: all FN 2211 and FN 2210 provide unsymmetrical mounting hole patterns to prevent inverse filter installation in the field.

Dimensions

| | FN 2211 250 A | FN 2210* 250 A | FN 2211 400 A | FN 2210* 400 A | FN 2211 600 A | FN 2210* 600 A | FN 2211 1'000 A | FN 2210* 1'000 A | FN 2211 1'500 A | FN 2210* 1'500 A | FN 2211 2'300 A | FN 2210* 2'300 A |
|-----------|------------------|-------------------|------------------|-------------------|------------------|-------------------|--------------------|---------------------|--------------------|---------------------|--------------------|---------------------|
| A | 220 | 205 | 235 | 215 | 240 | 225 | 265 | 265 | 275 | 275 | 305 | 305 |
| B | 160 | 145 | 175 | 160 | 175 | 170 | 180 | 180 | 215 | 215 | 230 | 230 |
| C* | 135 | 95 | 150 | 100 | 150 | 100 | 160 | 110 | 200 | 150 | 210 | 210 |
| D | 285 | 270 | 310 | 290 | 315 | 300 | 380 | 380 | 440 | 440 | 495 | 495 |
| E | 245 | 277 | 260 | 240 | 265 | 250 | 300 | 300 | 315 | 315 | 345 | 345 |
| F1 | 130 | 120 | 140 | 125 | 140 | 135 | 140 | 140 | 175 | 175 | 190 | 190 |
| F2 | 135 | 125 | 145 | 130 | 145 | 140 | 145 | 145 | 180 | 180 | 195 | 195 |
| G | Ø 7 | Ø 7 | Ø 9 | Ø 9 | Ø 9 | Ø 9 | Ø 11 | Ø 11 | Ø 11 | Ø 11 | Ø 11 | Ø 11 |
| H | 1.5 | 1.5 | 2 | 2 | 2 | 2 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 |
| J | M6 | M6 | M8 | M8 | M8 | M8 | M8 | M8 | M10 | M10 | M10 | M10 |
| K | 250 (+/- 1) | 230 (+/- 1) | 265 (+/- 1) | 245 (+/- 1) | 270 (+/- 1) | 255 (+/- 1) | 310 (+/- 1) | 310 (+/- 1) | 321 (+/- 1) | 321 (+/- 1) | 351 (+/- 1) | 351 (+/- 1) |
| L | 265 | 245 | 285 | 265 | 290 | 275 | 330 | 330 | 345 | 345 | 375 | 375 |
| P | 84 (+/- 0.5) | 74 (+/- 0.5) | 86 (+/- 0.5) | 71 (+/- 0.5) | 84 (+/- 0.5) | 79 (+/- 0.5) | 86 (+/- 0.5) | 86 (+/- 0.5) | 86 (+/- 0.5) | 86 (+/- 0.5) | 93 (+/- 0.5) | 93 (+/- 0.5) |
| S | | | | | | | | | 26 | 26 | 40 | 40 |
| T | | | | | | | | | 26 | 26 | 35 | 35 |
| U | 41 | 41 | 46 | 46 | 49.5 | 49.5 | 53 | 53 | 58 | 58 | 60.5 | 60.5 |
| V | 20 | 20 | 25 | 25 | 25 | 25 | 40 | 40 | 60 | 60 | 70 | 70 |
| W | 3 | 3 | 4 | 4 | 8 | 8 | 8 | 8 | 10 | 10 | 15 | 15 |
| X | 10 | 10 | 12.5 | 12.5 | 12.5 | 12.5 | 20 | 20 | 17 | 17 | 20 | 20 |
| Y | 32.5 | 32.5 | 37.5 | 37.5 | 37.5 | 37.5 | 57.5 | 57.5 | 82.5 | 82.5 | 82.5 | 95 |
| Z | Ø 9 | Ø 9 | Ø 11 | Ø 11 | Ø 11 | Ø 11 | Ø 13.5 | Ø 13.5 | Ø 13.5 | Ø 13.5 | Ø 13.5 | Ø 13.5 |

* FN 2210 with flat top (Dimension C)

All dimensions in mm; 1 inch=25.4 mm

Tolerances according: ISO 2768-m/EN 22768-m, if not stated otherwise

Please see the brochure "Basics in EMC and Power Quality" on our website www.schaffner.com/downloads to find more details on filter connectors.



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