schaffner
shaping electrical power

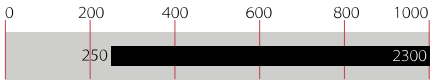
# Compact power line AC EMC/EMI filter

- High current 3-phase filter up to 2300 A
- Extremely compact and light weight design
- Minimum installation foot print
- Performance optimised for standard purpose applications
- FN 3310 series without Cy capacitors to ground
- FN 3311 IT versions for use in IT power networks

## Performance indicators

Attenuation performance

Rated current [A]




## Technical specifications

| | |
|---|---|
| **Maximum continuous operating voltage** | 3x 520/300 VAC for FN 3311<br>3x 520 VAC for FN 3310 |
| **Operating frequency** | DC to 60 Hz |
| **Rated currents** | 250 to 2300 A @ 50°C |
| **High potential test voltage** | P –> E 2 kVAC for 2 sec (FN 3311 IT 3 kVAC for 2 sec)<br>P –> P 2.25 kVDC for 2 sec (FN 3311 IT 2.68 kVDC for 2 sec) |
| **Protection category** | IP 00 |
| **Overload capability** | 4x rated current at switch on, max. 8 sec<br>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, IEC/EN 60939, EN 60721-3 |

## Approvals

RoHS

## Features and benefits

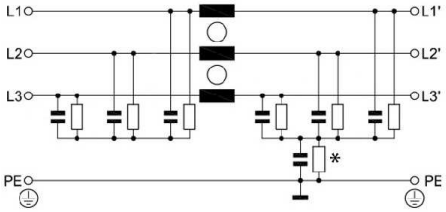
The FN 3311/FN 3310 poduct series of standard EMC/EMI filters are based on Schaffner's many years of expertise in filter design for all types of converter and inverter applications. Installed between the PV inverter and the power grid, the FN 3311/FN 3310 AC filters are used to influence positively the conducted emissions on the grid side to help to comply with the required emission standards.

The FN 3311/FN 3310 series are the most compact dedicated high current AC filters, not only suitable for PV applications, but being an optimum fit with most modern PV inverter topologies. In addition the filters can be configured in a very flexible way to fulfil custom specific application requirements. All FN 3311/FN 3310 come in unsymmetrical housings, which help to prevent inverse installation and wrong electrical connection. Along with solar panel-side installed Schaffner DC EMC/EMI filters FN 2211/FN 2210, the AC filters FN 3311/FN 3310 are key to meet the stringent international standards for electro-magnetic compatibility and help to ensure a reliable and fault-free operation of the entire PV system.

## Typical applications

The FN 3311/FN 3310 series are primarily designed for all kind of power line connected converter and inverter applications between 250 and 2'300 A. However, they are optimised for PV inverter and can potentially also be applied for general purpose motor drives applications.

## Typical electrical schematic FN 3311




*
- FN 3311 IT series without resistor to PE
- FN 3310 series without resistor and capacitor to PE

## Filter selection table

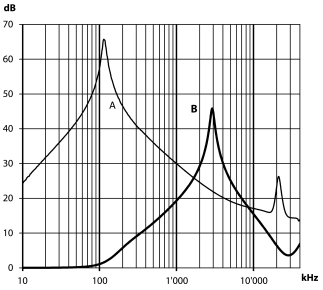
| Filters */** | Rated current @ 50°C [A] | Typical inverter AC power rating*** [kVA] | Leakage current**** @ 520 VAC/50 Hz [mA] | Power losss @ 25°C/DC [W] | Weight [kg] |
|---|---|---|---|---|---|
| **FN 3311 with Cy caps** | | | | | |
| **FN 3311-250-99-C16-R55 or FN 3311 IT-250-99-C18-R5** | 250 | 100 | 0.06 | 18 | 2.3 |
| **FN 3311-400-99-C16-R55 or FN 3311 IT-400-99-C18-R5** | 400 | 150 | 0.06 | 30 | 3.1 |
| **FN 3311-600-99-C16-R55 or FN 3311 IT-600-99-C18-R5** | 600 | 250 | 0.06 | 33 | 4.0 |
| **FN 3311-1000-99-C16-R55 or FN 3311 IT-1000-99-C18-R5** | 1000 | 400 | 0.06 | 70 | 5.5 |
| **FN 3311-1500-99-C16-R55 or FN 3311 IT-1500-99-C18-R5** | 1500 | 500 | 0.06 | 133 | 9.9 |
| **FN 3311-2300-99-C16-R55 or FN 3311 IT-2300-99-C18-R5** | 2300 | 800/1000 | 0.06 | 201 | 18.2 |
| | | | | | |
| **FN 3310 without Cy caps** | | | | | |
| **FN 3310-250-99-R5** | 250 | 100 | | 18 | 2.3 |
| **FN 3310-400-99-R5** | 400 | 150 | | 30 | 3.1 |
| **FN 3310-600-99-R5** | 600 | 250 | | 33 | 4.0 |
| **FN 3310-1000-99-R5** | 1000 | 400 | | 70 | 5.5 |
| **FN 3310-1500-99-R5** | 1500 | 500 | | 133 | 9.9 |
| **FN 3310-2300-99-R5** | 2300 | 800/1000 | | 201 | 18.2 |

* Filters with higher current ratings available upon request.
** Filters with reduced Cy capacitance to ground for high asymmetrical currents and higher voltages available upon request.
*** Calculated at rated current, 480 VAC (FN 3311)/690 VAC (FN 3311 HV) and cos phi=0.8. The exact value depends upon the efficiency of the drive, the motor and the entire application.
**** Leakage current according IEC 60939-1

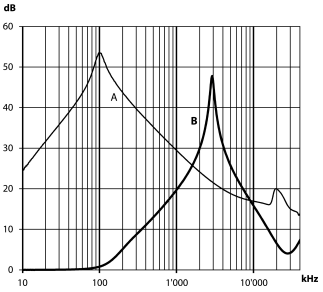
## Typical filter attenuation FN 3311-xxx-99-C16-R55

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

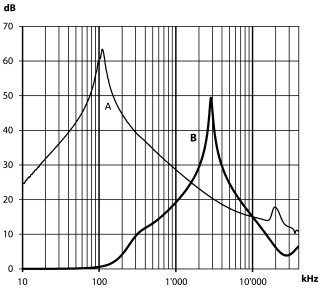
250/400 A types



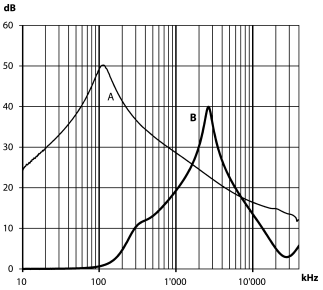

600 A types



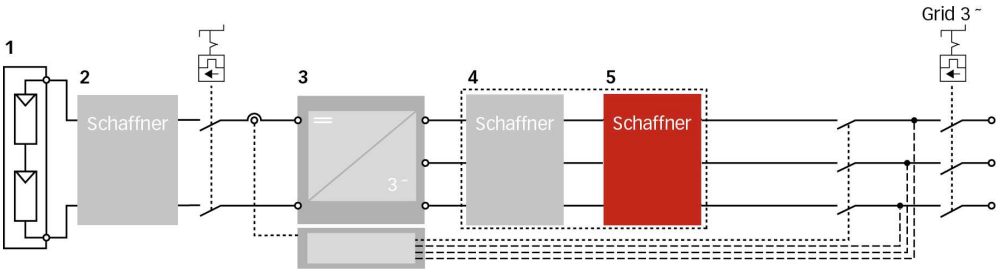

1'000/1'500 A types




2'300A types




## Typical block schematic

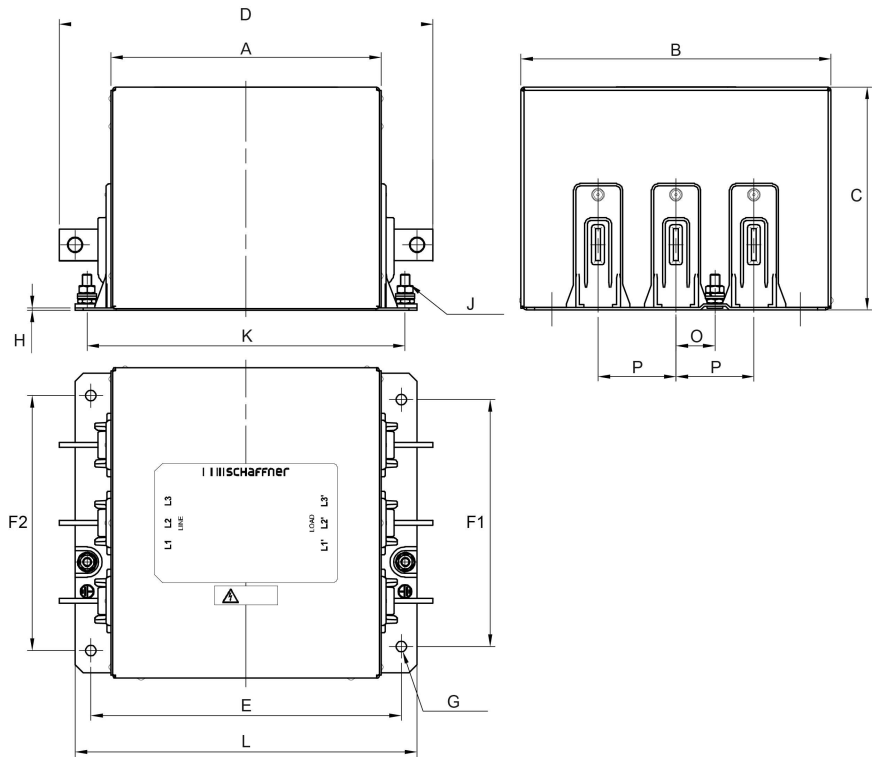



**1** PV modules
**2** Schaffner DC filter FN 22xx
**3** Central Inverter
**4** Schaffner magnetic components
**5** Schaffner AC EMC/EMI filter FN 3xxx

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.

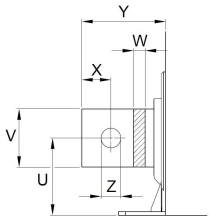
## Mechnical data

250 to 2'300 A types

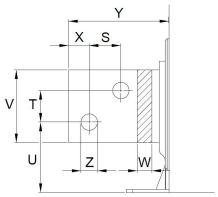



## Busbar connections

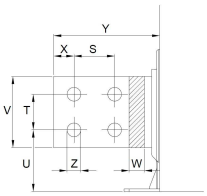
250 to 1'000 A types




1'500 A types




2'300 A types




**Note:** all FN 3311 and FN 3310 provide unsymmetrical mounting hole patterns to prevent inverse filter installation in the field.

## Dimensions (the FN 3311 IT versions have the same dimensions as the FN 3311)

| | 250 A | 400 A | 600 A | 1'000 A | 1'500 A | 2'300 A |
|---|---|---|---|---|---|---|
| **A** | 170 | 175 | 190 | 190 | 195 | 220 |
| **B** | 195 | 210 | 220 | 220 | 225 | 280 |
| **C** | 140 | 140 | 140 | 140 | 150 | 165 |
| **D** | 235 | 250 | 265 | 305 | 360 | 410 |
| **E** | 195 | 205 | 220 | 220 | 240 | 265 |
| **F1** | 155 | 170 | 180 | 180 | 215 | 235 |
| **F2** | 160 | 175 | 185 | 185 | 220 | 240 |
| **G** | Ø7 | Ø9 | Ø9 | Ø9 | Ø11 | Ø11 |
| **H** | 1.5 | 2 | 2 | 2.5 | 2.5 | 2.5 |
| **J** | M6 | M8 | M8 | M8 | M10 | M10 |
| **K** | 200 (+/- 1) | 210 (+/- 1) | 225 (+/- 1) | 225 (+/- 1) | 241 (+/- 1) | 266 (+/- 1) |
| **L** | 215 | 230 | 245 | 245 | 265 | 290 |
| **O** | 24.5 | 27 | 29.5 | 29.5 | 34.8 | 40 |
| **P** | 49 (+/- 0.5) | 54 (+/- 0.5) | 59 (+/- 0.5) | 59 (+/- 0.5) | 69.5 (+/- 0.5) | 80 (+/- 0.5) |
| **S** | | | | | 26 | 40 |
| **T** | | | | | 26 | 35 |
| **U** | 41 | 46 | 50 | 53 | 59 | 60.5 |
| **V** | 20 | 25 | 25 | 40 | 60 | 70 |
| **W** | 3 | 4 | 8 | 8 | 10 | 15 |
| **X** | 10 | 12.5 | 12.5 | 20 | 17 | 20 |
| **Y** | 32.5 | 37.5 | 37.5 | 57.5 | 82.5 | 95 |
| **Z** | Ø9 | Ø11 | Ø11 | Ø13.5 | Ø13.5 | Ø13.5 |

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 to find more details on filter connectors.

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