schaffner
shaping electrical power

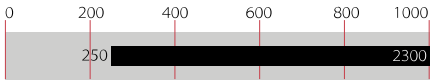
# Compact power line AC EMC/EMI filter

- 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

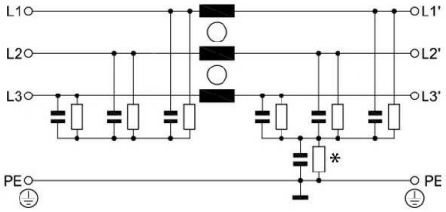
The FN 3311/FN 3310 poduct series of standard EMC/EMI filters are based on Schaffner's many years of expertise in filter design for all types of converter and inverter applications. Installed between the PV inverter and the power grid, the FN 3311/FN 3310 AC filters are used to influence positively the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

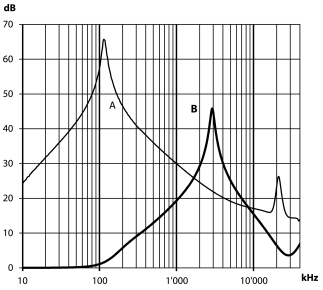
| Filters */** | Rated current @ 50°C [A] | Typical inverter AC power rating*** [kVA] | Leakage current**** @ 520 VAC/50 Hz [mA] | Power losss @ 25°C/DC [W] | Weight [kg] |
|---|---|---|---|---|---|
| **FN 3311 with Cy caps** | | | | | |
| **FN 3311-250-99-C16-R55 or FN 3311 IT-250-99-C18-R5** | 250 | 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

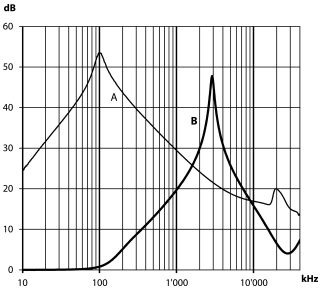
## Typical filter attenuation FN 3311-xxx-99-C16-R55

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

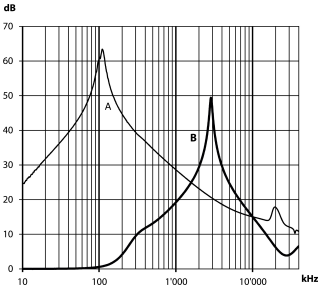
250/400 A types



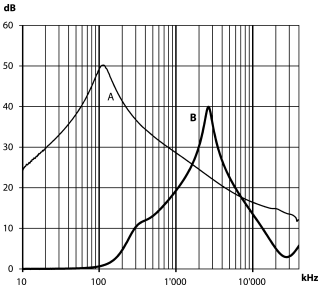

600 A types



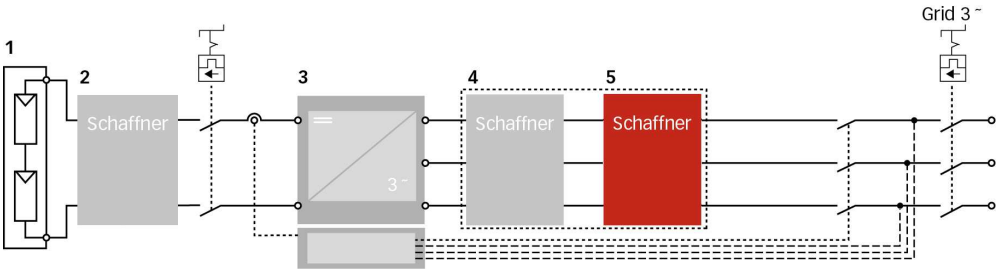

1'000/1'500 A types




2'300A types




## Typical block schematic

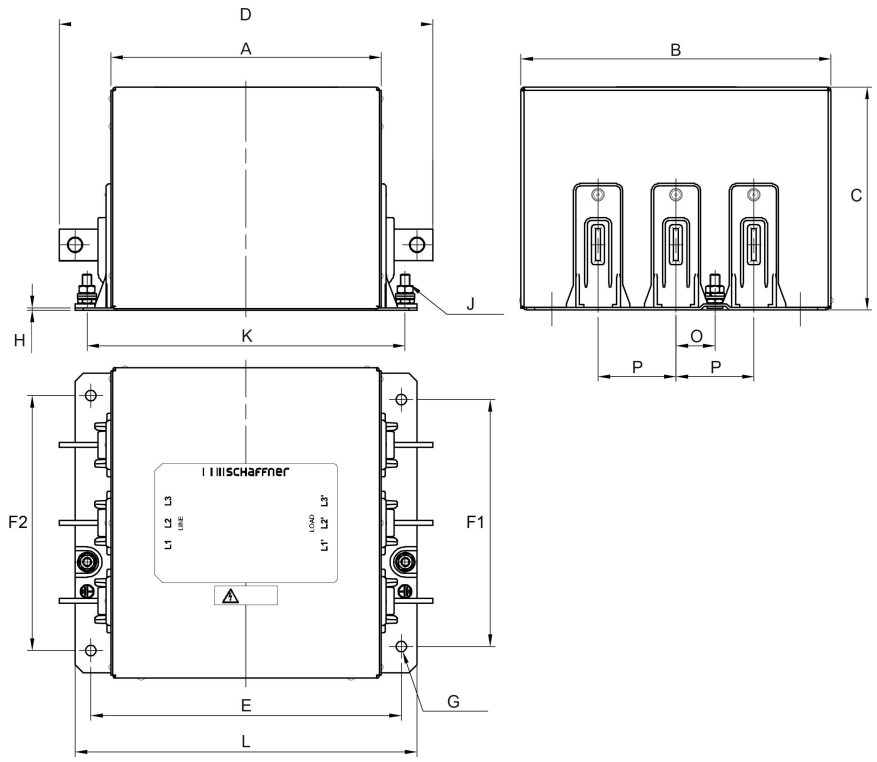



**1** PV modules
**2** Schaffner DC filter FN 22xx
**3** Central Inverter
**4** Schaffner magnetic components
**5** Schaffner AC EMC/EMI filter FN 3xxx

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.

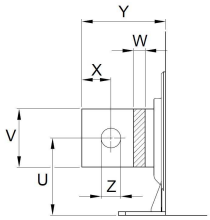
## Mechnical data

250 to 2'300 A types

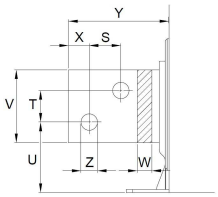



## Busbar connections

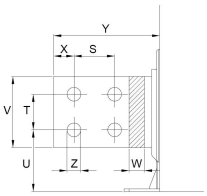
250 to 1'000 A types




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.

## Headquarters, global innovation and development

Switzerland
**Schaffner Group**
Nordstrasse 11
4542 Luterbach
T +41 32 681 66 26
info@schaffner.com
www.schaffner.com

To find your local partner within Schaffner's global network: www.schaffner.com

© 2018 Schaffner Group

The content of this document has been carefully checked and understood. However, neither Schaffner nor its subsidiaries assume any liability whatsoever for any errors or inaccuracies of this document and the consequences thereof. Published specifications are subject to change without notice. Product suitability for any area of application must ultimately be determined by the customer. In all cases, products must never be operated outside their published specifications. Schaffner does not guarantee the availability of all published products. This disclaimer shall be governed by substantive Swiss law and resulting disputes shall be settled by the courts at the place of business of Schaffner Holding AG. Latest publications and a complete disclaimer can be downloaded from the Schaffner website. All trademarks recognized.

## Sales and application centers

China
**Schaffner EMC Ltd. Shanghai**
T20-3 C, No 565 Chuangye Road,
Pudong district
201201 Shanghai
T +86 21 3813 9500
cschina@schaffner.com
www.schaffner.com.cn

Finland
**Schaffner Oy**
Sauvonrinne 19 H
08500 Lohja
T +358 50 468 7284
finlandsales@schaffner.com

France
**Schaffner EMC S.A.S.**
16-20 Rue Louis Rameau
95875 Bezons
T +33 1 34 34 30 60
F +33 1 39 47 02 28
francesales@schaffner.com

Germany
**Schaffner Deutschland GmbH**
Schoemperlenstrasse 12B
76185 Karlsruhe
T +49 721 56910
F +49 721 569110
germanysales@schaffner.com

India
**Schaffner India Pvt. Ltd**
REGUS WORLD TRADE CENTRE
WTC, 22nd Floor Unit No 2238, Brigade
Gateway Campus, 26/1, Dr. Rajkumar Road
Malleshwaram (W)
560055 Bangalore
T +91 80 67935355
indiasales@schaffner.com

Italy
**Schaffner EMC S.r.l.**
Via Ticino, 30
20900 Monza (MB)
T +39 039 21 41 070
italysales@schaffner.com

Japan
**Schaffner EMC K.K.**
1-32-12, Kamiuma, Setagaya-ku
7F Mitsui-seimei Sangenjaya Bldg.
154-0011 Tokyo
T +81 3 5712 3650
F +81 3 5712 3651
japansales@schaffner.com
www.schaffner.jp

Singapore
**Schaffner EMC Pte Ltd.**
#05-09, Kg Ubi Ind. Estate
408705 Singapore
T +65 6377 3283
F +65 6377 3281
singaporesales@schaffner.com

Spain
**Schaffner EMC España**
Calle Caléndula 93, Miniparc III, Edificio E
El Soto de Moraleja, Alcobendas
28109 Madrid
T +34 917 912 900
F +34 917 912 901
spainsales@schaffner.com

Sweden
**Schaffner EMC AB**
Tegeluddsvägen 76, 2tr
115 28 Stockholm
T +46 8 5050 2425
swedensales@schaffner.com
www.schaffner.com

Switzerland
**Schaffner EMV AG**
Nordstrasse 11
4542 Luterbach
T +41 32 681 66 26
switzerlandsales@schaffner.com

Taiwan R.O.C.
**Schaffner EMV Ltd.**
20 Floor-2, No 97, Section 1, XinTai 5th Road
22175 XiZhi District New Taipei City 22175
T +886 2 2697 5500
F +886 2 2697 5533
taiwansales@schaffner.com
www.schaffner.com.tw

Thailand
**Schaffner EMC Co. Ltd.**
Northern Region Industrial Estate
67 Moo 4 Tambon Ban Klang
Amphur Muangg P.O. Box 14
51000 Lamphun
T +66 53 58 11 04
F +66 53 58 10 19
thailandsales@schaffner.com

United Kingdom
**Schaffner Ltd.**
5 Ashville Way, Molly Millars Lane
Wokingham
RG41 2PL Berkshire
T +44 118 9770070
F +44 118 9792969
uksales@schaffner.com

USA
**Schaffner EMC Inc.**
52 Mayfield Avenue
08837 Edison, New Jersey
T +1 800 367 5566
T +1 732 225 9533
F +1 732 225 4789
usasales@schaffner.com
www.schaffnerusa.com

**Schaffner North America**
6722 Thirlane Road
24019 Roanoke, Virginia
T +1 276 228 7943
F +1 276 228 7953

**Schaffner North America**
823 Fairview Road
24382 Wytheville, Virginia
T +1 276 228 7943
F +1 276 228 7258

# OCEAN CHIPS
## Океан Электроники
## Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

**«JONHON»** (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

**«FORSTAR»** (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А