

# 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 HV without Cy capacitors to ground

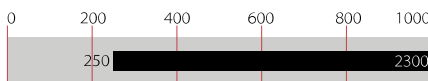


### Performance indicators

Attenuation performance



Rated current [A]



## Technical specifications

<b>Maximum continuous operating voltage</b>	1'500 VDC
<b>Operating frequency</b>	DC
<b>Rated currents</b>	250 to 2300 A @ 50°C
<b>High potential test voltage</b>	P -> E 6'800 VDC for 2 sec P -> P 3'850 VDC for 2 sec
<b>Protection category</b>	IP 00
<b>Overload capability</b>	4x rated current at switch on, max. 8 sec 1.5x rated current for 1 minute, once per hour -40°C
<b>Temperature range (operation and storage)</b>	to +100°C
<b>Climatic category</b>	40/100/21 acc. to IEC 60068-1
<b>Terminals/Housing</b>	Ni plated cu bars/Metal
<b>Flammability corresponding to</b>	UL 94V-0
<b>Design corresponding to</b>	UL 1283, CSA 22.2 No. 8 1986, IEC/EN 60939, EN 60721-3, EN 62109

### Approvals



The FN 2211 HV/FN 2210 HV 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 HV/FN 2210 HV 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 HV/FN 3310 HV, the DC filters FN 2211 HV/FN 2210 HV 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.

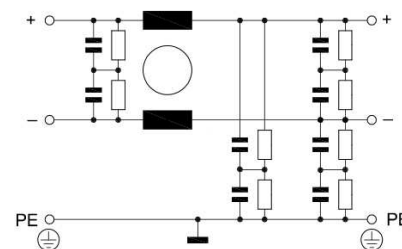
## Features and benefits

Installed between the PV inverter and the solar panel, the FN 2211 HV and FN 2210 HV 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 highfrequency (HF) interference radiation of the panel. The filter also helps to prevent premature panel aging because of HF stray and leakage currents.

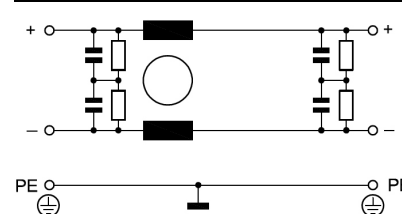
## Typical applications

The FN 2211 HV/FN 2210 HV series are primarily designed for PV inverter applications between 250 and 2'300 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 HV



### Typical electrical schematic FN 2210 HV



### Filter selection table

Filters *	Rated current @ 50°C [A]	Power loss @ 25°C/DC [W]	Weight [kg]
<b>FN 2211 HV with Cy caps</b>			
FN 2211HV-250-99-C27-R99	250	9	3.3
FN 2211 HV-400-99-C27-R99	400	14	4.2
FN 2211 HV-600-99-C27-R99	600	15	4.8
FN 2211 HV-1000-99-C27-R99	1000	31	7.1
FN 2211 HV-1500-99-C27-R99	1500	41	12.4
FN 2211 HV-2300-99-C27-R99	2300	64	18.3
<b>FN 2210 HVwithout Cy caps</b>			
FN 2210 HV-250-99-R9	250	9	2.
FN 2210 HV-400-99-R9	400	14	3.3
FN 2210 HV-600-99-R9	600	15	4.0
FN 2210 HV-1000-99-R9	1000	31	6.4
FN 2210 HV-1500-99-R9	1500	41	11.2
FN 2210 HV-2300-99-R9	2300	64	17.6

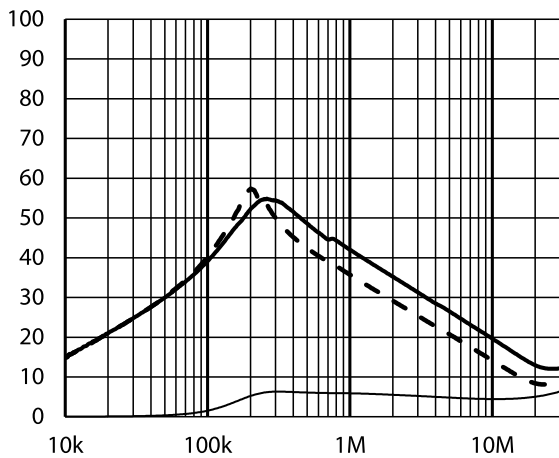
\* Filters with reduced Cy capacitance to ground for high asymmetrical currents and higher voltages available upon request.

### Typical filter attenuation FN 221x HV-xxx-99-C27-R99

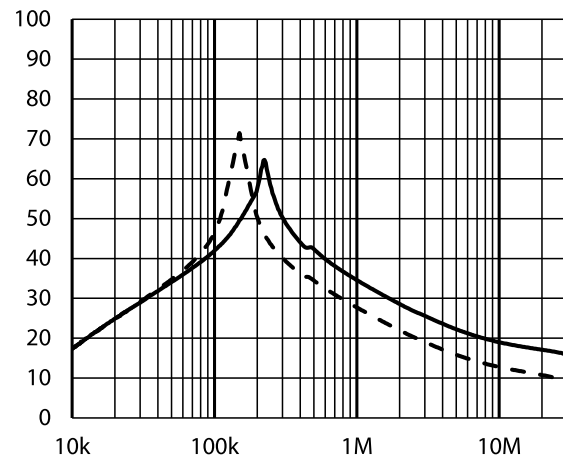
Per CISPR 17

50 / 50 Ω asym

50 / 50 Ω sym



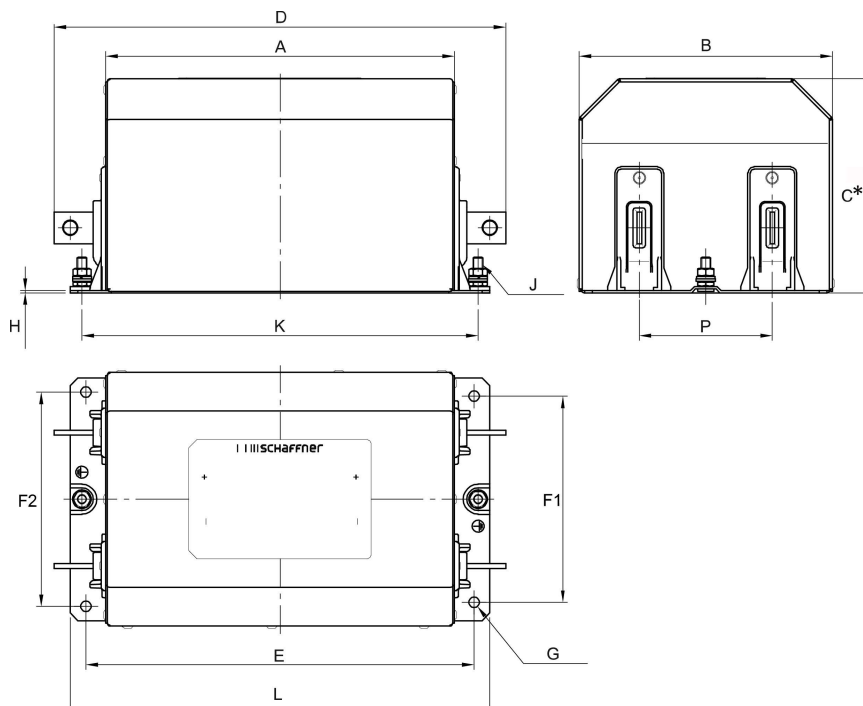
— FN 2211 HV (250 - 1000A)  
 - - FN 2211 HV (1500 - 2300A)  
 — FN 2210 HV



— FN 221X HV (250 - 1000A)  
 - - FN 221X HV (1500 - 2300A)

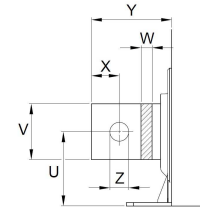
## Mechanical data

250 to 2'300 A types

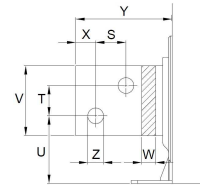


## Busbar connections

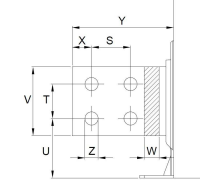
250 to 1'000 A types



1'500 A types



2'300 A types



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

## Dimensions

	FN 2211 HV 250 A	FN 2210 HV* 250 A	FN 2211 HV 400 A	FN 2210 HV* 400 A	FN 2211 HV 600 A	FN 2210 HV* 600 A	FN 2211 HV 1'000 A	FN 2210 HV* 1'000 A	FN 2211 HV 1'500 A	FN 2210 HV* 1'500 A	FN 2211 HV 2'300 A	FN 2210 HV* 2'300 A
<b>A</b>	220	205	235	215	240	225	265	265	275	275	305	305
<b>B</b>	160	145	175	160	175	170	180	180	215	215	230	230
<b>C*</b>	140	105	150	110	150	110	165	110	200	150	210	165
<b>D</b>	285	270	310	290	315	300	380	380	440	440	495	495
<b>E</b>	245	227	260	240	265	250	300	300	315	315	345	345
<b>F1</b>	130	120	140	125	140	135	140	140	175	175	180	180
<b>F2</b>	135	125	145	130	145	140	145	145	180	180	185	185
<b>G</b>	Ø 7	Ø 7	Ø 9	Ø 9	Ø 9	Ø 9	Ø 11	Ø 11	Ø 11	Ø 11	Ø 11	Ø 11
<b>H</b>	1.5	1.5	2	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5
<b>J</b>	M6	M6	M8	M8	M8	M8	M8	M8	M10	M10	M10	M10
<b>K</b>	250 (+/- 1)	230 (+/- 1)	265 (+/- 1)	245 (+/- 1)	270 (+/- 1)	255 (+/- 1)	310 (+/- 1)	310 (+/- 1)	321 (+/- 1)	321 (+/- 1)	351 (+/- 1)	351 (+/- 1)
<b>L</b>	265	245	285	265	290	275	330	330	345	345	375	375
<b>P</b>	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)
<b>S</b>									26	26	40	40
<b>T</b>									26	26	35	35
<b>U</b>	41	41	46	46	49.5	49.5	53	53	58	58	60.5	60.5
<b>V</b>	20	20	25	25	25	25	40	40	60	60	70	70
<b>W</b>	3	3	4	4	8	8	8	8	10	10	15	15
<b>X</b>	10	10	12.5	12.5	12.5	12.5	20	20	17	17	20	20
<b>Y</b>	32.5	32.5	37.5	37.5	37.5	37.5	57.5	57.5	82.5	82.5	82.5	95
<b>Z</b>	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

\* Filters with flat top (Dimension C)

All dimensions in mm; 1 inch=25.4mm

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](http://www.schaffner.com/downloads) 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](mailto:info@schaffner.com)  
<http://www.schaffner.com>



## 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](mailto:cschina@schaffner.com)  
<http://www.schaffner.com.cn>

### Finland

#### Schaffner Oy

Sauvonrinne 19 H  
08500 Lohja  
T +358 50 468 7284  
[finlandsales@schaffner.com](mailto: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](mailto:francesales@schaffner.com)

### Germany

#### Schaffner Deutschland GmbH

Schoemperlenstrasse 12B  
76185 Karlsruhe  
T +49 721 56910  
F +49 721 569110  
[germanysales@schaffner.com](mailto:germanysales@schaffner.com)

### India

#### Schaffner India Pvt. Ltd

Unit 59, Level, Mfar Greenheart 7  
Manyata Tech Park, Hebbal Outer Ring Road  
560045 Bangalore  
T +91 80 6781 9805  
F +91 80 6781 9998  
[indiasales@schaffner.com](mailto:indiasales@schaffner.com)

### Italy

#### Schaffner EMC S.r.l.

Via Ticino, 30  
20900 Monza (MB)  
T +39 039 21 41 070  
[italysales@schaffner.com](mailto:italysales@schaffner.com)

### Japan

#### Schaffner EMC K.K.

1-32-12, Kamiyama, Setagaya-ku  
7F Mitsui-seimei Sengenjaya Bldg.  
154-0011 Tokyo  
T +81 3 5712 3650  
F +81 3 5712 3651  
[japansales@schaffner.com](mailto:japansales@schaffner.com)  
<http://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](mailto: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](mailto:spainsales@schaffner.com)

### Sweden

#### Schaffner EMC AB

Tegeluddsvägen 76, 2tr  
115 28 Stockholm  
T +46 8 5050 2425  
[swedensales@schaffner.com](mailto:swedensales@schaffner.com)  
<http://www.schaffner.com>

### Switzerland

#### Schaffner EMV AG

Nordstrasse 11  
4542 Luterbach  
T +41 32 681 66 26  
[switzerlandsales@schaffner.com](mailto: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](mailto:taiwansales@schaffner.com)  
<http://www.schaffner.com.tw>

### Thailand

#### Schaffner EMC Co. Ltd.

Northern Region Industrial Estate  
67 Moo 4 Tambon Ban Klang  
Amphur Muangng P.O. Box 14  
51000 Lamphun  
T +66 53 58 11 04  
F +66 53 58 10 19  
[thailandsales@schaffner.com](mailto: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](mailto: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](mailto:usasales@schaffner.com)  
<http://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

To find your local partner within Schaffner's global network: [www.schaffner.com](http://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.