

## DC EMC/EMI filter for PV inverters

**SCHAFFNER**

energy efficiency and reliability



- Reduces conducted emissions towards the solar panel
- Reduces the probability of EMI radiation off the solar panel
- Helps to prevent pre-mature panel aging because of HF leakage currents
- Helps to meet international EMC regulations for the entire PV system
- Most compact standard solution in the industry, optionally available without capacitors to ground (B types)

### Approvals

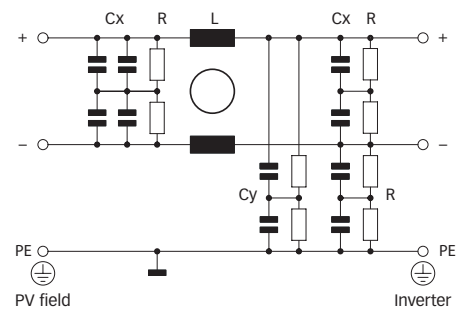


(ENEC in preparation)

### Technical specifications

Maximum continuous operating voltage:	Max. 1200VDC
Operating frequency:	DC
Rated currents:	25 to 1500A @ 55°C
High potential test voltage:	P → E 3600VDC for 5 sec P → P 3000VDC for 5 sec
Protection category:	IP20 (25 to 150A types); IP00 (250 to 1500A types)
Overload capability:	4x rated current at switch on, 1.5x rated current for 1 minute, once per hour
Temperature range (operation and storage):	-40°C to +100°C (40/100/21)
Flammability corresponding to:	UL 94V-2 or better
Design corresponding to:	UL 1283, CSA 22.2 No. 8 1986, IEC/EN 60939

### Typical electrical schematic



### Features and benefits

FN 2200 range of standard EMC/EMI filters is based on Schaffner's years of experience in custom filter design for the global photovoltaic (PV) inverter industry. Installed between the PV inverter and the solar panel, FN 2200 DC filters help to control conducted emissions on the panel side of the system and therefore significantly reduce the potential for high-frequency (HF) interference radiation off the panel. The filter also protects the solar panel from HF stray and leakage currents which can cause pre-mature aging in the PV modules.



FN 2200 are the most compact dedicated DC filters for PV inverters in the industry and therefore support the integration in the ever shrinking frame sizes of today's power electronics. All FN 2200 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 2200 are key to meet the stringent international standards for electromagnetic compatibility (EMC) like FN 61000-6-5 and -6-4 and help to ensure a reliable and fault-free operation of the entire PV system.

FN 2200 are designed for very low power loss, to support overall PV system efficiency.

### Typical applications

FN 2200 are primarily designed for PV inverters. However, they can potentially also be used in other DC applications within published specifications.

Filter selection table

Filter	Rated current @ 55°C (40°C)	Typical inverter AC power rating*	Filter efficiency @ 25°C / DC	Power loss @ 25°C/DC	Input/Output connections	Weight
	[A]	[kW]	[%]	[W]	 	[kg]
FN 2200-25-33	25 (28)	10	> 99.9	8	-33	0.9
FN 2200-50-34	50 (57)	20	> 99.9	17	-34	1.6
FN 2200-75-34	75 (86)	30	> 99.9	18	-34	1.7
FN 2200-100-35	100 (115)	40	> 99.9	22	-35	2.7
FN 2200-150-40	150 (173)	60	> 99.9	31	-40	4.9
FN 2200-250-99	250 (288)	100	> 99.9	10	-99	5.0
FN 2200-400-99	400 (460)	150	> 99.9	16	-99	6.1
FN 2200-600-99	600 (690)	250	> 99.9	29	-99	6.5
FN 2200-800-99	800 (920)	350	> 99.9	26	-99	9.3
FN 2200-1000-99	1000 (1150)	400	> 99.9	40	-99	9.4
FN 2200-1500-99	1500 (1600)	500	> 99.9	45	-99	14.6

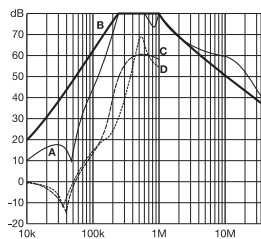
FN 2200B-25-33	25 (28)	10	> 99.9	8	-33	0.9
FN 2200B-50-34	50 (57)	20	> 99.9	17	-34	1.6
FN 2200B-75-34	75 (86)	30	> 99.9	18	-34	1.7
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FN 2200B-1500-99	1500 (1600)	500	> 99.9	45	-99	14.6

\* Based on rated DC current of typical 3-phase PV inverters with 900VDC input. Note: depending upon manufacturer and model, DC currents for a given PV inverter power can differ significantly. Filters with higher current ratings for large central inverters up to the MW range are available upon request.

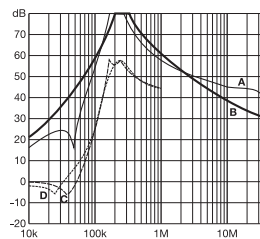
Typical filter attenuation

Per CISPR 17; A = 50Ω/50Ω sym; B = 50Ω/50Ω asym; C = 0.1Ω/100Ω sym; D = 100Ω/0.1Ω sym

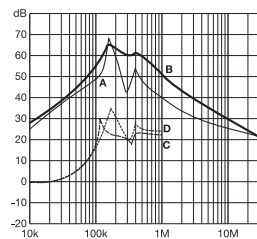
25 to 75A types



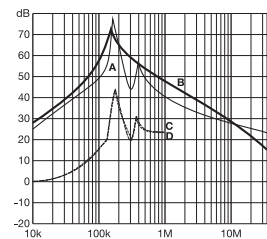
100 to 150A types



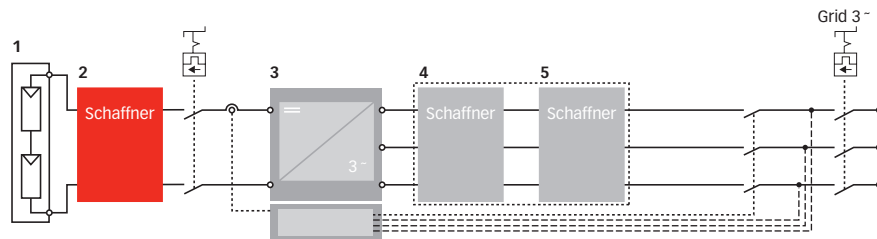
250A types



400 to 1500A types



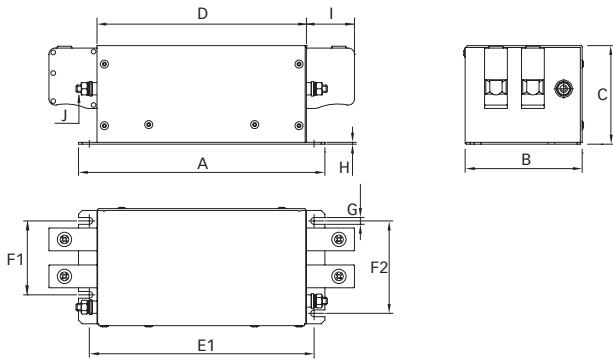
Typical block schematic



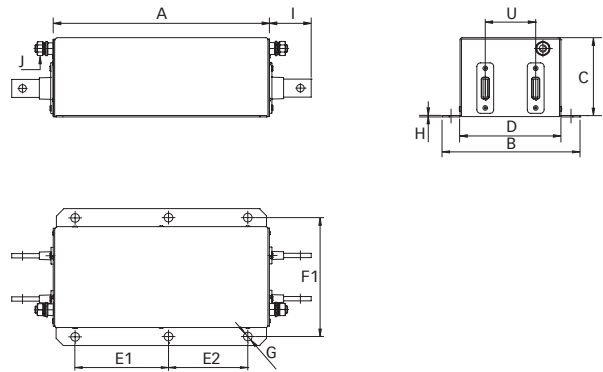
- 1 PV modules
- 2 Schaffner FN 2200
- 3 Central inverter
- 4 Schaffner magnetic components
- 5 Schaffner AC EMC/EMI filter

**Mechanical data**

25 to 150A types



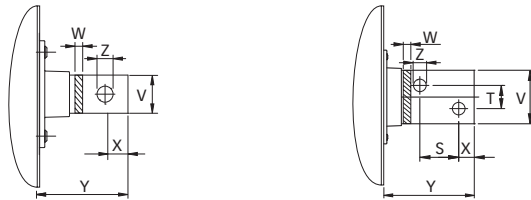
250 to 1500A types



**Busbar connections**

250 to 1000A types

1500A types



**Note:** all FN 2200 provide unsymmetrical mounting hole patterns to prevent inverse filter installation in the field.

**Dimensions**

	25A	50A	75A	100A	150A	250A	400A	600A	800A	1000A	1500A
A	170	200	200	220	250	300	300	300	300	300	300
B	80	95	95	125	140	180	190	190	200	200	200
C	65	80	80	95	115	110	110	110	140	140	150
D	140	170	170	190	220	130	140	140	150	150	150
E1	152.5	182.5	182.5	202.5	232.5	130	130	130	130	130	130
E2						110	110	110	110	110	110
F1	45	60	60	80	100	155	165	165	175	175	175
F2	60	75	75	100	120						
G	5.5	5.5	5.5	5.5	5.5	Ø12	Ø12	Ø12	Ø12	Ø12	Ø12
H	1	1.5	1.5	1.5	2	2	2	2	3	3	3
I	25	39	39	45	50	58	58	58	65	65	110
J	M5	M6	M6	M8	M10	M10	M10	M10	M12	M12	M12
S											43
T											26
U						70	70	70	70	70	70
V						20	25	25	40	40	60
W						5	6	8	8	8	10
X						15	15	15	20	20	17
Y						58	58	58	65	65	110
Z						Ø9	Ø10.5	Ø10.5	Ø14	Ø14	Ø14

All dimensions in mm; 1 inch = 25.4mm  
Tolerances according: ISO 2768-m / EN 22768-m

**Filter input/output connector cross sections**

	-33	-34	-35	-40
<b>Solid wire</b>	16mm <sup>2</sup>	35mm <sup>2</sup>	50mm <sup>2</sup>	95mm <sup>2</sup>
<b>Flex wire</b>	10mm <sup>2</sup>	25mm <sup>2</sup>	50mm <sup>2</sup>	95mm <sup>2</sup>
<b>AWG type wire</b>	AWG 6	AWG 2	AWG 1/0	AWG 4/0
<b>Recommended torque</b>	1.5 - 1.8Nm	4.0 - 4.5Nm	7 - 8Nm	17 - 20Nm

Please visit [www.schaffner.com](http://www.schaffner.com) to find more details on filter connectors.

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