

# EMC/EMI Filter for PV Inverters



- 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)
- New: up to 2300 A



### Performance indicators

Attenuation performance



Rated current [A]



## Technical specifications

<b>Maximum continuous operating voltage</b>	Max. 1200 VDC
<b>Operating frequency</b>	DC
<b>Rated currents</b>	25 to 2300 A @ 55°C
<b>High potential test voltage</b>	P → E 3600 VDC for 2 sec P → P 3000 VDC for 2 sec
<b>Protection category</b>	IP 20 (25 to 150 A types); IP 00 (250 to 2300 A types)
<b>Overload capability</b>	4x rated current at switch on, 1.5x rated current for 1 minute, once per hour
<b>Temperature range (operation and storage)</b>	-40°C to +100°C (40/100/21)
<b>Design corresponding to</b>	UL 1283, CSA 22.2 No. 8 1986, IEC/EN 60939
<b>Flammability corresponding to</b>	UL 94 V-2 or better
<b>MTBF @ 55°C/1200 V (Mil-HB-217F)</b>	min. 223,000 hours

### Approvals & Compliances



(cURus:600 VDC) (ENEC 14: 600 VDC)

FN 2200 are the most compact dedicated DC filters for PV inverters in the industry and therefore support the integration in shrinking frame sizes of power electronics. All FN 2200 come in unsymmetrical housings, which help to prevent inverse installation and wrong electrical connection. Along with grid-side installed AC EMC/EMI filters, FN 2200 are key to meet the international standards for electromagnetic compatibility (EMC) like EN 61000-6-3 and -6-4 and help to ensure a reliable and fault-free operation of the entire system. FN 2200 are designed for very low power loss, to support overall efficiency.

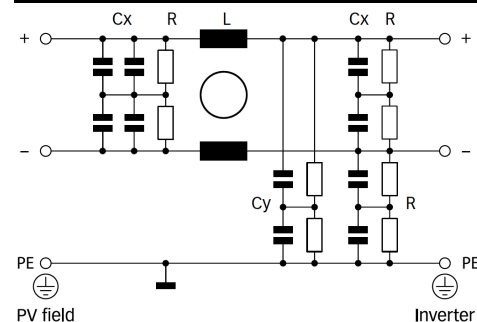
## Features and benefits

FN 2200 range is based on experience in custom filter design for the 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.

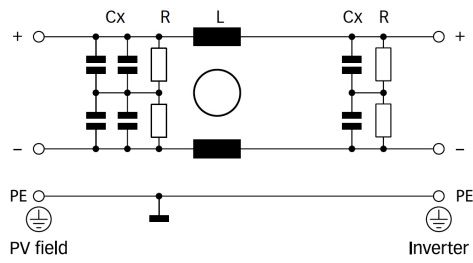
## Typical applications

FN 2200 are primarily designed for PV inverters. However, they can potentially also be used in other DC applications within published specifications, like UPS, DC motor drives, or DC quick chargers.



























### Typical electrical schematic FN2200



Typical electrical schematic FN2200B



### Filter selection table

Filter	Buy	Rated current	Typical inverter	Filter efficiency	Power loss	Input/Output connections		Weight
		@ 55°C (40°C)	AC power rating*	@ 25°C/DC	@ 25°C/DC			[kg]
		[A]	[kW]	[%]	[W]			
FN2200-25-33		25 (28)	10	> 99.9	8	-33		0.9
FN2200-50-34		50 (57)	20	> 99.9	17	-34		1.6
FN2200-75-34		75 (86)	30	> 99.9	18	-34		1.7
FN2200-100-35		100 (115)	40	> 99.9	22	-35		2.7
FN2200-150-40		150 (173)	60	> 99.9	31	-40		4.9
FN2200-250-99		250 (288)	100	> 99.9	10	-99		5.0
FN2200-400-99		400 (460)	150	> 99.9	16	-99		6.1
FN2200-600-99		600 (690)	250	> 99.9	29	-99		6.5
FN2200-800-99		800 (920)	350	> 99.9	26	-99		9.3
FN2200-1000-99		1000 (1150)	400	> 99.9	40	-99		9.4
FN2200-1500-99		1500 (1600)	500	> 99.9	45	-99		14.6
FN2200-2300-99		2300 (2500)	800/1000	> 99.9	84	-99		25.0
FN2200B-25-33		25 (28)	10	> 99.9	8	-33		0.9
FN2200B-50-34		50 (57)	20	> 99.9	17	-34		1.6
FN2200B-75-34		75 (86)	30	> 99.9	18	-34		1.7
FN2200B-100-35		100 (115)	40	> 99.9	22	-35		2.7
FN2200B-150-40		150 (173)	60	> 99.9	31	-40		4.9
FN2200B-250-99		250 (288)	100	> 99.9	10	-99		5.0
FN2200B-400-99		400 (460)	150	> 99.9	16	-99		6.1
FN2200B-600-99		600 (690)	250	> 99.9	29	-99		6.5
FN2200B-800-99		800 (920)	350	> 99.9	26	-99		9.3
FN2200B-1000-99		1000 (1150)	400	> 99.9	40	-99		9.4
FN2200B-1500-99		1500 (1600)	500	> 99.9	45	-99		14.6
FN2200B-2300-99		2300 (2500)	800/1000	> 99.9	84	-99		25.0

\* Based on rated DC current of typical 3-phase PV inverters with 900 VDC 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.

### Distribution inventory

Up-to-date inventory levels for global distributors is available at

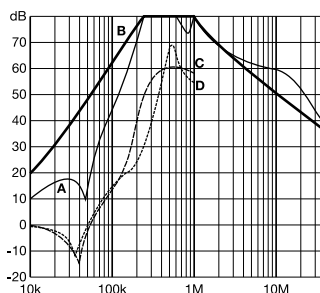
<https://products.schaffner.com/stock>



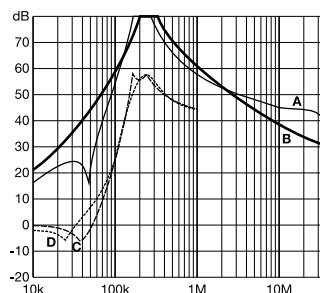
### Typical filter attenuation

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

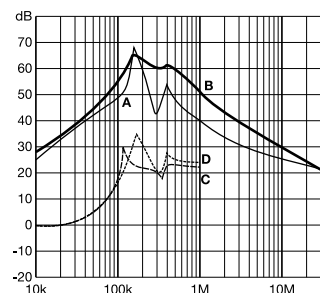
25 to 75 A types



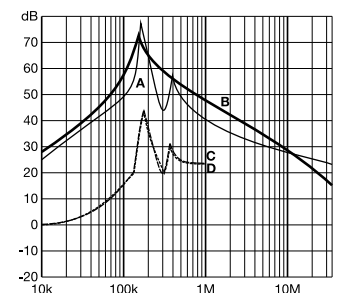
100 to 150 A types



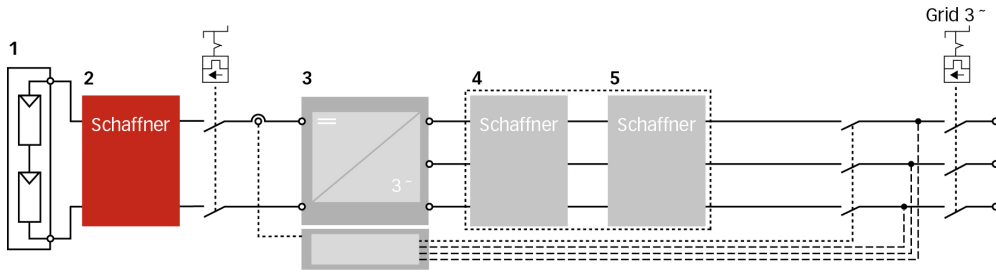
250 A types



400 to 2300 A types



### Typical block schematic

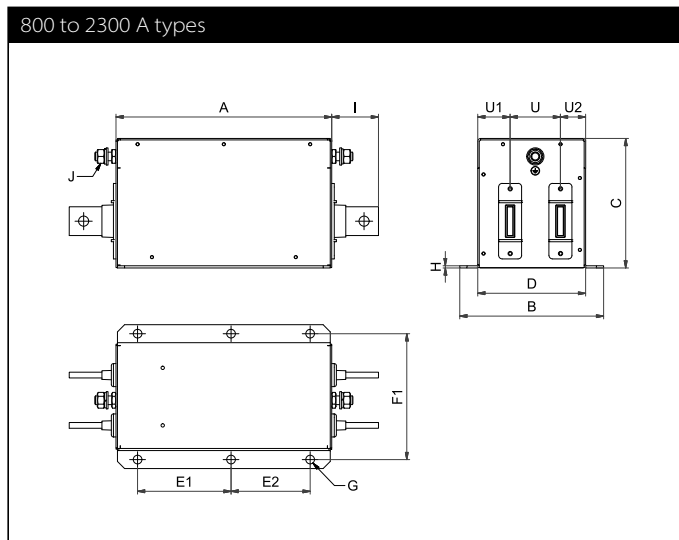
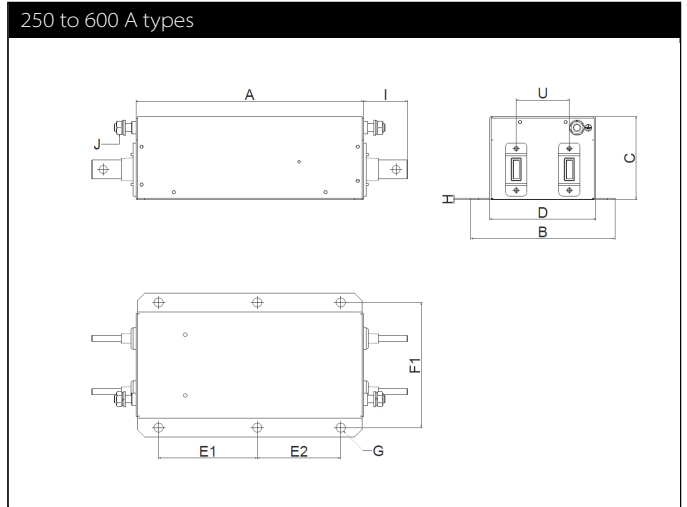
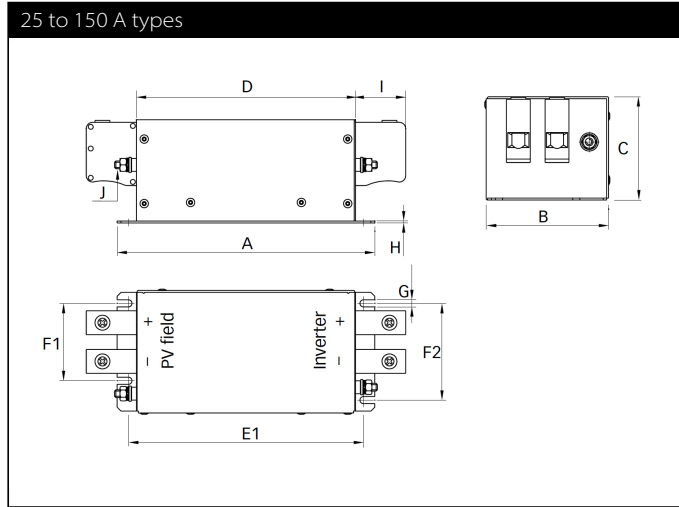


- 1 PV modules
- 2 Schaffner FN 2200

- 3 Central Inverter
- 4 Schaffner magnetic components

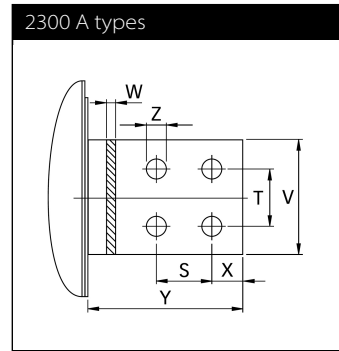
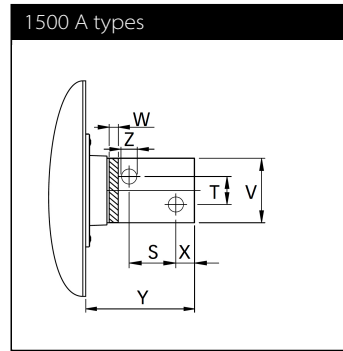
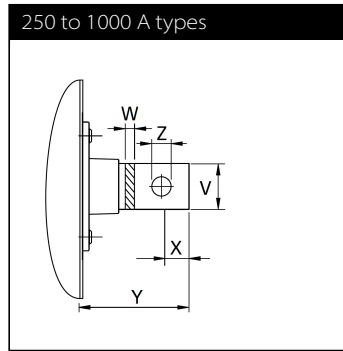
- 5 Schaffner AC EMC/EMI filter

### Mechanical data



**Note:** all FN 2200 provide unsymmetrical mounting hole patterns to prevent inverse filter installation in the field. (Dimensions E1 E2 and F1/F2)

## Busbar connections



## Dimensions

	25 A	50 A	75 A	100 A	150 A	250 A	400 A	600 A	800 A	1000 A	1500 A	2300 A
<b>A</b>	170	200	200	220	250	300	300	300	300	300	300	400
<b>B</b>	80	95	95	125	140	180	190	190	200	200	200	250
<b>C</b>	65	80	80	95	115	110	110	110	140	140	150	180
<b>D</b>	140	170	170	190	220	130	140	140	150	150	150	195
<b>E1</b>	152.5	182.5	182.5	202.5	232.5	130	130	130	130	130	130	190
<b>E2</b>						110	110	110	110	110	110	150
<b>F1</b>	45	60	60	80	100	155	165	165	175	175	175	225
<b>F2</b>	60	75	75	100	120							
<b>G</b>	5.5	5.5	5.5	5.5	5.5	Ø 12	Ø 12	Ø 12	Ø 12	Ø 12	Ø 12	Ø 12
<b>H</b>	1	1.5	1.5	1.5	2	2	2	2	3	3	3	3
<b>I</b>	25	39	39	45	51	58	58	58	65	65	110	100
<b>J</b>	M5	M6	M6	M8	M10	M10	M10	M10	M12	M12	M12	M16
<b>S</b>											43	35
<b>T</b>											26	35
<b>U</b>						70	70	70	70	70	70	100
<b>U1</b>									45	45	55	61
<b>U2</b>									35	35	25	34
<b>V</b>						20	25	25	40	40	60	70
<b>W</b>						5	6	8	8	8	10	15
<b>X</b>						15	15	15	20	20	17	20
<b>Y</b>						58	58	58	65	65	110	100
<b>Z</b>						Ø 9	Ø 10.5	Ø 10.5	Ø 14	Ø 14	Ø 14	Ø 14

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

## Filter input/output connector cross sections

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

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



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