

ECosine™ Advanced Passive Harmonic Filters



- Efficient mitigation of harmonic currents
- Compliance with IEEE 519 and other Power Quality standards
- Increased equipment service life and system reliability
- More efficient utilization of electric system capacity
- Long-term savings in system operation and maintenance cost

Approvals



Technical specifications

Nominal operating voltage:	3x 380 to 500VAC ±10% (FN 3410/11) 3x 380 to 480VAC ±10% (FN 3412/13)
Operating frequency:	50Hz ±1Hz (FN 3410/11) 60Hz ±1Hz (FN 3412/13)
Nominal motor drive input power rating:	4 to 200kW (FN 3410/11) 5 to 250HP (FN 3412/13)
Total harmonic current distortion THID**:	<5% @ rated power
Total demand distortion TDD:	According to IEEE-519, table 10-3
Efficiency:	98.5 to 99.5% @ nominal line voltage and power
High potential test voltage:	P → E 2500VAC (1min)
Protection category:	IP20 / NEMA1
Cooling:	Internal fan cooling
Overload capability:	1.6x rated current for 1 minute, once per hour
Ambient temperature range:	-25°C to +50°C fully operational +50°C to +70°C derated operation*** -25°C to +85°C transport and storage
Flammability corresponding to:	UL 94V-2 or better
Design corresponding to:	UL 508, EN 61558-2-20, CE (LVD 2006/95/EC)
MTBF @ 50°C/460V (Mil-HB-217F):	200,000 hours
SCCR****:	100kA

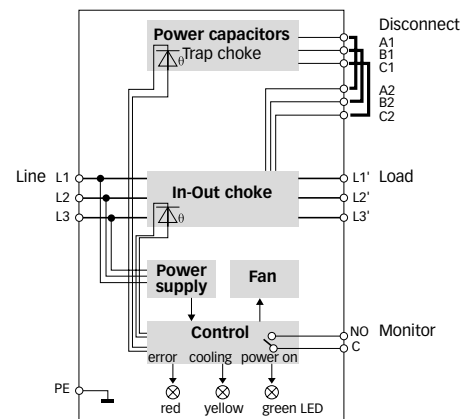
* ECosine filters reduce RMS input and peak current by reducing harmonic currents and improving true power factor.
 ** System requirements: THVD <2%, line voltage unbalance <1%
 Note: performance specifications in this brochure refer to six-pulse diode rectifiers. SCR rectifier front-ends will produce different results, dependent upon the firing angle of the thyristors.
 *** $I_{derated} = I_{nominal} * \sqrt{(85°C - T_{amb}) / 35°C}$
 **** External UL-rated fuses required. Please consult the user manual.

Features and benefits

Schaffner ECosine™ harmonic filters represent an economical solution to the challenge of load-applied harmonics mitigation in three-phase power systems. With a plug-and-play approach and more compact dimensions than comparable products, they can be quickly installed and easily commissioned. They increase the reliability and service life of electric installations, help utilize electric system capacity better, and are the key to meet Power Quality standards such as IEEE 519.

ECosine™ filters calm your harmonic waves. Schaffner ECosine™ filters can be applied to virtually any kind of power electronics with front-end six-pulse rectifiers, where harmonic current distortion needs to be reduced to defined limits. Typical applications, where the above-mentioned non-sinusoidal consumers of power can account for a significant portion of the load, include:

Typical electrical schematic



Typical applications




- Equipment with front-end six-pulse rectifier
- Motor drives
- Factory automation equipment
- Water/wastewater treatment facilities
- Fan and pump applications
- HVAC installations
- Mission-critical processes
- DC fast chargers

Filter selection table FN 3410/11

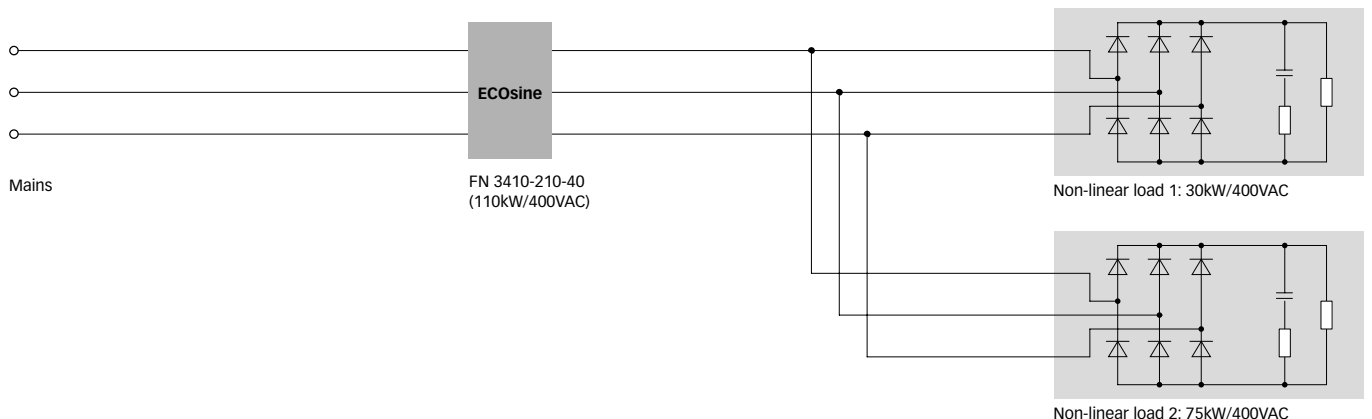
Filter*	Rated load power @ 400VAC/50Hz	Rated load power @ 500VAC/50Hz	Power loss** @ 400V/500V	Input/Output connections	Capacitor disconnections	Weight [kg]	NEMA1 covers***
	[kW]	[kW]	[W]				Order code
FN 341x-10-44	4	5.5	60/83	-44	-44	13	1151-081
FN 341x-13-44	5.5	7.5	83/113	-44	-44	14	1151-081
FN 341x-16-44	7.5	11	113/165	-44	-44	21	1151-082
FN 341x-24-33	11	15	165/225	-33	-44	27	1151-083
FN 341x-32-33	15	18.5	225/278	-33	-44	31	1151-083
FN 341x-38-33	18.5	22	259/308	-33	-44	35	1151-083
FN 341x-45-34	22	30	286/390	-34	-33	45	1151-084
FN 341x-60-34	30	37	360/444	-34	-33	54	1151-084
FN 341x-75-35	37	45	407/495	-35	-34	65	1151-085
FN 341x-90-35	45	55	450/550	-35	-34	77	1151-085
FN 341x-110-35	55	75	495/675	-35	-34	86	1151-085
FN 341x-150-40	75	90	600/720	-40	-35	118	1151-086
FN 341x-180-40	90	110	630/770	-40	-35	136	1151-086
FN 341x-210-40	110	132	770/924	-40	-35	154	1151-086
FN 341x-260-99	132	160	792/960	-99	-35	201	1151-086
FN 341x-320-99	160	200	960/1200	-99	-35	201	1151-086

- * To compile a complete part number, please replace the x with a 0 for diode or 1 for SCR rectifiers.
Filter to be selected by system voltage and load (motor drive) power. Note: the harmonic filter will reduce the RMS input current. Example: the rated RMS input current of an unfiltered 400V/15kW/32A drive will be reduced to approximately 23A. Therefore, filter selection by current rating, as it is common for EMC/EMI filters, is not suitable.
- ** Calculated power loss at rated load power.
- *** Please contact your local Schaffner partner to order the optional NEMA1 covers with the order code in the table above.

Filter selection table FN 3412/13

Filter*	Rated load power @ 460VAC/60Hz	Power loss** @ 460V	Input/Output con- nections	Capacitor disconnections	Weight [kg]	NEMA1 covers***
	[HP]	[W]	 			Order code
FN 341x-8-44	5	56	-44	-44	12	1151-081
FN 341x-11-44	7.5	84	-44	-44	13	1151-081
FN 341x-15-44	10	112	-44	-44	17	1151-082
FN 341x-21-44	15	168	-44	-44	21	1151-082
FN 341x-28-33	20	209	-33	-44	28	1151-083
FN 341x-35-33	25	261	-33	-44	32	1151-083
FN 341x-41-33	30	291	-33	-33	35	1151-083
FN 341x-53-34	40	328	-34	-33	48	1151-084
FN 341x-65-34	50	373	-34	-34	52	1151-084
FN 341x-80-35	60	403	-35	-34	69	1151-085
FN 341x-105-35	75	447	-35	-34	77	1151-085
FN 341x-130-35	100	522	-35	-35	87	1151-085
FN 341x-160-40	125	559	-40	-35	124	1151-086
FN 341x-190-40	150	671	-40	-35	132	1151-086
FN 341x-240-99	200	746	-99	-35	185	1151-086
FN 341x-310-99	250	932	-99	-35	202	1151-086

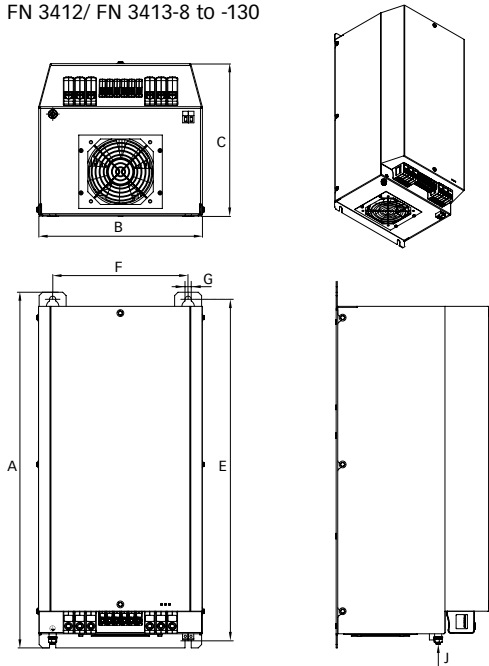
- * To compile a complete part number, please replace the x with a 2 for diode or 3 for SCR rectifiers.
Filter to be selected by system voltage and load (motor drive) power. Note: the harmonic filter will reduce the RMS input current. Example: the rated RMS input current of an unfiltered 460V/20HP/28A drive will be reduced to approximately 20A. Therefore, filter selection by current rating, as it is common for EMC/EMI filters, is not suitable.
- ** Calculated power loss at rated load power.
- *** Please contact your local Schaffner partner to order the optional NEMA1 covers with the order code in the table above.



Mechanical data

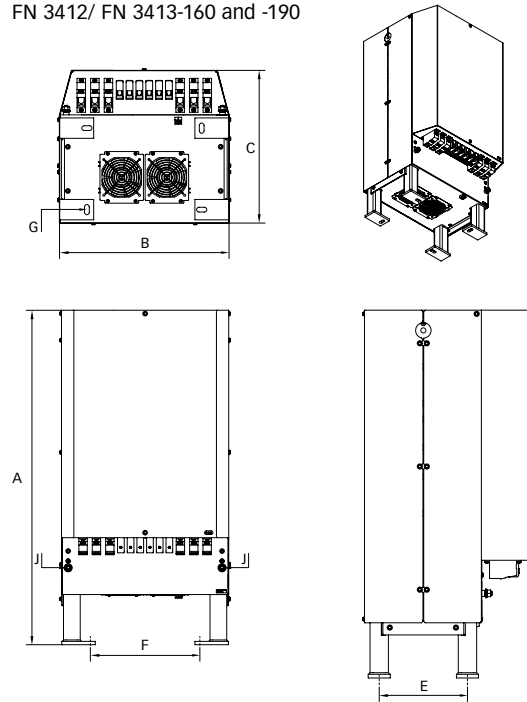
FN 3410/ FN 3411-10 to -110

FN 3412/ FN 3413-8 to -130



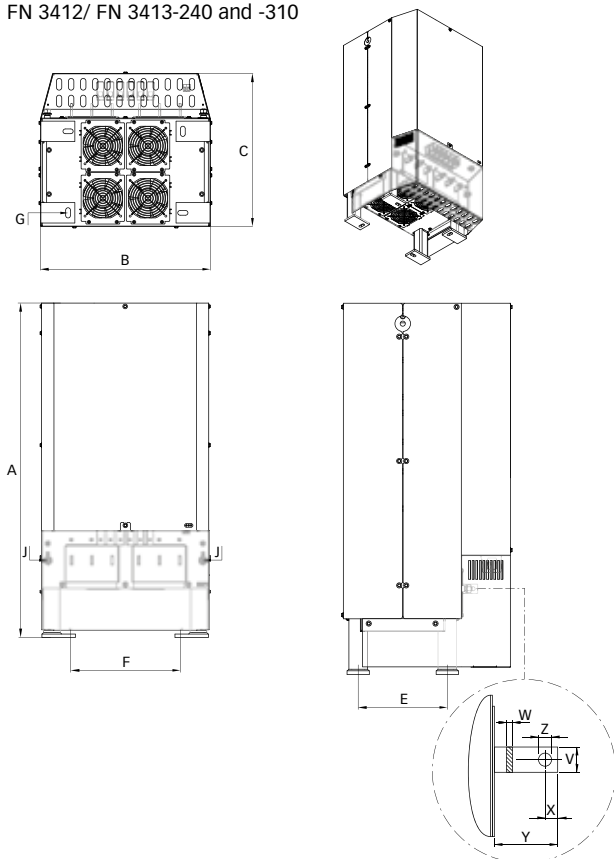
FN 3410/ FN 3411-150 to -210

FN 3412/ FN 3413-160 and -190



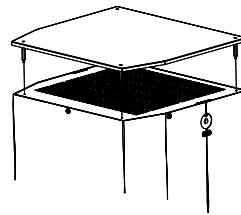
FN 3410/ FN 3411-260 and -320

FN 3412/ FN 3413-240 and -310



Installation. All filters from FN 341x-8 to -130 are wall mountable and have to be operated vertically. The filters FN 341x-150 and higher are designed for floor mounting. In order to allow for sufficient air flow all filters must be clear on top and bottom min. 150mm.

Optional NEMA1 cover. All filters can be optionally fitted with a NEMA1 cover. Please find order codes on previous pages.








Dimensions

FN 3410/ FN 3411-...	10	13	16		24	32	38	45	60	75	90	110	150	180	210	260	320
FN 3412/ FN 3413-...	8	11	15	21	28	35	41	53	65	80	105	130	160	190		240	310
A	400	400	430	430	520	520	520	590	590	750	750	750	1000	1000	1000	1000	1000
B	170	170	210	210	250	250	250	300	300	320	320	320	500	500	500	500	500
C	190	190	210	210	280	280	280	300	300	300	300	300	450	450	450	450	450
E	380	380	410	410	495	495	495	565	565	725	725	725	240	240	240	240	240
F	130	130	170	170	200	200	200	250	250	270	270	270	338	338	338	338	338
G	7	7	9	9	11	11	11	11	11	11	11	11	14x30	14x30	14x30	14x30	14x30
J	M6	M6	M6	M6	M8	M8	M8	M8	M8	M10	M10	M10	M10	M10	M10	M10	M10
V																25	25
W																6	6
X																12.5	12.5
Y																40	40
Z																11	11

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

Filter connector cross sections

	-33	-34	-35	-40	-44
					
Solid wire	16mm ²	35mm ²	50mm ²	95mm ²	10mm ²
Flex wire	10mm ²	25mm ²	50mm ²	95mm ²	6mm ²
AWG type wire	AWG 6	AWG 2	AWG 1/0	AWG 4/0	AWG 8
Recommended torque	1.5 – 1.8Nm	4.0 – 4.5Nm	7 – 8Nm	17 – 20Nm	1.0 – 1.2Nm

Please visit www.schaffner.com to find more details on filter connectors.

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