

# Harmonic filters FN 3416 / FN 3418

## ECOsine™ Compact economy line of passive harmonic filters

**SCHAFFNER**  
energy efficiency and reliability



- Help to comply with IEEE-519, table 10-3 (TDD)
- Help to comply with EN61000-3-12, table 3 (THD)
- Support an efficient utilization of electrical system capacity
- Ideal for motor drives with 6-pulse rectifier front-end
- Same filter for both diode and thyristor (SCR) rectifiers

### Approvals

**UL** US LISTED  
(in preparation) **CE**

**ROHS**

### Technical specifications

Nominal operating voltage:	3x 380 to 500 VAC ±10% (FN 3416) 3x 380 to 480 VAC ±10% (FN 3418)
Operating frequency:	50 Hz ± 1 Hz (FN3416) 60 Hz ± 1 Hz (FN3418)
Nominal motor drive input power rating:	4 to 200 kW (FN3416) 5 to 250 HP (FN3418)
Total harmonic current distortion THID*:	According to EN61000-3-12, table 3 <10% @ rated power (with L <sub>dc</sub> ) <15% @ rated power (without L <sub>dc</sub> )
Total demand distortion TDD:	According to IEEE-519, table 10-3
Efficiency:	>98% @ nominal line voltage and power
High potential test voltage:	P → E 2500 VAC (2 sec)
Protection category:	IP20
Cooling:	Internal fan cooling, unregulated
Overload capability:	1.6x rated current for 1 minute, once per hour
Ambient temperature range:	-25°C to +45°C fully operational +45°C to +55°C derated operation** -25°C to +70°C transport and storage
Flammability corresponding to:	UL 94 V-2 or better
Design corresponding to:	UL508, EN61558-2-20, CE (LVD2006/95/ EC)
MTBF @ 45°C/500V (Mil-HB-217F):	200 000 hours
SCCR***:	100 kA

\* System requirements: THVD <2%, line voltage unbalance <1%

Note: performance specifications in this datasheet refer to six-pulse diode rectifiers. SCR rectifier front-end will produce different results, depending upon the firing angle of the thyristors.

\*\* I<sub>derated</sub> = I<sub>nominal</sub> \* √((70°C - T<sub>amb</sub>) / 25°C)

\*\*\* External UL-rated fuses required.

### Features and benefits

FN3416 (50Hz) and FN3418 (60Hz) models of the ECOsine™ product family represent the very compact "economy line" of load-applied passive harmonic filters.

They are ideal for non-linear three-phase equipment with B6 rectifier front-end that do not require the industry leading performance provided by Schaffner ECOsine™ FN3410/12 filters.

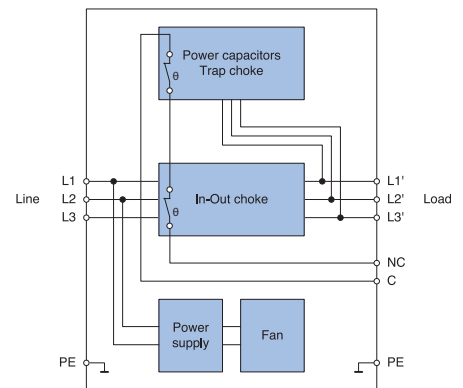
The performance, however, is still sufficient to comply with EN61000-3-12 (for THD) or with IEEE-519, table 10-3 (for TDD).

Schaffner ECOsine™ filters help to unburden the electrical infrastructure from excess loading and heat caused by current harmonics, and therefore support a better utilization of electric system capacity.

Lower harmonics also reduce the risk of system resonances and potential downtime of sensitive electronic equipment.

FN3416/18 filters upgrade standard motor drives to "low-harmonic drives" quickly and easily.

### Typical electrical schematic

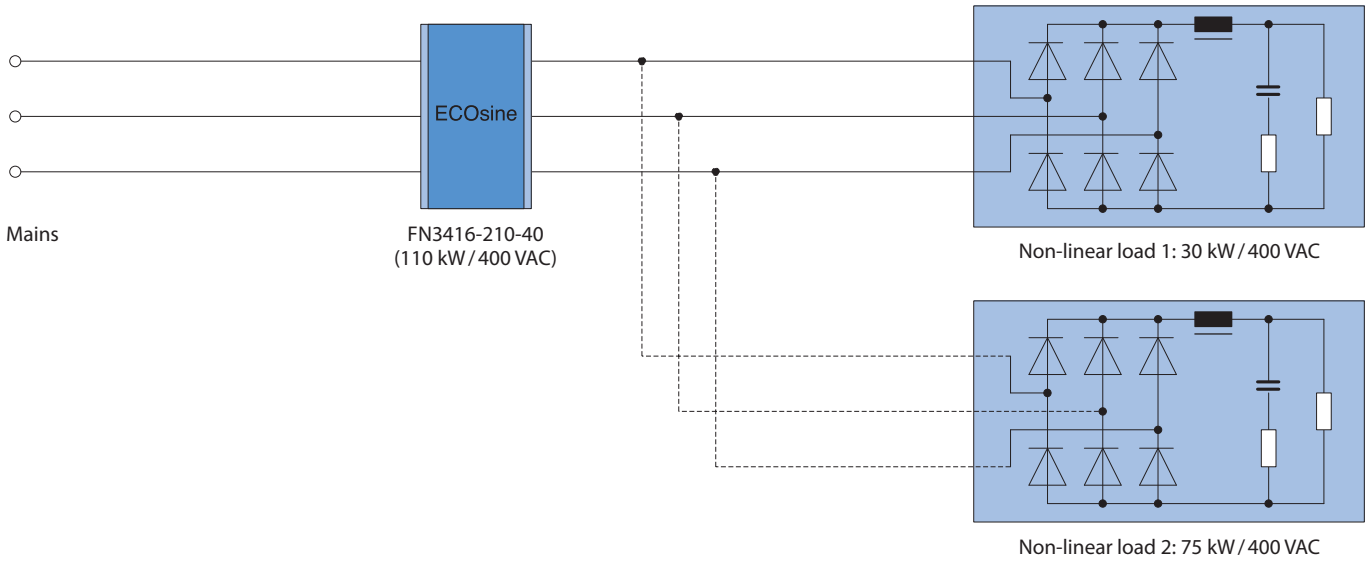


### Typical applications

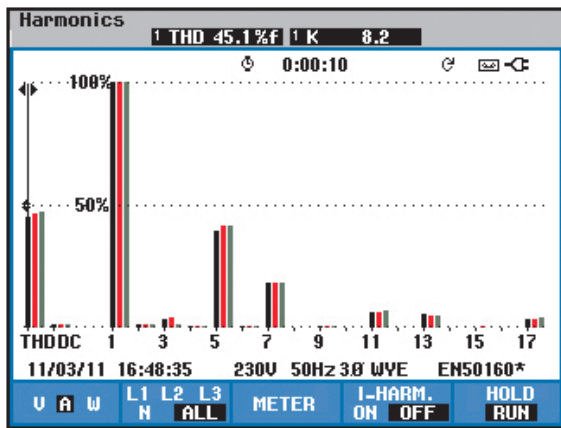
- Three-phase power conversion equipment with front-end six-pulse rectifier (diode or SCR)
- Motor drives, like those used e.g. in pump and fan applications
- Battery chargers, incl. DC fast chargers for e-cars

**Filter application**

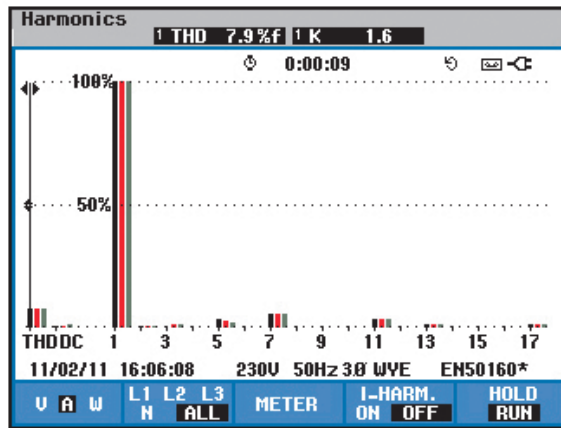
ECOsine™ filters are best installed directly at the input of 6-pulse rectifiers. It is possible to connect several non-linear loads (e.g. motor drives) in parallel. In this case the rating of the filter must match the sum of the power ratings of drives connected to it. The use of a (built-in) DC-link choke is recommended for best harmonics mitigation performance. If the expected input power exceeds the rating of the largest available filter, and a custom solution is not desired, then two or more filters can be wired in parallel. In this mode of operation, it is recommended to use filters with equal power ratings to ensure proper current sharing.



**Typical filter performance**




Motor drive with  $L_{dc}$   
without harmonic filter



Motor drive with  $L_{dc}$   
with ECOsine™ FN3416


Filter selection table FN3416

Filter*	Rated load power @ 400 VAC / 50 Hz	Rated load power @ 500 VAC / 50 Hz	Power loss** @ 25 °C / 50 Hz	Input/output connections	Weight
	[kW]	[kW]	[W]		[kg]
FN3416-10-44	4	5.5	63	-44	10
FN3416-13-44	5.5	7.5	82	-44	10
FN3416-16-44	7.5	11	105	-44	15
FN3416-24-33	11	15	153	-33	20
FN3416-32-33	15	18.5	294	-33	22
FN3416-38-33	18.5	22	256	-33	25
FN3416-45-33	22	30	306	-33	29
FN3416-60-34	30	37	408	-34	37
FN3416-75-34	37	45	410	-34	43
FN3416-90-35	45	55	493	-35	47
FN3416-110-35	55	75	546	-35	50
FN3416-150-40	75	90	784	-40	86
FN3416-180-40	90	110	817	-40	92
FN3416-210-40	110	132	887	-40	100
FN3416-260-99	132	160	947	-99	125
FN3416-320-99	160	200	988	-99	135

\* Filter to be selected by system voltage and load (motor drive) power. Note: the harmonic filter will reduce RMS input current. Therefore, filter selection by current rating, as it is common for EMC/EMI filters, is not recommended.

\*\* Calculated power loss at rated load power.

Filter selection table FN3418

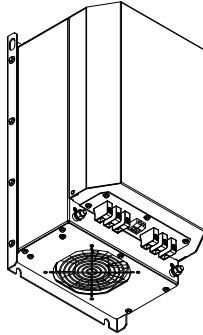
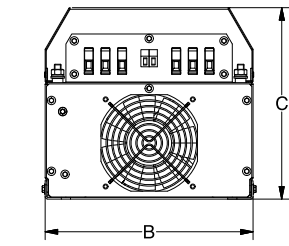
Filter*	Rated load power @ 460 VAC / 60 Hz	Power loss** @ 25 °C / 60 Hz	Input/output connections	Weight
	[HP]	[W]		[kg]
FN3418-8-44	5	41	-44	10
FN3418-11-44	7.5	81	-44	10
FN3418-15-44	10	72	-44	16
FN3418-21-33	15	152	-33	20
FN3418-28-33	20	214	-33	22
FN3418-35-33	25	277	-33	25
FN3418-41-33	30	289	-33	28
FN3418-53-34	40	383	-34	38
FN3418-65-34	50	393	-34	42
FN3418-80-35	60	493	-35	45
FN3418-105-35	75	514	-35	54
FN3418-130-40	100	741	-40	78
FN3418-160-40	125	832	-40	87
FN3418-190-40	150	873	-40	100
FN3418-240-99	200	876	-99	126
FN3418-310-99	250	984	-99	135

\* Filter to be selected by system voltage and load (motor drive) power. Note: the harmonic filter will reduce RMS input current. Therefore, filter selection by current rating, as it is common for EMC/EMI filters, is not suitable.

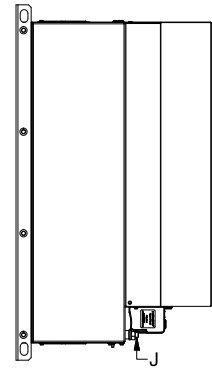
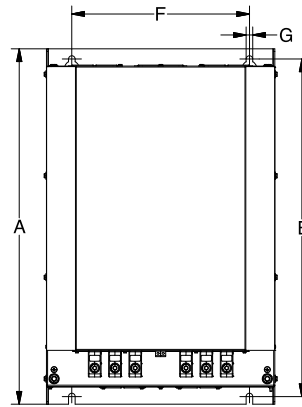
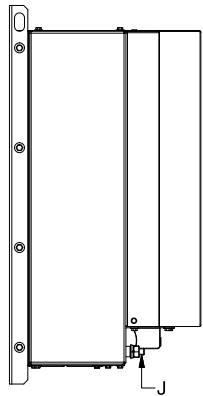
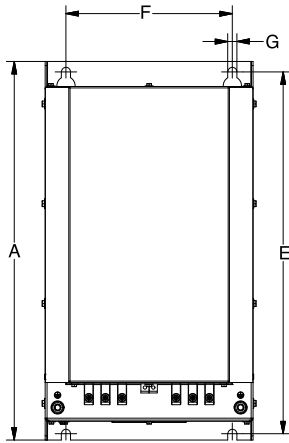
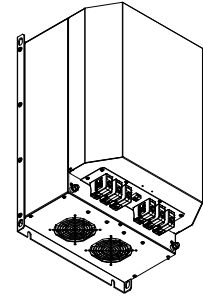
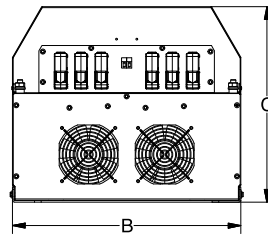
\*\* Calculated power loss at rated load power.

Mechanical Data:

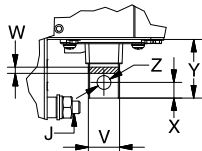
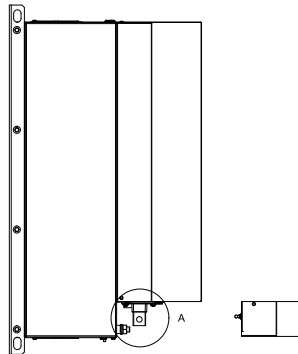
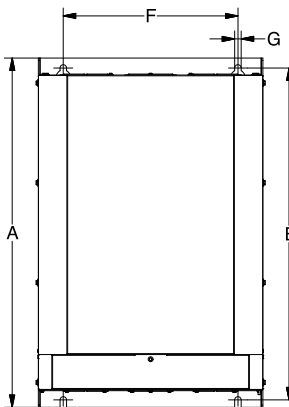
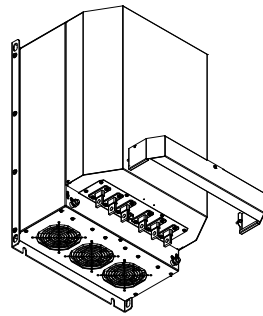
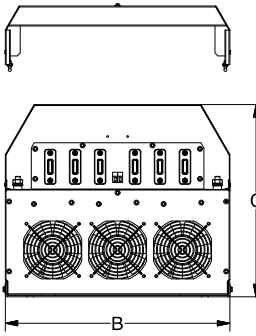
FN3416-10 to -110  
FN3418-8 to -105



FN3416-150 to -210  
FN3418-130 to -190



FN3416-260 to -320  
FN3418-240 to -310








## Dimensions

FN3416-...	10	13	16	24	32	38	45	60	75	90	110	150	180	210	260	320
FN3418-...	8	11	15	21	28	35	41	53	65	80	105	130	160	190	240	310
<b>A</b>	390	390	390	455	455	455	455	520	520	580	580	700	700	700	700	700
<b>B</b>	185	185	185	250	250	250	250	280	280	280	280	450	450	450	450	450
<b>C</b>	190	190	190	230	230	230	230	248	248	248	248	385	385	385	385	385
<b>E</b>	370	370	370	435	435	435	435	500	500	555	555	665	665	665	665	665
<b>F</b>	140	140	140	200	200	200	200	225	225	225	225	350	350	350	350	350
<b>G</b>	9	9	9	11	11	11	11	11	11	11	11	13	13	13	13	13
<b>J</b>	M6	M6	M6	M8	M8	M8	M8	M8	M8	M10	M10	M10	M10	M10	M10	M10
<b>V</b>																25
<b>W</b>																6
<b>X</b>																12.5
<b>Y</b>																47
<b>Z</b>																11

All dimensions in mm; 1 inch = 25.4 mm

Tolerances according to: ISO 2768-m / EN 22768-m

## Filter connector cross sections

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

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

## Installation

For more detailed information and step by step installation guidelines, please consult the user manual at [www.schaffner.com](http://www.schaffner.com) or the installation instructions (delivered with each filter).

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