

# Ecosine 60 Hz Passive Harmonic Filters



- The industry standard for 6-pulse rectifiers and motor drives
- The most compact 5% THID filter available
- Excellent behavior under partial load conditions
- Filters for diode rectifiers



## Approvals



## Technical specifications

<b>Nominal operating voltage</b>	3x 380 to 480 VAC ±10%
<b>Operating frequency</b>	60 Hz ±1 Hz
<b>Total harmonic current distortion THID*</b>	<5% @ rated power
<b>Total demand distortion TDD</b>	According to IEEE-519
<b>Nominal motor drive input power rating</b>	5 to 250 HP
<b>Efficiency</b>	98.5 to 99.5% @ nominal line voltage and power
<b>High potential test voltage</b>	P → E 2500 VAC (1 min)
<b>Protection category</b>	IP 20/NEMA 1
<b>Cooling</b>	Internal fan cooling
<b>Ambient temperature range</b>	-25°C to +50°C fully operational -25°C to +80°C transport and storage +50°C to +55°C derated operation***
<b>Overload capability</b>	1.6x rated current for 1 minute, once per hour
<b>Flammability corresponding to</b>	UL 94 V-2 or better
<b>Design corresponding to</b>	UL 508, EN 61558-2-20, CE (LVD 2006/95/EC)
<b>MTBF @ 50°C/460 V (Mil-HB-217F)</b>	200,000 hours
<b>SCCR****</b>	100 kA
<b>Earthing System</b>	TN, TT, IT

\* 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.

\*\* Ecosine filters reduce RMS input and peak current by reducing harmonic currents and improving true power factor.

\*\*\*  $I_{derated} = I_{nominal} * \sqrt{\frac{(T_{max}-T_{amb})}{(T_{max}-T_{nominal})}} = I_{nominal} * \sqrt{\frac{(55^{\circ}C-T_{amb})}{5^{\circ}C}}$

\*\*\*\* External UL-rated fuses required. Please consult the user manual.

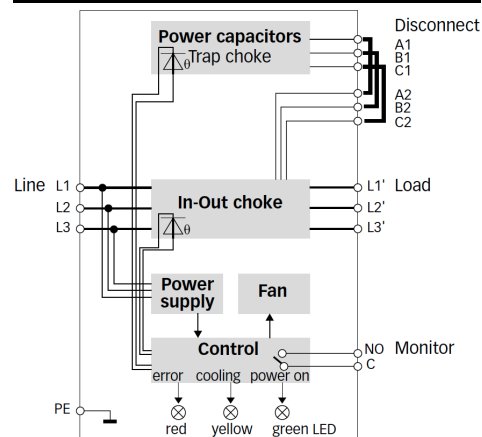
## Features and benefits

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 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

## Typical electrical schematic



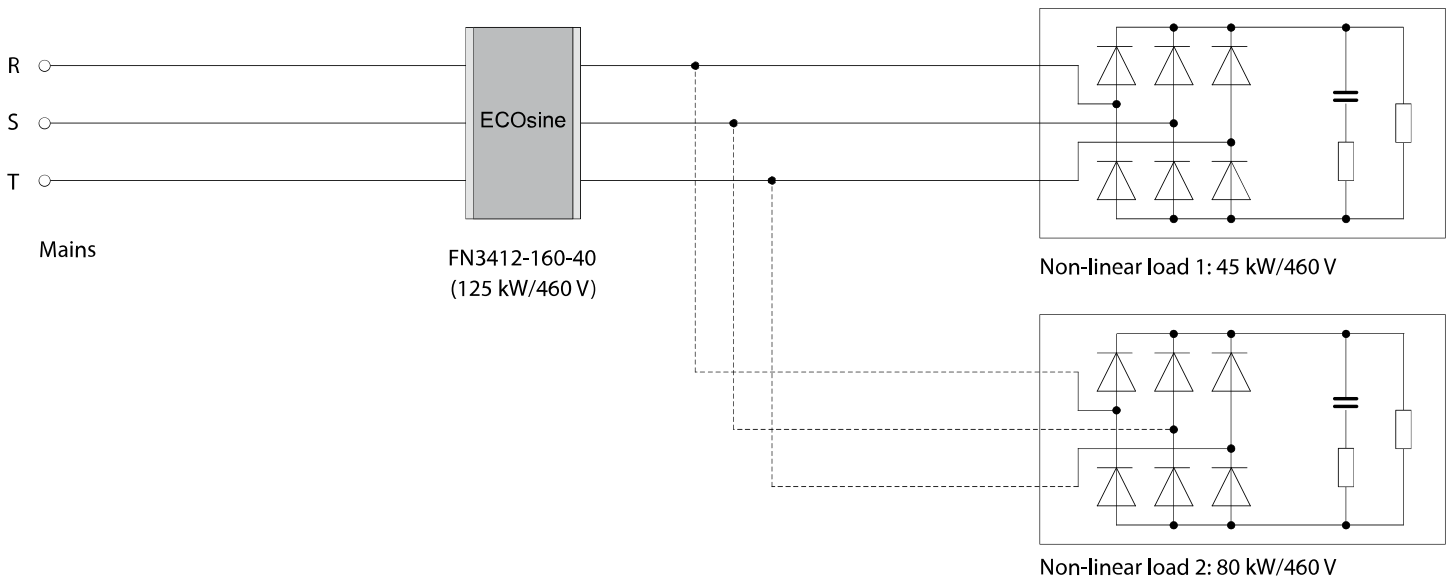
### Filter selection table FN 3412

Filter*	Rated load power @ 460 VAC/60 Hz	Power loss** @ 460 V	Input/Output Connections		Capacitor disconnections	Weight	NEMA 1 covers***
	[HP]	[W]				[kg]	Order code
FN 3412-8-44	5	56	-44		-44	12	803565
FN 3412-11-44	7.5	84	-44		-44	13	803565
FN 3412-15-44	10	112	-44		-44	17	803566
FN 3412-21-44	15	168	-44		-44	21	803566
FN 3412-28-33	20	209	-33		-44	28	803567
FN 3412-35-33	25	261	-33		-44	32	803567
FN 3412-41-33	30	291	-33		-44	35	803567
FN 3412-53-34	40	328	-34		-33	48	803568
FN 3412-65-34	50	373	-34		-33	52	803568
FN 3412-80-35	60	403	-35		-34	69	803569
FN 3412-105-35	75	447	-35		-34	77	803569
FN 3412-130-35	100	522	-35		-34	87	803569
FN 3412-160-40	125	559	-40		-35	124	803570
FN 3412-190-40	150	671	-40		-35	132	803570
FN 3412-240-99	200	746		-99	-35	185	803570
FN 3412-310-99	250	932		-99	-35	202	803570

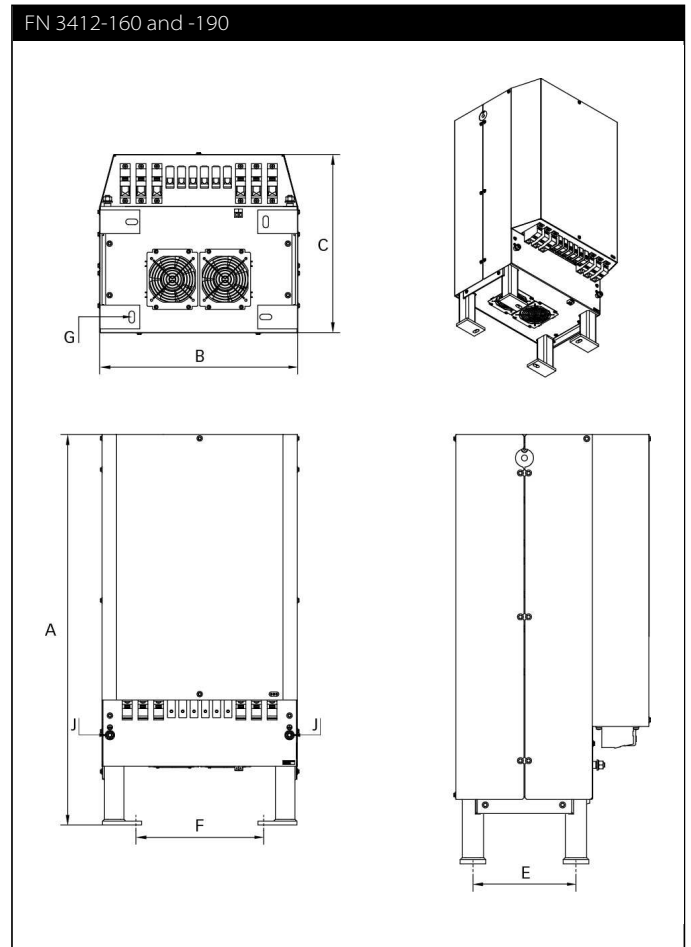
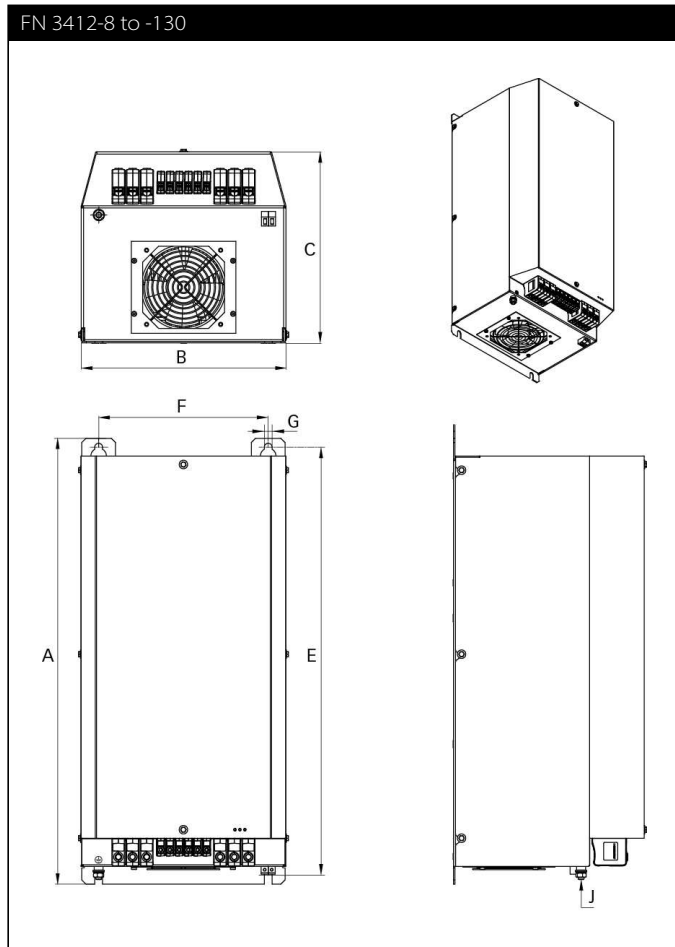
\* Filter to be selected by system voltage and load (motor drive) power. Note: the harmonic filter will reduce the RMS input current. Example: the rated RMS input current of an unfiltered 460 V/20 HP/28 A drive will be reduced to approximately 20 A. Therefore, filter selection by current rating, as it is common for EMC/EMI filters, is not suitable.

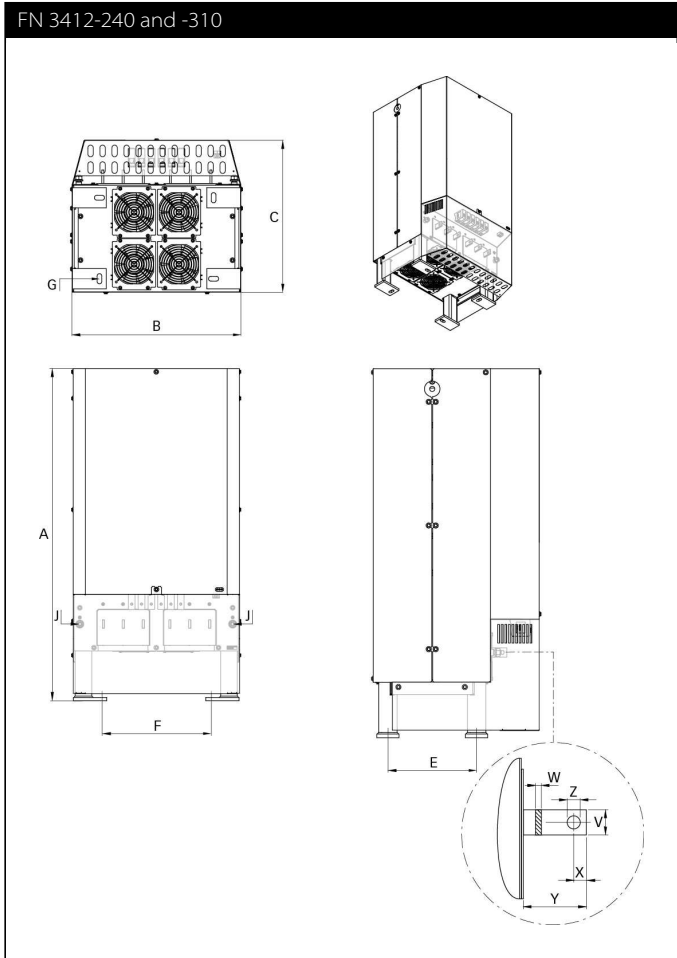
\*\* Calculated power loss at rated load power.

\*\*\* Please contact your local Schaffner partner to order the optional NEMA 1 covers with the order code in the table above.



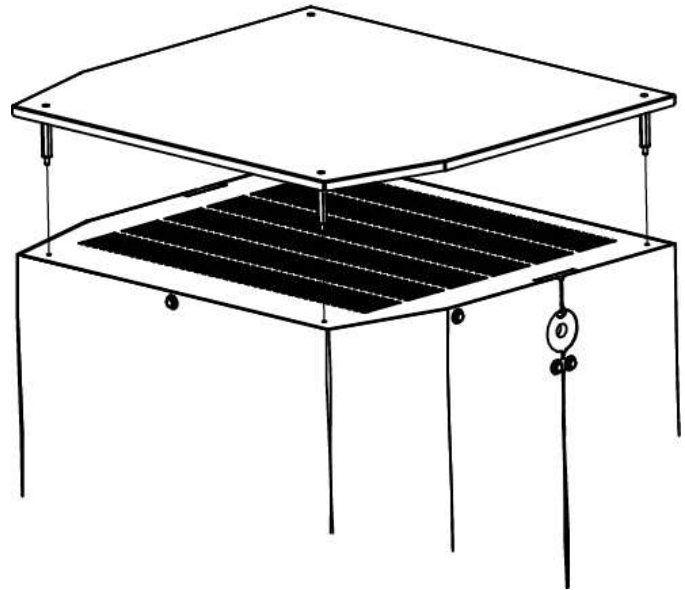
### Mechanical data





**Installation.** All filters from FN 3412-8 to -130 are wall mountable and have to be operated vertically. The filters FN 3412-150 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. 150 mm.

**Optional NEMA 1 cover.** All filters can be optionally fitted with a NEMA 1 cover. Please find order codes on previous pages.



**Dimensions FN 3412**

60 Hz	8	11	15	21	28	35	41	53	65	80	105	130	160	190	240	310
<b>A</b>	400	400	430	430	520	520	520	590	590	750	750	750	1000	1000	1000	1000
<b>B</b>	170	170	210	210	250	250	250	300	300	320	320	320	500	500	500	500
<b>C</b>	190	190	210	210	280	280	280	300	300	300	300	300	450	450	450	450
<b>E</b>	380	380	410	410	495	495	495	565	565	725	725	725	240	240	240	240
<b>F</b>	130	130	170	170	200	200	200	250	250	270	270	270	338	338	338	338
<b>G</b>	7	7	9	9	11	11	11	11	11	11	11	11	14x30	14x30	14x30	14x30
<b>J</b>	M6	M6	M6	M6	M8	M8	M8	M8	M8	M10	M10	M10	M10	M10	M10	M10
<b>V</b>															25	25
<b>W</b>															6	6
<b>X</b>															12.5	12.5
<b>Y</b>															40	40
<b>Z</b>															11	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.



## 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)  
[www.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)  
[www.schaffner.com.cn](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

REGUS WORLD TRADE CENTRE  
WTC, 22nd Floor Unit No 2238, Brigade  
Gateway Campus, 26/1, Dr. Rajkumar Road  
Malleswaram (W)  
560055 Bangalore  
T +91 80 67935355  
[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 Sangenjaya Bldg.  
154-0011 Tokyo  
T +81 3 5712 3650  
F +81 3 5712 3651  
[japansales@schaffner.com](mailto:japansales@schaffner.com)  
[www.schaffner.jp](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)  
[www.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)  
[www.schaffner.com.tw](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)  
[www.schaffnerusa.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.