

# 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<br>-25°C to +80°C transport and storage<br>+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.

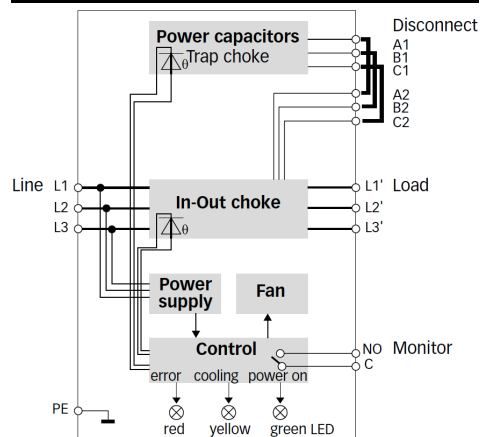
## Features and benefits

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



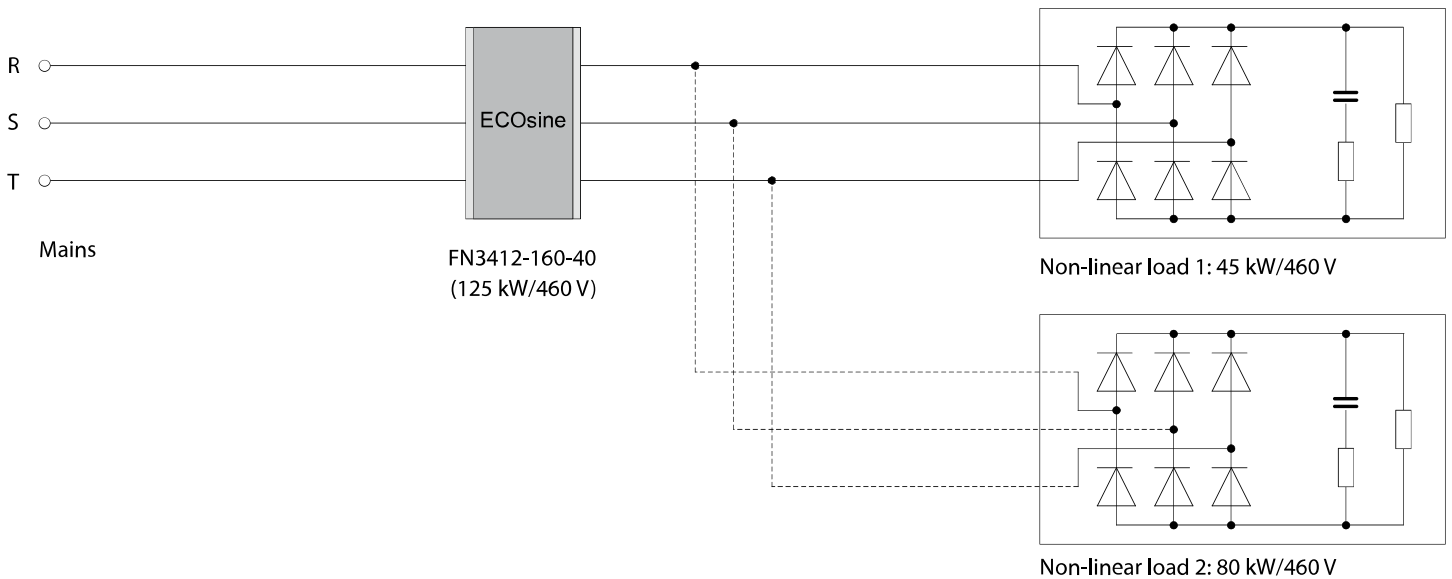
### Filter selection table FN 3412

| Filter*        | Rated load power<br>@ 460 VAC/60 Hz |     | Power loss**<br>@ 460 V |     | Input/Output<br>Connections |     | Capacitor<br>disconnections | Weight     | NEMA 1<br>covers*** |
|----------------|-------------------------------------|-----|-------------------------|-----|-----------------------------|-----|-----------------------------|------------|---------------------|
|                | [HP]                                | [W] | [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     |                     |

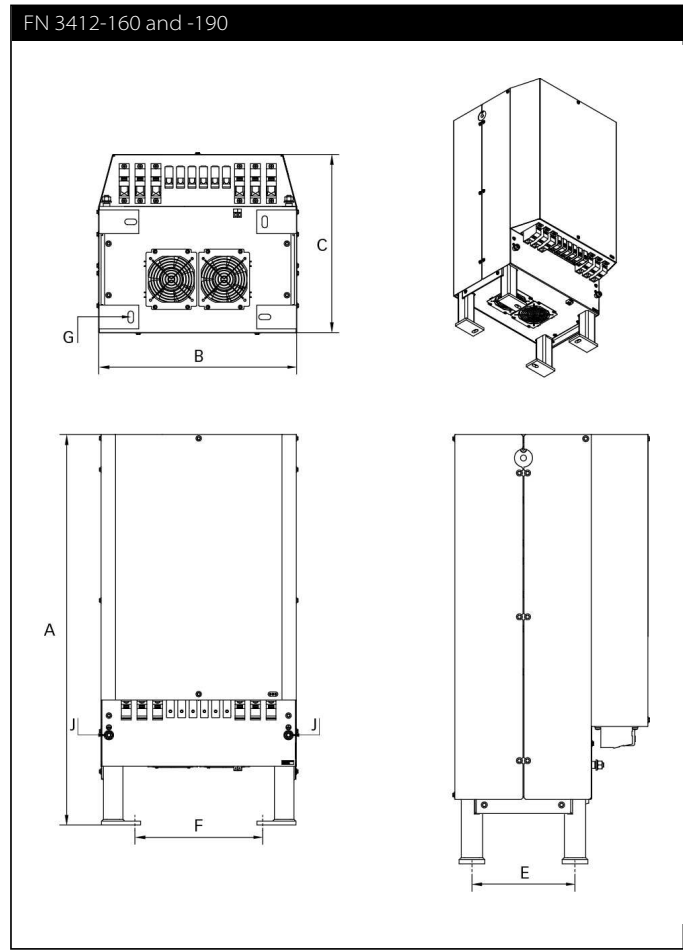
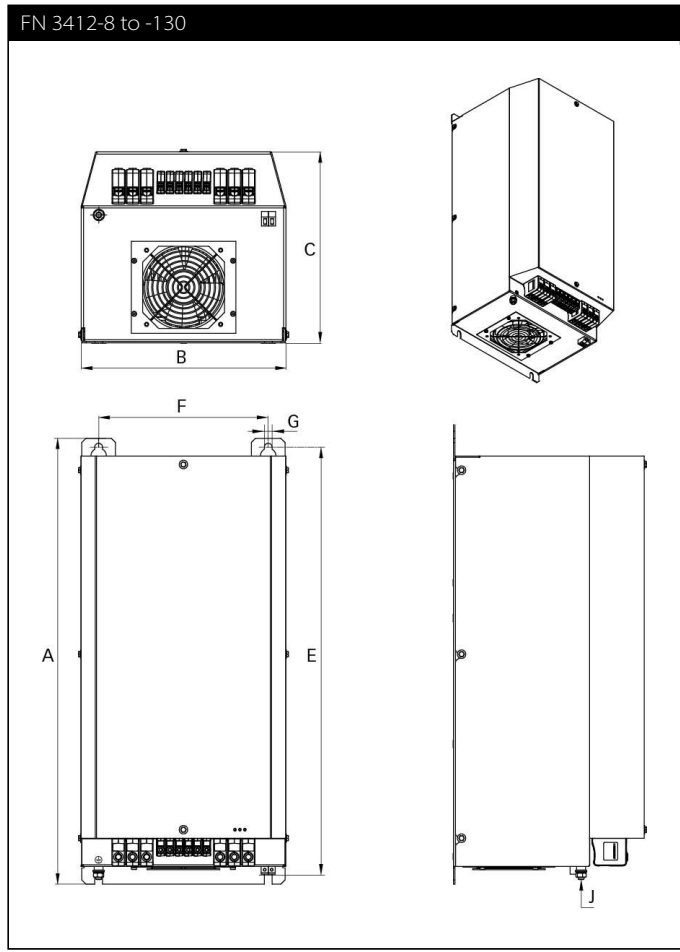
\* Filter to be selected by system voltage and load (motor drive) power. Note: the harmonic filter will reduce the RMS input current. Example: the rated RMS input current of an unfiltered 460 V/20 HP/28 A drive will be reduced to approximately 20 A. Therefore, filter selection by current rating, as it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

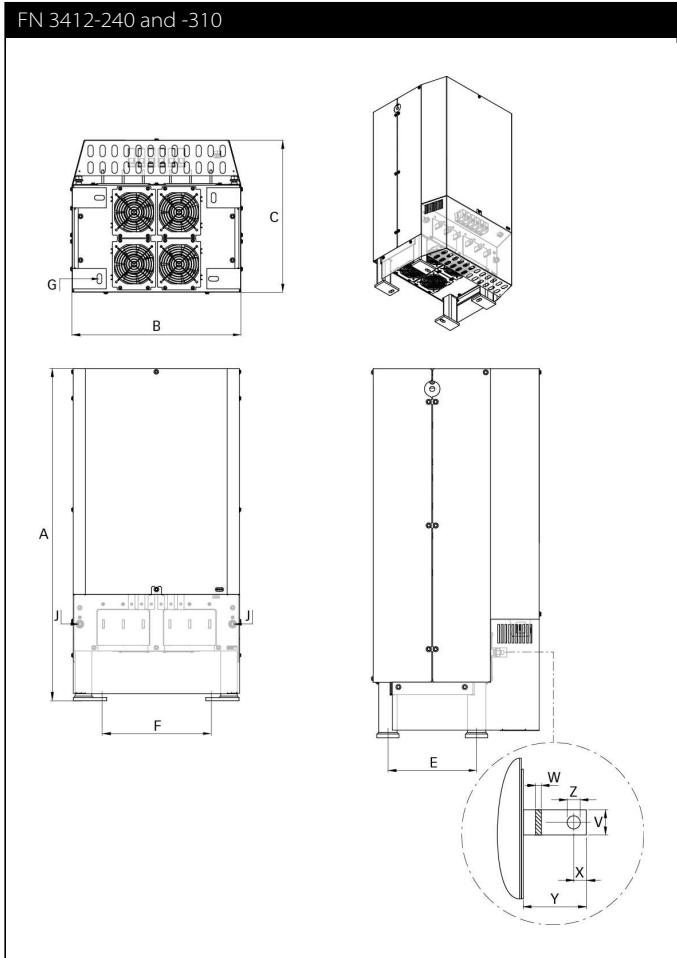
\*\* Calculated power loss at rated load power.

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



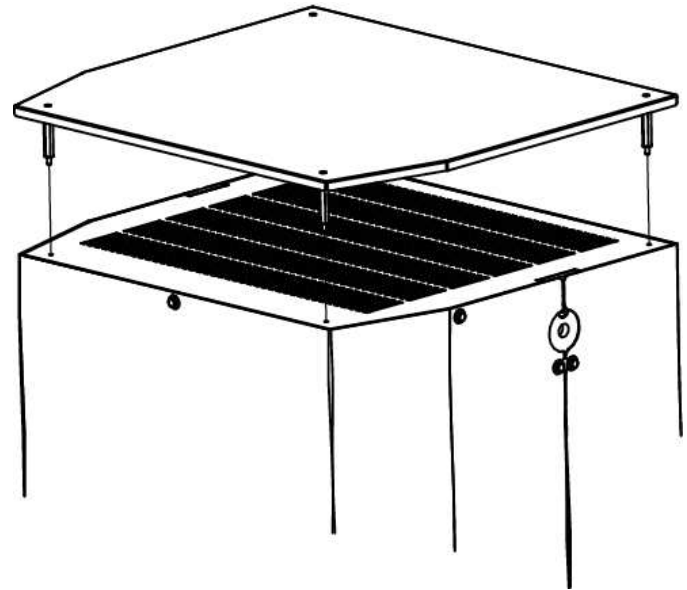
**Mechanical data**





**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.



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