Ecosine 50Hz Passive Harmonic Filters

The industry standard for 6-pulse rectifiers and motor drives
- Excellent behavior under partial load conditions
- Filters for thyristor (SCR) rectifiers

Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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<tbody>
<tr>
<td>Nominal operating voltage</td>
<td>3x 380 to 500 VAC ±10%</td>
</tr>
<tr>
<td>Operating frequency</td>
<td>50 Hz ±1 Hz</td>
</tr>
<tr>
<td>Total harmonic current distortion THID*</td>
<td>&lt;5 % @ rated power</td>
</tr>
<tr>
<td>Total demand distortion TDD</td>
<td>According to IEEE-519</td>
</tr>
<tr>
<td>Nominal motor drive input power rating</td>
<td>98.5 to 99.5% @ nominal line voltage and power</td>
</tr>
<tr>
<td>Efficiency</td>
<td>4 to 160 kW</td>
</tr>
<tr>
<td>High potential test voltage</td>
<td>P -&gt; E 2500 VAC (1 min)</td>
</tr>
<tr>
<td>Protection category</td>
<td>IP 20/NEMA 1</td>
</tr>
<tr>
<td>Cooling</td>
<td>Internal fan cooling</td>
</tr>
<tr>
<td>Overload capability</td>
<td>1.6x rated current for 1 minute, once per hour</td>
</tr>
<tr>
<td>Ambient temperature range</td>
<td>-25°C to +50°C fully operational</td>
</tr>
<tr>
<td></td>
<td>-25°C to +80°C transport and storage</td>
</tr>
<tr>
<td></td>
<td>+50°C to +55°C derated operation***</td>
</tr>
<tr>
<td>Flammability corresponding to</td>
<td>UL 94V-2 or better</td>
</tr>
<tr>
<td>Design corresponding to</td>
<td>UL 508, EN 61558-2-20, CE (LVD 2006/95/EC)</td>
</tr>
<tr>
<td>MTBF @ 50°C/460 V (Mil-HB-217F)</td>
<td>200,000 hours</td>
</tr>
<tr>
<td>SCCR****</td>
<td>100 kA</td>
</tr>
<tr>
<td>Earthing System</td>
<td>TN, TT, IT</td>
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</table>

* System requirements: THVD <2%, line voltage unbalance <1%
Note: performance specifications in this brochure refer to six-pulse diode rectifiers.
** Ecosine filters reduce RMS input and peak current by reducing harmonic currents and improving true power factor.
*** \( I_{\text{derated}} = I_{\text{nominal}} \times \sqrt{\frac{(T_{\text{max}}-T_{\text{ambient}})}{(T_{\text{nominal}}-T_{\text{ambient}})/5^\circ C}} \)
**** 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 meeting 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

![Typical electrical schematic](image-url)
### Filter selection table FN 3411

<table>
<thead>
<tr>
<th>Filter*</th>
<th>Rated load power @ 400 VAC/50 Hz [kW]</th>
<th>Rated load power @ 500 VAC/50 Hz [kW]</th>
<th>Power loss** @ 400 V/500 V [W]</th>
<th>Input/Output Connections</th>
<th>Capacitor disconnections</th>
<th>Weight [kg]</th>
<th>NEMA 1 covers***</th>
<th>Order code</th>
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<tr>
<td>FN 3411-10-44</td>
<td>4</td>
<td>5.5</td>
<td>60/83</td>
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<td>-44</td>
<td>13</td>
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<td>FN 3411-13-44</td>
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<td>7.5</td>
<td>83/113</td>
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<td>14</td>
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<tr>
<td>FN 3411-16-44</td>
<td>7.5</td>
<td>11</td>
<td>113/165</td>
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<td>21</td>
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<tr>
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<td>15</td>
<td>165/225</td>
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<td>FN 3411-32-33</td>
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<td>18.5</td>
<td>225/278</td>
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<td>-44</td>
<td>31</td>
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<td>18.5</td>
<td>22</td>
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<td>FN 3411-210-40</td>
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<td>FN 3411-260-99</td>
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* 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 400 V/15 kW/32 A drive will be reduced to approximately 23 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.

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**Diagram:**

- **Mains:**
  - FN3411-210-40 (160 kW/480 V)

- **Non-linear load 1:** 45 kW/480 V

- **Non-linear load 2:** 110 kW/480 V
Mechanical data

FN 3411-10 to -110

FN 3411-150 to -210
## Installation
All filters from FN 3411-8 to -130 are wall mountable and have to be operated vertically. The filters FN 3411-150 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 3411

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<tr>
<th>50 Hz</th>
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<th>16</th>
<th>24</th>
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</table>

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

### Filter connector cross sections

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<tr>
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<th>-33</th>
<th>-34</th>
<th>-35</th>
<th>-40</th>
<th>-44</th>
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<tbody>
<tr>
<td>Solid wire</td>
<td>16 mm²</td>
<td>35 mm²</td>
<td>50 mm²</td>
<td>95 mm²</td>
<td>10 mm²</td>
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<tr>
<td>Flex wire</td>
<td>10 mm²</td>
<td>25 mm²</td>
<td>50 mm²</td>
<td>95 mm²</td>
<td>6 mm²</td>
</tr>
<tr>
<td>AWG type wire</td>
<td>AWG 6</td>
<td>AWG 2</td>
<td>AWG 1/0</td>
<td>AWG 1/0</td>
<td>AWG 1/0</td>
</tr>
<tr>
<td>Recommended torque</td>
<td>1.5-1.8 Nm</td>
<td>4.0-4.5 Nm</td>
<td>7-8 Nm</td>
<td>17-20 Nm</td>
<td>1.0-1.2 Nm</td>
</tr>
</tbody>
</table>

Please visit [www.schaffner.com](http://www.schaffner.com) to find more details on filter connectors.
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### Headquarters, global innovation and development

**Schaffner Group**  
Nordstrasse 11  
4542 Luterbach  
T +41 32 681 66 26  
info@schaffner.com  
www.schaffner.com

### Sales and application centers

<table>
<thead>
<tr>
<th>Country</th>
<th>Address</th>
<th>Phone Numbers</th>
<th>Email Addresses</th>
</tr>
</thead>
</table>
| China   | Schaffner EMC Ltd. Shanghai  
T20-3 C, No 565 Chuangye Road,  
Pudong district  
201201 Shanghai  
T +86 21 3813 9500  
cschina@schaffner.com  
www.schaffner.com.cn | T: +86 21 3813 9500  
F: +86 21 3813 9501 | cschina@schaffner.com  
www.schaffner.com.cn |
| Finland | Schaffner Oy  
Sauvonrinne 19 H  
08500 Lohja  
T +358 50 468 7284  
finlandsales@schaffner.com | T: +358 50 468 7284  
F: +358 50 468 7285 | 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 | T: +33 1 34 34 30 60 | francesales@schaffner.com |
| Germany | Schaffner Deutschland GmbH  
Schoemperlenstrasse 128  
76185 Karlsruhe  
T +49 721 56910  
F +49 721 569110 | T: +49 721 56910  
F: +49 721 569110 | 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  
Malleshwaraparam (W)  
560055 Bangalore  
T +91 80 67935355  
indiasales@schaffner.com | T: +91 80 67935355  
F: +91 80 67935356 | indiasales@schaffner.com |
| Italy   | Schaffner EMC S.r.l.  
Via Ticino, 30  
20909 Monza (MB)  
T +39 039 21 41 070 | T: +39 039 21 41 070  
F: +39 039 21 41 071 | italysales@schaffner.com |
| Japan   | Schaffner EMC K.K.  
1-32-12, Kamiuma, Setagaya-ku  
7F Mitsu-seimei Sangenjaya Bldg.  
154-0011 Tokyo  
T +81 3 5712 3650  
F +81 3 5712 3651 | T: +81 3 5712 3650  
F: +81 3 5712 3651 | japansales@schaffner.com  
www.schaffner.jp |
| Singapore | Schaffner EMC Pte Ltd.  
#05-09, Kg Ubi Ind. Estate  
408705 Singapore  
T +65 6377 3283  
F +65 6377 3281 | T: +65 6377 3283  
F: +65 6377 3281 | singaporesales@schaffner.com |
| Spain   | Schaffner EMC España  
Calle Calendula 93, Miniparc III, Edificio E  
El Soto de Moraleja, Alcobendas  
28109 Madrid  
T +34 917 912 900  
F +34 917 912 901 | T: +34 917 912 900  
F: +34 917 912 901 | spansales@schaffner.com |
| Sweden  | Schaffner EMC AB  
Tegeluddsvägen 76, 2tr  
115 28 Stockholm  
T +46 8 5050 2425  
swedensales@schaffner.com  
www.schaffner.com | T: +46 8 5050 2425  
F: +46 8 5050 2426 | swedensales@schaffner.com  
www.schaffner.com |
| Switzerland | Schaffner EMV AG  
Nordstrasse 11  
4542 Luterbach  
T +41 32 681 66 26  
switzerlandsales@schaffner.com | T: +41 32 681 66 26  
F: +41 32 681 66 27 | 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 | T: +886 2 2697 5500  
F: +886 2 2697 5533 | taiwansales@schaffner.com  
www.schaffner.com.tw |
| Thailand | Schaffner EMC Co. Ltd.  
Northern Region Industrial Estate  
67 Moo 4 Tambon Ban Klang  
Amphur Muang P.O. Box 14  
51000 Lampun  
T +66 53 58 11 04  
F +66 53 58 10 19 | T: +66 53 58 11 04  
F: +66 53 58 10 19 | thailandsales@schaffner.com |
| United Kingdom | Schaffner Ltd.  
5 Ashville Way, Molly Millsars Lane  
Wokingham  
RG41 2PL Berkshire  
T +44 118 9770070  
F +44 118 9792969 | T: +44 118 9770070  
F: +44 118 9792969 | uksales@schaffner.com |
| USA     | Schaffner EMC Inc.  
52 Mayfield Avenue  
08837 Edison, New Jersey  
T +1 800 367 5566  
F +1 800 367 5566 | T: +1 800 367 5566  
F: +1 800 367 5566 | usasales@schaffner.com  
www.schaffnerusa.com |
| Schaffner North America | Schaffner North America  
823 Fairview Road  
24382 Wytheville, Virginia  
T +1 276 228 7943  
F +1 276 228 7953 | T: +1 276 228 7943  
F: +1 276 228 7953 | usasales@schaffner.com  
www.schaffnerusa.com |