Ecosine 50 Hz Passive Harmonic Filters

Filters for 3-phase diode and SCR rectifiers

The industry standard for AC and DC and motor drives

The most compact 5% THID filter available

Excellent behavior under partial load conditions

Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominal operating voltage</td>
<td>3x 690 VAC</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 (filters ≤37 kW)</td>
</tr>
<tr>
<td></td>
<td>~5% @ rated power with DC-link choke (filters ≥45 kW)</td>
</tr>
<tr>
<td>Nominal motor drive input power rating</td>
<td>7.5 to 250 kW</td>
</tr>
<tr>
<td>Nominal motor drive input current rating</td>
<td>10 to 320 A @ 50°C</td>
</tr>
<tr>
<td>Total demand distortion TDD</td>
<td>According to IEEE-519, table 10-3</td>
</tr>
<tr>
<td>Voltage tolerance range</td>
<td>3x 586 to 760 VAC</td>
</tr>
<tr>
<td>Efficiency</td>
<td>&gt;98% @ nominal line voltage and power</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</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 +85°C transport and storage</td>
</tr>
<tr>
<td></td>
<td>+50°C to +70°C derated operation***</td>
</tr>
<tr>
<td>Flammability corresponding to</td>
<td>UL 94 V-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>
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</tbody>
</table>

Earthing System

* 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.

*** derated = I_{nominal} * √((T_{max}-T_{amb})/(T_{max}-T_{nominal})) = I_{nominal} * √((70°C-T_{amb})/20°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
- AC and DC 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 3410 HV 690

<table>
<thead>
<tr>
<th>Filter*</th>
<th>Rated load power @ 690 VAC/50 Hz [kW]</th>
<th>Power loss** @ 690 V [W]</th>
<th>min. required L(_{DC})*** [mH]</th>
<th>min. required L(_{AC})*** [mH]</th>
<th>Input/Output Capacitor Connections</th>
<th>Weight [kg]</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN 3410 HV-10-44</td>
<td>7.54</td>
<td>150</td>
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<tr>
<td>FN 3410 HV-13-44</td>
<td>11</td>
<td>209</td>
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<td>FN 3410 HV-16-33</td>
<td>15</td>
<td>270</td>
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<td>FN 3410 HV-24-33</td>
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<td>FN 3410 HV-32-53</td>
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<td>FN 3410 HV-38-53</td>
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<td>FN 3410 HV-45-53</td>
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<td>FN 3410 HV-60-35</td>
<td>45</td>
<td>610</td>
<td>2.313</td>
<td>1.565</td>
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<td>FN 3410 HV-75-35</td>
<td>55</td>
<td>690</td>
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<td>FN 3410 HV-210-40</td>
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<td>FN 3410 HV-260-99</td>
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<td>FN 3410 HV-320-99</td>
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</table>

* 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.

*** L\(_{DC}\) refers to DC-link choke, L\(_{AC}\) refers to AC line choke.

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**Diagram:**

- **Mains:** FN 3410 HV-210-40 (160 kW/690 VAC)
- **Non-linear load 1:** 45 kW/690 VAC
- **Non-linear load 2:** 110 kW/690 VAC
Mechanical data

Installation. Detailed installation and wiring instructions as well as cooling requirements can be found in the user manual available from every Schaffner sales point or from www.myecosine.com.
### Dimensions

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<tr>
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<th>E</th>
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</tbody>
</table>

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

### Filter connector cross sections

<table>
<thead>
<tr>
<th>-33</th>
<th>-34</th>
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<th>-40</th>
<th>-44</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Solid wire</td>
<td>16 mm²</td>
<td>35 mm²</td>
<td>50 mm²</td>
<td>95 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 4/0</td>
<td>AWG 8</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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