Compact 690 VAC power line EMC/EMI filter

**Features and benefits**

The FN 3311 HV/FN 3310 HV series are the most compact dedicated high current AC filters, not only suitable for PV applications, but being an optimum fit with most modern PV inverter topologies. In addition the filters can be configured in a very flexible way to fulfill custom specific application requirements.

**Technical specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>FN 3311 HV/FN 3310 HV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum continuous operating voltage</td>
<td>3x 760/440 VAC for FN 3311 HV</td>
</tr>
<tr>
<td></td>
<td>3x 760 VAC for FN 3310 HV and FN 3311 HMT</td>
</tr>
<tr>
<td>Operating frequency</td>
<td>DC to 60 Hz</td>
</tr>
<tr>
<td>Rated currents</td>
<td>250 to 2300 A @ 50°C</td>
</tr>
<tr>
<td>High potential test voltage</td>
<td>P -&gt; E 3.0 kVAC for 2 s</td>
</tr>
<tr>
<td></td>
<td>(FN 3310 HV/FN 3311 HVIT 3.35 kVAC for 2 s)</td>
</tr>
<tr>
<td></td>
<td>P -&gt; P 3.45 kVDC for 2 s</td>
</tr>
<tr>
<td>Protection category</td>
<td>I P 00</td>
</tr>
<tr>
<td>Overload capability</td>
<td>4x rated current at switch on, max. 8 sec</td>
</tr>
<tr>
<td></td>
<td>1.5x rated current for 1 minute, once per hour</td>
</tr>
<tr>
<td>Temperature range (operation and storage)</td>
<td>-40°C to +100°C</td>
</tr>
<tr>
<td>Climatic category</td>
<td>40/100/21 acc. to IEC 60068-1</td>
</tr>
<tr>
<td>Terminals/Housing</td>
<td>Ni plated cu bars/Metal</td>
</tr>
<tr>
<td>Flammability corresponding to</td>
<td>UL 94V-0</td>
</tr>
<tr>
<td>Design corresponding to</td>
<td>UL 1283, CSA 22.2 No. B, IEC/EN 60939, EN 60721-3</td>
</tr>
<tr>
<td>MTBF @ Rated amb. Temp./Voltage</td>
<td>&gt; 200,000 hours</td>
</tr>
</tbody>
</table>

**Approvals & Compliances**

The FN 3311 HV/FN 3310 HV product series of standard EMC/EMI filters are based on Schaffner's many years of expertise in filter design for all types of converter and inverter applications. Installed between the PV inverter and the power grid, the FN 3311 HV and FN 3310 HV AC filters are used to influence positively the conducted emissions on the grid side to help to comply with the required emission standards.

**Features and benefits**

The FN 3311 HV/FN 3310 HV series are the most compact dedicated high current AC filters, not only suitable for PV applications, but being an optimum fit with most modern PV inverter topologies. In addition the filters can be configured in a very flexible way to fulfill custom specific application requirements.

All FN 3311 HV/FN 3310 HV come in unsymmetrical housings, which help to prevent inverse installation and wrong electrical connection. The AC filters FN 3311 HV/FN 3310 HV are key to meet the stringent international standards for electromagnetic compatibility and help to ensure a reliable and fault-free operation of the entire PV system.

**Typical applications**

The FN 3311 HV/FN 3310 HV series are primarily designed for all kind of power line connected converter and inverter applications between 250 and 2300 A. However, they are optimised for PV inverter and can potentially also be applied for general purpose motor drives applications.

**Typical electrical schematic FN 3311 HV**

- FN 3311 HMT series without resistor to PE
- FN 3310 HV series without resistor and capacitor to PE
## Filter selection table

<table>
<thead>
<tr>
<th>Filters <em>/</em>*</th>
<th>Rated current @ 50°C</th>
<th>Typical inverter AC power rating*** @ 760 VAC/50 Hz</th>
<th>Leakage current**** @ 25°C/DC</th>
<th>Power loss @ 25°C/DC</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN 3311 HV with Cy caps FN 3311 HVIT with Cy caps</td>
<td>[A]</td>
<td>[kVA]</td>
<td>[mA]</td>
<td>[W]</td>
<td>[kg]</td>
</tr>
<tr>
<td>FN 3311 HV-250-99-C18-R5 FN 3311 HVIT-250-99-C18-R5</td>
<td>250</td>
<td>240</td>
<td>0.09</td>
<td>18</td>
<td>2.7</td>
</tr>
<tr>
<td>FN 3311 HV-400-99-C18-R5 FN 3311 HVIT-400-99-C18-R5</td>
<td>400</td>
<td>380</td>
<td>0.09</td>
<td>30</td>
<td>3.3</td>
</tr>
<tr>
<td>FN 3311 HV-600-99-C18-R5 FN 3311 HVIT-600-99-C18-R5</td>
<td>600</td>
<td>570</td>
<td>0.09</td>
<td>33</td>
<td>4.5</td>
</tr>
<tr>
<td>FN 3311 HV-1000-99-C18-R5 FN 3311 HVIT-1000-99-C18-R5</td>
<td>1000</td>
<td>950</td>
<td>0.09</td>
<td>70</td>
<td>6.1</td>
</tr>
<tr>
<td>FN 3311 HV-1500-99-C18-R5 FN 3311 HVIT-1500-99-C18-R5</td>
<td>1500</td>
<td>1430</td>
<td>0.09</td>
<td>133</td>
<td>11.0</td>
</tr>
<tr>
<td>FN 3311 HV-2300-99-C18-R5 FN 3311 HVIT-2300-99-C18-R5</td>
<td>2300</td>
<td>2200</td>
<td>0.09</td>
<td>201</td>
<td>18.0</td>
</tr>
<tr>
<td>FN 3310 HV-250-99-R5</td>
<td>250</td>
<td>240</td>
<td>18</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>FN 3310 HV-400-99-R5</td>
<td>400</td>
<td>380</td>
<td>30</td>
<td>3.3</td>
<td></td>
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<tr>
<td>FN 3310 HV-600-99-R5</td>
<td>600</td>
<td>570</td>
<td>33</td>
<td>4.5</td>
<td></td>
</tr>
<tr>
<td>FN 3310 HV-1000-99-R5</td>
<td>1000</td>
<td>950</td>
<td>70</td>
<td>6.1</td>
<td></td>
</tr>
<tr>
<td>FN 3310 HV-1500-99-R5</td>
<td>1500</td>
<td>1430</td>
<td>133</td>
<td>11.0</td>
<td></td>
</tr>
<tr>
<td>FN 3310 HV-2300-99-R5</td>
<td>2300</td>
<td>2200</td>
<td>201</td>
<td>18.0</td>
<td></td>
</tr>
</tbody>
</table>

* Filters with higher current ratings available upon request.
** Filters with reduced Cy capacitance to ground for high asymmetrical currents and higher voltages available upon request.
*** Calculated at rated current, 690 VAC and cos phi = 0.8. The exact value depends upon the efficiency of the drive, the motor and the entire application.
**** Leakage current according IEC 60939-1

## Typical filter attenuation curves

Per CISPR 17; A=50 Q/50 Ω sym; B=50 Q/50 Ω asym

- FN 3311 HV-250-2300-99-C18-R5
- FN 3311 HVIT-250-2300-99-C18-R5

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## Typical block schematic

1. PV modules
2. Schaffner DC filter FN 22xx
3. Central Inverter
4. Schaffner magnetic components
5. Schaffner AC EMC/EMI filter FN 3xxx

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Important note: depending on the grounding scheme of the solar power system, including the solar panel and the grid side transformer, the appropriate DC- and AC EMC/EMI filter version need to be selected. For support, please contact your local Schaffner sales office or partner.
Mechanical data

250 to 2'300 A types

Busbar connections

250 to 1'000 A types

1'500 A types

2'300 A types

Note: all FN 3311 and FN 3310 provide unsymmetrical mounting hole patterns to prevent inverse filter installation in the field.

Dimensions of FN 3311 HV and FN 3310 HV series

(the FN 3311 HVT versions have the same dimensions as the FN 3311 HV)

<table>
<thead>
<tr>
<th></th>
<th>250 A</th>
<th>400 A</th>
<th>600 A</th>
<th>1'000 A</th>
<th>1'500 A</th>
<th>2'300 A</th>
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<tbody>
<tr>
<td>A</td>
<td>170</td>
<td>175</td>
<td>190</td>
<td>190</td>
<td>195</td>
<td>220</td>
</tr>
<tr>
<td>B</td>
<td>267</td>
<td>280</td>
<td>290</td>
<td>290</td>
<td>310</td>
<td>320</td>
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<tr>
<td>C</td>
<td>140</td>
<td>140</td>
<td>140</td>
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<tr>
<td>D</td>
<td>235</td>
<td>250</td>
<td>265</td>
<td>305</td>
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<td>E</td>
<td>195</td>
<td>205</td>
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<tr>
<td>F1</td>
<td>227</td>
<td>240</td>
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<td>250</td>
<td>270</td>
<td>275</td>
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<tr>
<td>F2</td>
<td>232</td>
<td>245</td>
<td>255</td>
<td>255</td>
<td>275</td>
<td>280</td>
</tr>
<tr>
<td>G</td>
<td>Ø7 (6x)</td>
<td>Ø9 (6x)</td>
<td>Ø9 (6x)</td>
<td>Ø9 (6x)</td>
<td>Ø11 (6x)</td>
<td>Ø11 (6x)</td>
</tr>
<tr>
<td>H</td>
<td>1.5</td>
<td>2</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>J</td>
<td>M6 (2x)</td>
<td>M8 (2x)</td>
<td>M8 (2x)</td>
<td>M8 (2x)</td>
<td>M10 (2x)</td>
<td>M10 (2x)</td>
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<tr>
<td>K</td>
<td>200 (+/- 1)</td>
<td>210 (+/- 1)</td>
<td>225 (+/- 1)</td>
<td>225 (+/- 1)</td>
<td>241 (+/- 1)</td>
<td>266 (+/- 1)</td>
</tr>
<tr>
<td>L</td>
<td>215</td>
<td>230</td>
<td>245</td>
<td>245</td>
<td>265</td>
<td>290</td>
</tr>
<tr>
<td>O</td>
<td>245</td>
<td>27</td>
<td>29.5</td>
<td>29.5</td>
<td>34.8</td>
<td>40</td>
</tr>
<tr>
<td>P</td>
<td>49 (+/- 0.5)</td>
<td>54 (+/- 0.5)</td>
<td>59 (+/- 0.5)</td>
<td>59 (+/- 0.5)</td>
<td>69.5 (+/- 0.5)</td>
<td>80 (+/- 0.5)</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
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<td>8</td>
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<tr>
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<td>12.5</td>
<td>12.5</td>
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<tr>
<td>Y</td>
<td>32.5</td>
<td>37.5</td>
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<td>57.5</td>
<td>82.5</td>
<td>95</td>
</tr>
<tr>
<td>Z</td>
<td>Ø9</td>
<td>Ø11</td>
<td>Ø11</td>
<td>Ø13.5</td>
<td>Ø13.5</td>
<td>Ø13.5</td>
</tr>
</tbody>
</table>

All dimensions in mm; 1 inch = 25.4 mm
Tolerances according: ISO 2768-m/EN 22768-m, if not stated otherwise

Please see the brochure “Basics in EMC and Power Quality” on our website [www.schaffner.com](http://www.schaffner.com) to find more details on filter connectors.
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