Compact 690 VAC power line EMC/EMI filter

- High current 3-phase filter up to 2300 A
- Extremely compact and light weight design
- Minimum installation foot print
- Performance optimised for standard purpose applications
- FN 3310 HV series without Cy capacitors to ground
- FN 3311 HMT versions for use in IT power networks

### Technical specifications

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maximum continuous operating voltage</strong></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><strong>Operating frequency</strong></td>
<td>DC to 60 Hz</td>
</tr>
<tr>
<td><strong>Rated currents</strong></td>
<td>250 to 2300 A @ 50°C</td>
</tr>
<tr>
<td><strong>High potential test voltage</strong></td>
<td>P -&gt; E 3.0 kVAC for 2 s</td>
</tr>
<tr>
<td></td>
<td>(FN 3310 HV/FN 3311 HVT 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><strong>Protection category</strong></td>
<td>IP 00</td>
</tr>
<tr>
<td><strong>Overload capability</strong></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><strong>Temperature range (operation and storage)</strong></td>
<td>-40°C to +100°C</td>
</tr>
<tr>
<td><strong>Climatic category</strong></td>
<td>40/100/21 acc. to IEC 60068-1</td>
</tr>
<tr>
<td><strong>Terminals/Housing</strong></td>
<td>Ni plated cu bars/Metal</td>
</tr>
<tr>
<td><strong>Flammability corresponding to</strong></td>
<td>UL 94V-0</td>
</tr>
<tr>
<td><strong>Design corresponding to</strong></td>
<td>UL 1283, CSA 22.2 No. 8, IEC/EN 60939, EN 60721-3</td>
</tr>
<tr>
<td><strong>MTBF @ Rated amb. Temp./Voltage (Mil-HB-217F)</strong></td>
<td>&gt; 200,000 hours</td>
</tr>
</tbody>
</table>

### Performance indicators

<table>
<thead>
<tr>
<th>Attenuation performance</th>
<th>Standard</th>
<th>High</th>
<th>Very High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated current [A]</td>
<td>0</td>
<td>200</td>
<td>300</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>600</td>
<td>800</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>2300</td>
<td></td>
</tr>
</tbody>
</table>

### Approvals & Compliances

The FN3311 HV / FN3310 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 FN3311 HV and FN3310 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 FN3311 HV / FN3310 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 fulfil custom specific application requirements.

All FN3311 HV / FN3310 HV come in unsymmetrical housings, which help to prevent inverse installation and wrong electrical connection. The AC filters FN3311 HV / FN3310 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 FN3311 HV / FN3310 HV series are primarily designed for all kind of power line connected converter and inverter applications between 250 A 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

- FN3311 HVIT series without resistor to PE
- FN3310 HV series without resistor and capacitor to PE
## Filter selection table

<table>
<thead>
<tr>
<th>Filters /**</th>
<th>Rated current @ 50°C</th>
<th>Typical inverter AC power rating***</th>
<th>Leakage current**** @ 760 VAC/50 Hz</th>
<th>Power loss @ 25°C/DC</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN3311HV with Cy caps</td>
<td>FN3311HVIT with Cy caps</td>
<td>[A]</td>
<td>[kVA]</td>
<td>[mA]</td>
<td>[W]</td>
</tr>
<tr>
<td>FN3311HV-250-99-C18-R55</td>
<td>FN3311HVIT-250-99-C18-R5</td>
<td>250</td>
<td>240</td>
<td>0.09</td>
<td>18</td>
</tr>
<tr>
<td>FN3311HV-400-99-C18-R55</td>
<td>FN3311HVIT-400-99-C18-R5</td>
<td>400</td>
<td>380</td>
<td>0.09</td>
<td>30</td>
</tr>
<tr>
<td>FN3311HV-600-99-C18-R55</td>
<td>FN3311HVIT-600-99-C18-R5</td>
<td>600</td>
<td>570</td>
<td>0.09</td>
<td>33</td>
</tr>
<tr>
<td>FN3311HV-1000-99-C18-R55</td>
<td>FN3311HVIT-1000-99-C18-R5</td>
<td>1000</td>
<td>950</td>
<td>0.09</td>
<td>70</td>
</tr>
<tr>
<td>FN3311HV-1500-99-C18-R55</td>
<td>FN3311HVIT-1500-99-C18-R5</td>
<td>1500</td>
<td>1430</td>
<td>0.09</td>
<td>133</td>
</tr>
<tr>
<td>FN3311HV-2300-99-C18-R55</td>
<td>FN3311HVIT-2300-99-C18-R5</td>
<td>2300</td>
<td>2200</td>
<td>0.09</td>
<td>201</td>
</tr>
<tr>
<td>FN3310 without Cy caps</td>
<td>FN3310HV-250-99-R5</td>
<td>250</td>
<td>240</td>
<td>18</td>
<td>2.7</td>
</tr>
<tr>
<td>FN3310HV-400-99-R5</td>
<td>FN3310HV-400-99-R5</td>
<td>400</td>
<td>380</td>
<td>30</td>
<td>3.3</td>
</tr>
<tr>
<td>FN3310HV-600-99-R5</td>
<td>FN3310HV-600-99-R5</td>
<td>600</td>
<td>570</td>
<td>33</td>
<td>4.5</td>
</tr>
<tr>
<td>FN3310HV-1000-99-R5</td>
<td>FN3310HV-1000-99-R5</td>
<td>1000</td>
<td>950</td>
<td>70</td>
<td>6.1</td>
</tr>
<tr>
<td>FN3310HV-1500-99-R5</td>
<td>FN3310HV-1500-99-R5</td>
<td>1500</td>
<td>1430</td>
<td>133</td>
<td>11.0</td>
</tr>
<tr>
<td>FN3310HV-2300-99-R5</td>
<td>FN3310HV-2300-99-R5</td>
<td>2300</td>
<td>2200</td>
<td>201</td>
<td>18.0</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 Ω/50 Ω sym; B=50 Ω/50 Ω asym

FN3311HV-250...2300-99-C18-R5
and
FN3311HVIT-250...2300-99-C18-R55

![Typical filter attenuation curves](image)

## 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

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

| Type   | A   | B   | C   | D   | E   | F1  | F2  | G   | H   | J   | K   | L   | O   | P   | S   | T   | U   | V   | W   | X   | Y   | Z   |
|--------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 250 A  | 170 | 170 | 190 | 190 | 195 | 227 | 232 | Ø7  | 1.5 | M6  | 200 | 215 | 245 | 49  | 41  | 42  | 3   | 10  | 32.5| Ø9  |
| 400 A  | 175 | 175 | 200 | 200 | 205 | 240 | 245 | Ø9  | 2   | M8  | 210 | 230 | 27  | 54  | 46  | 46  | 4   | 12.5| 37.5| Ø11 |
| 600 A  | 190 | 190 | 225 | 225 | 220 | 250 | 255 | Ø9  | 2.5 | M8  | 225 | 245 | 29.5| 59  | 50  | 50  | 5   | 12.5| 37.5| Ø11 |
| 1'000 A| 190 | 190 | 225 | 225 | 220 | 250 | 255 | Ø9  | 2.5 | M8  | 225 | 245 | 29.5| 59  | 50  | 50  | 5   | 12.5| 37.5| Ø11 |
| 1'500 A| 195 | 195 | 241 | 241 | 240 | 270 | 275 | Ø11 | 2.5 | M10 | 225 | 245 | 34.8| 59  | 50  | 50  | 5   | 13.5| 37.5| Ø11 |
| 2'300 A| 220 | 220 | 266 | 266 | 265 | 290 | 280 | Ø11 | 2.5 | M10 | 225 | 245 | 34.8| 59  | 50  | 50  | 5   | 13.5| 37.5| Ø11 |

All dimensions in mm; 1 inch = 25.4 mm

**Note:** all FN3311 and FN3310 provide unsymmetrical mounting hole patterns to prevent inverse filter installation in the field.

**Dimensions of FN3311HV and FN3310HV series**

(the FN3311HV/IT versions have the same dimensions as the FN3311HV)

<table>
<thead>
<tr>
<th>Type</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>
</tr>
</thead>
<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>
</tr>
<tr>
<td>C</td>
<td>140</td>
<td>140</td>
<td>140</td>
<td>140</td>
<td>150</td>
<td>165</td>
</tr>
<tr>
<td>D</td>
<td>235</td>
<td>250</td>
<td>265</td>
<td>305</td>
<td>360</td>
<td>410</td>
</tr>
<tr>
<td>E</td>
<td>195</td>
<td>205</td>
<td>220</td>
<td>220</td>
<td>240</td>
<td>265</td>
</tr>
<tr>
<td>F1</td>
<td>227</td>
<td>240</td>
<td>250</td>
<td>250</td>
<td>270</td>
<td>275</td>
</tr>
<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>
</tr>
<tr>
<td>K</td>
<td>200 (+/- 1)</td>
<td>210 (+/- 1)</td>
<td>225 (+/- 1)</td>
<td>225 (+/- 1)</td>
<td>225 (+/- 1)</td>
<td>225 (+/- 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>
</tr>
</tbody>
</table>

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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