Multi-stage AC/DC EMI Filter with Excellent Attenuation Performance

- Rated currents from 1 to 30 A
- Two-stage filter
- Very high differential and common-mode attenuation
- Optional medical versions (B type)
- Optional safety versions (A type)
- Optional enhanced performance versions
- Optional overvoltage protection (Z type)

**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 20 40 60 80 100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Technical specifications**

- **Rated voltage***: 250 VAC, 50/60 Hz; 250 VDC
- **Operating frequency**: DC to 400 Hz
- **Rated currents**: 1 to 30 A @ 40°C max.
- **High potential test voltage**:
  - P –> PE 2000 VAC for 2 sec (equiv. cap <88 nF)
  - P –> PE 2550 VDC for 2 sec (equiv. cap >88 nF)
  - P –> PE 2500 VAC for 2 sec (B types)
  - P –> N 1100 VDC for 2 sec
- **Temperature range (operation and storage)**: -25°C to +100°C (25/100/21)
- **Certified to**: UL 1283, CSA 22.2 No. 8, 1986, IEC/EN 60939 (applies to AC and DC applications)
- **Flammability corresponding to**: UL 94 V-2 or better
- **Surge pulse protection (Z type)**: Helps compliance to IEC61000-4-5 (Differential Mode only)
- **MTBF @ 40°C/230 V (MIL-HB-217F)**:
  - 1,300,000 hours (1 to 10 A types)
  - 1,100,000 hours (12 A types)
  - 517,000 hours (16 and 30 A types)

*maximum RMS operating voltage at rated frequency or the maximum DC operating voltage

**Features and benefits**

- FN 2090 two-stage filters are designed for easy and fast chassis mounting.
- The FN 2090 filters are also available as B versions with no Y-capacitors for medical applications as well as A versions with low capacitance for safety critical applications with a requirement for low leakage currents.
- FN 2090 filters offers an optimized filter range for enhanced performance AC and DC applications in same compact size (KK, LL, NN types)
- All filters provide an exceptional conducted attenuation performance, based on chokes with high permeable core material and excellent thermal behaviour.
- FN 2090 two-stage filters are designed for noisy applications requiring excellent filter performance.
- The higher inductivity versus amperage offers increased attenuation performance with the same form factor compared to FN 2060 and FN 2080 filter series.
- All FN 2090 filters can be delivered with optional surge pulse protection (Z type).
- FN 2090 filters are also available as single-stage filters (FN 2030 series).
- Various terminal options allow you to select the desired connection style.

**Typical applications**

- Electrical and electronic equipment
- Consumer goods
- Household equipment
- Building automation
- Industrial applications
- Machinery
- Medical equipment
- Electronic data processing equipment
- Office automation and datacom equipment
- Various noisy applications requiring high filter performance

**Typical electrical schematic**

```
ONLINE
P
L
L
L
N
N
N
N
N
N

PE

```

**Approvals**

- UL
- CSA
- IEC
- ROHS
- CE
## Filter selection table

<table>
<thead>
<tr>
<th>Filter</th>
<th>Rated current @ 40°C (25°C)</th>
<th>Leakage current** @ 250V AC/50 Hz (@ 120V AC/60 Hz)</th>
<th>Inductance L</th>
<th>Capacitance Cx</th>
<th>Capacitance Cy1</th>
<th>Capacitance Cy2</th>
<th>Resistance R</th>
<th>Input/Output connections</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN 2090-1-..</td>
<td>1 (1.1)</td>
<td>0.45 (0.26)</td>
<td>20</td>
<td>0.22</td>
<td>2.2</td>
<td>1.0</td>
<td>680</td>
<td>-06</td>
<td>-07</td>
</tr>
<tr>
<td>FN 2090-20-..</td>
<td>20 (22.4)</td>
<td>0.93 (0.54)</td>
<td>1.5</td>
<td>1</td>
<td>10</td>
<td>1.0</td>
<td>220</td>
<td>-06</td>
<td>-08</td>
</tr>
</tbody>
</table>

** For surge pulse protection, please add Z (e.g. FN 2090Z-10-06, FN 2090BZ-20-08). The different letters code the used Cy values in the filter type (A = 0.47nF; K = 22nF; L = 33nF; N = 100nF; as the FN2090 is a dual stage filter each letter stands for one stage of Cy)

** Maximum leakage under usual AC operating conditions (acc. IEC 60939-3). Note: if the neutral line is interrupted, worst case leakage could reach twice this level. Leakage current for DC application is 0 mA

Enhanced performance

<table>
<thead>
<tr>
<th>Filter</th>
<th>Rated current @ 40°C (25°C)</th>
<th>Leakage current**@ 250V AC/50 Hz (@ 120V AC/60 Hz)</th>
<th>Inductance L</th>
<th>Capacitance Cx</th>
<th>Capacitance Cy1</th>
<th>Capacitance Cy2</th>
<th>Resistance R</th>
<th>Input/Output connections</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>FN 2090 KK-1-06</td>
<td>1 (1.15)</td>
<td>3.46 (1.99)</td>
<td>20</td>
<td>0.22</td>
<td>22</td>
<td>22</td>
<td>680</td>
<td>-06</td>
<td>-07</td>
</tr>
<tr>
<td>FN 2090 NN-4-06</td>
<td>4 (4.5)</td>
<td>15.71 (8.96)</td>
<td>14</td>
<td>0.33</td>
<td>100</td>
<td>100</td>
<td>470</td>
<td>-06</td>
<td>-07</td>
</tr>
</tbody>
</table>

** To compile a complete part number, please replace the -.. with the required I/O connection style.

For surge pulse protection, please add Z (e.g. FN 2090Z-10-06, FN 2090BZ-20-08). The different letters code the used Cy values in the filter type (A = 0.47nF; K = 22nF; L = 33nF; N = 100nF; as the FN2090 is a dual stage filter each letter stands for one stage of Cy)

** Maximum leakage under usual AC operating conditions (acc. IEC 60939-3). Note: if the neutral line is interrupted, worst case leakage could reach twice this level. Leakage current for DC application is 0 mA
Typical filter attenuation

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

1 A: Standard type  A type  B type  Enhanced performance

3 A: Standard type  A type  B type  Enhanced performance

4 A: Standard type  A type  B type  Enhanced performance

6 A: Standard type  A type  B type  Enhanced performance

8 A: Standard type  A type  B type  Enhanced performance
Product selector

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>06</td>
<td>Factor 6.3 x 0.8 mm (lugs/welding)</td>
</tr>
<tr>
<td>07</td>
<td>Wire leads</td>
</tr>
<tr>
<td>08</td>
<td>Stud (M4 screw)</td>
</tr>
<tr>
<td>1 to 60</td>
<td>Rated current</td>
</tr>
<tr>
<td>Blank</td>
<td>Standard version</td>
</tr>
<tr>
<td>Z</td>
<td>With surge protection</td>
</tr>
<tr>
<td>A</td>
<td>Safety version</td>
</tr>
<tr>
<td>B</td>
<td>Medical version</td>
</tr>
<tr>
<td>JKK/L/NN</td>
<td>High performance version</td>
</tr>
</tbody>
</table>

Mechanical data

Connection style -06, 1 A types

Connection style -06, 3 to 20 A types

Connection style -07, 1 A types (same dimensions as style -06)

Connection style -07, 3 to 20 A types (same dimensions as style -06)

Connection style -08, 10 to 30 A types
### Dimensions

<table>
<thead>
<tr>
<th></th>
<th>1 A</th>
<th>3 A</th>
<th>4 A</th>
<th>6 A</th>
<th>8 A</th>
<th>10 A</th>
<th>12 A</th>
<th>16 A</th>
<th>20 A</th>
<th>30 A</th>
<th>Tolerances</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>71</td>
<td>85</td>
<td>85</td>
<td>85</td>
<td>113.5 ±1</td>
<td>113.5 ±1</td>
<td>113.5 ±1</td>
<td>113.5 ±1</td>
<td>113.5 ±1</td>
<td>113.5 ±1</td>
<td>±0.5</td>
</tr>
<tr>
<td>B</td>
<td>46.6</td>
<td>54</td>
<td>54</td>
<td>57.5 ±1</td>
<td>57.5 ±1</td>
<td>57.5 ±1</td>
<td>57.5 ±1</td>
<td>57.5 ±1</td>
<td>57.5 ±1</td>
<td>57.5 ±1</td>
<td>±0.5</td>
</tr>
<tr>
<td>C</td>
<td>22.3</td>
<td>30.3</td>
<td>30.3</td>
<td>45.4 ±1</td>
<td>45.4 ±1</td>
<td>45.4 ±1</td>
<td>45.4 ±1</td>
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<td>±0.5</td>
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<tr>
<td>D</td>
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<td>94 ±1</td>
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<tr>
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<td>±0.3</td>
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<tr>
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<td>27</td>
<td>25</td>
<td>25</td>
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<tr>
<td>J</td>
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<td>19.9</td>
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<tr>
<td>K</td>
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<tr>
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<td>6.3</td>
<td>6</td>
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<td>6</td>
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<td>±0.3</td>
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<tr>
<td>M</td>
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<td>1</td>
<td>1</td>
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</table>

**Connection style -06**

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<tr>
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<th>6.3 x 0.8</th>
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<th>6.3 x 0.8</th>
<th>6.3 x 0.8</th>
<th>6.3 x 0.8</th>
<th>6.3 x 0.8</th>
<th>6.3 x 0.8</th>
<th>6.3 x 0.8</th>
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</table>

**Connection style -07**

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<tr>
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<th>8.4</th>
<th>8.4</th>
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<th>±0.5</th>
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</table>

**AWG type wire**

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<th>AWG 20</th>
<th>AWG 20</th>
<th>AWG 18</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Wire length</td>
<td>140</td>
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<td>140</td>
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</table>

**Connection style -08**

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<tr>
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<th>M4</th>
<th>M4</th>
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</thead>
</table>

**Recommended torque (Nm)**

<table>
<thead>
<tr>
<th></th>
<th>1.2 - 1.3</th>
<th>1.2 - 1.3</th>
<th>1.2 - 1.3</th>
<th>1.2 - 1.3</th>
<th>1.2 - 1.3</th>
</tr>
</thead>
</table>

**Earth terminal**

<table>
<thead>
<tr>
<th></th>
<th>1.5 - 1.7</th>
<th>1.5 - 1.7</th>
<th>1.5 - 1.7</th>
<th>1.5 - 1.7</th>
<th>1.5 - 1.7</th>
</tr>
</thead>
</table>

All dimensions in mm; 1 inch = 25.4 mm

Tolerances according: ISO 2768-m/EN 22768-m

Please visit [www.schaffner.com](http://www.schaffner.com) to find more details on filter connectors.
To find your local partner within Schaffner’s global network: www.schaffner.com

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