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>
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<table>
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<tr>
<th>Rated current [A]</th>
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<tbody>
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</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 singlestage 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**
## 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 [g]</th>
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<tbody>
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<td>FN 2090-1-..</td>
<td>1 (1.1)</td>
<td>0.45 (0.26)</td>
<td>20</td>
<td>0.22</td>
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<td>1.0</td>
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<td>-07</td>
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<td>0.45 (0.26)</td>
<td>14</td>
<td>0.33</td>
<td>2.2</td>
<td>1.0</td>
<td>470</td>
<td>-06</td>
<td>-07</td>
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<tr>
<td>FN 2090-4-..</td>
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<td>0.45 (0.26)</td>
<td>14</td>
<td>0.33</td>
<td>2.2</td>
<td>1.0</td>
<td>470</td>
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<td>6 (6.7)</td>
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<td>0.47</td>
<td>3.3</td>
<td>1.0</td>
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<td>3.3</td>
<td>1.0</td>
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<td>10</td>
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<td>-07</td>
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<td>10</td>
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<td>220</td>
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<td>-07</td>
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<tr>
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<td><strong>Enhanced performance</strong></td>
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</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

Standard Types
1 to 4 A types
6 to 10 A types
12 to 20 A types
30 A types

Enhanced Performance Types
1 to 4 A types
6 to 10 A types
12 to 20 A types
30 A types
Product selector

FN 2090-sy-xx-yy

- **06**: Factor 6.3 x 0.8 mm (solder/soldering)
- **07**: Wire leads
- **08**: Stud (M4 screw)
- **1 to 69**: Rated current
- **Blank**: Standard version
- **Z**: With surge protection
- **Blank**: Standard version
- **A**: Safety version
- **B**: Medical version
- **IXL/NN**: High-performance version

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, 20 and 30 A types
### Dimensions

<table>
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<tr>
<th>A</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>
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<td>54</td>
<td>54</td>
<td>54</td>
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<td>303</td>
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<td>6.3</td>
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<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>±0.3</td>
<td>±0.3</td>
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#### Connection style -06

| N | 6.3 x 0.8 | 6.3 x 0.8 | 6.3 x 0.8 | 6.3 x 0.8 | 6.3 x 0.8 | 6.3 x 0.8 | 6.3 x 0.8 | 6.3 x 0.8 | 6.3 x 0.8 | 6.3 x 0.8 |

#### Connection style -07

| O | 8.3 | 8.3 | 8.3 | 8.3 | 8.4 | 8.4 | 8.4 | 8.4 | ±0.5 | ±0.5 |
| P | 14 | 14.9 | 14.9 | 14.9 | 18 | 18 | 18 | 18 | ±0.5 | ±0.5 |

#### AWG type wire

| AWG 20 | AWG 20 | AWG 18 | AWG 18 | AWG 16 | AWG 16 |

| Wire length | 140 | 140 | 140 | 140 | 140 | 140 |

#### Connection style -08

| N | | | | | | | | | | M4 | M4 |

| Recommended torque (Nm) | 1.2 - 1.3 | 1.2 - 1.3 |
| Earth terminal | 1.5 - 1.7 | 1.5 - 1.7 |

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.
# Headquarters, global innovation and development

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

# Sales and application centers

<table>
<thead>
<tr>
<th>Country</th>
<th>Branch</th>
<th>Address</th>
<th>Phone</th>
<th>Email</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  
csschina@schaffner.com  
www.schaffner.com.cn |
| Finland | Schaffner Oy | Sauvonrinne 19 H  
08500 Lohja  
T +358 10 567 2855  
finlandsales@schaffner.com |
| France | Schaffner EMC S.A.S. | 16-20 Rue Louis Rameau  
95875 Bezons  
T +33 1 34 34 30 60  
francesales@schaffner.com |
| Germany | Schaffner Deutschland GmbH | Schoeperlenstrasse 128  
76185 Karlsruhe  
T +49 721 56910  
germany.sales@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  
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560055 Bangalore  
T +91 80 67935355  
indiasales@schaffner.com |
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T +39 039 21 41 070  
italysales@schaffner.com |
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1-32-12, Kameumi, Setagaya-ku  
154-0011 Tokyo  
T +81 3 5712 3650  
F +81 3 5712 3651  
japan.sales@schaffner.com  
www.schaffner.jp |
| Singapore | Schaffner EMC Pte Ltd. | #05-09, Kg Ubi Ind. Estate  
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F +65 6377 3281  
singapore.sales@schaffner.com |
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El Soto de Moraleja, Alcobendas  
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F +34 917 912 901  
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T +46 8 5050 2425  
wedensales@schaffner.com  
www.schaffner.com |
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