

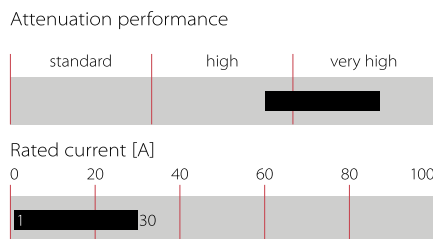
# Multi-stage AC/DC EMI Filter with Excellent Attenuation Performance



- 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



### Approvals



### 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.

### Technical specifications

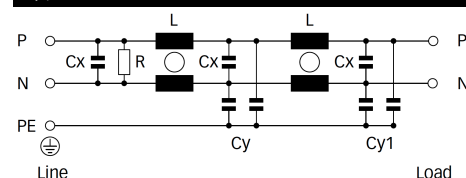
|  |   |
|--|---|
| <b>Rated voltage*</b>                            | 250 VAC, 50/60 Hz; 250 VDC  |
| <b>Operating frequency</b>                       | DC to 400 Hz  |
| <b>Rated currents</b>                            | 1 to 30 A @ 40°C max.   |
| <b>High potential test voltage</b>               | P → PE 2000 VAC for 2 sec (equiv. cap <88 nF)<br>P → PE 2550 VDC for 2 sec (equiv. cap >88 nF)<br>P → PE 2500 VAC for 2 sec (B types)<br>P → N 1100 VDC for 2 sec |
| <b>Temperature range (operation and storage)</b> | -25°C to +100°C (25/100/21)   |
| <b>Certified to</b>                              | UL 1283, CSA 22.2 No. 8 1986, IEC/EN 60939 (applies to AC and DC applications)  |
| <b>Flammability corresponding to</b>             | UL 94 V-2 or better   |
| <b>Surge pulse protection (Z type)</b>           | 2 kV (PN), IEC 61000-4-5  |
| <b>MTBF @ 40°C/230 V (Mil-HB-217F)</b>           | 1,300,000 hours (1 to 10 A types)<br>1,100,000 hours (12 A types)<br>517,000 hours (16 and 30 A types)  |

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

### 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

| Filter*                     | Rated current<br>@ 40°C (25°C)<br><br>[A] | Leakage current**<br>@ 250V AC/50 Hz<br>(@ 120V AC/60 Hz)<br><br>[mA] | Inductance<br>L<br><br>[mH] | Capacitance |             |             | Resistance<br>R<br><br>[kΩ] | Input/Output<br>connections |     | Weight<br><br>[g] |
|-----------------------------|---|---|-----------------------------|-------------|-------------|-------------|-----------------------------|-----------------------------|-----|-------------------|
|                             |   |   |                             | Cx<br>[μF]  | Cy1<br>[nF] | Cy2<br>[nF] |                             |                             |     |                   |
| <b>FN 2090-1-..</b>         | 1 (1.1)                                   | 0.45 (0.26)   | 20                          | 0.22        | 2.2         | 1.0         | 680                         | -06                         | -07 | 73                |
| <b>FN 2090-3-..</b>         | 3 (3.4)                                   | 0.45 (0.26)   | 14                          | 0.33        | 2.2         | 1.0         | 470                         | -06                         | -07 | 158               |
| <b>FN 2090-4-..</b>         | 4 (4.5)                                   | 0.45 (0.26)   | 14                          | 0.33        | 2.2         | 1.0         | 470                         | -06                         | -07 | 176               |
| <b>FN 2090-6-..</b>         | 6 (6.7)                                   | 0.61 (0.35)   | 8                           | 0.47        | 3.3         | 1.0         | 330                         | -06                         | -07 | 191               |
| <b>FN 2090-8-..</b>         | 8 (8.9)                                   | 0.61 (0.35)   | 8                           | 0.47        | 3.3         | 1.0         | 330                         | -06                         | -07 | 330               |
| <b>FN 2090-10-..</b>        | 10 (11.2)                                 | 0.61 (0.35)   | 8                           | 0.47        | 3.3         | 1.0         | 330                         | -06                         | -07 | 369               |
| <b>FN 2090-12-..</b>        | 12 (13.4)                                 | 0.93 (0.54)   | 4                           | 1           | 10          | 1.0         | 220                         | -06                         | -07 | 391               |
| <b>FN 2090-16-..</b>        | 16 (17.9)                                 | 0.93 (0.54)   | 4                           | 1           | 10          | 1.0         | 220                         | -06                         | -07 | 425               |
| <b>FN 2090-20-..</b>        | 20 (22.4)                                 | 0.93 (0.54)   | 2.7                         | 1           | 10          | 1.0         | 220                         | -06                         | -08 | 530               |
| <b>FN 2090-30-08</b>        | 30 (33.5)                                 | 0.93 (0.54)   | 1.5                         | 1           | 10          | 1.0         | 220                         |                             | -08 | 548               |
| <b>FN 2090 A-1-..</b>       | 1 (1.1)                                   | 0.13 (0.07)   | 20                          | 0.22        | 0.47        | 0.47        | 680                         | -06                         | -07 | 73                |
| <b>FN 2090 A-3-..</b>       | 3 (3.4)                                   | 0.13 (0.07)   | 14                          | 0.33        | 0.47        | 0.47        | 470                         | -06                         | -07 | 158               |
| <b>FN 2090 A-4-..</b>       | 4 (4.5)                                   | 0.13 (0.07)   | 14                          | 0.33        | 0.47        | 0.47        | 470                         | -06                         | -07 | 176               |
| <b>FN 2090 A-6-..</b>       | 6 (6.7)                                   | 0.13 (0.07)   | 8                           | 0.47        | 0.47        | 0.47        | 330                         | -06                         | -07 | 191               |
| <b>FN 2090 A-8-..</b>       | 8 (8.9)                                   | 0.13 (0.07)   | 8                           | 0.47        | 0.47        | 0.47        | 330                         | -06                         | -07 | 330               |
| <b>FN 2090 A-10-..</b>      | 10 (11.2)                                 | 0.13 (0.07)   | 8                           | 0.47        | 0.47        | 0.47        | 330                         | -06                         | -07 | 369               |
| <b>FN 2090 A-12-..</b>      | 12 (13.4)                                 | 0.13 (0.07)   | 4                           | 1           | 0.47        | 0.47        | 220                         | -06                         | -07 | 391               |
| <b>FN 2090 A-16-..</b>      | 16 (17.9)                                 | 0.13 (0.07)   | 4                           | 1           | 0.47        | 0.47        | 220                         | -06                         | -07 | 425               |
| <b>FN 2090 A-20-..</b>      | 20 (22.4)                                 | 0.13 (0.07)   | 2.7                         | 1           | 0.47        | 0.47        | 220                         | -06                         | -08 | 530               |
| <b>FN 2090 B-1-..</b>       | 1 (1.1)                                   | 0.00  | 20                          | 0.22        |             |             | 680                         | -06                         | -07 | 73                |
| <b>FN 2090 B-3-..</b>       | 3 (3.4)                                   | 0.00  | 14                          | 0.33        |             |             | 470                         | -06                         | -07 | 158               |
| <b>FN 2090 B-4-..</b>       | 4 (4.5)                                   | 0.00  | 14                          | 0.33        |             |             | 470                         | -06                         | -07 | 176               |
| <b>FN 2090 B-6-..</b>       | 6 (6.7)                                   | 0.00  | 8                           | 0.47        |             |             | 330                         | -06                         | -07 | 191               |
| <b>FN 2090 B-8-..</b>       | 8 (8.9)                                   | 0.00  | 8                           | 0.47        |             |             | 330                         | -06                         | -07 | 330               |
| <b>FN 2090 B-10-..</b>      | 10 (11.2)                                 | 0.00  | 8                           | 0.47        |             |             | 330                         | -06                         | -07 | 369               |
| <b>FN 2090 B-12-..</b>      | 12 (13.4)                                 | 0.00  | 4                           | 1           |             |             | 220                         | -06                         | -07 | 391               |
| <b>FN 2090 B-16-..</b>      | 16 (17.9)                                 | 0.00  | 4                           | 1           |             |             | 220                         | -06                         | -07 | 425               |
| <b>FN 2090 B-20-..</b>      | 20 (22.4)                                 | 0.00  | 2.7                         | 1           |             |             | 220                         | -06                         | -08 | 530               |
| <b>FN 2090 B-30-08</b>      | 30 (33.5)                                 | 0.00  | 1.5                         | 1           |             |             | 220                         |                             | -08 | 548               |
| <b>Enhanced performance</b> |   |   |                             |             |             |             |                             |                             |     |                   |
| <b>FN 2090 KK-1-06</b>      | 1 (1.15)                                  | 3.46 (1.99)   | 20                          | 0.22        | 22          | 22          | 680                         | -06                         |     | 95                |
| <b>FN 2090 NN-3-06</b>      | 3 (3.4)                                   | 15.71 (9.05)  | 14                          | 0.33        | 100         | 100         | 470                         | -06                         |     | 200               |
| <b>FN 2090 NN-4-06</b>      | 4 (4.5)                                   | 15.71 (9.05)  | 14                          | 0.33        | 100         | 100         | 470                         | -06                         |     | 210               |
| <b>FN 2090 NN-6-06</b>      | 6 (6.7)                                   | 15.71 (9.05)  | 8                           | 0.47        | 100         | 100         | 330                         | -06                         |     | 220               |
| <b>FN 2090 NN-8-06</b>      | 8 (8.9)                                   | 15.71 (9.05)  | 8                           | 0.47        | 100         | 100         | 330                         | -06                         |     | 340               |
| <b>FN 2090 LL-10-06</b>     | 10 (11.2)                                 | 5.18 (2.98)   | 8                           | 0.47        | 33          | 33          | 330                         | -06                         |     | 470               |
| <b>FN 2090 LL-12-06</b>     | 12 (13.4)                                 | 5.18 (2.98)   | 4                           | 1           | 33          | 33          | 220                         | -06                         |     | 500               |
| <b>FN 2090 LL-16-06</b>     | 16 (17.9)                                 | 5.18 (2.98)   | 4                           | 1           | 33          | 33          | 220                         | -06                         |     | 530               |
| <b>FN 2090 LL-20-..</b>     | 20 (23)                                   | 5.18 (2.98)   | 2.7                         | 1           | 33          | 33          | 220                         | -06                         | -08 | 580               |
| <b>FN 2090 LL-30-08</b>     | 30 (33.5)                                 | 5.18 (2.98)   | 1.5                         | 1           | 33          | 33          | 220                         |                             | -08 | 600               |

\*\* 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)

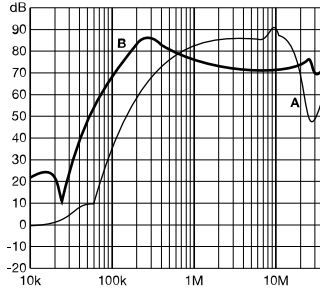
\*\* Maximum leakage under usual AC operating conditions (acc. IEC 60939-3). Note: if the neutral line is interrupted, worst case leakage could reach twice this level. Leakage current for DC application is 0 mA

## Typical filter attenuation

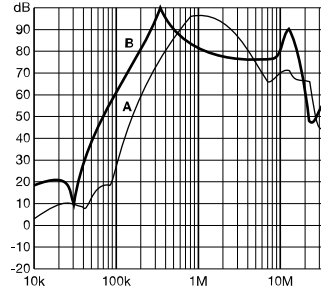
Per CISPR 17; A=50 Ω/50 Ω sym; B=50 Ω/50 Ω asym

### Standard Types

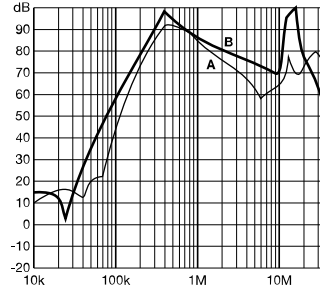
1 to 4 A types



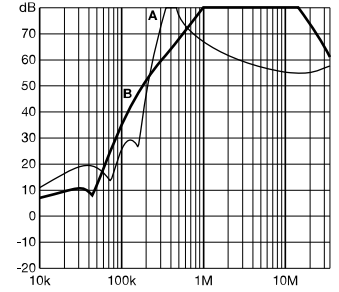
6 to 10 A types



12 to 20 A types

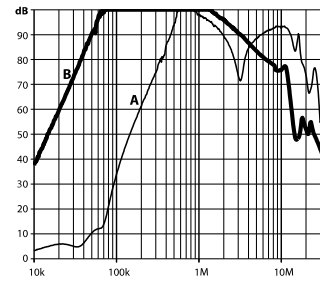


30 A types

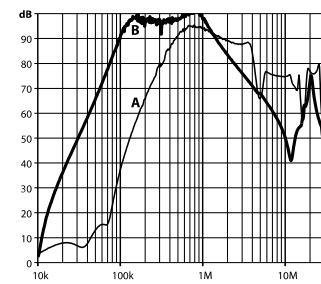


### Enhanced Performance Types

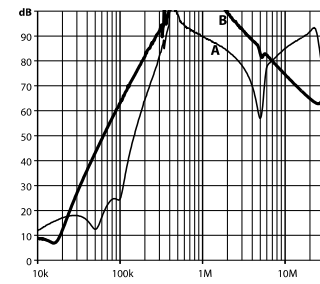
1 to 4 A types



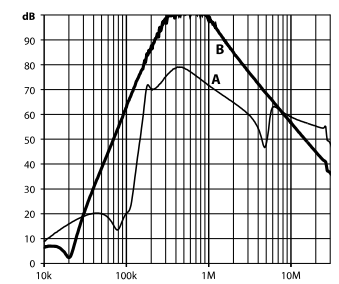
6 to 10 A types



12 to 20 A types

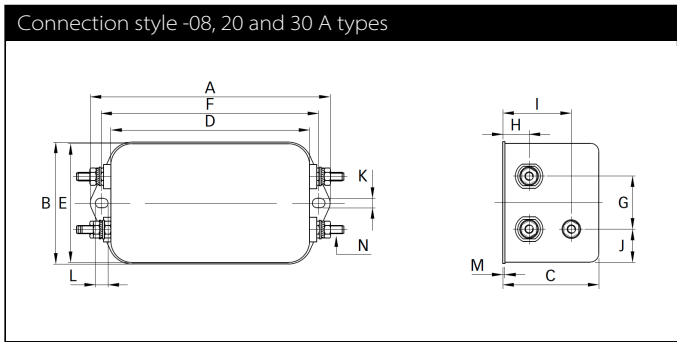
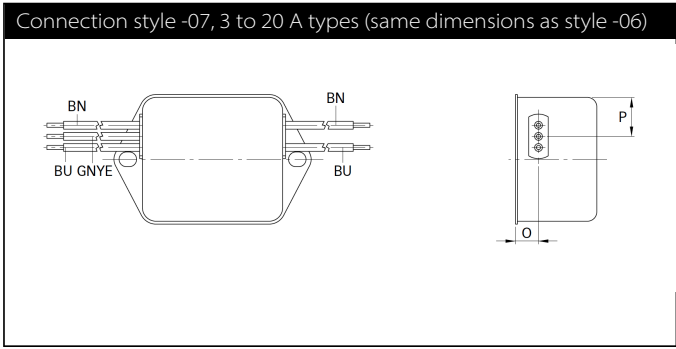
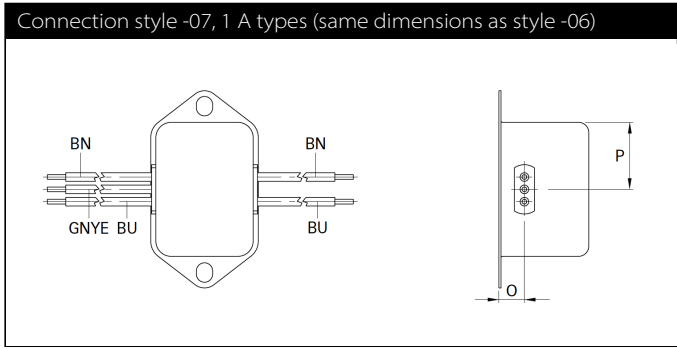
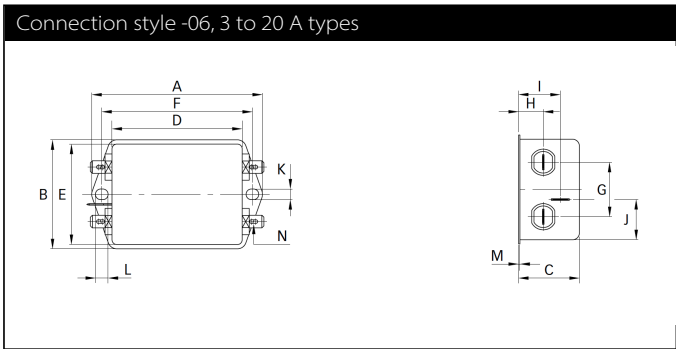
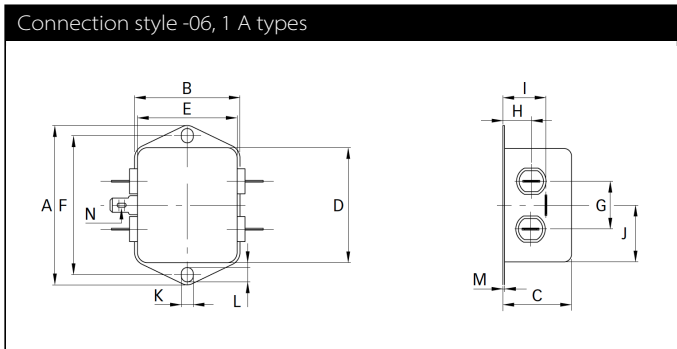


30 A types



| Product selector |          |                                       |
|------------------|----------|---------------------------------------|
| FN 2090-xy-xx-yy | 06       | Faston 6.3 × 0.8 mm (spade/soldering) |
|                  | 07       | Wire leads                            |
|                  | 08       | Studs (M4 screws)                     |
|                  | 1 to 60  | Rated current                         |
|                  | Blank    | Standard version                      |
|                  | Z        | With surge protection                 |
|                  | Blank    | Standard version                      |
|                  | A        | Safety version                        |
|                  | B        | Medical version                       |
|                  | KK/LL/NN | High performance version              |

**Mechanical data**



## Dimensions

|                                | 1 A       | 3 A       | 4 A       | 6 A       | 8 A       | 10 A      | 12 A      | 16 A      | 20 A      | 30 A      | Tolerances |
|--------------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| <b>A</b>                       | 71        | 85        | 85        | 85        | 113.5 ±1  | 113.5 ±1  | 113.5 ±1  | 113.5 ±1  | 113.5 ±1  | 113.5 ±1  | ±0.5       |
| <b>B</b>                       | 46.6      | 54        | 54        | 54        | 57.5 ±1   | 57.5 ±1   | 57.5 ±1   | 57.5 ±1   | 57.5 ±1   | 57.5 ±1   | ±0.5       |
| <b>C</b>                       | 22.3      | 30.3      | 30.3      | 30.3      | 45.4 ±1   | 45.4 ±1   | 45.4 ±1   | 45.4 ±1   | 45.4 ±1   | 45.4 ±1   | ±0.5       |
| <b>D</b>                       | 50.5      | 64.8      | 64.8      | 64.8      | 94 ±1     | 94 ±1     | 94 ±1     | 94 ±1     | 94 ±1     | 94 ±1     | ±0.5       |
| <b>E</b>                       | 44.5      | 49.8      | 49.8      | 49.8      | 56        | 56        | 56        | 56        | 56        | 56        | ±0.5       |
| <b>F</b>                       | 61        | 75        | 75        | 75        | 103       | 103       | 103       | 103       | 103       | 103       | ±0.3       |
| <b>G</b>                       | 21        | 27        | 27        | 27        | 25        | 25        | 25        | 25        | 25        | 25        | ±0.2       |
| <b>H</b>                       | 10.8      | 12.3      | 12.3      | 12.3      | 12.4      | 12.4      | 12.4      | 12.4      | 12.4      | 12.4      | ±0.5       |
| <b>I</b>                       | 16.8      | 20.8      | 20.8      | 20.8      | 32.4      | 32.4      | 32.4      | 32.4      | 32.4      | 32.4      | ±0.5       |
| <b>J</b>                       | 25.25     | 19.9      | 19.9      | 19.9      | 15.5      | 15.5      | 15.5      | 15.5      | 15.5      | 15.5      | ±0.5       |
| <b>K</b>                       | 5.3       | 5.3       | 5.3       | 5.3       | 4.4       | 4.4       | 4.4       | 4.4       | 4.4       | 4.4       |            |
| <b>L</b>                       | 6.3       | 6.3       | 6.3       | 6.3       | 6         | 6         | 6         | 6         | 6         | 6         |            |
| <b>M</b>                       | 0.7       | 0.7       | 0.7       | 0.7       | 0.9       | 0.9       | 0.9       | 0.9       | 0.9       | 0.9       |            |
| <b>Connection style -06</b>    |           |           |           |           |           |           |           |           |           |           |            |
| <b>N</b>                       | 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 |            |
| <b>Connection style -07</b>    |           |           |           |           |           |           |           |           |           |           |            |
| <b>O</b>                       | 8.3       | 8.3       | 8.3       | 8.3       | 8.4       | 8.4       | 8.4       | 8.4       | 8.4       | 8.4       | ±0.5       |
| <b>P</b>                       | 14        | 14.9      | 14.9      | 14.9      | 18        | 18        | 18        | 18        | 18        | 18        | ±0.5       |
| <b>AWG type wire</b>           | AWG 20    | AWG 20    | AWG 20    | AWG 18    | AWG 18    | AWG 18    | AWG 16    | AWG 16    | AWG 16    | AWG 16    |            |
| <b>Wire length</b>             | 140       | 140       | 140       | 140       | 140       | 140       | 140       | 140       | 140       | 140       | +5         |
| <b>Connection style -08</b>    |           |           |           |           |           |           |           |           |           |           |            |
| <b>N</b>                       |           |           |           |           |           |           |           |           | M4        | M4        |            |
| <b>Recommended torque (Nm)</b> |           |           |           |           |           |           |           |           | 1.2 - 1.3 | 1.2 - 1.3 |            |

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.



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