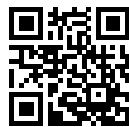


# Multi-stage AC/DC EMI Filter with Excellent Attenuation Performance

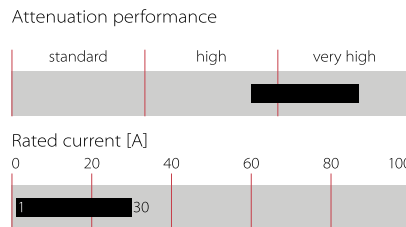


- Rated currents from 1 to 30 A
- Two-stage filter
- Very high differential and common-mode attenuation
- Optional medical versions (B type)
- Optional safety versions (A type)
- Optional enhanced performance versions
- Optional overvoltage protection (Z type)

Approvals & Compliances



Performance indicators



Features and benefits

FN 2090 two-stage filters are designed for easy and fast chassis mounting.

FN 2090 B versions without capacitors to earth comply to 1MOP for ME (medical equipment) acc. IEC 60601-1

FN 2090 A versions with low capacitance to earth 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.

Technical specifications

- Rated voltage\***
- Operating frequency**
- Rated currents**
- High potential test voltage**
  
- Temperature range (operation and storage)**
- Certified to**
- Flammability corresponding to**
- Surge pulse protection (Z type)**
- Overvoltage category**
- Pollution degree**
- Altitude**
- MTBF @ 40°C/230 V (Mil-HB-217F)**

250 VAC, 50/60 Hz; 250 VDC  
 DC to 400 Hz  
 1 to 30 A @ 40°C max.  
 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  
 -25°C to +100°C (25/100/21)\*\*  
 UL 1283, CSA 22.2 No. 8 1986, IEC/EN 60939 (applies to AC and DC applications)  
 Terminal plastic for -06/-08 version: UL 94 V-0  
 Laces for -07 version: UL 94 VW-1  
 Grommet for -07 version: UL 94 V-0  
 Helps compliance to IEC61000-4-5 (Differential Mode only)  
 II acc. IEC 60664-1  
 2 acc. IEC 60664-1  
 2000m (above derating applies)\*\*  
 1,300,000 hours (1 to 10 A types)  
 1,100,000 hours (12 A types)  
 517,000 hours (16 and 30 A types)

FN 2090 two-stage filters are designed for noisy applications requiring excellent filter performance.

The higher inductivity offers increased attenuation performance with the same form factor as FN 2060 and FN 2080 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).

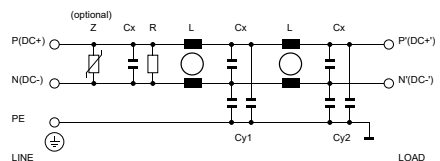
Various terminal options allow you to select the desired connection style.

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

\* maximum RMS operating voltage at rated frequency or the maximum DC operating voltage  
 \*\* for dedicated requests exceeding this specification (e.g. -40 °C or higher altitude) please contact your local Schaffner Sales office

Typical electrical schematic



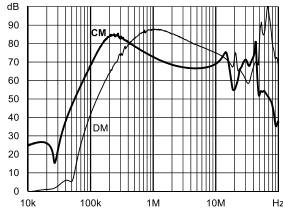
Filter selection table

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

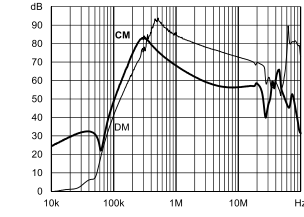
\*\* To compile a complete part number, please replace the .. with the required I/O connection style.  
 \*\* For surge pulse protection, please add Z (e.g. FN 2090Z-10-06, FN 2090BZ-20-08). The different letters code the used Cy values in the filter type (A = 0.47nF; K = 22nF; L = 33nF; N = 100nF; as the FN 2090 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  
 \*\*\* Tolerances apply: Inductance: -30/+50%, Capacitance: ±20%, Resistance: ±10%

### Typical filter attenuation

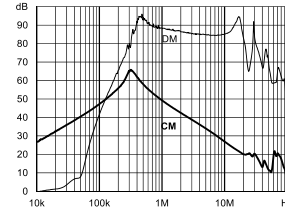
Per CISPR 17; A=50 Ω/50 Ω sym; B=50 Ω/50 Ω asym



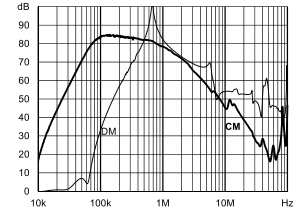
1 A: Standard type



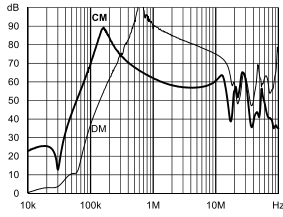
A type



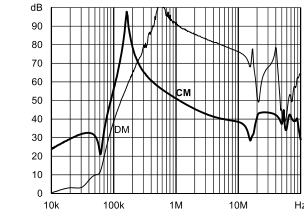
B type



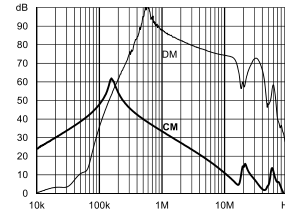
Enhanced performance



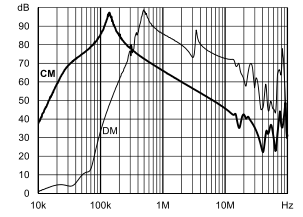
3 A: Standard type



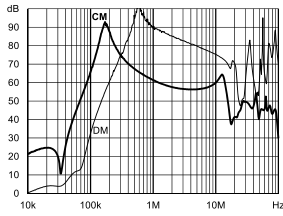
A type



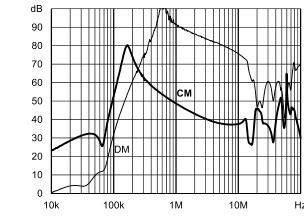
B type



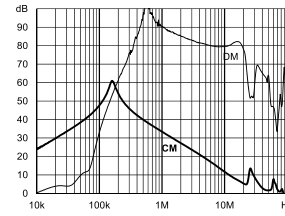
Enhanced performance



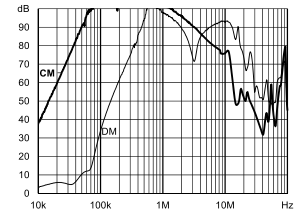
4 A: Standard type



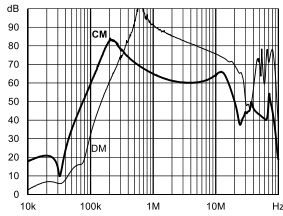
A type



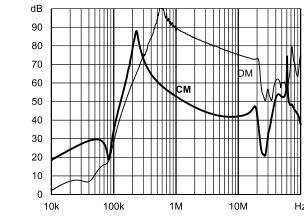
B type



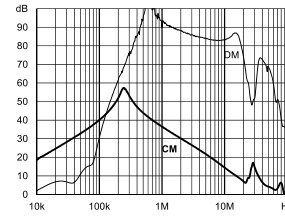
Enhanced performance



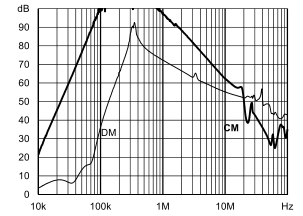
6 A: Standard type



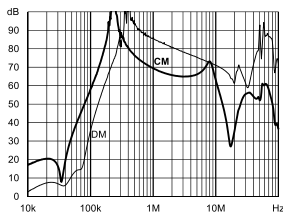
A type



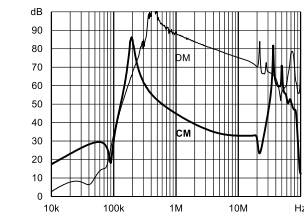
B type



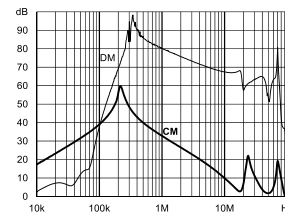
Enhanced performance



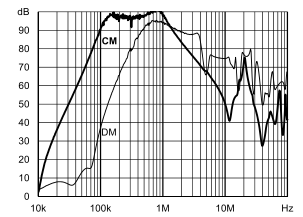
8 A: Standard type



A type



B type

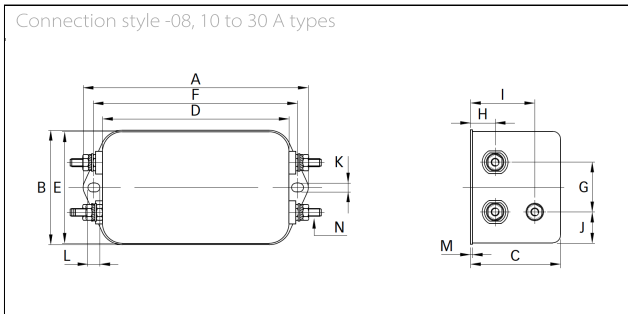
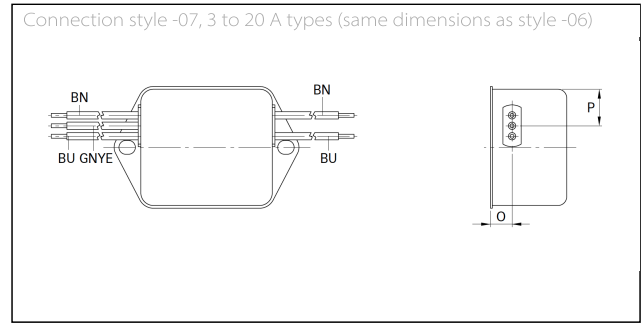
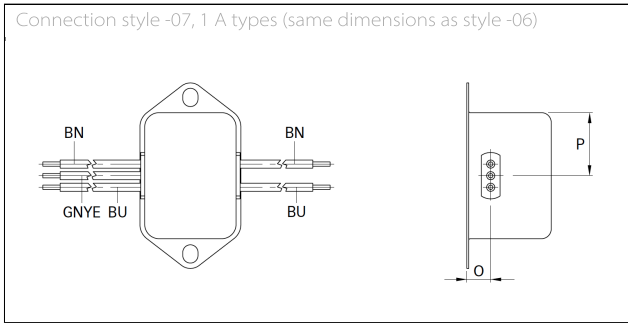
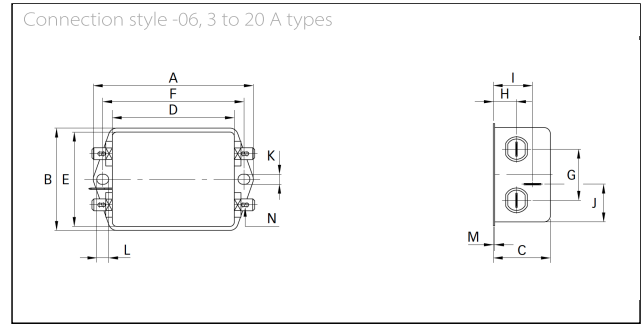
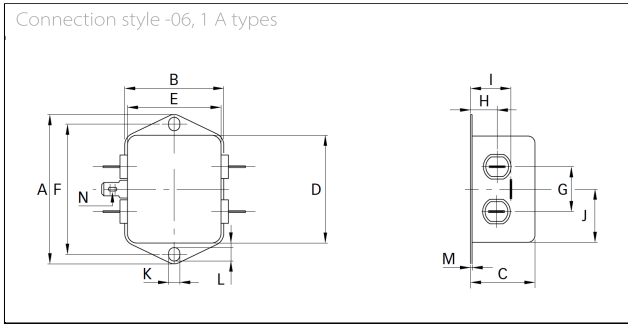


Enhanced performance



|                  |          |                                       |
|------------------|----------|---------------------------------------|
| FN 2090 xy-xx-yy | 06       | Faston 6.3 × 0.8 mm (spade/soldering) |
|                  | 07       | Wire leads                            |
|                  | 08       | Studs (M4 screws)                     |
|                  | 1 to 30  | 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 |
|---|------|------|------|------|----------|----------|----------|----------|----------|----------|------------|
| A | 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 | 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       |
| C | 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       |
| D | 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       | 1         | 1         | 1         | 1         | 1         | 1         | ±0.3 |
| <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        | M4        | M4        | M4        |      |
| <b>Recommended torque (Nm)</b> |           |           |           |           |           | 1.2 - 1.3 | 1.2 - 1.3 | 1.2 - 1.3 | 1.2 - 1.3 | 1.2 - 1.3 |      |
| <b>Earth terminal</b>          |           |           |           |           |           | 1.5 - 1.7 | 1.5 - 1.7 | 1.5 - 1.7 | 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.



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