

# High Performance EMC/EMI Filter with Earth Line Choke



- Rated currents up to 15 A
- Excellent attenuation performance
- Integrated earth line choke
- Complies with IEC/EN 60601-1
- Snap-in versions (S and S1 type)
- Hot inlet versions (HI type)



## Performance indicators

Attenuation performance



Rated current [A]



## Approvals



(CQC except HI-types)

The FN 9233 E IEC inlet filter combines an IEC inlet and mains filter with excellent filter attenuation in a small form factor. The FN 9233 E high performance power entry module offers additional EMI suppression on the earth line. Choosing the FN 9233 E product line brings you the rapid availability of a standard filter associated with the necessary safety acceptances. Standard IEC connector filters are a practical solution helping you to pass EMI system approval in a short time. A wide selection on amperage ratings, output connections, mounting possibilities and filters for medical applications are designed to offer you the desired solution. For types without additional earth line choke please consult the FN 9233 data sheet.

## Technical specifications

|                                                  |                                                                                                               |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------|
| <b>Maximum continuous operating voltage</b>      | 250 VAC, 50/60 Hz                                                                                             |
| <b>Operating frequency</b>                       | DC to 400 Hz                                                                                                  |
| <b>Rated currents</b>                            | 1 to 15 A @ 50°C                                                                                              |
| <b>Approvals by rated current</b>                | 1 to 10 A (ENEC, CQC)<br>1 to 15 A (UL, CSA)                                                                  |
| <b>High potential test voltage</b>               | P → PE 2000 VAC for 2 sec (standard types)<br>P → PE 2500 VAC for 2 sec (B types)<br>P → N 1000 VAC for 2 sec |
| <b>Protection category</b>                       | IP 40 according to IEC 60529                                                                                  |
| <b>Temperature range (operation and storage)</b> | -25°C to +85°C (25/85/21)                                                                                     |
| <b>Design corresponding to</b>                   | UL 1283, CSA 22.2 No. 8 1986, IEC/EN 60939                                                                    |
| <b>Flammability corresponding to</b>             | UL 94 V-2 or better                                                                                           |
| <b>MTBF @ 40°C/230 V (Mil-HB-217F)</b>           | 1,710,000 hours                                                                                               |

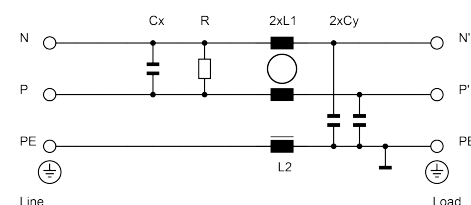
## Features and benefits

- Exceptional conducted attenuation performance, based on chokes with high saturation resistance and excellent thermal behavior
- Rear/front or snap-in mounting
- Without earth line choke see FN 9233 data sheet
- Optional medical versions (B type) comply with the requirements of IEC/EN 60601-1 for creepage and clearance, leakage current and high potential testing
- Wide mounting flanges available
- Different output connections offering maximum flexibility for assembly
- Custom-specific versions are available on request

## Typical applications

- Portable electrical and electronic equipment
- Small to medium-sized machines and household equipment
- Single-phase power supplies, switch-mode power supplies
- Test and measurement equipment
- Medical equipment
- Rack mounting equipment

## Typical electrical schematic

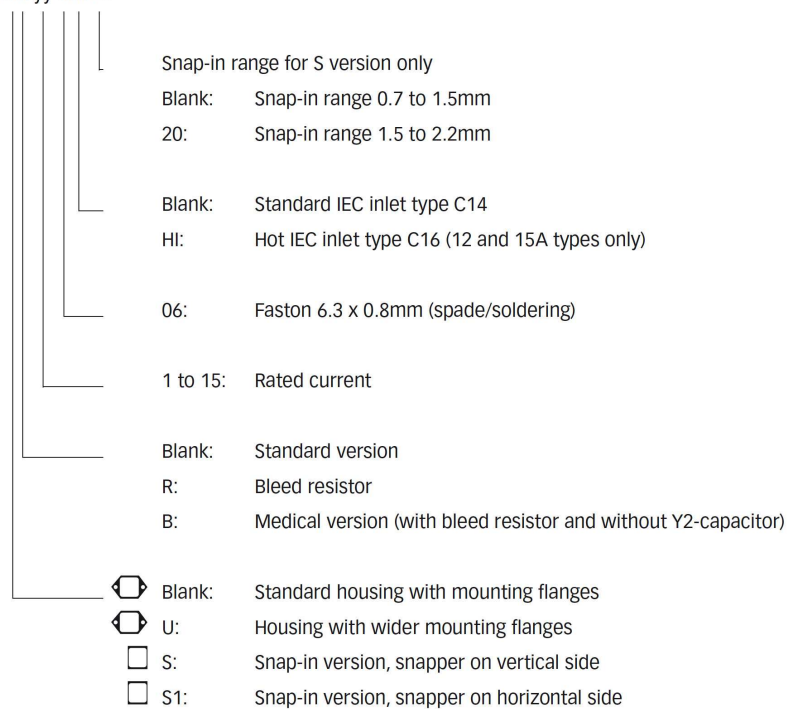


## Filter selection table

| Filter                     | Rated current<br>@ 50°C(25 °C) | Leakage current*<br>@ 250 VAC/50 Hz<br>(@ 120 VAC/60 Hz) | Inductance |      | Capacitance |      | Resistance<br>R | Output connections<br> | Weight |
|----------------------------|--------------------------------|----------------------------------------------------------|------------|------|-------------|------|-----------------|-----------------------------------------------------------------------------------------------------------|--------|
|                            |                                |                                                          | L1         | L2   | Cx          | Cy   |                 |                                                                                                           |        |
|                            | [A]                            | [mA]                                                     | [mH]       | [mH] | [µF]        | [nF] | [kΩ]            |                                                                                                           | [g]    |
| <b>FN 9233 Ex-1-06</b>     | 1 (1.2)                        | 0.31 (0.18)                                              | 22.5       | 0.4  | 0.1         | 2.2  |                 | -06                                                                                                       | 46     |
| <b>FN 9233 Ex-3-06</b>     | 3 (3.5)                        | 0.31 (0.18)                                              | 4.6        | 0.4  | 0.1         | 2.2  |                 | -06                                                                                                       | 46     |
| <b>FN 9233 Ex-6-06</b>     | 6 (7.2)                        | 0.31 (0.18)                                              | 1.6        | 0.4  | 0.1         | 2.2  |                 | -06                                                                                                       | 46     |
| <b>FN 9233 Ex-8-06</b>     | 8 (10.6)                       | 0.31 (0.18)                                              | 0.9        | 0.4  | 0.1         | 2.2  |                 | -06                                                                                                       | 46     |
| <b>FN 9233 Ex-10-06</b>    | 10 (11.6)                      | 0.31 (0.18)                                              | 0.45       | 0.4  | 0.1         | 2.2  |                 | -06                                                                                                       | 46     |
| <b>FN 9233 Ex-12-06</b>    | 12 (12)                        | 0.31 (0.18)                                              | 0.27       | 0.1  | 0.1         | 2.2  |                 | -06                                                                                                       | 46     |
| <b>FN 9233 Ex-15-06</b>    | 15 (15)                        | 0.31 (0.18)                                              | 0.2        | 0.1  | 0.1         | 2.2  |                 | -06                                                                                                       | 46     |
| <b>FN 9233 Ex-12-06HI</b>  | 12 (12)                        | 0.31 (0.18)                                              | 0.27       | 0.1  | 0.1         | 2.2  |                 | -06                                                                                                       | 46     |
| <b>FN 9233 Ex-15-06HI</b>  | 15 (15)                        | 0.31 (0.18)                                              | 0.2        | 0.1  | 0.1         | 2.2  |                 | -06                                                                                                       | 46     |
| <b>FN 9233 ExR-1-06</b>    | 1 (1.2)                        | 0.31 (0.18)                                              | 22.5       | 0.4  | 0.1         | 2.2  | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExR-3-06</b>    | 3 (3.5)                        | 0.31 (0.18)                                              | 4.6        | 0.4  | 0.1         | 2.2  | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExR-6-06</b>    | 6 (7.2)                        | 0.31 (0.18)                                              | 1.6        | 0.4  | 0.1         | 2.2  | 1000            | -06                                                                                                       | 46     |
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| <b>FN 9233 ExR-10-06</b>   | 10 (11.6)                      | 0.31 (0.18)                                              | 0.45       | 0.4  | 0.1         | 2.2  | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExR-12-06</b>   | 12 (12)                        | 0.31 (0.18)                                              | 0.27       | 0.1  | 0.1         | 2.2  | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExR-15-06</b>   | 15 (15)                        | 0.31 (0.18)                                              | 0.2        | 0.1  | 0.1         | 2.2  | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExR-12-06HI</b> | 12 (12)                        | 0.31 (0.18)                                              | 0.27       | 0.1  | 0.1         | 2.2  | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExR-15-06HI</b> | 15 (15)                        | 0.31 (0.18)                                              | 0.2        | 0.1  | 0.1         | 2.2  | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExB-1-06</b>    | 1 (1.2)                        | 0.00                                                     | 22.5       | 0.4  | 0.1         |      | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExB-3-06</b>    | 3 (3.5)                        | 0.00                                                     | 4.6        | 0.4  | 0.1         |      | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExB-6-06</b>    | 6 (7.2)                        | 0.00                                                     | 1.6        | 0.4  | 0.1         |      | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExB-8-06</b>    | 8 (10.6)                       | 0.00                                                     | 0.9        | 0.4  | 0.1         |      | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExB-10-06</b>   | 10 (11.6)                      | 0.00                                                     | 0.45       | 0.4  | 0.1         |      | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExB-12-06</b>   | 12 (12)                        | 0.00                                                     | 0.27       | 0.1  | 0.1         |      | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExB-15-06</b>   | 15 (15)                        | 0.00                                                     | 0.2        | 0.1  | 0.1         |      | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExB-12-06HI</b> | 12 (12)                        | 0.00                                                     | 0.27       | 0.1  | 0.1         |      | 1000            | -06                                                                                                       | 46     |
| <b>FN 9233 ExB-15-06HI</b> | 15 (15)                        | 0.00                                                     | 0.2        | 0.1  | 0.1         |      | 1000            | -06                                                                                                       | 46     |

\* Maximum leakage under normal operating conditions (acc. to IEC60939-3). Note: if the neutral line is interrupted, worst case leakage could reach twice this level.

FN 9233Exx-vv-..HI-zz

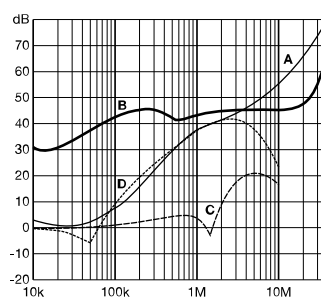


For example: FN 9233 E-15-06, FN 9233 ES1B-10-06-20, FN 9233 ER-12-06HI, FN 9233 EUB-8-06-20

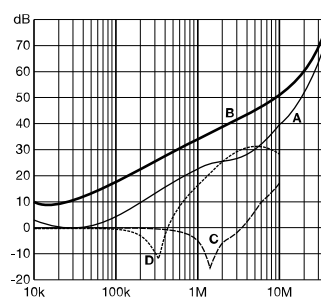
### Typical filter attenuation

Per CISPR 17; A=50  $\Omega$ /50  $\Omega$  sym; B=50  $\Omega$ /50  $\Omega$  asym; C=0.1  $\Omega$ /100  $\Omega$  sym; D=100  $\Omega$ /0.1  $\Omega$  sym

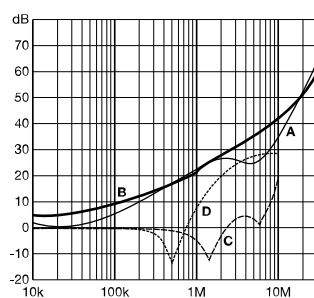
1 and 3 A types



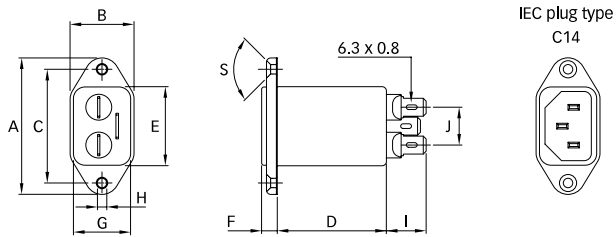
6 to 10 A types



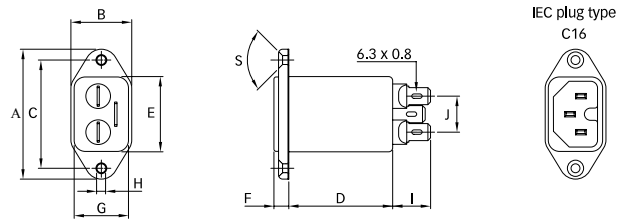
12 and 15 A types



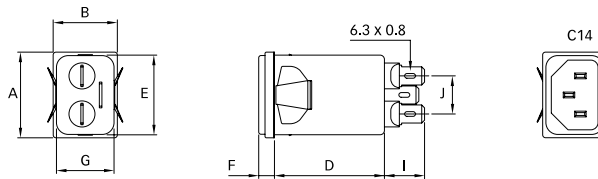
FN 9233 E



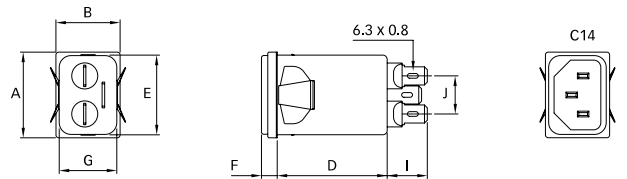
FN 9233 E-HI



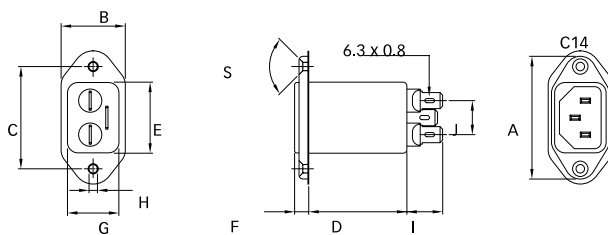
FN 9233 ES



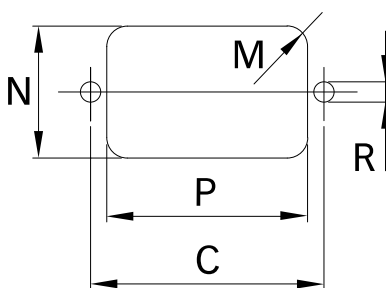
FN 9233 ES1



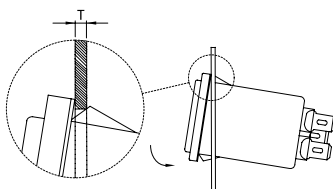
FN 9233 EU



Panel cut out



Installation



## Dimensions

|            | FN 9233 E | FN 9233 EU | FN 9233 ES | FN 9233 ES1 | FN 9233 E-HI | Tol.    |
|------------|-----------|------------|------------|-------------|--------------|---------|
| <b>A</b>   | 48        | 48         | 29.9       | 29.9        | 48           |         |
| <b>B</b>   | 22.4      | 25         | 22.4       | 22.4        | 22.4         |         |
| <b>C</b>   | 40        | 40         |            |             | 40           | 0.2     |
| <b>D</b>   | 46.8      | 46.7       | 46.8       | 46.8        | 46.8         |         |
| <b>E</b>   | 27.8      | 27.7       | 27.8       | 27.8        | 27.8         | +0.6/-0 |
| <b>F</b>   | 5.7       | 5.7        | 5.7        | 5.7         | 5.7          |         |
| <b>G</b>   | 20.1      | 20.1       | 20.1       | 20.1        | 20.1         | +0.6/-0 |
| <b>H</b>   | Ø3.3      | Ø3.3       |            |             | Ø3.3         |         |
| <b>I</b>   | 14        | 14         | 14         | 14          | 14           |         |
| <b>J</b>   | 13.3      | 13.3       | 13.3       | 13.3        | 13.3         |         |
| <b>M</b>   | R ≤3      | R ≤3       | R ≤1.5     | R ≤1.5      | R ≤3         |         |
| <b>N</b>   | 21.5      | 21.5       | 20.8       | 21.9        | 21.5         |         |
| <b>P</b>   | 28.5      | 28.5       | 29.4       | 28.5        | 28.5         |         |
| <b>R*</b>  | M3        | M3         |            |             | M3           |         |
| <b>S</b>   | 90°       | 90°        |            |             | 90°          |         |
| <b>T**</b> |           |            | 0.7 - 1.5  | 0.7 - 1.5   |              |         |
| <b>T**</b> |           |            | 1.5 - 2.2  | 1.5 - 2.2   |              |         |

\* Recommended torque for M3 (90° countersunk flat head) is 0.5 Nm

\*\* For selecting the panel thickness, please refer to the filter selector 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 connectors.

## Accessories for IEC Inlet Filters and Power Entry Modules

The accessories displayed are a selection of available accessories for IEC Inlet filters and IEC Power entry modules. As they are displayed in a general way there might be variants of the filters where the accessories are not available.

For further information please ask your local Schaffner Sales Partner and visit our homepage <https://www.schaffner.com/>.

### Power Cord with Locking System for Inlet Filters IL 13, IL 13 P, IL 19



Link to Datasheet: [Datasheet IEC C13/C19 locking cable](#)

The locking system has a tensile force of typical 200N.

It is recommended to use it with flange mount filters.

Lock Power Cords with IEC Inlets and Filters"

Schaffner power cords with IEC lock guard against

accidental disconnection of all electrical appliances

with an IEC inlet. No exchange or modification of the

IEC inlet or IEC inlet filter system is

needed. Easy

retrofit for all electronic equipments and devices.

### IEC C13 Rewireable Connector for individual Power Cord with Locking System



Link to Datasheet: [Datasheet IEC C13 rewireable](#)

The locking system has a tensile force of typical 300N. It is recommended to

use it with flange mount filters. For details refer to our Application Note

"Using IEC Lock Power Cords with IEC Inlets and Filters"

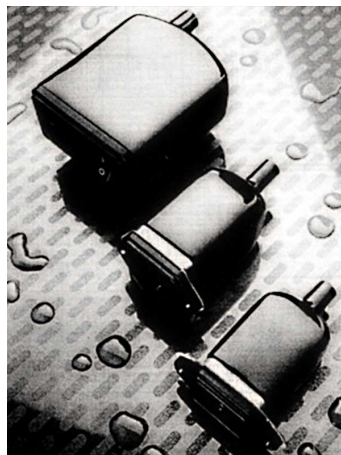
Schaffner power connector with IEC lock guard against

accidental disconnection of all electrical appliances with an IEC inlet.

No exchange or modification of the IEC inlet or IEC inlet filter system is

needed. Easy retrofit for all electronic equipments and devices.

### IB - Insulating Boots



There is a full range of insulating boots available from Schaffner that provide a

physical cover for the exposed terminals on the back of IEC Inlet

Filters.

These boots fit the simplest non-fused

and unswitched style up to the fully

fused and switched IEC filtered inlet.

The boots are made from a durable

black PVC material that conforms to UL94-V0 flammability requirements.

The boots slip easily over the back of the filter and reduce the risk of

electrical shock to maintenance

personnel whilst protecting the filter

from environmental hazard such as the ingress of dust and moisture.



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