

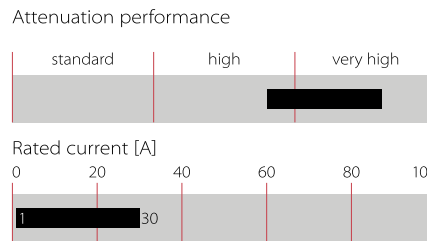
# Multi-stage AC/DC EMI Filter with Excellent Attenuation Performance



- 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 & Compliances



### 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.
- 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.

### Technical specifications

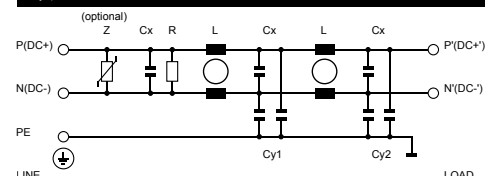
<b>Rated voltage*</b>	250 VAC, 50/60 Hz; 250 VDC
<b>Operating frequency</b>	DC to 400 Hz
<b>Rated currents</b>	1 to 30 A @ 40°C max.
<b>High potential test voltage</b>	P → PE 2000 VAC for 2 sec (equiv. cap <88 nF) P → PE 2550 VDC for 2 sec (equiv. cap >88 nF) P → PE 2500 VAC for 2 sec (B types) P → N 1100 VDC for 2 sec
<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>	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
<b>Surge pulse protection (Z type)</b>	Helps compliance to IEC61000-4-5 (Differential Mode only)
<b>Overvoltage category</b>	II acc. IEC 60664-1
<b>Pollution degree</b>	2 acc. IEC 60664-1
<b>Altitude</b>	2000m (above derating applies)**
<b>MTBF @ 40°C/230 V (Mil-HB-217F)</b>	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  
 \*\* for dedicated requests exceeding this specification (e.g. -40 °C or higher altitude) please contact your local Schaffner Sales office

### 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*	Buy	Rated current @ 40°C (25°C)	Leakage current** @ 250V AC/50 Hz (@ 120V AC/60 Hz)	Power Loss @ 25°C/DC	Inductance***		Capacitance***			Resistance*** R	Input/Output connections			Weight [g]
					L	Cx	Cy1	Cy2						
		[A]	[mA]	[W]	[mH]	[μF]	[nF]	[nF]	[kΩ]					
FN2090-1-..	🛒	1 (1.1)	0.45 (0.26)	1.8	20	0.22	2.2	1.0	680	-06	-07		73	
FN2090-3-..	🛒	3 (3.4)	0.45 (0.26)	3.7	14	0.33	2.2	1.0	470	-06	-07		158	
FN2090-4-..	🛒	4 (4.5)	0.45 (0.26)	6.4	14	0.33	2.2	1.0	470	-06	-07		176	
FN2090-6-..	🛒	6 (6.7)	0.61 (0.35)	7.1	8	0.47	3.3	1.0	330	-06	-07	-08	191	
FN2090-8-..	🛒	8 (8.9)	0.61 (0.35)	7.7	8	0.47	3.3	1.0	330	-06	-07		330	
FN2090-10-..	🛒	10 (11.2)	0.61 (0.35)	8.4	8	0.47	3.3	1.0	330	-06	-07	-08	369	
FN2090-12-..	🛒	12 (13.4)	0.93 (0.54)	12.1	4	1	10	1.0	220	-06	-07	-08	391	
FN2090-16-..	🛒	16 (17.9)	0.93 (0.54)	10.7	4	1	10	1.0	220	-06	-07		425	
FN2090-20-..	🛒	20 (22.4)	0.93 (0.54)	8.2	2.7	1	10	1.0	220	-06		-08	530	
FN2090-30-08	🛒	30 (33.5)	0.93 (0.54)	10.1	1.5	1	10	1.0	220			-08	548	
FN2090A-1-..	🛒	1 (1.1)	0.13 (0.07)	1.8	20	0.22	0.47	0.47	680	-06	-07		73	
FN2090A-3-..	🛒	3 (3.4)	0.13 (0.07)	3.7	14	0.33	0.47	0.47	470	-06	-07		158	
FN2090A-4-..	🛒	4 (4.5)	0.13 (0.07)	6.4	14	0.33	0.47	0.47	470	-06	-07		176	
FN2090A-6-..	🛒	6 (6.7)	0.13 (0.07)	7.1	8	0.47	0.47	0.47	330	-06	-07	-08	191	
FN2090A-8-..	🛒	8 (8.9)	0.13 (0.07)	7.7	8	0.47	0.47	0.47	330	-06	-07		330	
FN2090A-10-..	🛒	10 (11.2)	0.13 (0.07)	8.4	8	0.47	0.47	0.47	330	-06	-07	-08	369	
FN2090A-12-..	🛒	12 (13.4)	0.13 (0.07)	12.1	4	1	0.47	0.47	220	-06	-07	-08	391	
FN2090A-16-..	🛒	16 (17.9)	0.13 (0.07)	10.7	4	1	0.47	0.47	220	-06	-07		425	
FN2090A-20-..	🛒	20 (22.4)	0.13 (0.07)	8.2	2.7	1	0.47	0.47	220	-06		-08	530	
FN2090A-30-08	🛒	30 (33.5)	0.13 (0.07)	10.1	1.5	1	10	10	220			-08	548	
FN2090B-1-..	🛒	1 (1.1)	0.00	1.8	20	0.22			680	-06	-07		73	
FN2090B-3-..	🛒	3 (3.4)	0.00	3.7	14	0.33			470	-06	-07		158	
FN2090B-4-..	🛒	4 (4.5)	0.00	6.4	14	0.33			470	-06	-07		176	
FN2090B-6-..	🛒	6 (6.7)	0.00	7.1	8	0.47			330	-06	-07	-08	191	
FN2090B-8-..	🛒	8 (8.9)	0.00	7.7	8	0.47			330	-06	-07		330	
FN2090B-10-..	🛒	10 (11.2)	0.00	8.4	8	0.47			330	-06	-07	-08	369	
FN2090B-12-..	🛒	12 (13.4)	0.00	12.1	4	1			220	-06	-07	-08	391	
FN2090B-16-..	🛒	16 (17.9)	0.00	10.7	4	1			220	-06	-07		425	
FN2090B-20-..	🛒	20 (22.4)	0.00	8.2	2.7	1			220	-06		-08	530	
FN2090B-30-08	🛒	30 (33.5)	0.00	10.1	1.5	1			220			-08	548	
<b>Enhanced performance</b>														
FN2090KK-1-06	🛒	1 (1.15)	3.46 (1.99)	1.8	20	0.22	22	22	680	-06	-07		95	
FN2090NN-3-06	🛒	3 (3.4)	15.71 (9.05)	3.7	14	0.33	100	100	470	-06			200	
FN2090NN-4-06	🛒	4 (4.5)	15.71 (9.05)	6.4	14	0.33	100	100	470	-06			210	
FN2090NN-6-06	🛒	6 (6.7)	15.71 (9.05)	7.1	8	0.47	100	100	330	-06			220	
FN2090NN-8-06	🛒	8 (8.9)	15.71 (9.05)	7.7	8	0.47	100	100	330	-06			340	
FN2090LL-10-..	🛒	10 (11.2)	5.18 (2.98)	8.4	8	0.47	33	33	330	-06		-08	470	
FN2090LL-12-..	🛒	12 (13.4)	5.18 (2.98)	12.1	4	1	33	33	220	-06		-08	500	
FN2090LL-16-06	🛒	16 (17.9)	5.18 (2.98)	10.7	4	1	33	33	220	-06			530	
FN2090LL-20-..	🛒	20 (23)	5.18 (2.98)	8.2	2.7	1	33	33	220	-06		-08	580	
FN2090LL-30-08	🛒	30 (33.5)	5.18 (2.98)	10.1	1.5	1	33	33	220			-08	600	

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

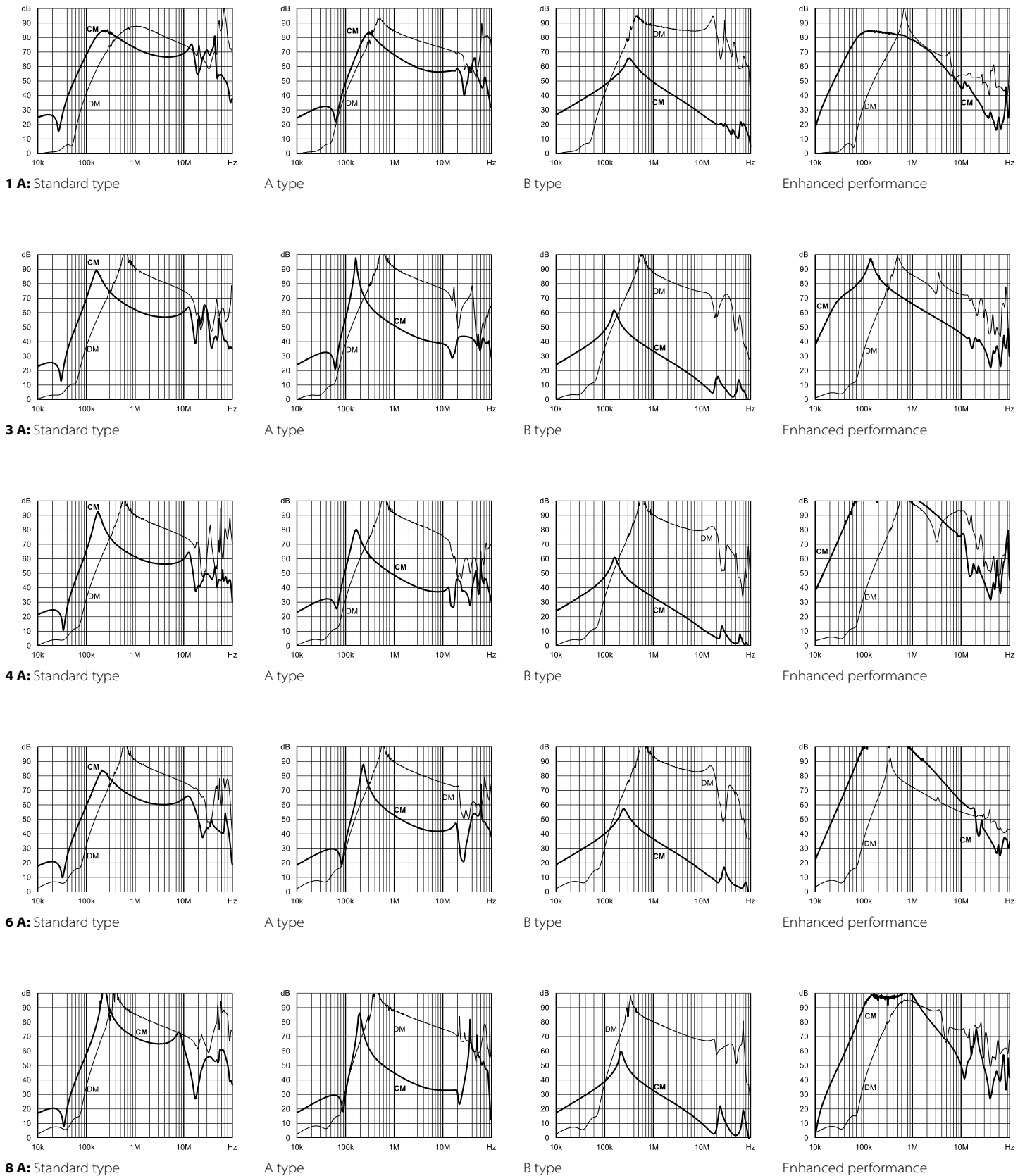
For surge pulse protection, please add Z (e.g. FN2090Z-10-06, FN2090BZ-20-08). The different letters code the used Cy values in the filter type (A = 0.47nF; K = 22nF; L = 33nF; N = 100nF; as the FN2090 is a dual stage filter each letter stands for one stage of Cy)

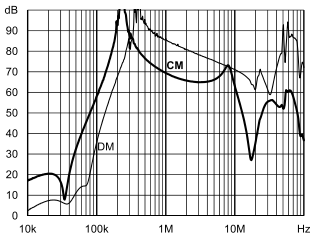
\*\* Maximum leakage under usual AC operating conditions (acc. IEC 60939-3). Note: if the neutral line is interrupted, worst case leakage could reach twice this level. Leakage current for DC application is 0mA

\*\*\* Tolerances apply: Inductance: -30/+50%, Capacitance: ±20%, Resistance: ±10%

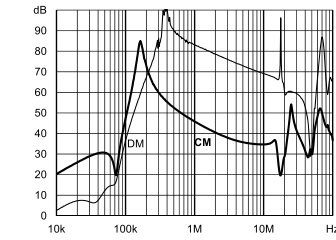
### Typical filter attenuation

Per CISPR 17; CM=50 Ω/50 Ω sym; DM=50 Ω/50 Ω asym

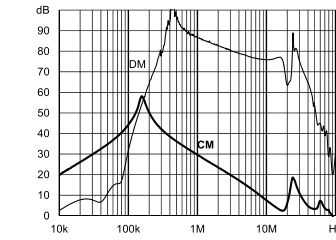




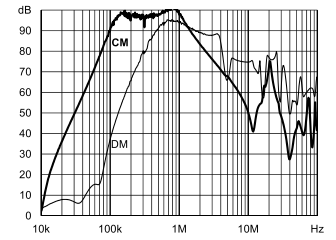
10 A: Standard type



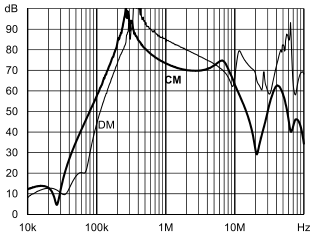
A type



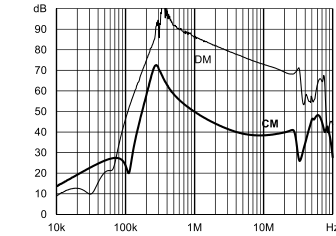
B type



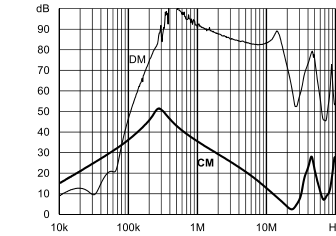
Enhanced performance



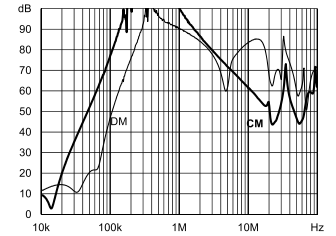
12 A: Standard type



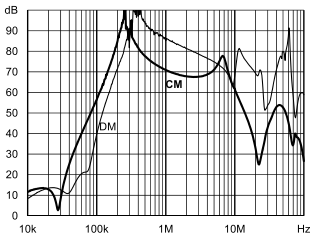
A type



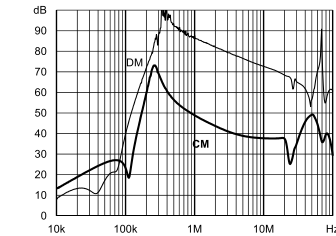
B type



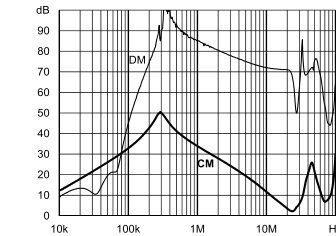
Enhanced performance



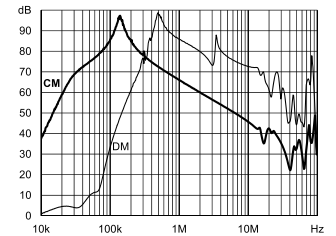
16 A: Standard type



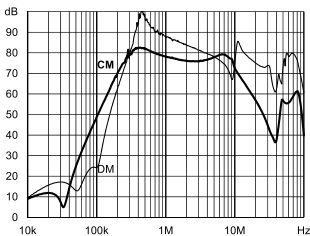
A type



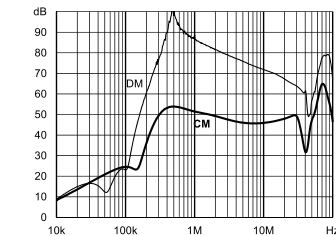
B type



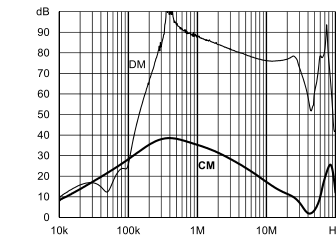
Enhanced performance



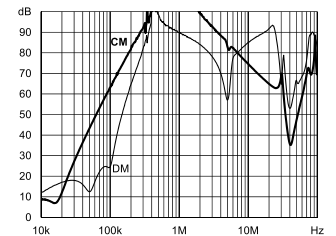
20 A: Standard type



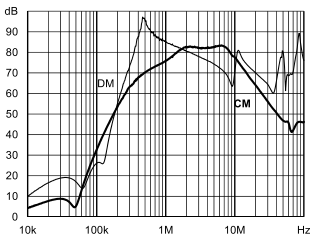
A type



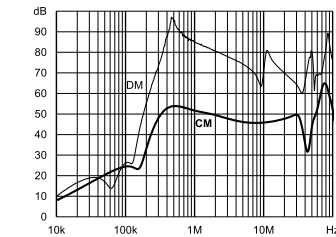
B type



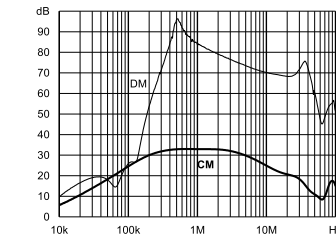
Enhanced performance



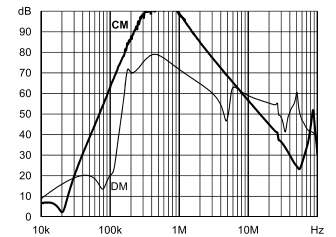
30 A: Standard type



A type



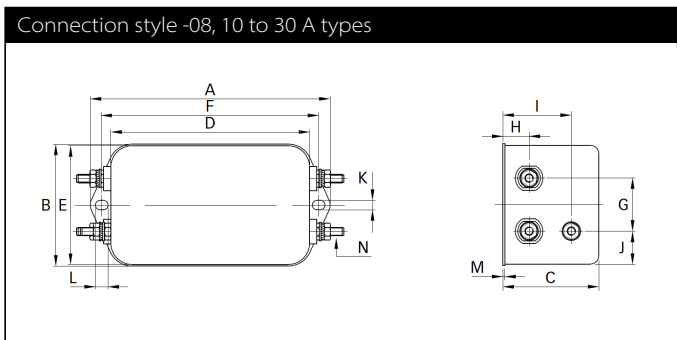
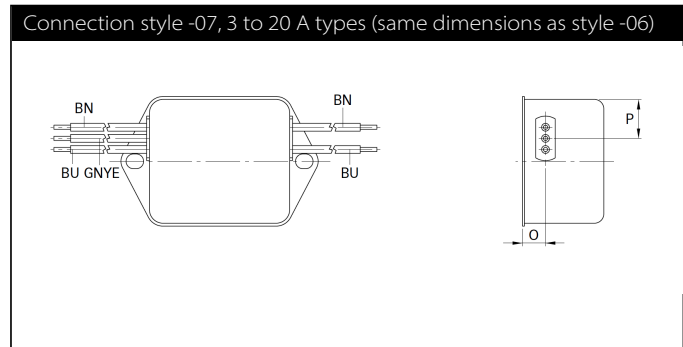
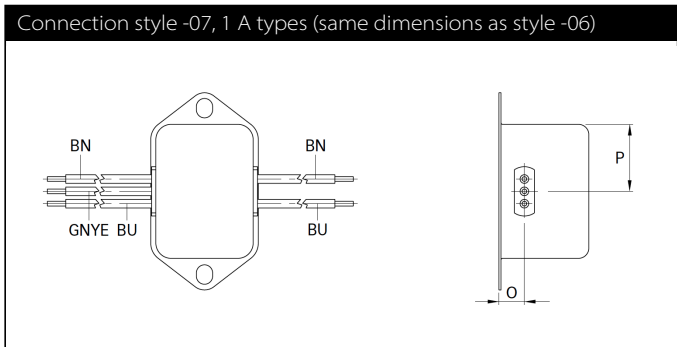
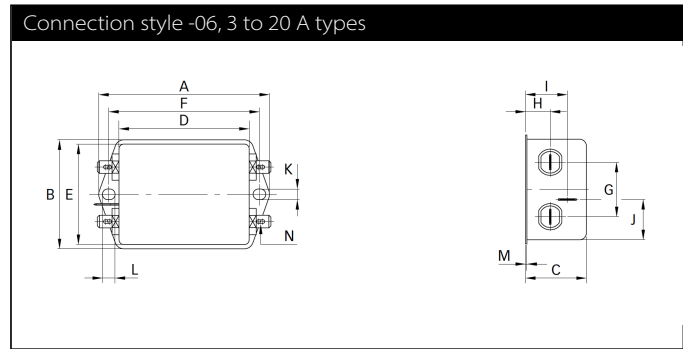
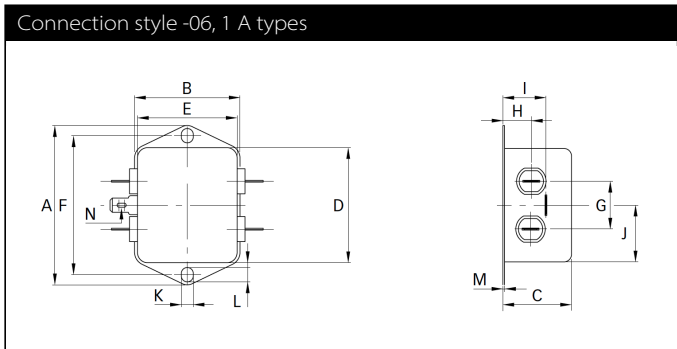
B type



Enhanced performance

Product selector		
	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
<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	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			±0.5
<b>P</b>	14	14.9	14.9	14.9	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			
<b>Wire length</b>	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.



## Headquarters, global innovation and development

### Switzerland

#### Schaffner Group

Industrie Nord  
Nordstrasse 11e  
4542 Luterbach  
T +41 32 681 66 26  
[info@schaffner.com](mailto:info@schaffner.com)



## Sales and application centers

### China

#### Schaffner EMC Ltd. Shanghai

T20-3 C, No 565 Chuangye Road,  
Pudong district  
201201 Shanghai  
T +86 21 3813 9500  
[cschina@schaffner.com](mailto:cschina@schaffner.com)  
[www.schaffner.com.cn](http://www.schaffner.com.cn)

### Finland

#### Schaffner Oy

Sauvonrinne 19 H  
08500 Lohja  
T +358 50 468 7284  
[finlandsales@schaffner.com](mailto:finlandsales@schaffner.com)

### France

#### Schaffner EMC S.A.S.

16-20 Rue Louis Rameau  
95875 Bezons  
T +33 1 34 34 30 60  
F +33 1 39 47 02 28  
[francesales@schaffner.com](mailto:francesales@schaffner.com)

### Germany

#### Schaffner Deutschland GmbH

Schoemperlenstrasse 12B  
76185 Karlsruhe  
T +49 721 56910  
[germanysales@schaffner.com](mailto:germanysales@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  
Malleshwaram (W)  
560055 Bangalore  
T +91 80 67935355  
[indiasales@schaffner.com](mailto:indiasales@schaffner.com)

### Italy

#### Schaffner EMC S.r.l.

Via Ticino, 30  
20900 Monza (MB)  
T +39 039 21 41 070  
[italysales@schaffner.com](mailto:italysales@schaffner.com)

### Japan

#### Schaffner EMC K.K.

Taiju-Seimei Sangenjaya Bldg.  
1-32-12, Kamiyuma, Setagaya-ku  
154-0011 Tokyo  
T +81 3 5712 3650  
F +81 3 5712 3651  
[japansales@schaffner.com](mailto:japansales@schaffner.com)  
[www.schaffner.jp](http://www.schaffner.jp)

### Singapore

#### Schaffner EMC Pte Ltd.

#05-09, Kg Ubi Ind. Estate  
408705 Singapore  
T +65 6377 3283  
F +65 6377 3281  
[singaporesales@schaffner.com](mailto:singaporesales@schaffner.com)

### Spain

#### Schaffner EMC España

Calle Caléndula 93, Miniparc III, Edificio E  
El Soto de Moraleja, Alcobendas  
28109 Madrid  
T +34 917 912 900  
F +34 917 912 901  
[spainsales@schaffner.com](mailto:spainsales@schaffner.com)

### Sweden

#### Schaffner EMC AB

Östermalmstorg 1  
114 42 Stockholm  
T +46 8 5050 2425  
[swedensales@schaffner.com](mailto:swedensales@schaffner.com)  
[www.schaffner.com](http://www.schaffner.com)

### Switzerland

#### Schaffner EMV AG

Industrie Nord  
Nordstrasse 11e  
4542 Luterbach  
T +41 32 681 66 88  
T +41 32 681 66 26  
[switzerlandsales@schaffner.com](mailto:switzerlandsales@schaffner.com)

### Taiwan

#### Schaffner EMV Ltd.

20 Floor-2, No 97, Section 1, XinTai 5th Road  
22175 XiZhi District New Taipei City 22175  
T +886 2 2697 5500  
F +886 2 2697 5533  
[taiwansales@schaffner.com](mailto:taiwansales@schaffner.com)  
[www.schaffner.com.tw](http://www.schaffner.com.tw)

### Thailand

#### Schaffner EMC Co. Ltd.

Northern Region Industrial Estate  
67 Moo 4 Tambon Ban Klang  
Amphur Muangng P.O. Box 14  
51000 Lamphun  
T +66 53 58 11 04  
F +66 53 58 10 19  
[thailandsales@schaffner.com](mailto:thailandsales@schaffner.com)

### United Kingdom

#### Schaffner Ltd.

1, Oakmede Place  
Binfield  
RG42 4JF Berkshire  
T +44 118 9770070  
F +44 118 9792969  
[uksales@schaffner.com](mailto:uksales@schaffner.com)

### USA

#### Schaffner EMC Inc.

52 Mayfield Avenue  
Edison, New Jersey  
T +1 732 225 9533  
F +1 732 225 4789  
[usasales@schaffner.com](mailto:usasales@schaffner.com)  
[www.schaffnerusa.com](http://www.schaffnerusa.com)

To find your local partner within Schaffner's global network: [www.schaffner.com](http://www.schaffner.com)

© 2021 Schaffner Group

The content of this document has been carefully checked and understood. However, neither Schaffner nor its subsidiaries assume any liability whatsoever for any errors or inaccuracies of this document and the consequences thereof. Published specifications are subject to change without notice. Product suitability for any area of application must ultimately be determined by the customer. In all cases, products must never be operated outside their published specifications. Schaffner does not guarantee the availability of all published products. This disclaimer shall be governed by substantive Swiss law and resulting disputes shall be settled by the courts at the place of business of Schaffner Holding AG. Latest publications and a complete disclaimer can be downloaded from the Schaffner website. All trademarks recognized.