

# Multi-stage AC/DC EMC/RFI 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)

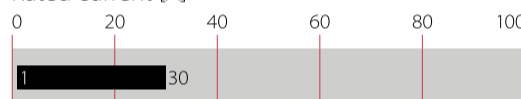


### Performance indicators

Attenuation performance



Rated current [A]



### 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

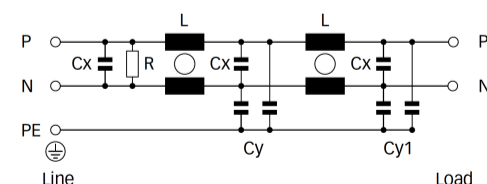
<b>Maximum continuous operating voltage</b>	250 VAC, 50/60 Hz 250 VDC
<b>Nominal operating voltage</b>	230 VAC
<b>Rated currents</b>	1 to 30 A @ 40°C
<b>Operating frequency</b>	DC to 400 Hz
<b>High potential test voltage</b>	P → N 1100 VDC for 2 sec P → PE 2000 VAC for 2 sec (equiv. cap <88 nF) P → PE 2550 VDC for 2 sec (equiv. cap >88 nF) P → PE 2500 VAC for 2 sec (B types)
<b>Overvoltage category</b>	II acc. IEC 60664-1
<b>Pollution degree</b>	2 acc. IEC 60664-1
<b>Surge pulse protection (Z type)</b>	Helps compliance to IEC61000-4-5 (Differential Mode only)
<b>Temperature range (operation and storage)</b>	-25°C to +100°C (25/100/21)**
<b>Altitude</b>	2000m (above derating applies)**
<b>Flammability corresponding to</b>	Laces for -07 version: UL 94 VW-1 Terminal plastic for -06/-08 version: UL 94 V-0 Grommet for -07 version: UL 94 V-0
<b>Certified to</b>	UL 1283, CSA 22.2 No. 8 1986, IEC/EN 60939 (applies to AC and DC applications)
<b>MTBF (Mil-HB-217F)</b>	≤10 A: >1,300,000 h @ 40°C/230 V ≥12 A: >1,100,000 h @ 40°C/230 V

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

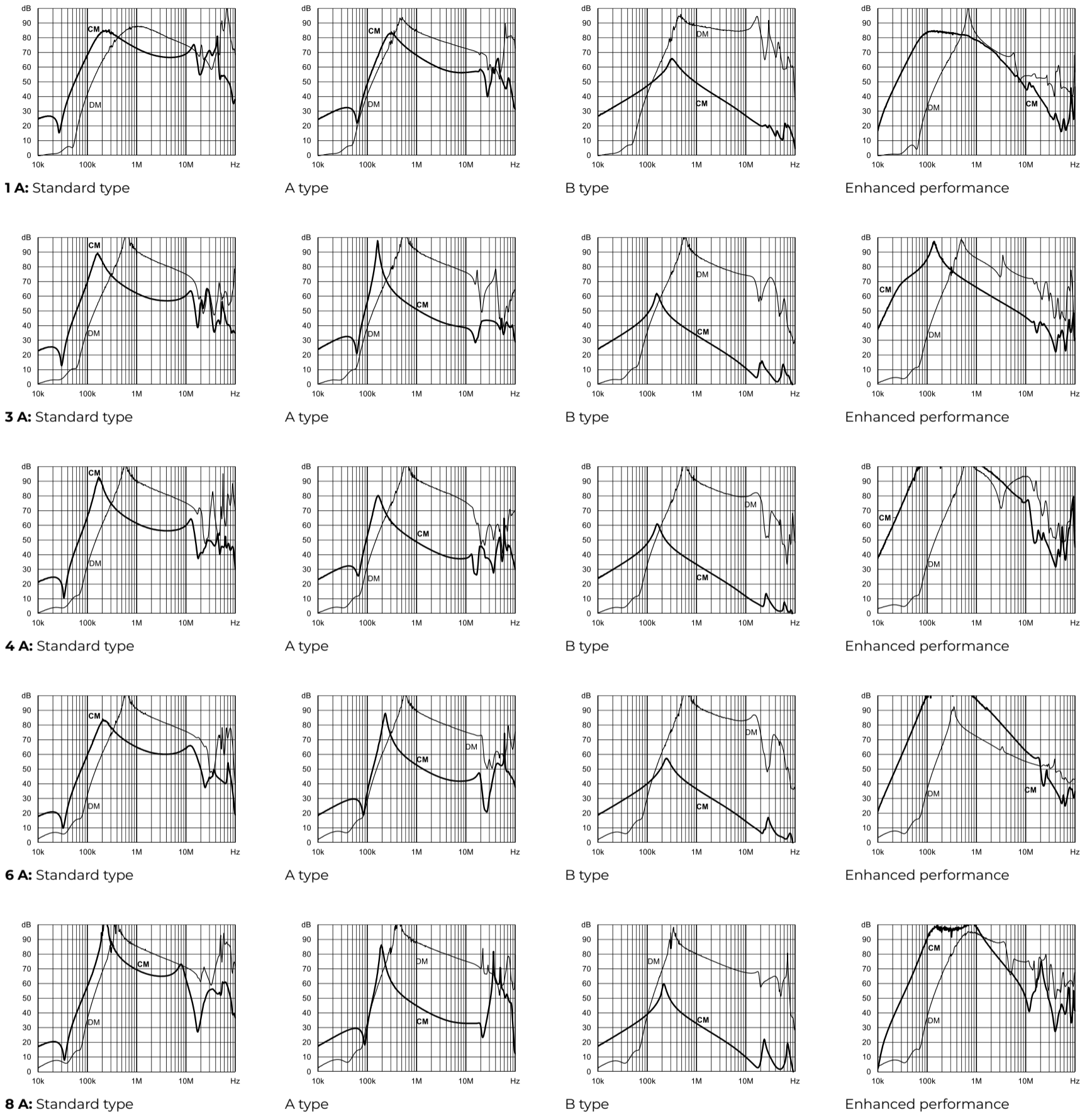
\* To compile a complete part number, please replace the .. with the required I/O connection style. For surge pulse protection, please add Z (e.g. FN2090Z-10-06, FN2090BZ-20-08). The different letters code the used Cy values in the filter type (A = 0.47nF; K = 22nF; L = 33nF; N = 100nF; as the FN2090 is a dual stage filter each letter stands for one stage of Cy)

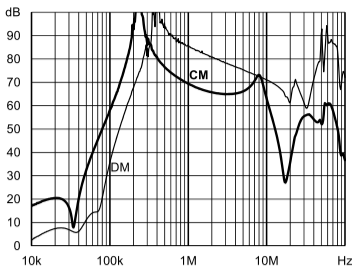
\*\* Maximum leakage under usual AC operating conditions (acc. IEC 60939-3). Note: if the neutral line is interrupted, worst case leakage could reach twice this level. Leakage current for DC application is 0mA

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

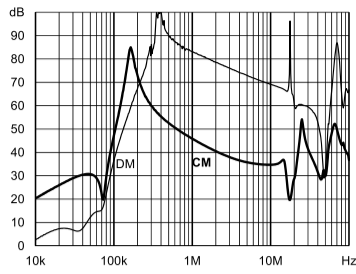
## Typical Filter Attenuation

Per CISPR 17: symmetrical 50 Ω/50 Ω -> Differential Mode (DM); asymmetrical 50 Ω/50 Ω -> Common Mode (CM)

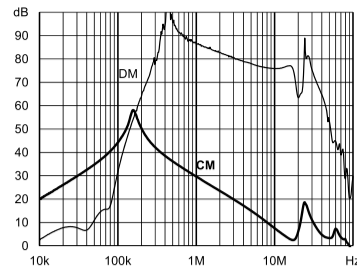




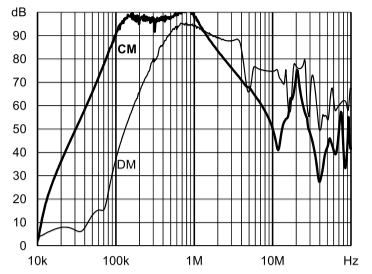
10 A: Standard type



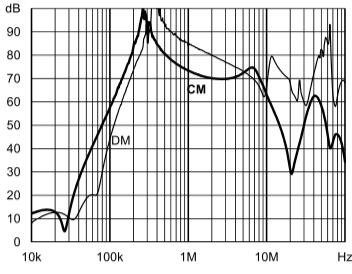
A type



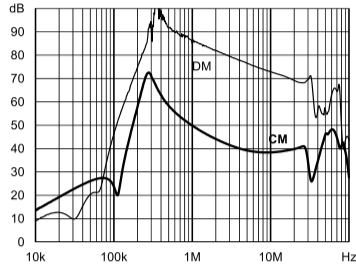
B type



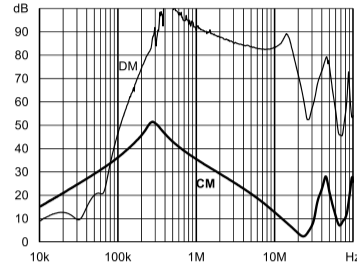
Enhanced performance



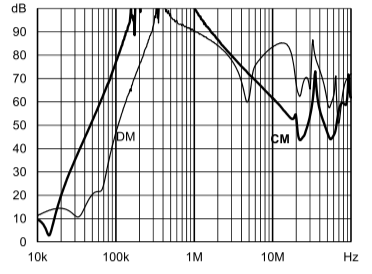
12 A: Standard type



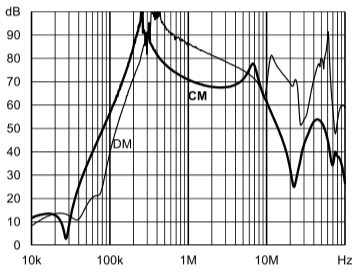
A type



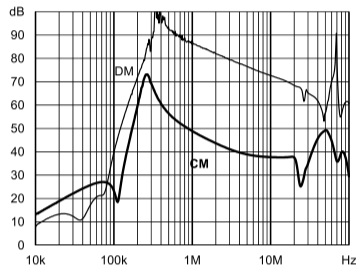
B type



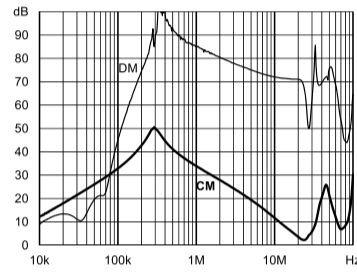
Enhanced performance



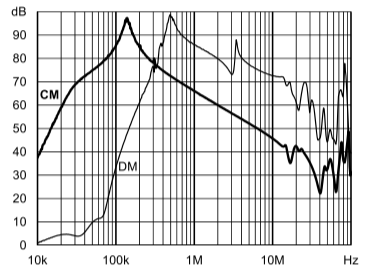
16 A: Standard type



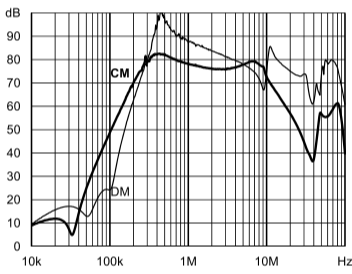
A type



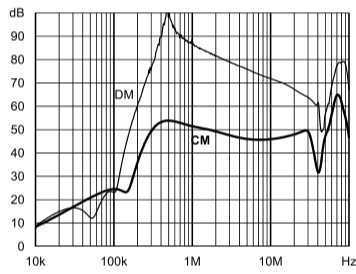
B type



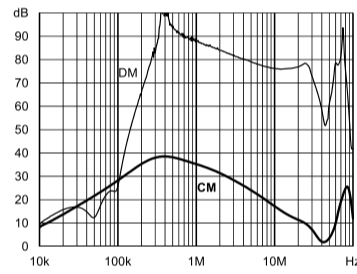
Enhanced performance



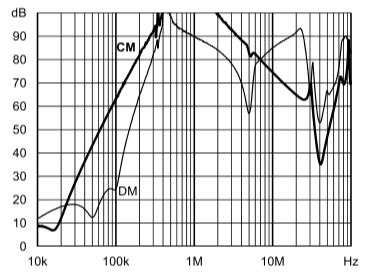
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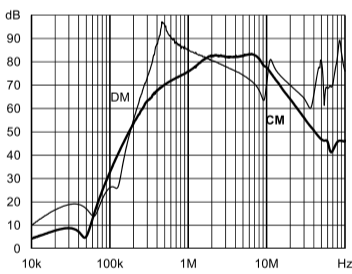
A type



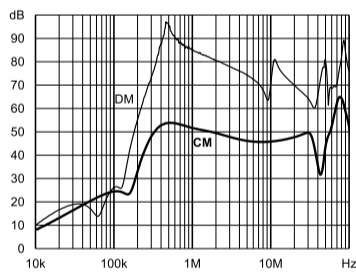
B type



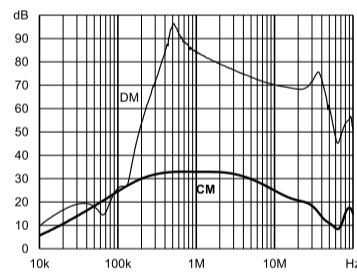
Enhanced performance



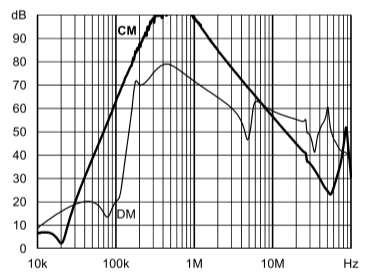
30 A: Standard type



A type



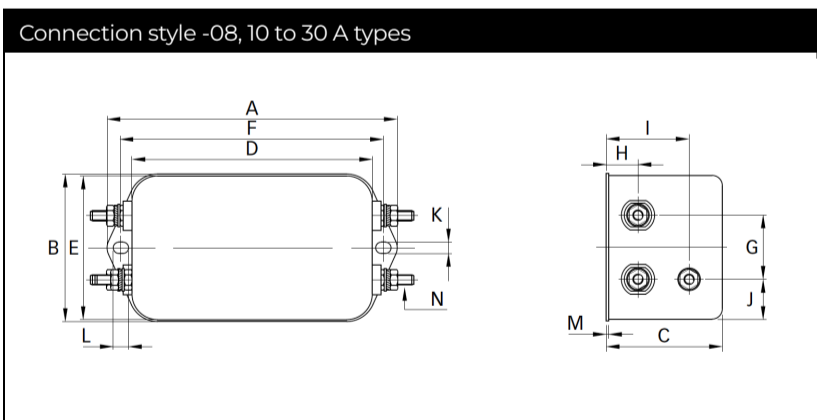
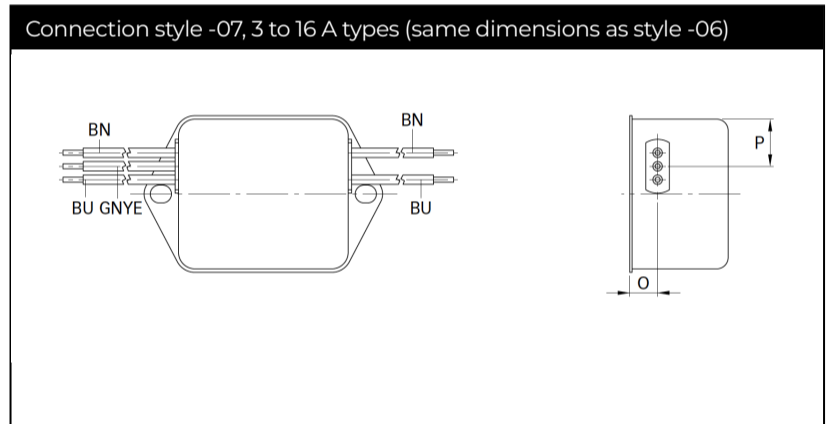
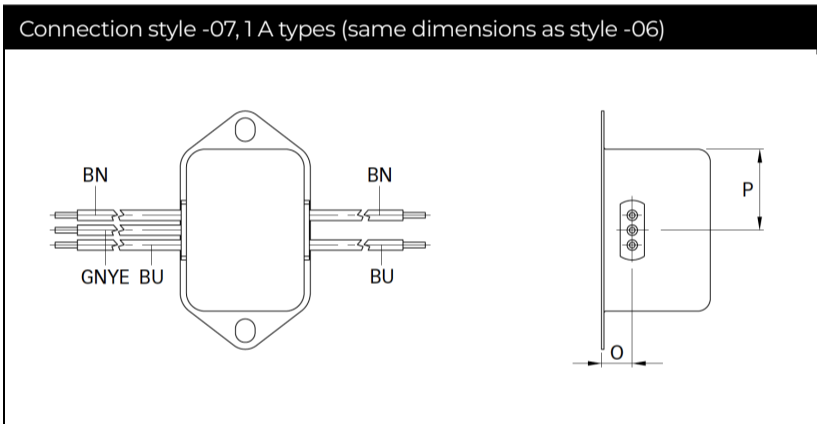
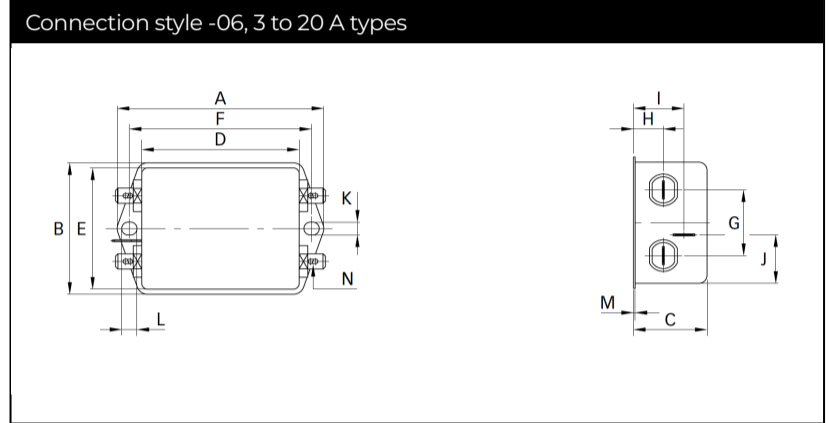
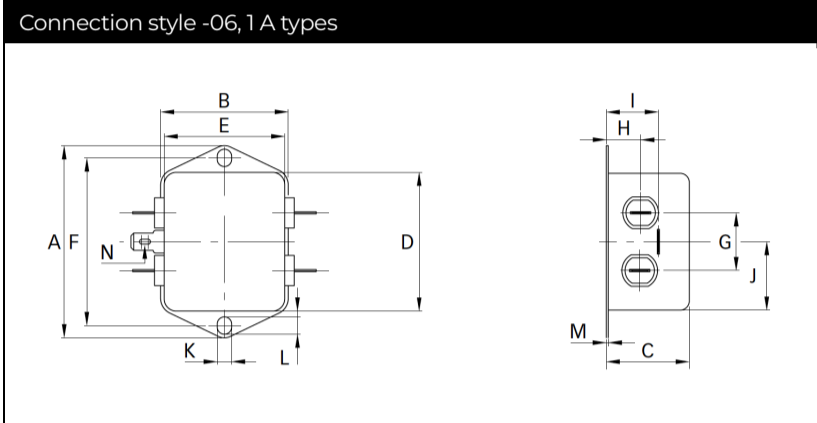
B type



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.

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