

## DATASHEET

## Sine wave filters FN 5040/FN 5045



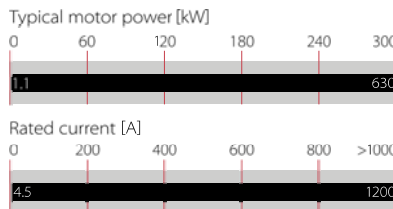
## LC Sine Wave Filter for Motor Drives



Smooth sine wave without voltage peaks  
 Perfect motor protection  
 Reduce bearing currents  
 Motor frequency up to 200 Hz  
 Extended motor cable length capability



## Performance indicators



## Approvals &amp; Compliances



UL 61800-5-1 up to 750 A for FN 5040, 480 A for FN 5045. For use with AC or DC drives (power conversion equipment) only

## Features and benefits

Converts the rectangular PWM output voltage of motor drives into a smooth sine wave with low residual ripple

Elimination of premature motor damage caused by high dv/dt, overvoltages, cable ringing, motor overheating, and eddy current losses

Improves bearing life time because of bearing currents caused by circulating currents

Complies with IEC 60034-17\* and NEMA-MG1 requirements for general purpose motors

Optional with NEMA 1 protective cover

## Technical specifications

<b>Nominal operating voltage</b>	3x480 VAC
<b>Rated operating voltage</b>	3x525 VAC
<b>Motor frequency</b>	0..70 Hz (up to 200Hz with derating (see graph))
<b>Switching frequency</b>	See filter selection table
<b>Rated currents</b>	4.5 to 1200 A @ 45°C
<b>Motor cable length</b>	Up to 2,000 m (see graph)
<b>Impedance (uk)</b>	8 to 10% @ 400 V, 50 Hz and rated current
<b>Residual ripple voltage</b>	<5%
<b>High potential test voltage</b>	P → E 3000 VAC, 1 minute P → P 2500 VAC, 1 minute
<b>Protection category</b>	IP 00 (FN 5040) IP 20 (FN 5045)
<b>Overload capability</b>	1.5x rated current for 1 minute, once per hour
<b>Ambient temperature range</b>	-25°C to +45°C fully operation +45°C to 70°C derated operation* -25°C to +85°C transport and storage
<b>Insulation class</b>	EIS 200
<b>Flammability corresponding to</b>	UL 94 V-2
<b>Design corresponding to</b>	Chokes: EN 61558-2-20 or EN 60076-6 Filter: UL 61800-5-1, EN 61800-5-1
<b>MTBF</b>	>100,000 hours
<b>Rated currents</b>	4.5 to 1200 A @ 50°C

\* I<sub>derated</sub> = I<sub>nominal</sub> \* √((T<sub>max</sub>-T<sub>amb</sub>)/(T<sub>max</sub>-T<sub>nominal</sub>)) = I<sub>nom</sub> \* √((70°C-T<sub>amb</sub>)/25°C)

## Typical applications

HVAC applications

Pumps

Ventilators

Conveyors

Compressors

Elevators

Cranes

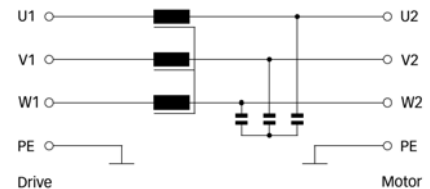
Medium voltage applications, deployed in front of the step-up transformer

Retrofit installations with motor drives



Motor drive with long motor cable

Motor drive with multiple motors in parallel

## Typical electrical schematic



## Filter selection table

Filter	Rated current @ 45°C/ 50Hz	Rated current @ 45°C/ 100Hz	Typical motor drive power rating @ 400 V*	Typical motor drive power rating @ 480 V**	Nominal inductance	Nominal capacitance	Capacitance connection	Min. switching frequency	Typical power loss***	Input/Output connections		Weight
	[A]	[A]	[kW]	[kW]	[mH]	[µF]		[kHz]	[W]			[kg]
<b>FN 5040-4.5-82</b>	4.5	4.05	1.1/1.5	1.3/1.8	13	2.2	Y	4	65	-82		3.3
<b>FN 5040-8-82</b>	8	7.2	2.2/3	2.64/3.6	6.9	4.7	Y	4	80	-82		4.6
<b>FN 5040-10-83</b>	10	9	4	4.8	5.2	6.8	Y	4	90	-83		6.1
<b>FN 5040-17-83</b>	17	15.3	5.5/7.5	6.6/9.0	3.1	10	Y	4	115	-83		7.8
<b>FN 5040-24-84</b>	24	21.6	11	13.2	2.4	10	Y	4	150	-84		14.4
<b>FN 5040-38-84</b>	38	34.2	15/18.5	18/22.2	1.6	10	Y	4	170	-84		25.0
<b>FN 5040-48-85</b>	48	43.2	22	26.4	1.1	14.7	Y	4	260	-85		33.0
<b>FN 5040-62-86</b>	62	55.8	30	36	0.85	30	Y	3	280	-86		36.0
<b>FN 5040-75-87</b>	75	67.5	37	44.4	0.75	30	Y	3	330	-87		42.0
<b>FN 5040-115-87</b>	115	103.5	45/55	52.8/66	0.5	20	Δ	3	500	-87		68.0
<b>FN 5040-180-99</b>	180	162	75/90	90/108	0.3	33	Δ	3	680		-99	86.0
<b>FN 5040-260-99</b>	260	234	110/132	132/158.4	0.2	47	Δ	3	880		-99	125.0
<b>FN 5040-410-99</b>	410	369	160/200	192/240	0.13	66	Δ	3	1100		-99	184.0
<b>FN 5040-480-99</b>	480	432	250	300	0.11	94	Δ	3	1350		-99	235.0
<b>FN 5040-660-99</b>	660	594	315/355	378/426	0.14	141	Δ	2	2000		-99	310.0
<b>FN 5040-750-99</b>	750	675	400	480	0.12	165	Δ	2	2800		-99	470.0
<b>FN 5040-880-99</b>	880	792	400/500	480/600	0.11	188	Δ	2	3400		-99	640.0
<b>FN 5040-1200-99</b>	1200	1080	560/630	672/756	0.075	282	Δ	2	3800		-99	680.0
<b>FN 5045-4.5-44</b>	4.5	4.05	1.1/1.5	1.3/1.8	13	2.2	Y	4	65	-44		4.1
<b>FN 5045-8-44</b>	8	7.2	2.2/3	2.64/3.6	6.9	4.7	Y	4	80	-44		5.4
<b>FN 5045-10-44</b>	10	9	4	4.8	5.2	6.8	Y	4	90	-44		6.9
<b>FN 5045-17-33</b>	17	15.3	5.5/7.5	6.6/9.0	3.1	10	Y	4	115	-33		9.0
<b>FN 5045-24-33</b>	24	21.6	11	13.2	2.4	10	Y	4	150	-33		15.6
<b>FN 5045-38-33</b>	38	34.2	15/18.5	18/22.2	1.6	10	Y	4	170	-33		18.9
<b>FN 5045-48-34</b>	48	43.2	22	26.4	1.1	14.7	Y	4	260	-34		35.8
<b>FN 5045-62-34</b>	62	55.8	30	36	0.85	30	Y	3	280	-34		37.8
<b>FN 5045-75-35</b>	75	67.5	37	44.4	0.75	30	Y	3	330	-35		60.0
<b>FN 5045-115-35</b>	115	103.5	45/55	52.8/66	0.5	20	Δ	3	500	-35		70.0
<b>FN 5045-180-99</b>	180	162	75/90	90/108	0.3	33	Δ	3	680		-99	92.0
<b>FN 5045-260-99</b>	260	234	110/132	132/158.4	0.2	47	Δ	3	880		-99	131.0
<b>FN 5045-410-99</b>	410	369	160/200	192/240	0.13	66	Δ	3	1100		-99	198.0
<b>FN 5045-480-99</b>	480	432	250	300	0.11	94	Δ	3	1350		-99	243.0
<b>FN 5045-660-99</b>	660	594	315/355	378/426	0.14	141	Δ	2	2000		-99	425.0
<b>FN 5045-750-99</b>	750	675	400	480	0.12	165	Δ	2	2800		-99	482.0
<b>FN 5045-880-99</b>	880	792	400/500	480/600	0.11	188	Δ	2	3400		-99	652.0
<b>FN 5045-1200-99</b>	1200	1080	560/630	672/756	0.075	282	Δ	2	3800		-99	692.0

\* General purpose four-pole (1500 r/min) AC induction motor rated 400 V/50 Hz.

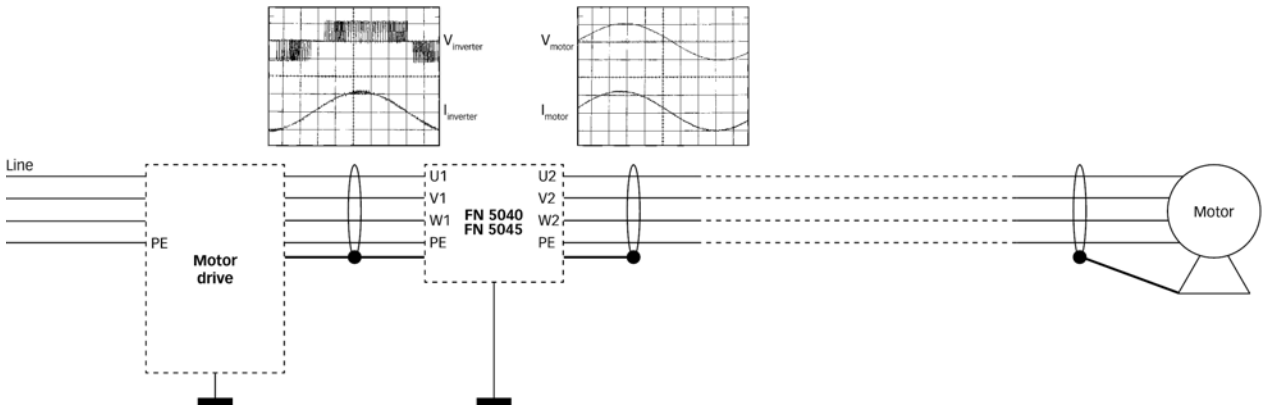
\*\* General purpose four-pole (1500 r/min) AC induction motor rated 480 V/50 Hz.

\*\*\* Exact value depends on the motor cable length and type, switching frequency and further stray parameters of the system.

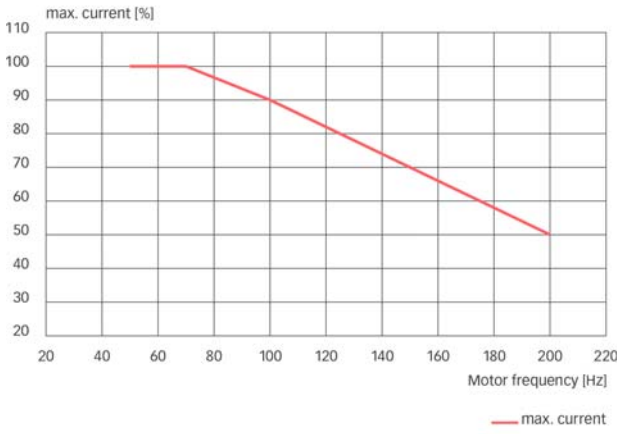
## Required drive settings

Ensure the drive's switching frequency is set to the required minimum switching frequency (see filter selection table). The mode of operation must be "scalar" (V/Hz) with a fixed switching frequency. Check the drives manufacturer manual whether special settings are necessary. In any doubt contact the drives manufacturer. **CAUTION: If the motor drives settings are not correct the filter may be damaged.**

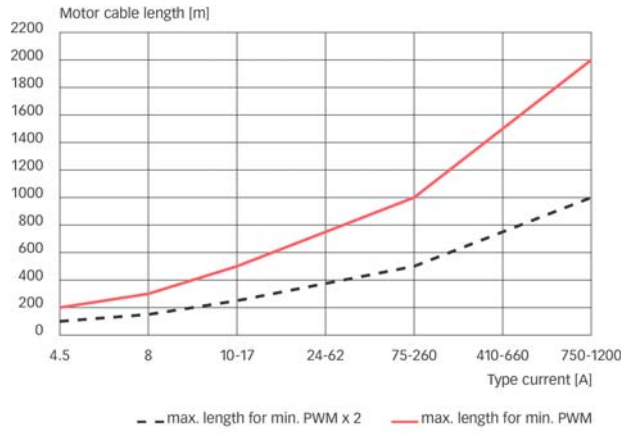
**Typical block schematic**



**Motor frequency derating**

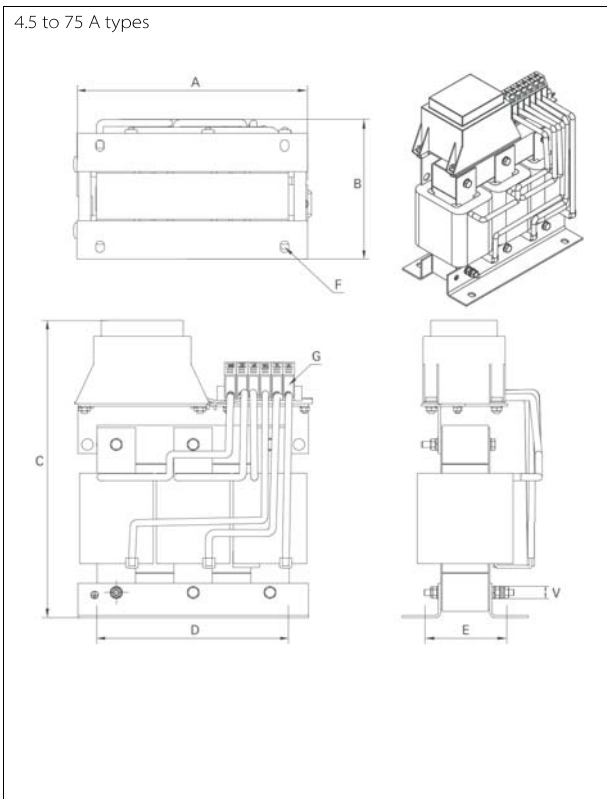


**Max. motor cable length**

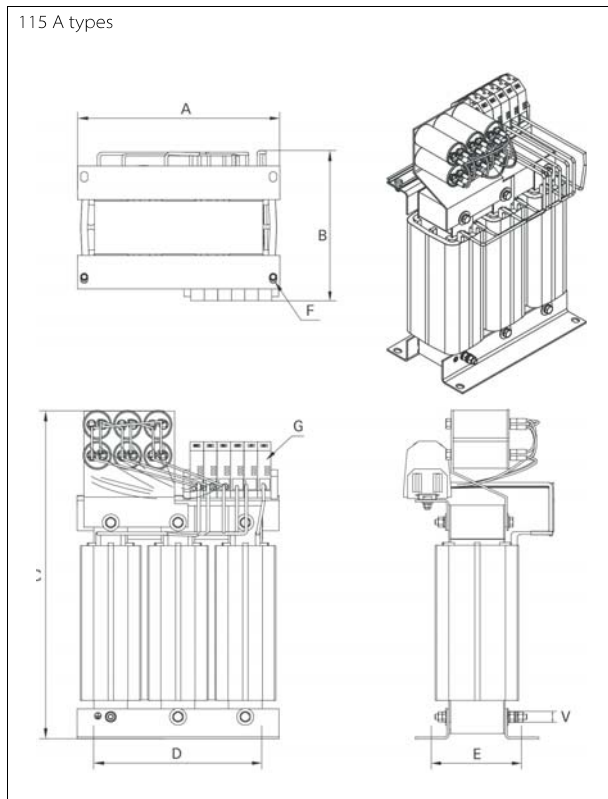


**Mechanical data FN 5040**

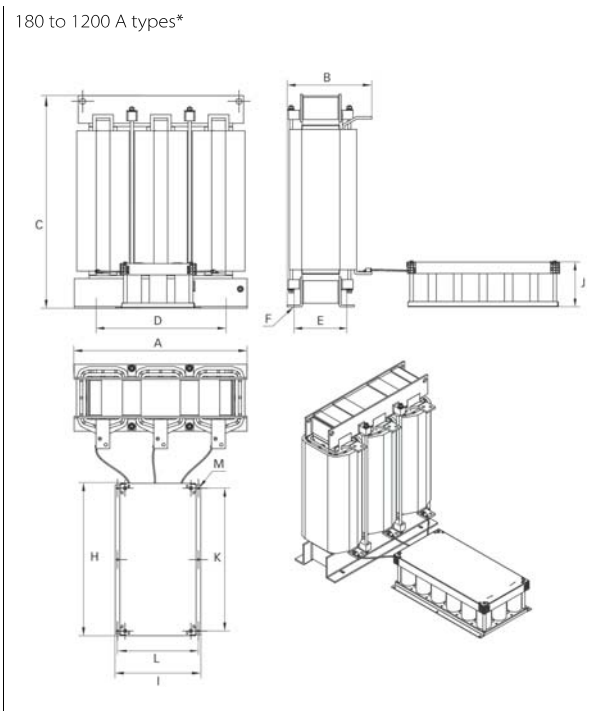
4.5 to 75 A types



115 A types



180 to 1200 A types\*



Cable length of capacitor box:

180 to 410 A = 1000 mm

480 A to 1200 A = 1500 mm

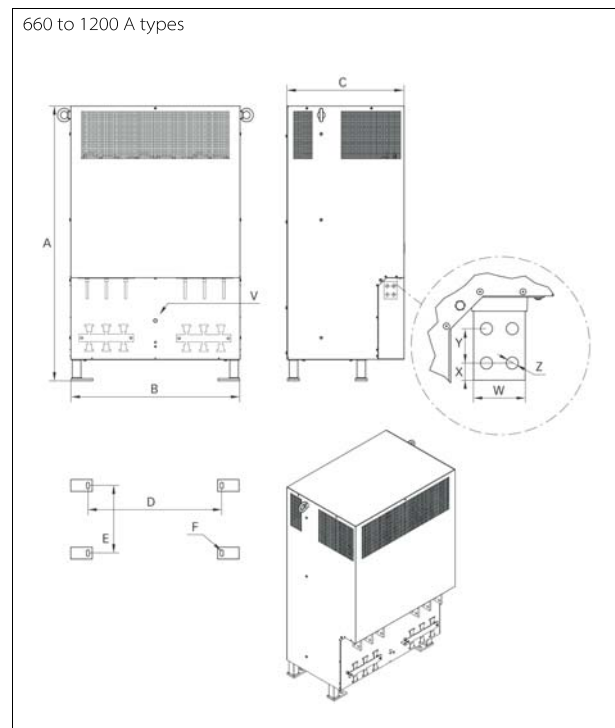
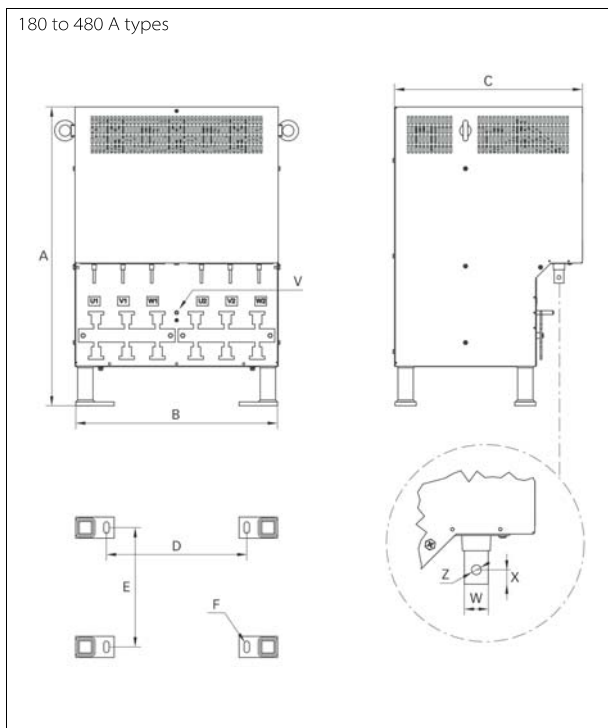
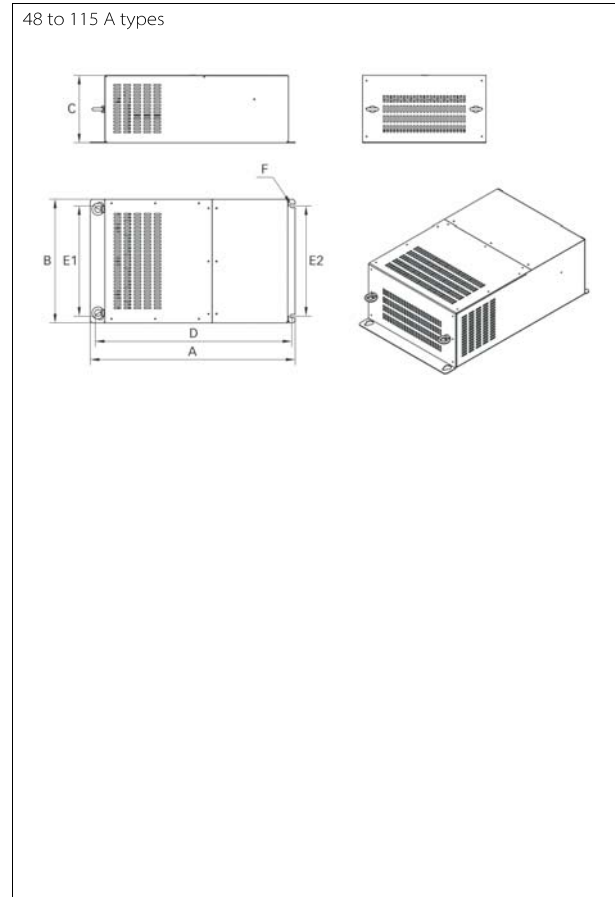
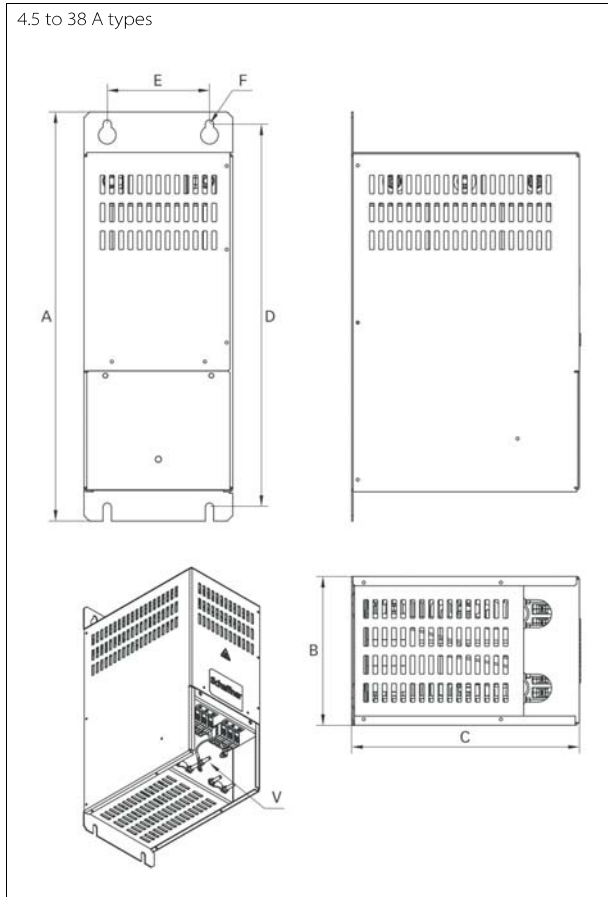
**Dimensions FN 5040**

	<b>4.5 A</b>	<b>8 A</b>	<b>10 A</b>	<b>17 A</b>	<b>24 A</b>	<b>38 A</b>	<b>48 A</b>	<b>62 A</b>	<b>75 A</b>	<b>115 A</b>
<b>A</b>	125	155	155	190	190	230	300	320	305	305
<b>B</b>	77	84	94	115	116	151	171	190	240	236
<b>C</b>	171	212	208	224	224	275	355	395	395	495
<b>D</b>	100	130	123	170	170	180	240	240	240	280
<b>E</b>	55	56	71.5	57.5	77.5	122	137	132	162	151
<b>F</b>	5x8	8x12	8x12	8x12	8x12	8x12	11x15	11x15	11x15	11x15
<b>G</b>	2.5 mm <sup>2</sup>	2.5 mm <sup>2</sup>	4 mm <sup>2</sup>	4 mm <sup>2</sup>	10 mm <sup>2</sup>	10 mm <sup>2</sup>	16 mm <sup>2</sup>	35 mm <sup>2</sup>	50 mm <sup>2</sup>	50 mm <sup>2</sup>
<b>V</b>	M3	M4	M4	M6	M6	M8	M8	M8	M8	M8

	<b>180 A</b>	<b>260 A</b>	<b>410 A</b>	<b>480 A</b>	<b>660 A</b>	<b>750 A</b>	<b>880 A</b>	<b>1200 A</b>
<b>A</b>	450	453	490	510	645	665	660	750
<b>B</b>	260	255	355	355	410	468	450	375
<b>C</b>	385	485	600	618	732	670	885	925
<b>D</b>	400	370	430	430	570	570	570	570
<b>E</b>	130	150	194	195	210	220	220	220
<b>F</b>	9x13	11x15	10.5x18.5	13x27	13x27	13x26	13x26	13x26
<b>H</b>	328	328	328	328	463	555	463	665
<b>I</b>	170	170	170	270	370	375	370	375
<b>J</b>	200	220	240	220	220	200	220	220
<b>K</b>	300 (150)	300 (150)	300 (150)	300 (150)	400 (200)	510 (255)		620 (310)
<b>L</b>	150	150	150	250	350	350	350	350
<b>M</b>	9	9	9	9	9	9	9	9
<b>V</b>	M10	M10	M10	M10	M10	M10	M10	M10
<b>W</b>	25	25	40	40	40	40	50	60
<b>X</b>	13/15	13/15	13/16	13/20	20	20	14	17
<b>Y</b>	21	20	25	23	40	40	22	26
<b>Z</b>	10.3	10.3	10.3	10.3	14	14	14	14

All dimensions in mm; 1 inch = 25.4 mm  
Tolerances according: ISO 2768-m / EN 22768-m

**Mechanical data FN 5045**










## Dimensions FN 5045

	4.5 A	8 A	10 A	17 A	24 A	38 A	48 A	62 A	75 A	115 A	180 A	260 A	410 A	480 A	660 A	750 A	880 A	1200 A
<b>A</b>	330	330	330	440	440	440	515	515	615	615	650	650	780	780	1280	1280	1280	1280
<b>B</b>	100	100	100	160	160	160	320	320	370	370	508	508	538	538	794	794	794	794
<b>C</b>	165	165	165	245	245	245	153	153	203	203	400	400	494	494	498	498	550	550
<b>D</b>	310	310	310	412	412	412	488	488	590	590	336	336	336	336	622	622	622	622
<b>E</b>	60	60	60	110	110	110	280	280	330	330	243	243	312	312	315	315	315	315
<b>F</b>	7	7	7	9	9	9	9	9	11	11	14x30	14x30	14x30	14x30	14x30	14x30	14x30	14x30
<b>J</b>	M5	M5	M5	M5	M5	M5	M5	M5	M8	M8	M10	M10	M10	M10	M10	M10	M10	M10
<b>W</b>											20	20	25	40	40	40	40	60
<b>X</b>											15	15	15	15	20	20	20	20
<b>Y</b>															40	40	40	30/40
<b>Z</b>											9	9	10.2	10.2	14	14	14	14

All dimensions in mm; 1 inch = 25.4 mm

Tolerances according: ISO 2768-m / EN 22768-m

## Filter output connector cross sections

	-33	-34	-35	-44	-82
<b>Solid wire</b>	 16 mm <sup>2</sup>	 35 mm <sup>2</sup>	 50 mm <sup>2</sup>	 10 mm <sup>2</sup>	 0.75 - 2.5 mm <sup>2</sup>
<b>Flex wire</b>	10 mm <sup>2</sup>	25 mm <sup>2</sup>	50 mm <sup>2</sup>	6 mm <sup>2</sup>	1.0 - 2.5 mm <sup>2</sup>
<b>AWG type wire</b>	AWG 6	AWG 2	AWG 1/0	AWG 8	AWG 18 - 12
<b>Recommended torque</b>	1.5-1.8 Nm	4.0-4.5 Nm	7-8 Nm	1.5-1.8 Nm	1.0-1.2 Nm
	-83	-84	-85	-86	-87
<b>Solid wire</b>	 0.75-4.0 mm <sup>2</sup>	 2.5-10.0 mm <sup>2</sup>	 2.5-25.0 mm <sup>2</sup>	 0.75-50 mm <sup>2</sup>	 16.0-50.0 mm <sup>2</sup>
<b>Flex wire</b>	1.0-4.0 mm <sup>2</sup>	4.0-10.0 mm <sup>2</sup>	4.0-16.0 mm <sup>2</sup>	0.75-35 mm <sup>2</sup>	25.0-50.0 mm <sup>2</sup>
<b>AWG type wire</b>	AWG 18-10	AWG 18-6	AWG 22-4	AWG 18-0/1	AWG 6-0
<b>Recommended torque</b>	1.5-1.8 Nm	4.0-4.5 Nm	1.5-1.8 Nm	3.2-3.7 Nm	6.0-8.0 Nm

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)

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

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## 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 Muang 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)