

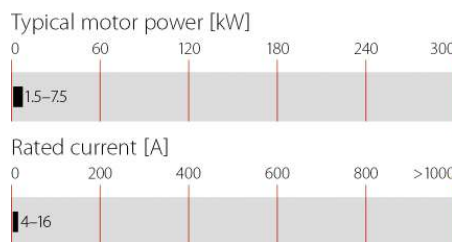
Sine Wave and EMC Output Filter for Motor Drives with a Voltage dc Link



- ▮ Smoothing of PWM drive output voltage
- ▮ Efficient motor protection
- ▮ Reduction of common-mode interferences on motor cables
- ▮ Improvement of EMC environment
- ▮ Elimination of motor bearing damages
- ▮ Possibility to use very long unshielded motor cables
- ▮ Improvement of system reliability



Performance indicators



Technical specifications

Current in +/- control loop	1 to 2 A approx.
dc link voltage	850 VDC max.
Design corresponding to	UL 1283, CSA 22.2 No. 8 1986, IEC/EN 60939
Flammability corresponding to	UL 94 V-2 or better
High potential test voltage	P → E 2500 VDC for 2 sec P → P 1100 VDC for 2 sec
Motor cable length	1000 m max.
Motor frequency	0 to 200 Hz
MTBF @ 40°C/400V (Mil-HB-217F)	>100,000 hours
Nominal operating voltage	3x 500/288 VAC
Overload capability	1.4x rated current for 1 minute, every 15 minutes
Protection category	IP20
Rated currents	4 to 16 A @ 40 °C
Residual ripple voltage	<5%
Switching frequency	6 to 20 kHz
Temperature range (operation and storage)	-25 °C to +100 °C (25/100/21)
Voltage drop	≤10 V @ 50 Hz

Approvals

ROHS



Features and benefits

- ▮ Conversion of the PWM output signal (differential and common-mode voltage components) of motor drives into a smooth sine wave with low residual ripple
- ▮ Elimination of premature motor damage caused by high dv/dt, overvoltages, motor overheating, eddy current losses or bearing damage
- ▮ Elimination of interference propagation towards components or conductors in the vicinity
- ▮ Provision of all benefits of traditional LC sine wave filters, plus:
- ▮ Allows the use of extremely long unshielded motor cables without causing radiation problems (EN 55014, MDS clamp)
- ▮ Restricts pulse currents to ground and hence limits leakage currents in the PE
- ▮ Reduces the required EMI suppression efforts on the line side
- ▮ Allows the use of lower rated drives with long motor cables due to lower losses in the IGBTs and in the motor cable

Typical applications

- ▮ Motor drive applications with extremely long motor cables
- ▮ Motor drive applications with unshielded motor cables
- ▮ Chemical and petro-chemical applications
- ▮ Semi-conductor manufacturing
- ▮ Mission critical applications
- ▮ Applications with multiple motors in parallel
- ▮ Retrofit of motor drives into existing installations with old wiring and motors

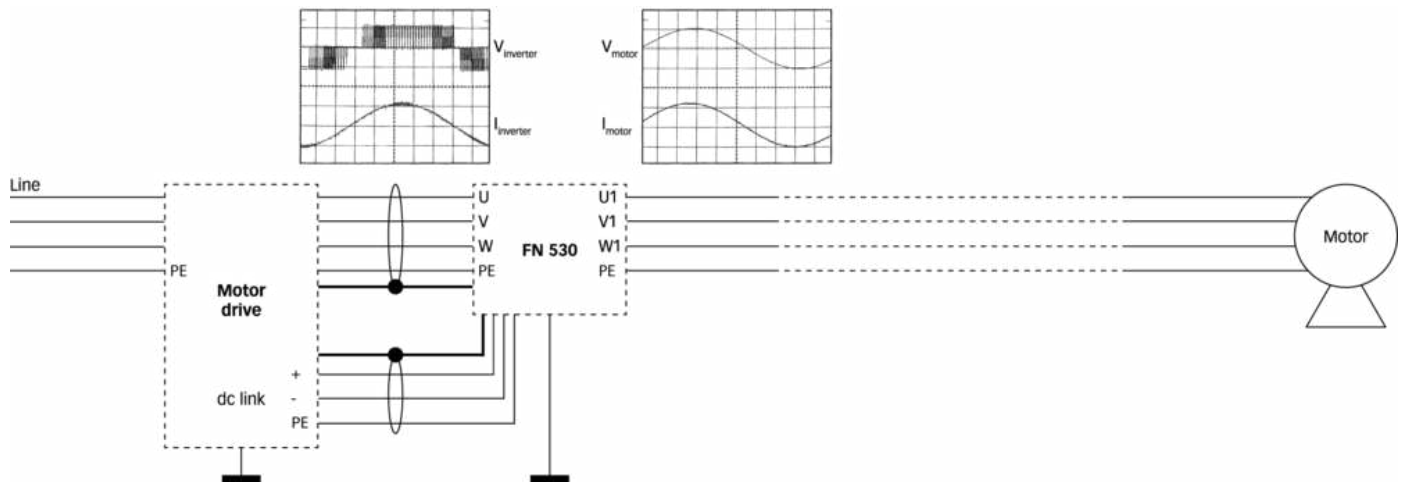
Filter selection table

Filter	Rated current @ 40 °C	Typical motor power rating*	Typical power loss**	Input connections	Output connections	Weight
	[A]	[kW]	[W]			[kg]
FN 530-4-99	4	1.5	15	-29	-99	11.5
FN 530-8-99	8	3.0	33	-29	-99	15
FN 530-12-99	12	5.5	50	-29	-99	18.5
FN 530-16-99	16	7.5	37	-33	-99	21

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

** Exact value depends upon the motor cable type and length, switching frequency, motor frequency and further stray parameters within the system.

Typical block schematic



Connection to the dc link

For best results, the connection to the dc link of the motor drive is required with this series of filters.

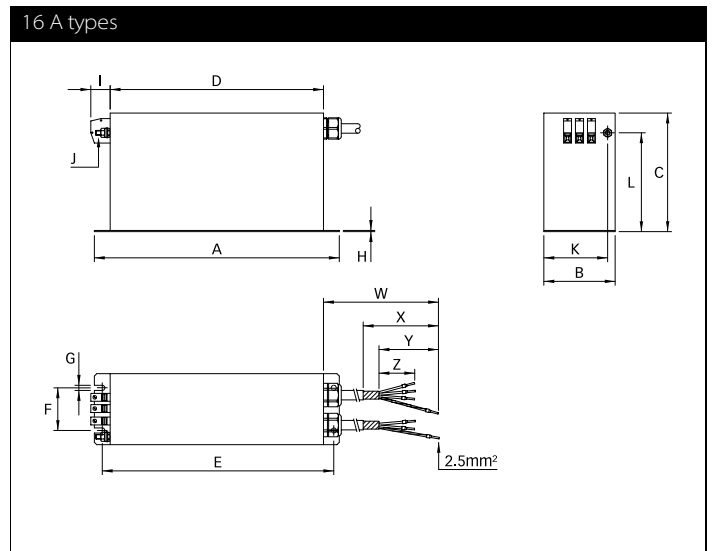
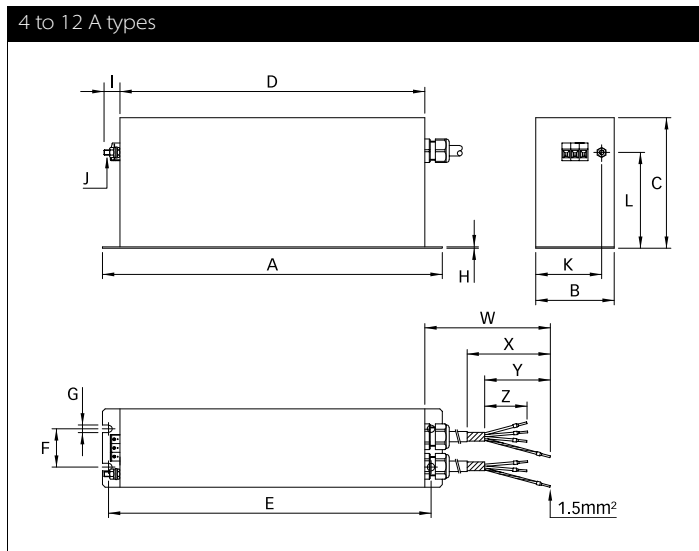
If only one connection to the dc link is brought out of the drive («+» or «-») then the dc link cable connections from the filter (identified by «DC+» and «DC-») must be connected together to the «+» or «-» motor drive connection.

The operation of the sine wave interference filter is not seriously affected as a result. The «+» and «-» connections on the motor drive must never be connected together. Otherwise a short-circuit will result.

The PWM switching frequency must lie within the range from 6 to 20kHz in order to ensure satisfactory operation of the filter. A lower switching frequency or a pure square wave is unsuitable and will result in the motor drive switching off with the error message «overcurrent or short to earth.»

For additional information please refer to the Schaffner application note "Sine Wave Filter Solutions for Motor Drives Applications" available on the homepage www.schaffner.com/downloads

Mechanical data



Dimensions

	4 A	8 A	12 A	16 A
A	390	390	390	350
B	90	90	90	140
C	150	180	215	230
D	350	350	350	310
E	373	370	370	330
F	44	44	44	95
G	6.5	8.7	8.7	8.7
H	1.5	1.5	1.5	2.3
I	19	19	19	25
J	M6	M6	M6	M6
K	75	75	75	107.5
L	107	137	172	181
W	720 +15/-0	720 +15/-0	720 +15/-0	720 +15/-0
X	120	120	120	120
Y	100	100	100	100
Z	70	70	70	70

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

Filter input connector cross sections

	-29	-33
Solid wire	6 mm ²	16 mm ²
Flex wire	4 mm ²	10 mm ²
AWG type wire	AWG 10	AWG 6
Recommended torque	0.6-0.8 Nm	1.5-1.8 Nm

Please visit www.schaffner.com to find more details on filter connectors.



Headquarters, global innovation and development center

Switzerland

Schaffner Group

Nordstrasse 11
4542 Luterbach
T +41 32 6816 626
F +41 32 6816 630
info@schaffner.com
<http://www.schaffner.com>



Sales and application centers

China

Schaffner EMC Ltd. Shanghai

T20-3, No 565 Chuangye Road
Pudong New Area
201201 Shanghai
T +86 21 3813 9500
F +86 21 3813 9501 / 02
cschina@schaffner.com
<http://www.schaffner.com.cn/>

Finland

Schaffner Oy

Sauvonrinne 19 H
08500 Lohja
T +358 19 35 72 71
finlandsales@schaffner.com

France

Schaffner EMC S.A.S.

112, Quai de Bezons
Boîte postale 133
95103 Argenteuil
T +33 1 34 34 30 60
F +33 1 39 47 02 28
francesales@schaffner.com

Germany

Schaffner Deutschland GmbH

Schoemperlenstrasse 12B
76185 Karlsruhe
T +49 721 56910
F +49 721 569110
germanysales@schaffner.com

Italy

Schaffner EMC S.r.l.

Via Galileo Galilei 47
20092 Cinisello Balsamo (MI)
T +39 02 66 04 30 45/47
F +39 02 61 23 943
italysales@schaffner.com

Japan

Schaffner EMC K.K.

1-32-12, Kamiyama, Setagaya-ku
7F Mitsui-seimei Sangenjaya Bldg.
154-0011 Tokyo
T +81 3 5712 3650
F +81 3 5712 3651
japansales@schaffner.com
<http://www.schaffner.jp>

Singapore

Schaffner EMC Pte Ltd.

Blk 3015A Ubi Road 1
05-09 Kampong Ubi Industrial Estate
408705 Singapore
T +65 6377 3283
F +65 6377 3281
singaporesales@schaffner.com

Spain

Schaffner EMC España

Calle Caléndula 93
Miniparc III, Edificio E
El Soto de la Moraleja
Alcobendas
28109 Madrid
T +34 618 176 133
spainsales@schaffner.com

Sweden

Schaffner EMC AB

Turebergstorg 1, 6
19147 Sollentuna
T +46 8 5792 1121 / 22
F +46 8 92 96 90
swedensales@schaffner.com

Switzerland

Schaffner EMV AG

Nordstrasse 11
4542 Luterbach
T +41 32 6816 626
F +41 32 6816 641
sales@schaffner.ch

Taiwan R.O.C.

Schaffner EMV Ltd.

6 Floor, No. 413
Rui Guang Road
114 Neihu District Taipei City
T +886 2 87525050
F +886 2 87518086
taiwansales@schaffner.com

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

UK

Schaffner Ltd.

5 Ashville Way
Molly Millars Lane
Wokingham
RG41 2PL Berkshire
T +44 118 9770070
F +44 118 9792969
uksales@schaffner.com
<http://www.schaffner.uk.com>

USA

Schaffner EMC Inc.

52 Mayfield Avenue
08837 Edison, New Jersey
T +1 800 367 5566
T +1 732 225 9533
F +1 732 225 4789
usasales@schaffner.com
<http://www.schaffner.com/us>

Schaffner MTC LLC

6722 Thirlane Road
24019 Roanoke, Virginia
T +1 276 228 7943
F +1 276 228 7953
<http://www.schaffner-mtc.com>

Schaffner Trencos LLC

2550 Brookpark Road
44134 Cleveland, Ohio
T +1 216 741 5282
F +1 216 741 4860
www.schaffner-trencos.com

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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: ocean@oceanchips.ru

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А