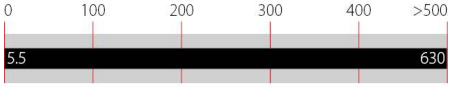
schaffner
energy efficiency and reliability

Output Filter for Motor Drives

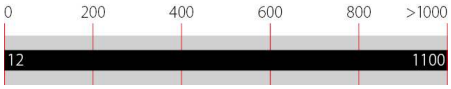
- Reduction of drive output voltage dv/dt
- Reduction of voltage stress at motor windings
- Protect AC motors from destructive effect of peak voltages
- Increase of motor service life
- Improvement of system reliability

Performance indicators

Typical motor rating [kW]



Rated current [A]



Technical specifications

Operating voltage	3ph 500VAC +10%
Rated currents	12 to 1100 A @ 40°C
Motor frequency	0...60 Hz (with derating up to 120 Hz)
Switching frequency	2...16kHz, depending on motor cable lenght and motor frequency -> refer graph on page 2
Typical dv/dt reduction	Factor 8 to 12
Max. peak voltage	≤1000V
Voltage drop	<3V @ 50 Hz
Rated temperature	+40°C without derating up to 100°C
Operation temperature	-25°C to +100°C (25/100/21)
Transportation and storage temperature	-40°C to +100°C (25/100/21)
Overload capability	1.5 x rated current for 1 minute, ones per hour
Protection category	IP00
Flammability corresponding to	UL 94V-2
Design corresponding to	UL508c, CSA 22.2 No.14, EN61558-2-20

Approvals

RoHS cULus CE

Features and benefits

- Efficient reduction of high output voltage dv/dt from IGBT motor drives (as per IEC60034-17/25)
- Restriction of overvoltages caused by line reflections on motor cables (as per IEC60034-17/25)
- Protection of motor winding insulation from premature aging and destruction
- Increase service life of electric motors
- High reliability and production up time for mission critical applications
- Less interference propagation towards neighbouring equipment or lines
- Output filter with low impedance, ideal for processes requiring exceptional precision and reproducibility of movements

Typical applications

- Motor drive applications with short to medium motor cable length
- Machinery comprising servo or torque motors
- Submersible- and irrigation pumps
- HVAC equipment, incl. pumps, fans and compressors
- Elevators, hoisting and cranes
- Motor drives for process lines
- Applications where sine wave filters are not applicable

Filter selection table

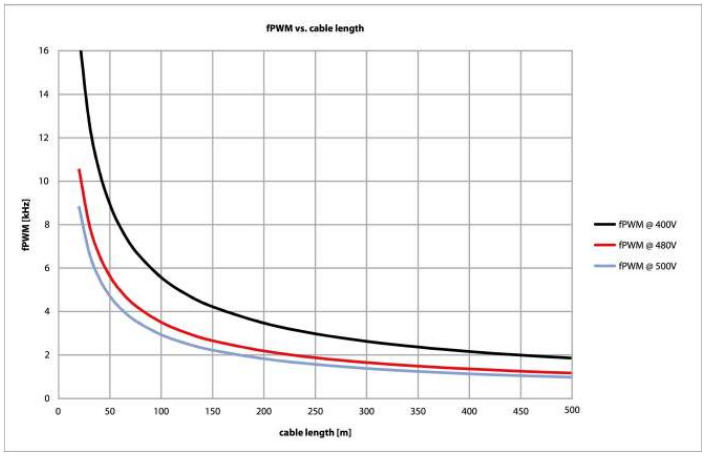
Filter	Rated current @ 40°C/ 50 Hz [A]	*Typical motor drive rating [kW]	Nominal inductance [mH]	Nominal capacitance [nF]	**Typical power loss [W]	***Voltage drop [V]	Input/ Output connections	Weight [kg]
FN 5060-12-84	12	5.5	0.095	4.7	53	0.4	-84	1
FN 5060-24-84	24	11	0.098	4.7	55	0.7	-84	1.6
FN 5060-30-99	30	15	0.254	33	143	2.4	-99	6.3
FN 5060-45-99	45	22	0.17	33	182	2.4	-99	6.3
FN 5060-60-99	60	30	0.127	33	189	2.4	-99	7.4
FN 5060-70-99	70	37	0.109	33	214	2.4	-99	8.6
FN 5060-90-99	90	45	0.085	33	254	2.4	-99	10.4
FN 5060-110-99	110	55	0.069	33	316	2.4	-99	11.5
FN 5060-150-99	150	75	0.051	68	449	2.4	-99	14.6
FN 5060-180-99	180	90	0.042	68	464	2.4	-99	18.0
FN 5060-250-99	250	132	0.031	68	508	2.4	-99	22.1
FN 5060-320-99	320	160	0.024	68	604	2.4	-99	29.6
FN 5060-400-99	400	200	0.019	68	637	2.4	-99	32.2
FN 5060-500-99	500	250	0.015	68	471	2.4	-99	54.5
FN 5060-600-99	600	315	0.013	100	437	2.5	-99	63.5
FN 5060-700-99	700	400	0.011	100	486	2.4	-99	74.0
FN 5060-900-99	900	500	0.008	100	597	2.3	-99	86.5
FN 5060-1100-99	1100	630	0.007	100	695	2.4	-99	114.0

* General purpose four-pole (1500r/min) AC induction motor rated 400 V/50 Hz.
** Power loss at 2 kHz switching frequency/80m motor cable length. Exact value depends upon the motor cable type and length, switching frequency and further stray parameters within the system.
*** Voltage drop at rated current and 50Hz.

Switching frequency vs. motor cable length

Ensure the motor drive switching frequency is set to the required switching frequency (see filter selection table). Check the drives manual whether special settings are necessery. For any questions please contact the drives manufacturer.

Refer also to the "fPWM/cable length" diagram below - valid for FN5060 ≥60A:

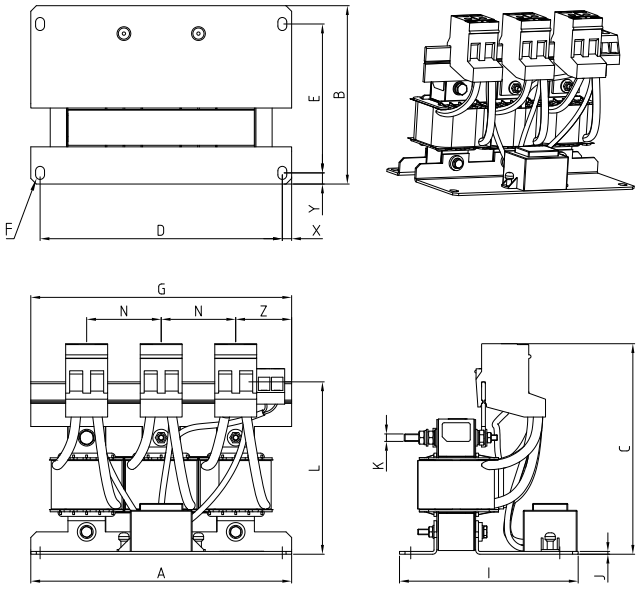


Temperature monitoring function

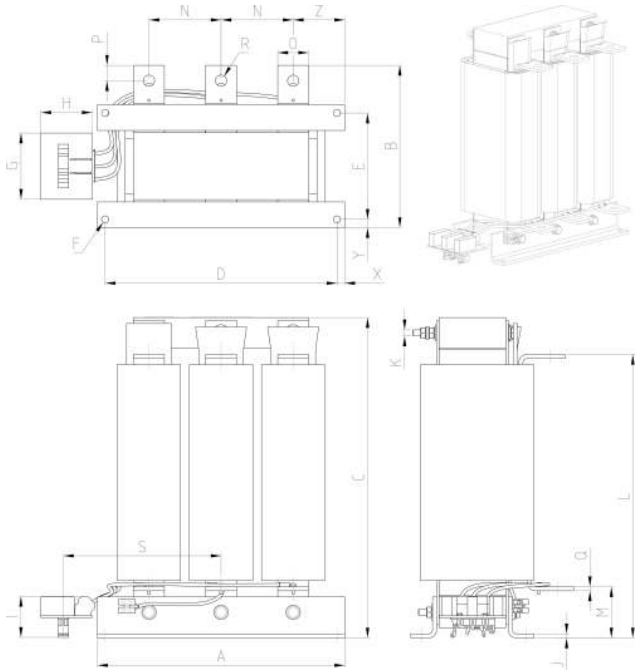
The temperature monitoring device opens a potential-free contact in the case of filter overtemperature (>180 °C). The maximum switching capability is 5 A/240V. The switch can be used, for example, in the input of a CNC controller or as the trip of a circuit breaker in order to interrupt the mains power supply.

Mechanical data

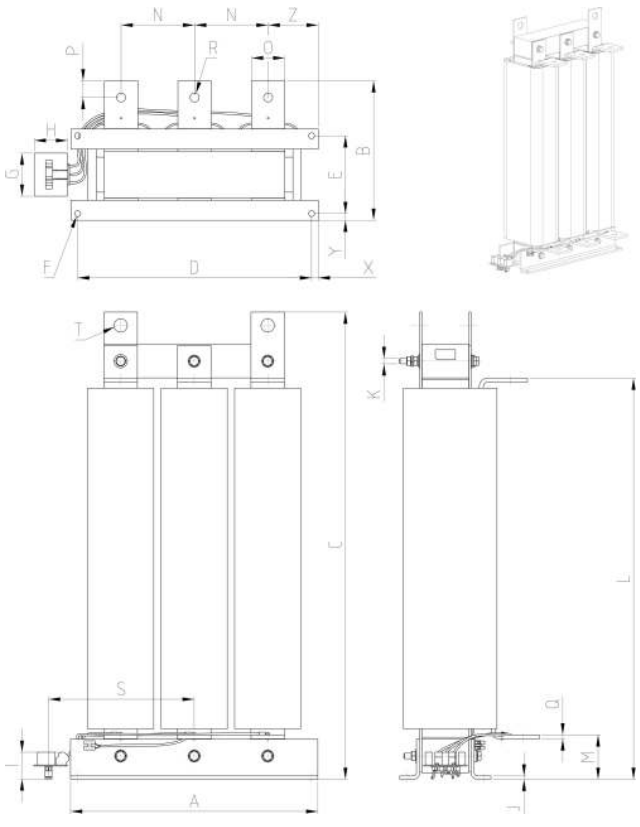
12A to 24A types



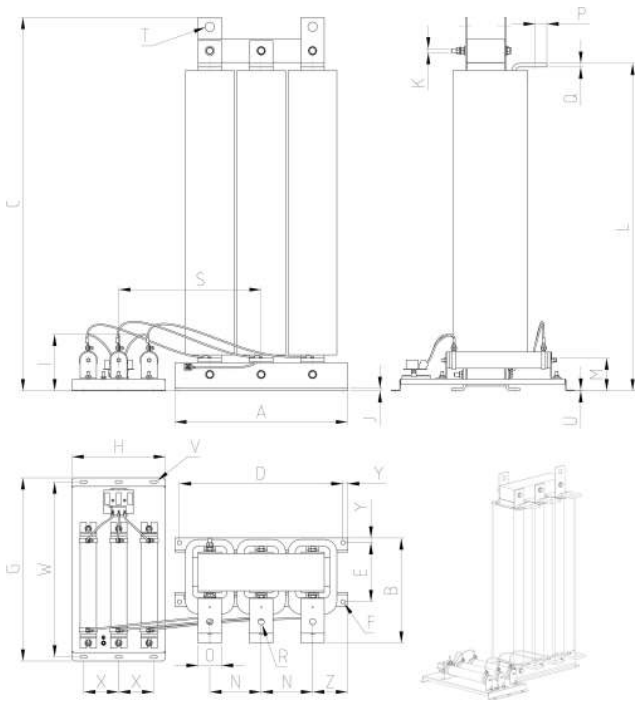
30A to 250A types



320A to 900A types



1100A type



Dimensions (12 - 250 A)

	12 A	24 A	30 A	45 A	60 A	70 A	90 A	110 A	150 A	180 A	250 A
A	125	140	240	240	240	240	240	240	240	240	240
B	85.5	96	109	110	110	121	130	136	141.5	142.5	158
C	104	113	151	151	181	222	221	221	254	310	312
D	115	130	225	225	225	225	225	225	225	225	225
E	70	80	66.5	66.5	66.5	66.5	76.5	81.5	86.5	88.5	103.5
F	7x4.8	7x4.8	Ø7(4x)	Ø7(4x)	Ø7(4x)	Ø7(4x)	Ø7(4x)	Ø7(4x)	Ø7(4x)	Ø7(4x)	Ø7(4x)
G	120	140	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5	64.5
H			50	50	50	50	50	50	50	50	50
I			40	40	40	40	40	40	40	40	40
J			4	4	4	4	4	4	4	4	4
K	M4	M4	M6	M6	M6	M6	M6	M6	M6	M6	M6
L	84	93	120	121	148	181	181	181	222	275	276
M			43	44	46	54	54	54	46	49	50
N	34.5	40	70	70	70	70	70	70	70	70	70
O			20	20	20	30	30	30	30	30	30
P											
Q			3	3	3	3	3	3	4	4	4
R			Ø9(6x)	Ø9(6x)	Ø9(6x)	Ø11(6x)	Ø11(6x)	Ø11(6x)	Ø11(6x)	Ø11(6x)	Ø11(6x)
S	max. 360	max. 360	max. 360	max. 360	max. 360	max. 360	max. 360	max. 360	max. 360	max. 360	
T											
U											
V											
W											
X	5	5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5
Y	6	6	8	8	8	8	8	8	8	8	8
Z	27.5	30									

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

Dimensions (320 -110 A)

	320 A	400 A	500 A	600 A	700 A	900 A	1100 A
A	240	240	370	370	370	370	370
B	165	174	197	199	209	209	225
C	438	438	499	598	599	700	801
D	225	225	350	350	350	350	350
E	103.5	108.5	106.5	106.5	116.5	116.5	126.5
F	Ø7(4x)	Ø7(4x)	Ø9(4x)	Ø9(4x)	Ø9(4x)	Ø9(4x)	Ø9(4x)
G	64.5	64.5	64.5	64.5	64.5	64.5	393
H	50	50	50	50	50	50	200
I	40	40	40	40	40	40	120
J	4	4	5	5	5	5	5
K	M6	M6	M8	M8	M8	M8	M8
L	375	375	401	500	501	601	702
M	51	51	66	65	67	67	70
N	70	70	110	110	110	110	110
O	30	30	50	50	50	50	50
P	15	15	25	25	25	25	25
Q	6	6	5	5	6	6	8
R	Ø11(6x)	Ø11(6x)	Ø13.5(6x)	Ø13.5(6x)	Ø13.5(6x)	Ø13.5(6x)	Ø13.5(6x)
S	max. 360	max. 360	max. 420	max. 420	max. 420	max. 420	max. 550
T	Ø18(2x)	Ø18(2x)	Ø20(2x)	Ø20(2x)	Ø20(2x)	Ø20(2x)	Ø20(2x)
U							1.5
V							6.5
W							375
X	7.5	7.5	10	10	10	10	75
Y	8	8	10	10	10	10	10
Z							

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

Filter input/output cross sections

	-84
Solid wire	6 mm2
Flex wire	4 mm2
AWG type wire	AWG 10
Recommended torque	0.6-0.8 Nm

Please note:
The input/output cross sections have to be of equal or bigger size as the cross section of the filter bus bar terminals.
Make sure to consult and respect local, national and international safety codes.
Connect the protective earth terminal(s) first, before attempting to connect phase terminals.
Please consult the documents „Mounting and Installation Guidelines“ being shipped with the product.

For additional information please consult the document „Basis in EMC and Power Quality“, published in the download section of www.schaffner.com.

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