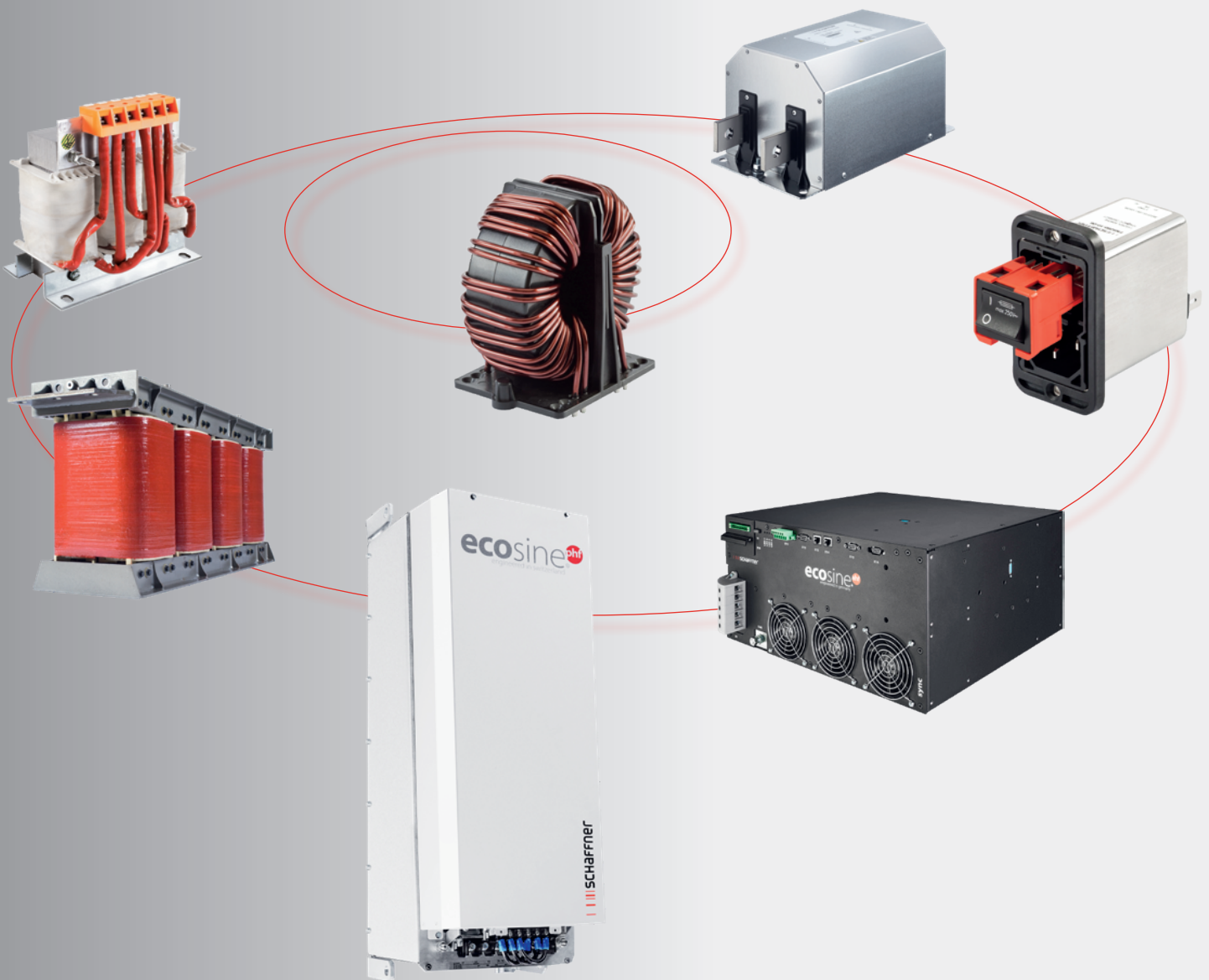

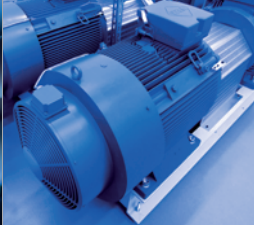















## EMC/EMI Components and Power Quality Filters



					
<b>Typical applications</b>	<b>EDP &amp; office</b> – PCs – Printers – PC periphery – Fax machines – Copy machines – Monitors – Plotters – Mainframe computers	<b>Drives &amp; controls</b> – AC & DC motor drives – SCR drives – Servo drives – Regenerative drives – Rectifiers (AC-DC) – Converters (AC-AC, DC-DC) – Inverters (DC-AC) – Battery chargers	<b>Process automation</b> – Robotics – Conveyors – Assembly lines – Control units – Mining industry – Chemical industry – Oil production – Metal processing	<b>Elevators &amp; cranes</b> – Elevators for people and goods – Escalators – Cranes – Lifts – Hoists – Dumbwaiters	<b>Consumer</b> – Amplifiers, video, TV, s – Receivers, c – Laundry ma – Tumblers – Cooking eq – Induction h – Exercise ma – Coffee mac
<b>Line reactors and harmonic filters</b>		FN 3410/11 (page 1) FN 3412/13 (page 1) FN 3416/18 (page 1) FN 3440/41 (page 1) FN 3450/51 (page 1) FN 3452/53 (page 1) RWK 212 (page 6)	FN 3410/11 (page 1) FN 3412/13 (page 1) FN 3416/18 (page 1) FN 3530/31 (page 1) FN 3532 (page 1) FN 3545 (page 1)	FN 3410/11 (page 1) FN 3412/13 (page 1) FN 3416/18 (page 1) FN 3530/31 (page 1) FN 3532 (page 1) FN 3545 (page 1) RWK 212 (page 6)	
<b>PCB filters</b>		FN 402 (page 2) FN 405 (page 2) FN 406 (page 2) FN 410 (page 2)			FN 402 FN 405 FN 406 FN 410
<b>IEC inlet filters and Power entry modules</b>		FN 280 (page 3) FN 390 (page 3) FN 9222(E) (page 3) FN 9233(E) (page 3) FN 9244(E) (page 3) FN 9264 (page 3) FN 9280(E) (page 3) FN 9290 (page 3) IL 13 (page 2) IL 13+ (page 2) IL 19 (page 2)			FN 280 FN 3x0 FN 9222(E) FN 9233(E) FN 9260 FN 9280(E) FN 9290 IL 13 IL 13+ IL 19
<b>Single-phase filters and DC filters</b>		FN 343 (page 5) FN 20x0 (page 4/5) FN 350 (page 4) FN 2070 (page 5) FN 2080 (page 5) FN 2090 (page 5) FN 241x (page 4/5) FN 2200 (page 4) FN 2210/FN 2210 HV (page 4) FN 2211/FN 2211 HV (page 4)	FN 350 (page 4) FN 2070 (page 5) FN 2080 (page 5) FN 2090 (page 5) FN 241x (page 4/5)	FN 685 (page 5) FN 2070 (page 5) FN 2080 (page 5) FN 241x (page 4/5)	FN 332 FN 20x0
<b>Three-phase filters</b>		FN 3025/26 (page 6) FN 3258 (page 6) FN 3268 (page 6) FN 258 (page 6) FN 3025/26 (page 6) FN 3100 (page 6) FN 3258 (page 6) FN 3268 (page 6) FN 3270 (page 6) FN 3310/FN 3310 HV (page 6) FN 3311/FN 3311 HV (page 6) FN 3359 (page 6)	FN 258 (page 6) FN 3025/26 (page 6) FN 31xx (page 6) FN 3258 (page 6) FN 3268 (page 6) FN 3270 (page 6) FN 3310/FN 3310 HV (page 6) FN 3311/FN 3311 HV (page 6) FN 3359 (page 6)	FN 258 (page 6) FN 3100 (page 6) FN 3258 (page 6) FN 3268 (page 6)	FN 3258 FN 3268 FN 3025 FN 3026
<b>Three-phase and neutral line filters</b>		FN 354 (page 7) FN 355 (page 7) FN 3256 (page 7) FN 356 (page 7) FN 3256 (page 7) FN 3280 (page 7)	FN 356 (page 7) FN 3256 (page 7) FN 3280 (page 7)		FN 354 FN 355
<b>Output filters and load reactors</b>		FN 5x0 (page 8) FN 5020 (page 8) FN 5030 (page 8) FN 5040 (page 8) FN 5040 HV (page 8) FN 5045 (page 8) RWK 305 (page 8) FN 5060/FN 5060 HV (page 8)	FN 510 (page 8) FN 5020 (page 8) FN 5030 (page 8) FN 5040 (page 8) FN 5040 HV (page 8) FN 5045 (page 8) RWK 305 (page 8) FN 5060/FN 5060 HV (page 8)	FN 510 (page 8) FN 5040 (page 8) FN 5040 HV (page 8) FN 5045 (page 8) RWK 305 (page 8) FN 5060 (page 8) FN 5060 HV (page 8)	
<b>Feedthrough components</b>		FN 756x (page 9) FN 766x (page 9) FN 756x (page 9) FN 766x (page 9)	FN 751x (page 9) FN 761x (page 9)		
<b>EMC/EMI chokes</b>		EV/EH series (page 10) RD series (page 10) RN series (page 10) RB series (page 10) RT series (page 10)	RD series (page 10) RI series (page 10) RB series (page 10) RT series (page 10)	RD series (page 10) RN series (page 10) RT series (page 10)	EV/EH series RD series RN series RT series
<b>Pulse transformers</b>		IT series (page 11)	IT series (page 11)	IT series (page 11)	

This illustration only contains a few typical products and applications. Schaffner is also active in numerous other industry segments. Most standard components can be customized to meet special requirements.



<b>Goods</b> audio, screens, decoders, machines, equipment, heaters, machines, machines	<b>Medical</b> – X-ray equipment – CAT scanners – Defibrillators – Laboratory equipment – Analyzers – Measurement devices – MRI, MSI, EEG, ECG – Test equipment – Hospitals	<b>Building automation</b> – HVAC – Security systems – Control units – Pumps – Self-ballasted lighting equipment – Autom. window shades – Water treatment – Office buildings	<b>Power &amp; energy</b> – SMPS, UPS – DC/DC converters – Gen-sets – Wind turbines – Fuel cells – Gas turbines – UPS – PV systems	<b>Telecom &amp; datacom</b> – Base stations for GSM, UMTS, GPRS – Power line communications – Network technology – Servers – Telephone installations – Broadcast installations – Data centers	<b>Machinery</b> – Machine tools – Printing machines – Packaging machines – Extruders – Wood working mach. – Milling/drilling mach. – Laser cutting machines – Welding machines – Grinding machines
	FN 3530/31 (page 1) FN 3532/42 (page 1) FN 3540/41 (page 1) FN 3545 (page 1)	FN 3410/11 (page 1) FN 3412/13 (page 1) FN 3416/18 (page 1) FN 3440/41 (page 1) FN 3450/51 (page 1) FN 3452/53 (page 1) FN 3530/31 (page 1) FN 3532/42 (page 1) FN 3540/41 (page 1) FN 3545 (page 1)	FN 3530/31 (page 1) FN 3532/42 (page 1) FN 3540/41 (page 1) FN 3545 (page 1)	FN 3530/31 (page 1) FN 3532/42 (page 1) FN 3540/41 (page 1) FN 3545 (page 1)	FN 3410/11 (page 1) FN 3412/13 (page 1) FN 3416/18 (page 1) FN 3530/31 (page 1) FN 3532 (page 1) FN 3545 (page 1) RWK 212 (page 6)
(page 2) (page 2) (page 2) (page 2)	FN 402B (page 2) FN 406B (page 2)	FN 406 (page 2) FN 410 (page 2)	FN 402 (page 2) FN 405 (page 2) FN 406 (page 2) FN 410 (page 2)		
(page 3) (page 3) (page 3) (page 3) (page 3) (page 3) (page 3) (page 2) (page 2) (page 2)	FN 280B (page 3) FN 9222(EB) (page 3) FN 9233(EB) (page 3) FN 9244(EB) (page 3) FN 9246B (page 3) FN 9260B (page 3) FN 9264 (page 3) FN 9280B (page 3) FN 9290B (page 3) IL 13 (page 2) IL 13+ (page 2) IL 19 (page 2)	FN 9246 (page 3)	FN 280 (page 3) FN 3x0 (page 3) FN 9222(E) (page 3) FN 9233(E) (page 3) FN 9244(E) (page 3) FN 926x (page 3) FN 9280(E) (page 3) FN 9290 (page 3)	FN 9246 (page 3)	
(page 4) (page 4/5)	FN 332 (page 4) FN 20x0B (page 4/5) FN 700Z (page 5)	FN 350 (page 4) FN 2060 (page 5) FN 2070 (page 5) FN 2090 (page 5)	FN 2030 (page 4) FN 2060 (page 5) FN 2070 (page 5) FN 2090 (page 5) FN 2200 (page 4) FN 2210/FN 2210 HV (page 4) FN 2211/FN 2211 HV (page 4)	FN 700Z (page 5) Customized single-phase telecom filters	FN 350 (page 4) FN 2070 (page 5) FN 2080 (page 5) FN 2410 (page 4) FN 2412 (page 4)
(page 6) (page 6) (page 6) (page 6)	FN 258P (page 6) FN 258L (page 6) FN 3025/26 (page 6) FN 3268 (page 6)	FN 258 (page 6) FN 351 (page 6) FN 3025/26 (page 6) FN 3258 (page 6) FN 3268 (page 6)	FN 258 (page 6) FN 3025/26 (page 6) FN 3100 (page 6) FN 3120 (page 6) FN 3258 (page 6) FN 3268 (page 6) FN 3310/FN 3310 HV (page 6) FN 3311/FN 3311 HV (page 6) FN 3359 (page 6)	Customized three-phase telecom filters	FN 258 (page 6) FN 3100 (page 6) FN 3120 (page 6) FN 3258 (page 6) FN 3268 (page 6) FN 3270 (page 6) FN 3310/FN 3310 HV (page 6) FN 3311/FN 3311 HV (page 6) FN 3359 (page 6)
(page 7) (page 7)	FN 354 (page 7) FN 355 (page 7)	FN 3256 (page 7)	FN 356 (page 7) FN 3256 (page 7) FN 3280 (page 7)	FN 354 (page 7)	FN 356 (page 7) FN 3256 (page 7) FN 3280 (page 7)
		FN 510 (page 8) FN 5040 (page 8) FN 5040 HV (page 8) FN 5045 (page 8) RWK 305 (page 8) FN 5060 (page 8) FN 5060 HV (page 8)	Customized reactor and filter solutions for (renewable) energy production and feeding power into the network		FN 510 (page 8) FN 5040 (page 8) FN 5040 HV (page 8) FN 5045 (page 8) RWK 305 (page 8) FN 5060 (page 8) FN 5060 HV (page 8)
	FN 751x (page 9) FN 756x (page 9) FN 761x (page 9) FN 766x (page 9)		FN 751x (page 9) FN 756x (page 9) FN 761x (page 9) FN 766x (page 9)	FN 751x (page 9) FN 756x (page 9) FN 761x (page 9) FN 766x (page 9)	FN 751x (page 9) FN 761x (page 9)
(page 10) (page 10) (page 10) (page 10)	EV/EH series (page 10) RD series (page 10) RN series (page 10) RB series (page 10) RT series (page 10)	EV/EH series (page 10) RD series (page 10) RI series (page 10) RN series (page 10) RB series (page 10) RT series (page 10)	EV/EH series (page 10) RD series (page 10) RN series (page 10) RB series (page 10) RT series (page 10)	EV/EH series (page 10) RN series (page 10) RB series (page 10) RT series (page 10)	RD series (page 10) RB series (page 10) RT series (page 10)
	IT series (page 11)	IT series (page 11)	IT series (page 11)	IT series (page 11)	

# Product selection chart







EMC filter & components									
1-phase					3-phase				
Number of phases									
IEC inlet filter/ Power entry modules PEM	PCB filter	Feedthrough components	Cassis mount filter		DC filter	3-phase filter		3-phase + neutral filter	
	≤ 10 A	≤ 250 A	≤ 100 A	≤ 36 A	≤ 30 A	≤ 2500 A	≤ 300 A	≤ 2500 A	≤ 600 A
	FN 402 FN 405 FN 406 FN 410	Capacitors FN 751X FN 756X  Filter FN 761X FN 766X	<b>1-stage filters</b> FN 332 FN 350 FN 2010 FN 2020 FN 2030 FN 2410 FN 2450	<b>2-stage filters</b> FN 343 FN 685 FN 2060 FN 2070 FN 2080 FN 2090	<b>3-stage filters</b> FN 352Z FN 700Z FN 2060 FN 2070 FN 2090	FN 2200 FN 2210 FN 2210 HV FN 2211 FN 2211 HV	FN 258 FN 3258 FN 3268 FN 351 FN 3025/3026 FN 3100 FN 3120	FN 3270 FN 3359 FN 3310 FN 3310 HV FN 3311 FN 3311 HV	FN 354 FN 355 FN 356 FN 3256 FN 3280
	page 2	page 9	page 4	page 5	page 5	page 4	page 6	page 6	page 7

Chokes							
No				Yes			
Commonmode							
IEC inlet filter	PEM with fuses or switch	PEM with fuses and switch or volt. selector	IEC power cords	Saturating chokes	1-phase	3-phase	3-phase + neutral
≤ 20 A	≤ 10 A	≤ 10 A	≤ 16 A	≤ 25 A	≤ 80 A	≤ 80 A	≤ 64 A
FN 9222(E) FN 9226 FN 9233(E) FN 9244(E) FN 9246	FN 9260 FN 9264	FN 280 FN 370 FN 380 FN 390 FN 1390 FN 9280(E) FN 9290	IL 13 IL 13+ IL 19	RI series	EV/EH series RD series RN series RB series RN series RT series	RD series RB series RT series	RD series
page 3	page 3	page 3	page 2	page 10	page 10	page 10	page 10

Harmonic filter		3-phase reactor		Output filter	
Technology?		Location at motor drive		Voltage shape	
Passive	Active	Load	Line	dv/dt	Sinewave
FN 3410/11 FN 3410 HV FN 3416 FN 3412/13/18 FN 3440/41 FN 3450/51 FN 3452/53	FN 3530/31 FN 3540/41 FN 3532/42 FN 3545	0.8%	4%	dv/dt filter	Sinusoidal filter
		≤ 1100 A	≤ 1100 A	≤ 1200 A	≤ 1320 A
RWK 305	RWK 212	FN 510 FN 5060 FN 5060 HV	FN 530 FN 5020 FN 5030 FN 5040 FN 5040 HV FN 5045		
page 1	page 1	page 8	page 6	page 8	page 8

To define your proper solution competent assistance and more detailed product specifications can be obtained by your local partner within Schaffner's global network.

**Active and passive harmonic filters.** Harmonic filters help to obtain compliance with international standards like e.g. IEEE 519-1992 or EN 61000-3-12, and with local utility codes. They reduce electrical and thermal stress upon the electrical infrastructure, eliminate the risk of harmonics-related reliability problems, and support long-term energy efficiency and cost savings. Ecosine passive filters are the industry standard for 6-pulse rectifiers and non-regenerative motor drives to achieve the often specified level of < 5% THID. Ecosine active harmonic filters provide latest generation digital technology. With a response time of less than 300 μs an efficient harmonics mitigation, power factor correction, and load balancing is achieved in real time.

Approvals *		Rated power [kW/HP]					Features										Typical applications								
  	  	Filter family	Nom. voltage	Rated power [kW/HP]					For 50 Hz grids	For 60 Hz grids	For 6-pulse diode rectifiers without L <sub>dc</sub>	For 6-pulse diode rectifiers with L <sub>dc</sub>	For 6-pulse SCR rectifiers	THID < 5%	Power factor correction	Load balancing	3-phase/3-wire	3-phase/4-wire	AC motor drives	DC motor drives/welding	HVAC + building technology	Industry	Water/wastewater	Mixed (complex) loads	
				Mitigation current [A]																					
		FN 3440	380–415 VAC	1.1	200 kW				■	■		■ <sup>1)</sup>	■					■	■	■	■	■	■	■	
		FN 3441	380–415 VAC	1.1	200 kW				■		■		■						■	■	■	■	■	■	■
		FN 3450	440–500 VAC	1.1	250 kW				■		■		■ <sup>1)</sup>	■					■	■	■	■	■	■	■
		FN 3451	440–500 VAC	1.1	250 kW				■			■		■					■		■	■	■	■	■
		FN 3410	380–500 VAC		200		400 kW			■		■		■				■		■	■	■	■	■	
		FN 3411	380–500 VAC		200		400 kW			■			■						■	■	■	■	■	■	
		FN 3410 HV	690 VAC	7.5	250 kW				■		■ <sup>2)</sup>	■ <sup>3)</sup>		■					■		■	■	■	■	
		FN 3416	200–500 VAC	2.5	200 kW				■		■	■	■						■	■	■	■	■	■	■
		FN 3452	440–480 VAC	1.5	300 HP					■	■		■ <sup>1)</sup>	■					■	■	■	■	■	■	■
		FN 3453	440–480 VAC	1.5	300 HP					■		■		■						■	■	■	■	■	■
		FN 3412	380–480 VAC		300		500 HP			■		■		■					■		■	■	■	■	■
		FN 3413	380–480 VAC		300		500 HP			■			■							■	■	■	■	■	■
		FN 3418	200–480 VAC	2.5	250 HP				■	■	■	■							■	■	■	■	■	■	■
<b>NEW</b>		FN 3530/31 FN 3540/41	380–480 VAC	60 A					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>NEW</b>		FN 3532/42	380–480 VAC	120 A					■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■
<b>NEW</b>		FN 3545	200–415 VAC	60	300 A				■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■

\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.

<sup>1)</sup> 5% THID is not guaranteed when FN 3440, FN 3450 and FN 3452 filters are applied to SCRs

<sup>2)</sup> With and up to 45 A filters

<sup>3)</sup> 60 A–320 A filters



**PCB filters.** Very compact EMI suppression components can directly be mounted on printed circuit boards of low-power office, medical, telecom and IT equipment, DC/DC converters and power supplies etc. Ideal low cost solution for manufacturers who have planned for EMC compliance throughout the equipment design process already.

Approvals *		Attenuation performance / Rated current [A]						Features						Typical applications											
Filter family	Max. voltage	standard			high		very high			1-stage filter circuit	2-stage filter circuit	For DC applications only	PCB mounting	With metal case	Low profile	Small footprint	Automotive	DC/DC converters	IT and telecom applications	Building automation	Power supplies	Medical devices	Office automation equipment	General applications	Consumer electronics
		0	3	6	9	12	15																		
FN 402	250 VAC	0.5 to 6.5						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
FN 405	250 VAC	0.5 to 10						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
FN 406	250 VAC	0.5 to 8.4						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
FN 410	250 VAC	0.5 to 6						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

**Power cords with locking systems for IEC inlet filters.** Guarding against accidental disconnection of all electrical appliances with an IEC inlet, no exchange or modification of the IEC inlet or IEC inlet filter is needed. An easy retrofit for all electronic equipment and devices is possible.

Approvals *		standard length / on request								Available line connectors								Typical applications				
Power cord family	Max. voltage	6 ft	2 m	3 m	9 ft	12 ft	5 m	10 m	C14 line side plug IEC C14 male, straight	C20 line side plug IEC C20, male, straight	EU1 line side plug CEE7/VII, right angled	US1 line side plug NEMA5-15, straight	US2 line side plug NEMA5-15, straight hospital grade	UK1 line side plug BS1363, right angled, fused 5A	CH1 line side plug SEV1011, straight	JP1 line side plug JIS8303, straight	Data centers	Industrial equipment	Medical, in-vitro diagnostic devices	Broadcasting stations	Mobile applications	
		●	●	×	●	●	×	×														
IL 13	250 VAC	●	●	×	●	●	×	×	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
IL 13+ **	250 VAC								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
IL 19	250 VAC		●						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	

\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.  
 \*\* Rewireable – offering total flexibility when assembling cables.

## IEC inlet filters / Power entry modules.

All the advantages of IEC connector, EMC/EMI filter, fuses, switch and voltage selector combined in a powerful compact all-in-one solution. Ideal for computers, monitors and office equipment like printers and copy machines.

Approvals *				Features										Typical applications													
Filter family	Max. voltage	Attenuation performance										With earth line choke	For fuse(s)	With switch (1-pole)	With switch (2-pole)	With voltage selector	For PCB mounting	Snap-in version	Extra wide mounting	IT equipment	Medical equipment	Switch-mode power supplies	Office equipment	Prof. audio, TV, VCR	Telecommunication	Light industrial equipment	General purpose
		standard			high			very high																			
		0	4	8	12	16	20																				
FN 9222 FN 9222E	250 VAC	1					20																				
FN 9226	250 VAC	1		10																							
FN 9233 FN 9233E	250 VAC	1			15																						
FN 9244 FN 9244E	250 VAC	1			15																						
FN 9246	250 VAC	1					20																				
FN 9260	250 VAC	1		10																							
FN 9264	250 VAC	1		10																							
FN 9280 FN 9280E	250 VAC	1		10																							
FN 9290	250 VAC	1		10																							
FN 280	250 VAC	1		10																							
FN 370	250 VAC	2		6																							
FN 380	250 VAC	2		6																							
FN 390 FN 1390	250 VAC	1		10																							

\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.

**Single-phase and DC filters.** Single-phase filters for chassis or DIN-rail mounting are key for EMC compliance of higher power office equipment and low to medium power industrial applications. A broad selection of electrical and mechanical features allows a specific choice and deployment for countless applications. DC filters are specifically optimized for applications with DC supply like e.g. PV inverters.

Filter family		Max. voltage	Attenuation performance			Features										Typical applications					
			standard	high	very high	1-stage filter circuit	2-stage filter circuit	3-stage filter circuit	For DC applications	With overvoltage protection	Low frequency attenuation	High frequency attenuation	Choice of connection style	DIN-rail mounting	Power supplies, SMPS	Medical equipment	Single-phase motor drives	Control unit in machine tools	PV inverters	Office, test & measure. equip.	General purpose
FN 332		250 VAC	1-10			■															■
FN 350		250 VAC	8	55		■							■		■						■
FN 2010		250 VAC	1	60		■						■			■						■
FN 2020		250 VAC	1	60		■						■			■						■
FN 2030		250 VAC	1	30		■				■	■	■	■		■						■
FN 2200		1200 VDC		25	2300	■		■		■	■			■							■
FN 2210 FN 2211		1000 VDC			250-2300	■		■		■	■			■							■
FN 2210 HV FN 2211 HV		1500 VDC			250-2300	■		■		■	■			■							■
FN 2410		250 VAC 520 VAC (H)	8	100		■									■		■				
FN 2412		250 VAC 520 VAC (H)	8	45		■								■	■		■	■			
FN 2450		250 VAC	1	20		■								■	■						■

\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.



Approvals \*



Filter family	Max. voltage	Attenuation performance			Features										Typical applications					
		standard	high	very high	1-stage filter circuit	2-stage filter circuit	3-stage filter circuit	With earth line choke	With overvoltage protection	Low frequency attenuation	High frequency attenuation	Choice of connection style	TEMPEST protection	Power supplies, SMPS	Medical equipment	Single-phase motor drives	Control unit in machine tools	Interception protection	Office, test & measure. equip.	General purpose
FN 343	250 VAC	1-10	40-60			■	■												■	■
FN 2060	250 VAC	1-30	30-50			■					■		■	■					■	■
<b>NEW</b> FN 2070	250 VAC	1-36	30-50			■				■	■		■	■	■				■	■
FN 2080	250 VAC	1-16	40-50			■				■		■	■	■		■	■			
FN 2090	250 VAC	1-30	50-60			■			■	■	■	■	■	■		■	■			
FN 700Z	250 VAC	6-20	60-80				■		■	■	■		■	■	■			■	■	






\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.

**Three-phase filters and line reactors.** EMC/EMI filter solutions for industrial applications like motor drives and machine tools. Furthermore, these types of filters are also suitable for mainframe computer systems, large uninterruptible power supplies, medical equipment, wind turbine power stations and a vast array of other three-phase power electronics. Line reactors, also operated on the line side of power drive systems, efficiently protect inverter electronics and DC link capacitors from inrush, peak and short-circuit currents. Additionally, low-frequency interference and harmonics are reduced significantly.

Approvals *				Features													Typical applications						
Filter family	Max. voltage	Attenuation performance					Multi-stage filter circuit	Safety connector blocks	Busbar connection	Optional protective covers	Standard protective covers	Offering EMC compliance	Low leakage current	Less commutation notches	Inrush current limitation	Harmonics reduction	4% impedance	Inverters, servo drives	Energy regeneration drives	Machinery, machine tools	Industrial automation	General purpose	Power and energy
		standard	high	very high	Rated current [A]																		
FN 258	480 VAC 690 VAC (HV)	7	250				■	■			■	■					■		■	■	■	■	
FN 351	440 VAC 520 VAC (H)	8	280					■			■						■			■	■	■	
FN 3025	520 VAC	10-50					■			■	■	■					■			■	■	■	
FN 3026	520 VAC	10-50					■			■	■	■					■			■	■	■	
FN 3100	520 VAC	35	300				■				■						■	■	■	■	■	■	
FN 3120	520 VAC (H)	25	230				■				■						■	■	■	■	■	■	
FN 3258	480 VAC 520 VAC (H)	7	180				■				■						■		■	■	■	■	
FN 3268	520 VAC	7	180				■				■	■					■		■	■	■	■	
FN 3270	520 VAC	10				1000	■	■	■		■						■		■	■	■	■	
FN 3310 FN 3311	520 VAC		250			2300		■			■						■		■	■	■	■	
FN 3310 HV FN 3311 HV	690 VAC		250			2300		■			■						■		■	■	■	■	
FN 3359	520 VAC 690 VAC (HV)	150				2500	■	■	■		■						■	■	■	■	■	■	
RWK 212	500 VAC	4				1100	■	■					■	■	■	■	■		■	■	■	■	











\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.

**Three-phase and neutral line filters.** Three-phase and neutral line filters are a compact solution for the interference suppression on the mains input of cabinets and control units of equipment, ranging from industrial applications like machine tools to sensitive medical installations. These typically involve separate and often insufficiently filtered frequency inverters and SMPS, causing current imbalance and significant interference problems. As individual elements they may be interference-suppressed already. The conjunction of several switching components in the same cabinet and a non-EMC conscious cabling will rise the demand for an additional EMC/EMI filter on the mains input of the whole installation. Many times this is the only way to get the CE mark for the cabinet in accordance with the EMC directive.

Approvals *				Features										Typical applications													
Filter family	Max. voltage	Attenuation performance						Rated current [A]																			
		standard		high		very high																					
		0	120	240	360	480	600	1-stage filter circuit	2-stage filter circuit	Safety connector blocks	Faston connectors	Offering EMC compliance	For asymmetrical loads	Broadband attenuation	Very low leakage current	For entire systems, install.	Machinery, machine tools	Industrial automation	Power supplies	Medical equipment	For high frequency appl.	High power office equipment	General purpose				
FN 354 	440 VAC	4-25							■		■	■		■					■	■	■	■	■				
FN 355 	440 VAC	3-20						■			■	■			■					■		■	■				
FN 356 	440 VAC	16-150						■		■		■	■			■		■	■								
FN 3256 	520 VAC (H)	8-160						■		■		■	■			■	■	■	■			■	■				
FN 3280 	520 VAC (H)	8-600						■	■			■	■	■		■	■	■	■								













\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.





**Output filters and load reactors.** Output components for motor protection and the improvement of system reliability, availability and functionality. Deployed at the output side of frequency inverters, these filters ensure reliable operation by avoiding expensive downtimes of installations, manufacturing plants, machinery and a vast array of other industrial and domestic motor drive applications due to premature motor damage. An appropriate output solution will even allow the deployment of unshielded motor cables, the use of multiple motors in parallel on the same drive or the retrofit of modern drives in existing installations with old motors and unshielded cabling.

Approvals *		Typical motor power [kW]						Features										Typ. applications					
Filter family	Max. voltage	Rated current [A]						dv/dt restriction	Overvoltage restriction	Motor temperature reduction	Red. acoustic motor noise	Sym. sinusoidal output signal	Asym. sinusoidal output signal	Eliminat. of bearing damage	Replaces cable shields	Connection to DC link required	Improves overall EMC	Reduces equipment downtime	Motor drives	Servo drives, torque motors	High-speed motor applications	Appl. with long unshield. cabl.	Retrofit of motor drives
		0	60	120	180	240	300																
FN 510 	520 VAC	1.5-30	4-66					■	■	■						■	■	■	■				
FN 530 	520 VAC	1.5-7.5	4-16					■	■	■	■	■	■	■	■	■	■	■			■	■	
FN 5020 	500 VAC	11-55	25-120					■	■	■	■					■	■	■		■			
FN 5030** 	500 VAC	11-55	25-120							■	■	■	■	■	■	■	■	■		■	■	■	
FN 5040 	500 VAC	1.1-630	4.5-1200					■	■	■	■	■				■	■	■				■	
FN 5040 HV 	690 VAC	7.5-1200	13-1320					■	■	■	■	■				■	■	■				■	
FN 5045 	500 VAC	1.1-630	4.5-1200					■	■	■	■	■				■	■	■				■	
FN 5060 	500 VAC	5-630	12-1100					■	■	■						■	■	■	■				
FN 5060 HV 	690 VAC	7.5-1000	16-1200					■	■	■						■	■	■	■				
RWK 305 	500 VAC	1.5-630	4-1100					■		■						■	■	■	■				

\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.  
 \*\* Additional output filter module to be operated in conjunction with FN 5040/45 or FN 5020.

## Feedthrough components. Interference suppression up into the GHz range for high-tech applications such as IT, telecom, server and networking equipment.

Approvals *							Features						Typical applications								
		 Capacitance [nF]  Rated current [A]  Attenuation performance					AC capacitors	DC capacitors	AC filters	DC filters	Very high performance	Y2 capacitor class	Y4 capacitor class	Medical equipment	Professional power supplies	Power electronic equipment	Telecommunication	Scientific equipment	Test and measurement equip.	Security systems	IT, server and network
Feedthrough capacitors	Max. voltage	0	1000	2000	3000	4000	5000														
FN 7510 	300 VAC	2.2–47	10	100																	
FN 7511 	300 VAC	4.7–220	10			200															
FN 7512 	300 VAC	47–100	16	63																	
FN 7513 	300 VAC	100	16																		
FN 7560 	130 VDC	10–100	10			200															
FN 7561 	130 VDC	47–470		63		200															
FN 7562 	130 VDC	100–1000	16			200															
FN 7563 	130 VDC	470	16			200	4700														

Feedthrough filters		standard	high	very high													
FN 7611 	300 VAC	10		250													
FN 7612 	300 VAC	10	100														
FN 7660 	130 VDC	10		200													
FN 7661 	130 VDC	10		200													

\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.

## EMC/EMI chokes. An extensive selection of discrete EMC/EMI chokes with various inductance and current ratings allows optimized circuitry for EMC compliance to be designed easily and economically.

Approvals *		Inductance value [mH]							Features							Typical applications									
Choke family	Max. voltage	Inductance value [mH]							Features							Typical applications									
		0	20	40	60	80	100	150	For common-mode noise	Saturating chokes	Single-choke	Dual-choke	Triple-choke	Quad-choke	PCB mounting	With flying leads	Frequency converters, UPS	Medical equipment	Traction systems	DC/DC or AC/DC converters	Switch-mode power supplies	Home electronics, TV, balasts	Battery chargers	Heaters, air conditioners	
EV/EH series	250 VAC	0.5	90						0.3-5	■		■				■	■	■			■	■	■	■	
<b>NEW</b> RN series	300 VAC 300 VDC	0.4	100						0.3-10	■		■				■	■	■			■	■	■	■	■
RD 5000 series	600 VAC 850 VDC	1-10	6-16						■			■	■		■		■		■						
RD 6000 series	600 VAC 850 VDC	1.5 15	6-16						■			■	■		■	■		■		■					
RD 7000 series	600 VAC 850 VDC	0.2 25	6 36						■			■	■	■		■	■		■						
RD 8000 series	600 VAC 850 VDC	0.2-12	16 64						■			■	■	■		■	■		■						
<b>NEW</b> RT series	600 VAC 425 VDC	2.5-10	6-20 (32)						■			■	■		■	■	■	■	■	■	■	■	■	■	■
RB series	600 VAC 1000 VDC	0.2 3	16 50 (80)**						■			■	■		■		■	■	■	■	■	■	■	■	■
RI series	500 VAC	1.5 25							■	■	■				■	■	■		■	■	■				

\* Products evaluated by one or more of the above certification agencies. For details please consult the detailed data sheet.

\*\* forced cooling





## EMC Support

**EMI measurement and EMC engineering services.** In addition to offering one of the world's most comprehensive ranges of standard filter products, Schaffner offers the full complement of measurement and engineering services, along with customized product development, to support equipment manufacturers and users.

**EMC/EMI testing.** Schaffner operates the most sophisticated EMC test facilities available anywhere today with extensive investment in specialized test equipment and application engineering teams. As a global provider these services are distributed at several locations throughout the world.

**Service available at these locations include:**

- open field testing
- harmonics instrumentation for current and voltage up to the 50th harmonic
- emission and immunity tests according to European and international standards (EN, IEC, FCC, CISPR)

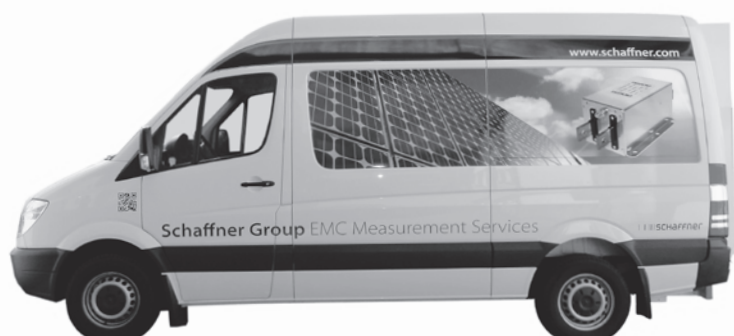
**Additional services available at the accredited testing facility in Switzerland:**

- 500 kW full load test set-up for motor drives
- safety testing and environmental simulation for passive components for electromagnetic interference suppression according to European, international and North American standards

**Engineering services.** Schaffner has the world's most engineering experience in solving EMC problems. In addition to testing and measuring services, Schaffner can provide the expert engineering support to help you bring your equipment to market quickly and efficiently.

**Services available include:**

- custom filter design – to optimize filter performance and solve space, layout, mounting or connection problems
- circuit and equipment design – advising on circuit and equipment or enclosure design to overcome EMC problems
- turnkey component design and build



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