SHORT FORM CATALOG
JANUARY 2021

EMI Components and Quality Filters for Medical Devices

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shaping electrical power

Typical Medical Applications Include:

- X-ray equipment
- CAT scanners
- Defilibrators
- Laboratory equipment
- Analyzers
- Measurement devices
- MRI, MSI, EEG, ECG
- Test equipment
- Hospitals

PCB filters

IEC inlet filters and Power entry modules

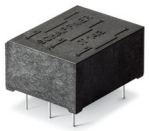
Single-phase filters and DC filters

Three-phase filters

Three-phase and neutral line filters

Feedthrough components

EMI chokes



Pulse transformers

Product Selection Chart

EMC Filter & Components

Number of phases

1-phase

IEC inlet filter/ Power entry modules PEM

PCB filter

≤ 10 A

FN 402
FN 406

page 2

Feedthrough components

≤ 250 A

Capacitors
FN 751X
FN 756X

Filter
FN 761X
FN 766X

page 9

Chassis mount filter

≤ 100 A

1-stage filters

FN 332
FN 2010
FN 2020
FN 2030
FN 2450

page 4

≤ 30 A

3-stage filters

FN 352Z
FN 700Z
FN 2060
FN 2070
FN 2090

page 5

DC

DC filter

≤ 2500 A

FN 2200
FN 2210
FN 2210 HV
FN 2211
FN 2211 HV

page 4

3-phase

3-phase filter

≤ 300 A

FN 3025/3026
FN 3268
FN 3287
FN 3288

page 6

≤ 2500 A

FN 3270
FN 3359
FN 3310
FN 3310 HV
FN 3311
FN 3311 HV

page 6

3-phase + neutral filter

≤ 600 A

FN 354
FN 355

page 7

Chokes

Commonmode

No

IEC inlet filter

≤ 20 A

FN 9222(E)
FN 9226
FN 9233(E)
FN 9244(E)
FN 9246
FN 9255(E)
FN 9274

page 3

PEM with fuses or switch

≤ 10 A

FN 9260
FN 9264

page 3

PEM with fuses and switch or volt. selector

≤ 10 A

FN 280
FN 370
FN 380
FN 9280(E)
FN 9290

page 3

IEC power cords

≤ 16 A

IL 13
IL 13+
IL 19
IF 13

page 2

Differential mode chokes

≤ 4 A

RS series

page 10

Yes

1-phase

≤ 80 A

EV/EH series
RD series
RB series
RN series
RT series

page 10

3-phase

≤ 80 A

RD series
RB series
RT series

page 10

3-phase + neutral

≤ 64 A

RD series

page 10

PCB filters.

Very compact EMI suppression components can directly be mounted on printed circuit boards of low-power medical devices. Ideal low-cost solution for manufacturers who have planned for EMC compliance throughout the equipment design process already.

Approvals *	Filter family	Max. voltage	Attenuation performance / Rated current [A] (standard / high / very high; 0 3 6 9 12 15)	Features: 1-stage filter circuit	2-stage filter circuit	For DC applications only	PCB mounting	With metal case	Low profile	Small footprint
	FN 402 	250 VAC	0.5 – 6.5	■			■		■	
	FN 406 	250 VAC	0.5 – 8.4	■			■	■		■

Power cords with locking systems for IEC inlet filters.

Guarding against accidental disconnection of all medical devices 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.

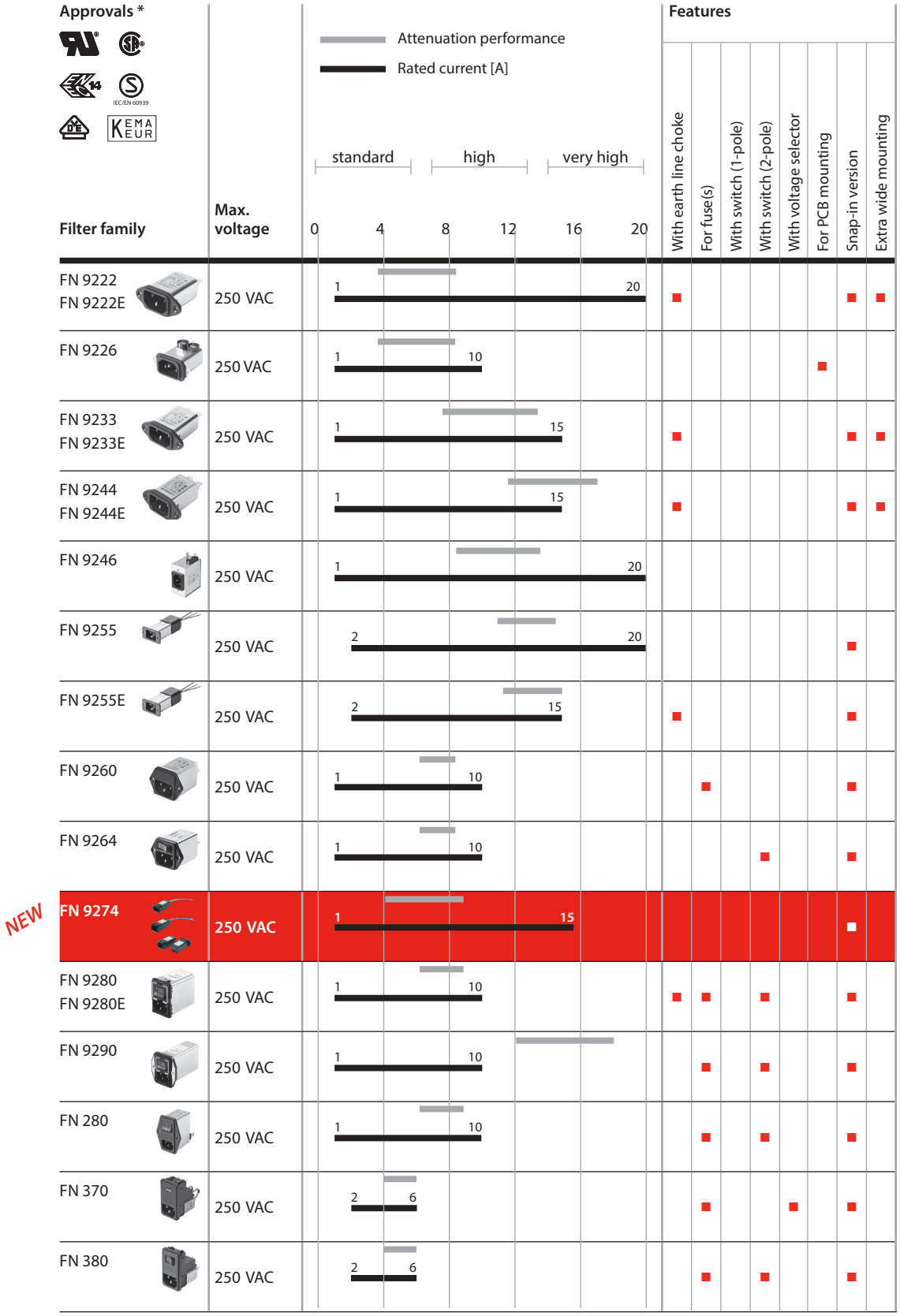
Approvals *	Power cord family	Max. voltage	● standard length / × on request: 6 ft	2 m	3 m	9 ft	12 ft	5 m	10 m	Available line connectors: C14 line side plug IEC C14 male, straight	C20 line side plug IEC C20, male, straight	EU1 line side plug CEE7/VII, right angled	US1 line side plug NEMA5-15, straight	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
	IL 13 	250 VAC	●	●	×	●	●	×	×	■		■	■	■	■	■	■
	IL 13+** 	250 VAC															
	IL 19 	250 VAC		●							■	■	■		■		
NEW	IF 13 	250 VAC								■		■	■				

* 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, EMI filter, fuses, switch and voltage selector combined in a powerful compact all-in-one solution.



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Single-phase and DC filters.

Single-phase filters for chassis or DIN-rail mounting are key for EMC compliance of higher power medical machines equipment and low to medium power medical 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.

Approvals *

IEC/EN 60939

Attenuation performance (standard / high / very high) — Rated current [A] (scale 0–100)

Filter family		Max. voltage	Rated current [A]	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
FN 332		250 VAC	1–10	■				■				
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 2412		250 VAC 520 VAC (H)	8 – 45	■					■			■
FN 2450		250 VAC	1 – 20	■					■	■		
FN 343		250 VAC	1–10		■		■					
FN 2060		250 VAC	1 – 30		■						■	
FN 2070		250 VAC	1 – 36		■					■	■	
FN 2080		250 VAC	1 – 16		■				■		■	
FN 2090		250 VAC	1 – 30		■			■	■	■	■	
FN 700Z		250 VAC	6 – 20			■		■	■	■		■

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Three-phase filters and line reactors.

EMI filter solutions for industrial applications like medical devices and equipment. 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 *	Filter family	Max. voltage	Attenuation performance / Rated current [A] (standard / high / very high; 0 200 400 600 800 >1000)	Features: 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
	FN 3025 	520 VAC	10–50		■			■	■	■				
	FN 3026 	520 VAC	10–50		■			■	■	■				
	FN 3268 	520 VAC	7 180		■				■	■				

* 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 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 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 *	Filter family	Max. voltage	Attenuation performance / Rated current [A] (standard / high / very high; 0 120 240 360 480 600)	Features: 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
	FN 354 	440 VAC	4–25		■		■	■		■	
	FN 355 	440 VAC	3–20	■			■	■			■

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

Feedthrough components.

Interference suppression up into the GHz range for high-tech applications such as medical devices.

Approvals *

Capacitance [nF]
Rated current [A]
Attenuation performance

Feedthrough capacitors	Max. voltage	0 1000 2000 3000 4000 5000 0 50 100 150 200 250	Features: AC capacitors	DC capacitors	AC filters	DC filters	Very high performance	Y2 capacitor class	Y4 capacitor class
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 4700 16 200		■			■		■

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				■	■		■

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EMI chokes.

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

Choke family	Approvals *	Max. voltage	Inductance value [mH] / Rated current [A] (0 20 40 60 80 100 / 0 30 60 90 120 150)	Features: For common-mode noise	Saturating chokes	Single-choke	Dual-choke	Triple-choke	Quad-choke	PCB mounting	With flying leads
EV/EH series 		250 VAC	0.5 – 90; 0.3–5	■			■			■	
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	■			■	■	■		■
RT series 		600 VAC 425 VDC		■			■	■		■	
RB series 		600 VAC 1000 VDC	0.2–3; 16 50 (80)**	■			■	■		■	
NEW **RS series** 		**250 VAC**	0.003–3.6; 0.5–4			■	■			■	

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** forced cooling

Pulse transformers.

They provide a proper galvanic separation between gate drive circuitry and high voltage path in IGBT, thyristor, triac, power MOSFET and DC/DC converter circuits.

Pulse transformer	Nominal voltage	Voltage-time area [Vµs] / Ignition current [A]	Features: 1:1	1:1:1	2:1	2:1:1	3:1	3:1:1	PCB	Faston	Galvanic separation
		0 1000 2000 3000 4000 5000 / 0 0.6 1.2 1.8 2.4 3									
IT 155/237 	500 VAC	500 1100 / 0.1–0.25	■						■		■
IT 245/255/258 	750 VAC	250–500 / 0.1 1	■						■		■
IT 239 	1000 VAC	350 / 0.25	■						■		■
IT 370 	1000 VAC	4000 / 0.1 1	■						■		■
IT 364 	3000 VAC	5000 / 0.1 3	■							■	■
IT 213 	380 VAC	450 / 0.25		■					■		■
IT 312/313 	380 VAC	450 1200 / 0.25 1		■					■		■
IT 143/233/242 IT 243/253 	500 VAC	180–800 / 0.025–0.25		■					■		■
IT 246/248 	750 VAC	200–350 / 0.1–0.25			■				■		■
IT 249 	500 VAC	350 / 0.25				■			■		■
IT 260 	500 VAC	200 / 0.1					■		■		■
IT 314 	380 VAC	500 / 0.25 1						■	■		■
IT 234/244 IT 154 	500 VAC	200–600 / 0.1–0.25						■	■		■

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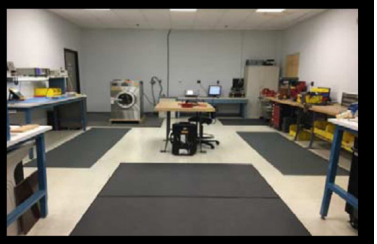
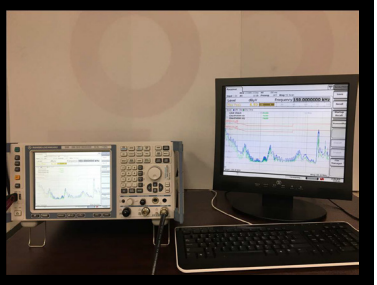
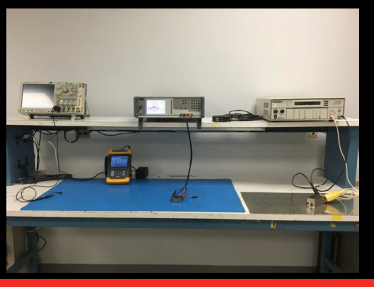
EMC SAMPLE & DESIGN CENTER

Our expert engineering team can help avoid future EMI/EMC related issues by analyzing designs, building quick-turn prototypes, and working with the customer right through the testing phase.

Over 40 years of engineering experience solving EMC related issues







Rapid prototype delivery of custom RFI/EMC filters

- ✓ Material on hand to wind cores, assemble filters and produce samples for all types of filters
- ✓ Cost effective approach with safety in mind in order to comply with various industry standards including UL/CSA/IEC/EN
- ✓ Simulation of expected insertion loss: Leakage currents, residual voltage, thermal characteristics and core saturation
- ✓ Hi-pot and insulation resistance testing of final samples
- ✓ 3-D mechanical housing design meeting custom layouts, size, installation and connection requirements

Pre-Compliance testing service and consultation

- ✓ Test / Consult can be in-house, on customer site or at their local test house in order to achieve the optimal EMC solution for the customer's end product
- ✓ Analyze the conducted emissions profile of a customer's existing design and provide the best cost effective filter solution for meeting EMC requirements
- ✓ This could result in utilizing one of our standard filters or a custom solution
- ✓ Conducted emissions are performed using the latest technology in test equipment for close correlation with test lab compliance results
- ✓ Testing to FCC part 15 and European standards, (i.e. EN61000 series, EN55011, EN55014, EN55015, EN55022, CISPR16)

Contact Us

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