

# Smallest book-style EMC/RFI Filter for Inverter and Power Drive Systems

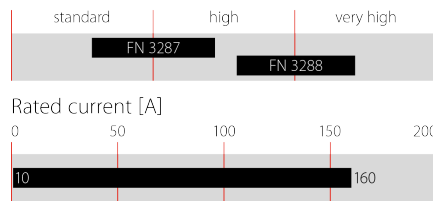


- Standard and high performance EMC solution
- Footprint space-saving book-style housing
- Solid safety connector blocks
- Standard attenuation performance FN 3287
- High attenuation performance FN 3288
- HV versions for 690 VAC applications
- HMIT- and IT versions for IT distribution networks
- Versions with low leakage current



### Performance indicators

Attenuation performance



### Approvals



600 VAC

### Features and benefits

- FN 3287 and FN 3288 series of filters provides state-of-the-art EMI attenuation based on an innovative filter topology. They help to ensure compliance with Class C2 or even C1 limits.
- The slim book-style shape allows a convenient and space-saving installation next to inverters, converters or motor drives.
- The compact FN3287 and FN3288 filter from 10 to 160A are designed for the most diverse applications worldwide, including machinery and machine tools.
- FN 3288 HV filters up to 160 A are applicable for 690 VAC distribution networks.
- FN 3288IT and FN 3288HVIT filters up to 160 A meet the special requirements for IT distribution networks.
- Low leakage current filter versions help to fulfill tough requirements (e.g. 0.1 mA) in respect of leakage current limitation.

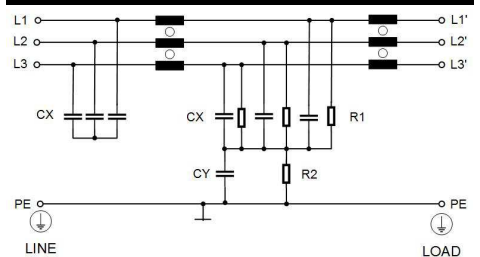
### Technical specifications

<b>Maximum continuous operating voltage</b>	3x 530/305 VAC (FN 3287, FN 3288) 3x 530 VAC (FN 3288 IT) 3x 760/440 VAC (FN 3288 HV) 3x 760 VAC (FN 3288 HVIT)
<b>Rated currents</b>	10 to 160 A @50°C
<b>Operating frequency</b>	DC to 60 Hz
<b>High potential test voltage</b>	P -> E 2260 VDC for 2 s (FN 3287, FN 3288) P -> E 2900 VDC for 2 s (FN 3288 IT) P -> P 2280 VDC for 2 s (FN 3287, FN 3288, FN 3288 IT) P -> E 2650 VDC for 2 s (FN 3288 HV) P -> E 3530 VDC for 2 s (FN 3288 HVIT) P -> P 3270 VDC for 2 s (FN 3288 HV)
<b>Pollution degree</b>	2 acc. IEC 60664-1
<b>Protection category</b>	IP 20 acc. to IEC 60529
<b>Overload capability</b>	6x rated current for 1 sec, once per hour 1.5x rated current for 1 minute, once per hour
<b>Temperature range (operation and storage)</b>	-40°C to +100°C (with current derating >50°C)
<b>Climatic class</b>	-40/100/21 acc. to IEC 60068-1
<b>Vibration and shock</b>	3M4 (operation); 2M2 (transport) acc. to IEC 60721-3-3; IEC 60721-3-2
<b>Flammability according to</b>	UL 94 V-0
<b>Compliance with insulation requirement</b>	> 1 MOhm acc. to IEC 60204-1
<b>Design corresponding to</b>	UL 60939-3, IEC 60939-3
<b>MTBF</b>	> 200,000 hours
<b>Overtoltage category</b>	II acc. IEC 60664-1

### Typical applications

- Three-phase variable speed drives and power drive systems (PDS)
- Machine tool and machinery equipment
- IT power distribution networks (FN 3288IT and FN 3288 HVIT)
- General energy conversion devices (inverters, converters)
- Process automation equipment
- Three-phase power supplies
- Low-leakage current requirements

### Typical electrical schematic



Note: IT and HVIT versions without discharge resistor to ground.

## Filter selection table

Filter	Rated current @ 50°C (40°C) [A]	Typical drive power rating** [kW]	Leakage current*** @ 530 VAC/50 Hz [mA]								Power loss @ 25°C [W]	Terminal Type	Weight [kg]	Frame
			C35	C34	C33	C28	C27	C26	C21	C17				
<b>*C..</b>														
<b>Standard performance:</b>														
FN 3287-10-44-C...R65	10 (11)	5.5				3.7		2.2	0.4		6.9	-44	0.7	Q
FN 3287-16-44-C...R65	16 (17)	7.5			4.3			2.4	0.4		8.5	-44	0.8	R
FN 3287-20-33-C...R65	20 (22)	11			4.9			2.5	0.4		9.4	-33	0.9	S
FN 3287-25-33-C...R65	25 (27)	15			4.9			2.5	0.4		11.0	-33	1.0	S
FN 3287-40-33-C...R65	40 (44)	22			4.9			2.5	0.4		19.2	-33	1.5	T
FN 3287-50-53-C...R65	50 (55)	30			4.9			2.5	0.4		21.7	-53	2.1	U
FN 3287-63-53-C...R65	63 (69)	37			4.9			2.5	0.4		27.4	-53	2.2	U
FN 3287-80-34-C...R65	80 (88)	45			5.6			2.7	0.4		32.6	-34	3.4	F
FN 3287-100-35-C...R65	100 (110)	55			5.6			2.7	0.4		33.0	-35	4.2	G
FN 3287-125-35-C...R65	125 (137)	75			5.6			2.7	0.4		37.5	-35	4.6	G
FN 3287-160-40-C...R65	160 (175)	90			5.6			2.7	0.4		38.4	-40	6.0	H
<b>High performance:</b>														
FN 3288-10-44-C...R65	10 (11)	5.5		5.9				2.5	0.4	0.1	6.8	-44	0.8	A
FN 3288-16-44-C...R65	16 (17)	7.5	6.0					2.5	0.4	0.1	9.2	-44	1.0	B
FN 3288-20-33-C...R65	20 (22)	11	6.0					2.5	0.4	0.1	10.0	-33	1.2	C
FN 3288-25-33-C...R65	25 (27)	15	6.0					2.5	0.4	0.1	16.9	-33	1.2	C
FN 3288-40-33-C...R65	40 (44)	22	6.0				3.5		0.4	0.1	20.2	-33	1.8	D
FN 3288-50-53-C...R65	50 (55)	30	6.6					2.6	0.4	0.1	24.0	-53	2.5	E
FN 3288-63-53-C...R65	63 (69)	37	6.6					2.6	0.4	0.1	34.5	-53	2.7	E
FN 3288-80-34-C...R65	80 (88)	45	7.1					2.7	0.4	0.1	28.8	-34	4.3	F
FN 3288-100-35-C...R65	100 (110)	55	7.1					2.7	0.4	0.1	36.0	-35	5.1	G
FN 3288-125-35-C...R65	125 (137)	75	7.1					2.7	0.4	0.1	42.2	-35	5.0	G
FN 3288-160-40-C...R65	160 (175)	90	7.1					2.7	0.4	0.1	46.1	-40	6.6	H
<b>HP for IT power networks****:</b>														
FN 3288IT-10-44-C...R60	10 (11)	5.5		5.9							6.2	-44	1.1	I
FN 3288IT-16-44-C...R60	16 (17)	7.5		5.9							9.6	-44	1.3	J
FN 3288IT-20-33-C...R60	20 (22)	11		5.9							13.2	-33	1.6	K
FN 3288IT-25-33-C...R60	25 (27)	15		5.9							15.6	-33	1.6	K
FN 3288IT-40-33-C...R60	40 (44)	22		5.9							18.7	-33	2.8	L
FN 3288IT-50-53-C...R60	50 (55)	30		6.5							22.2	-53	2.8	M
FN 3288IT-63-53-C...R60	63 (69)	37		6.5							29.8	-53	2.9	M
FN 3288IT-80-34-C...R60	80 (88)	45		7.0							28.8	-34	4.6	N
FN 3288IT-100-35-C...R60	100 (110)	55		7.0							33.0	-35	5.4	O
FN 3288IT-125-35-C...R60	125 (137)	75		7.0							42.2	-35	5.3	O
FN 3288IT-160-40-C...R60	160 (175)	90		7.0							46.1	-40	6.9	P

\* Replace C.. with corresponding listed C35, C34, C33, C28, C27, C26, C21 or C17.

\*\* Typical power rating at 400 VAC for FN 3287 and FN 3288 with  $\cos \phi = 0.85$ . The exact value depends upon the efficiency of the drive, the motor and the entire application.

\*\*\* Standardized calculated leakage current acc. IEC 60939 under normal operating conditions (FN 3287, FN 3288 and FN 3288 IT at 530 VAC).

\*\*\*\* These filters may be operated in IT system as long as the operation conditions and possible short circuit/fault (earth connection of one conductor) occurs between the supply (line side) and the filter. The filters are not designed for short circuit/faults occurring between converter and motor.

## Filter selection table

Filter	Rated current @ 50°C (40°C) [A]	Typical drive power rating** [kW]	Leakage current*** @ 760 VAC/50 Hz [mA]							Power loss @ 25°C [W]	Input/output Connections	Weight [kg]	Frame
			C44	C43	C42	C36	C34	C26	C25				
<b>* C..</b>													
<b>High voltage versions:</b>													
FN 3288HV-10-44-C..-R65	10 (11)	10					8.4		1.8	6.9	-44	1.2	I
FN 3288HV-16-44-C..-R65	16 (17)	16					8.4		2.5	10.8	-44	1.5	J
FN 3288HV-20-33-C..-R65	20 (22)	20				10.9			2.5	12.0	-33	1.8	K
FN 3288HV-25-33-C..-R65	25 (27)	25				10.9			2.5	14.6	-33	1.9	K
FN 3288HV-40-33-C..-R65	40 (44)	40				12.4			2.6	19.2	-33	2.9	L
FN 3288HV-50-53-C..-R65	50 (55)	50				12.4			2.6	26.3	-53	3.3	M
FN 3288HV-63-53-C..-R65	63 (69)	64				12.4			2.6	32.1	-53	3.5	M
FN 3288HV-80-34-C..-R65	80 (88)	80				12.4			2.6	28.8	-34	4.9	N
FN 3288HV-100-35-C..-R65	100 (110)	100				12.4			2.6	33.0	-35	5.8	O
FN 3288HV-125-35-C..-R65	125 (137)	125				12.4			2.6	42.0	-35	5.9	O
FN 3288HV-160-40-C..-R65	160 (175)	160				12.4			2.6	46.1	-40	7.2	P
<b>HV for IT power networks****:</b>													
FN 3288HVIT-10-44-C..-R60	10 (11)	10			4.6				3.6	6.9	-44	1.2	I
FN 3288HVIT-16-44-C..-R60	16 (17)	16		6.8					3.7	10.8	-44	1.5	J
FN 3288HVIT-20-33-C..-R60	20 (22)	20		6.8					3.7	12.0	-33	1.8	K
FN 3288HVIT-25-33-C..-R60	25 (27)	25		6.8					3.7	14.6	-33	1.9	K
FN 3288HVIT-40-33-C..-R60	40 (44)	40		6.8					3.7	19.2	-33	2.9	L
FN 3288HVIT-50-53-C..-R60	50 (55)	50		6.8					3.7	26.3	-53	3.3	M
FN 3288HVIT-63-53-C..-R60	63 (69)	64		6.8					3.7	32.1	-53	3.5	M
FN 3288HVIT-80-34-C..-R60	80 (88)	80		6.8					3.7	28.8	-34	4.9	N
FN 3288HVIT-100-35-C..-R60	100 (110)	100		6.8					3.7	33.0	-35	5.8	O
FN 3288HVIT-125-35-C..-R60	125 (137)	125	5.9						3.7	42.2	-35	5.9	O
FN 3288HVIT-160-40-C..-R60	160 (175)	160		6.8					3.7	46.1	-40	7.2	P

\* Replace C.. with corresponding listed C44, C43, C42, C36, C34, C26, C25 or C24.

\*\* Typical power rating (400 VAC for FN 3287 and FN 3288 / 690 VAC for FN 3288 HV and FN 3288 HVIT) with  $\cos \phi=0.85$ . The exact value depends upon the efficiency of the drive, the motor and the entire application.

\*\*\* Standardized calculated leakage current acc. IEC 60939 under normal operating conditions (FN 3288 HV and FN 3288 HVIT at 760 VAC).

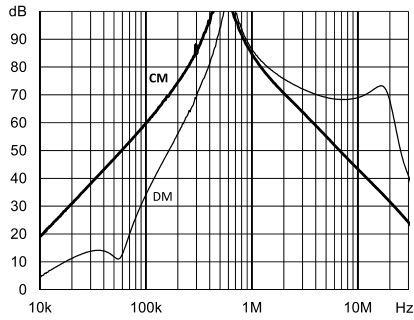
\*\*\*\*These filters may be operated in IT system as long as the operation conditions and possible short circuit/fault (earth connection of one conductor) occurs between the supply (line side) and the filter. The filters are not designed for short circuit/faults occurring between converter and motor.

### Typical filter attenuation – FN 3287 standard performance

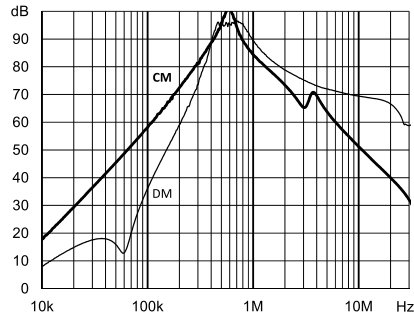
(FN 3287 standard performance version with standard leakage current)

Per CISPR 17: symmetrical 50 Ω/50 Ω -> Differential Mode (DM); asymmetrical 50 Ω/50 Ω -> Common Mode (CM)

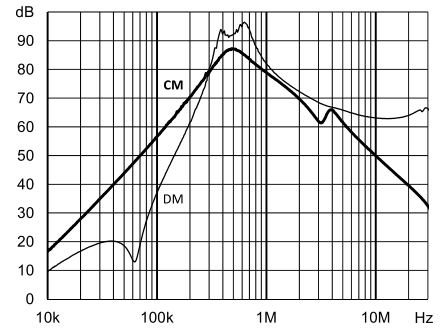
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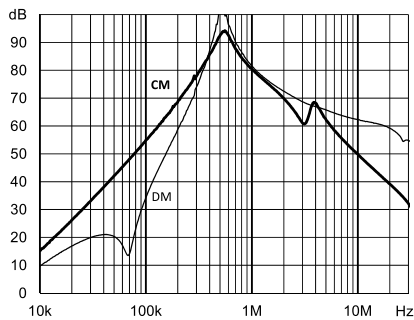
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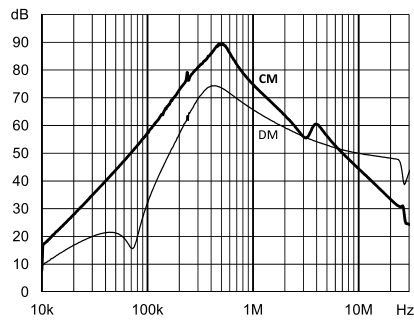
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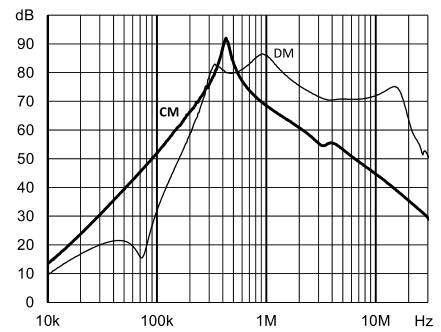
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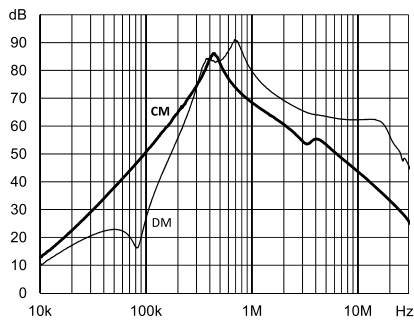
FN3287-40-33-C33-R65



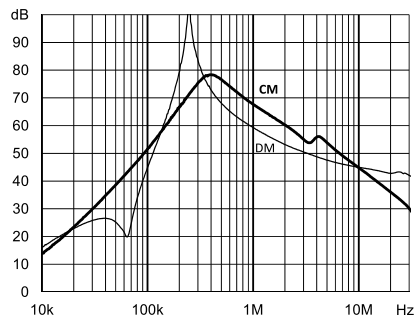
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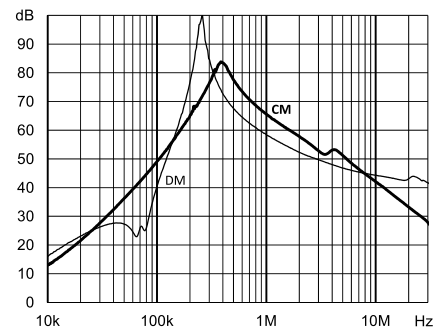
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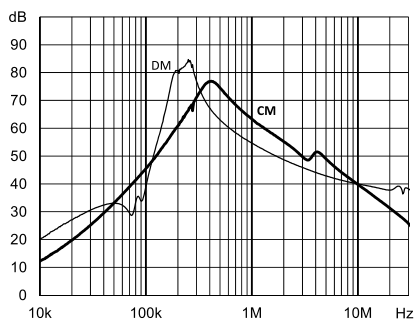
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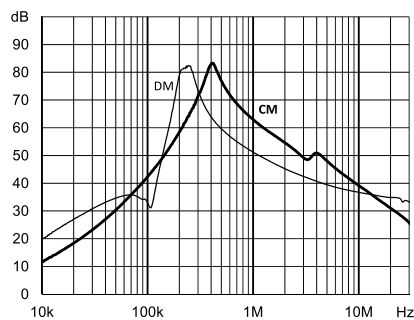
FN 3287-100-35-C33-R65



FN 3287-125-35-C33-R65



FN 3287-160-40-C33-R65

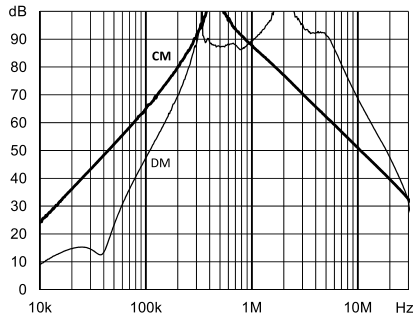


### Typical filter attenuation – FN 3288 high performance

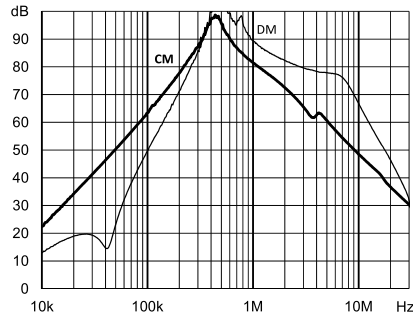
(FN 3288 high performance version with standard leakage current)

Per CISPR 17: symmetrical 50 Ω/50 Ω -> Differential Mode (DM); asymmetrical 50 Ω/50 Ω -> Common Mode (CM)

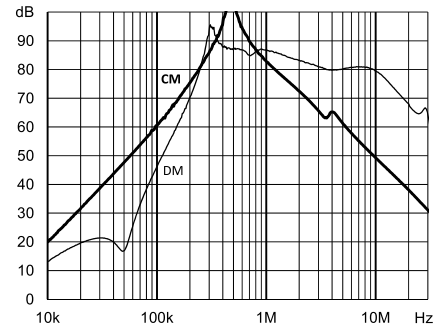
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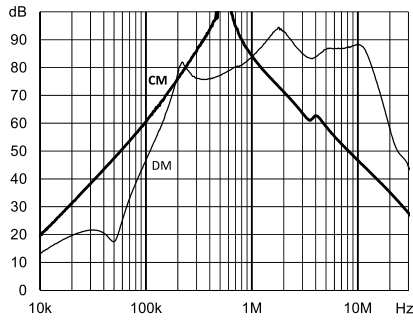
FN 3288-16-44-C35-R65



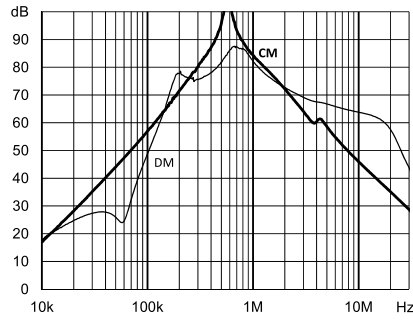
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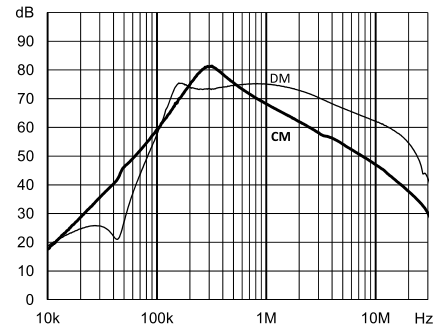
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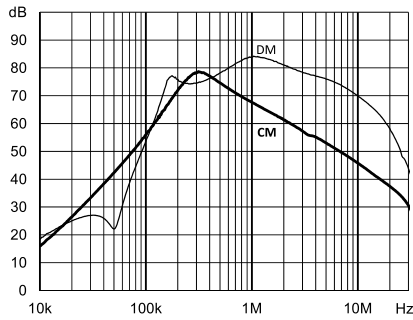
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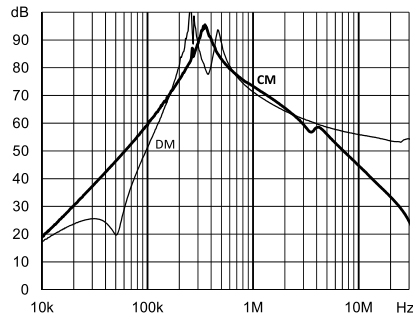
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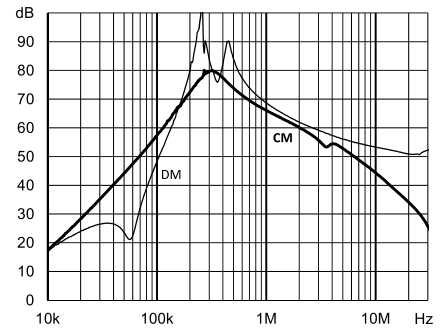
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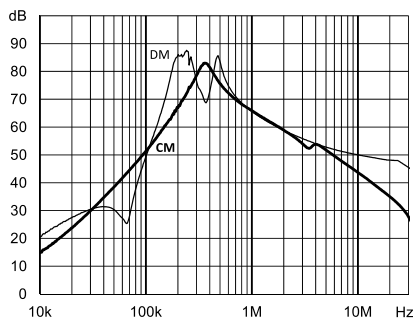
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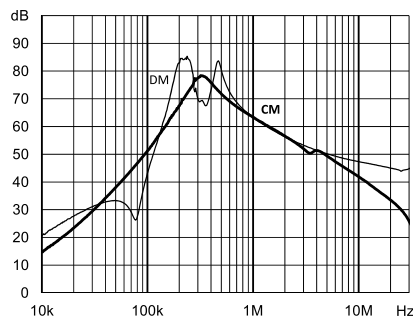
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FN 3288-125-35-C35-R65



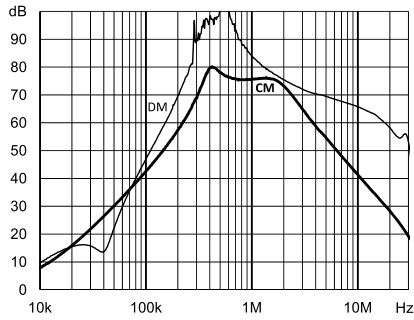
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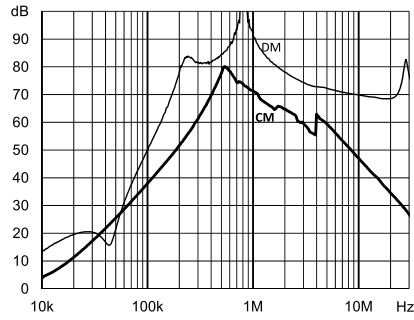
### Typical filter attenuation – FN 3288 low leakage current version

Per CISPR 17: symmetrical 50 Ω/50 Ω -> Differential Mode (DM); asymmetrical 50 Ω/50 Ω -> Common Mode (CM)

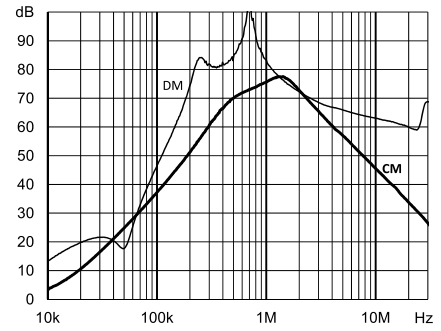
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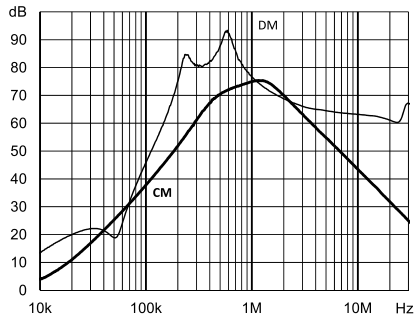
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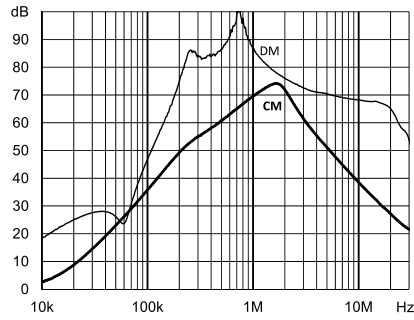
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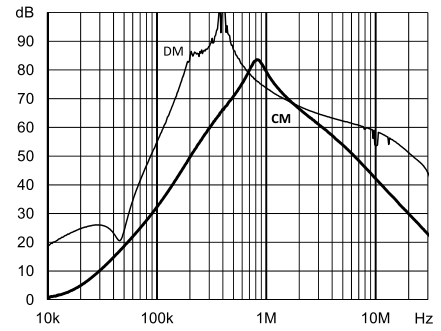
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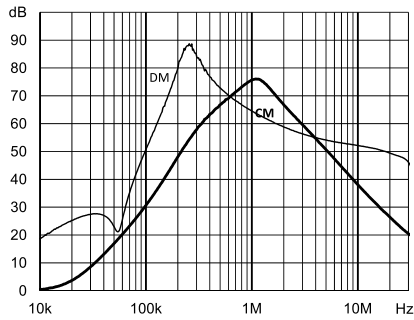
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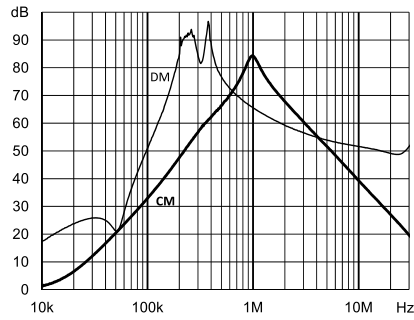
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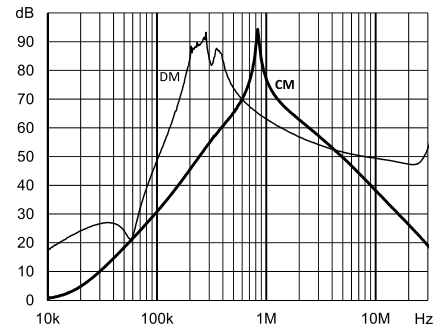
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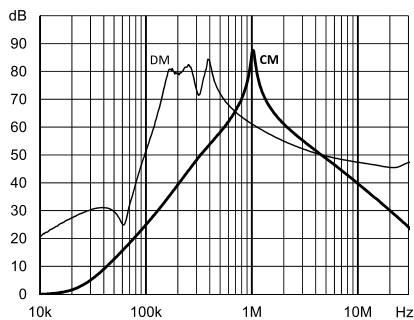
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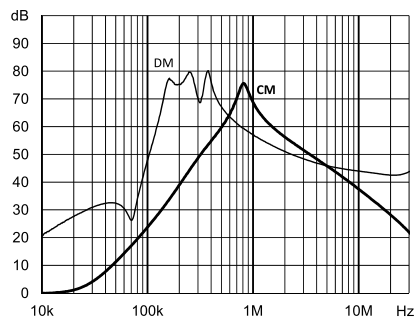
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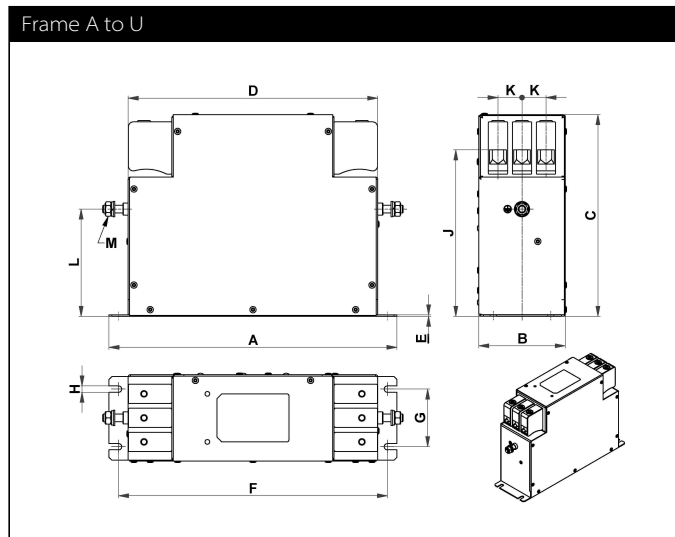
FN 3288-125-35-C21-R65



FN 3288-160-40-C21-R65



## Mechanical data



## Dimensions\*

Frame	A	B	C	D	E	F	G	H	J+/-2	K	L+/-1	M**
A	185	40	120	157	0.8	175	20	4.5	102	11	76	M5
B	195	45	140	164	0.8	180	25	5.4	122	11	93	M5
C	210	45	145	174	0.8	195	25	5.4	126	13	96	M5
D	235	50	168	207	1.0	220	30	5.4	149	13	115	M6
E	255	65	180	226	1.0	240	45	5.4	156	16	120	M6
F	290	80	205	250	1.2	270	50	6.5	172	22	110	M6
G	300	90	210	260	1.5	280	60	6.5	173	25	112	M8
H	310	100	225	270	1.5	290	70	6.5	183	28	110	M10
I	230	50	132	203	0.8	220	30	4.5	114	12.5	88	M5
J	230	55	159	198	0.8	215	35	5.4	141	13	112	M5
K	245	55	167	212	0.8	230	35	5.4	148	13	118	M5
L	265	60	191	237	1.0	250	40	5.4	172	13	135	M6
M	265	70	194	237	1.0	250	50	5.4	170	16	133	M6
N	310	95	220	270	1.2	290	65	6.5	187	22	125	M6
O	320	95	230	280	1.5	300	65	6.5	192	25	127	M8
P	330	100	240	290	1.5	310	70	6.5	198	30	127	M10
Q	180	40	112	153	0.8	170	20	4.5	94	11	68	M5
R	200	45	120	170	0.8	185	25	5.4	102	11	76	M5
S	205	45	132	173	0.8	190	25	5.4	113	13	83	M5
T	215	50	147	185	1.0	200	30	5.4	128	13	95	M6
U	220	65	180	186	1.0	205	45	5.4	156	16	120	M6

\* All dimensions in mm. For dimensions without stated tolerances: ISO 2768-m/EN 22768-m

\*\* Earth screw torque: M5 2.0-2.2 Nm; M6 3.5-4.0 Nm; M8 8.0-9.0 Nm; M10 15-17 Nm

## Filter input/output connector cross sections

	-44	-33	-53	-34	-35	-40
<b>Solid wire</b>	0.5-10 mm <sup>2</sup>	0.5-16 mm <sup>2</sup>	0.5-16 mm <sup>2</sup>	6-35 mm <sup>2</sup>	10-50 mm <sup>2</sup>	25-95 mm <sup>2</sup>
<b>Flex wire</b>	0.5-6 mm <sup>2</sup>	0.5-10 mm <sup>2</sup>	0.5-16 mm <sup>2</sup>	6-25 mm <sup>2</sup>	10-16 mm <sup>2</sup>	25-95 mm <sup>2</sup>
<b>Flex wire AWG</b>	AWG 20-8	AWG 22-6	AWG 20-4	AWG 10-2	AWG 6-1/0	AWG 0-4/0
<b>Recommended torque</b>	1.0-1.2 Nm	1.5-1.8 Nm	2.0-2.3 Nm	4.0-4.5 Nm	7.0-8.0 Nm	17-20 Nm

Please visit [www.schaffner.com](http://www.schaffner.com) to find more details on filter connectors.



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