FEATURES

- -55°C to +125°C operation
- Up to 60 dB attenuation at 500 kHz.
- Compliant to MIL-STD-461C, CE03
- · Compatible with MIL-STD-704E DC power bus

EMI INPUT FILTERS 28 & 270 VOLT INPUT

FMD/FME EMI FILTER 0.7 TO 15 AMP



MODELS					
INPUT VOLTAGE					
AND CURRENT					
Input (V)	Current (A)				
28	7.0				
28	15.0				
270	0.7				
270	1.5				

Size (max.): Case U2, FME all models; Case U1, FMD28-461SL and FMD270-461SL

3 005 x 1 505 x 0 400 inches (76 33 x 38 23 x 11 16 mm)

[FME models, shown in Case U2 (flanged, short leads). Also available: Flanged - leads bent down (case V); Tabbed - leads bent up (case W), short leads (case Y), and leads bent down (case Z). See Section B8, cases U2, V, W,

Y, and Z for dimensions and options.]

Case J4. FMD28-461

2.720 x 1.350 x 0.505 inches (69.09 x 34.29 x 12.83 mm) See Section B8, cases J4, U1, U2, V, W, Y, and Z for dimensions. 77 grams typical cases U1, U2, V, W, Y, and Z; 55 grams typical case J4

Screening: Standard, ES, or 883 (Class H).

See Section C2 for screening options, see Section A5 for ordering information.

DESCRIPTION

The FMD Series™ and FME Series™ EMI filters are specifically designed to reduce the reflected input ripple current of Interpoint's high frequency DC/DC converters. FMD/FME filters minimize electromagnetic interference (EMI) for the MHE, MHL, MLP, MRH, MTO, MHF, MHF+, MHV, MHD, MTR, MFL, MHP, and MFLHP Series. These filters are intended for use in 28 or 270 volt applications which must meet MIL-STD-461C, CE03 levels of conducted emissions. One filter can be used with multiple converters up to the rated output current of the filter.

Weight:

INPUT RIPPLE AND EMI

Switching DC/DC converters naturally generate two noise components on the power input line: differential noise and common mode noise. Input ripple current refers to both of these components. Differential noise occurs between the positive input and input common. Most Interpoint converters have an input filter that reduces differential noise which is sufficient for many applications. Common mode noise occurs across stray capacitances between the converter's power train components and the baseplate (bottom of the package) of the converter.

Where low noise currents are required to meet CE03 of MIL-STD-461, a power line filter is needed. The FMD/FME Series of EMI power line filters reduces the common mode and differential noise generated by the converters. FMD/FME-461 filters reduce input ripple current by as much as 60 dB at 500 kHz and 55 dB at 1 MHz when used in conjunction with Interpoint's DC/DC converters. See Figures 8 and 9.

Place the filter as close as possible to the converter for optimum performance. The baseplates of the filter and the converter should be connected with the shortest and widest possible conductors. For the best connection, mount the filter's and converter's baseplates on or above a small ground plane. See Figure 5.

TRANSIENTS

The transients listed below will not damage the filter but will be passed on to the converter:

- All filters: ±600 volts (50 ohm source
- impedance) for up to 10 μs. 28 volt filter: ±100 volts (0.5 ohm source impedance) for up to 100 ms.
- 270 volt filter: ±500 volts (independent of source impedance) for up to 100 ms.

OPERATION OVER TEMPERATURE

All FMD/FME-461 Series filters are rated for full power operation from -55°C to +125°C case temperature. Current is derated linearly to zero at +135°C case temperature.

INSERTION LOSS

The maximum dc insertion loss at full load and nominal input voltage represents a power loss of less than 4%.

PACKAGING

FMD/FME-461 filters are sealed in metal hermetic side-leaded packages. See Section B8, cases U1, U2, V, W, Y, and Z. Additionally the FMD28-461 filter is available in a metal hermetic down-leaded package (see Section B8, case J4).

LAYOUT REQUIREMENTS

The case of the filter must be connected to the case of the converter through a low impedance connection to minimize EMI.



FMD/FME EMI FILTER EMI INPUT FILTERS 0.7 TO 15 AMP

ABSOLUTE MAXIMUM RATINGS

- Input Voltage

 0 to 40 VDC continuous for 28 V models

 0 to 400 VDC continuous for 270 V models

Lead Soldering Temperature (10 sec per lead)

• 300°C

Storage Temperature Range (Case)
• -65°C to +150°C

Isolation

• 100 megohm minimum at 500 V, any pin to case (except FMD downleaded case case pin)

RECOMMENDED OPERATING CONDITIONS

- Input Voltage Range

 0 to 40 VDC continuous for 28 V models

 0 TO 400 VDC continuous for 270 V models

Case Operating Temperature (Tc) - -55°C to +125°C full power

- -55°C to +135°C absolute

Derating Input/Output Current
• Linearly from 100% at 125°C to 0% at 135° C

Electrical Characteristics: 25°C Tc, nominal Vin, unless otherwise specified.

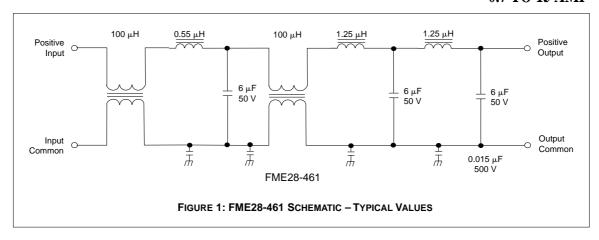
			FMD28-4	61	F	MD270-4	61	F	ME28-46	i1	F	ME270-46	61	
PARAMETER	CONDITION	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	MIN	TYP	MAX	UNITS
INPUT VOLTAGE	CONTINUOUS	0	28	40	0	270	400	0	28	40	0	270	400	VDC
	TRANSIENT 100 ms ¹	-100	_	100	-500	_	500	-100	_	100	-500	_	500	V
NOISE	500 kHz	50	60	_	50	60	_	30	40	_	40	50	_	dB
REJECTION	1 MHz	45	55	_	45	55	_	40	50	_	45	55	_	uВ
DC RESISTANCE	MAX. CURRENT													
(R _{DC})	Tc=25°C	_	_	0.12	–	_	5.0	_	_	0.07	–	_	2.0	Ω
	Tc=125°C	_	_	0.15	_	_	6.3	_	_	0.07	_	_	3.2	
CAPACITANCE	ANY PIN TO CASE	_	20,000	_	_	30,000	_	_	60,000	_	_	60,000	_	pF
OUTPUT VOLTAGE	STEADY STATE	$V_{OUT} = V_{IN} \cdot I_{IN}(R_{DC})$							VDC					
OUTPUT CURRENT	STEADY STATE	_	_	7	_	_	0.7	_	_	15	_	_	1.5	A
POWER	MAX. CURRENT													
DISSIPATION	Tc=25°C	_	_	6.0	-	_	2.5	_	_	15.75	-	_	4.5	W
	Tc=125°C	_	_	7.4	_	_	3.1	_	_	15.75	_	_	7.2	VV

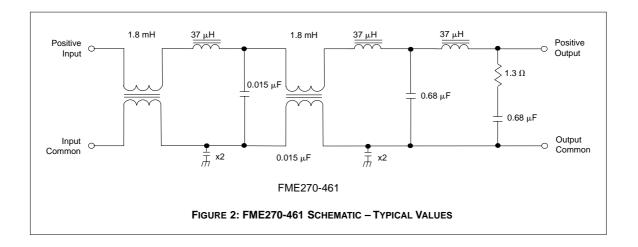
Note

1. 28 V models = 0.5 Ω source impedance, 270 V models = independent of source impedance.

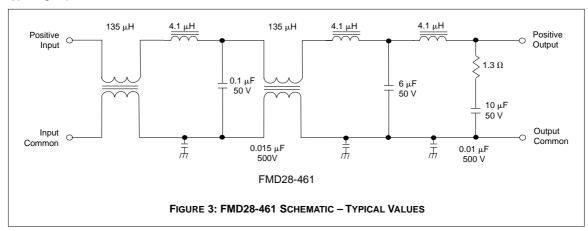


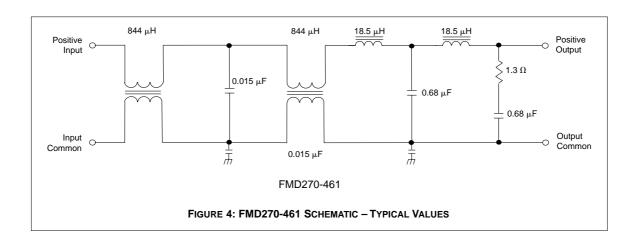
EMI INPUT FILTERS FMD/FME EMI FILTER 0.7 TO 15 AMP

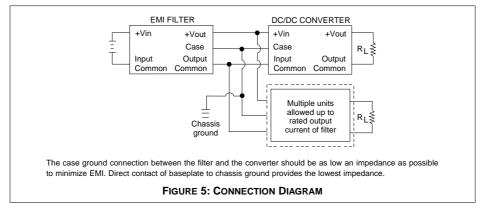




FMD/FME EMI FILTER EMI INPUT FILTERS 0.7 TO 15 AMP









EMI INPUT FILTERS

FMD/FME EMI FILTER 0.7 TO 15 AMP

FMD28-461SL, FMD270-461SL, FME28-461, and FME270-461

	Pin ¹	Designation
1	, 2, 3	Positive Input
4	, 5, 6	Input Common
7	, 8, 9	Output Common
1	0, 11, 12	Positive Output
	_	Case Ground ²

- 1. All pins must be connected.
- 2. The baseplate is the only case ground connection and should directly contact chassis ground.

PIN OUT SIDE-LEADED MODELS

3

Angled corner and cover marking indicate pin one for cases U1, U2, and V. Cover marking indicates pin one for cases W, Y and Z.

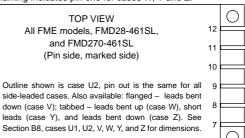


FIGURE 6: PIN OUT SIDE-LEADED MODELS

FMD28-461

Pin	Designation			
1	Positive Input			
2	Positive Output			
3	Output Common			
4	Case Ground ¹			
5	Input Common			

Note

1. Although down-leaded packages can be connected to chassis ground with the case ground lead, direct contact of the base plate to chassis improves EMI performance.

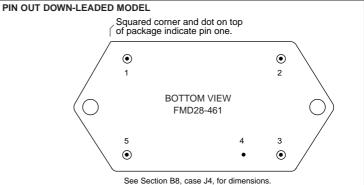


FIGURE 7: PIN OUT FMD28-461

DSCC NUMBERS							
	DSCC DRAWING (5915)	FME SERIES SIMILAR PART					
	95004-01HXC	FME28-461/883					
	95004-01HTC	FME28-461W/883					
	95004-01HUC	FME28-461V/883					
	95004-01HYC	FME28-461Y/883					
	95004-01HZC	FME28-461Z/883					
	95009-01HXC	FME270-461/883					
	IN PROCESS	FME270-461W/883					
	IN PROCESS	FME270-461V/883					
	IN PROCESS	FME270-461Y/883					
	IN PROCESS	FME270-461Z/883					

For exact specifications for a DSCC product, refer to the DSCC drawing. Contact your Interpoint representative for status on the FME DSCC releases. See Section A3, "SMD/DSCC Lists", for more information.

MODEL NUMBERING KEY FME 28 - 461 V / 883 Base Mode Input Voltage MIL-STD-461 Reference Case/Lead Option* Screening ______(Standard screening has no designator

*Case/Lead Option: See section B8, cases J4, U1, U2, V, W, Y, and Z for drawings and dimensions, see Section A5 for ordering information.

in this position.)

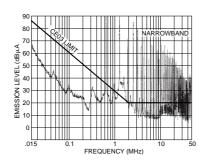
FME models: Case U2 has no designator in the case/lead option position. To designate a case option add the case letter to the model number -FME28-461V.

FMD models: Case J4 (down-leaded) has no designator in the case/leadoption position. To designate case U1 (side-leaded) for the FMD place "SL" in the case/lead option position – FMD28-461**SL**. The 270 volt FMD is only available in the side-leaded case - FMD270-461SL.



FMD/FME EMI FILTER **EMI INPUT FILTERS** 0.7 TO 15 AMP

Typical Performance Curves: 25°C Tc , nominal Vin, unless otherwise specified.



Three paralleled and synchronized MFL2815D converters without filtering.

FIGURE 8

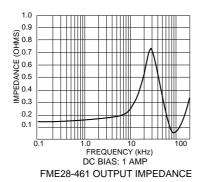
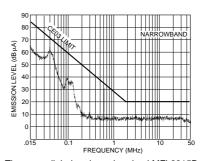


FIGURE 10



Three paralleled and synchronized MFL2815D converters with an FME28-461.

FIGURE 9

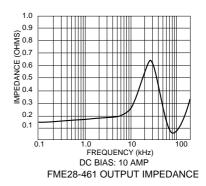
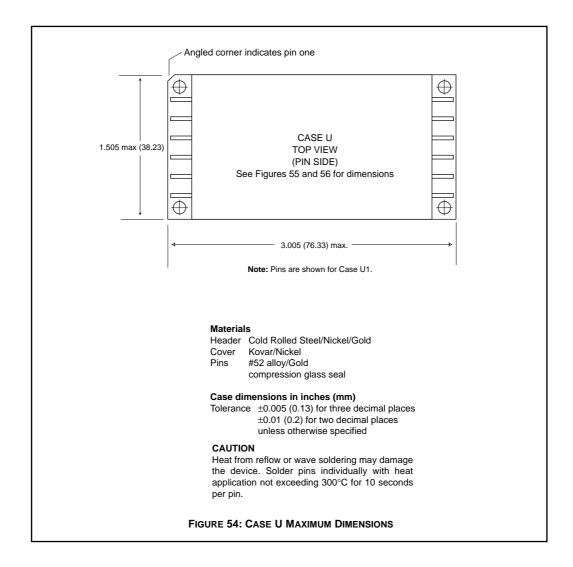


FIGURE 11



CASE U CASES

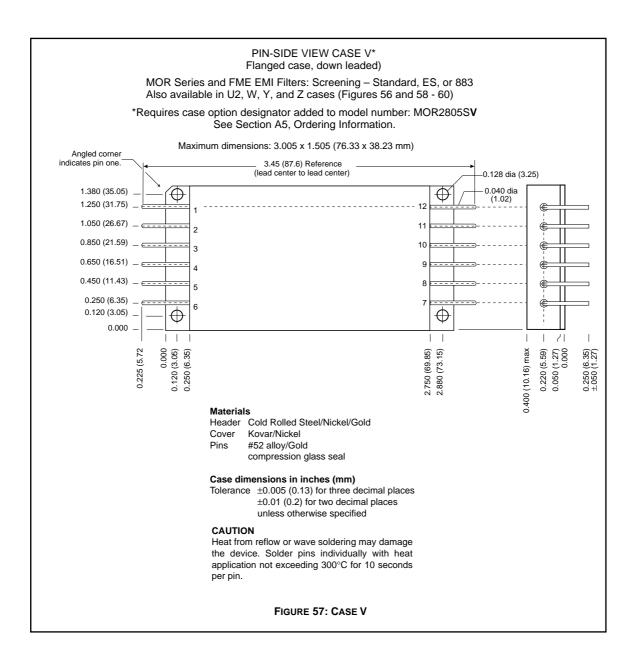




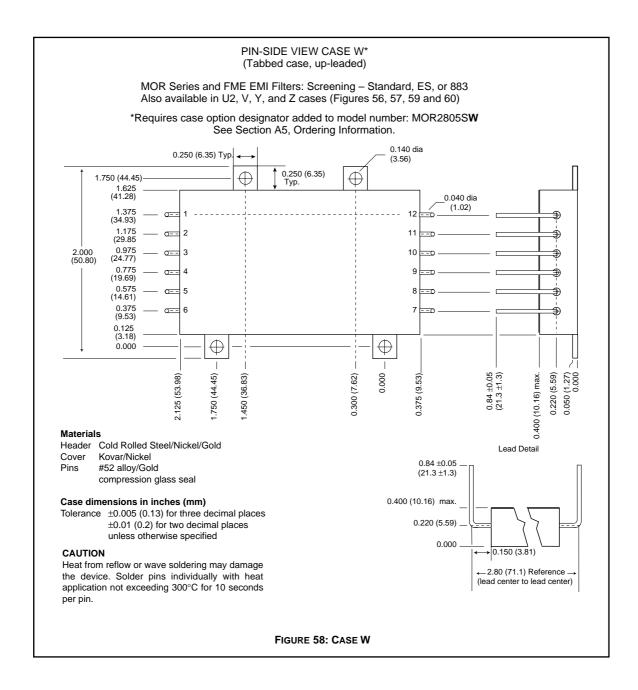
CASE U CASES

PIN-SIDE VIEW CASE U2* (Flanged case, short leads) MOR Series and FME EMI Filters: Screening – Standard, ES, or 883 Also available in V, W, Y, and Z cases (Figures 57 - 60) Seam Seal Pin Length 0.30 ±0.05 (7.6 ±1.3) Angled corner indicates pin one. 0.128 dia -(3.25). _0.040 dia (1.02) \bigoplus \bigoplus 1.380 (35.05) -1.250 (31.75) -12 **(** 1.050 (26.67) — \oplus 11 0.850 (21.59) -**(** 10 0.650 (16.51) -**(** \oplus 0.450 (11.43) -0.250 (6.35) -**(** \oplus 0.120 (3.05) 0.000 I - I - I0.000 0.120 (3.05) 0.250 (6.35) 0.220 (5.59 - 0.050 (1.27) - 0.000 -2.750 (69.85) 2.880 (73.15) 0.400 (10.16) max. *No designator is required in the case option position, see Section A5, Ordering Information. FIGURE 56: CASE U2

CASE V

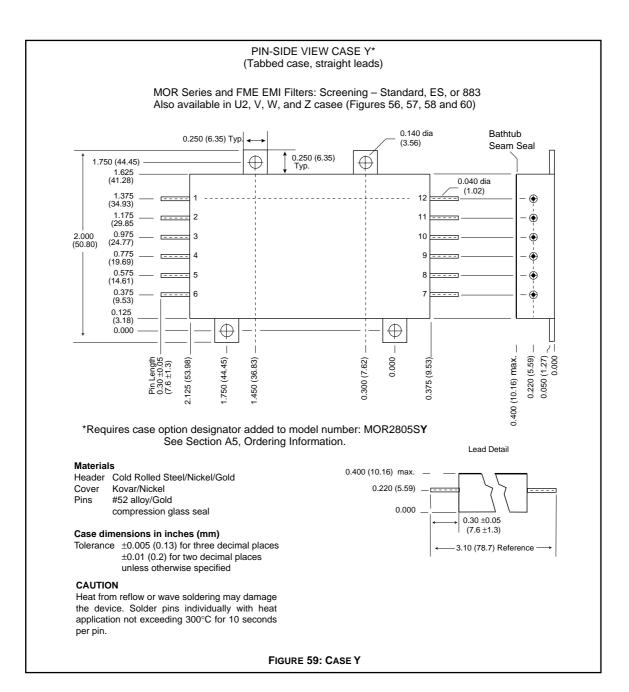


CASE W CASES



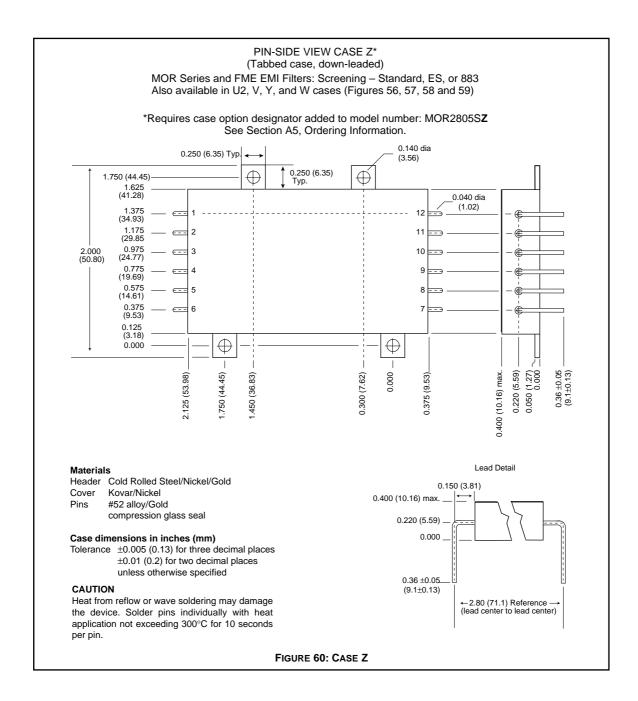


CASE Y





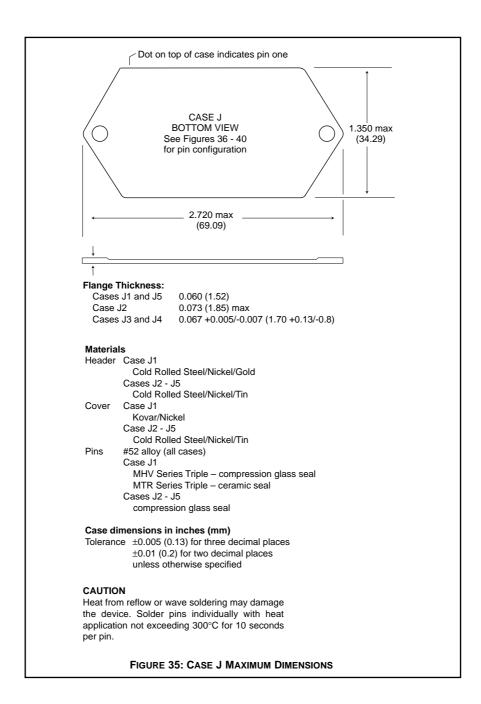
CASE Z CASES





TOP VIEW CASE U1 MFL Series and MHP Series: Screening – Standard, ES or 883 MFLHP Series, FMD270 EMI Filter, and FMD28-461SL EMI Filters: Screening – Standard or ES SMFL, SMFLHP, SMHP, and SSP SERIES; SFCS, and SFME EMI Filters: Screening – Standard, Class H or K HUM70 Module and LCM Module: Screening – Standard or ES Seam Seal Angled corner indicates pin one. 0.23 (5.8) Lead Length 0.128 dia -(3.25). 1.505 (38.23) max. _0.040 dia (1.02) \bigoplus \mathbb{H} 1.380 (35.05) **(** 1.250 (31.75) \oplus 1.050 (26.67) **(** 0.850 (21.59) 0.650 (16.51) -**(** 0.450 (11.43) - 0.250 (6.35) -**(** $\overline{\oplus}$ 0.120 (3.05) \oplus 0.000 -2.750 (69.85) – 2.880 (73.15) – 3.005 (76.33) max. – 0.220 (5.59 -0.050 (1.27) -0.000 -0.000 0.120 (3.05) 0.250 (6.35) 0.400 (10.16) max. FIGURE 55: CASE U1

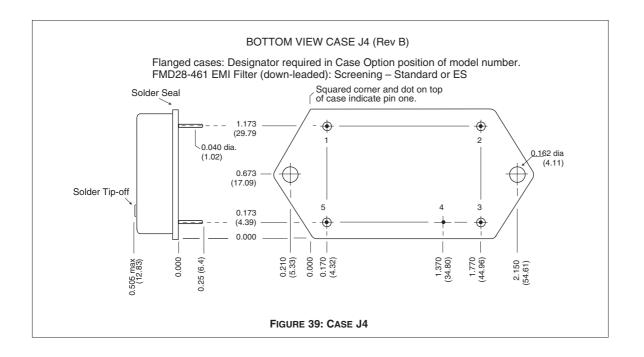
CASE J CASES



Note: Although every effort has been made to render the case drawings at actual size, variations in the printing process may cause some distortion. Please refer to the numerical dimensions for accuracy.



CASE J





QA SCREENING 125°C PRODUCTS

125°C PRODUCTS

TEST (125°C Products)	STANDARD	/ES	/883 (Class H)*
PRE-CAP INSPECTION			
Method 2017, 2032	yes	yes	yes
TEMPERATURE CYCLE (10 times)			
Method 1010, Cond. C, -65°C to 150°C	no	no	yes
Method 1010, Cond. B, -55°C to 125°C	no	yes	no
CONSTANT ACCELERATION			
Method 2001, 3000 g	no	no	ves
Method 2001, 500 g	no	yes	no
BURN-IN			
Method 1015, 160 hours at 125°C	no	no	yes
96 hours at 125°C case (typical)	no	yes	no
FINAL ELECTRICAL TEST MIL-PRF-38534, Group A			
Subgroups 1 through 6: -55°C, +25°C, +125°C	no	no	yes
Subgroups 1 and 4: +25°C case	yes	yes	no
HERMETICITY TESTING			
Fine Leak, Method 1014, Cond. A	no	yes	yes
Gross Leak, Method 1014, Cond. C	no	yes	yes
Gross Leak, Dip (1 x 10 ⁻³)	yes	no	no
FINAL VISUAL INSPECTION			
Method 2009	yes	yes	yes

Test methods are referenced to MIL-STD-883 as determined by MIL-PRF-38534.

Applies to the following products

• •	• .		
MOR Series	MHD Series	MGH Series	FMGA EMI Filter
MFLHP Series	MHV Series	MCH Series	FMSA EMI Filter
MFL Series	MHF+ Series	FM-704A EMI Filter	HUM Modules**
MHP Series	MHF Series**	FMD**/FME EMI Filter	LCM Modules**
MTR Series	MGA Series	FMC EMI Filter	LIM Modules
MOO Sorioo**	MSA Sorios	EMU EMI Eiltor	

^{**}MFLHP Series, MQO Series, MHF Series, FMD EMI Filters, Hum Modules, and LCM Modules do not offer '883" screening.



^{*883} products are built with element evaluated components and are 100% tested and guaranteed over the full military temperature range of –55°C to +125°C.