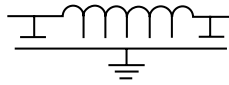


38999 SJT I II III  
26482 Matrix 2  
83723 III Pyle  
5015 Crimp Rear Release Matrix  
26500 Pyle  
Printed Circuit Board  
EMI Filter Transient  
Fiber Optics  
High Speed Contacts  
Options Others

Amphenol® EMI Connectors are produced with several types of filters. They are all low band pass filters with the following configurations:

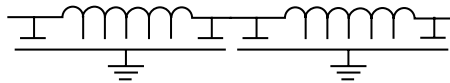
**Pi -**

Typical of the VHF, UHF and MF filter



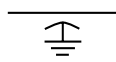
**Cascaded Pi -**

Typical of the HF filter. It consists of two VHF Pi filters on a common pin and is available in tubular designs only.



**Capacitor \*-**

Consists of a feed-through capacitor without any ferrite. It can be 50pf to 1µf and carry the MF, HF and VHF designation depending on its typical 50dB performance.



**L-C \*-**

Typical of HF, VHF and UHF filter. Low source / high load impedance.



**C-L \*-**

Typical of HF, VHF and UHF filter. High load impedance / low source.



**T \*-**

Typical of HF, VHF and UHF filter. Low source / low load impedance.



\* Consult factory for attenuation performance values.

| Parameters   |                  | Medium Frequency Filter↕      | High Frequency Filter↕ | Very High Frequency Filter |                | Ultra High Frequency Filter |                |
|--|------------------|-------------------------------|------------------------|----------------------------|----------------|-----------------------------|----------------|
|  |                  | MF-1 (Pi)                     | HF-1 (Cascaded Pi)     | VHF-1 (Pi)                 | VHF-2† (Pi)    | UHF-1† (Pi)                 | UHF-2† (Pi)    |
| Minimum Attenuation (Test Points)*   | 150kHz           | 20dB                          | -                      | -                          | -              | -                           | -              |
|  | 15MHz            | -                             | 50dB                   | -                          | -              | -                           | -              |
|  | 50MHz            | -                             | 80dB                   | -                          | -              | -                           | -              |
|  | 100MHz           | 80dB                          | -                      | 62dB                       | 46dB           | 18dB                        | 28dB           |
| Maximum Working Voltage (User must specify DC or AC)†††  | DC†††            | 50VDC                         | 200VDC                 | 200VDC                     | 200VDC         | 200VDC                      | 200VDC         |
| Dielectric Withstanding Voltage Capability (for 5 sec. with 10 milliamperes max. charging current)◆◆ |                  | 100 volts DC                  | 500 volts DC           | 500 volts DC               | 500 volts DC   | 500 volts DC                | 500 volts DC   |
| Maximum Feed-thru Current (DC and/or Audio Frequency R.M.S.)   | Size 16 contacts | 13.0 amps                     | 13.0 amps              | 13.0 amps                  | 13.0 amps      | 13.0 amps                   | 13.0 amps      |
|  | Size 20 contacts | 7.5 amps                      | 7.5 amps               | 7.5 amps                   | 7.5 amps       | 7.5 amps                    | 7.5 amps       |
|  | Size 22 contacts | not available                 | not available          | 5.0 amps                   | 5.0 amps       | 5.0 amps                    | 5.0 amps       |
| Maximum RF Current   |                  | 3.0 amps                      | 3.0 amps               | 3.0 amps                   | 3.0 amps       | 3.0 amps                    | 3.0 amps       |
| Minimum Insulation Resistance  |                  | 250 megohms                   | 10 gigaohms            | 10 gigaohms                | 10 gigaohms    | 10 gigaohms                 | 10 gigaohms    |
| Typical Capacitance**  |                  | 1.0 microfarad                | 16 nanofarads          | 7 nanofarads               | 2.5 nanofarads | 375 picofarads              | 710 picofarads |
| Air Leakage††  |                  | 4.6 x 10 <sup>-3</sup> cc/sec |                        |                            |                |                             |                |
| Operating Temperature Range  |                  | -55°C to +125°C               |                        |                            |                |                             |                |

\* When tested at 25°C per MIL-STD-220.

\*\* When measured at a frequency of 1 ±.1kHz and a voltage not exceeding 1.0 V.A.C.R.M.S. at +25°C.

† Consult Amphenol, Sidney, NY or your Amphenol representative for part number.

†† Lower leakage rates are available upon request.

††† Summation of the DC and low level AC super-imposed peak voltage.

†††† Consult Amphenol, Sidney, NY whenever AC voltage is present.

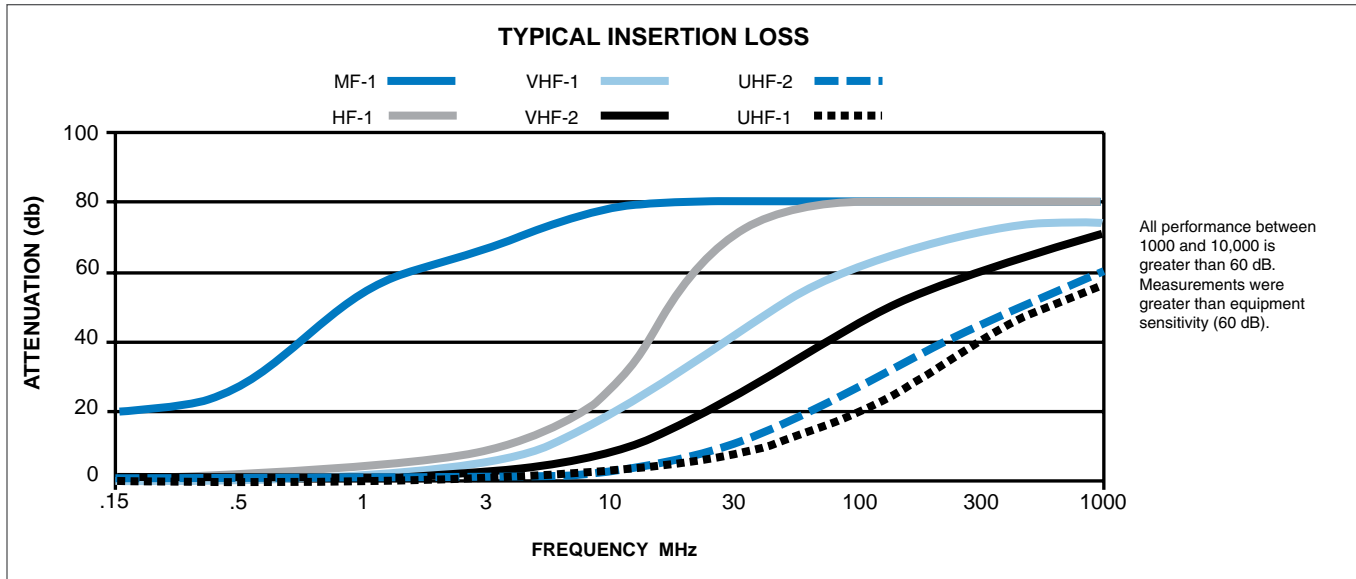
◆ Consult Amphenol, Sidney, NY or your Amphenol representative for availability.

◆◆ Higher DWV ratings are available upon request. Consult Amphenol, Sidney, NY.

# Effect of Temperature on EMI Filter Attenuation



Note: Below are typical capacitance values. Other capacitance values are available from 5pf to 400 NF in one capacitor element. Please consult factory for part numbers.



**TYPICAL INSERTION LOSS (dB)  
PER MIL-STD-220, 5 ADC, 25°C**

| Capacitance              | 1MHz | 3MHz | 10MHz | 30MHz | 100MHz | 300MHz | 1000MHz |
|--------------------------|------|------|-------|-------|--------|--------|---------|
| 375 pf UHF <sub>1</sub>  | 0    | 0    | 1     | 8     | 16     | -      | -       |
| 750 pf UHF <sub>2</sub>  | 0    | 0    | 3     | 10    | 19     | -      | -       |
| 2500 pf VHF <sub>2</sub> | 0    | 2    | 8     | 20    | 28     | -      | -       |
| 7000 pf VHF <sub>1</sub> | 5    | 9    | 17    | 23    | 40     | -      | -       |
| 16000 pf HF <sub>1</sub> | 6    | 14   | 20    | 24    | 80     | -      | -       |

Most filter attenuation curves and capacitance values are expressed at 25°C. However, temperature can affect the capacitance of a titanate filter element, affecting the insertion loss that the element will cause.

In order to assist the user in anticipating the effect of various temperatures, the following charts applicable to Amphenol® filter connectors utilizing MF-1, HF-1, VHF-1, VHF-2, UHF-1 and UHF-2 filters are provided. Please note that all insertion loss (attenuation) values given were measured with no load applied. The band designations refer to MIL-STD-2120.

**MF-1\***

Typical Capacitance = 1,000,000 pf Min. 800,000 pf Max. 1,600,000 pf Type Pi

| Temp.  | F <sub>co</sub> | 1MHz | 3MHz | 10MHz | 30MHz | 100MHz | 300MHz | 1000MHz |
|--------|-----------------|------|------|-------|-------|--------|--------|---------|
| -55°C  | -               | 18   | -    | 64    | 80    | 80     | 80     | 80      |
| Room   | 7.94K           | 55   | -    | 80    | 80    | 80     | 80     | 80      |
| +125°C | -               | 22   | -    | 70    | 80    | 80     | 80     | 80      |

**VHF-2**

Typical Capacitance = 2,500 pf Min. 1,900 pf Max. 4,000 pf Band E, Type Pi

| Temp.  | F <sub>co</sub> | 1MHz | 3MHz | 10MHz | 30MHz | 100MHz | 300MHz | 1000MHz |
|--------|-----------------|------|------|-------|-------|--------|--------|---------|
| -55°C  | -               | 0    | 2    | 7     | 17    | 40     | 58     | 71      |
| Room   | 3.3M            | 0    | 2    | 8     | 24    | 46     | 61     | 71      |
| +125°C | -               | 0    | 3    | 10    | 26    | 46     | 63     | 69      |

**HF-1\***

Typical Capacitance = 16,000 pf Min. 9,800 pf Max. 24,000 pf Type Cascaded Pi

| Temp.  | F <sub>co</sub> | 1MHz | 3MHz | 15MHz | 50MHz | 100MHz | 300MHz | 1000MHz |
|--------|-----------------|------|------|-------|-------|--------|--------|---------|
| -55°C  | -               | 2    | 6    | 24    | 62    | 80     | 80     | 80      |
| Room   | 648K            | 3    | 9    | 50    | 80    | 80     | 80     | 80      |
| +125°C | -               | 0    | 6    | 30    | 62    | 80     | 80     | 80      |

**UHF-2**

Typical Capacitance = 750 pf Min. 500 pf Max. 1,100 pf Band C, Type Pi

| Temp.  | F <sub>co</sub> | 1MHz | 3MHz | 10MHz | 30MHz | 100MHz | 300MHz | 1000MHz |
|--------|-----------------|------|------|-------|-------|--------|--------|---------|
| -55°C  | -               | 0    | 0    | 3     | 9     | 25     | 46     | 61      |
| Room   | 12.7M           | 0    | 0    | 3     | 10    | 28     | 46     | 61      |
| +125°C | -               | 0    | 0    | 3     | 10    | 24     | 42     | 60      |

**VHF-1**

Typical Capacitance = 7,000 pf Min. 4,900 pf Max. 12,000 pf Band G, Type Pi

| Temp.  | F <sub>co</sub> | 1MHz | 3MHz | 10MHz | 30MHz | 100MHz | 300MHz | 1000MHz |
|--------|-----------------|------|------|-------|-------|--------|--------|---------|
| -55°C  | -               | 1    | 2    | 8     | 21    | 44     | 61     | 65      |
| Room   | 1.27M           | 1    | 6    | 18    | 42    | 62     | 72     | 75      |
| +125°C | -               | 0    | 2    | 9     | 24    | 45     | 62     | 64      |

**UHF-1**

Typical Capacitance = 375 pf Min. 290 pf Max. 450 pf Band B, Type Pi

| Temp.  | F <sub>co</sub> | 1MHz | 3MHz | 10MHz | 30MHz | 100MHz | 300MHz | 1000MHz |
|--------|-----------------|------|------|-------|-------|--------|--------|---------|
| -55°C  | -               | 0    | 0    | 1     | 6     | 21     | 43     | 58      |
| Room   | 21.9M           | 0    | 0    | 1     | 8     | 18     | 42     | 56      |
| +125°C | -               | 0    | 0    | 1     | 8     | 17     | 38     | 50      |

Note: F<sub>co</sub> = Cut-off Frequency

\* Consult Amphenol, Sidney, NY for availability.

- III 38999
- II 26482 Matrix 2
- I 83723 III Matrix Pyle
- SJT 5015 Crimp Rear Release Matrix
- 26500 Pyle
- Printed Circuit Board
- EMI Filter Transient
- Fiber Optics
- High Speed Contacts
- Options Others

38999  
SJT I II III

26482  
Matrix 2

83723 III  
Matrix Pyle

5015  
Crimp Rear Release Matrix

26500 Pyle

Printed  
Circuit Board

EMI Filter  
Transient

Fiber Optics

High Speed  
Contacts

Options  
Others

The following formula and example are offered in order to determine the expected filter performance in an impedance system other than 50 ohms.

With the attenuation expressed in 50 ohms and the transfer impedance curve shown in Figure 1 below, a designer can relate the expressed attenuation to the input and output impedance of his circuit.

Example:

- (1) Noise is 40dB above specification level at 100 MHz
- (2) Input and output impedance are 10 and 100 ohms respectively
- (3) Amphenol® VHF 7000 pf filter has a 65 dB minimum attenuation at 100 MHz and +25°C

Formula (Taken from Figure 1):

1.4 x 10 ohm = transfer impedance  
for 65 dB in a 50 ohm system

$$\text{Atten (dB)} = 20 \log_{10} \left[ 1 + \frac{Z_s Z_L}{Z_{12}(Z_s + Z_L)} \right]$$

$Z_s$  = source impedance

$Z_L$  = load impedance

$Z_{12}$  = transfer impedance

Atten = filter performance in a system other than 50 ohms

$$\text{Atten (dB)} = 20 \log_{10} \left[ 1 + \frac{10(100)}{1.4 \times 10^{-2} (10 + 100)} \right]$$

Attenuation = 56.3dB

In this case, the 7000 pf VHF filter will give 56.3 dB which is 16.3dB below the desired reduction in noise (40dB) as stated in the above problem.

**Attenuation vs Transfer Impedance in 50 Ohm System**

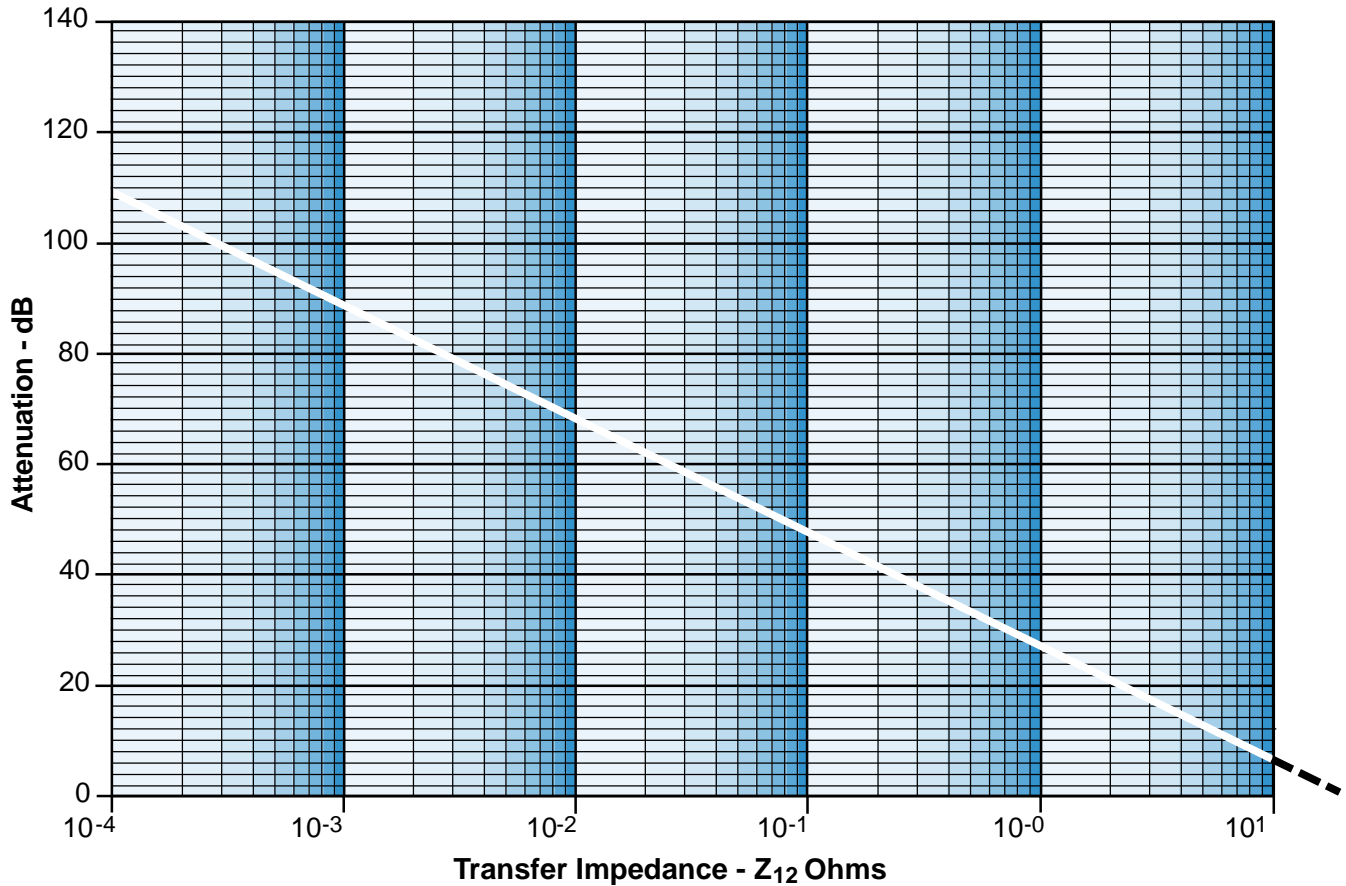


Figure 1

### ACCEPTANCE TESTING

All filter connectors undergo extensive acceptance testing to assure product quality. An outline of standard acceptance testing performed is as follows:

#### Mechanical Inspection

- Dimensional inspection of shells, keys, keyways and mounting surfaces by either in-process inspection of components or inspection of final assemblies.
- Visual inspection of contacts, inserts and seals, gaskets and surface finish of shells and hardware.

#### Electrical Tests

- Insulation resistance of filter contacts is checked 100% **at the working voltage and to the test limit** listed for each filter in the filter selection data table.
- Dielectric withstanding voltage is tested on 100% of filter contacts at the voltage listed in the filter selection data table.
- Capacitance is tested 100% at 1KHz.

### Special Tests/Processes

In addition to the standard acceptance testing and processes, the following additional production testing and processing can be provided upon request:

- Attenuation testing (through 100 MHz)
- Leakage inspection
- Thermal cycling/shock
- Burn-in
- De-gassing

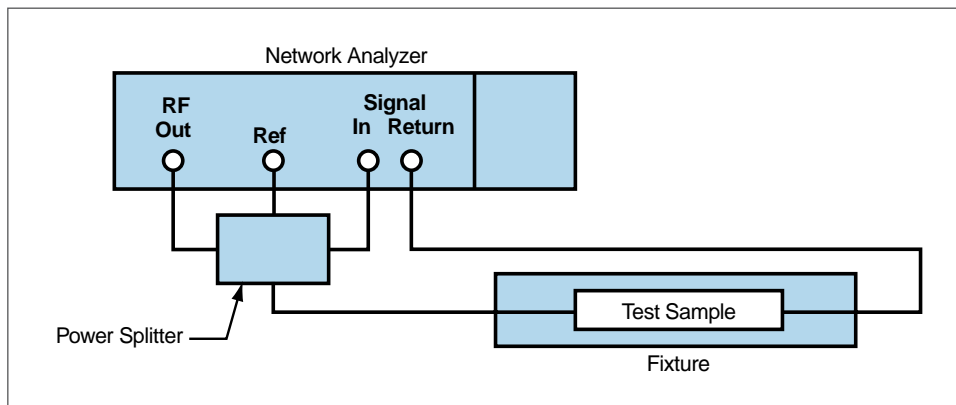
Consult Amphenol Aerospace for further information.

### Qualifications

Amphenol® filter connectors have been qualified and are on periodic requalification to specification BSF-1 (available from your Amphenol representative). This is patterned after MIL-DTL-38999, modified to include mechanical and environmental testing and electrical parameters important to filter connector performance.

These acceptance tests, along with exhaustive in-process inspection and testing, give Amphenol® filter connectors their reputation for reliability.

### ATTENUATION TEST CIRCUIT



There are multiple test stations located on the Amphenol production floor that support all in-process, final electric and qualification testing as necessary.

38999 III II I SJT

26482 Matrix 2

83723 III Matrix Pyle

5015 Crimp Rear Release Matrix

26500 Pyle

Printed Circuit Board

EMI Filter Transient

Fiber Optics

High Speed Contacts

Options Others