YOUR CHECKLIST TO SELECTING AN EMI FILTER DESIGN

An EMI filter protects electronic devices from incoming electrical noise through the power line and controls the levels of outgoing noise to other devices. Your product requires a filter that will pass EMC compliance testing, and there are many considerations to keep in mind when choosing one. This checklist was designed to ensure you don't overlook any EMI filter design requirements or other necessary information.

☑ **IDENTIFY TARGET APPLICATION**
Military, Industrial, Commercial, Medical

☑ **KNOW THE MAXIMUM INPUT POWER VOLTAGE (AC/DC)**
The rated voltage of the filter defines the maximum continuous operating voltage, i.e. the maximum voltage at which the filter should be used continuously. The continuous voltage should not exceed the rated voltage for an extended period to avoid damage to the filter capacitors (over-voltages for short periods of time are allowable in accordance with IEC 60939 and UL 1283 safety specifications).

☑ **CALCULATE THE MAXIMUM INPUT CURRENT**
This current value drawn through a filter should be less than or equal to the maximum rated input current to be drawn from the device being filtered (over-currents for short periods of time are allowable in accordance with IEC 60939 and UL 1283 safety specifications).

☑ **IF AC (ALTERNATING CURRENT) FILTER, POWER LINE FREQUENCY IS:**
- 50 Hz (for Europe)
- 60 Hz (for US)
- 400 Hz (for Military and Commercial Aircrafts)

☑ **KEEP IN MIND THE LEAKAGE CURRENT SHOULD NOT EXCEED THE MAXIMUM ALOWABLE LIMITS OF ANY COMMERCIAL OR MILITARY STANDARDS**
During normal operation of electrical equipment, some current flows to earth ground. Such currents, called leakage currents, pose a potential safety risk to the user and are therefore limited by most current product safety and military standards.

Examples: EN 60950-1 for information technology equipment, IEC60601 for medical equipment or UL 1283 and MIL-STD-461 for passive EMI filters.

☑ **DEFINE WHETHER SINGLE-PHASE OR THREE-PHASE**
If three-phase: Delta configuration or Wye configuration?

☑ **MEASURE THE AVAILABLE SPACE OR VOLUME ALLOWED FOR THE FILTER**
What are the dimensions?

DECIDE THE FILTER MOUNTING METHOD TO BE USED

Examples: power entry, chassis/panel mount, screw, insert, etc.

CONSIDER TERMINATIONS

Examples: screws, fast-on, pigtail leads/flying wires, mil/field connector, etc.

CHECK ENVIRONMENTAL REQUIREMENTS:

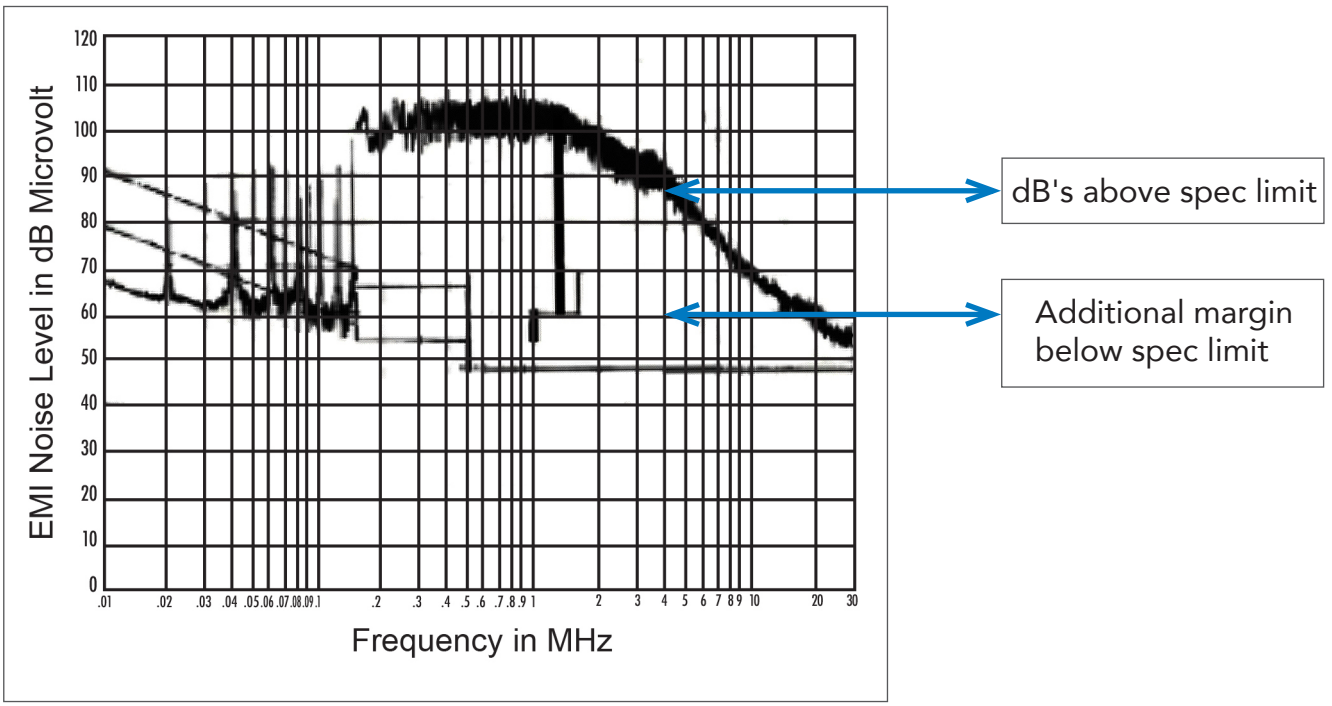
Examples: ambient temperature range, humidity, shock/vibration, altitude, etc.

DETERMINE CONDUCTED ATTENUATION/INSERTION LOSS REQUIRED (DB'S VS. FREQUENCY)

Filter performance is generally specified by attenuation or insertion loss vs. frequency. Insertion loss is defined as 20xlog of the ratio input voltage without the filter installed (V1), to the output voltage with the filter installed (V2). This ratio is described in dB according to the following equation:

$$\text{Insertion loss (dB)} = 20 \log (V1/V2)$$

The initial EMI noise level of a product is measured or estimated without a filter installed to determine how high the EMI conducted noise is above the desired specification limit, and then add an additional margin of 4-to-6 dB for manufacturing inconsistencies.



Minimum Total Insertion Loss = (dB's above spec limit) + (Additional margin below spec limit)

THEN SELECT OR DESIGN A FILTER THAT MEETS OR EXCEEDS THE CALCULATED MINIMUM TOTAL INSERTION LOSS ABOVE.