



MPE
Quality, Reliability, Performance

Company Bulletin

for EMC, EMP & TEMPEST Protection

Issue 1



MIL-STD HEMP filters that break the mould

MPE has recently shipped a number of what are believed to be the World's first single-line, 1200A-rated High-Altitude Electromagnetic Pulse (HEMP) filters fully compliant with the 10A residual let-through current requirement of MIL-STD-188-125 Parts 1 and 2. These models complement MPE's existing range of MIL-STD HEMP powerline filters with current ratings from 6A to 800A.

Incorporating MPE's proprietary 1200A feedthrough capacitors for high performance to beyond 10GHz, the new 1200A filters are ideal for the HEMP protection of the incoming power cables of critical infrastructure installations. Models are available optimised for the 277/480V AC supply in the USA and 250/440V AC in Europe and other regions.

The feedthrough capacitors contain proprietary self-healing, metallised plastic film capacitor material, which has demonstrated extreme levels of reliability in field service over more than 25 years. They also utilise a solderless capacitor assembly technique to avoid heat damage.

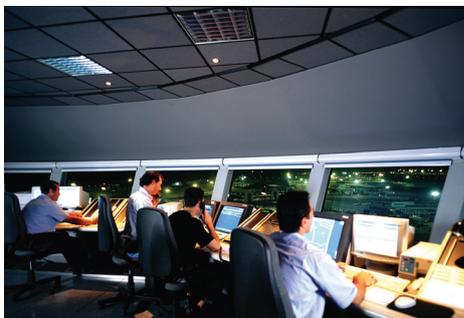
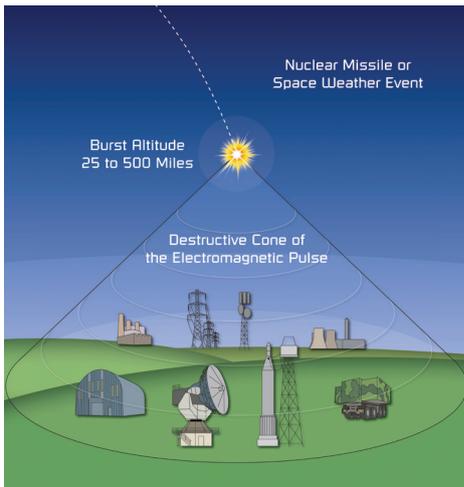
These new MPE powerline filters consist of a single 1200A circuit with no current-sharing elements, thus avoiding the problems inherent in high-current filters that are based on the paralleling of multiple lower current filters. The paralleling of filters commonly leads to overheating and filter failures due to current imbalances.

Where a series of filters are connected in parallel, a slight mismatch in the resistance of filters will cause an imbalance in current. As an example, even a 10% difference in the resistance of filters will result in a 10% current overload in the filter with the lowest resistance.

The situation is actually much worse than this would indicate, as the 10% current overload represents a power overload of 21%, because the power dissipated is based on I^2R . This will cause significant overheating and possible failure in the lowest-resistance filter, unless it has a significant safety margin in terms of temperature rise. If a parallel element fails, then the increased load placed on the remaining interconnected filters can potentially cause a cascade failure of the entire HEMP protection system.

As filter temperature rise is a well-known factor affecting lifetime and reliability, the MPE filters also utilise a design that ensures a low internal temperature rise of capacitor elements, inductors and current-carrying busbars. This design feature contributes significantly to increased reliability.

Furthermore, as the MPE filters are specifically designed to suit the pulse performance requirements of MIL-STD-188-125, there is no unnecessary overdesign for insertion loss performance. This means the MPE filters are less susceptible to any harmonic





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content in the mains supply and, consequently, less prone to overheating introduced by harmonics.

The newly launched filters have been independently tested and certified for the early-time E1 pulse in MIL-STD-188-125 by the US Department of Defense (DoD) contractor Jaxon Engineering & Maintenance of Colorado Springs (www.jaxon-em.com). For both MPE's 250/440V AC and 277/480V AC models, Jaxon measured an E1 pulse's residual current waveforms. They fell well below the limits stated in the MIL-STD for their maximum peak, derivative and root action at seven different pulse current injection (PCI) levels, ranging from 50A to 2500A.

The fact that the MPE HEMP filters exceed the MIL-STD specification by some margin provides both the installer and the end user with an increased safety factor to counter the imperfect conditions commonly found on site and to further ensure reliability.

MPE prides itself on the reliability of its filters, manufacturing all key components, carrying out the critical processes and employing a 100% final inspection of filters prior to shipment – all conducted in-house at MPE. In excess of 5,000 lines of MPE HEMP filter protection, compliant with MIL-STD-188-125, have now been installed around the world, without a single electrical failure having been reported and hence achieving a zero returns rate.

In addition to their proven electrical performance and reliability, the single-line design realised by MPE creates a far more compact and lighter unit for installation. Those size and weight advantages afford significant shipping, installation and space benefits to installer and user alike.

Full product information on MPE's standard performance, single-line, 1200A HEMP filter, including a graph of its insertion loss performance, may be downloaded via this link:
www.mpe.co.uk/products/standard-performance-1200a-single-line-hemp-filter/