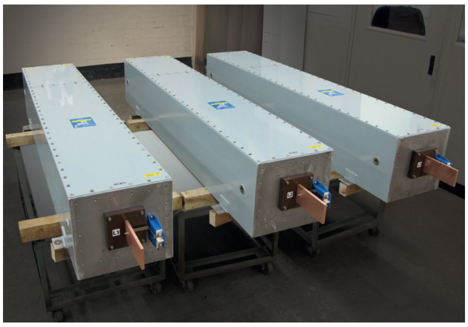
MPE
Quality, Reliability, Performance

Company Bulletin
for EMC, EMP & TEMPEST Protection
Issue 2

Test report proves low heat rise of MPE HEMP filters

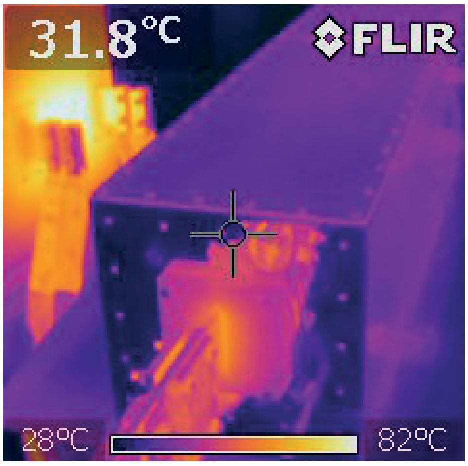


1200A MPE HEMP powerline filters ready for despatch

We reported in Issue 1 of the *MPE Company Bulletin* on MPE's ground-breaking, single-line, 1200A-rated, High-Altitude Electromagnetic Pulse (HEMP) powerline filters which are fully compliant with the 10A residual let-through current requirement of MIL-STD-188-125 Parts 1 and 2.

Now MPE has taken its own independent measurements to prove that the temperature rise of the filter case, conductive busbar, inductor and capacitor under full load and specified overload currents over 24 hours is substantially below the design rule limit of 25°C. The test report is available upon request from MPE.

The maximum permissible heat rise for a filter is generally accepted as 25°C, as detailed in many applicable specifications including the UL-1283 Standard. In fact, in the worst case scenario, the heat rise of the MPE filter was measured at 18.4°C, and that was without subsequent mounting on site to the metal HEMP shield that acts as a large heat dissipating device.



This FLIR thermal image shows how the temperature on the endplate of the HEMP filter case stabilises at 31.8°C at an applied current of 1200A and ambient temperature of 24°C

The filters, based on a single 1200A circuit with no current-sharing elements, are specially designed by MPE to avoid overheating problems which commonly lead to filter failures owing to current imbalances.

Firstly, MPE avoids the paralleling of multiple lower current filters, which often results in a mismatch of paralleled filter elements leading to current overload in the lowest resistance filter. Even a filter imbalance as small as 10% represents a power overload of more than double that figure, because the power dissipated is based on I^2R. Should a parallel element fail, then the increased load placed on the remaining interconnected filters can potentially cause a disastrous cascade failure of the entire HEMP protection system.

Secondly, these MPE filters incorporate 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.

Thirdly, because 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. Therefore MPE filters are less susceptible to any harmonic content in the mains supply and, consequently, less prone to overheating introduced by harmonics.

Accordingly MPE's test report indicates a significant temperature safety margin, thus providing high reliability of the HEMP filters over a long service life. MPE prides itself on the absolute dependability of its filters, manufacturing the key components, carrying out the critical processes and employing a 100% final inspection of filters prior to shipment – all conducted in-house at MPE.

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MPE started designing and testing tailormade HEMP filters to meet the pulse current injection (PCI) requirements of MIL-STD 188-125-1 E1 and E2 pulses ten years ago, back in 2004. Right from the start MPE designed these filters for pulse performance rather than insertion loss and found that this approach gave results far superior to alternative solutions out in the marketplace.

In excess of 5,500 lines of MPE HEMP filter protection compliant with MIL-STD-188-125 have now been installed around the world, without any heat rise issues or electrical failures having been reported and hence achieving a zero returns rate.

Finally, reliability over a long service life avoids costly plant maintenance and system downtime.

The costs of replacement can be substantial – in terms of dismantling an equipment system to access and retrieve faulty filters from their locations and thereby putting critical facilities temporarily out of action, with unknown consequences. In general the health condition of thousands of installed filters becomes highly significant when most cannot be accessed easily to survey or replace – having been installed deep within the fabric of command posts, tactical shelters, satellite ground stations, anechoic chambers, shielded rooms, bunkers and so forth.