

Interference — Designing for the Threat



Available in:

- Americas ■
- Europe ■
- Asia Pacific ■

Electrical Shielding



Applications

In many applications, shielding of cables is important, whether it be to minimize cross-talk within the cable, to prevent interference from external sources, or to eliminate radiation from the cable itself.

The design of cables to provide effective shielding over a broad frequency spectrum is complex, and cables must be tailored to

specific electromagnetic environments. From simple aluminized Mylar® film that provides electrostatic shielding, progressively more complex shielding can be designed incorporating plated copper braids and Mu metal wraps.

Optimization

Performance of conventional braiding can be significantly improved by computer optimization. This tightly controlled

process can give many times the shielding performance of a basic braided shield with minimal weight penalty or increase in optical coverage. Supershielded cables combine Mu metal wraps with optimized braids to provide even further enhanced performance, especially at low frequencies.

Available Shields

Shield type	Construction	Typical Application
Aluminized Mylar®		Electrostatic shielding
Single Braid		Low level EMI Low sensitivity
Single Optimized Braid		Sensitive lines High EMI
Double Optimized Braid		Highly sensitive lines Severe EMI
Supershielded		EMP/Tempest
Double Supershielded		Severest of applications

MYLAR is a trademark of Dupont Teijin Films U.S.

Electrical Shielding (Continued)

Measuring Shielding Efficiency

Surface Transfer Impedance (Zt)

To assess the effectiveness of a shield, Tyco Electronics has adopted the line injection method as described in IEC 1196-1 to measure the surface transfer impedance (Zt) of a cable shield. This relates the open circuit voltage generated on a component wire inside the cable to the current injected on the overall shield. The unit of Zt is Ohms per meter, thus the voltage coupling is length dependent and long cables exhibit more leakage than similar but shorter length ones. To determine the surface transfer impedance across a range of frequencies, a drive signal is generated by the internal tracking generator of a spectrum analyzer, and amplified. The voltage is induced on the center conductor of the sample which is amplified and returned to the signal generator for measurement. The understanding of leakage mechanisms has enabled Tyco Electronics to design Raychem cables with guaranteed minimum Zt values for the desired operating environment.

Supershielding

EMP Hardened Cables

The requirements for nuclear hardened cables present the engineer with a range of problems. The waveform of the EMP is such that the majority of power is dissipated in a frequency band between 1 KHz and 5 MHz, where little protection is given by conventionally shielded cables. Tyco Electronics has solved this problem with a range of

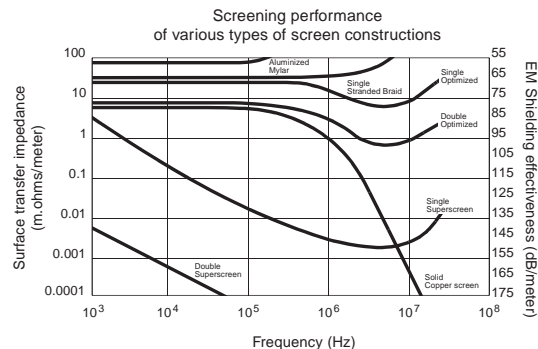
supershielded cables which give shielding performance at these frequencies by incorporating materials which change the inductance of the shield and lower the transfer impedance. Raychem supershielded cables have a sandwich construction of Mu metal tapes between optimized braids. Mu metal is a ferro-magnetic material which has a high permeability over a wide range of field strengths. It is applied to the cable in a way which maintains cable flexibility and minimizes work hardening and any consequent reduction in permeability. Supershielded cables not only give protection against EMP but also other major interference modes.

Design and Manufacturing Expertise

The problems of shielding cables are complex. However, with the introduction of optimized braids and supershielded cables, Tyco Electronics has the capability to solve the most difficult shielding problems. Shielding of cables without degrading cable flexibility can be provided for coaxial and multiconductor cables for all EMC and EMP conditions. To complement this range of cables, Tyco Electronics manufactures Raychem cable terminations and connector back fittings to give total interconnection system shielding performance.

Shielded Cables

Controlling the Threat



Testing

Tyco Electronics EMC test facilities have the capability for bulk current injection and radiation field testing in addition to surface transfer impedance measurements. The installation is a proven facility in characterizing new design parameters.