

Mineral Insulated Cables

for nucleonic systems

Features

- Optimised geometries to minimise surface transfer impedance
- Designed to maintain screening performance of measurement chain
- Very high insulation resistance to minimise signal losses
- All cable supplied fully tested
- Maximum operating temperature of 700 °C in high neutron flux fields
- Dimensions and lengths can be adapted to particular applications

A key requirement of high performance instrumentation systems is the provision of adequate interference immunity. This applies from the source of the signal through the complete measurement chain. Mineral Insulated (MI) cables are typically used within the reactor core. Standard MI cables are inadequate in maintaining immunity and low losses. Ultra's cables are designed to transmit very small pulse or dc signals through regions of high temperature, radiation and electromagnetic noise found within the core of a nuclear reactor.

Specialised cable geometries have been developed to maintain levels of insulation resistance and minimise the surface transfer impedance. These make use of multiple metal and insulating sheaths. Two different types of cable are available; Triaxial and Colaminax, and these offer varied screening properties for different applications.

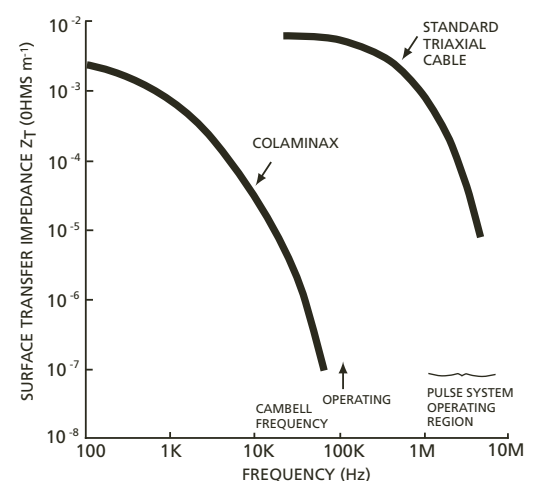
The Triaxial cables achieve good high frequency screening and are suitable for a wide range of signal applications. Colaminax cable provides effective screening at lower frequencies and is ideal for Campbell flux measuring systems. Colaminax is a good match with 'soft' superscreened cables.

Both cables will operate in high neutron flux fields and at temperatures of up to 700 °C whilst maintaining a high insulation resistance. At their typical operating temperature of 550 °C, the insulation is better than 3×10^{-9} amps per metre. The overall cable dimensions can be specified for each application but standard diameters are 4.75 mm for Triaxial cables and 5.38 mm for Colaminax cables.

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Technical Data

MINERAL INSULATED CABLE TYPES			
		Colaminax MI Cable	Triaxial MI Cable
Materials	Conductor	High conductivity copper	High conductivity copper
	Inner sheath	High conductivity copper	High conductivity copper
	Outer sheath	Stainless steel/copper/ mild steel/copper	Stainless steel
	Insulant	Magnesia	Magnesia
Dimensions	Outer sheath OD	5.28 - 5.49 mm	4.65 - 4.85 mm
	Inner sheath OD	N/A	2.95 - 3.20 mm
	Centre conductor OD	0.50 - 0.70 mm	0.50 - 0.70 mm
	Eccentricity	Less than 15% of insulant radial thickness	Less than 15% of insulant radial thickness
Electrical Performance at Room Temperature	Centre conductor resistance	70 - 120 mΩ m ⁻¹	65.5 - 115 mΩ m ⁻¹
	Centre conductor - sheath capacitance	200 - 350 pF m ⁻¹	197 - 328 pF m ⁻¹
	Centre conductor - sheath leakage at 100V	<1 x 10 ⁻¹¹ A m ⁻¹	< 3 x 10 ⁻⁹ A m ⁻¹
	Inner to outer sheath leakage at 100V	N/A	< 3 x 10 ⁻⁷ A m ⁻¹
Electrical Performance at 550 °C	Centre conductor - sheath leakage at 100V	< 3 x 10 ⁻⁷ A. m ⁻¹	< 3 x 10 ⁻⁶ A m ⁻¹
	Inner to outer sheath leakage at 100V	NA	< 3 x 10 ⁻⁴ A m ⁻¹
	Breakdown	Free from small pulse breakdown to 1 kV	Free from small pulse breakdown to 1 kV



Cable Surface Transfer Performance



Ultra Electronics

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