



Piezo Film Sensors

Technical Manual

Internet Version

Part 5 of 18

Piezoelectric Cable and Properties
Table 4. Kynar ® Piezo Cable Typical Properties

PEZOELECTRIC CABLE PROPERTIES

One of the most recent developments in piezo polymer technology is piezo cable. The appearance of standard coaxial cable (16-24 gauge), but is constructed with a piezoelectric polymer insulator between the copper braid outer shield and the inner conductor (Figure 26).

Protected by a rugged polyethylene jacket, the cable is used in buried or traffic sensors including vehicle classification and weight-in-motion systems, and taxiway sensors for aircraft identification, safety and security applications. Other applications include sensors for anti-tampering, door edge safety monitoring, floor mats, touch pads and panels, and patient mattress monitors. The new cables feature the same piezoelectric properties that are characteristic of piezo film sensors. The electrical output is proportional to the stress imparted to the cable. The long, thin piezoelectric insulating layer provides a relatively low output impedance (600 pF/m), unusual for a piezoelectric device. The dynamic range of the cable is substantial (>200 dB), sensing distant, small amplitude vibrations caused by rain or hail, yet responding linearly to the impacts of heavy trucks. The cables have withstood pressures of 100 MPa. The typical operating temperature range is -40 to +125°C. Table 4 lists typical properties for piezo cable.

Figure 26. Piezo cable construction

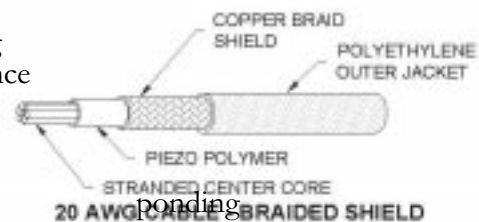


Table 4. Kynar® Piezo Cable Typical Properties

Parameter	Units	Value
Capacitance @ 1kHz	pF/m	600
Tensile Strength	MPa	60
Young's Modulus	GPa	2.3
Density	kg/m ³	1890
Acoustic Impedance	MRayl	4.0
Relative Permittivity	@1kHz	9
$\tan \delta_e$	@1kHz	0.017
Hydrostatic Piezo Coefficient	pC/N	15
Longitudinal Piezo Coefficient	Vm/N	250×10^{-3}
Hydrostatic Piezo Coefficient	Vm/N	150×10^{-3}
Electromechanical Coupling	%	20
Energy Output	mJ/Strain (%)	10
Voltage Output	kV/Strain (%)	5

Cable Typical Properties

The output sensitivity of piezo cable in response to increasing impact load is shown in Figure 27a. The linearity in output for increasing force as shown in Figure 27b is typical of all piezo cable gauges.

Figure 27a. Sensitivity vs. load

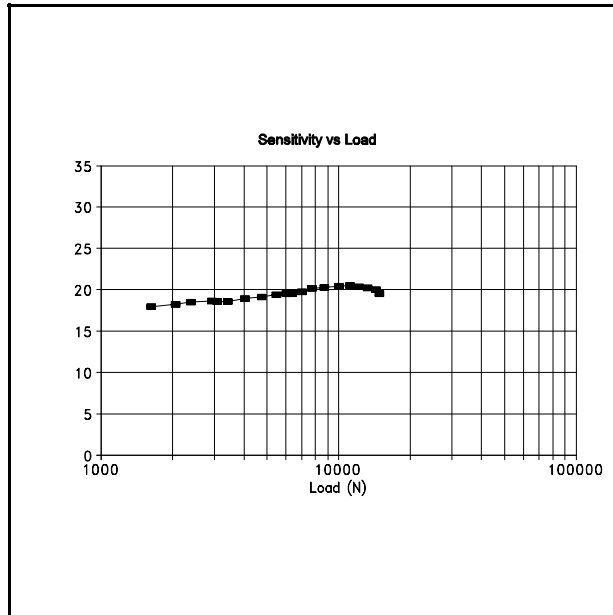


Figure 27b. Piezo cable linearity

