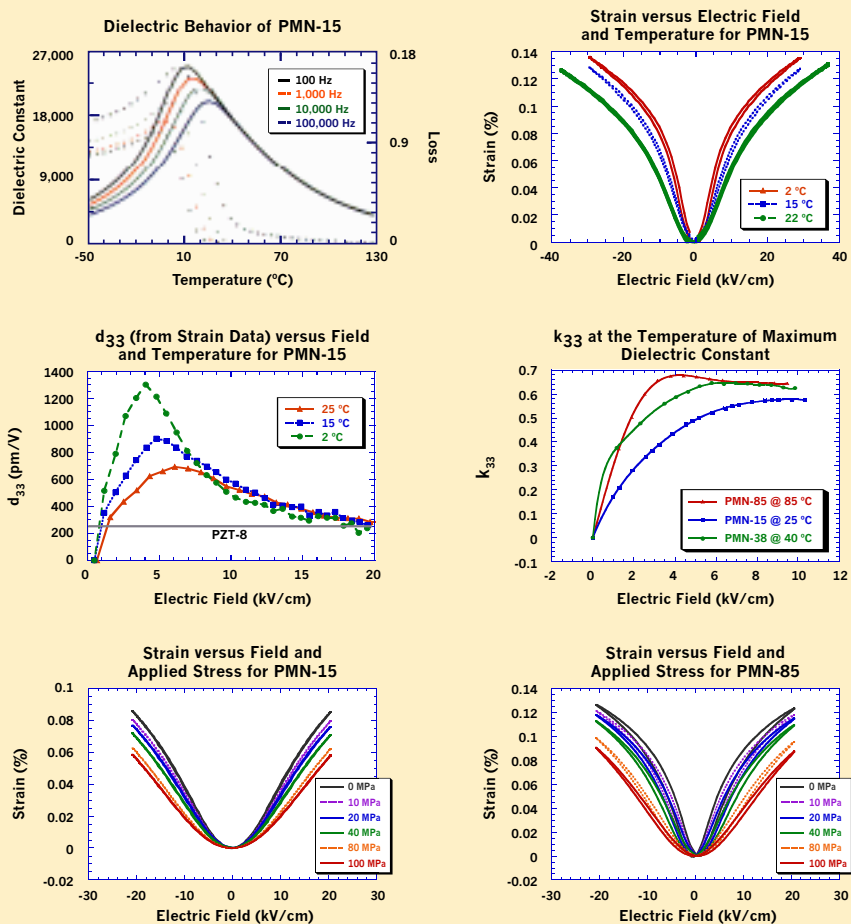




Electrostrictors

PMN-PT Electrostrictors

TRS has developed three PMN-PT compositions for Sonar applications. PMN-15, PMN-38, and PMN-85 have operating temperature ranges of 0 to 30, 10 to 50, and 75 to 95 °C, respectively, and 6 to 10 times the strain energy density of PZT-8. The higher temperature materials have higher coupling coefficients at the temperature of the peak dielectric constant.



Property Summary of TRS' PMN-PT Family

Property	PMN-15		PMN-38		PMN-85	
	Value	Conditions	Value	Conditions	Value	Conditions
Density	7.9 g/cm ³	Ceramic	7.9 g/cm ³	Ceramic	7.9 g/cm ³	Ceramic
Grain Size	3 - 6 μm		3 - 6 μm		3 - 6 μm	
Young's Modulus	>105 GPa	No Field	—		—	
Mechanical Strength	> 85 MPa	4-Point Bend	—		—	
Peak Dielectric Constant	25,000	15°C, 0.1 kHz	30,000	38°C, 0.1 kHz	40,000	85°C, 0.1 kHz
Room Temperature Dielectric Constant	20,000	25°C, 1 kHz	19,000	25°C, 1 kHz	7,700	25°C, 1 kHz
Dielectric Loss	< 0.008	25°C, 1 kHz	< 0.008	38°C, 1 kHz 25°C, 1 kHz	<0.008	85°C, 1 kHz 25°C, 1 kHz
Saturation Polarization	26 μC/cm ²	25°C, 35 kV/cm	28 μC/cm ²	38°C, 35 kV/cm	30 μC/cm ²	85°C, 35 kV/cm
Peak Strain	0.12%	25°C, 35 kV/cm	0.14%	38°C, 35 kV/cm	0.16%	85°C, 35 kV/cm
Depolarization Temperature	< -10 °C	10 kV/cm Bias	10 °C	10 kV/cm Bias	70 °C	10 kV/cm Bias
Peak d ₃₃	700 pm/V	25°C, 6.5 kV/cm	1000 pm/V	38°C, 4 kV/cm	1100 pm/V	85°C, 3.5 kV/cm
Peak d ₃₁	-230 pm/V	25°C, 6.5 kV/cm	—	—	-440 pm/V	85°C, 3.5 kV/cm
Maximum k ₃₃	0.60	25°C, > 10 kV/cm	0.64	38°C, 6 kV/cm	0.67	85°C, 4 kV/cm
Maximum k ₃₁	0.22	25°C, > 10 kV/cm	0.30	38°C, 5 kV/cm	0.31	85°C, 4 kV/cm
Maximum k _p	0.40	25°C, > 10 kV/cm	0.47	38°C, 6 kV/cm	0.50	85°C, 4 kV/cm
Maximum k _t	0.50	25°C, > 10 kV/cm	0.52	38°C, 6 kV/cm	0.57	85°C, >10 kV/cm
k ₃₃ at Peak d ₃₃	0.55	25°C, 6.5 kV/cm	0.59	38°C, 3.9 kV/cm	0.65	85°C, 3.5 kV/cm
k ₃₁ at Peak d ₃₃	0.20	25°C, 6.5 kV/cm	0.27	38°C, 3.9 kV/cm	0.27	85°C, 3.5 kV/cm
k _p at Peak d ₃₃	0.34	25°C, 6.5 kV/cm	0.42	38°C, 3.9 kV/cm	0.45	85°C, 3.5 kV/cm
k _t at Peak d ₃₃	0.45	25°C, 6.5 kV/cm	0.47	38°C, 3.9 kV/cm	0.55	85°C, 3.5 kV/cm