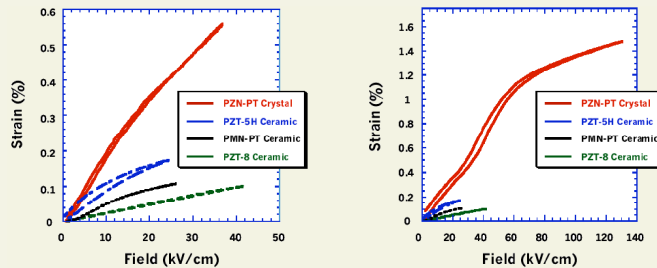


Single Crystal Piezoelectrics



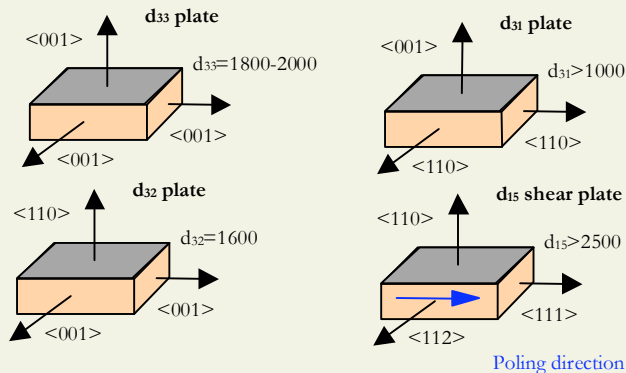
TRS-X2B
A revolutionary
piezoelectric material

TRS' new single crystals possess exceptional properties and are poised to revolutionize piezoelectric materials applications. In addition to strain levels exceeding 1% (usable strain: 0.5% at 35 kV/cm), TRS crystals exhibit five times the strain energy density of conventional piezoceramics. Thus, unlike piezoceramic actuators that employ strain magnification schemes, single crystal actuators can deliver higher strain levels without sacrificing generative force. The high electromechanical coupling of TRS crystals (>90%) increases transducer bandwidth, resulting in greater sensitivity and acoustic power. In addition, low strain hysteresis results in improved high power efficiency, and lower acoustic impedance than piezoceramics allows for easier matching to air or water. High coupling also leads to dramatic improvement in passive vibration damping.



Orientations

Standard crystals are cut oriented $\langle 001 \rangle$ for d_{33} type applications. Additional crystal cuts are available with optimal properties for specific applications.



Single Crystal Specifications

Property	TRS-X2A	TRS-X2B	TRS-X2C
Composition	PMN-28%PT	PMN-30%PT	PMN-32%PT
Dielectric, K_3^T	4000-5500	5500-7500	6500-8500
Loss ($\tan \delta$)	<0.01	<0.01	<0.01
T_{RT} (1 kHz, °C)	95	85	75
T_C (1 kHz, °C)	145	152	160
E_c (kV/cm)		3.2	
d_{33} (pC/N)	1200-1700	1700-2200	2200-2700
d_{31} (pC/N)		-1000	
d_{15} (pC/N)		2500-4000*	
k_{33}	0.88	0.90	0.92
k_{31}		0.51	
k_t	>0.54	>0.55	>0.56
N_{33} (Hz-m)		599	
N_{31} (Hz-m)		721	
N_t (Hz-m)		2002	
Density (g/cm ³)	8.0	8.0	8.0

* Denotes optimized property, poled along $\langle 111 \rangle$, as shown under "Orientations"

Single Crystal Size and Metallization Options

	Dimensional Range	Tolerances (+/-)	
		Standard	Fine
X (mm)	1.0-25	0.1	0.025
Y (mm)	1.0-25	0.1	0.025
Thickness (mm)	0.3-5	0.025	0.01

Notes:

Crystals are available as plates, discs, rings or tubes
Size range can be extended on request (0.1mm is smallest thickness)
Tolerances can be reduced on request

Electrodes:

Sputtered Cr/Au 500/2000 Å (standard)
Plated Ni/Au is standard for tubes or rings with OD/ID metallization