

Piezoelectric Materials

DIT's Piezoceramic Materials	Standard grade									Special grade					
	D110	D140	D210	D220	D221	D223	D310	D410	D510	D111	D211	D222	D230	D231	D240
Relative Dielectric Constant $\epsilon_{33}^T / \epsilon_0$	1450	1450	800	2250	2200	2100	720	830	1100	1300	570	2100	1900	3250	1900
Dielectric Loss Factor at low field & 1kHz $\tan \delta$	0.003	0.003	0.020	0.013	0.009	0.020	0.002	0.010	0.003	0.006	0.005	0.002	0.006	0.2	0.003
Electromechanical Coupling Coefficient K_p	0.61	0.59	0.57	0.65	0.64	0.68	0.37	0.20	0.34	0.59	0.56	0.64	0.64	0.68	0.61
Piezoelectric Constants d_{33} (10^{-12} m/V)	360	380	300	530	500	500	160	160	140	340	210	500	500	660	470
Piezoelectric Constants g_{33} (10^{-3} Vm/N)	28	29	42	27	25	28	25	22	14	29	42	27	29	23	28
Frequency Constant N_p , Radial (Hz-m)	2160	2240	2120	2000	2000	1920	2160	-	3290	2190	2310	2010	1990	1970	2050
Mechanical Quality Factor Q_m	900	850	90	80	58	75	730	70	950	780	1100	80	63	64	240
Curie Temperature T_c (°C)	320	310	345	320	310	330	345	-	130	320	320	325	310	230	280
Density ρ (10^3 kg/m ³)	7.6	7.6	7.2	7.6	7.6	7.4	7.4	5.4	5.7	7.6	7.6	7.4	7.5	7.3	7.2

* This specifications might be subjected to changes without a prior notice.

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110	Hard PZT(Lead Zirconate Titanate) ceramic for high-power ultrasonic transducer. The material retains a low dielectric loss at high electrical field and is resistant to depoling under high mechanical stresses and high electrical fields. Primary application is ultrasonic cleaners and sonars.
D111	Hard PZT ceramic equivalent to PZT-4.
D140	Low-loss PZT ceramic for multilayer application. The material has a low dielectric loss and high piezoelectric constants and is cofirable with pure Ag electrode. Specially developed for piezoelectric transformers and other multilayer devices working under resonance mode or high frequency.
D210	PZT ceramic with a high piezoelectric voltage constant. Best for voltage receiver.
D211	PZT ceramic with a high piezoelectric voltage constant. Similar to PZT-7A.
D220	All-purpose soft PZT ceramic. The material has a high piezoelectric strain constant, a high electro-mechanical coupling coefficient and a high dielectric constant. The material is well suited for hydrophones, sound detectors, flow meters, and accelerometers.
D221	Low-temperature firable PZT ceramic for multilayer actuators. The material is cofirable with pure Ag and has a high piezoelectric strain constant, a high electro-mechanical coupling coefficient and a high a dielectric constant.
D222	Soft PZT ceramic equivalent to PZT-5A.
D223	Soft PZT Ceramic with a low temperature coefficient of capacitance.
D230	Soft PZT ceramic with a very low aging rate of piezoelectric constants. Well suited for hydrophones and array receivers.
D231	PZT ceramic equivalent to PZT-5H. Very high piezoelectric strain constant and dielectric constant. Well suited for low frequency actuators.
D240	For ultrasonic humidifier.
D310	PZT ceramic with a high stability of resonance frequency and a high Curie temperature. Suited for knock sensors and accelerometers with wide range of operating temperature
D410	Modified lead metaniobate ceramic with a low mechanical Q, negligible aging of the piezoelectric parameters, a low acoustic impedance and a relatively high piezoelectric strain constant for higher signal to noise ratio. Primary application is broadband width sensors for pulse-echo measurement in medical or NDT application. Specially designed for immersion application.
D510	Modified barium titanate ceramic. Primary application is fish finders and hydrophones.

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