

Data Sheet

PZT400 Series

Material	Units	Primary Materials			Custom Materials		
		PZT401	PZT402	PZT404	PZT403	PZT406	PZT407
Designation		Hard PZT	Hard PZT	Hard PZT	Hard PZT	Hard PZT	Custom
Navy Type		I	I	I	I	I	Custom
EN 50324-1		100	100	100	100	100	Custom
Curie Temperature	T _c °C	330	325	320	320	325	315
Max. Operating Temperature	T _{max} °C	165	160	160	160	160	155
Mechanical Properties							
Density	ρ kg/m ³	7600	7720	7650	7600	7800	7900
Poisson's ratio	σ -	0.31	0.31	0.31	0.31	0.30	0.30
Compliances	S ^E ₃₃ x 10 ⁻¹² m ² /N	15.60	15.57	16.98	16.80	15.00	15.00
	S ^E ₁₁ x 10 ⁻¹² m ² /N	12.70	12.30	13.23	13.30	13.00	12.00
	S ^D ₃₃ x 10 ⁻¹² m ² /N	7.76	7.94	8.42			
	S ^D ₁₁ x 10 ⁻¹² m ² /N	11.10	10.89	11.49	11.80		
	Y ^E ₃₃ x 10 ¹⁰ N/m ²	6.41	6.42	5.89	5.95	6.67	6.67
	Y ^E ₁₁ x 10 ¹⁰ N/m ²	7.87	8.19	7.56	7.52	7.69	8.33
	Y ^D ₃₃ x 10 ¹⁰ N/m ²	12.89	12.59	11.88			
	Y ^D ₁₁ x 10 ¹⁰ N/m ²	9.01	9.18	8.70	8.48		

Electrical Properties								
Dielectric Constant	K _{T33}	-	1395	1320	1650	1350	1325	1225
	K _{T11}	-		1303	1331			1400
Dielectric Loss	tanδ	%	0.20	0.22	0.30	0.30	0.35	2.50
Coercive Field	E _c	kV/mm		1.5	1.5			
Piezoelectric Properties								
Coupling Factors	k _p	-	0.58	0.56	0.62	0.58	0.61	0.64
	k ₃₁	-	0.35	0.33	0.36	0.33	0.34	0.38
	k ₃₃	-	0.67	0.70	0.71	0.68	0.70	0.74
	k _t	-		0.42	0.43			
	k ₁₅	-	0.70	0.71	0.72	0.60		0.70
Charge or Strain Constants	d ₃₃	pC/N or pm/V	315	307	372	315	315	325
	d ₃₁	pC/N or pm/V	132	125	159	135	130	150
	d ₁₅	pC/N or pm/V	511	495	515			480
Voltage or Stress Constants	g ₃₃	x 10 ⁻³ V m/N	25.5	26.3	25.5	26.4	26.9	30.0
	g ₃₁	x 10 ⁻³ V m/N	10.7	10.7	10.9	11.3	11.1	13.8
	g ₁₅	x 10 ⁻³ V m/N		38.0	38.7			39.0
Frequency Constants	N _p	Hz-m	2190	2235	2158	2120	2190	2175
	N ₁	Hz-m	1636	1650	1515	1515		1620
	N ₃₁	Hz-m	2080	2000	1950	2000	2015	2000
	N ₅	Hz-m	1800	1944	1877			
Mechanical Quality Factor	Q _m	-	600	575	457	600	750	1200
Time Stability								
Aging Rate - Dielectric	α	% per decade	-4.6	-4.8	-5.2	-4.6	-6.0	-1.0
Aging Rate - d constants	α	% per decade		-5.3	-5.3	-3.4		
Aging Rate - Coupling	α	% per decade	-1.7	-1.9	-1.6	-2.1	-2.5	-1.5
Aging Rate - Frequency	α	% per decade	1.0	1.2	1.2	1.2	0.5	0.5

Typical Values measured at 20°C ±1°C are provided for design information only. Standard tolerances are approximately ±20% of these values. Material properties are measured according to standard IEEE and DOD definitions and measuring techniques.

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