



C E R A M T E C

Piezoceramic Hard Materials

CA220108/EN/2205/IM

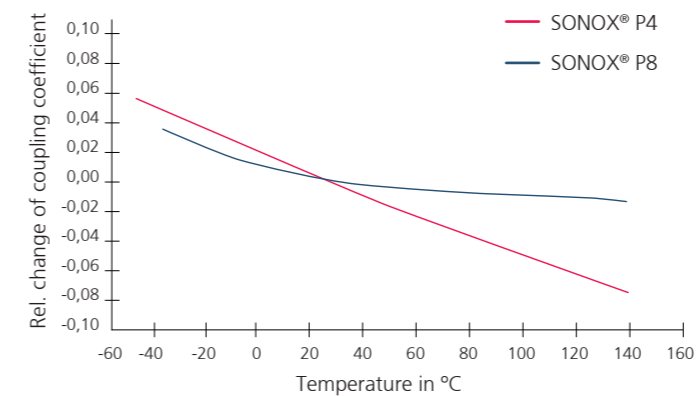


Thermal dependency of piezo electric characteristics

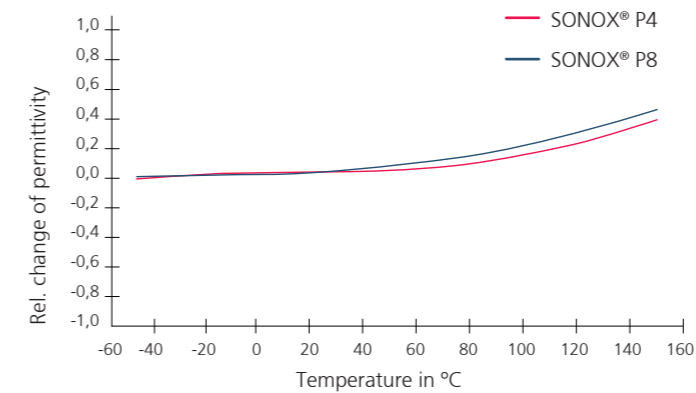
Material		Sonox® P4	PZT401	PZT403	PZT406	Sonox® P8	PZT807	
Navy Type		I	I	I	II	III	III	
Dielectric properties								
Relative permittivity ϵ_r	$\epsilon_{33}^T/\epsilon_0$	1300	1395	1350	1325	1000	1105	
	$\epsilon_{33}^S/\epsilon_0$	660	735	660	660	540	625	
	$\epsilon_{11}^T/\epsilon_0$	1535	1330	1295	1295	1250	1190	
	$\epsilon_{11}^S/\epsilon_0$	885	680	980	980	800	830	
Dielectric dissip. factor $\tan \delta$	10^{-3}	3,0	2,0	3,0	1,8	2,0	1,6	
Curie temperature T_c	$^{\circ}\text{C}$	325	330	320	325	305	300	
Electromechanical properties								
Frequency constant	N_p	2210	2190	2120	2190	2280	2320	
	N_t	2000	2080	2015	2015	2020	2030	
	N_1	1480	1635	1530	1530	1600	1720	
	N_3	1340	1550	1500	1500	1490	1660	
Coupling coefficient	k_p	0,57	0,58	0,58	0,61	0,55	0,55	
	k_{31}	0,31	0,35	0,33	0,34	0,30	0,29	
	k_{33}	0,68	0,67	0,68	0,70	0,68	0,69	
	k_t	0,50	0,50	0,50	0,47	0,48	0,47	
	k_{15}	0,65	0,70	0,70	0,60	0,60	0,58	
Charge constant	d_{33}	310	315	315	315	240	260	
	d_{31}	10^{-12} C/N	-130	-130	-135	-130	-95	-90
	d_{15}	455	510	540	550	380	295	
Voltage constant g_{33}	10^{-3} Vm/N	26,9	25,5	26,4	26,9	27,1	26,6	
Mechanical properties								
Elastic compliance	S_{11}^E	10^{-12} m ² /N	14,9	12,7	13,3	13,0	11,4	10,9
	S_{33}^E	18,1	15,6	16,8	15,0	13,7	15,7	
Elastic stiffness	C_{33}^D	10^{10} m ² /N	15,9	15,0	15,2	15,2	16,2	16,3
	C_{55}^D	4,8	4,9	4,0	4,0	4,5	4,7	
Density ρ	10^3 kg/m ³	7,65	7,60	7,60	7,80	7,70	7,60	
Mechan. quality factor Q_m		500	600	600	750	1000	1200	
Stability								
Aging rate	Capacitance	%/Decade	-4,5	-4,6	-3,2	-6,0	-3,0	-3,5
	Frequency	1,0	1,0	0,8	0,5	0,8	0,8	
	Coupling coefficient	-1,6	-1,5	-1,3	-2,5	-2,0	-1,5	

The materials data shown were evaluated on specific sample components and shall only be used to give an indication for design purposes. These values were determined based on national and international standards, if those standards were not available, then the values were determined on the basis of CeramTec internal standards. The displayed values are material properties and do not guarantee any properties of piezoceramic parts / products. CeramTec and its affiliates do not assume any responsibility for the correctness of such information nor for any damages subject to its use. Please note that material specifications and information detailed in this media are subject to changes.

Relative temperature dependence of coupling coefficient



Relative temperature dependence of permittivity



Relative temperature dependence of serial resonant frequency

