



Leadfree Piezoceramic Materials

CA220108/EN/Z604/IM

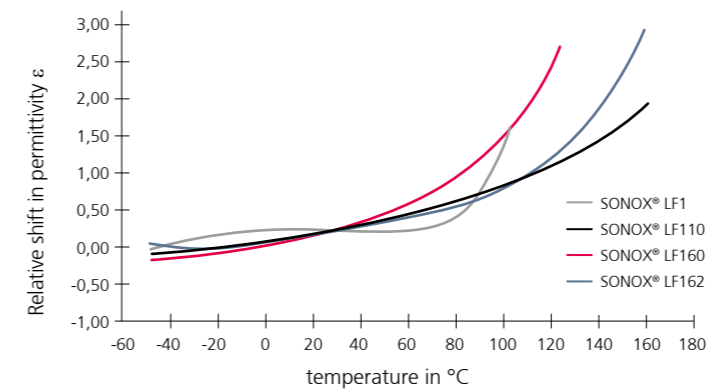


Material Characteristics (preliminary Data Sheet)

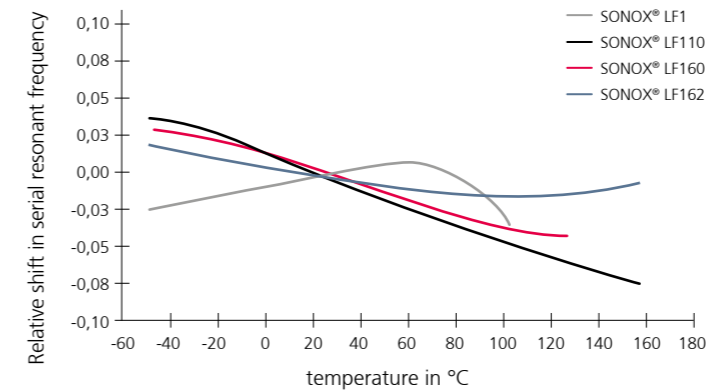
Material		SONOX® LF1	SONOX® LF110	SONOX® LF160	SONOX® LF162	
Dielectric properties						
Relative permittivity ϵ_r	$\epsilon_{33}^T/\epsilon_0$	1325	950	700	600	
	$\epsilon_{33}^S/\epsilon_0$	1100	750	475	425	
	$\epsilon_{11}^T/\epsilon_0$	1425	875	1050	650	
	$\epsilon_{11}^S/\epsilon_0$	1250	825	925	575	
Dielectric dissip. factor $\tan \delta$		10^{-3}	10	35	21	6
Curie temperature	T_C	C°	250	410	250	410
Depolarisation temperature	T_D	C°	80	160	110	140
Electromechanical properties						
Frequency constant	N_p	kHz x mm	3150	2750	3000	3050
	N_t		2600	2300	2250	2250
	N_1		2350	2250	2250	2300
	N_3		2300	2200	2100	2100
Coupling coefficient	k_p		0,27	0,17	0,30	0,18
	k_{31}		0,17	0,18	0,19	0,12
	k_{33}		0,38	0,43	0,50	0,45
	k_t		0,35	0,43	0,51	0,51
	k_{15}		0,34	0,26	0,44	0,37
Charge constant	d_{33}	10^{-12} C/N	139	150	172	128
	d_{31}		-53	-47	-45	-24
	d_{15}		166	106	192	122
Voltage constant g_{33}		10^{-3} Vm/N	11,8	17,7	27,4	23,8
Mechanical properties						
Elastic compliance	S_{11}^E	10^{-12} m ² /N	8,0	8,7	8,4	8,3
	S_{33}^E		8,5	9,3	10,4	10,2
Elastic stiffness	C_{33}^D	10^{10} N/m ²	17,1	14,8	15,2	14,5
	C_{55}^D		5,9	5,1	6,0	5,7
Density ρ		10^3 kg/m ³	5,76	5,82	5,76	5,68
Mechan. quality factor $Q_m(k_p)$			300	80	140	590
Mechan. quality factor $Q_m(k_t)$			140	40	40	80
Stability						
Aging rate	Capacitance	%/Decade	-1,80	-2,50	-1,0	-1,00
	Frequency		0,20	0,40	0,60	0,40
	Coupling coefficient		0,00	-2,60	-0,70	-1,00

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 permittivity



Rel. temperature dependence of serial resonant frequency (thickn.)



Relative temperature dependence of coupling coefficient (thickn.)

