

# Material Specification

Property	Symbol	Units	Soft Material		Hard Material		
			NCE51	NCE55	NCE81	NCE40	NCE41
Dielectric Constant (1 kHz)	$K^T_3$		1900	5000	1020	1250	1350
Dielectric Loss Factor (1 kHz)	$\tan\delta_e$		0.015	0.022	0.0017	0.0025	0.004
Dielectric Loss Factor (at 0.4V/mm)	$\tan\delta_e$				0.006	.0014	.002
Density	$\rho$	kg/m <sup>3</sup>	7850	8000	7730	7750	7930
Curie Point	$T_c$	°C	360	160	300	318	284
Mechanical Quality Factor	$Q_m$		80	70	1400	700	1400
Coupling Coefficients	$k_p$		0.65	0.62	0.56	0.58	0.57
	$k_{33}$		0.74	0.72	0.69	0.70	0.68
	$k_{31}$		0.39	0.39	0.31	0.35	0.33
	$k_t$		0.5	0.5	0.47	0.50	0.5
Piezoelectric Charge	$d_{31}$	Coul/N x 10 <sup>-12</sup> (or)	-208	-260	-100	-140	-130
Displacement Coefficient	$d_{33}$	m/V x 10 <sup>-12</sup>	443	670	255	320	310
Piezoelectric Voltage Coefficient	$g_{31}$		13	-9	-10.8	-12	-11
Voltage Coefficient	$g_{33}$	V·m/N x 10 <sup>-3</sup>	26.3	19	28	27.5	25
Frequency Constants	$N_p$		1925	1970	2300	2160	2280
	$N_t$		2000	1990	2130	1980	2000
	$N_{ta}$	Hz·m					
	$N_{33}$						
	$N_{31}$						
Poisson's Ratio	$\gamma$				22		
Elastic Constants Short Circuit	$S^E_{11}$		16	17	16	13	13
	$S^E_{33}$		19	21	17	17	16
	$S^E_{12}$	x 10 <sup>-12</sup> m <sup>2</sup> /N	-4.8	-6	-4.3	-3.4	-4.1
	$S^E_{13}$		-8.9	-7.5	-5.4	-5.4	-5.7
	$S^E_{55}$		49.0	36.2	34.5	34.5	39.5
	$S^E_{66}$		43.4	46	30.8	31.5	33.2



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