Johnson Matthey
Inspiring science, enhancing life

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Piezoceramic Masses

Data Sheet

Piezoceramics has been developed by Johnson Matthey – Piezo Products from the basic research to production-ready materials.

Here are some examples of our piezoceramic masses.

Characteristic Value	Masses of ceramic									
	Symbol	Unit	M420	M524.5	M1100	M202	M455	M1599	M1224	M1334	M1876
Electrical Data											
Relative dielectric constant	ε^T_{11}		1600	---	4750	960	---	---	700	---	6500
(e_0 = 8.85 pF/m)	ε^T_{33}		1600	2400	4500	1000	1450	250	550	3500	7000
Dielectric loss factor	tan δ	10^{-3}	20	19	25	7	5	7	30	7	25
Coercive field strength	E_c	10^3 V/m	900	1200	570	2400	1280	---	730	615	390
Conductivity	σ	10^{-12} 1/Ωm	<1	<1	<1	<1	<1	<1	<1	<1	<1
Elektromechanical Data											
Piezoelectrical coupling coefficient	k_p		0.60	0.64	0.70	0.50	0.57	0.07	0.45	0.64	0.67
	k_{31}		0.34	0.36	0.42	0.28	0.31	0.03	0.24	0.33	0.38
	k_t		0.48	0.44	0.50	0.45	0.47	0.50	0.55	0.47	0.48
	k_{33}		0.69	0.69	0.71	0.60	0.32	0.24	0.45	0.67	0.75
	k_{15}		0.66	0.72	0.67	0.57	---	---	0.64	0.67	0.76
Piezoelectrical charge constant	d_{31}	10^{-12} C/N	-160	-230	-315	-90	-120	-3.80	-58	-230	-385
	d_{33}	=	355	430	640	205	125	31	115	500	860
	d_{15}	10^{-12} m/V	525	690	895	295	---	---	310	740	1160
Piezoelectrical voltage constant	g_{31}		-11.00	-9.00	-7.90	-10.00	-9.70	-1.70	-12.00	-7.00	-5.90
	g_{33}	10^{-3}(V· m)/N	25.00	17.00	16.00	27.00	9.90	14.10	23.80	15.50	13.30
	g_{15}		37.00	30.00	21.00	35.00	---	---	50.70	25.00	20.00
Mechanical Data											
Compliance	s^E_{11}		15.40	14.90	14.20	11.80	12.70	7.40	12.00	15.50	15.80
	s^E_{12}		-5.70	-4.80	-3.70	-4.50	-5.10	-2.70	-5.50	-6.10	-5.60
	S^E_{13}	10^{-12} m²/N	-6.50	-6.00	-6.50	---	-6.70	-4.20	-3.70	-6.50	-8.00
	s^E_{33}		18.70	17.20	20.60	13.80	12.50	7.60	13.50	17.50	20.50
	s^E_{55}		45.00	45.00	43.00	31.10	---	---	39.50	44.50	57.80
Frequency constant	N^E_p		2000	2030	1940	2290	2260	2900	2280	2050	1970
(Sound velocity)	N^E_1		1460	1460	1470	1660	1595	2200	1640	1440	1400
	N_t	m/s	1940	2120	2070	---	2100	2200	1930	2050	2030
	N^D_3		1830	1870	1870	1920	1700	2250	1740	1800	1860
	N^D_5		1140	1200	1140	1240	---	---	1190	1130	1130
Mechanical quality factor	Q		100	80	50	800	890	1200	135	220	45
Density	ρ	10^3 kg/m³	7.60	7.90	8.10	7.70	7.70	6.90	7.60	7.90	8.00
Depolarizing pressure (5%depolarization)			30	70	30	120	120		---	---	---
Compressive strength		10^6 N/m²	>600	>600	>600	>600	>600	---	---	---	---
Tensile strength			~80	~80	~80	~80	~80	---	---	---	---
Thermal Behavior											
Temperature coefficient											
of: rel. diel. constant	$TK_\varepsilon{}^T_{33}$	10^{-6} 1/K	3500	2500	6000	3000	2400	3500	4800	2500	6700
Frequency constant	TKN_p		-100	150	400	100	250	---	-170	400	---
Thermal Data											
Curie temperature	ϑ_c	°C	320	290	177	330	300	245	305	200	121
Pyroelectric coefficient	p	10^{-6} C/m²K	420	---	---	430	---	---	---	---	---
Specific heat	c	Ws/kgK	380	380	380	380	380	380	380	380	380
Thermal conductivity	λ	W/K · m	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Thermal expansion	α^E	10^{-6} 1/K	7	7	7	7	7	7	7	7	7

All values are approximate and no guarantee of specific technical properties. Changes in the course of technical progress are possible without notice.