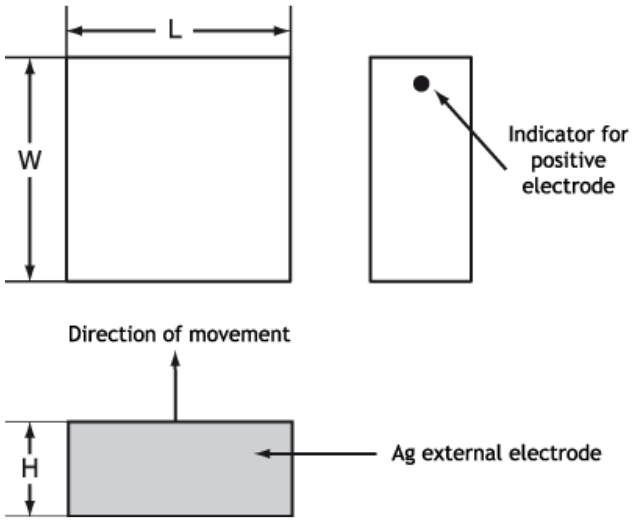
Technical Data - Ceramic Multilayer Actuators - CMA Plate

	Length (L)	Width (W)	Height (H) (+/- 0.05)	Operating voltage	Free stroke (+/- 15%)	Blocking force (+/- 20%)	Capacitance (+/- 15%)	Maximum operating temperature	Curie temperature	Material	Unloaded resonance frequency
	mm	mm	mm	V	µm	N	nF	°C	°C	-	Hz
CMAP01	3 +/-0.10	3 +/-0.10	2	60	2.6	360	500	125	235	S2	> 500 k
CMAP02	5 +/-0.10	5 +/-0.10	2	60	2.8	1000	1460	125	235	S2	> 500 k
CMAP03	3 +/-0.10	3 +/-0.10	3	150	4.4	360	105	200	350	S1	> 300 k
CMAP04	5 +/-0.10	5 +/-0.10	3	150	4.8	1000	250	200	350	S1	> 300 k
CMAP05	7 +/-0.15	7 +/-0.15	2	150	3.1	1960	410	200	350	S1	> 500 k
CMAP06	3 +/-0.10	3 +/-0.10	2	200	2.9	360	30	200	350	S1	> 500 k
CMAP07	5 +/-0.10	5 +/-0.10	2	200	3.1	1000	100	200	350	S1	> 500 k
CMAP08	7 +/-0.15	7 +/-0.15	2	200	3.2	1960	220	200	350	S1	> 500 k
CMAP09	10 +/-0.20	10 +/-0.20	2	200	3.2	4000	440	200	350	S1	> 500 k
CMAP10	3 +/-0.10	3 +/-0.10	2	200	1.8	290	25	200	350	H1	> 500 k
CMAP11	5 +/-0.10	5 +/-0.10	2	200	2.0	800	75	200	350	H1	> 500 k
CMAP12	2 +/-0.10	2 +/-0.10	2	120	2.8	160	36	150	350	S1	> 500 k

External electrodes: Screen-printed Ag

Wires: None as standard. Options available.

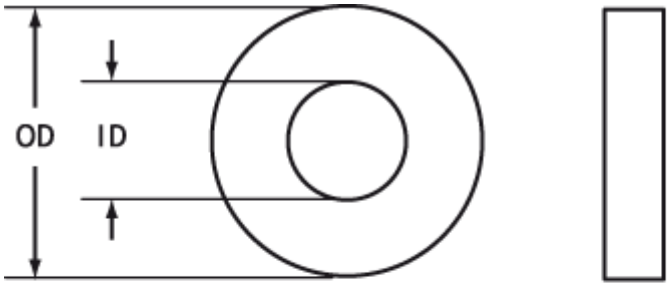


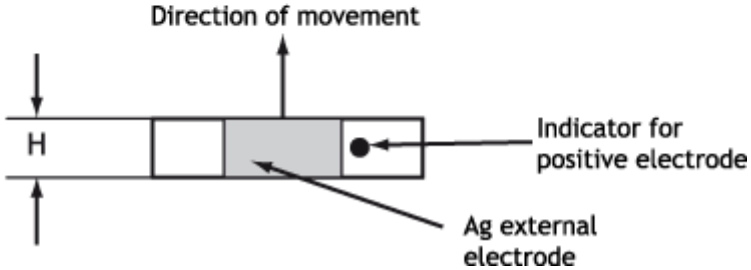
Technical Data - Ceramic Multilayer Actuators - CMA Ring

	Outer diameter (OD)	Inner diameter (ID)	Height (H) (+/- 0.05)	Operating voltage	Free stroke (+/- 15%)	Blocking force (+/- 20%)	Capacitance (+/- 15%)	Maximum operating temperature	Material	Unloaded resonance frequency
Unit	mm	mm	mm	V	µm	N	nF	°C	-	Hz
CMAR01	6 +/- 0.20	2 +/-0.1	2	200	2.7	1000	100	200	S1	> 500 k
CMAR02	8 +/- 0.25	3 +/-0.1	2	200	2.7	1700	170	200	S1	> 500 k
CMAR03	12 +/- 0.40	6 +/-0.2	2	200	2.8	2670	350	200	S1	> 500 k
CMAR04	15 +/- 0.45	9 +/-0.3	2	200	2.8	4530	500	200	S1	> 500 k
CMAR05	20 +/- 0.60	12 +/-0.4	2	200	3.0	8000	825	200	S1	> 500 k

External electrodes: Screen-printed Ag or Ag/Pd

Wires: None as standard. Options available.





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Technical Data - Stacked Ceramic Multilayer Actuators - SCMA Plate

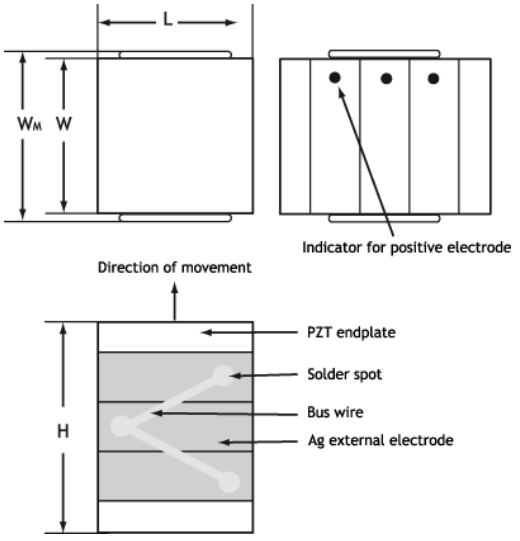
	Length (L)	Width (W)	Width max (W_M) (including bus wire and solder material, no wire)	Height (H) (+/-0.2 or 1%)*	Operating voltage	Free stroke (+/-15%)	Blocking force (+/-20%)	Capacitance (+/-15%)	Maximum operating temperature	Curie temperature	Material	Unloaded resonance frequency
Unit	mm	mm	max	mm	V	µm	N	nF	°C	°C	-	Hz
SCMAP01	3 +0.30 -0.10	3 +0.30 -0.10	4.8	4-30	60	2.3 - 32.8	360	450 - 6300	125	235	S2	>250 k - >35 k
SCMAP02	5 +0.30 -0.10	5 +0.30 -0.10	5.8	4-50	60	2.7 - 63.8	1000	1400 - 33300	125	235	S2	>250 k - >22 k
SCMAP03	3 +0.30 -0.10	3 +0.30 -0.10	4.8	5-30	150	4.2 - 39	360	100 - 950	150	350	S1	>200 k - >35 k
SCMAP04	5 +0.30 -0.10	5 +0.30 -0.10	6.8	5-50	150	4.6 - 73	1000	238 - 3800	150	350	S1	>200 k - >22 k
SCMAP05	7 +0.35 -0.15	7 +0.35 -0.15	8.9	4-70	150	2.9 - 100	1960	390 - 13250	150	350	S1	>250 k - >16 k
SCMAP06	3 +0.30 -0.10	3 +0.30 -0.10	4.8	4-30	200	2.8 - 39	360	29 - 400	150	350	S1	>250 k - >35 k
SCMAP07	5 +0.30 -0.10	5 +0.30 -0.10	6.8	4-50	200	2.9 - 71	1000	100 - 2300	150	350	S1	>250 k - >22 k
SCMAP08	7 +0.35 -0.15	7 +0.35 -0.15	8.9	4-70	200	3.0 - 103	1960	209 - 7100	150	350	S1	>250 k - >16 k
SCMAP09	10 +0.40 -0.20	10 +0.40 -0.20	11.9	4-100	200	3.0 - 149	4000	418 - 20500	150	350	S1	>250 k - >11 k
SCMAP10	3 +0.30 -0.10	3 +0.30 -0.10	4.8	4-30	200	1.7 - 24	290	24 - 350	150	350	H1	>250 k - >35 k
SCMAP11	5 +0.30 -0.10	5 +0.30 -0.10	6.8	4-50	200	1.9 - 46	800	71 - 1700	150	350	H1	>250 k - >22 k
SCMAP12**	2 +0.30 -0.10	2 +0.30 -0.10	3.8	4-20	120	2.4 - 21	160	34 - 310	150	350	S1	>250 k - >52 k

*Whichever is largest

**For stacks higher than 10mm, it may be necessary to add a support within the application in order to avoid bending and buckling during mounting and operation

External electrodes: Screen-printed Ag & soldered bus wire

Wires: 28 AWG x 200 mm (+/-20 mm) Teflon



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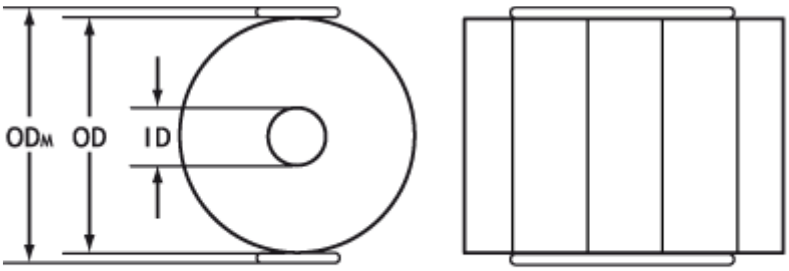
Technical Data - Stacked Ceramic Multilayer Actuators - SCMA Ring

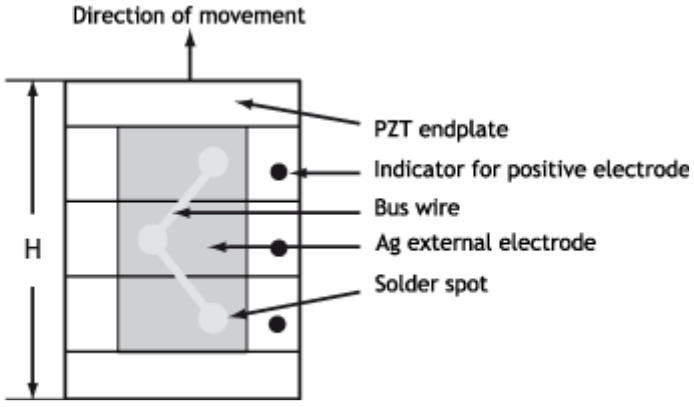
	Outer diameter (OD)	Inner diameter (ID)	Outer diameter max (OD_M) (including bus wire and solder material, no wire)	Height (H) (+/-0.2 or 1%)*	Operating voltage	Free stroke (+/- 15%)	Blocking force (+/- 20%)	Capacitance (+/- 15%)	Maximum operating temperature	Curie temperature	Material	Unloaded resonance frequency
Unit	mm	mm	max	mm	V	µm	N	nF	°C	°C	-	Hz
SCMAR01	6 +0.40 -0.20	2 +0.10 -0.30	7.9	4-60	200	2.6 - 74	1000	95 - 2750	150	350	S1	>250k - >18k
SCMAR02	8 +0.45 -0.25	3 +0.10 -0.30	10.0	4-80	200	2.6 - 100	1700	162 - 6300	150	350	S1	>250k ->14k
SCMAR03	12 +0.60 -0.40	6 +0.20 -0.40	14.1	4-120	200	2.7 - 157	2670	333 - 19600	150	350	S1	>250k - >9 k
SCMAR04	15 +0.65 -0.45	9 +0.30 -0.50	17.2	4-150	200	2.7 - 197	4530	475 - 35150	150	350	S1	>250k - >7 k
SCMAR05	20 +0.80 -0.60	12 +0.40 -0.60	22.3	4-200	200	2.9 - 282	8000	784 - 77600	150	350	S1	>250k - >6 k

*Whichever is largest

External electrodes: Screen-printed Ag & soldered bus wire

Wires: 28 AWG x 200 mm (+/-20 mm) Teflon





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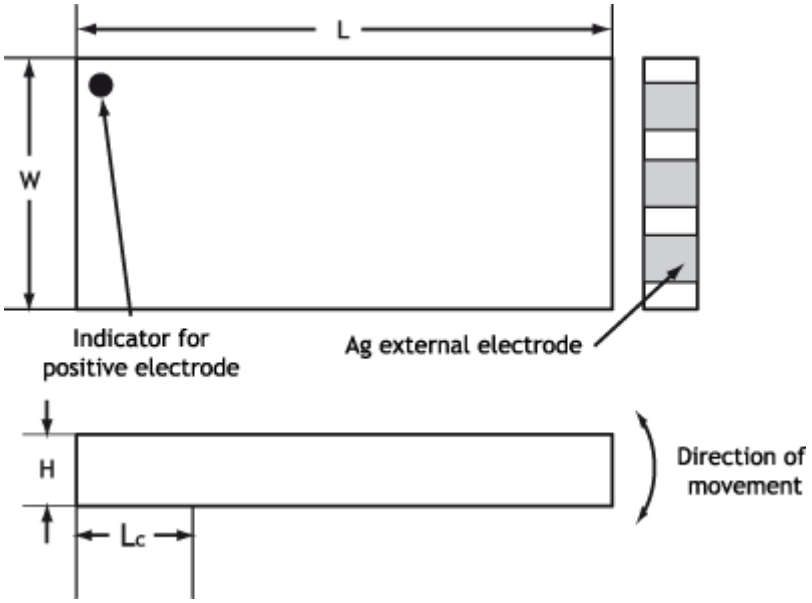
Technical Data - Ceramic Multilayer Benders - CMB Plate

	Length (L)		Width (W)		Height (H) (+/- 0.1)	Operating voltage	Free stroke (+/- 15%)	Blocking force (+/- 20%)	Capacitance (+/- 15%)	Maximum operating temperature	Curie temperature	Material	Unloaded resonance frequency
Unit	mm		mm		mm	V	µm	N	nF	°C	°C	-	Hz
CMBP01	21	+/-0.45	7.8	+/- 0.15	0.7	200	+/-195	1.2	2 x 110	150	350	S1	>730
CMBP02	21	+/-0.45	7.8	+/- 0.15	1.25	200	+/-120	3.7	2 x 220	150	350	S1	>1300
CMBP03	21	+/-0.45	7.8	+/- 0.15	1.8	200	+/-85	5.5	2 x 330	150	350	S1	>1880
CMBP04	32	+/-0.65	7.8	+/- 0.15	0.7	200	+/-475	0.75	2 x 160	150	350	S1	>275
CMBP05	32	+/-0.65	7.8	+/- 0.15	1.25	200	+/-345	2.25	2 x 320	150	350	S1	>490
CMBP06	32	+/-0.65	7.8	+/- 0.15	1.8	200	+/-210	4.3	2 x 480	150	350	S1	>705
CMBP07	50	+/-1.00	7.8	+/- 0.15	0.7	200	+/-1270	0.4	2 x 250	150	350	S1	>100
CMBP08	50	+/-1.00	7.8	+/- 0.15	1.25	200	+/-850	1.6	2 x 500	150	350	S1	>180
CMBP09	50	+/-1.00	7.8	+/- 0.15	1.8	200	+/-635	2.9	2 x 750	150	350	S1	>265

External electrodes: Ag

Wires: 30 AWG (Teflon) x 20 cm if height <1,2 mm

28 AWG (Teflon) x 20 cm if height ≥1,2 mm



Lc = Clamping length = 3.5 mm

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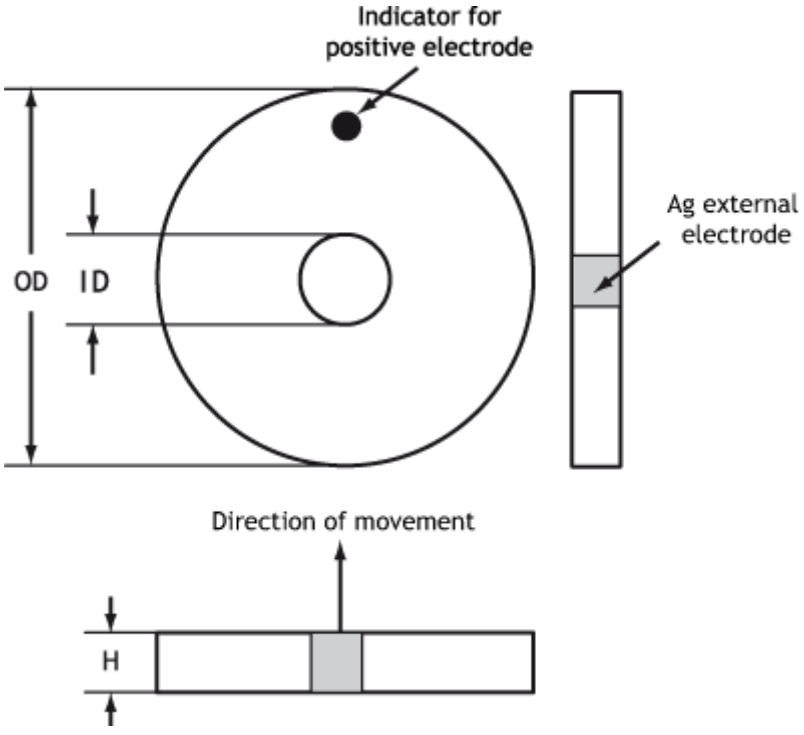
Technical Data - Ceramic Multilayer Benders - CMB Ring

	Outer diameter (OD)		Inner diameter (ID)		Height (H) (+/- 0.1)	Operating voltage	Free stroke (+/- 15%)	Blocking force (+/- 20%)	Capacitance (+/- 15%)	Maximum operating temperature	Curie temperature	Material	Unloaded resonance frequency
Unit	mm		mm		mm	V	µm	N	nF	°C	°C	-	Hz
CMBR01	20	+/- 0.60	4	+/-0.15	0.70	200	+/-47	9	2 x 180	150	350	S1	>6.9 k
CMBR02	20	+/- 0.60	4	+/-0.15	1.25	200	+/-28	16	2 x 400	150	350	S1	>12.8 k
CMBR03	20	+/- 0.60	4	+/-0.15	1.80	200	+/-20	22	2 x 670	150	350	S1	>18.4 k
CMBR04	30	+/- 0.90	6	+/-0.20	0.70	200	+/-108	11	2 x 470	150	350	S1	>3.7 k
CMBR05	30	+/- 0.90	6	+/-0.20	1.25	200	+/-70	29	2 x 940	150	350	S1	>6.0 k
CMBR06	30	+/- 0.90	6	+/-0.20	1.80	200	+/-48	39	2 x 1470	150	350	S1	>8.0 k
CMBR07	40	+/- 1.20	8	+/-0.25	0.70	200	+/-185	13	2 x 800	150	350	S1	>1.8 k
CMBR08	40	+/- 1.20	8	+/-0.25	1.25	200	+/-115	39	2 x 1740	150	350	S1	>3.4 k
CMBR09	40	+/- 1.20	8	+/-0.25	1.80	200	+/-83	56	2 X 2740	150	350	S1	>4.8 k

External electrodes: Ag

Wires: 30 AWG (Teflon) x 20 cm if height <1,2 mm

28 AWG (Teflon) x 20 cm if height ≥1,2 mm



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