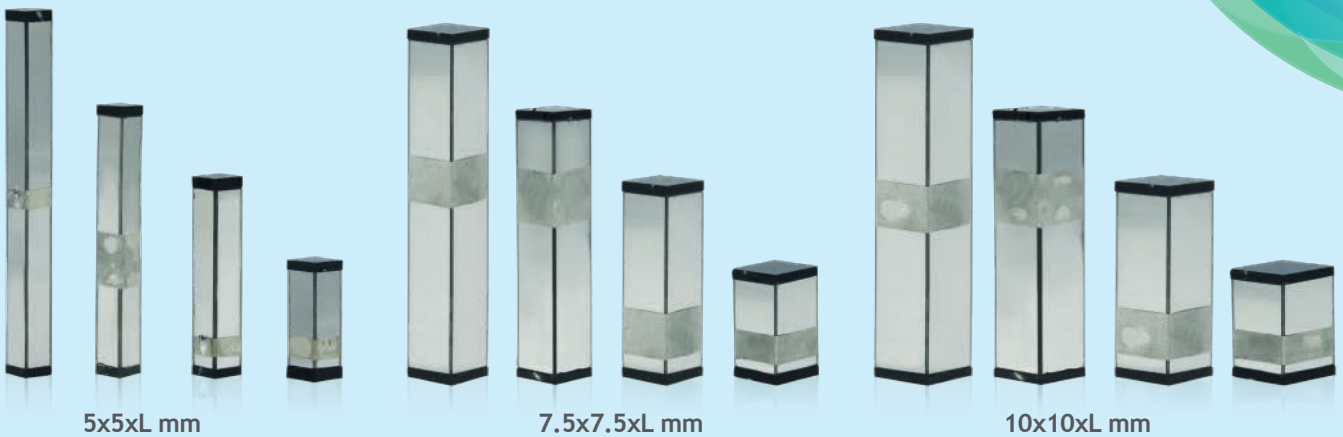
MICROFINE
MATERIALS TECHNOLOGIES PTE LTD

Large-Stroke Hi-Fi Piezoelectric Single Crystal STAKE Actuator



5x5xL mm | 7.5x7.5xL mm | 10x10xL mm

L = 15, 28, 41, 54 mm

Key Features

- Compact & light (<7g)
- Large linear stroke (up to 58 µm @ +240V) with negligible strain hysteresis up to 40℃
- Moderate working loads (up to 10 kg)
- Nanometer resolutions, microsecond responses
- Low device capacitance (17 nF for 5x5x15L & 290 nF for 5x5x54L)
- Low power consumption under a.c. drive
- Larger working load and cryogenic versions are available.

Dimensional and Performance Specifications						
Stake Code & Dimensions W_1xW_2xL (mm)	Stroke[1,4] @ +240V (µm)	Stiffness[3] (kg-f/µm)	Maximum Load Allowed @ +240V (kg-f)[2,4]			Blocking Force[3] (kg-f)
			@ 22 ˚C	@ 32 ˚C	@ 40 ˚C	
32M-5x5x15L	-14	0.37	4.0	3.0	2.5	5.5
32M-5x5x28L	-29	0.20				
32M-5x5x41L	-43	0.13				
32M-5x5x54L	-58	0.10				
32M-7.5x7.5x15L	-14	0.59	6.5	5.0	4.0	8.8
32M-7.5x7.5x28L	-29	0.33				
32M-7.5x7.5x41L	-43	0.21				
32M-7.5x7.5x54L	-58	0.16				
32M-10x10x15L	-14	0.80	10.0	8.0	6.0	12.0
32M-10x10x28L	-29	0.44				
32M-10x10x41L	-43	0.29				
32M-10x10x54L	-58	0.22				

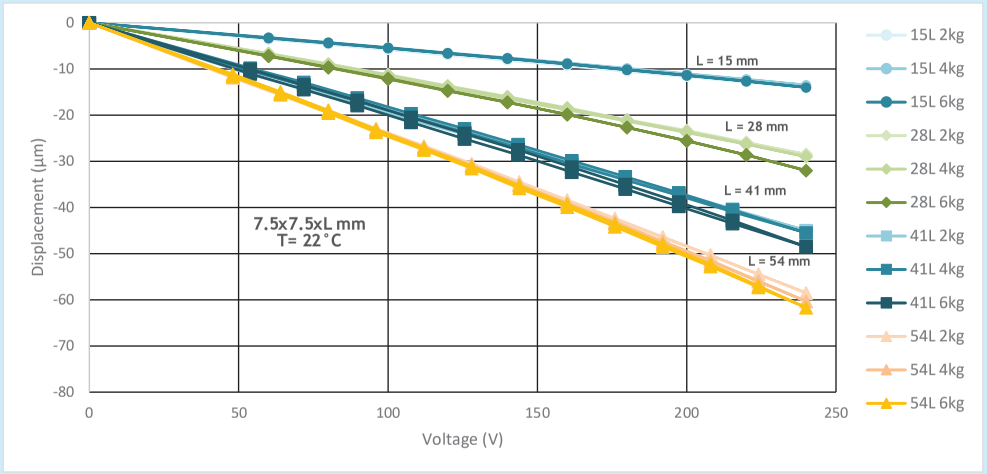
See behind page for footnotes. Versions with top spherical end-cap and bonded strain gauges are also available.

Microfine Materials Technologies Pte Ltd

10 Bukit Batok Crescent,
The Spire #06-02, S(658079)
SINGAPORE

Tel/Fax: +65 6515 3122
Web: www.microfine-piezo.com

Product & Sales Enquiries:
sales@microfine-piezo.com
Technical & Other Enquiries:
info@microfine-piezo.com



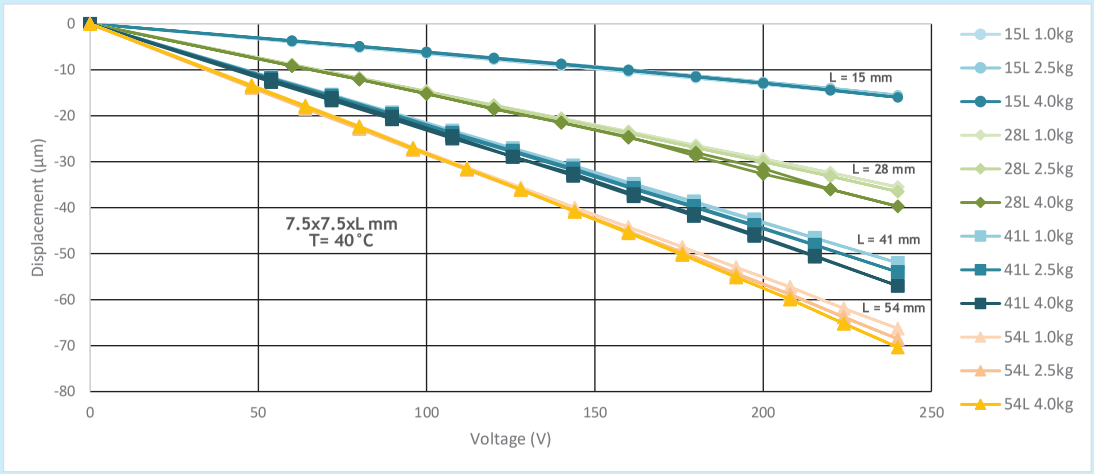


Figure - Displacement ΔL vs. applied voltage of 7.5x7.5xL stakes under different loads at (a) 22°C and (b) 40°C. While ΔL is relatively insensitive to the applied load, it varies with temperature via the following empirical relationship: $\Delta L=[a+b(T-22)]VL_{ac}$, where ΔL is in µm, T in °C, V in volt and L_{ac} in mm; L_{ac} = (L-3) mm for 15L and 28L stakes and L_{ac}=(L-4) mm for 41L and 54L stakes; a= 0.0048 and b= $7.0x10^{-5}$

Applications

- Fine positioning and tilt control in optics and laser communications
- Micro and nano-positioning of precision instrument and machinery
- Deformable mirrors / actuator array surface
- Motor sections for compact low-frequency sonar
- Industrial, medical, aviation applications requiring compact and light piezo actuators

Footnotes for specification table

[1] The actuator contracts under positive-polarity applied voltage. Negative-polarity applied voltage under +240V_{dc} bias drive is recommended for extensional axial displacement.

[2] Unlike PZT stacks, the performance of single crystal STAKE actuators is determined by the phase transformation properties of the component single crystals and not the blocking force. When driven at up to +240V below the allowed maximum loads (including pre-loads), the displacement response is linear with no occurrence of rhombohedral-to-orthorhombic phase transformation of the component single crystals at stipulated operating temperatures.

[3] The blocking forces provided are for reference only. They were obtained under +240V_{dc} bias drive condition and equal the mechanical force required to offset the extensional displacement of the actuator when the bias voltage is reduced to 0V. When divided by the stroke, it give the stiffness of respective stake actuator.

[4] Larger working load and cryogenic versions are available. The attainable stroke is about half that provided in the specification table under cryogenic environment.

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