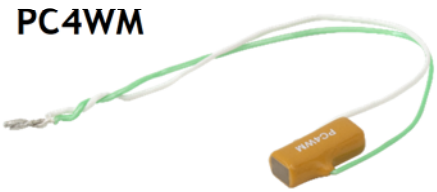
Co-Fired Piezo Actuator, 150 V, 9.5 µm Travel



Description

The PC4WM co-fired piezo actuator consists of a series of stacked piezoelectric ceramic layers separated by electrodes that extend across the full surface of each layer. The entire stack is sintered as a single unit. This construction provides a free-stroke displacement significantly larger than discrete piezo stacks, which are constructed from individual piezo chips epoxied together. As the electrodes span the entire surface of the piezoelectric layers, the entire surface is active and responds to the driving voltage.

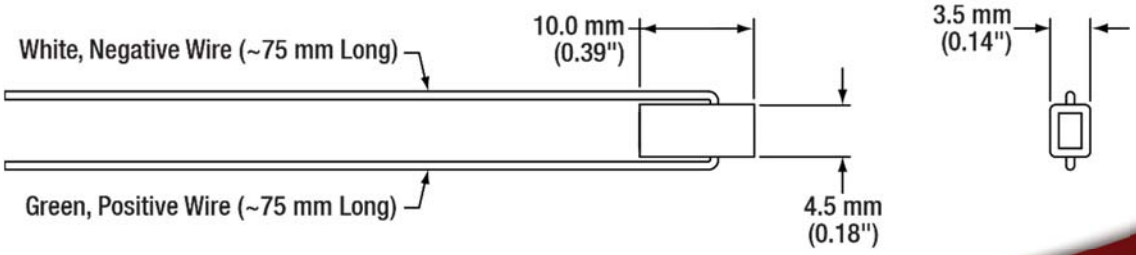
The PC4WM offers a maximum displacement of 9.5 µm ± 15%. A green wire is soldered to the electrode that should receive positive bias; the other electrode should be grounded.

Specifications

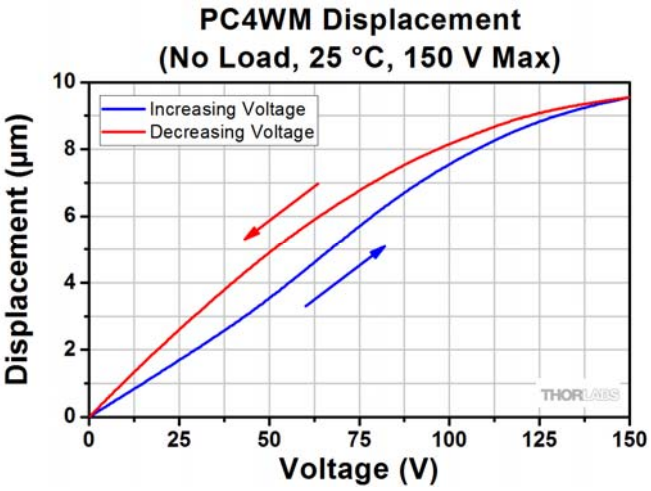
PC4WM[a]	
Drive Voltage Range	0 to 150 V
Displacement (Free Stroke) at 150 V[b]	9.5 µm ± 15%
Hysteresis	≤15% (See Graph on Next Page)
Load for Maximum Displacement[c]	100 N (22.5 lbs)
Recommended Preload	<100 N (22.5 lbs)
Blocking Force at 150 V	250 N (55 lbs)
Resonant Frequency	115 kHz ± 10% (No Load)
Impedance at Resonant Frequency	700 mΩ
Anti-Resonant Frequency	165 kHz ± 10% (No Load)
Dissipation Factor[d]	<2.0%
Capacitance[d]	180.0 nF ± 15%
Operating Temperature	-25 to 110 °C
Curie Temperature	230 °C
Dimensions	Width 1: 3.5 mm + 0/-0.5 mm Width 2: 4.5 mm + 0/-0.5 mm Length: 10.0 mm ± 5 µm

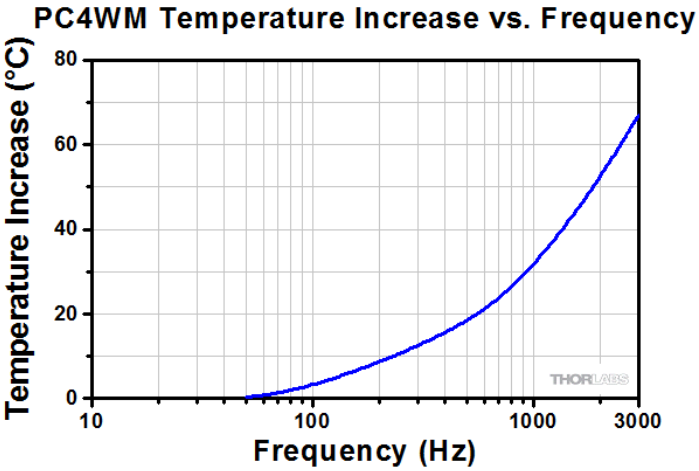
a. All specifications are quoted at 25 °C, unless otherwise stated.
b. The "free stroke" displacement corresponds to no load.
c. The displacement may vary slightly for different loads, and the maximum displacement occurs when the load for maximum displacement is used.
d. Specified at 1 kHz, 1 V_{RMS}.

Drawing



Typical Performance Plots





The temperature increase of the stack was measured after applying a sine-wave driving voltage, with maximum and peak-to-peak amplitudes of 150 V, at the specified frequency for 10 minutes.

Operation

Electrical Considerations

- The electrode attached to the green wire should be connected to a positive (+) drive voltage, and the opposite electrode attached to the white wire should be negative. The maximum drive voltage is 150 V. Exceeding 150 V will decrease the device's lifespan and may cause mechanical failure. Reverse biasing the device may cause mechanical failure.
- After driving, the piezo is fully charged. Directly connecting the green and white wires has the risk of electricity discharging, spark, and even failure. We recommend using a resistor (>1 kΩ) between the green and white wires to release the charge.

Attaching Devices to the Piezo

- Any epoxy which cures at a temperature lower than 80 °C is safe to use. We recommend Thorlabs Item #s 353NDPK or TS10. Loctite Hysol 9340 is also usable.
- Loads should only be attached to the uncoated faces since the polymer-coated faces do not translate. Attaching a load to the coated faces may lead to mechanical failure.

Storage Instructions

- Do not store the device at temperatures above 110 °C.
- Do not store the device in a humid environment. The relative humidity (RH) should be less than 40%.
- Do not immerse the device in organic solvents.
- Do not use the device around combustible gases or liquids.