Amplified Piezoelectric Actuator, 150 V, 2.5 mm Displacement

APFH720

Description

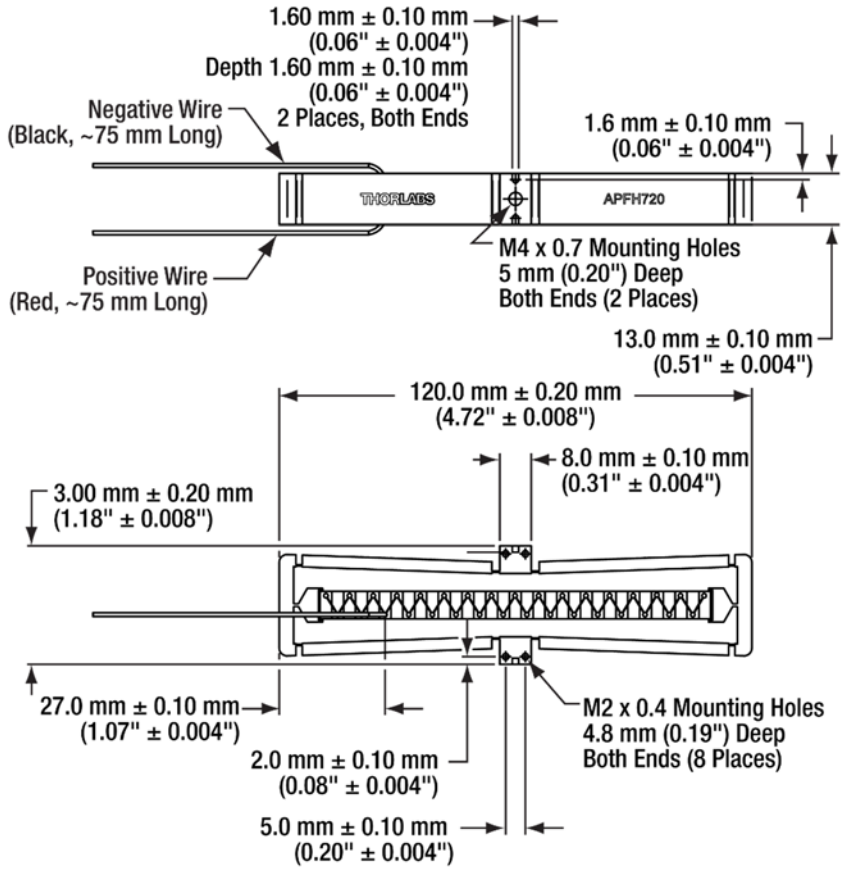
The APFH720 amplified piezoelectric actuator consists of a discrete piezo stack in a flexure mount. The flexure increases the travel range through lever amplification. It offers a maximum pushing displacement of 2.5 mm ± 15%. A red wire is attached to the electrode that should receive positive bias, and a black wire is attached to the electrode that should be grounded.

Specifications

APFH720[a]	
Drive Voltage Range	-30 to 150 V
Displacement (Free Stroke) from 0 to 150 V	1.8 mm ± 15%
Displacement (Free Stroke) from -30 to 150 V	2.5 mm ± 15%
Maximum Pushing Force In Motion Direction[b]	30 N (6.74 lbs)
Maximum Pulling Force In Motion Direction[c]	3 N (0.67 lbs)
Hysteresis	<15% (See Graph on Next Page)
Resonant Frequency (No Load)	160 Hz
Resonant Frequency (5 g, On-Axis Load)	151 Hz
Resonant Frequency (50 g, On-Axis Load)	110 Hz
Resonant Frequency (5 g, Off-Axis Load)	123 Hz
Resonant Frequency (50 g, Off-Axis Load)	89 Hz
Maximum Dynamic Load	1000 g
Maximum Static Load	2000 g
Stiffness	0.03 N/µm
Impedance at Resonant Frequency	3000 mΩ
Dissipation Factor[d]	<2.0%
Capacitance[d]	16.5 µF ± 15%
Operating Temperature	-25 to 130 °C
Curie Temperature	230 °C
Outer Dimensions	120.0 x 30.0 x 13.0 mm
Piezo Stack Dimensional Tolerance	± 0.1 mm

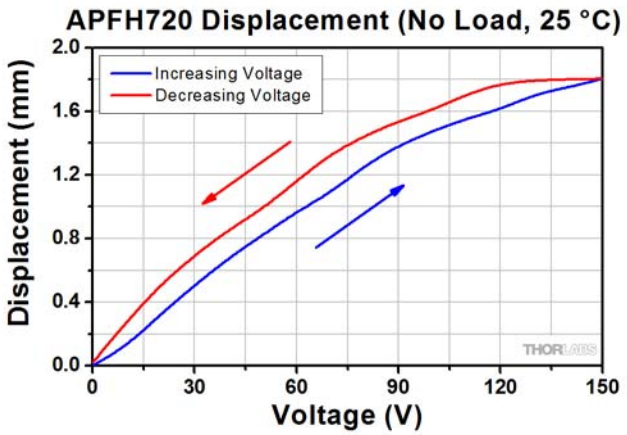
a. All specifications are quoted at 25 °C, unless otherwise stated.
b. When Increasing Voltage
c. When Decreasing Voltage
d. Specified at 1 kHz, 1 V_{RMS}

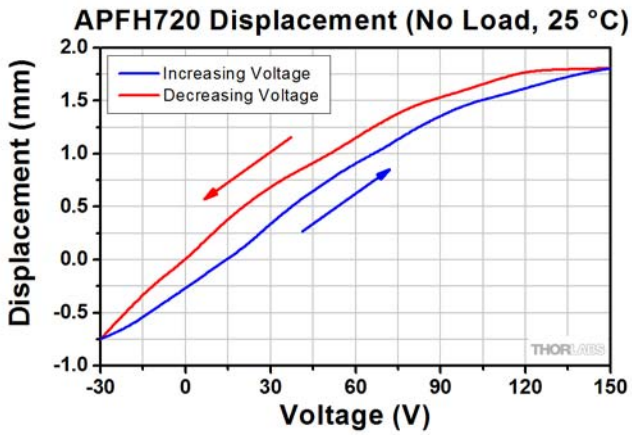
Drawing



The front view dimensions are valid when the piezo actuator is at free state and powered off (0 V).

Typical Performance Plots





The left graph shows a voltage cycle from 0 to 150 V, while the right graph shows a voltage cycle over the full -30 to 150 V range.

Operation

Electrical Considerations

- The electrode attached to the red wire should be positively biased, and the electrode attached to the black wire should be grounded. The recommended maximum drive voltage range is -30 to 150 V; exceeding the range will decrease the device's lifespan and may cause mechanical failure. Reverse-biasing the device more than 30 V may cause depolarization or mechanical failure.
- For quasi-static motion, the APFH720 can be driven by Thorlabs piezo controllers from 0 V to 150 V. To drive the actuator from -30 V to 150 V, the black wire should be used as a ground reference and a bipolar amplifier HVA200 and a function generator can be used to output a -30 V to 150 V signal to drive the red wire. Two drivers with floating ground can also be used, with applying one driver's +30 V to black wire, and applying the other driver to drive the red wire from 0 V to +180 V to finally achieve a -30 V to 150 V drive range. For dynamic motion, the maximum driving frequency is 15 Hz with voltage range from 0 to 150 V or -30 to 150 V.
- **Caution:** After driving, the piezo is fully charged. Directly connecting the red and black wires has the risk of electricity discharging, spark, and even failure. We recommend using a resistor (>1 kΩ) between the wires to release the charge.

Attaching Devices to the Piezo

- The APFH720 provides two M4 screw holes on both ends in stroke directions, for mounting to either solid plane or working plane. There are also two notches with a 1.6 mm diameter semicircle, 1.6 mm width, and 1.6 mm depth to accept a key feature on a mating part, as well as two M2 side holes on each side for side mounting. Refer to the mechanical drawing for details.

Storage Instructions

- Do not store the device at temperatures above 80 °C.
- Do not store the device in humid environments. 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.