

## PICA Shear Actuators

Compact Actuators for Cryogenic and UHV Environments



### P-1x1.0xT

- UHV-compatible to  $10^{-9}$  hPa
- For cryogenic environments
- Extreme reliability:  $>10^9$  cycles
- Picometer resolution
- Microsecond response

#### Piezo shear actuators

Operating voltage -250 to 250 V. Suitable for use in cryogenic and UHV environments to  $10^{-9}$  hPa. Lateral displacement is based on the piezoelectric shear effect. Excellent dynamics with minimum electric power requirement. Variants for multi-axis motion, also with inner hole.

#### Possible modifications

- Piezo ceramic material
- Nonmagnetic versions
- Operating voltage range, displacement, layer thickness, cross-sectional dimension
- Load capacity, force generation
- Mechanical interfaces: flat, spherical, metal, ceramic, glass, sapphire, etc.
- Extra-tight length tolerances

#### Fields of application

- Industry and research
- Low temperature / vacuum environment to  $10^{-9}$  hPa
- Scanning applications
- Microscopy
- Precision mechanics
- Switching applications

## Specifications

	Active axis	Travel range	Surface A × B	Length L	Max. shear load	Axial stiffness	Electrical capacitance	Axial resonant frequency
		$\mu\text{m}$	$\text{mm}$	$\text{mm}$	$\text{N}$	$\text{N}/\mu\text{m}$	$\text{nF}$	$\text{kHz}$
P-111.01T	X	1	3 × 3	2.2	20	110	2 × 0.25	530
P-111.03T	X	3	3 × 3	4.4	20	55	6 × 0.25	260
P-121.01T	X	1	5 × 5	2.2	50	310	2 × 0.70	530
P-121.03T	X	3	5 × 5	4.4	50	150	6 × 0.70	260

Travel range: At -250 to 250 V, measured at room temperature. Value is reduced at lower temperatures. Tolerance  $\pm 30\%$ .

Length L: Tolerance  $\pm 0.3\text{ mm}$

Electrical capacitance: Measured at  $1\text{ V}_{pp}$ ,  $1\text{ kHz}$ , RT, tolerance  $\pm 20\%$ .

Axial resonant frequency: Measured at  $1\text{ V}_{pp}$ , unloaded, unclamped. The value is halved for unilateral clamping.

Piezo ceramic type: PIC255

Standard connections: Possible with Ta. contacting with conductive adhesive or welding.

Operating voltage range: -250 to 250 V

Operating temperature range: -269 to  $85\text{ }^\circ\text{C}$ . Temporary short-term bakeout to  $150\text{ }^\circ\text{C}$  only when short-circuited.

Standard mechanical interfaces: Ceramic ( $\text{Al}_2\text{O}_3$ , 96 % pure)

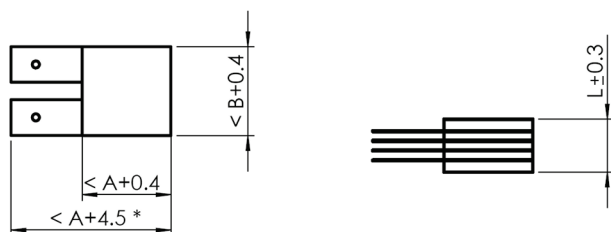
Outer surface: Epoxy resin

Recommended electronics: E-413, E-508.

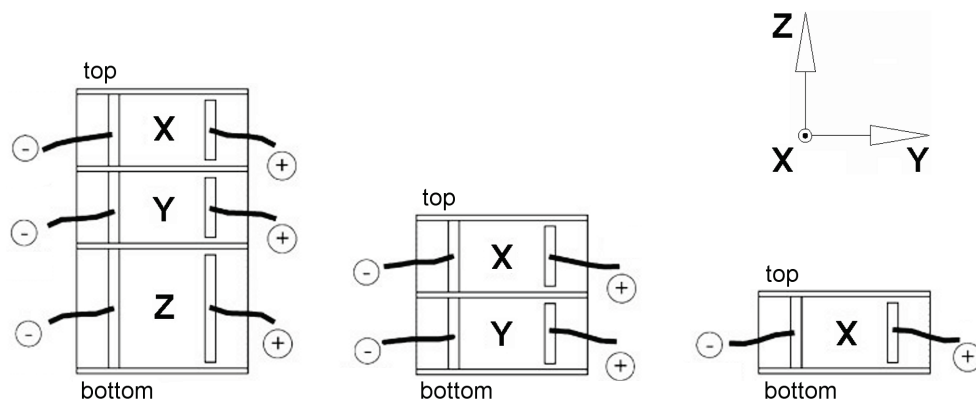
Other specifications on request.

Ask about customized versions.

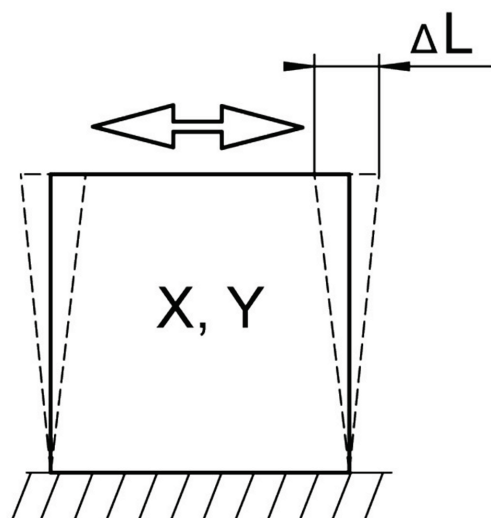
## Drawings / Images



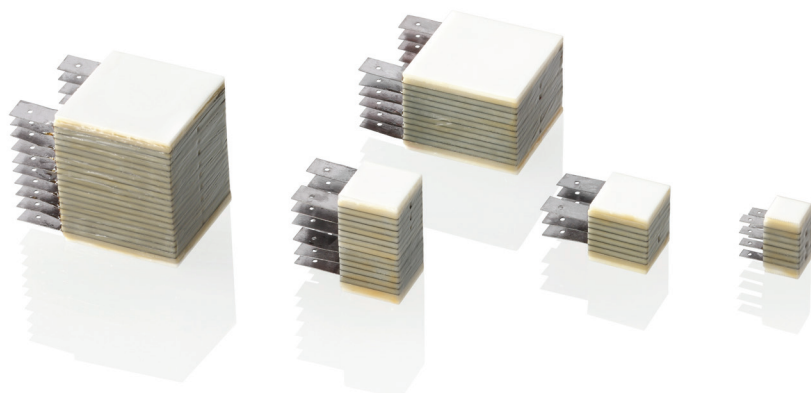
PICA Shear P-1xx.xxT actuators. A, B, L, see data table. Dimensions in mm. The number of axes and wires depends on the type. (\*  $< A + 2.5$  with cross section  $3 \times 3$ )



Axis and cable assignment for PICA shear actuators. GND: 0 V, +:  $\pm 250\text{ V}$ .



Principle of shear motion.  $\Delta L$  refers to the travel range.



PICA Shear P-1x1.0xT actuators for cryogenic and UHV environments

## Ordering Information

### P-111.01T

PICA Shear X piezo actuator, 1  $\mu\text{m}$  travel range, 3 mm  $\times$  3 mm cross section, vacuum compatible to  $10^{-9}$  hPa, operating temperature up to  $-269^\circ\text{C}$

### P-111.03T

PICA Shear X piezo actuator, 3  $\mu\text{m}$  travel range, 3 mm  $\times$  3 mm cross section, vacuum compatible to  $10^{-9}$  hPa, operating temperature up to  $-269^\circ\text{C}$

### P-121.01T

PICA Shear X piezo actuator, 1  $\mu\text{m}$  travel range, 5 mm  $\times$  5 mm cross section, vacuum compatible to  $10^{-9}$  hPa, operating temperature up to  $-269^\circ\text{C}$

### P-121.03T

PICA Shear X piezo actuator, 3  $\mu\text{m}$  travel range, 5 mm  $\times$  5 mm cross section, vacuum compatible to  $10^{-9}$  hPa, operating temperature up to  $-269^\circ\text{C}$