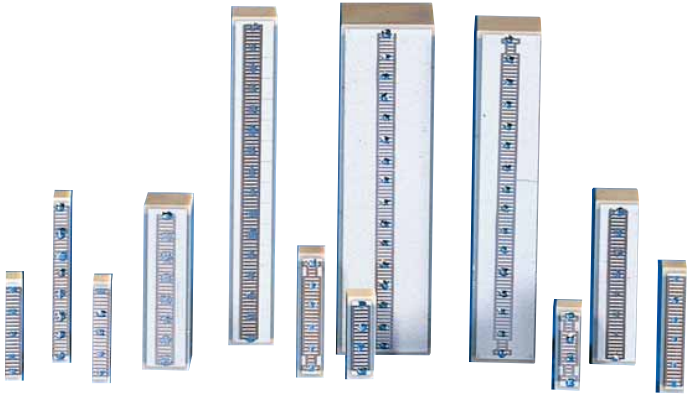


P-882 • P-888 PICMA® Multilayer Piezo Stack Actuators

Ceramic-Insulated High-Power Actuators



PICMA® piezo actuators are available with cross-sections of 2 x 3, 3 x 3, 5 x 5, 7 x 7 and 10 x 10 mm²

- Superior Lifetime Even Under Extreme Conditions
- Very Large Operating Temperature Range
- High Humidity Resistance
- Excellent Temperature Stability
- High Stiffness
- Peak Current up to 20 A
- UHV Compatible to 10⁹ hPa
- Sub-Millisecond Response / Sub-Nanometer Resolution
- Ideal for Dynamic Operation

PICMA® (PI Ceramic Monolithic Multilayer Actuator) piezo stack actuators are characterized by their high performance and reliability, even in extremely harsh environments. They are superior to conventional multilayer actuators in

industrial applications and high-endurance situations, where they show substantially longer lifetimes both in static and dynamic operation.

New Production Process, Optimized Piezo Ceramics

PICMA® piezo actuators are made from a ceramic material in which the piezoceramic properties such as stiffness, capacitance, displacement, temperature stability and lifetime are optimally combined. Thus the actuators accomplish sub-nanometer resolution in positioning and sub-millisecond response!

Increased Lifetime Through Humidity Resistance

The monolithic ceramic-encapsulated design provides better humidity protection than poly-

mer-film insulation. Diffusion of water molecules into the insulation layer is greatly reduced by the use of cofired, outer ceramic encapsulation. Due to their high resonant frequency the actuators are suitable for highly dynamic applications with small loads; depending on the load an external preload for dynamic applications is recommended. The high Curie temperature of 320 °C gives PICMA® actuators a usable temperature range extending up to 150 °C, far beyond 80 °C as is common for conventional multilayer actuators. With conventional multilayer actuators, heat generation - which is proportional to operating frequency - either limits the operating frequency or duty cycle in dynamic operation, or makes ungainly cooling provisions necessary. At the low end, operation down to a few Kelvin is possible (with reduction in performance specifications).

Optimum UHV Compatibility - Minimum Outgassing

The lack of polymer insulation and the high Curie temperature make for optimal ultra-high-vacuum compatibility (high bakeout temperatures, up to 150 °C).



PICMA® actuator with optional 0.1 m PTFE insulated wire leads and optional rounded top piece for decoupling lateral forces

Ideal for Closed-Loop Operation

The ceramic surface of the actuators is extremely well suited for use with resistive or optical fiber strain gauge sensors. Such sensors can be easily applied to the actuator surface and exhibit significantly higher stability and linearity than with conventional polymer-insulated actuators.

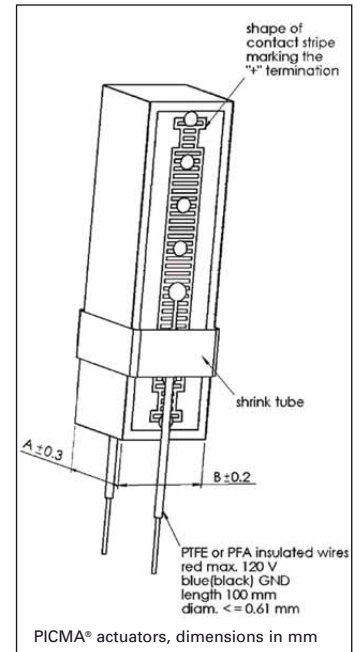
Piezo Drivers, Controllers & High-Voltage Amplifiers

High-resolution amplifiers and servo-control electronics, both digital and analog, are described in the "Piezo Drivers / Servo Controllers" section.

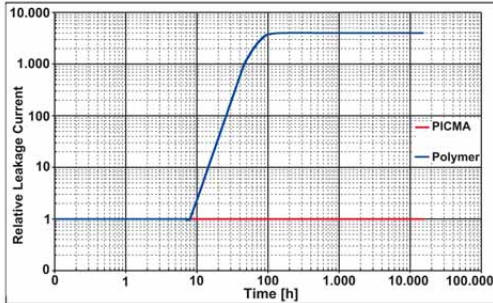
Read more on PICMA® reliability on page 1-65 ff.

Application Examples

- Precision mechanics / -machining
- High-speed switching
- Active and adaptive Optics
- Active vibration damping
- Pneumatic & hydraulic valves
- Metrology / Interferometry
- Life science, Biotechnology
- Nanotechnology

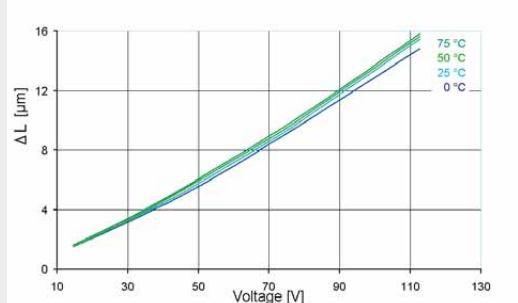


PICMA® actuators, dimensions in mm



PICMA® piezo actuators (bottom curve) compared with conventional multilayer actuators with polymer insulation (top curve). PICMA® actuators are not affected by the high-humidity test conditions. Conventional piezo actuators exhibit increased leakage current after only a few hours. Leakage current is an indicator quality and expected lifetime.

Test conditions: U = 100 VDC, T = 25 °C, Relative Humidity = 70%



The displacement of PICMA® actuators exhibits very low temperature dependence. This, in combination with their low heat generation, makes PICMA® actuators optimal for dynamic operation

Linear Actuators & Motors

PiezoWalk® Motors / Actuators

PLine® Ultrasonic Motors

DC-Servo & Stepper Actuators

Piezo Actuators & Components

Guided / Preloaded Actuators

Unpackaged Stack Actuators

Patches/Benders/Tubes/Shear..

Nanopositioning / Piezoelectrics

Nanometrology

Micropositioning

Index

Technical Data / Product Order Numbers

Order number*	Dimensions A x B x L [mm]	Nominal displacement [μm @ 100 V]	Max. displacement [μm @ 120 V]	Blocking force [N @ 120 V]	Stiffness [N/μm]	Electrical capacitance [μF] ±20 %	Resonant frequency [kHz] ±20 %
P-882.11	3 x 2 x 9	6.5 ±20 %	8 ±20 %	190	24	0.15	135
P-882.31	3 x 2 x 13.5	11 ±20 %	13 ±20 %	210	16	0.22	90
P-882.51	3 x 2 x 18	15 ±10 %	18 ±10 %	210	12	0.31	70
P-883.11	3 x 3 x 9	6.5 ±20 %	8 ±20 %	290	36	0.21	135
P-883.31	3 x 3 x 13.5	11 ±20 %	13 ±20 %	310	24	0.35	90
P-883.51	3 x 3 x 18	15 ±10 %	18 ±10 %	310	18	0.48	70
P-885.11	5 x 5 x 9	6.5 ±20 %	8 ±20 %	800	100	0.6	135
P-885.31	5 x 5 x 13.5	11 ±20 %	13 ±20 %	870	67	1.1	90
P-885.51	5 x 5 x 18	15 ±10 %	18 ±10 %	900	50	1.5	70
P-885.91	5 x 5 x 36	32 ±10 %	38 ±10 %	950	25	3.1	40
P-887.31	7 x 7 x 13.5	11 ±20 %	13 ±20 %	1700	130	2.2	90
P-887.51	7 x 7 x 18	15 ±10 %	18 ±10 %	1750	100	3.1	70
P-887.91	7 x 7 x 36	32 ±10 %	38 ±10 %	1850	50	6.4	40
P-888.31	10 x 10 x 13.5	11 ±20 %	13 ±20 %	3500	267	4.3	90
P-888.51	10 x 10 x 18	15 ±10 %	18 ±10 %	3600	200	6.0	70
P-888.91	10 x 10 x 36	32 ±10 %	38 ±10 %	3800	100	13.0	40

Standard piezo ceramic type: 252

Standard electrical interfaces: 100 mm wire leads

*For optional solderable contacts, change order number extension to .x0 (e.g. P-882.10).

Recommended preload for dynamic operation: 15 MPa

Maximum preload for constant force: 30 MPa

Resonant frequency at 1 V_{pp}, unloaded, free at both sides. The value is halved for unilateral clamping

Capacitance at 1 V_{pp}, 1 kHz

Operating voltage: -30 to +130 V; the lifetime depends on the voltage applied

Operating temperature range: -40 to +150 °C

Standard Mechanical Interfaces: Ceramics

Available Options: strain gauge sensors, special mechanical interfaces, etc.

Other specifications on request.