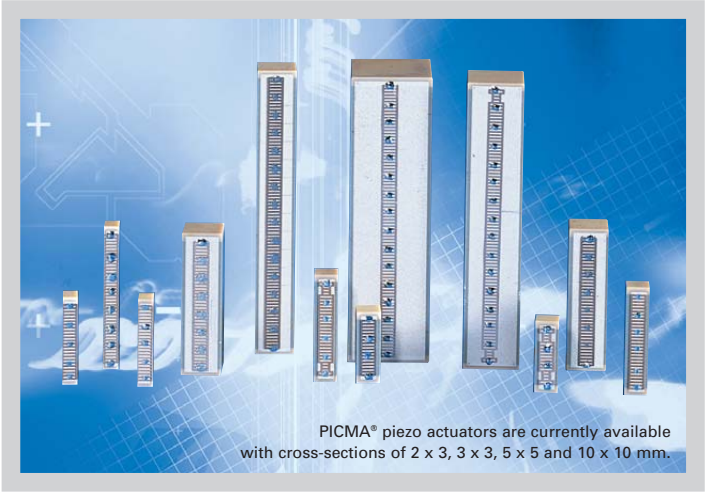
P-882 – P-888

PICMA® High-Performance Monolithic Multilayer Piezo Actuators (LVPZT)

>> Click http://www.pi.ws/fwd/Piezo-Actuator for the Latest Specs on these Products



PICMA® piezo actuators are currently available with cross-sections of 2 x 3, 3 x 3, 5 x 5 and 10 x 10 mm.

- **Award-Winning Technology**
- **Low Operating Voltage**
- **Superior Lifetime Even Under Extreme Conditions**
- **Very Large Operating-Temperature Range**
- **High Humidity Resistance**
- **Excellent Temperature Stability**
- **High Stiffness**
- **UHV Compatible to 10^{-9} hPa**
- **Sub-Millisecond Response & Sub-Nanometer Resolution**

Increased Lifetime and Higher Performance

PICMA® (PI Ceramic Monolithic Actuator) piezo 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 PZT 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. The actuators' monolithic design and special electrode structure was made possible by advances in production technology. This development is just one reflection of the more than 30 years experience PI has with thousands of industrial PZT applications.

Increased Lifetime Through Humidity Resistance

The monolithic ceramic-encapsulated design provides better humidity protection than polymer-film insulation. Diffusion of water molecules into the insulation layer, is greatly reduced by the use of cofired, outer ceramic encapsulation.

High-Level Dynamic Performance—Very Wide Temperature Range

The high Curie temperature of 320 °C gives PICMA® actuators a usable temperature range extending up to 150 °C. This means that they can be operated in hotter environments, or they can be driven harder in dynamic operation. 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—No Outgassing

The lack of polymer insulation and the high Curie temperature make for optimal ultra-high-vacuum compatibility (no outgassing / high bakeout temperatures, up to 150 °C)

Ideal for Closed-Loop Operation

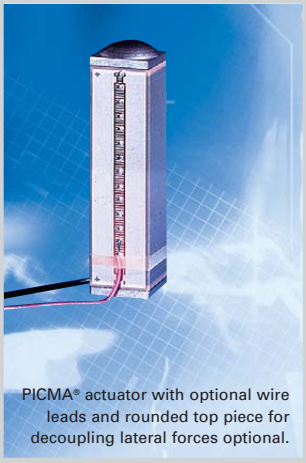
The ceramic surface of the actuators is extremely well suited for use with resistive or optical fiber strain gauge sensors. Such sensors can be easily applied to the actuator surface and exhibit significantly higher stability and linearity than with conventional polymer-insulated actuators.

Amplifiers, Drivers & Controllers

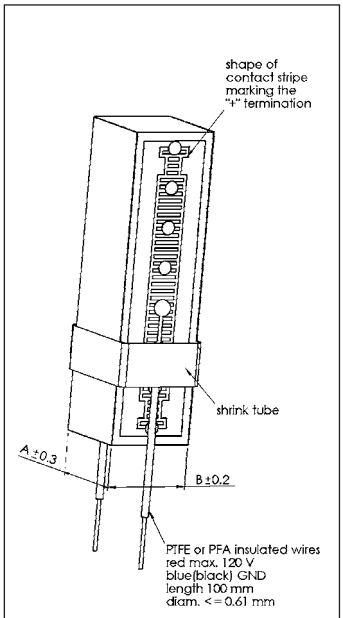
PI offers a wide range of control electronics for piezo actuators from low-power drivers to multichannel, closed-loop, digital controllers. Of course, PI also designs custom amplifiers and controllers.

Application Examples

- Precision mechanics and mechanical engineering
- Nanopositioning / high-speed switching
- Active and adaptive optics
- Vibration cancellation
- Pneumatic & hydraulic valves
- Metrology / interferometry
- Life sciences, medicine and biology



PICMA® actuator with optional wire leads and rounded top piece for decoupling lateral forces optional.



PICMA® dimensions, in mm

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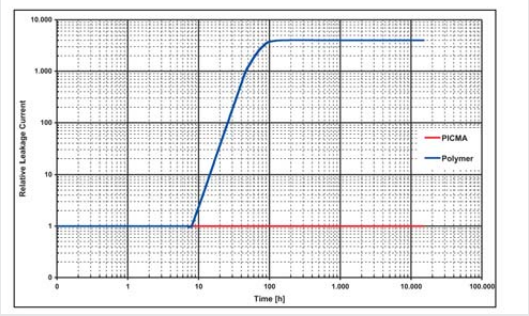
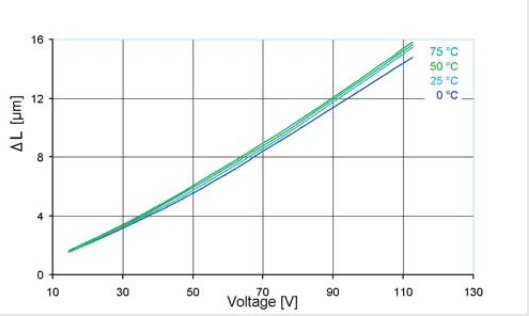


PICMA® piezo actuators (bottom curve) compared with conventional multilayer actuators with polymer insulation (top curve). PICMA® actuators are not affected by the high-humidity test conditions. Conventional piezo actuators exhibit increased leakage current after only a few hours. Leakage current is an indication of insulation quality and expected lifetime.
Test conditions: U = 100 V_{DC}; 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. (Operating frequency f = 200 Hz)

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-882.10	2 x 3 x 9	6.5 ±20%	8 ±20%	190	24	0.13	135
P-882.20	2 x 3 x11	8.5 ±20%	10.5 ±20%	210	20	0.18	110
P-882.30	2 x 3 x 13.5	11 ±20%	13 ±20%	210	16	0.22	90
P-882.50	2 x 3 x 18	15 ±10%	18 ±10%	210	12	0.31	70
P-883.10	3 x 3 x 9	6.5 ±20%	8 ±20%	290	36	0.21	135
P-883.20	3 x 3 x 11	8.5 ±20%	10.5 ±20%	310	29	0.27	110
P-883.30	3 x 3 x 13.5	11 ±20%	13 ±20%	310	24	0.35	90
P-883.50	3 x 3 x 18	15 ±10%	18 ±10%	310	18	0.48	70
P-885.10	5 x 5 x 9	6.5 ±20%	8 ±20%	800	100	0.6	135
P-885.20	5 x 5 x 11	8.5 ±20%	10.5 ±20%	850	82	0.8	110
P-885.30	5 x 5 x 13.5	11 ±20%	13 ±20%	870	67	1.1	90
P-885.50	5 x 5 x 18	15 ±10%	18 ±10%	900	50	1.5	70
P-885.90	5 x 5 x 36	32 ±10%	38 ±10%	950	25	3.1	40
P-887.30	7 x 7 x 13.5	11 ±20%	13 ±20%	1700	130	2.2	90
P-887.50	7 x 7 x 18	15 ±10%	18 ±10%	1750	100	3.1	70
P-887.90	7 x 7 x 36	32 ±10%	38 ±10%	1850	50	6.4	40
P-888.30	10 x 10 x 13.5	11 ±20%	13 ±20%	3500	267	4.3	90
P-888.50	10 x 10 x 18	15 ±10%	18 ±10%	3600	200	6.0	70
P-888.90	10 x 10 x 36	32 ±10%	38 ±10%	3800	100	13.0	40

Recommended preload for dynamic operation
15 to 30 MPa

* For optional PTFE insulated wires, pigtail length 100 mm, change order number extension to .x1 (e.g. P-882.11).

Unloaded (longitudinal) resonant frequency measured at 1 V_{pp}; capacitance at 1 V_{pp}, 1 kHz.

Standard PZT ceramic type:
PIC 252

Max. operating voltage:
-20 to +120 V
Max. operating temperature:
-40 to +150 °C

Standard Mechanical Interface:
ceramic (top & bottom)
Standard Electrical Interface:
solderable pads

Available Options: strain gauge sensors, special mechanical interfaces, etc.
Other specifications on request.
Specifications subject to change without notice.

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Piezo Actuator Selection Guides: PZT Stacks, Tubes, Shear, Bimorph, Rings, Disks ...

Piezo Flexure Stages | Piezo Linear Motors | Piezo Tip/Tilt Platforms | Piezo Ceramic Materials | Precision Actuator Overview |

>> Collapse Selection Guide Tables (quick overview)

>> Piezo Ceramic Stacks (unpackaged): Multilayer (PICMA®), High-Force PICA-Actuators, Miniature PZT Actuators

	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor
	P-882 - P-888	PICMA® Multilayer piezo stacks, cofired ceramic encapsulation, extreme lifetime, cross-sections: 2 x 3 to 10 x 10 mm	to 4000 / 20**	5, 9, 15, 30	-
	PL022 PL033 PL055	PICMA®-Chip. Smallest multilayer piezo actuators, from 2 x 2 x 2 mm	to 1000 / 5**	2, 3	-
	P-249	Compact Stack PZT Actuator	150 / 3**	5, 10	-
	P-007 - P-056	PICA™-Stack piezo actuators, wide variety, high-force capacity	to 80000 / 300**	5 to 300	optional
	P-010.xxP - P-056.xxP	PICA™-Power. stack actuators, wide variety, for high-level dynamics and high temperatures	to 80000 / 300**	5 to 300	optional

>> Small Piezo Stack Actuators With Steel Casing

>> Photonics Alignment Solutions
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>> Vacuum Hexapod

	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor
	P-810	Only 6 mm diameter, ferromagnetic end pieces	50 / 1	15, 30, 45	-
	P-820	Smallest preloaded piezo translator	50 / 10	15, 30, 45	-
	P-250	Piezo tip for micrometer	100 / 5	20	-
	P-830	Compact, ferromagnetic endpieces	1000 / 5	15, 30, 45, 60	-

>> Preloaded Piezo Stack Actuators for Medium Loads, with Position Sensor (optional)

	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor
	P-840 / P-841	Preloaded, optional ball tip	1000 / 50	15, 30, 45, 60, 90	SGS
	P-842 / P-843	Preloaded, higher tensile limit than P-840	800 / 300	15, 30, 45, 60, 90	SGS
	P-170 - P-178	Variety of tips available	2000 / 50	5, 10, 20, 40, 80	SGS

>> Scanning Microscopy Stage

	P-244 / P-245	Preloaded, long travel ranges	2000 / 300	10, 20, 40, 60, 80, 120	SGS

>> Preloaded High-load Piezo Stack Actuators, with Position Sensor (optional)

	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor
	P-844 / P-845	Preloaded, optional waterproof case	3000 / 700	15, 30, 45, 60, 90	SGS
	P-239	Preloaded, long travel ranges	4500 / 500	5, 10, 20, 40, 60, 100, 140, 180	SGS

>> Preloaded Ultra High-load Piezo Stack Actuators, with Position Sensor (optional)

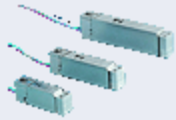
	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor
	P-242 / P-246, P-243 / P-247	Preloaded, (very) high stiffness, optional waterproof case.	12500 / 2000, 30000 / 3500	10, 20, 40, 60, 80, 120	SGS

>> Ultra-High-Precision Actuators with Flexure Guidance and Direct Metrology Sensors

	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor
	P-753	Flexure guidance, ultra-precise	100 / 20	12, 25, 38	Capacitive, directmetrology

>> Actuators with Long Travel Ranges (up to 1 mm) and Flexure Guidance

	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor

	P-290	Long-range piezo translator, 1 mm travel, with flexure guidance	50 / 10	1000	-
	P-287	Travel range to 0.7 mm, with flexure guidance, rotation to 12 mrad	80 / 10	700 µm, 12 mrad	-
	P-783	Closed-loop, with flexure guidance	20 / 10	300	LVDT
	P-601	Closed-loop, with flexure guidance	30 / 10	110, 300, 400	SGS

>> Shear Actuators: X, XY, XYZ

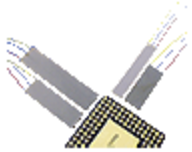
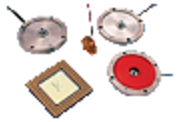
	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor
	P-111 - P-151	PICA™-Shear shear-effect actuator: Compact, X, XY, XYZ, e.g. for scanning-microscopy, optional clear aperture	10 to 300	1 to 10 x 10 x 10	-

>> Piezo Tube and Tubular Stack (Ring) Actuators

	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor
	P-010.xxH - P-025.xxH	PICA™-Thru ring actuators combine the advantages of piezo tubes with the high forces of stack actuators	to 60000 / 250**	5 to 300	optional
	PT120 - PT140	PT-Tube piezo tube actuators, minimum tolerances	0,1 / 0,1	4, 6, 8	-

>> Bender Actuators / Bimorph Actuators (travel ranges to 2 mm)

	Models*	Description	Compressive / Tensile Limits [N]	Travel [µm]	Sensor

	PL122 - PL140	PICMA® multilayer bender actuators, cofired ceramic encapsulation, low operating voltage	1 / 1	500, 900, 2000	-
	P-871	PICMA® multilayer bender actuators with position sensors	1 / 1	160 to 1600	-
	P-286, P-288, P-289	Disk translators (flat, long travel range)	10 / 5, 20 / 10	50, 100, 200	-

>> Linear Piezomotors and Long-Travel Actuators

* Ask about custom sizes, sensors or special designs.
** Preloading increases tensile force capacity
SGS = high-resolution strain gauge sensor LVDT = Linear Variable Differential Transformer

Piezo Ceramic Materials / Components .