

This product family has been replaced by the following new product families:

- >> P-212 / P-216 Preloaded Open & Closed-Loop PICA™ Power Piezo Actuators (HVPZT) with Sensor Option
- >> P-225 / P-235 Preloaded Open & Closed-Loop PICA™ Power Piezo Actuators (HVPZT) with Sensor Option

P-242 · P-243 · P-246 · P-247

Preloaded High-Load Piezo Actuators (HVPZT) with Sensor Option



- **Extremely High Stiffness**
- **Pushing Forces to 30,000 N**
- **Pulling Forces to 3500 N**
- **Travel Range to 120 µm**
- **Options: Versions for Vacuum, High- and Low-Temperatures and with Water-Resistant Case**

P-242, P-243, P-246 and P-247 are preloaded, high-load piezo actuators for static and dynamic applications. They provide sub-millisecond response and sub-nanometer resolution.

Design

The P-246.xx, P-247.xx, P-242.30, P-243.30, P-242.40

and P-243.40 models come with a stainless steel case with integrated, frictionless preload. The other models come with an aluminum case, stainless steel end pieces and spring bolts providing the preload. The high load capacity and internal spring preload makes them ideal for machining applications and active vibration cancellation.

The ceramic layers in the P-246 and P-247 models are double in number and thinner than those in the P-242 / P-243 models, thus providing larger travel ranges in the same size package. For maximum lifetime, voltages in excess of 750 V should be applied only for short durations.

High Accuracy in Closed-Loop Operation

The standard models are designed for open-loop opera-

tion. The factory-installed P-177.10 option of integrated high-resolution SGS position sensors is recommended for high accuracy through position servo-control (for more information, see "Tutorial: Piezo-electrics in Positioning," p. 4-31 ff.).

Options †:

P-177.10

SGS position sensors, p. 1-44

P-702.10

High-temperature option, p. 1-44

P-702.20

Low-temperature option, p. 1-44

P-703.20

High-vacuum option, p. 1-44

P-706.00

Water-resistant cases, see page 1-44 (not for P-242.10, P-242.20, P-243.10 or P-243.20)

To order an actuator with options, change the last digit of the actuator order number to "7" (e.g. P-243.10 to P-243.17) and then list the desired options separately.

Accessories

Extension cables with connectors: see page 6-56 in the "Piezo Drivers & Nanopositioning Controllers" section.

Note

High-resolution amplifiers and servo-control electronics, both digital and analog, are described in the "Piezo Drivers & Nanopositioning Controllers" section, page 6-8 ff.

Technical Data and Product Order Numbers

Order number (case, see drawing)	Open-loop travel @ 0 V to -1000 V [µm] ±20%	Closed-loop travel [µm]	Integrated position sensor*	Resolution closed-loop / open-loop [nm]**
P-242.10 (A)	10	10	*SGS	0.2* / 0.1
P-242.20 (A)	20	20	*SGS	0.4* / 0.2
P-242.30 (B)	40	40	*SGS	0.8* / 0.4
P-242.40 (B)	60	60	*SGS	1.2* / 0.6
P-246.20 (B)	20	20	*SGS	0.4* / 0.2
P-246.30 (B)	40	40	*SGS	0.8* / 0.4
P-246.50 (B)	80	80	*SGS	1.6* / 0.8
P-246.70 (B)	120	120	*SGS	2.4* / 1.2
P-243.10 (A)	10	10	*SGS	0.2* / 0.1
P-243.20 (A)	20	20	*SGS	0.4* / 0.2
P-243.30 (B)	40	40	*SGS	0.8* / 0.4
P-243.40 (B)	60	60	*SGS	1.2* / 0.6
P-247.20 (B)	20	20	*SGS	0.4* / 0.2
P-247.30 (B)	40	40	*SGS	0.8* / 0.4
P-247.50 (B)	80	80	*SGS	1.6* / 0.8
P-247.70 (B)	120	120	*SGS	2.4* / 1.2
Notes see page 1-46	A4	A6	B	C2

Application Examples

- Precision engineering / micromechanisms
- Adaptive mechanics
- Active vibration control
- Active structures (adaptronics)
- Static and dynamic precision positioning
- Force generation / materials testing

For more examples, see page 1-5

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Piezo • Nano • Positioning



Technical drawings showing dimensions and sensor options for piezo actuators. The left drawing shows a side view with dimensions: $\varnothing A \pm 0.15$, $\varnothing B$, M8, 7, 7.5, C, L ± 0.5 , 7, 11, Option Sensor, A, $\varnothing B$. The right drawing shows a top view with dimensions: SW, Position random / undef., $\varnothing B$ 0/-0.05, L ± 0.5 , 10, A, M8, Option Sensor P-24x.x.S, 6, 18.5, Piezo, 7, M8, SW27, $\varnothing A$ 0/-0.1, $\varnothing B$ 0/-0.1.

	$\varnothing A$	$\varnothing B$	C	L		$\varnothing A$	$\varnothing B$	C	L
P-242.10	40	23	20.7	41.4	P-243.10	50	30	20.7	41.4
P-242.17*	40	23	15.2	41.4	P-243.17*	50	30	15.2	41.4
P-242.20	40	23	31.3	62.5	P-243.20	50	30	31.3	62.5
P-242.27*	40	23	31.3	62.5	P-243.27*	50	30	31.3	62.5

*Option Sensor P-177.10

	$\varnothing A$	$\varnothing B$	SW	L		$\varnothing A$	$\varnothing B$	SW	L
P-246.2x	39.8	16	13	53.5	P-247.2x	49.8	20	17	56
P-246.3x	39.8	16	13	70.5	P-247.3x	49.8	20	17	73
P-242.3x/P-246.5x	39.8	16	13	114	P-243.3x/P-247.5x	49.8	20	17	116.5
P-242.4x/P-246.7x	39.8	16	13	141.5	P-243.4x/P-247.7x	49.8	20	17	144

P-242 or P-243, Case A: dimensions in mm; end pieces of non-magnetizable stainless steel, case Al; max. torque at tip: 1.5 Nm for P-242/P-246, 2 Nm for P-243/P-247

P-242/P-246 and P-243/P-247, Case B: dimensions in mm, end pieces and case of non-magnetizable stainless steel; max. torque at tip: 1.5 Nm for P-242/P-246, 2 Nm for P-243/P-247

Piezo Actuators

Nanopositioning & Scanning Systems

Active Optics / Steering Mirrors

Tutorial: Piezo-electrics in Positioning

Capacitive Position Sensors

Piezo Drivers & Nanopositioning Controllers

Hexapods / Micropositioning

Photonics Alignment Solutions

Motion Controllers

Ceramic Linear Motors & Stages

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Static large-signal stiffness [N/ μ m] $\pm 20\%$ ***	Push / pull force capacity [N]	Max. operating voltage [V]	Electrical capacitance [nF] $\pm 20\%$	Dynamic operating current coefficient [μ A/(Hz x μ m)]	Resonant frequency (unloaded) [kHz] $\pm 20\%$	Weight without cable [g] $\pm 5\%$	Recommended amplifier / controller (codes explain p. 1-3)
580	12500 / 2000	-1500	180	22	11	280	B, I, J
290	12500 / 2000	-1500	360	22	8	360	B, I, J
150	12500 / 2000	-1500	666	22	4.5	720	B, I, J
110	12500 / 2000	-1500	900	22	3.5	830	B, I, J
700	12500 / 2000	-1000	613	38	8	540	B, I, J
350	12500 / 2000	-1000	1150	38	6.5	600	B, I, J
180	12500 / 2000	-1000	2200	38	4	720	B, I, J
120	12500 / 2000	-1000	3280	38	3	830	B, I, J
1130	30000 / 2000	-1500	360	45	11	460	B, I, J
560	30000 / 2000	-1500	720	45	8	630	B, I, J
290	30000 / 2000	-1500	1330	45	5	850	B, I, J
210	30000 / 2000	-1500	1800	45	3.5	960	B, I, J
1280	30000 / 3500	-1000	1220	76	8	580	B, I, J
680	30000 / 3500	-1000	2300	76	6.5	660	B, I, J
360	30000 / 3500	-1000	4400	76	4.5	830	B, I, J
240	30000 / 3500	-1000	6560	76	3	960	B, I, J
D1	D3	A7	F1	F2	G2	K	

* Requires SGS sensor option, P-177.10. SGS versions can attain closed-loop linearity up to 0.2% and are shipped with performance reports.

Sensor connection: LEMO FFA.0S.304; 1 m coaxial cable with PUR insulation.

** The resolution of piezo actuators is not limited by stiction or friction. Value given is noise equivalent motion with E-507 amplifier.

*** Dynamic small-signal stiffness is $\sim 50\%$ higher.

Voltage connection: LEMO FFA.0A.250, 1 m coaxial cable, RG 174, PVC-insulation.

Temperature range: -40 to 80 °C.