

# P-840 · P-841 Preloaded Piezo Actuators

## Optional with Integrated Position Sensor



P-840, P-841 piezo translators (DIP switch for size comparison)

- Outstanding Lifetime Due to PICMA® Piezo Ceramic Stacks
- Travel Range to 90 µm
- Compact Case
- Pushing Forces to 1000 N
- Pulling Forces to 50 N
- Sub-Millisecond Response, Sub-Nanometer Resolution
- Versions: with Ball Tip, Vacuum Versions

The P-840 and P-841 series translators are high-resolution linear actuators for static and dynamic applications. They provide sub-millisecond response and sub-nanometer resolution.

### Application Examples

- Static and dynamic Precision positioning
- Disc-drive-testing
- Adaptronics
- Smart structures
- Active vibration control
- Switches
- Laser tuning
- Patch-Clamp
- Nanotechnology

### Design

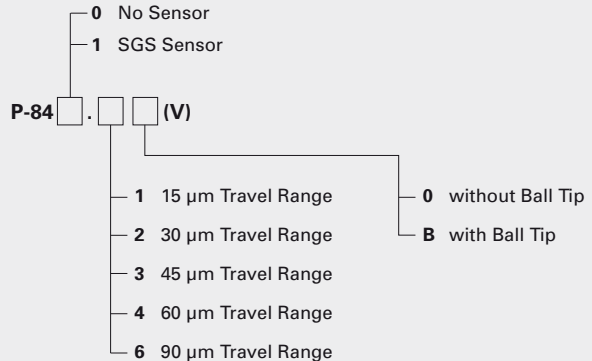
These translators are equipped with highly reliable multilayer piezo ceramic stacks protected by a non-magnetic stainless steel case with internal spring preload. The preload makes them ideal for dynamic applications and for tensile loads as well.

### Ceramic Insulated Piezo Actuators Provide Long Lifetime

The highest possible reliability is assured by employing the award-winning PICMA® multilayer piezo actuators. PICMA® actuators are the only actuators on the market with a ceramic-only insulation, which makes them resistant to ambient humidity and leakage-current failures. They are thus far superior to conventional actuators in reliability and lifetime.

### Ordering Information

#### Preloaded Piezo Actuator, 1000/50 N



V: Vacuum Compatible to 10<sup>-6</sup> hPa

### Optimum UHV Compatibility – Minimum 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).

### Mounting

Mounting is at the foot, with push/pull forces of less than 5 N, the actuator can be held by clamping the case. The versions with ball tip decouple torque and off-center forces from the piezoceramic.

To provide magnetic coupling, the P-176.20 magnetic adapter can be screwed into the top piece (only for versions without ball tip).

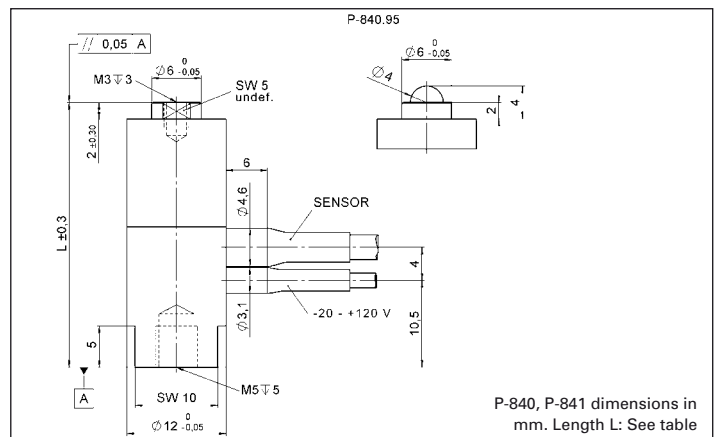
Read details in Mounting and Handling Guidelines (p. 1-67).

### High Accuracy in Closed-Loop Operation

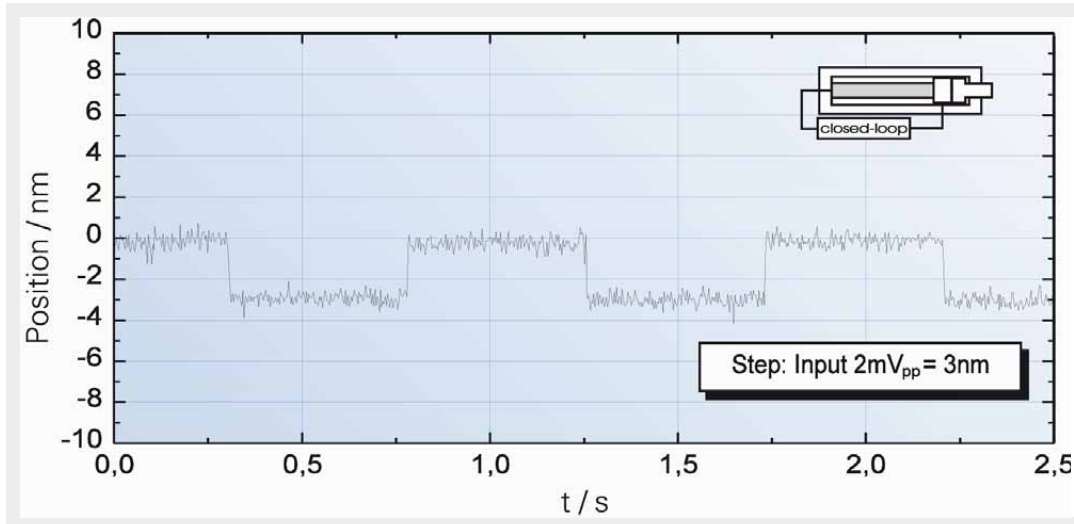
The standard model P-840 is designed for open-loop positioning. Version P-841 with integrated high-resolution strain gauge position sensors provides high precision for closed-loop operation (further details see p. 2-199).

### Piezo Drivers, Controllers & Amplifiers

High-resolution amplifiers and servo-control electronics, both digital and analog, are described in the “Piezo Drivers / Servo Controllers” (see p. 2-99) section.



P-840, P-841 dimensions in mm. Length L: See table



Response of a P-841.10 to a 3 nm peak-to-peak square wave control input signal, measured with servo-control bandwidth set to 240 Hz and 2 msec setting time.

### Linear Actuators & Motors

PiezoWalk® Motors / Actuators

PLLine® 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

Model	P-841.1 P-840.1	P-841.2 P-840.2	P-841.3 P-840.3	P-841.4 P-840.4	P-841.6 P-840.6	Units
Open-loop travel @ 0 to 100 V	15	30	45	60	90	$\mu\text{m} \pm 20\%$
Closed-loop travel	15 / -	30 / -	45 / -	60 / -	90 / -	$\mu\text{m}$
Integrated feedback sensor*	SGS / -	SGS / -	SGS / -	SGS / -	SGS / -	
Closed-loop / open-loop resolution**	0.3 / 0.15	0.6 / 0.3	0.9 / 0.45	1.2 / 0.6	1.8 / 0.9	nm
Static large-signal stiffness***	57	27	19	15	10	$\text{N}/\mu\text{m} \pm 20\%$
Pushing forces to 1000 N	1000	1000	1000	1000	1000	N
Pulling forces to 50 N	50	50	50	50	50	N
Max. torque limit (on tip)	0.35	0.35	0.35	0.35	0.35	Nm
Electrical capacitance	1.5	3.0	4.5	6.0	9.0	$\mu\text{F} \pm 20\%$
Dynamic operating current coefficient (DOCC)	12.5	12.5	12.5	12.5	12.5	$\mu\text{A} / (\text{Hz} \cdot \mu\text{m})$
Unloaded resonant frequency $f_0$	18	14	10	8.5	6	$\text{kHz} \pm 20\%$
Operating temperature	-20 to +80	-20 to +80	-20 to +80	-20 to +80	-20 to +80	$^{\circ}\text{C}$
Mass without cables	20	28	46	54	62	$\text{g} \pm 5\%$
Material: case, end pieces	N-S	N-S	N-S	N-S	N-S	
Length L	32	50	68	86	122	$\text{mm} \pm 0.3$

\*Closed-loop models can attain linearity up to 0.15% and are shipped with performance reports.

\*\*Resolution of piezo actuators is not limited by stiction or friction. Value given is noise equivalent motion with E-503 amplifier. (p. 2-146)

\*\*\*Dynamic small-signal stiffness is ~ 30% higher.

Voltage connection: LEMO FFA.00.250. Coaxial cable, RG 178, 1 m.

Sensor connector: LEMO FFA.0S.304. Coaxial cable, 1 m.

Recommended amplifiers / controllers

Single-channel: E-610 servo-controller / amplifier (p. 2-110), E-625 servo-controller, bench-top (p. 2-114), E-621 controller module (p. 2-160)

Modular piezo controller system E-500 (p. 2-142) with amplifier module E-505 (high-power) (p. 2-147) and E-509 controller (p. 2-152) (optional)

Multi-channel: modular piezo controller system E-500 (p. 2-142) with amplifier module E-503 (three channels) (p. 2-146) or E-505 (1 per axis, high-power) (p. 2-147) and E-509 controller (p. 2-152) (optional)