The flexure-guided, lever-amplified PiezoMove™ P-601 actuators provide large vertical travel ranges up to 400 μm, fast response and high positioning accuracy in a very small package. With settling times of only a few milliseconds and a resolution in the sub-nanometer range they are well suited for both static and dynamic applications.

P-601 PiezoMove™ lever-amplified actuators cover the range between direct-driven pre-loaded piezo translators, such as the P-840 series (see p. 1-74) and single-axis nanopositioning stages, like the P-611 series (see p. 2-20). Compared to direct-driven piezo translators, lever-amplified actuators offer larger travel ranges and much higher lateral stiffness and guiding precision. Compared to single-axis nanopositioning stages, they offer significantly smaller sizes. PiezoMove™ lever-amplified actuators feature a resolution to 0.2 nm and a repeatability to 8 nm.

OEM Actuator with Integrated Guidance
With their highly precise, frictionless flexure guidance, a very high stiffness and excellent straightness of motion are achieved. Together with their small dimensions and the cost-effective design, the P-601 lever amplified actuators are especially suited for OEM applications. Versions with strain-gauge sensors (SGS) are equipped with a full bridge circuit that is insensitive to thermal drift. Versions without sensors are also available for open-loop applications such as in high-speed switches and pumps. In addition to the standard steel models, special invar and non-magnetic versions are available on request.

Ceramic Insulated Piezo Actuators Provide Long Lifetime
Highest possible reliability is assured by the use of award-winning PICMA® multilayer piezo actuators. PICMA® actuators are the only actuators on the market with 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.

Application Example
- Nanopositioning
- Imaging
- High-speed switching
- Patch clamp
- Micro-dispensing
- Semiconductor testing
- Adaptronics / Automation
- Photonics / integrated optics
- Biotechnology

Ordering Information

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>P-601.1S</td>
<td>PiezoMove™ OEM Flexure-Guided, Lever-Amplified Actuator, 100 μm, SGS-Sensor</td>
</tr>
<tr>
<td>P-601.3S</td>
<td>PiezoMove™ OEM Flexure-Guided, Lever-Amplified Actuator, 250 μm, SGS-Sensor</td>
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<tr>
<td>P-601.4S</td>
<td>PiezoMove™ OEM Flexure-Guided, Lever-Amplified Actuator, 400 μm, SGS-Sensor</td>
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<tr>
<td>P-601.1SL</td>
<td>PiezoMove™ OEM Flexure-Guided, Lever-Amplified Actuator, 100 μm, SGS-Sensor, LEMO Connector</td>
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<tr>
<td>P-601.3SL</td>
<td>PiezoMove™ OEM Flexure-Guided, Lever-Amplified Actuator, 250 μm, SGS-Sensor, LEMO Connector</td>
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<tr>
<td>P-601.4SL</td>
<td>PiezoMove™ OEM Flexure-Guided, Lever-Amplified Actuator, 400 μm, SGS-Sensor, LEMO Connector</td>
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<td>P-601.10</td>
<td>PiezoMove™ OEM Flexure-Guided, Lever-Amplified Actuator, 100 μm, Open-Loop</td>
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<tr>
<td>P-601.30</td>
<td>PiezoMove™ OEM Flexure-Guided, Lever-Amplified Actuator, 250 μm, Open-Loop</td>
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<td>P-601.40</td>
<td>PiezoMove™ OEM Flexure-Guided, Lever-Amplified Actuator, 400 μm, Open-Loop</td>
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</table>

P-601 dimensions in mm

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Technical Data

<table>
<thead>
<tr>
<th>Model</th>
<th>P-601.1S</th>
<th>P-601.3S</th>
<th>P-601.4S</th>
<th>P-601.x0</th>
<th>Units</th>
<th>Tolerance</th>
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<td>Z</td>
<td>Z</td>
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</table>

### Motion and positioning

- **Integrated sensor**: SGS, SGS, SGS, –
- **Open-loop travel, -20 to +120 V**: 100, 250, 400, as P-601.xS μm min. (+20%/-0%)
- **Closed-loop travel**: 100, 250, 400, – μm calibrated
- **Open-loop resolution**: 0.2, 0.3, 0.4, as P-601.xS nm typ.
- **Closed-loop resolution**: 2, 6, 12, – nm typ.
- **Linearity, closed-loop**: 0.1, 0.3, 0.3, – % typ.
- **Repeatability**: 8, 10, 30, – nm typ.
- **Runout θx, θy**: 20 / 10, 20 / 10, 20 / 10, as P-601.xS μrad typ.

### Mechanical properties

- **Stiffness in motion direction**: 0.8, 0.38, 0.28, as P-601.xS N/μm ±20%
- **Unloaded resonant frequency**: 750, 440, 350, as P-601.xS Hz ±20%
- **Resonant frequency @ 30 g**: 620, 350, 290, as P-601.xS Hz ±20%
- **Push/pull force capacity in motion direction**: 30/10, 20/10, 15/10, as P-601.xS N Max.
- **Lateral force**: 30, 30, 30, as P-601.xS N Max.

### Drive properties

- **Ceramic type**: PICMA® P-885, PICMA® P-885, PICMA® P-885 as P-601.xS
- **Electrical capacitance**: 1.5, 3.1, 4.6, as P-601.xS μF ±20%
- **Dynamic operating current coefficient**: 1.9, 1.6, 1.4, as P-601.xS μA/(Hz·μm) ±20%

### Miscellaneous

- **Operating temperature range**: -20 to 80, -20 to 80, -20 to 80 °C
- **Material**: Stainless steel, Stainless steel, Stainless steel
- **Mass without cables**: 0.05, 0.08, 0.11 as P-601.xS kg ±5%
- **Cable length**: S-version: 0.3, S-version: 0.3, S-version: 0.3, 0.3 m ±10 mm

<table>
<thead>
<tr>
<th>Sensor / voltage connection</th>
<th>S-version:</th>
<th>S-version:</th>
<th>S-version:</th>
<th>Open leads</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>open leads</td>
<td>open leads</td>
<td>open leads</td>
<td>(no sensor)</td>
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<tr>
<td></td>
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<td>LEMO</td>
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</table>

Recommended controller / amplifier: E-610 controller / amplifier (p. 2-110), E-625 bench-top controller (p. 2-114)