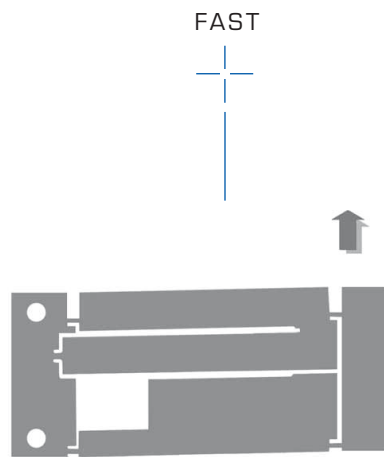
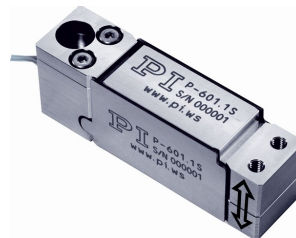


Piezo Flexure Positioners / Actuators

Zero Wear, High Speed, Affordable Precision



PRECISE

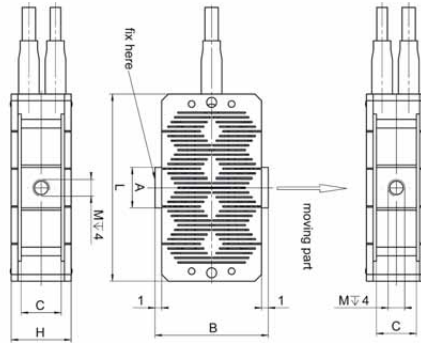


INDIVIDUAL

P-602 High Stiffness Flexure Actuators, to 1000 μm Integrated Guiding System, High Force and Large Travel Ranges



P-602 linear actuator family featuring travel ranges of 100, 500, and 1000 μm (from left to right)



	L	B	H
P-602.1xx	28	17	9
P-602.3xx	46	19	9
P-602.5xx	85	26	9
P-602.8xx	126	34	14
P-602.1x8	28	22	14
P-602.3x8	46	24	14
P-602.5x8	85	31	14

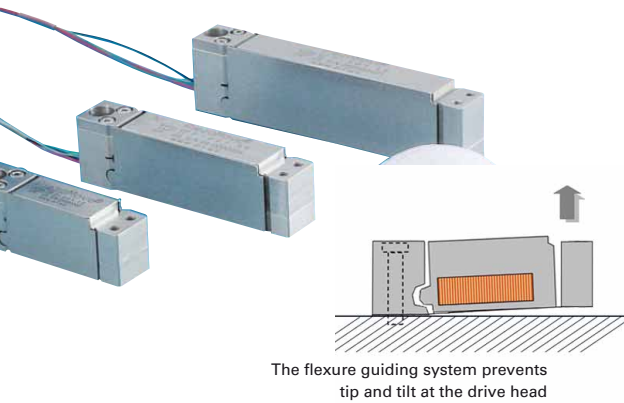
	M	A	C
P-602.1xx	M2,5	6	6
P-602.3xx	M2,5	6	6
P-602.5xx	M2,5	6	6
P-602.8xx	M2,5	6	6
P-602.1x8	M4	10	11
P-602.3x8	M2,5	6	11
P-602.5x8	M2,5	6	11

- Frictionless Flexure Guiding System for Straight Motion
- Integrated Motion Amplifier for Travel Ranges to 1 mm
- High Dynamics and Stiffness, Forces to 400 N, Backlash-Free Construction
- Outstanding Lifetime Due to PICMA® Piezo Actuators
- Available with Integrated Position Sensor
- Custom Designs with Larger Travel or Faster Response and Non-Magnetic Versions Feasible

Model	P-602.100 P-602.1S0 P-602.1SL	P-602.300 P-602.3S0 P-602.3SL	P-602.500 P-602.5S0 P-602.5SL	P-602.108 P-602.1S8 P-602.1L8	P-602.308 P-602.3S8 P-602.3L8	P-602.508 P-602.5S8 P-602.5L8	P-602.800 P-602.8S0 P-602.8SL	Units	Tolerance
Active axes	X	X	X	X	X	X	X		
Motion and positioning									
Integrated sensor	- / SGS / SGS	- / SGS / SGS	- / SGS / SGS	- / SGS / SGS	- / SGS / SGS	- / SGS / SGS	- / SGS / SGS		
Open-loop travel, -20 to +120 V	120	300	600	100	300	500	1000	μm	min. (+20%/-0)
Closed-loop travel	- / 100 / 100	- / 300 / 300	- / 500 / 500	- / 100 / 100	- / 300 / 300	- / 500 / 500	- / 1000 / 1000	μm	
Open-loop resolution	0.2	0.3	0.4	0.2	0.3	0.4	0.5	nm	typ.
Closed-loop resolution	- / 2 / 2	- / 3 / 3	- / 3 / 3	- / 2 / 2	- / 3 / 3	- / 3 / 3	- / 7 / 7	nm	typ.
Linearity, closed-loop	- / 0.5 / 0.5	- / 0.5 / 0.5	- / 0.5 / 0.5	- / 0.5 / 0.5	- / 0.5 / 0.5	- / 0.5 / 0.5	- / 1.5 / 1.5	%	typ.
Repeatability	- / 10 / 10	- / 20 / 20	- / 35 / 35	- / 10 / 10	- / 20 / 20	- / 35 / 35	- / 60 / 60	nm	typ.
Mechanical properties									
Stiffness in motion direction	0.8	0.35	0.3	2.3	0.75	0.65	0.4	N/ μm	$\pm 20\%$
Unloaded resonant frequency	1000	450	230	1000	450	230	150	Hz	$\pm 20\%$
Blocking force	80	105	150	230	225	325	400	N	max.
Drive properties									
Ceramic type	PICMA® P-885	PICMA® P-885	PICMA® P-885	PICMA® P-888	PICMA® P-888	PICMA® P-888	PICMA® P-888		
Electrical Capacitance	1.5	3.1	6.2	6	13	26	39	μF	$\pm 20\%$
Dynamic operating current coefficient	1.9	1.3	1.6	7.5	5	6	4	$\mu\text{A}/(\text{Hz}\cdot\mu\text{m})$	$\pm 20\%$
Miscellaneous									
Operating temperature range	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	-20 to 80	$^{\circ}\text{C}$	
Material	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel	Stainless steel		

P-601 PiezoMove™ Flexure-Actuator

Flexure-Guided OEM Piezo Actuator with Long Stroke to 400 µm



- Flexure Guidance for Frictionless, Ultra-Straight Motion
- Travel Ranges to 400 µm
- Resolution to 0.2 nm
- High Dynamics and Stiffness
- Custom Designs with Longer Travel or Faster Response and Non-Magnetic Versions Feasible
- Outstanding Lifetime Due to PICMA® Piezo Actuators
- Choice of Closed-Loop and Open-Loop Models
- Ideal OEM Actuator for Precision Motion Control in Optics, Medical, Biotech and Microfluidics Applications

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.

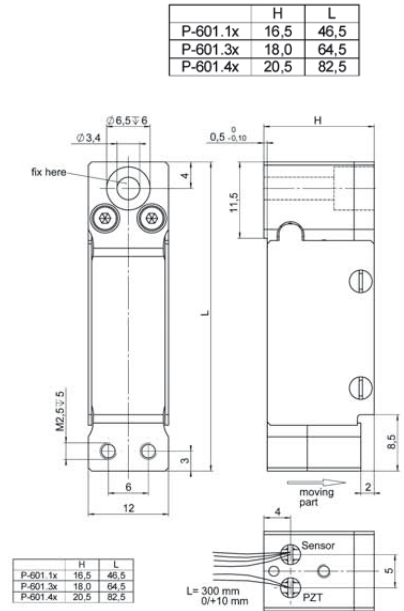
P-601 PiezoMove™ lever-amplified actuators cover the range between direct-driven pre-loaded piezo translators, such as the P-840 series (see p. 1-74) and single-axis nanopositioning stages, like the P-611 series (see p. 2-20). Compared to direct-driven piezo translators, lever-amplified actuators offer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

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

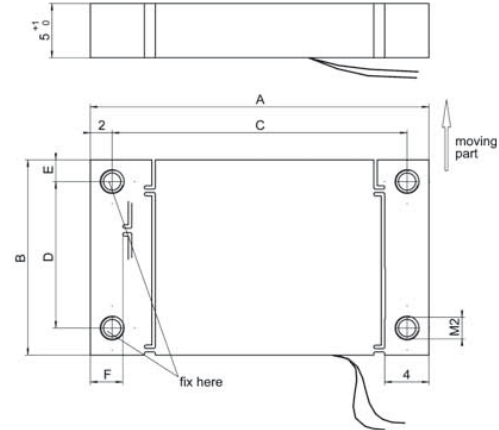
Highest possible reliability is assured by the use of award-winning PICMA® multilayer piezo actuators.



	P-601.1S P-601.1SL	P-601.4S P-601.4SL	Units
Active axes	Z	Z	s
Motion and positioning			
Integrated sensor	SGS	SGS	
Open-loop travel, -20 to +120 V	100	400	µm
Closed-loop travel	100	400	µm
Open-loop resolution	0.2	0.4	nm
Closed-loop resolution	2	12	nm
Linearity, closed-loop	0.1	0.3	%
Repeatability	8	30	nm
Runout θ_x, θ_y	20 / 10	20 / 10	µrad
Mechanical properties			
Stiffness in motion direction	0.8	0.28	N/µm
Unloaded resonant frequency	750	350	Hz
Resonant frequency @ 30 g	620	290	Hz
Push/pull force capacity in motion direction	30/10	15/10	N
Lateral force	30	30	N
Drive properties			
Ceramic type	PICMA® P-885	PICMA® P-885	
Electrical capacitance	1.5	4.6	µF
Miscellaneous			
Operating temperature range	-20 to 80	-20 to 80	°C
Material	Stainless steel	Stainless steel	
Mass without cables	0.05	0.11	kg
Cable length	S-version: 0.3 SL-version: 1.5	S-version: 0.3 SL-version: 1.5	m
Sensor / voltage connection	S-version: open leads SL-version: LEMO	S-version: open leads SL-version: LEMO	

P-603 PiezoMove Linear Flexure Actuator

Low-cost and with Large Travel Ranges



	A	B	C	D	E	F
P-603.1xx	31	18	27	13,5	2	3
P-603.3xx	51	20	47	13,5	3,25	3,5
P-603.5xx	60	20	56	16	2	3

P-603 linear actuators with 500 and 100 μm travel range (from left to right). CD for size comparison

- Frictionless, High-Precision Flexure Guiding System
- Travel Ranges to 500 μm
- Cost-Effective Design
- Outstanding Lifetime Due to PICMA® Piezo Actuators
- Available with Integrated Position Sensor
- Ideal OEM Actuators for Precision Motion Control in Optics, Medical, Biotech and Microfluidics Applications
- Custom Designs with Larger Travel or Faster Response and Non-Magnetic Versions Feasible

P-603 PiezoMove flexure-guided piezo actuators integrate a frictionless high-efficiency motion amplifier to combine large travel ranges up to 500 μm with high stiffness and very fast response. The flexure guides reduce tip at the drive head to a minimum saving the cost for additional guiding systems when integrating these actuators in micro-dispensing devices, pumps or servo valves. The overall precision of 10s of nanometers also makes these devices ideal for nanomanipulation applications.

Options and Custom Versions

For OEM applications, PiezoMove actuators can be modified in various ways to suit the customer's requirements. The stiffness and force generation can be influenced via the lever design and the dimensions of the piezo ceramics used in the actuator.

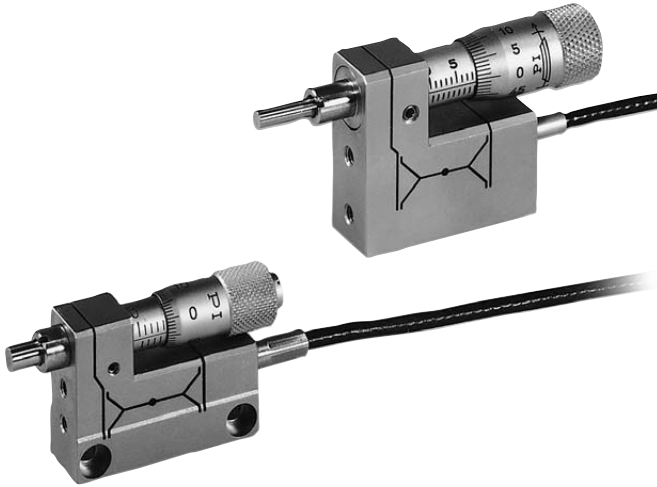
Technical Data (preliminary)

Model	P-603.1S0 P-603.1SL	P-603.3S0 P-603.3SL	P-603.5S0 P-603.5SL	P-603.x00 open-loop versions	Units
Active axes	X	X	X	X	
Motion and positioning					
Integrated sensor	SGS	SGS	SGS	–	
Open-loop travel, -20 to +120 V	100	300	550	as P-603.xS0	μm
Closed-loop travel	100	300	500	–	μm
Open-loop resolution	0.2	0.3	0.4	as P-603.xS0	nm
Closed-loop resolution	2	4	7.5	–	nm
Linearity, closed-loop	0.3	0.3	0.3	–	%
Repeatability	8	10	30	–	nm
Mechanical properties					
Stiffness in motion direction	0.25	0.14	0.06	as P-603.xS0	N/ μm
Unloaded resonant frequency	900	450	300	as P-603.xS0	Hz
Blocking force	20	35	25	as P-603.xS0	N
Drive properties					
Ceramic type	PICMA® P-885	PICMA® P-885	PICMA® P-885	PICMA® P-885	
Electrical Capacitance	1.5	3.1	3.7	as P-603.xS0	μF
Dynamic operating current coefficient	1.9	1.3	1.6	as P-603.xS0	$\mu\text{A}/(\text{Hz}\cdot\mu\text{m})$
Miscellaneous					
Operating temperature range	-20 to 80	-20 to 80	-20 to 80	-20 to 80	$^{\circ}\text{C}$
Material	Stainless steel	Stainless steel	Stainless steel	Stainless steel	
Dimensions	31x18x5	50x20x5	51x20x5	as P-603.xS0	mm
Mass	0.02 / 0.031	0.032 / 0.043	0.038 / 0.049	as P-603.xS0	kg
Cable length	0.5	0.5	0.5	0.5	m
Sensor / voltage connection	S-version: open leads SL-version: LEMO connector (SGS Sensor)	S-version: open leads SL-version: LEMO connector (SGS Sensor)	S-version: open leads SL-version: LEMO connector (SGS Sensor)	Open leads	

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

P-853 · P-854

PiezoMike: Piezoelectric Micrometer Drive



P-853 (left), P-854 (right)

- Alternative for Standard Micrometer Drives
- Manual Travel to 18 mm
- Piezoelectric High-Resolution Travel to 25 μm
- Sub-Nanometer Resolution
- Dynamic Operation to 10 Hz

P-853/P-854 PiezoMikes are micrometer drives with integrated high-resolution piezo linear drives. They can be operated manually, like standard micrometer drives. Sensitivity of the micrometer is 1 μm . By controlling the piezo voltage, the micrometer tip is automatically moved in and out (up to 25 μm) relative to the manually set position. Resolution of the piezoelectric motion is in the sub-nanometer range. The PiezoMike can therefore be used as a remotely controlled fine positioning element.

Working Principle

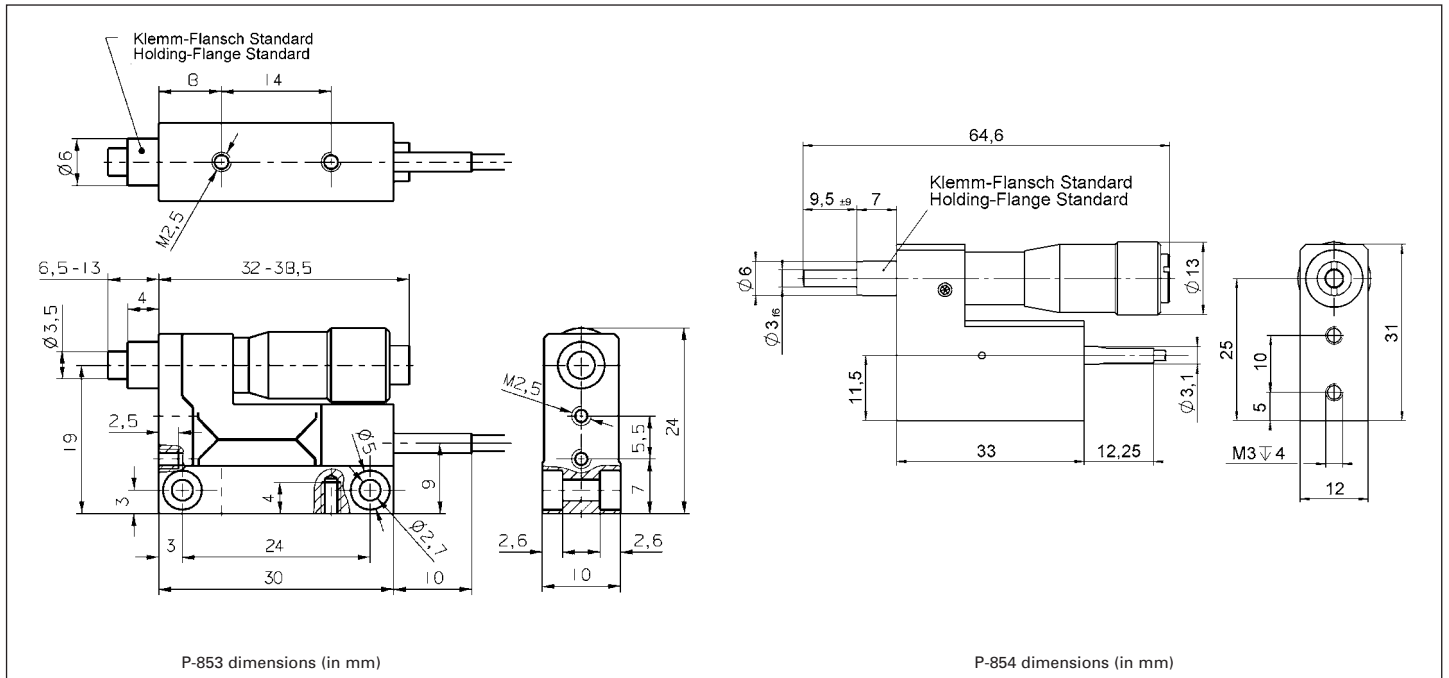
A sophisticated wire EDM (electric discharge machining) flexure motion amplifier doubles the displacement of a piezo linear actuator. It also serves as a linear guide to the micrometer drive, which is moved back and forth when the piezo drive voltage is changed. This design is compact and mechanically stable.

Ordering Information

P-853.00
PiezoMike, Piezoelectric Micrometer Drive, 6 mm, 25 μm

P-854.00
PiezoMike, Piezoelectric Micrometer Drive, 18 mm, 25 μm

Ask about custom designs!



Program Overview

- Piezo Ceramic Actuators & Motors
- Piezo Nanopositioning Systems and Scanners
- Active Optics / Tip-Tilt Platforms
- Capacitive Nanometrology Sensors
- Piezo Electronics: Amplifiers and Controllers
- Hexapod 6-Axis Positioners / Robots
- Micropositioning Stages & Actuators
- Photonics Alignment Systems, Solutions for Telecommunications
- Motor Controllers
- Ultrasonic Linear Motors

Request or download the complete PI Nanopositioning & Piezo Actuator Catalog



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