

P-737 PIFOC® Specimen-Focusing Z Stage

Low-Profile, Long-Range Piezo Z Nanopositioner for Microscopy Samples



P-737 piezo Z-stage for high-resolution microscopy

- High-Speed Piezo Z-Motion with Travel Ranges up to 500 μm
- Resolution in the Nanometer Range
- Clear Aperture to Accomodate Specimen Holders
- Perfect Mechanical Fit with XY OEM Manual or Motorized Stages
- Sub-Millisecond Response Times

PIFOC® P-737 high-speed vertical positioning systems are designed for use with XY microscopy stages—OEM manual stages as well as aftermarket motorized stages.

While the XY stage positions the sample, the piezo-actuator-based P-737 moves the sample along the optical axis to quickly and precisely adjust the focus. Vertical stepping with an accuracy in the nanometer range takes only a few milliseconds.

The large aperture is designed to accommodate a variety of specimen holders including slides or multiwell plates.

Application Examples

- Fluorescence microscopy
- Confocal microscopy
- Biotechnology
- Autofocus systems
- 3D Imaging
- Medical technology

High-Speed Z Steps for Fast Focus Control and Z Stack Acquisition

The immediate response of the solid-state piezo drives enables rapid Z-steps with typically 10 to 20 times faster step & settle times than classical stepper motor drives. This leads to higher image acquisition speed and throughput.

Closed-Loop Position Control for High-Precision and Stability

For high stability and repeatability, P-737 stages are equipped with position feedback. High-resolution, fast-responding, strain gauge sensors (SGS) are applied to appropriate locations on the drive train and provide a high-bandwidth, nanometer-precision position feedback signal to the controller. The sensors are connected in a full-bridge configuration to eliminate thermal drift, and assure optimal position stability in the nanometer range.

Excellent Guiding Accuracy

Flexures optimized with Finite Element Analysis (FEA) are used to guide the stage. FEA techniques are used to give the design the highest possible stiffness in, and perpendicular to, the direction of motion, and to minimize linear and angular runout. Flexures allow extremely high-precision motion, no matter how minute, as they are completely free of play and friction.

Ordering Information

P-737.1SL

PIFOC® Nanofocusing Z-Stage for Microscope Sample Holder, 100 μm , SGS, LEMO Connector, for Märzhäuser Microscope Stages

P-737.2SL

PIFOC® Nanofocusing Z-Stage for Microscope Sample Holder, 250 μm , SGS, LEMO Connector, for Märzhäuser Microscope Stages

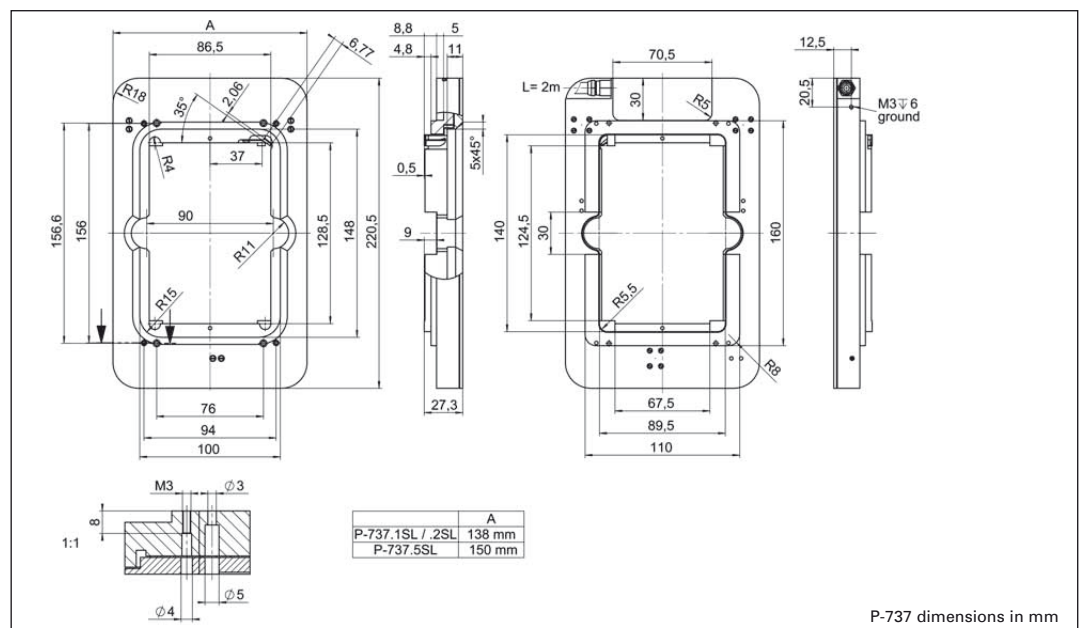
P-737.5SL

PIFOC® Nanofocusing Z-Stage for Microscope Sample Holder, 500 μm , SGS, LEMO Connector, for Märzhäuser Microscope Stages

Versions with high-resolution capacitive sensors on request. Ask about custom designs

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.





The P-737 piezo Z-stage (shown with multiwell plate) is compatible with motorized microscope XY stages like the one shown from Märzhäuser



Instead of moving the sample, it is also possible to move the objective. The P-725 PIFOC® Objective Scanner offers travel ranges over 400 µm with nanometer resolution and response times in the millisecond range

Technical Data

Model	P-737.1SL	P-737.2SL	P-737.5SL	Units	Tolerance
Active axes	Z	Z	Z		
Motion and positioning					
Integrated sensor	SGS	SGS	SGS		
Open-loop travel, -20 to +120 V	150	280	550	µm	min. (+20%/-0%)
Closed-loop travel	100	250	500	µm	
Open-loop resolution	0.8	1	1.6	nm	typ.
Closed-loop resolution	2.5	4	5	nm	typ.
Linearity, closed-loop	0.2	0.5	0.8	%	typ.
Repeatability	6	12	15	nm	typ.
Rotation around X	±36	±36	±36	µrad	typ.
Rotation around Y	±36	±100	±100	µrad	typ.
Mechanical properties					
Unloaded resonant frequency	270	210	120	Hz	±20%
Resonant frequency @ 100 g	230	180	115	Hz	±20%
Resonant frequency @ 200 g	210	155	100	Hz	±20%
Push/pull force capacity in motion direction	50 / 20	50 / 20	50 / 20	N	Max.
Drive properties					
Ceramic type	PICMA® P-885	PICMA® P-885	PICMA® P-885		
Electrical Capacitance	6.3	9.3	13.8	µF	±20%
Dynamic operating current coefficient	7.9	4.6	3.5	µA/(Hz • µm)	±20%
Miscellaneous					
Operating temperature range	-20 to 80	-20 to 80	-20 to 80	°C	
Material	Aluminum	Aluminum	Aluminum		
Dimensions	220.5 x 138 x 27.3	220.5 x 138 x 27.3	220.5 x 150 x 27.3	mm	
Mass	0.7	0.7	0.8	kg	±5%
Cable length	2	2	2	m	±10 mm
Sensor / voltage connection	LEMO	LEMO	LEMO		
System properties					
System configuration	E-500 System with E-503 amplifier (6 W) E-509 servo module	E-500 System with E-503 amplifier (6 W) E-509 servo module	E-665.SR controller/driver (12 W)		
Closed-loop amplifier bandwidth, small signal	60	30	15	Hz	typ.
Settling time (10% step width)	24	30	50	ms	typ.

Recommended controller / amplifier

Single-channel: E-610 servo controller / amplifier (p. 2-110), E-625 servo controller, bench-top (p. 2-114), E-665 powerful servo controller, bench-top (p. 2-116)

Linear Actuators & Motors

Nanopositioning / Piezoelectrics

Piezo Flexure Stages / High-Speed Scanning Systems

Linear

Vertical & Tip/Tilt

2- and 3-Axis

6-Axis

Fast Steering Mirrors / Active Optics

Piezo Drivers / Servo Controllers

Single-Channel

Multi-Channel

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