



Next Gen Piezo Focus Stages for Microscopy & Metrology

LONGER TRAVEL, FASTER STEP & SETTLE, HIGHER PRECISION



Main Benefits and Improved Usability

This Is what Makes the Difference



Matching spacer for same parfocal length / Slim cross-sections enable the use of directly adjacent lens mounts



New strain relief for robustness and longevity



Flat cross-sections of clamps for tight installation spaces



Highly flexible cables allow for tight bending radii / tolerated interfaces with threads for platform integration

For Better Work Results

- Up to 800 μm travel range
- Piezo drives with new lever designs
- High productivity due to short data acquisition times/quick scanning
- High dynamics i.e. high resonant frequencies and short settling times
- Reliable performance based on precise motion and positioning

Usability & Service

- Simple handling thanks to new strain relief and highly flexible cables
- Lowest possible restriction on the focus displacement in Z thanks to flat cross-sections of the clamps
- Always the right parfocal length when changing magnification thanks to adapted spacers
- No wear – nowhere: 24/7 operation thanks to wear-free, lever-amplified piezo drives
- Short delivery times
- Support by engineering and application experts



Comprehensively Improved: PIFOC® Objective Focussing Drives

Large Travel Ranges, High Dynamics, Easy Handling

Be it in life sciences, materials microscopy, quality assurance, or semiconductor manufacturing – vertical positioning systems for objectives play an increasingly important role in numerous applications. Piezo-based, lever-amplified vertical axes have proven themselves as being the standard solution for this task for about 20 years now. PI's extensive portfolio of compact PIFOC® objective positioners has now undergone a complete redesign. This redesign wanted to achieve higher dynamics, travel ranges to 800 µm, and an improved usability. The result is an even more powerful range than before, which has the right solution for virtually all applications.

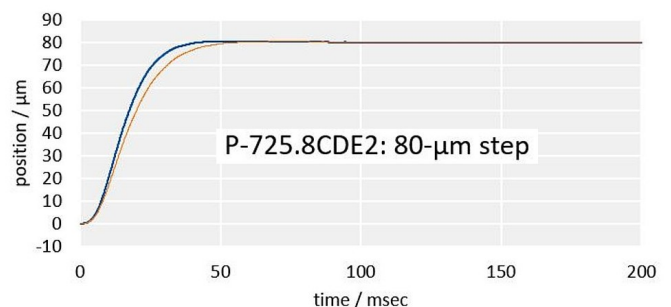
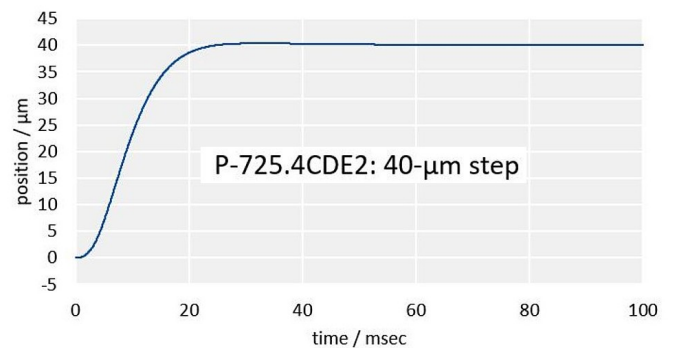
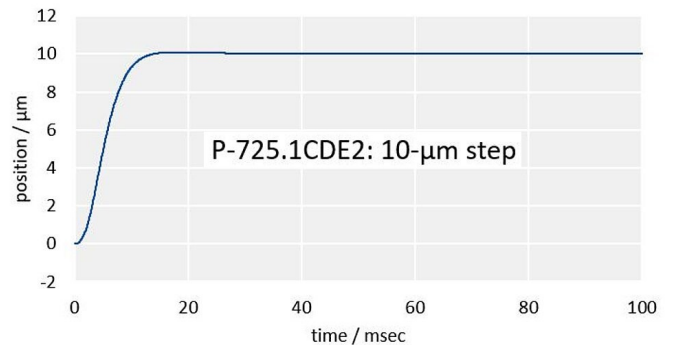


Integration Made Easy

Simple Clamp Ring for Threaded Adapter

PI provides all the necessary accessories needed for the most common usage, which is screwing the PIFOC® into the revolving nosepiece. The aperture of the clamp ring is big enough for objectives up to M34. The threaded adapter for objectives of different sizes are fixed with Torx screws in the clamp ring. Furthermore, the PIFOC® can flexibly be integrated in platform assemblies. For this purpose, tolerated interfaces are placed in the base body.

Step & Settle Performance of the 100, 400 and 800µm P-725 units, driven by an E-709.1C1L Digital Controller



— Tuning optimized for 80-µm step — Tuning optimized for 800-µm step



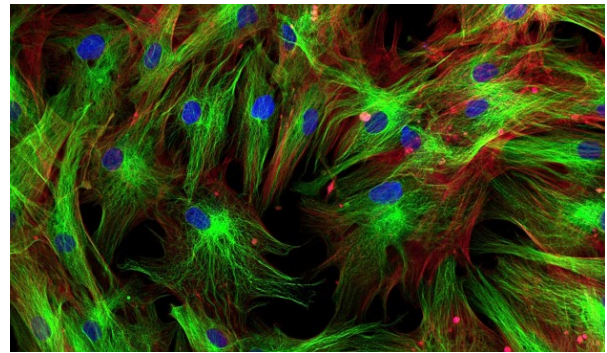
E-709.1C1L

Microscopy and Industrial Applications

Optical Coherence Tomography, Digital Slide Scanning, Surface Metrology, Microscopy

2 (3) Photon Fluorescence Microscopy

In 2 or 3-photon fluorescence microscopy, two photons excite visible fluorescence in deep tissue layers in the infrared range. By using infrared emissions, a deeper penetration is achieved, this is why a respectively large travel range of the focus drive is required. For example, cell organs, metabolic processes, etc. were examined. The users generate Z image stacks.

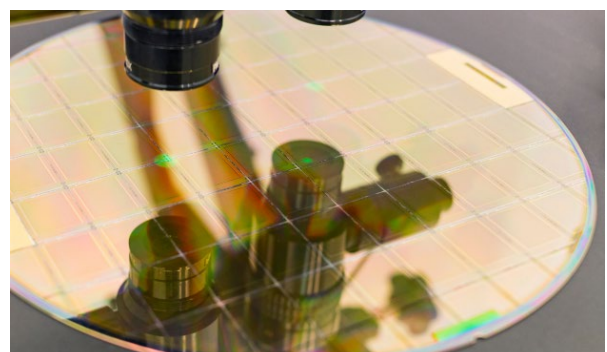


Digital Slide Scanning

Today most microscopy routine diagnostics on histological slides (histology, pathology, hematology, gynecology) is done by automated screening devices. These devices scan the sample slides in a structured way at a very high speed. To adjust the z-focus and to accommodate to z-height differences of the sample during the XY-scanning the Z-focus drive has to quickly and precisely adjust in travel ranges typically between several hundred micrometer to several millimeter, depending on the device design.

Wafer Inspection

As semiconductor devices move towards higher integration and density with advances in semiconductor materials and processes, the critical defect size will decrease. There are several factors that affect the topology of the wafer surface: The surface tension induced by IC manufacturing and the surface roughness. To quickly obtain a high-quality surface image, defect inspection tools must operate at high resolutions and with high dynamics. Precise and fast autofocus ability is critical.



The Right Model for Every Application

From 18 μm to 7 mm Travel Range: Piezo Flexure and Voice Coil Direct Drive Solutions

	Travel range	Step&Settle (10% step, 150 g load)	Minimal incremental motion	Resonant frequency (@ 150 g)	Recommended electronics	Mounting interface(s)	Comments
 P-725.CDD	$\leq 18 \mu\text{m}$	5 ms	0,6 nm	450 Hz (@ 200 g)	E-709.1C1L E-754.1CD*	Objective thread adapter / Threads & location holes in base body	Shortest settling times
 P-726.1CD	100 μm	6 ms	1 nm	560 Hz (@ 200 g)	E-709.1C1L E-754.1CD*	Objective thread adapter	For highload objectives
 P-725.1CDE2	100 μm	14 ms	1 nm	290 Hz	E-709.1C1L E-754.1CD*	Objective thread adapter / Threads & location holes in base body	NEW: higher stiffness & improved usability
 P-725.4CDE2	400 μm	22 ms	4 nm	175 Hz	E-709.1C1L E-754.1CD*	Objective thread adapter / Threads & location holes in base body	NEW: higher stiffness & improved usability
 P-725.8CDE2	800 μm	39 ms	5 nm	110 Hz	E-709.1C1L E-754.1CD*	Objective thread adapter / Threads & location holes in base body	NEW: long travel
 ND72Z2LAQ	2.000 μm	145 ms	5 nm	n.a.	E-861.1A1 (included in scope of delivery)	Objective thread adapter	Self-locking at rest due to NEXACT [®] technology
 V-308	7.000 μm	<15 ms (100nm; +15nm)	10 nm	n.a.	C-414 G-910 ACS SPiiPlus + NPMpm (NanoPWM incl.)	Through- holes for mounting on flat surfaces	Adjustable weight force compensation to 1 kg

* For special high performance requirements

If 800µm is not Enough or More Space is Available

V-308 Voice Coil Nanopositioning Z-Axis Focus Motor

High dynamics

- Acceleration: 8m/s²
- Max. speed: 200 mm/s
- Step-and-settle: <15 ms @ 100 nm and 250 nm; ±15 nm

Precision in motion

- Min. Step size: 10 nm
- Bidirectional repeatability: 25 nm (on 100 nm travel)
- Position noise: 3 nm



Flexible usage and mounting

- Adapter rings for simple exchange of objective
- Adapter plate for mounting the drive to an optical plate
- Objective holder for horizontal or vertical assembly

Compact design / proven precision components

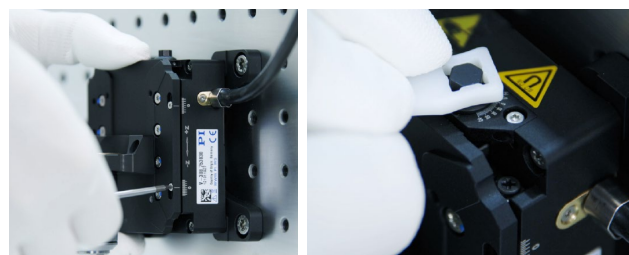
- Compact outer dimensions: 87 x 77 x 30 mm (H/W/D)
- Crossed roller bearings with anti-creep system
- Reliable voice coil motor
- Proven PIONe linear encoder

A Different Approach

Extraordinary Performance for Your Applications

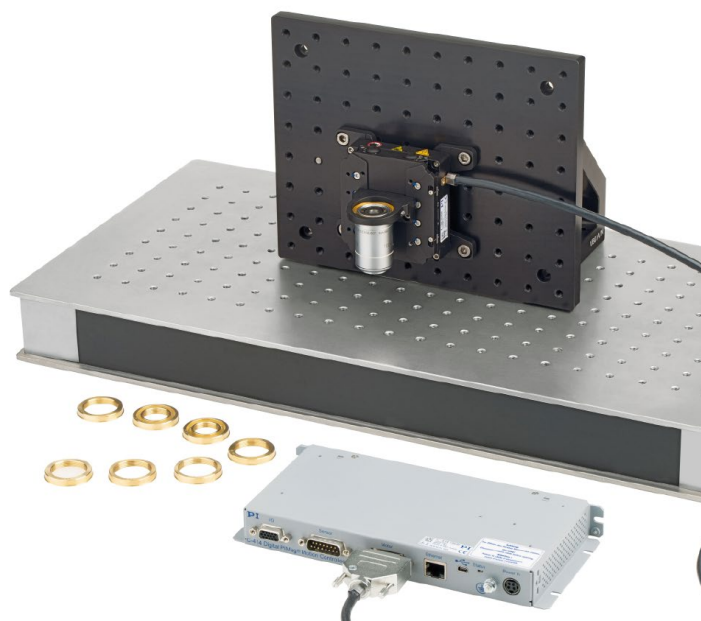
From genome sequencing through multiphoton fluorescence microscopy, deep tissue inspection, laser materials processing, and wafer inspection to magnetic tweezers in research ... vertical positioning systems with large travel range, high dynamics, and precision are required in numerous applications in microscopy and industry. With the new V-308 voice coil PIFOC, PI now offers a magnetic direct drive based solution that unites all these requirements.

The stage can be operated with the specially developed C-414 controller (see image) using the proven PIMicroMove user interface. Alternatively, the stage can also be operated with several ACS controllers, namely the SPiiPlus controller supplemented by the NPMpm driver/amplifier for even higher dynamics.



User-adjustable travel stops from 1 mm to 7 mm

User-adjustable weight force compensation: to 1 kg





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