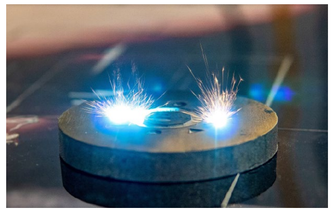
Industrial Applications

LMP - Laser Micromachining

Many laser micromachining processes used, for example, in the production of **photovoltaic cells**, electronic devices, and medical microelements require a small focal point to achieve high intensity and produce fine features. The V-308 enables high quality laser micromachining by providing nanometer precision control of the focal height. Even with irregular workpiece surfaces the V-308 allows fast compensation of the focusing optics according to the required focus height to avoid loss of quality. The compensation can be achieved by precharacterization or by using a high-speed autofocus sensor. This allows high volume production in processes where a narrow depth of focus is required.

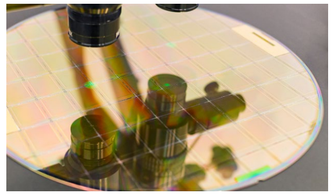


LMP – Laser Ablation

The laser ablation of the surface of engineering ceramics, such as silicon or **sapphire**, requires a narrow depth of focus to ensure a small focus point that leads to an accurate control of material removal and limits damage. The laser spot defines the fluence, i.e., the energy delivered per unit area, (the energy delivered per unit area) and its regulation is needed to control the ablation threshold. When material is removed, the distance between the surface being processed and the current focal point change. With the V-308, it is possible to control exactly how deep in the material the process takes place by adjusting the focal point. In addition, the processing efficiency and the quality of the sidewalls within the features can be optimized.

Wafer Inspection

As semiconductor devices move towards a higher integration and density with the advances in semiconductor materials and processes, the critical defect size decreases. There are two 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 high inspection speeds. A precise and fast and fast autofocus ability is critical. The V-308 allows a fast and precise compensation to maintain depth of focus. It has the added advantage of an extended travel range, eliminating the need for an additional coarse moving stage.



Headquarters

GERMANY

Physik Instrumente (PI) GmbH & Co. KG
Auf der Roemerstrasse 1
76228 Karlsruhe
Phone +49 721 4846-0
Fax +49 721 4846-1019
info@pi.ws
www.pi.ws

PI miCos GmbH
Freiburger Strasse 30
79427 Eschbach
Phone +49 7634 5057-0
Fax +49 7634 5057-99
info@pimicos.com
www.pi.ws

PI Ceramic GmbH
Lindenstrasse
07589 Lederhose
Phone +49 36604 882-0
Fax +49 36604 882-4109
info@piceramic.com
www.piceramic.com

ACS Motion Control

ISRAEL

ACS Motion Control Ltd.
Ramat Gabriel Industrial Park
1 Hataasia St.
Migdal HaEmek, 2307037
POB 984
Phone +972-4-6546440
Fax +972-4-6546443
info@acsmotioncontrol.com
www.acsmotioncontrol.com

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V-308 Voice Coil PIFOC

HIGH DYNAMICS OBJECTIVE FOCUS DRIVE WITH WEIGHT FORCE COMPENSATION

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Introducing the V-308 Voice Coil PIFOC

Highly Versatile Z Axis Positioner

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.

Key Features

Extraordinary Performance for Your Applications

High dynamics

- Accelaration: 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

>> For a complete overview of specifications please click here to visit the product webpage

Key Benefits

High Productivity, Fast, and Reliable Results

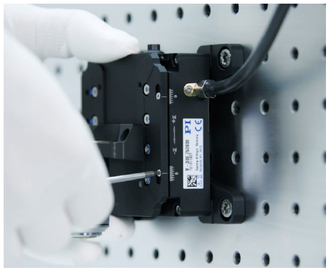
- High productivity due to short data acquisition times/ quick scanning
- Reliable performance based on precise motion and positioning
- High sample/workpiece safety in case of power failure by user-adjustable weight force compensation
- Highly flexible usage
- Easy integration
- Short delivery times
- Support by engineering and application experts
- Long warranties as a standard

Driven by PIMag®

Controlled by ACS

User-adjustable weight force compensation: to 1 kg

User-adjustable travel range/stops from 1 mm to 7 mm



EXTENSIVE ACCESSORIES

Adapter rings for objective mounting

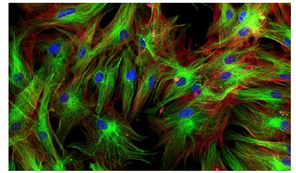
Adapter plate for mounting on an optical bench or plate

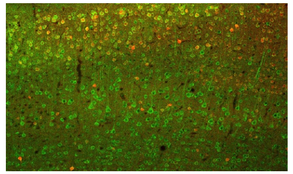
Holders for vertical or horizontal objective mounting

Microscopy Applications

2 or 3-Photon Fluorescence Microscopy

In two or three photon fluorescence microscopy, two photons (sometimes even three) 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 is required. For example, cell organs, metabolic processes, etc. were examined.





Deep Tissue Multiphoton Fluorescence Microscopy

The deep tissue multiphoton fluorescence microscopy is a subtype of the 2-photon fluorescence microscopy. Here, Z stacks with a thickness of 6 mm are created – correspondingly large is the travel range required for the Z positioner. This type of microscopy can, for example, be applied in the exploration of the connectome, the interconnection of neurons in the brain. Typically, inverse, confocal microscopes are used with special objectives that have a mass of up to 800 g.

Genome Sequencing

An essential method for genome analysis is the so-called 'squencing-by-synthesis' method. With this method, nucleotide with fluorescent markers are gradually incorporated into a single strand DNA and are so 'synthesized'. If it comes to a recombination of the base pair, a characteristic fluorescent color signal ('occurrence') is generated for each of the four different base pair combinations. These signals are detected microscopically. Since the signals are weak and also very short lived, the detection and imaging process must be very fast. For this purpose, the objective must be precisely aligned at the height of the occurrence along the optical axis, within the depth of field of the lens. Here, the required travel ranges are up to 5 mm.

Digital Slide Scanning

This application is about creating and achieving digital sample images by widely automating the scanning of tissue samples, mainly from routine examinations. These images can then be can be analyzed from experts around the world and samples do not have to be placed repeatedly under the microscope. For example, this is important for following up medical treatments.

The required travel ranges of one to two millimeters are not as large as in other applications; however, high dynamics when focusing is very important.