mps MICROSYSTEMS


# MPS PRODUCTS FOR OPTICS & PHOTONICS APPLICATIONS

MPS Microsystems develops and manufactures accurate, powerfu and very efficient electro-mechanical microsystems. Managing the miniaturization and integration of functions in small spaces, MPS Microsystems provides solutions perfectly suited to specific customer requirements. MPS Microsystems also offers a standard and scalable range of products, such as linear bearings and ball screws.

MPS's strengths particularly appreciated by its customers are:

- Innovative and reliable solutions
- Performance and miniaturization
- High quality service
- Trusted relationship

Located in Bienne, Switzerland, in a modern and well-equipped facility MPS Microsystems offers its 225 employees an exceptional working environment and offers its customers a sustainable competitive advantage in their market.

MPS belongs to the Faulhaber Group, the German manufacturer of micromotors - www.faulhaber.com

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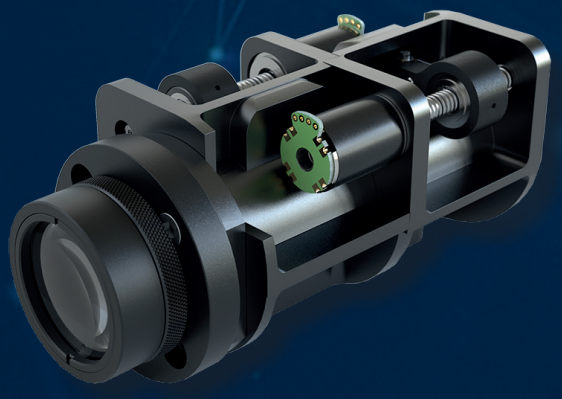
# SOLUTIONS FOR OPTICS & PHOTONICS INDUSTRY

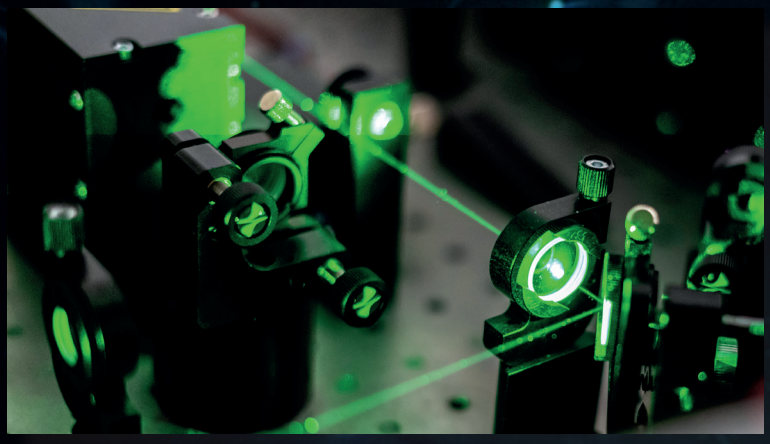
## OPTOMECHANICAL SYSTEMS

A major challenge faced in the realization of high performance optical devices with mobile elements is the requirement for perfectly smooth and collinear movements ensuring the successful transposition of complex software optimizations in real optical functions.



### Actuator technology platform with elimination of lens misalignment

To answer that issue MPS has created a technology platform for optical applications that shows very accurate axis displacements combined with very long lifetime. The precise relative positioning between two mobile lens groups moving on the same axis and the perpendicularity of a few tenth of a degree with the machine interfaces is achieved with shortest stack-up and MPS specific micro assembly skills (see below “Micro assembly”).



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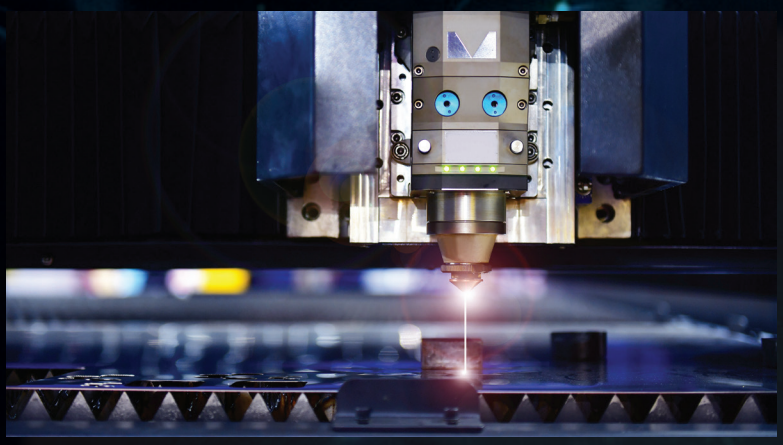
# SOLUTIONS FOR OPTICS & PHOTONICS INDUSTRY

## Particle free laser focus mechanisms

For high power laser machining applications requiring longer strokes and clean environment, MPS has developed a hermetically sealed linear actuator. In this case, the drive system is based on a 22 mm brushless DC motor coupled to a Ø4 mm ball screw. MPS L-510X linear bearings insure smooth and play free movement of the carriage, on which the lens holder is accurately fixed. In order to protect the optics from smallest particulates generated by the tiny wear of the system, the guiding as well as the screw drive mechanism are completely sealed by two bellows. In the purpose of giving the closest answer to customer requirements, the lens holder shape and size are adapted to the dimension of the required lens obtained in optical simulations.

Not only smart and elegant, the design has been strongly optimized in width to allow stackable configurations and bring the possibility to easily build more complex optical functions. The illustrations below show a typical assembly of several actuators with adapted lens holders allowing focusing and magnification functions of a laser beam.



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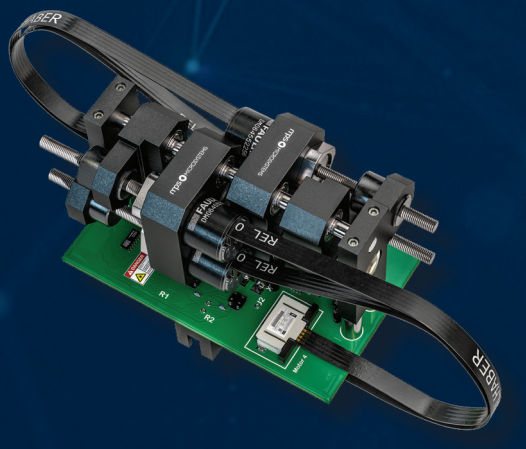
# SOLUTIONS FOR OPTICS & PHOTONICS INDUSTRY

## Miniature multi-lens actuator

This miniaturized system allows to move 1 to 3 sets of lenses very precisely over a stroke of several centimeters. The design of this miniaturized optomechanical system has been optimized to ensure perfect alignment of the lenses and to minimize their tilt throughout the movement. This system mainly consists of high-precision MPS and FAULHABER modules, such as brushless or stepper motors, precision ball screws with double nuts and linear ball bearings. It is particularly suited for focusing a laser over a long distance, for example for the guidance of unmanned flying objects or for communication between flying objects. Such a system is also ideal for moving optics in stereoscopic surgical glasses. The number of lens sets, lens size and stroke can be configured to the customer's liking.



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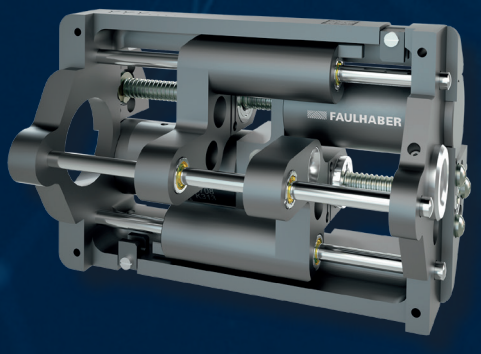
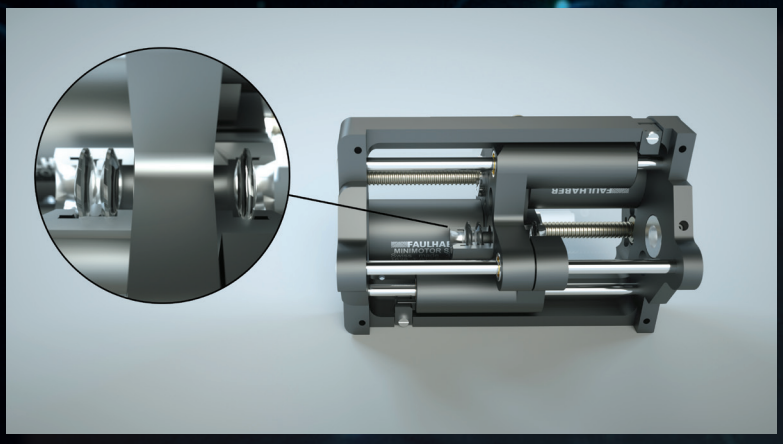
# SOLUTIONS FOR OPTICS & PHOTONICS INDUSTRY

## Laser guidance system

Developed and manufactured by MPS Microsystems based on customer specifications, this lens actuator forms an essential component of a laser guidance system for unmanned flying objects. It enables 2 lens groups to be displaced individually over a total range of 48 mm and makes it possible to focus a laser over a distance of several kilometres.

The main technical difficulty inherent to this actuator lies in meeting very stringent requirements for alignment between the two lens groups (< 10 µm) and in maintaining a very small tilt of the lenses over their entire stroke (lateral deviation < 2 µm).



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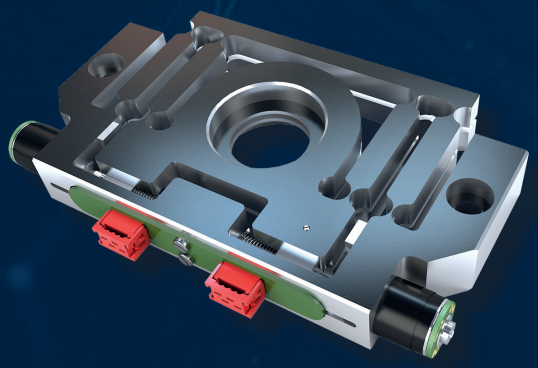
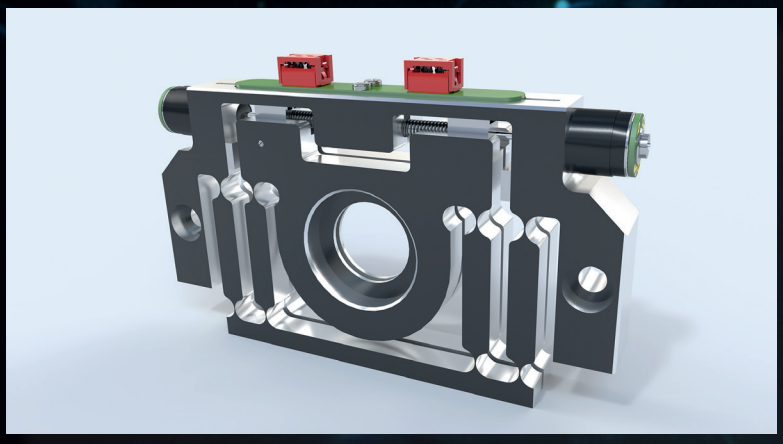
# SOLUTIONS FOR OPTICS & PHOTONICS INDUSTRY

## Microscopy

Microscopic observation of three-dimensional samples can be a challenge when moving the objective in the z-axis close to the sample: the risk of touching and destroying it is significant. MPS has developed a backlash-free, flexure elements based system, which moves 2 lenses laterally in order to make the fine focus and thus eliminate the risk of contact with the sample.



The system with a full stroke of 2.5 mm is driven in open loop by 2 stepper motors attached to a miniature lead screw. Light barriers set the home position at the beginning of each operation. The position repeatability is below 2 microns. The simplicity of the system makes it very reliable, easy to connect and affordable.



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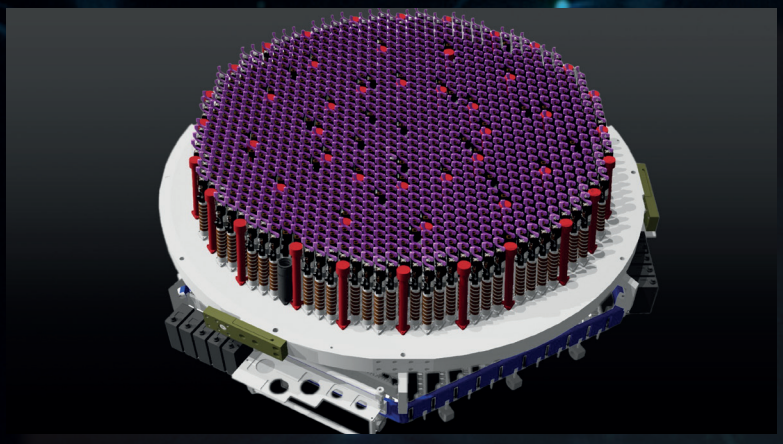
# SOLUTIONS FOR SCIENCE INDUSTRY

## Optical fiber positioner for Astronomical Observation

Research in the field of dark matter is leading to the development of new equipment that enable the collection and analysis of light emitted by distant galaxies. In partnership with a research group, MPS has developed and is manufacturing a number of high precision, reliable systems for positioning optical fiber directed towards these galaxies. Thousands of these positioners are installed in the focal plane of telescopes.

With a diameter of less than 10 mm, the positioner must be able to accommodate two parallel axes that rotate independently the optical fiber with two 4 mm Faulhaber gearmotors.

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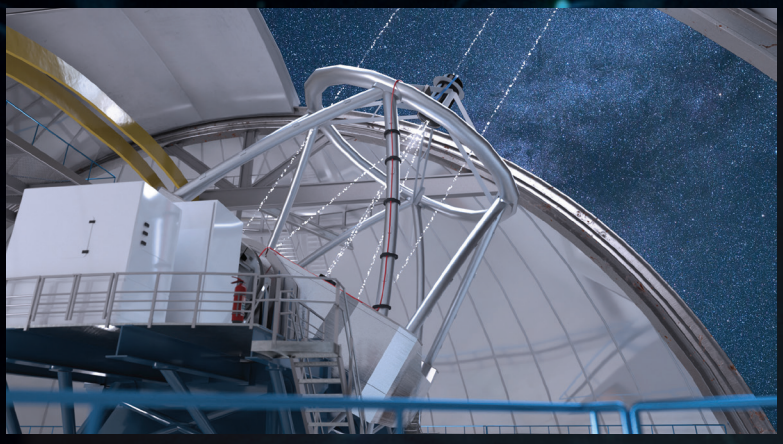
# SOLUTIONS FOR SCIENCE INDUSTRY

MPS is the leader in providing the Astronomy Research Community with positioners and has already realised three projects, for which positioners are installed or will soon be installed on three telescopes around the world (Very Large Telescope, Sloan Foundation 2.5 m Telescope at Apache Point Observatory, Irénée du Pont Telescope at Las Campanas Observatory).

An easily scalable positioner platform is available at MPS for any organisation needing such systems.

## Miniature test bench with six degrees of freedom

MPS is in the process of developing a miniature mechanism with six degrees of freedom (6DOF): X, Y, Z, Roll, Pitch and Yaw. The system is based on the principle of serial kinematics and modular: one DOF can be easily removed or added depending on customer requirements. The system can be designed very small (60 x 50 x 32 mm) but is scalable to bigger size if the test bench needs to move large or heavy objects. The system is smaller, more flexible and significantly easier to drive than hexapods. Regarding accuracy, positioning repeatability of 1 micron is achievable. This system is ideal for quality inspection of consumer electronic devices such a smartphones, tablets and laptops.



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# MPS COMPETENCES

## RESEARCH & DEVELOPMENT

The high level of training and experience of its microsystems engineers allows MPS to quickly develop innovative solutions that meet the needs of its customers. Our developments and documentation meet the international standards of the medical market.

Fully equipped, the prototyping workshop guarantees the production and modification of rapid prototypes, free from the logistical constraints of mass production. The equipment includes lathes, milling machines, wire erosion machines and grinding machines.

The test laboratory equipment is used to carry out service life tests, noise measurements, traction tests, torque measurements and other mechanical tests.

## MANUFACTURING
(precision as a key value of MPS)

The turning & milling workshop has a series of CNC and EDM machines. Each work bench is equipped with measuring instruments for controlling, at any time, the quality of the products manufactured.

Acquired over many decades, MPS's heat treatment knowledge is essential to achieve the material properties needed for the performance of the systems manufactured. MPS also has expertise in deburring and washing components.

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# MPS COMPETENCES

## MICRO ASSEMBLY

MPS specialises in the micro-assembly of complex systems which require specialist knowledge and specific expertise.

The size of parts and the required precision necessitate a controlled atmosphere in the entire assembly workshop, with continual air change and filtration. A clean room ISO 7 is available for implantable medical applications.

Our main skills include the assembly of micro-components, laser welding, laser marking, gluing, precision lubrication, washing and pairing, enabling adjustments of less than 0.2 µm. The workshop is organised according to «lean manufacturing» principles. Dedicated cells are set up when necessary.

## QUALITY

The MPS Quality department ensures the continuation of certification : ISO 9001 - ISO 13485 - ISO 14001.

In order to guarantee the delivery of products that observe legal requirements, MPS prepares the files that are essential for certifications (European Directives 93/42/EC, 90/385/EEC, 21CFRpart820, etc.) and for medical devices to be placed on the market.

## PROJECT MANAGEMENT

In our project development process, customers are in close contact with a dedicated project manager who ensures close communication and coordination with the internal project team and external partners.
The MPS management system integrates the project management process.

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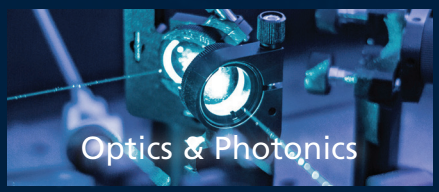
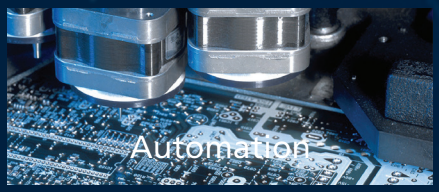
# MPS GROUP

## EXPERTS IN CUSTOM-MADE MICROSYSTEMS








## WHERE TO FIND US

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