



# Incorporating Smart Engineering and Swiss Precision

- Optics & Photonics
- Medical
- Automation
- Defense & Aerospace
- Science
- Measuring Instruments



**Table of contents**

03 Our company
04 Optics & Photonics
05 Medical
06 Automation
07 Defence & Aerospace
08 Science
09 Measuring Instruments
10 Microlinea
11 Research & Development
12 Manufacturing
13 Assembly
14 Quality
15 MPS Mission

## Our company

**„Today we are continuing to take on the toughest challenges by developing complex microsystems of ever smaller dimensions while constantly fulfilling the technical requirements set forth.“**

With more than 80 years of experience in the field of high-precision microsystems, MPS can offer complete customized solutions including innovative technologies.

Thanks to the reliability and quality of MPS ball bearings, the company has been quickly known in ambitious fields of activities such as implantable medical devices, active optics or high-end watch products.

Helping to ensure the achievement and success of our customers is our principal motivation. Pushing the limits of micro components by continuously improving the manufacturing process is a task that inspires our multidisciplinary professional teams.

Constantly maintaining and developing our unique know-how in assembling micro components, the fruit of pure Swiss watchmaking tradition, is the pride of the specialists who work in our micro-assembly departments. Guaranteeing and certifying a high level of quality by putting in place stringent control procedures illustrate the authority of our quality assurance experts.

The enthusiasm we put in each new project reflects our passion for our work. We look forward to sharing it with you.

**„From standard products to customized solutions: we want to be your privileged partner for microsystems in sophisticated application fields such as medical, optics, science, defense, automation and watch“.**

# Optics & Photonics

In active optics the systems need to be both smooth and stiff. This antagonism can only be solved with highly accurate components and experienced assembly.

## Ophthalmology

Miniature lens actuator for accurate laser beam focus:

- Equipment for eye tomography and refractive / cataract surgery
- Linear actuator of 6mm with a stepper motor, a pre-loaded lead screw and a precise linear bearing
- System compensates automatically misalignment of the axis
- Homing with a precision of 1µm between each measurement

## Guiding system

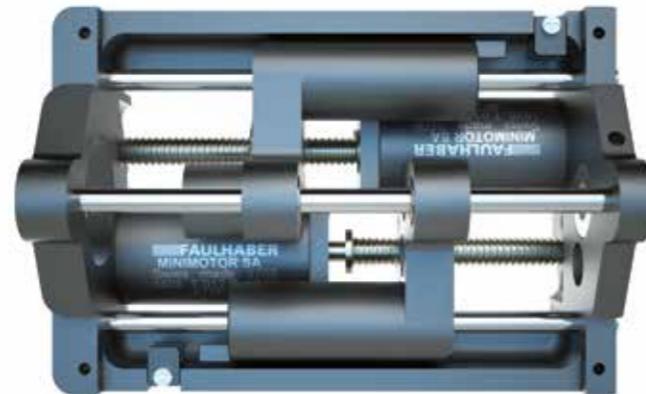
Miniature laser beam focus mechanism:

- For the guidance of unmanned flying objects
- System made of two ball screws, six linear bearings and two 10mm brushless micro motors
- Precise frame ensures full perpendicularity of the lenses over the full stroke
- Linear positioning precision 1 µm

## Sport optics – observation lenses

Differential for the coarse and fine adjustments of observation lenses:

- System focuses quickly on an object and then slowly adjusts the vision
- Miniature differential with ration of 1 to 3
- No clearance
- Accurate lubricant dosing in order to control the gentle resistance



# Medical

MPS's culture of precision as well as its unique competences in miniaturization, biocompatible materials and systems with extremely low friction are appreciated by the manufacturers of Active Implantable Medical Devices (AIMD), micro robotics and ophthalmology devices.

## Implantable pump

Implanted peristaltic pump (AIMD Class III):

- Continuous delivery of liquid drug to the spine
- Lifetime 7 years with one single battery load
- Extremely low energy consumption
- Dosing system made of titanium and ceramic
- Manufactured in controlled atmosphere (ISO class 7)

## Biocompatible implantable actuators

Miniature implantable biocompatible actuators (AIMD Class III):

- Long bone lengthening or other organs assistance
- Motor and electronic tightly encapsulated in titanium housing
- Efficient electro mechanical system with extremely low energy consumption
- Intelligent system with bidirectional transmission of data and wireless power transfer

## Miniature hexapod robot

Motorised hexapod robot (Class II):

- Instrument and implants positioning during spine surgery
- Movements enabled by 6 linear actuators, each operated by 5 mm brushless micromotors
- Positioning accuracy of each actuator = 1 µm
- Diameter = 50 mm, height = 80 mm, weight = 330 grams

## Artificial heart

Production of the critical components for the pumping unit:

- Precision manufacturing of carbon-filled PEEK components
- Extremely high surface finish requirements
- Balancing of moving components
- Full process qualification for class III medical device

# Automation

Linear and rotational bearing technologies can be combined in order to provide miniaturised and extremely precise solutions for the automation industry.

## High speed SMT machines

- Development and manufacturing of pick & place heads:
- Specific combination of MPS's linear and rotational bearing technology
  - High requirements in sliding force, precision, straightness and surface finish
  - Very high requirements in sliding force, precision, straightness and surface finish
  - All components ground, polished and finally paired with an accuracy range of 0.4 µm using balls sorted by groups of 0.25 µm

## Lab automation

- Development and manufacturing of specific linear bearings for pipetting equipment:
- Integrated antirotation
  - Clearance free adjustment in the pipetting head



# Defence & Aerospace

Integration of mechanical functions in the smallest available space as well as managing the tiniest friction belongs to MPS core competences.

## Powerful smallest fin actuator

- Powerful, backlash free actuator
- Compact design including a ball screw merged with the motor axis and a 4-point of contact bearing
  - Meets the vibration, storage and operational environment requirements for military equipment



## Guiding system

- Miniature laser beam focus mechanism:
- System made of two ball screws, six linear bearings and two 10 mm brushless micromotors
  - Full perpendicularity of the lenses ensured over the full stroke of 50 mm
  - Linear positioning precision of 1 µm



## Science

Robustness of design and manufacturing processes are appreciated by scientists who are looking for the origin of the universe.

### Micro SCARA robot

Electromechanical microsystem with two long axis rotating independently:

- Accurate positioning of optical fibre in telescopes
- Parallelism of the two axis is key for the quality of the light collection
- System is driven by two 4 mm brushless gear motors and has an outside diameter of less than 10 mm



## Measuring Instruments

Structure stiffness and movement smoothness are required for high performance measuring instruments.

### Touch probe

Stiff and friction free specific linear bearing:

- Tactile probe for the accurate measurement of surfaces
- Stiffness over the full stroke reached thanks to the smart arrangement and selection of the balls
- Stroke range between 1 and 4 mm



# Microlinea

## Standard product line – Linear bearings

Miniature high precision linear bearings:

- L series with stainless steel housing and brass retainer
- DBL series with plastic body (POM), with stainless steel balls and needles



## Standard product line – Ball screws

The MPS ball screws are entirely made out of stainless steel and all components are ground. They are fitted with a double nut to adjust the play. The manufacturing process guarantees a pitch variation of less than 5 µm over the full stroke.



## Customised product line- Customised ballscrews

MPS offers a comprehensive range of miniature high precision ball screws with a positioning accuracy < 5 µm.

The ball screw technology developed by MPS leads to outstanding performances such as high efficiencies, smoothness and long-life reliability.

Most applications require specific mechanical interfaces, or special characteristics.

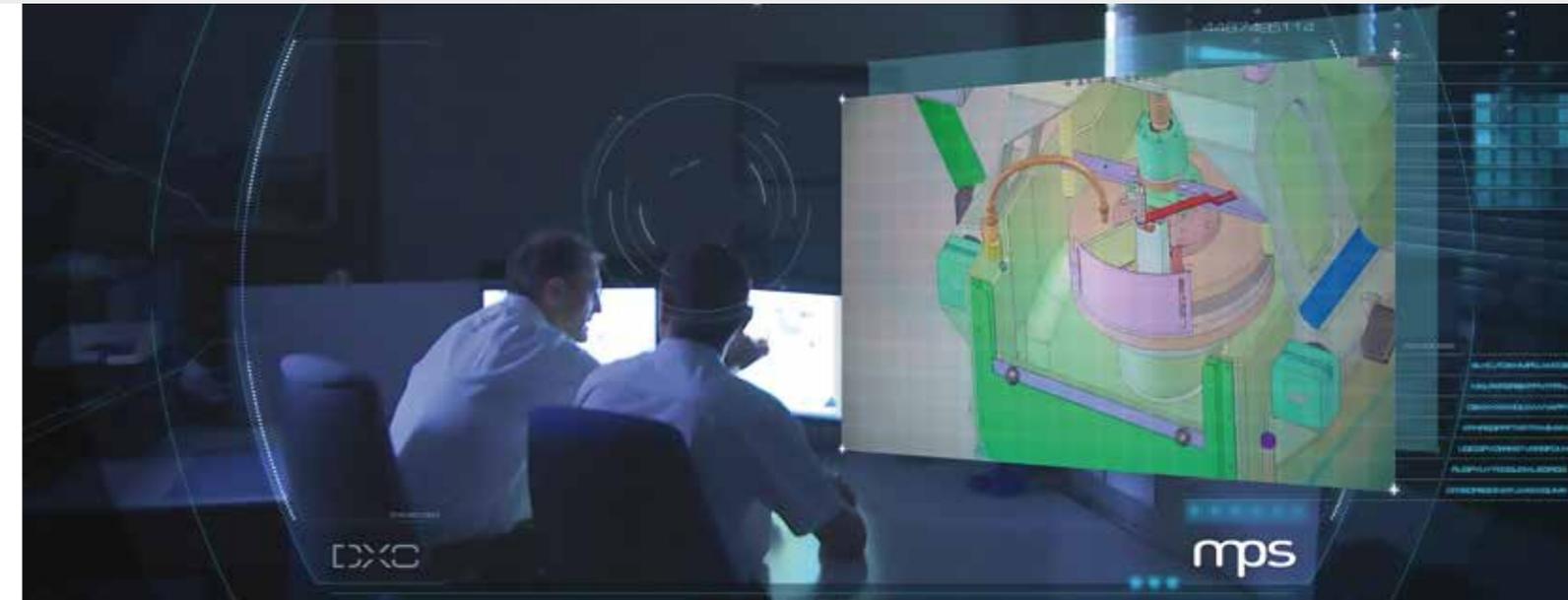
Throughout a long-time experience with countless cases in various application fields MPS has acquired an exceptional level of expertise in the design and manufacture of customized ball screws, thus always gathering two essential features: precision and compactness.



## Balls

**The sphere is a symbol of perfection that guides MPS in the ball manufacturing process.**

MPS specializes in the manufacturing of balls measuring less than a millimeter in diameter. The smallest sphere manufactured by MPS has a diameter of 0.130 mm.



# Research & Development

The high level of training and experience of its micro technology engineers allow MPS to quickly develop innovative solution that meet the needs of the customers.

## R&D services

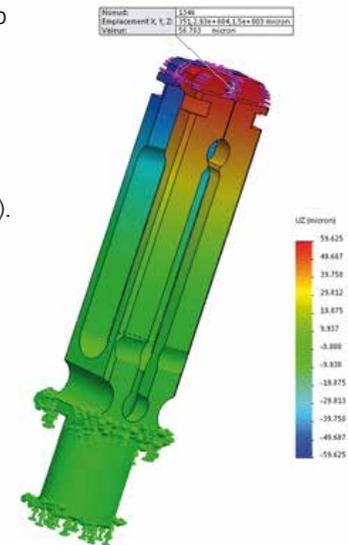
Based on product specifications MPS develops concepts, perform feasibility studies and product design, taking into consideration the international standards of medical or defense markets. Our engineers master the CAD system (Solidworks®) and the Product Life Cycle Management software (TeamCenter®). In the field of medical devices, MPS can draw up technical file submission for CE and FDA submissions.

## Prototyping workshop

Fully equipped, the prototyping workshop guarantees the production and modification of rapid prototypes. The equipment includes lathes, milling machines and EDM machines.

## Test lab

The test laboratory equipment is used to carry out service life tests, traction, torque as well as specific measurement systems.





## Manufacturing

Precision has always been a key value of MPS.

### Turning, milling & EDM

The workshop is equipped with CNC turning & milling machines and wire EDM equipment. Each work bench has measuring instruments for quality control.

### Heat treatment and washing

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

### Resurfacing/grinding/polishing/honing

MPS sets itself apart thanks to its grinding and polishing expertise. In these workshops, components achieve dimensional precision of less than one micron, through centreless grinding of internal and external diameters and mirror surface finishes ( $Ra < 0.1 \mu m$ ). All MPS ball screws have threads that are grinded on latest-generation equipment.

### Manufacture of balls

MPS internally manufactures high quality (ISO Grade 3) miniature stainless steel and ceramic balls with diameters between 0.130 mm and 1.588 mm.

## Assembly

MPS is specialized 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.

The workshop is organised according to «lean manufacturing» principles. Dedicated cells are set up when necessary.

Our main skills include the assembly of micro-components, welding and laser marking, gluing and precision lubrication, washing and pairing, enabling adjustments of less than  $0.2 \mu m$ .



## MPS Mission

MPS forms the framework of a group of companies, which develop and produce customised micro mechanicals solutions within over challenging fields of applications such as medical and orthopaedic instrumentation, defence and watch industry. Our success is based on 80 years of experience in miniature bearing and ball screw technologies, high-tech machining and assembly capabilities and long term partnership with our customers and suppliers. MPS is formed by a group of 3 companies and together employs 400 dedicated and highly skilled employees.

**Framework of MPS Micro Precision Systems AG:**

- MPS Microsystems located in Biel (Switzerland)
- MPS Watch with Business Development in Biel (Switzerland) and Production in Bonfol (Switzerland)
- MPS Décolletage SA located in Court (Switzerland)
- MPS Precimed SA located in Biel (Switzerland)
- MPS Micro Precision Systems AG is owned by the FAULHABER GROUP

## Quality

The MPS Quality department ensures the ISO certifications:

- Certification according to ISO 9001:2015
- Certification according to ISO 13485:2016
- Certification according to ISO 14001:2015

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

During each project, all means of production are validated by MPS. Qualified suppliers and products approved according to customer's specifications.

MPS guarantees a high level of quality thanks to the ongoing application of strict controls that are scheduled and managed, for example in a controlled atmosphere (temperature and humidity). All production is monitored by an SPC system.

MPS is able to develop metrology devices according to project-specific requirements.



400 EMPLOYEES

3 SITES

65 MILLION CHF TURN OVER



# Incorporating Smart Engineering and Swiss Precision

**MPS Micro Precision Systems AG**

Chemin du Long-Champ 95

2504 Biel-Bienne

Switzerland

T +41 32 344 43 00

F +41 32 344 43 01

[www.mpsag.com](http://www.mpsag.com)

[info@mpsag.com](mailto:info@mpsag.com)