FISBA Innovators in Photonics

Precision Alignment for compact Optics

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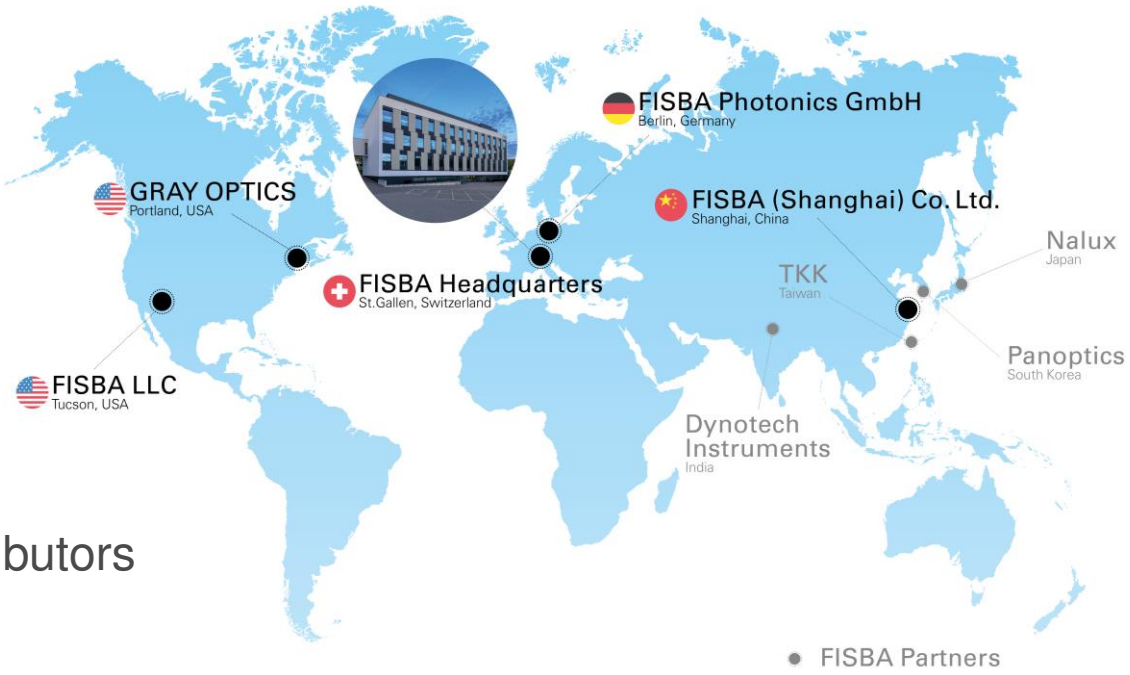
Our company

FISBA is a market leader in **optical components** and **customized optical systems**. We develop innovative glass technologies for shaping and delivering light.

- Founded in 1957
- Privately owned
- Approx. 360 employees around the world thereof 30 apprentices
- Revenue > CHF 65 Mio.
- 4 owned subsidiaries & 4 distributors
- ISO 13485



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Markets

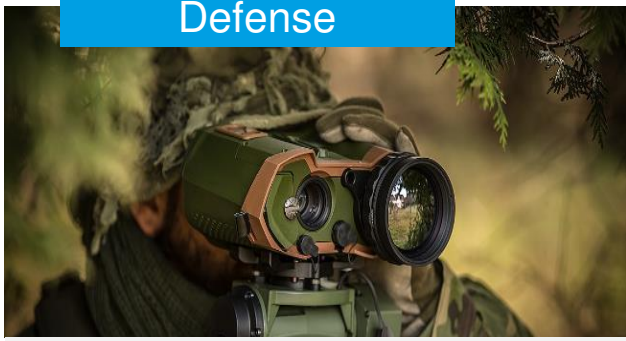
Life Science

- Endoscopy / Inside Imaging
- Diagnostics and Therapy
- Minimal Invasive Surgery
- Microscopy
- Flow Cytometry
- Surface Imaging
- Biotechnology
- Analytics and Process monitoring

Industrial Applications

- Laser Material Processing
- Production
- Imaging
- Metrology

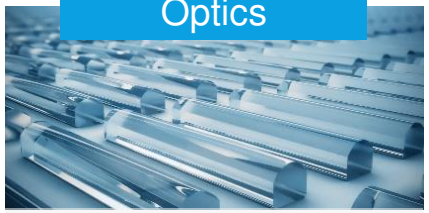
Aerospace & Defense



- Surveillance and Image Intelligence
- Target Acquisition and Designation
- Information Display and Augmented Reality
- Electro-optical Guidance and Control

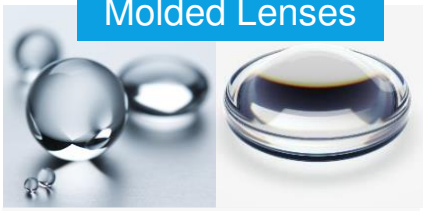
Micro Optics Components and Assemblies

Cylindrical Micro Optics



- High volume production
- Aspheric cylinder lenses
- Laser Diode Beam

Precision Molded Lenses



- Mid volume production
- Aspheric lenses

Flat Optics

- Angular accuracy 3"
- Edge length +/- 0.01 mm, chip < 0.03 mm
- Surface roughness < 0.5 nm

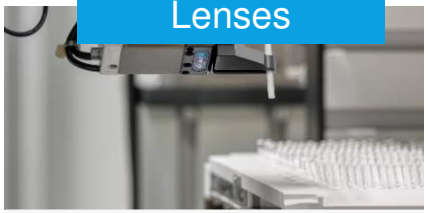
Spherical Optics

- Conventional and CNC machining
- Radii as small as 0.5 mm
- Diameter range from 0.4 mm to 50 mm

Cementing and Centering

- Highest centering accuracy
- Achromatic multi systems
- Lens / Prisms combinations

Endoscopic Rod Lenses



- Centering error < 5’
- Center thickness tolerance +/- 0.02 mm
- Diameter tolerance +/- 0.005 mm

Thin Film Coating

- Ion Assisted Deposition
- Thin film design and simulation
- Coating metrology and testing

Assembly, Machine Shop

- Positioning accuracy +/- 0.01 mm
- ISO class 6 clean rooms
- FDA Approval for Medical Devices
- 5 axis grinding machine
- Turning machine

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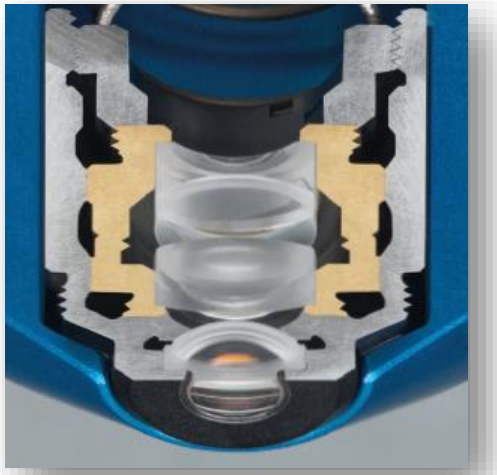
Precision alignment for compact optics

What do we mean by **precision alignment**?

Precision alignment is a general need in optical systems and can cover various technology fields, such as:

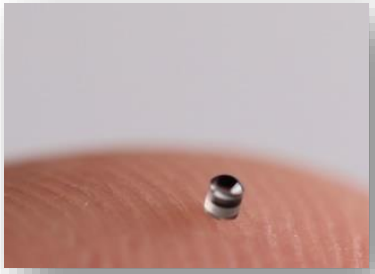
- Housing and joining technology
- Lens and prism centering
- Alignment turning of lenses and interfaces
- Gripping and positioning
- Measurement technology for compensator settings

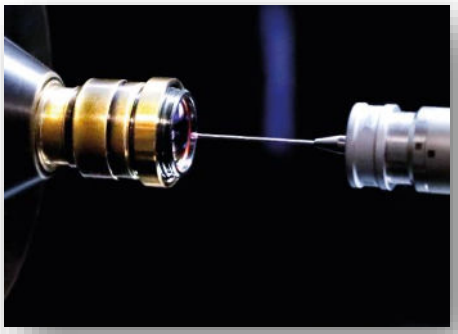


Precision alignment for compact optics

active precision alignment

- Assembly optimized to a certain **target value** using a dedicated **precision manipulator**
- target values can be **MTF** or **wavefront error** of the optical system, the position of **optical axis** or a defined **image area** on the sensor





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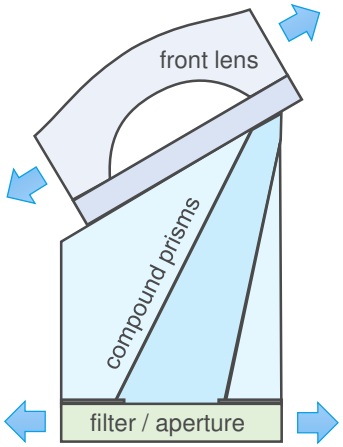
Precision alignment for compact optics

Aperture & front lens assemblies

spherical / aspherical front lenses on various angled compound prisms

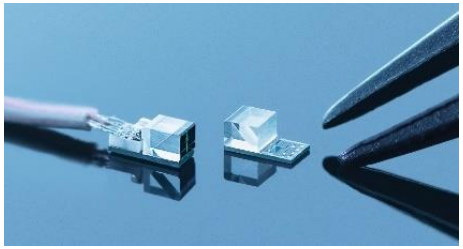


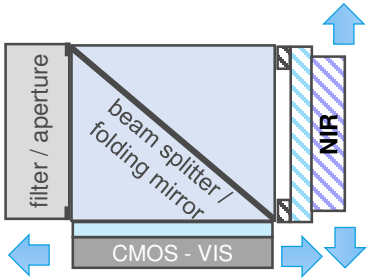
+/- 20 µm (typical)

used in series production

CMOS prism assemblies

robust CMOS die bonding on beam splitters and reflecting prisms



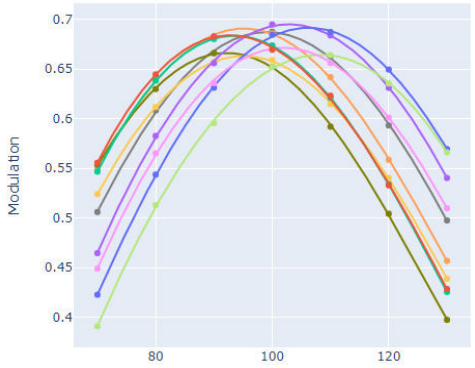


+/- 10 µm (typical)

used in series production

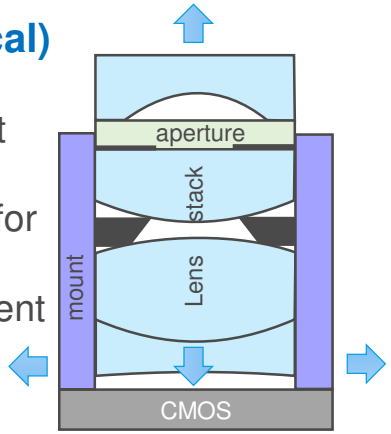
CMOS camera assemblies

MTF optimized tilt and focus adjustment possible



+/- 5 µm (typical)

used for product development. Bench capable for 6 degree of freedom alignment



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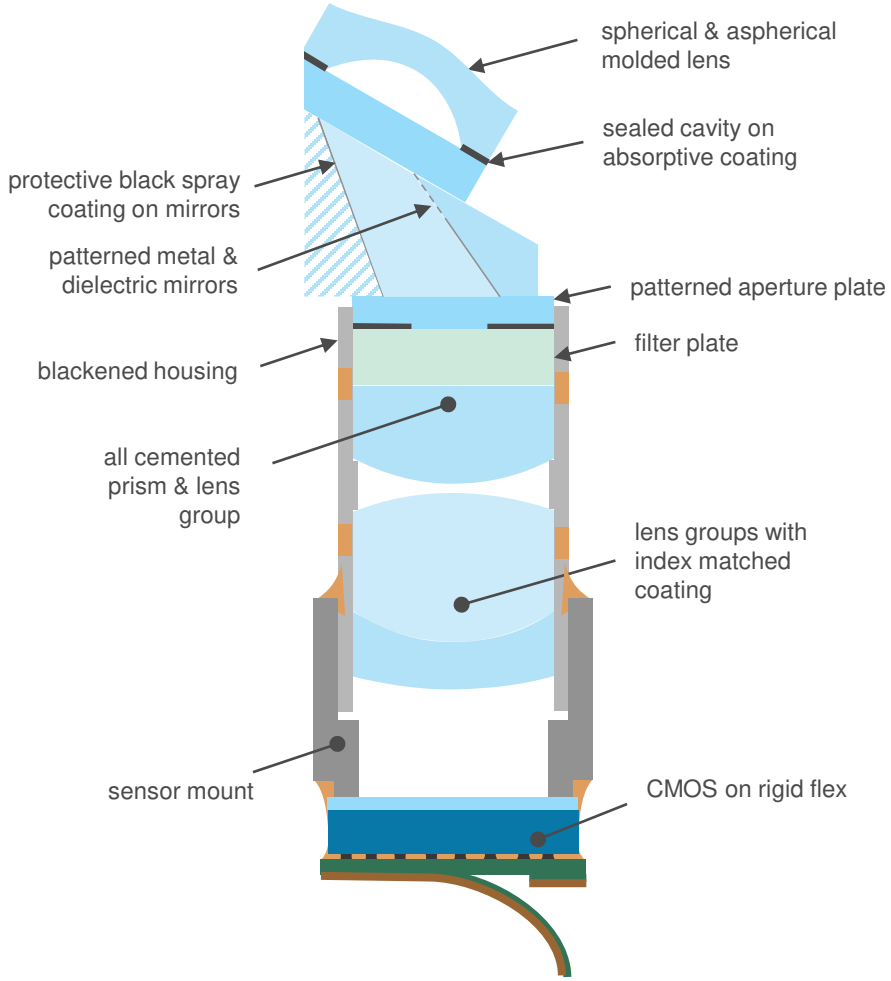
Precision alignment for compact optics

Technology integration (Endoscopy Case)

- **Design of opto-mechanics based on system requirement**
  - tolerancing
  - sensitivity analysis
  - stray light and ghost image analysis

- **Design for manufacturing**
  - component fabrication
  - coating strategy
  - protective spray coating
  - subgroup interface engineering
  - precision alignment and joining technology
  - assembly tolerance review

- **Design of measurement and verification**
  - image quality
  - environment testing
  - leakage testing
  - mechanical testing
  - shock and vibration testing



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Measurement capabilities for miniaturized cameras

Product specific verification

- MTF measurement with high flexibility of wavelength range and target definition
- Measurement in liquids possible (e.g. water, saline solution)
- Full field MTF measurement of optics with specific direction of view (e.g. 30°, 45°)
- MTF depth of field measurement
- Flexible image processing interface capable to handle customer specific imaging hardware and software
- Field of view and entrance pupil diameter measurement acc. ISO8600-3
- Capable to measure projectors with integrated light structuring pattern or scan heads comprising projector and imaging system.

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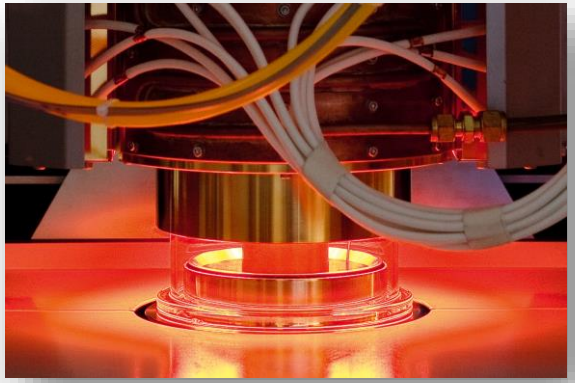
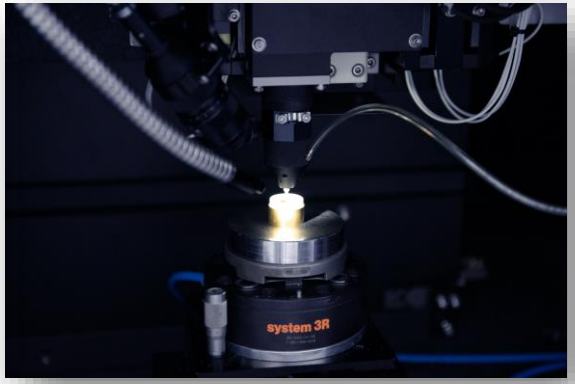
Precision alignment for compact optics

FISBA capabilities

- Ultra miniature optics with **diameter below 1mm**
- **High C**lear**A**perture/**D**iameter and housing-less (~zero bezel) optics
- **Wave-front optimized** objectives including alignment turning, lateral and axial compensators
- Precision **assembly of sensors**
- molded **glass aspherical optics** fabrication and assembly
- **Alignment turned sub-housings** (for objectives, sensor assemblies, fiber connectors)





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THANK YOU