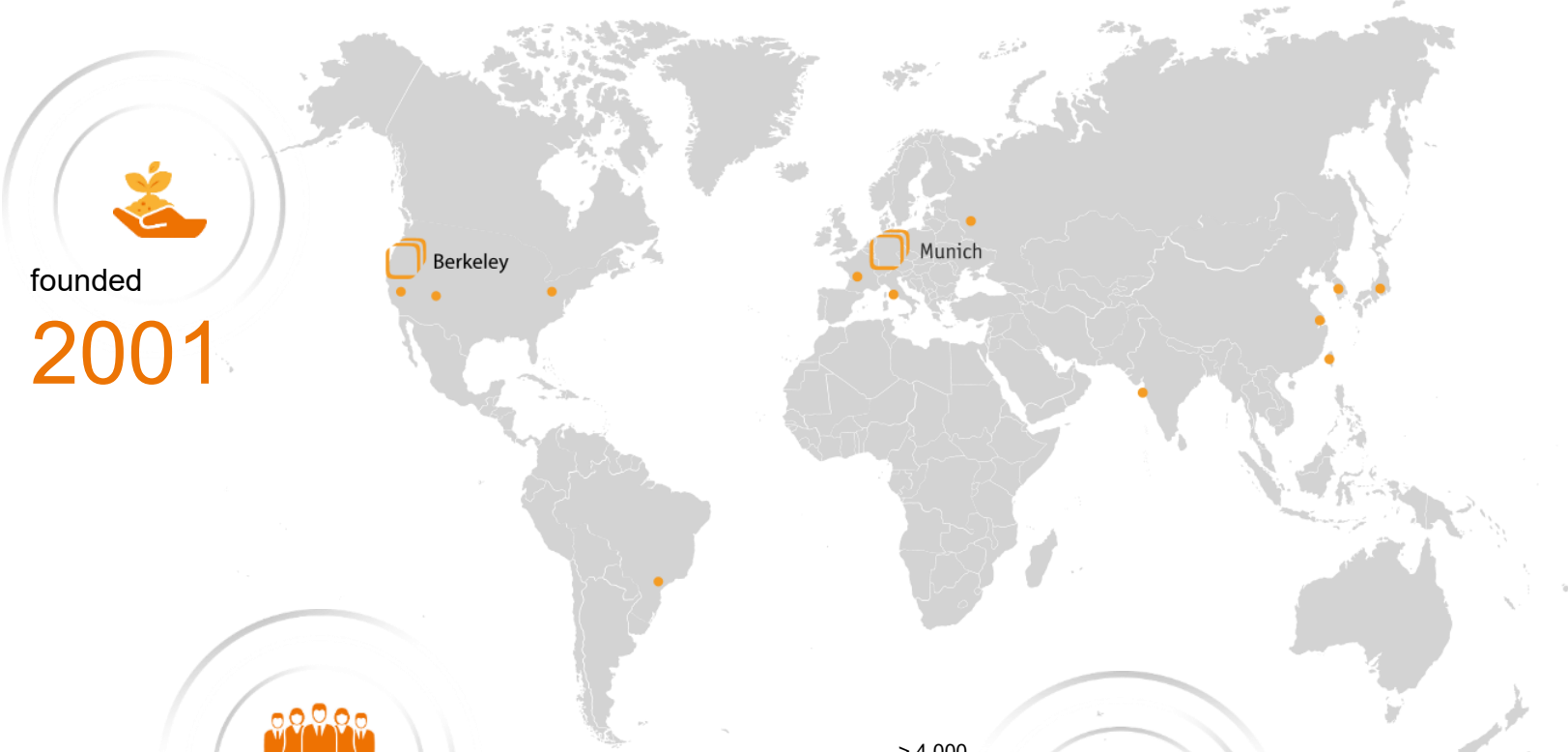


# Precision as key enabler for Semicon & Photonics innovation

Overcoming challenges in demanding Motion & Sensing applications



Technology leader in nanoscale applications.



founded  
**2001**



**2** offices  
Munich | Berkeley  
3 regional US sales representatives  
16 worldwide distributors



**250** employees  
18 nationalities  
18% PhDs

> 4.000  
customers in

**40** countries

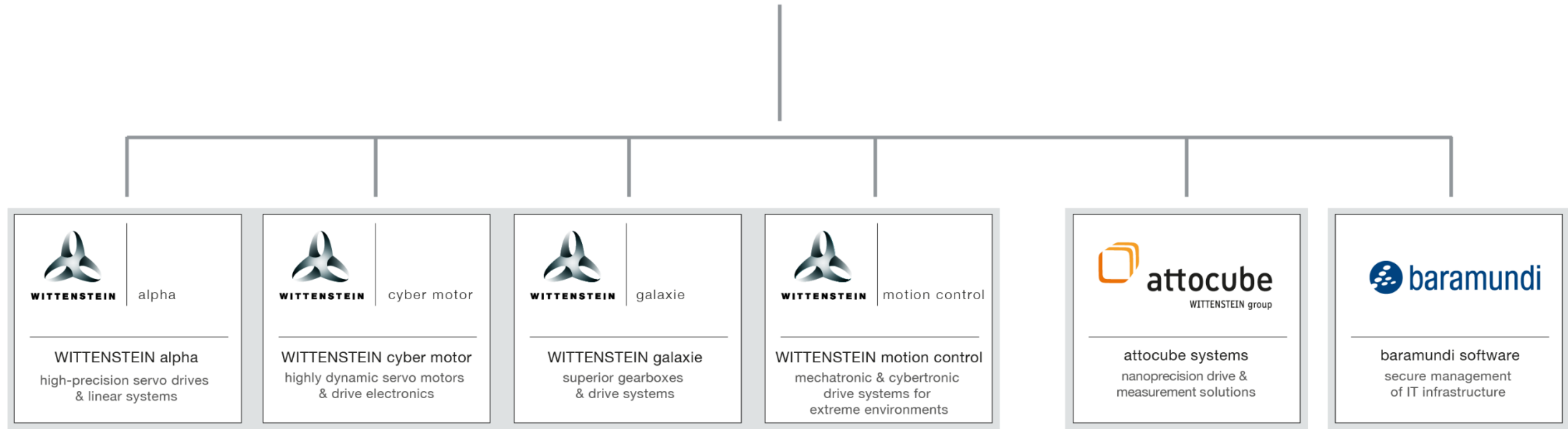




**WITTENSTEIN**

## Drivers of innovation in mechatronic drive technology.

- Founded 1949
- 519 Mio € sales revenues (2022/23)
- 2800 employees



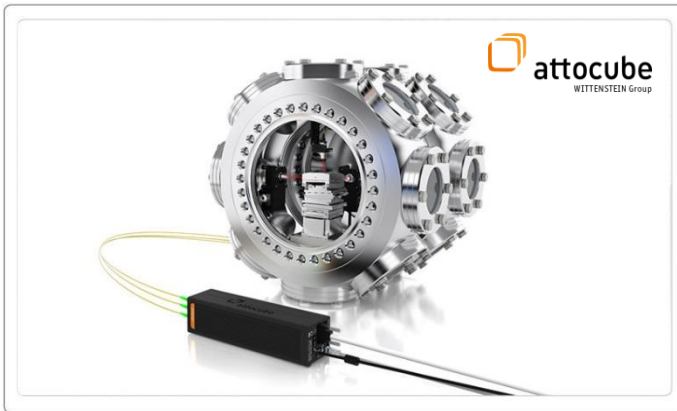
Since 2011

# Strategic Business Sectors

3 business sectors optimally serve customers in attocube's key markets

## MOTION & SENSING

precision engineering components



From engineers, for engineers.

focus on ambient and HV  
engineering customers

components and modules for  
precision engineering customers

## CRYOGENIC INSTRUMENTS

cool tools for cold science



From physicists, for physicists.

focus on flexible  
research customers

components, modules and research platforms for  
condensed matter physics at cryogenic temperatures

## NANOSCALE ANALYTICS

advanced imaging & spectroscopy



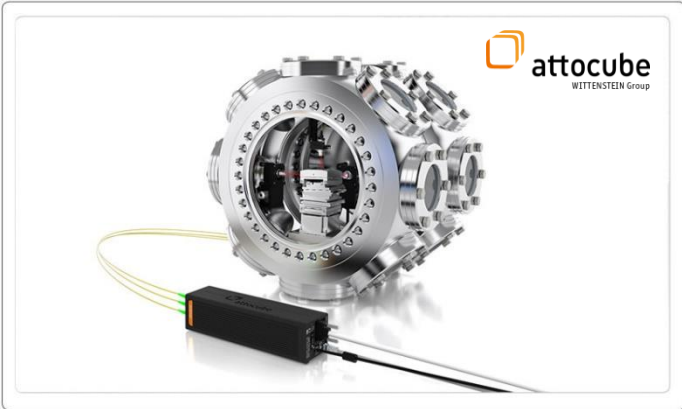
From experts, for experts.

focus on ready to use solutions  
for dedicated applications

turn key solutions for nanoscale  
analytics in surface science & inspection

## MOTION & SENSING

precision engineering components



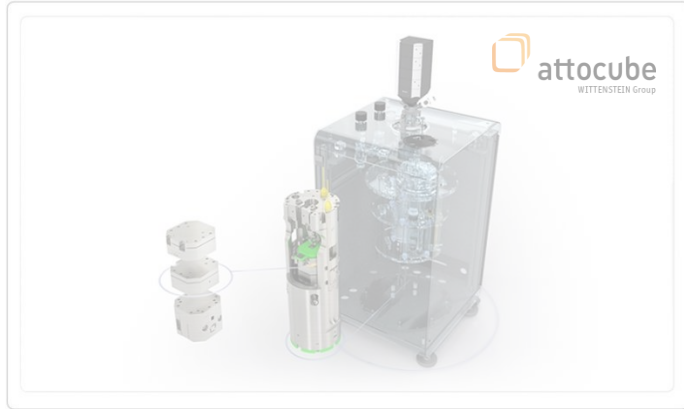
From engineers, for engineers.

focus on ambient and HV  
engineering customers

components and modules for  
precision engineering customers

## CRYOGENIC INSTRUMENTS

cool tools for cold science



## NANOSCALE ANALYTICS

advanced imaging & spectroscopy





## MOTION & SENSING

precision engineering components

### Nanopositioners

precision motion applications at ambient & vacuum conditions



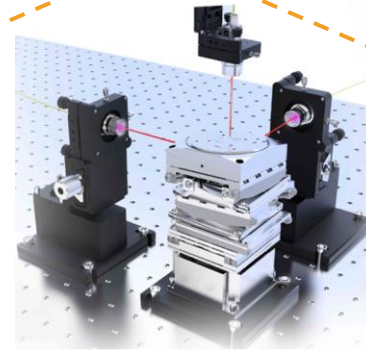
### Displacement Sensor

ultra precise position control & calibration



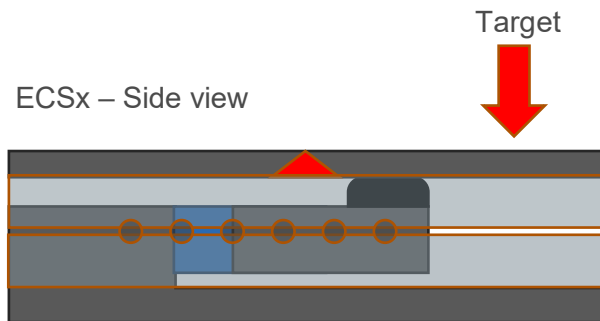
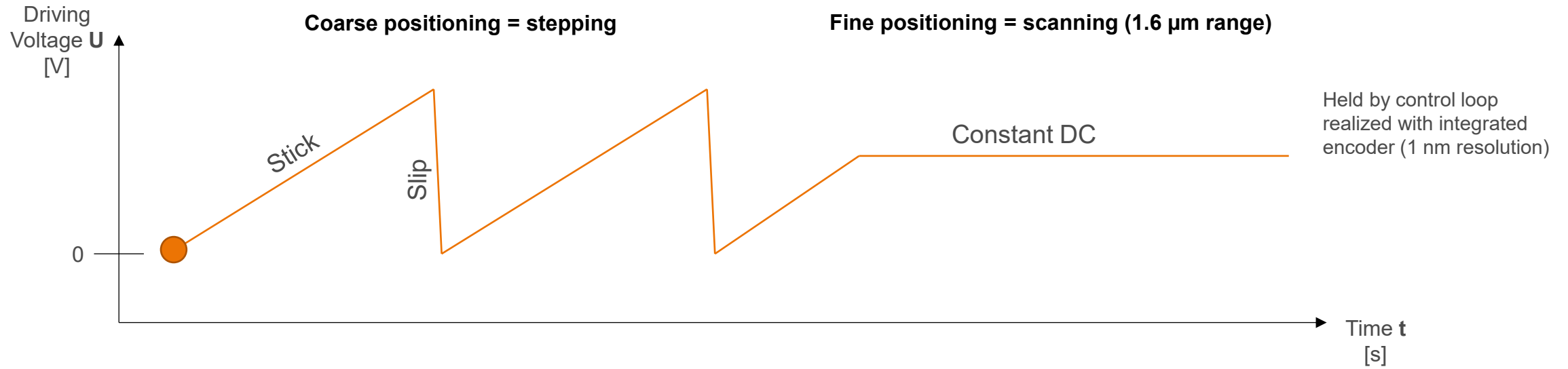
### Customized Solutions & Combined Systems

integrated solutions for demanding engineering applications



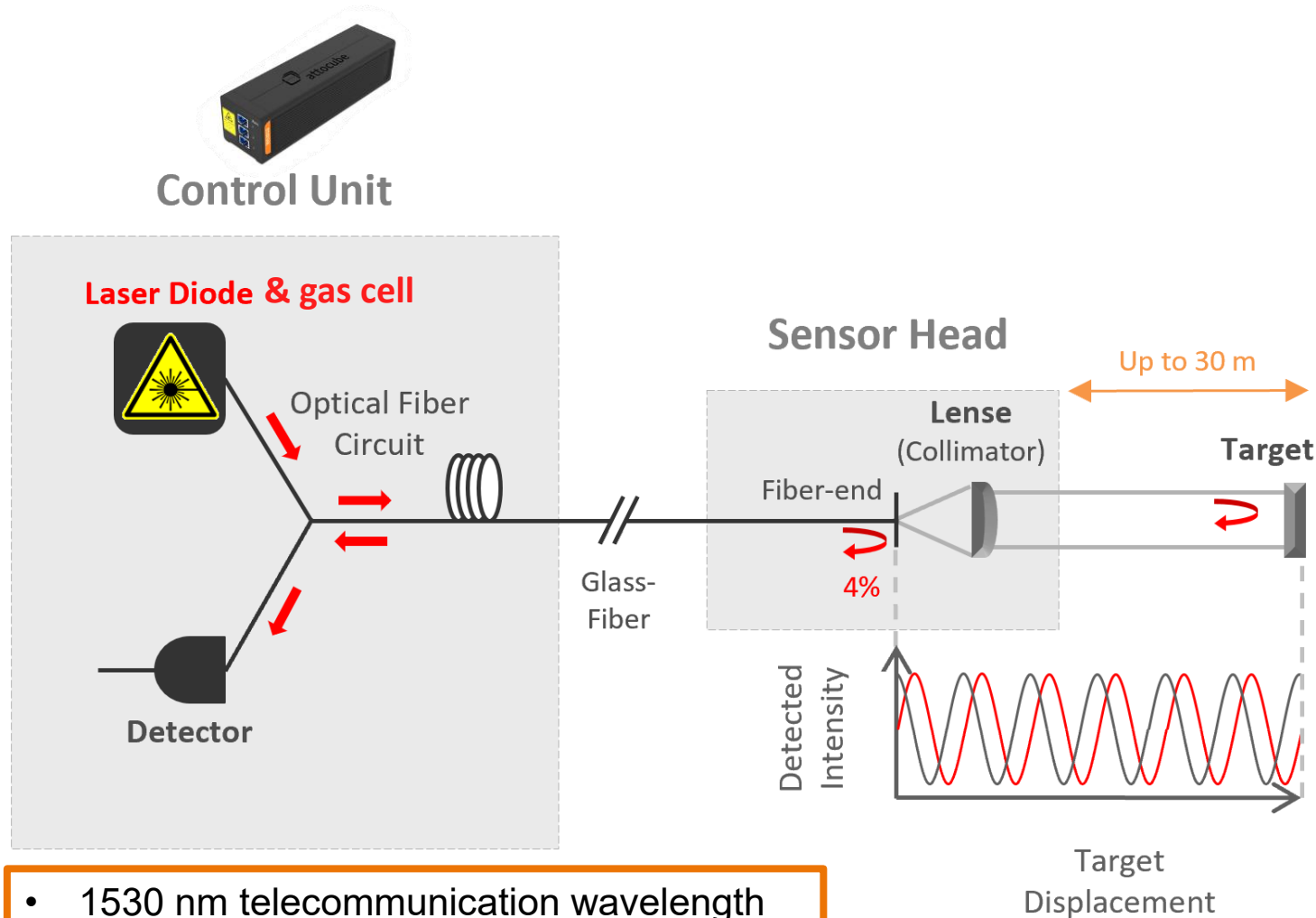
# Piezo stick-slip: Positioner working principle

Stepping and scanning – closed loop



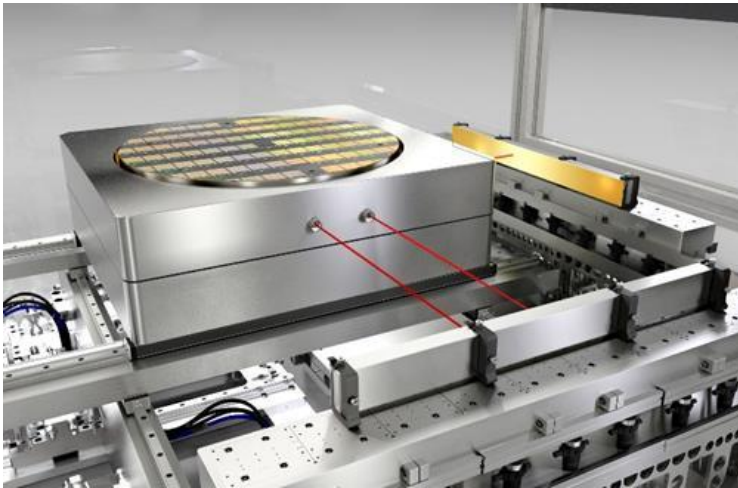
# Fabry-Pérot Interferometer: Working Principle of IDS3010

Interferometer setup using Fabry-Pérot cavity



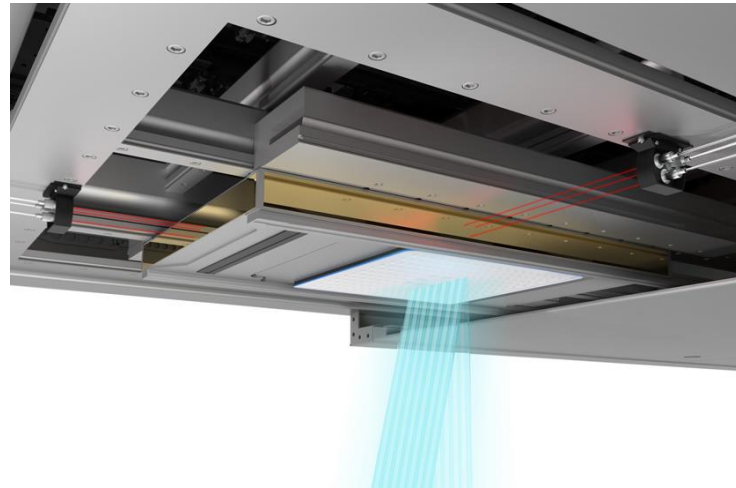
- 1530 nm telecommunication wavelength
- Combination of DFB laser and reference gas cell ensures accuracy over 10 years

- Laser current is modulated at high frequency (~MHz)
- Amplitude of modulation signal is sensitive to displacements when interference signal is insensitive



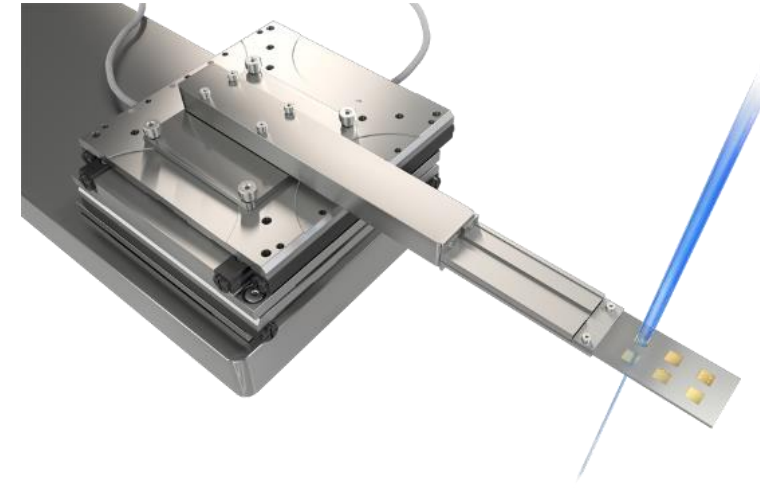
High speed Wafer Stage  
Position Control

- Challenge:  
High speed to increase throughput while achieving nanometer precision
- Solution:  
Fiber-based interferometer with light weight sensor heads integrated into the stage enables ultra fast motion control



Multi-Axis Stage control for actinic  
EUV mask inspection

- Challenge:  
Analyzing and controlling multi DoF motion errors in vacuum environment
- Solution:  
Multi-Axis laser interferometer measuring close to the POI with vacuum compatible sensor heads



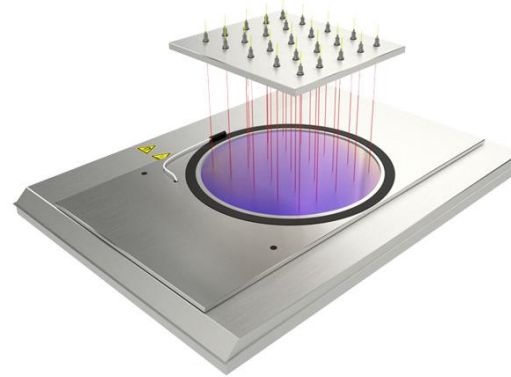
E-Beam Stencil Alignment for Mask  
Inspection or Lithography

- Challenge:  
Precise beam shaping in magnetic field and vacuum conditions (maintain position even without voltage)
- Solution:  
Self locking piezo stick-slip nanopositioner with ground to target functionality and UHV compatibility



### Dynamic Motion Control of Die Bonding Heads

- Motivation:  
Back-end miniaturization boosts semiconductor performance
- Challenge:  
Cost efficient, compact and highly accurate high-speed sensor solution
- Solution:  
DFB laser based interferometer



### Multi-Point Wafer Chucking Planarity Detection

- Motivation:  
Higher throughput requires faster acceleration and speed
- Challenge:  
Understanding wafer deformation by high bandwidth analysis
- Solution:  
Interferometric multi-point deformation measurement



### Beam Steering for High Power Display Laser Cutting

- Motivation:  
Increase yield and reducing cost
- Challenge:  
Ensure beam precision after extensive steering and shaping
- Solution:  
Closed-loop piezo nano positioners for highly stable optics alignment

## Application perspective

- Continuous precision and accuracy improvement reaching deep into sub-nm ranges
- Rising importance of extreme environments like UHV, clean room and magnetic fields
- Increase usability and robustness of interferometric measurement (beam interrupts, angular tolerance)

## Motion & Sensing Technology perspective

- Lowest noise DFB-Lasers with long lifetime and highly accurate sensors for refractive index detection
- Cost efficient sourcing of mechanical parts fulfilling these requirements (especially non-magnetic bearings)
- DFB-Lasers allowing fast changes in wavelength and optics/photonics components (fibers, detectors, lenses)

Collaborate to achieve higher levels of precision in a broader field of applications, through even better performance, usability & stability improvement and low cost of ownership

# Thank you!

Q&A session

