

## Fiber Optic Shape and Force Sensing

## Enabling Technologies for Next Generation Medical Devices and Tools



## We are

a developer and manufacturer of fiber optic sensor components and fiber optic sensor solutions



We are vertical from raw materials to software



## We do

Temperature sensing



Shape sensing



Strain sensing

Force sensing



Pressure sensing

## For

Medical



Process Industry



Civil engineering

Transportation



Energy



# Locations



## FBGS China (Suzhou)

Sales and applications (Chinese customers)



## FBGS North America (Montreal)

Sales and applications (North American market)

## FBGS Belgium (Geel)

Sales and applications  
Development and assembly of measurement systems (interrogators)  
Sensing Solution Engineering and R&D Work



## FBGS Germany (Jena)

Company Headquarter  
DTG® and FSG® production  
R&D location for special fibers and FBGs



# Key advantages optical fiber sensors



## • RELIABILITY

- Passive component
- Long lifetime (>20 years)
- No corrosion
- Stable over time (No calibration required)
- Cables and connectors are telecom grade

## • IMMUNITY

- Immune to electromagnetic radiation & radio frequency interference
- Immune to high voltage discharge
- Explosion safe

## • SIZE

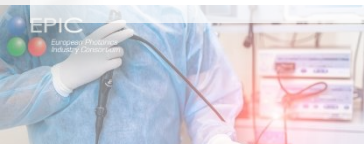
- Fiber is also the sensor
- Lightweight & small diameter (< 1/4 mm)
- High integration and embedding capabilities

## • PERFORMANCE

- 10's, 100's or 1000's of sensors in 1 fiber
- Less cables
- Easy installation
- High fatigue resistance
- Long distance measurements (20+ km)

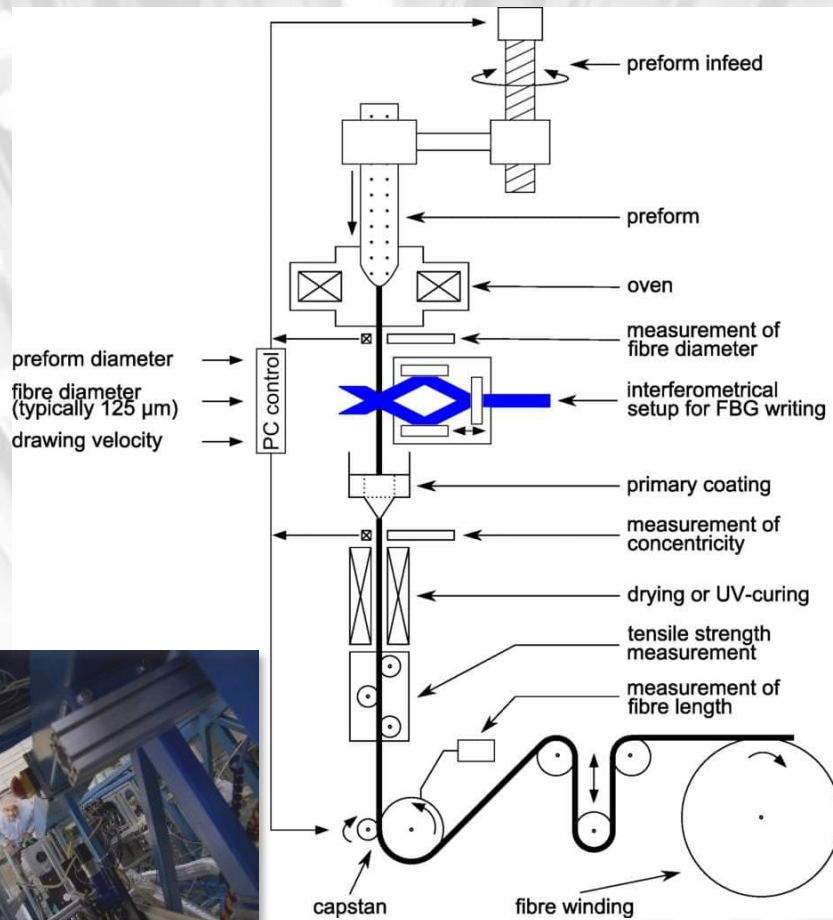
## • OMNI-FUNCTIONALITY

- Measurement of
  - Strain
  - Temperature
  - Vibration
  - Acoustics
  - Pressure
  - Force
  - Shape
  - Acceleration
  - Displacement
  - Flow
  - Liquid level

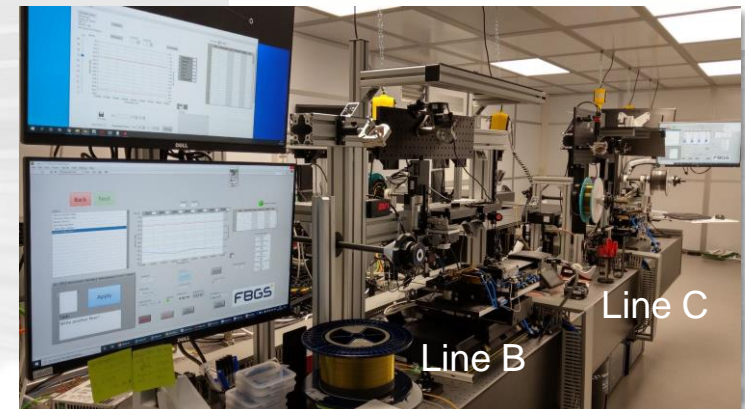
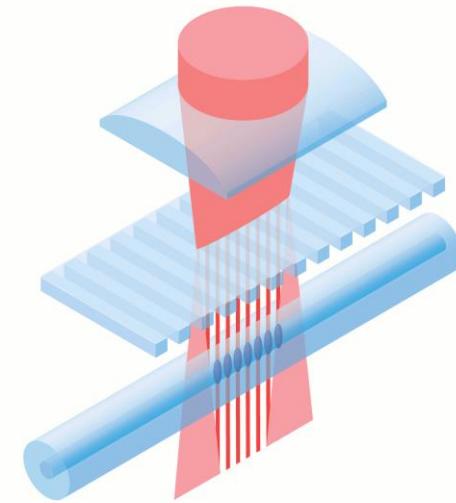
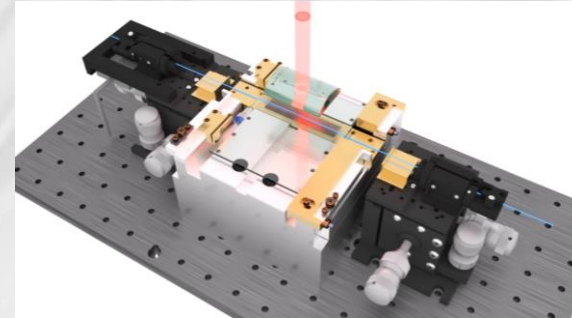


# Fiber Bragg grating manufacturing

## Draw Tower Grating® technology



## FemtoSecond Grating® technology



# Shape & Force Sensing – based on Wavelength Division Multiplexing in MultiCore Fiber

**Fiber optic shape sensing:** the possibility to determine the curvature, shape and position of an optical fiber in 2D and 3D.



Robotic and standard minimally invasive surgery

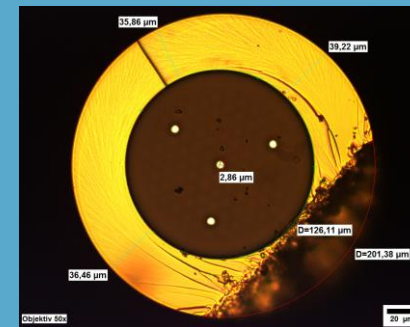
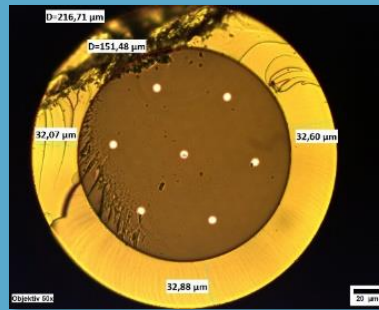
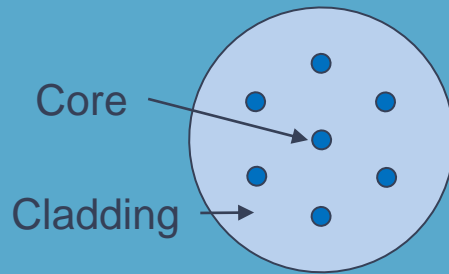
- Real-time position tracking
- Instrument and catheter navigation
- Bending detection and deformation monitoring

**Fiber optic force sensing**



Controlling the interaction force between minimally invasive surgery tools and the human tissue enabling next-generation surgical precision

- Cardiac catheterization procedures
  - Cardiac ablation treatments
- Robotic assisted laparoscopic surgeries



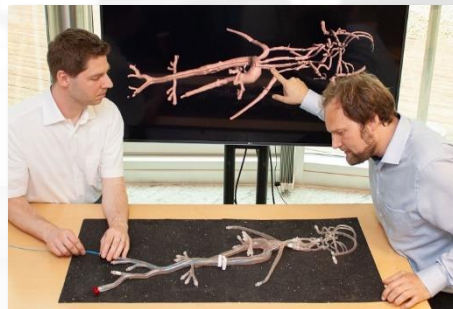
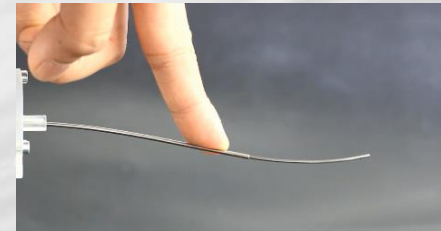
For navigation

For positioning

For 3D shape

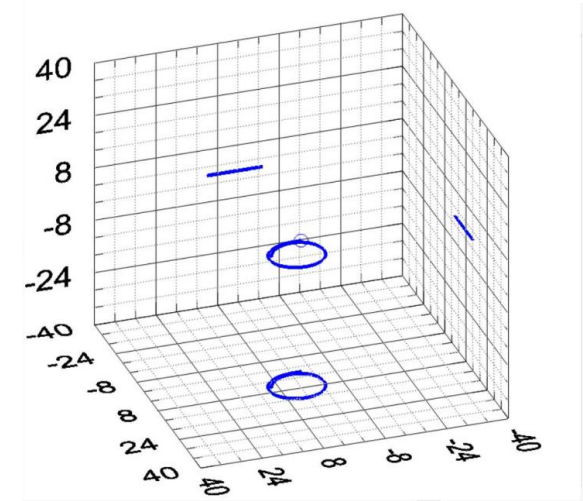
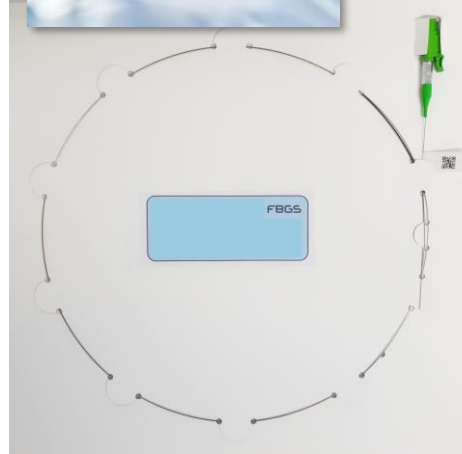
# Applications (Shape)

- Catheter navigation
- Sensing in continuum robotic systems
- Neurosurgical needle tracking
- Neuro-implant position tracking
- Instrument navigation during bronchoscopy
- Position tracking for manual and robotic orthopedic procedures



Success

# Building blocks



## Interrogation technology

FBGS' SHAPE-scan enhancing and simplifying shape sensing.

Plug & play MultiCore Fiber interrogation device

## Sensing probe

New high-end MultiCore Fiber Design

Dedicated protective (metallic) capillary.

Excellent flexibility

Special termination of the tip of the capillary in order to better protect the fiber.

Prevent direct contact of the fiber with liquids

## ILLumiSense software

Modular software architecture supporting different applications

Full application shape sensing software

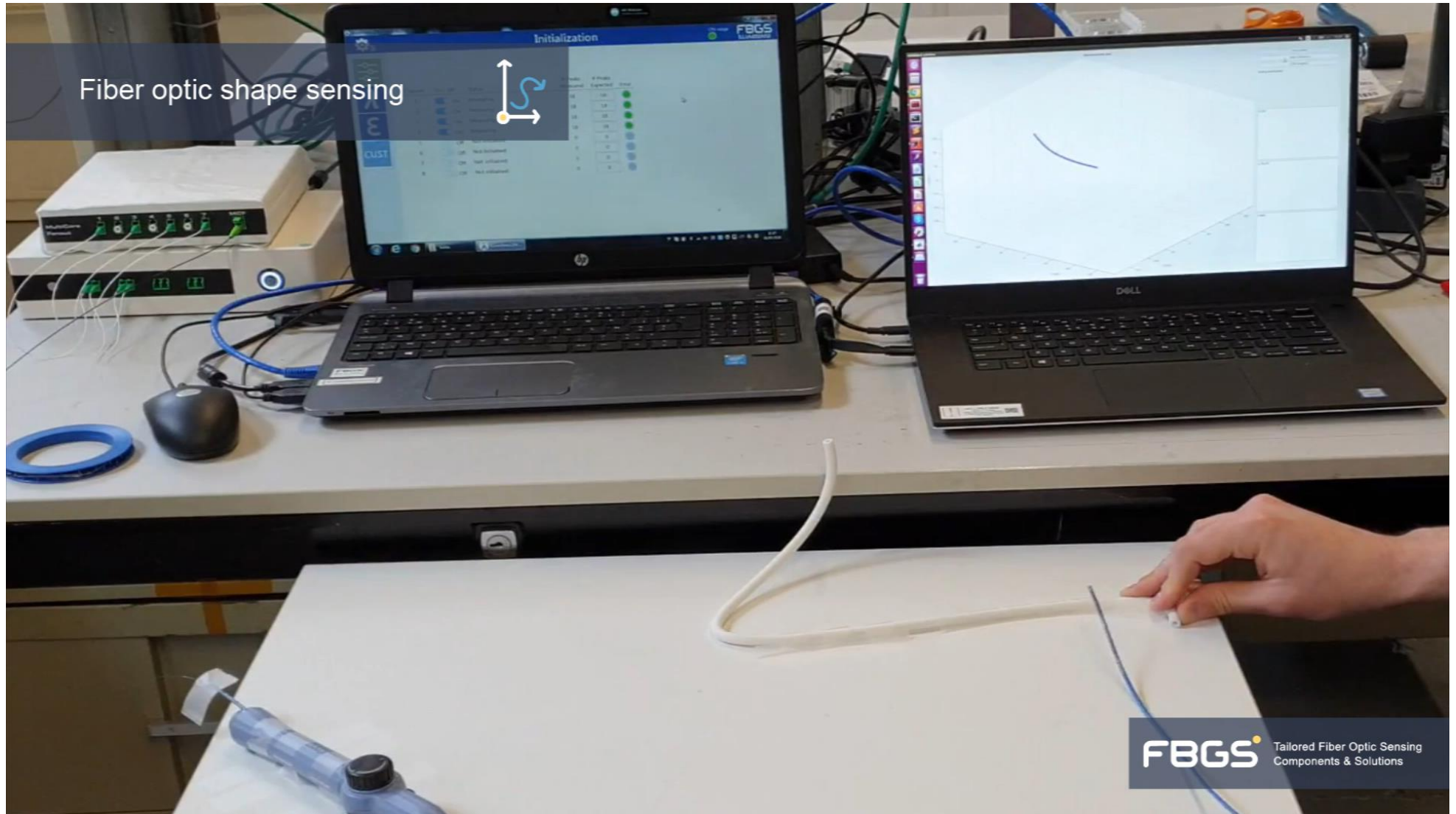
Automatic recognition of the active MCF cores

Data Streaming of graphical display and engineering values





# Demonstration





Tailored Fiber Optic Sensing  
Components & Solutions

**Thank you for your attention!**

Questions?

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