

# FIBER Series 6000

Advanced measuring and  
control technology for  
optical fibers

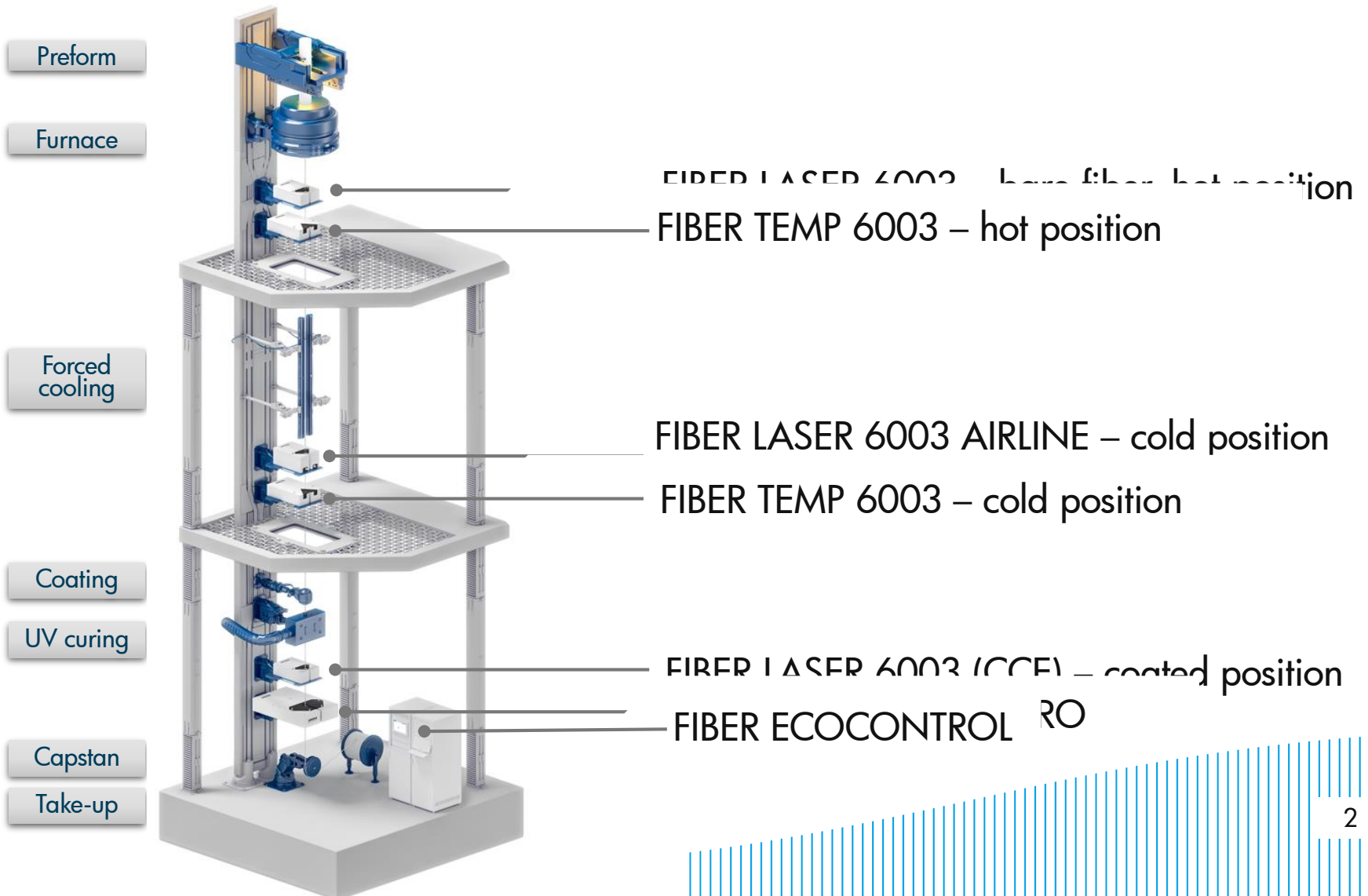
World Optical Fibre & Cable  
Conference 2017, CRU

Speaker: Harry Prunk, Executive Board  
SIKORA AG

November, 2017

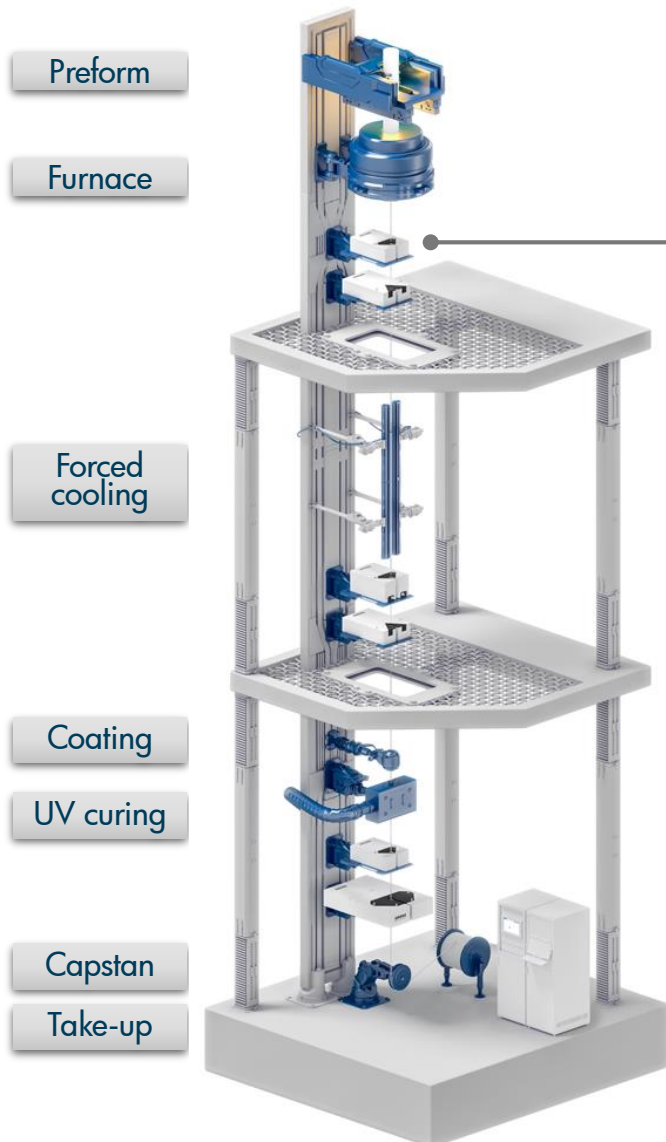
# Online quality control for optical fibers

## Overview



# Online quality control for optical fibers

## Overview

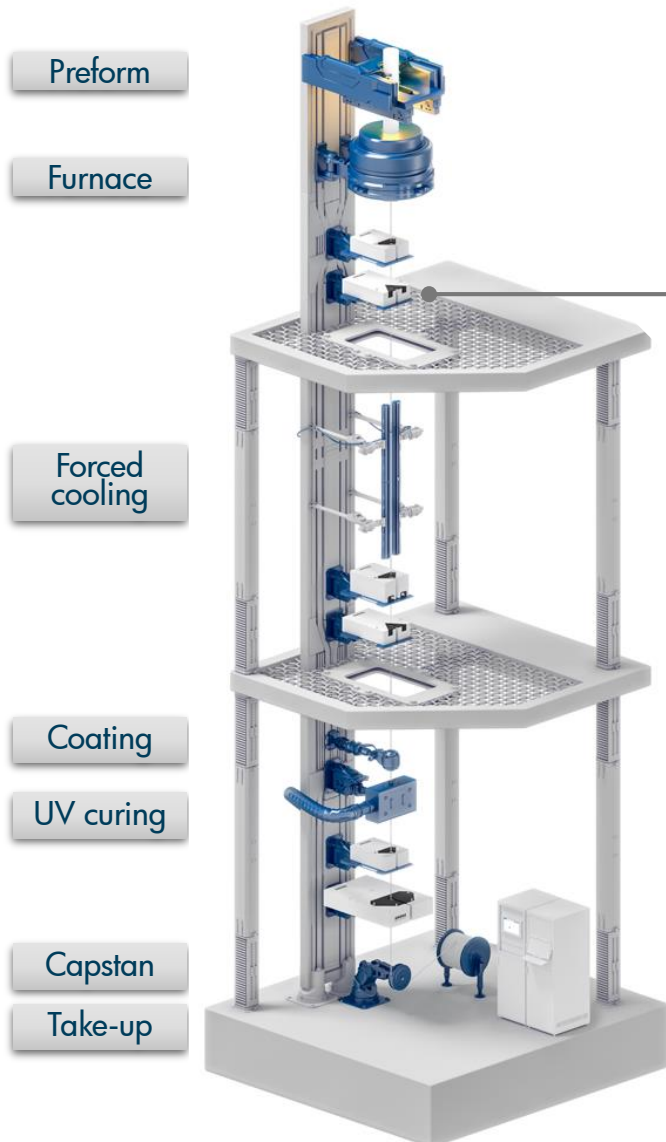


FIBER LASER 6003 – bare fiber, hot position

- Diameter 50 - 500  $\mu\text{m}$
- Ovality
- Fiber position
- Tension
- 2,500 Hz measurement rate

# Online quality control for optical fibers

## Overview

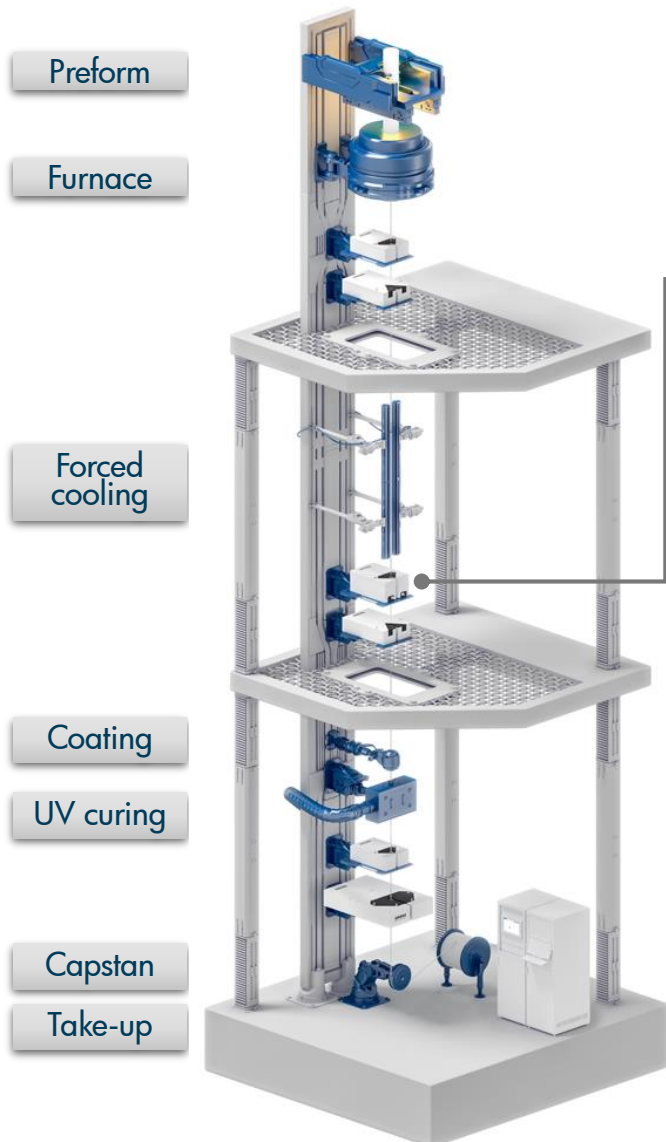


FIBER TEMP 6003 – hot position

- Temperature 500 - 1,500 °C
- 100 Hz measurement rate  
→ process optimization

# Online quality control for optical fibers

## Overview

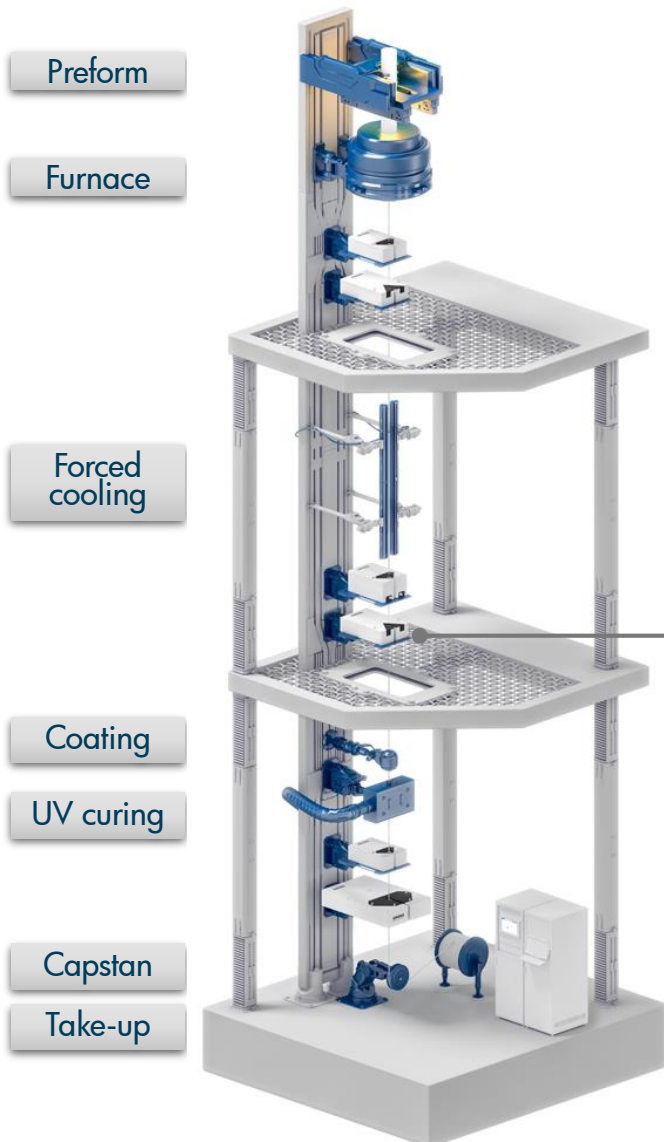


FIBER LASER 6003 AIRLINE – cold position  
(alternatively FIBER LASER 6003)

- Diameter 50 - 500  $\mu\text{m}$
- Ovality
- Fiber position
- Spinning
- Airline detection down to fine airlines of 0.5  $\mu\text{m}$
- 2,500 Hz measurement rate

# Online quality control for optical fibers

## Overview

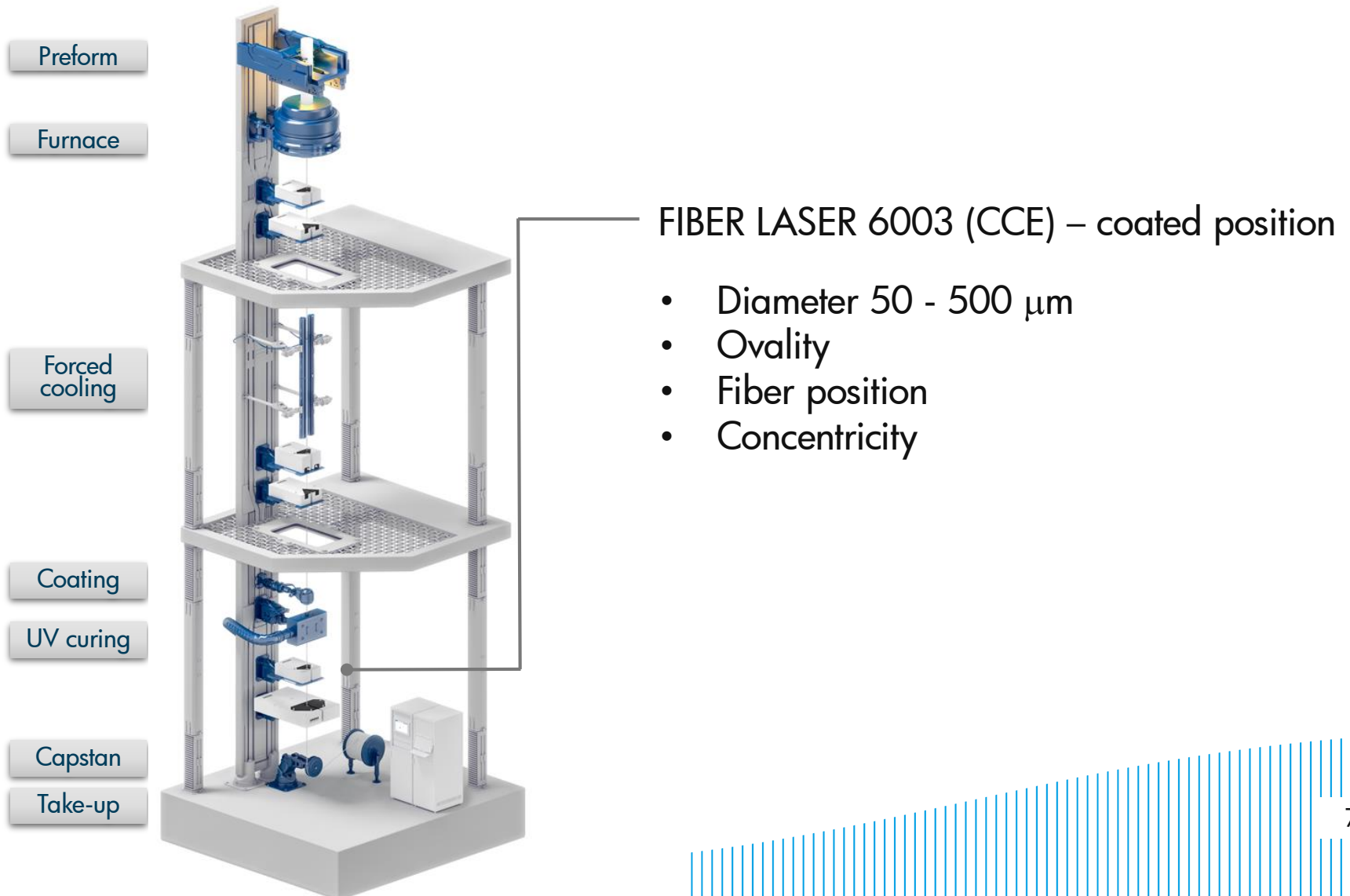


FIBER TEMP 6003 – cold position

- Temperature 40 - 120 °C
- 100 Hz measurement rate
  - cost savings in helium consumption
  - stable temperature for optimal coating application

# Online quality control for optical fibers

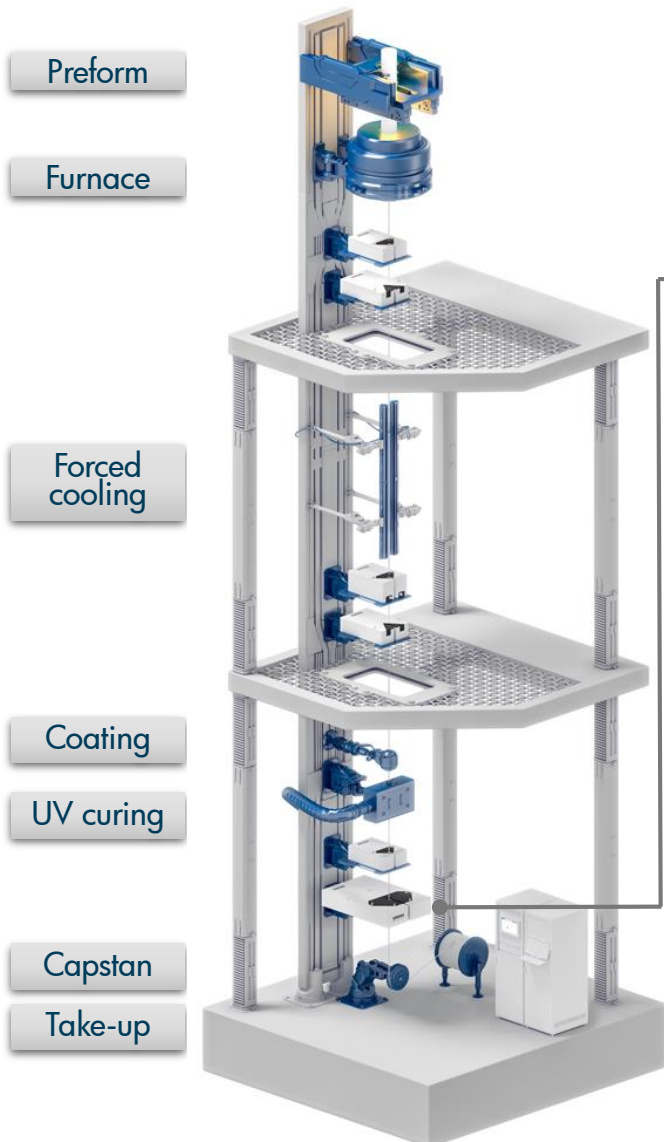
## Overview





# Online quality control for optical fibers

## Overview



### FIBER LUMP 6003 MICRO

- 6 axes eliminate shadow
- 5  $\mu\text{m}$  min. fault height
- 50  $\mu\text{m}$  min. fault length @ 3,000 m/min
- 100% coverage of the circumference

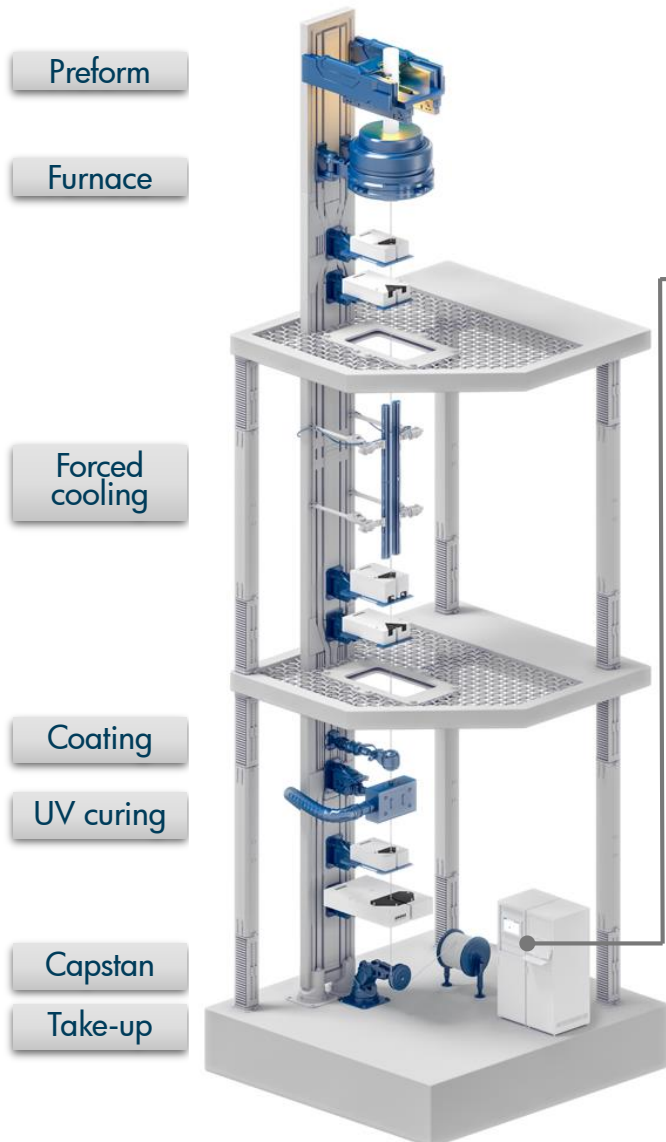
### Alternatively: FIBER LUMP 6003

- 3 axes
- 5  $\mu\text{m}$  min. fault height
- 500  $\mu\text{m}$  min. fault length @ 3,000 m/min



# Online quality control for optical fibers

## Overview



### FIBER ECOCONTROL

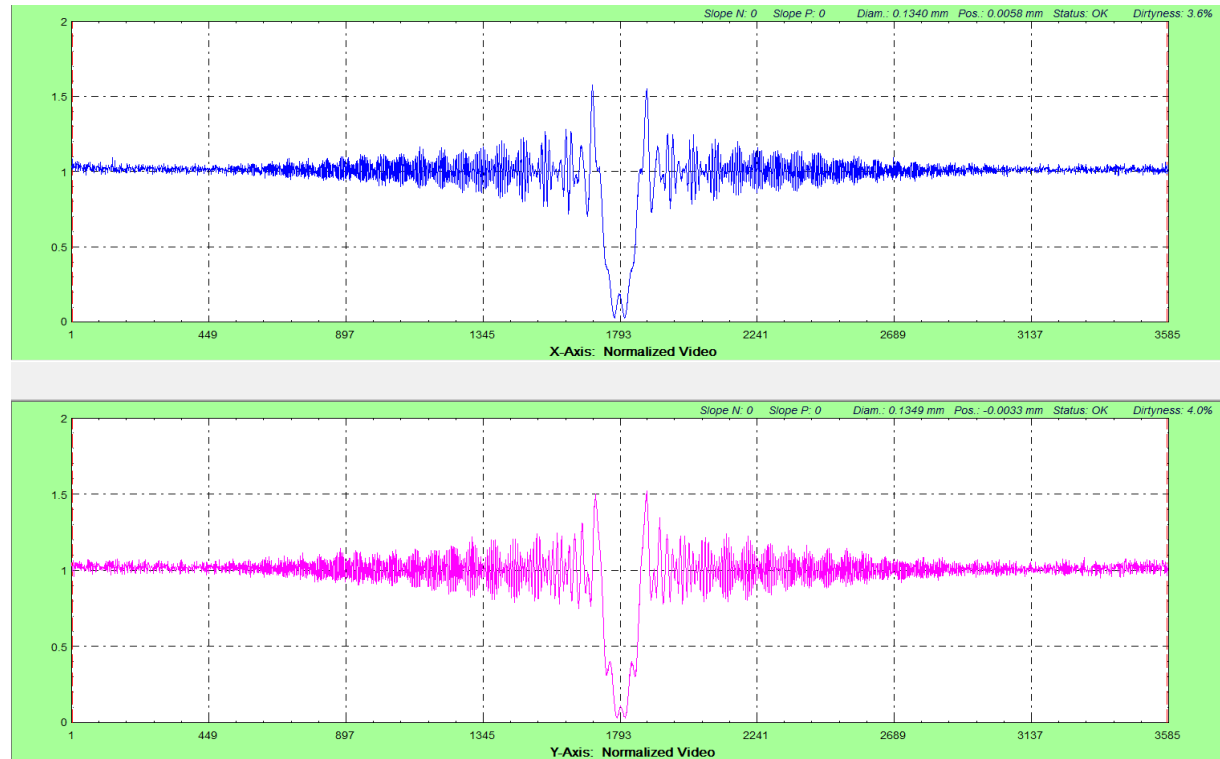
- 15" TFT touch monitor
- Display of measuring values, trend recordings, online statistics

# Online quality control for optical fibers

## FIBER LASER 6003



FIBER LASER 6003



# CMOS-technology with laser light source: FIBER LASER 6003



FIBER LASER 6003

## Working principle

- Enhanced diffraction analysis takes into account diffraction of both product edges and light transmitted through the fiber – not just a single bright-dark transition!
- Physical model and optimization algorithm for each single measurement
- No moving parts
- Factory calibrated, accuracy for a lifetime
- Full digital measurement and communication

# CMOS-technology with laser light source

## FIBER LASER 6003



FIBER LASER 6003

### Technical data

Measuring range	50 - 500 $\mu\text{m}$
Accuracy	$\pm 0.05 \mu\text{m}$
Repeatability	0.02 $\mu\text{m}$
Exposure time	1,2 $\mu\text{s}$
Measuring rate	2,500/s

# CMOS-technology with laser light source

## FIBER LASER 6003



FIBER LASER 6003

### Interfaces

- RS485 + RS232 serial interfaces
- LAN interface - full 2,500 single measurements per axis available (single diameter, average diameter, position)
- 4 analog outputs
  - unipolar 0 to 10 V or
  - bipolar -10 to +10 V,
  - resolution 16 bit
- Profibus-DP, alternatively industrial fieldbus such as Profinet IO, EtherNet/IP, CANopen, DeviceNet (option)

# CMOS-technology with laser light source

## FIBER LASER 6003



FIBER LASER 6003

### Your benefits

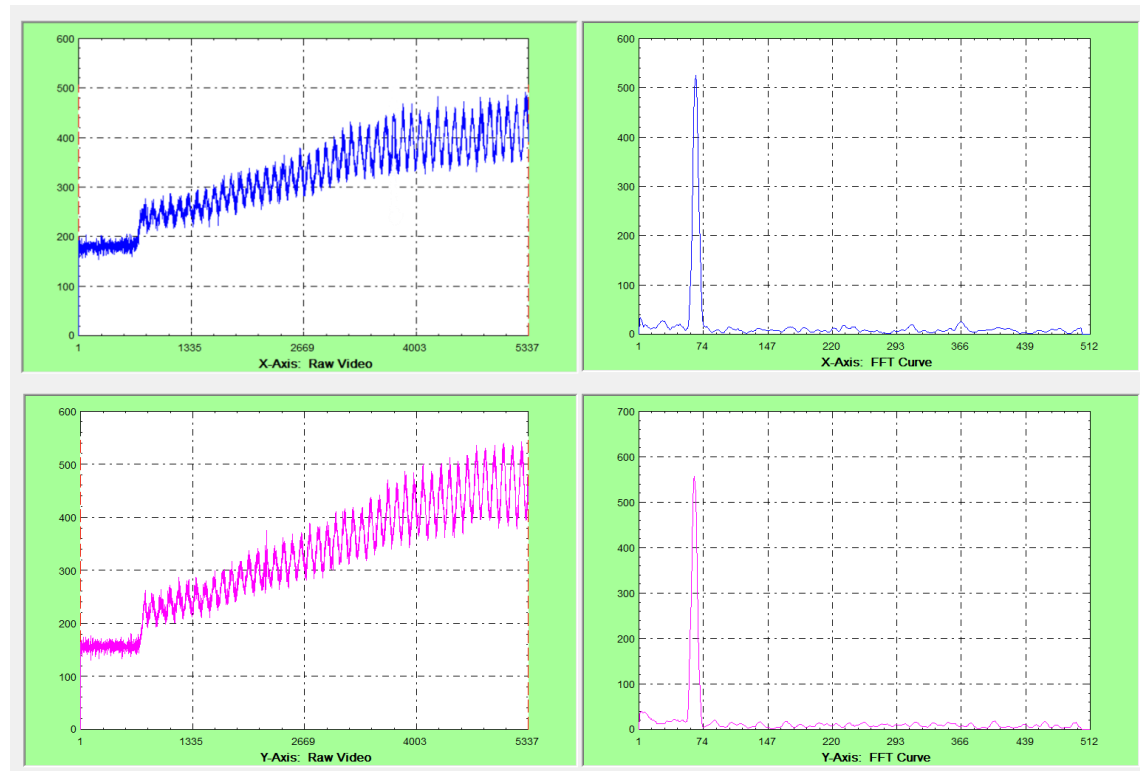
- Measurement of the diameter, position, tension, vibration frequency and spinning directly in the gauge head
- Unique scatter plot shows short term variations
- Highest accuracy for outstanding quality control during fiber production
- No moving parts, no calibration
- Availability 99.8 %

# CMOS-technology with laser light source

## FIBER LASER 6003 AIRLINE



FIBER LASER 6003 AIRLINE



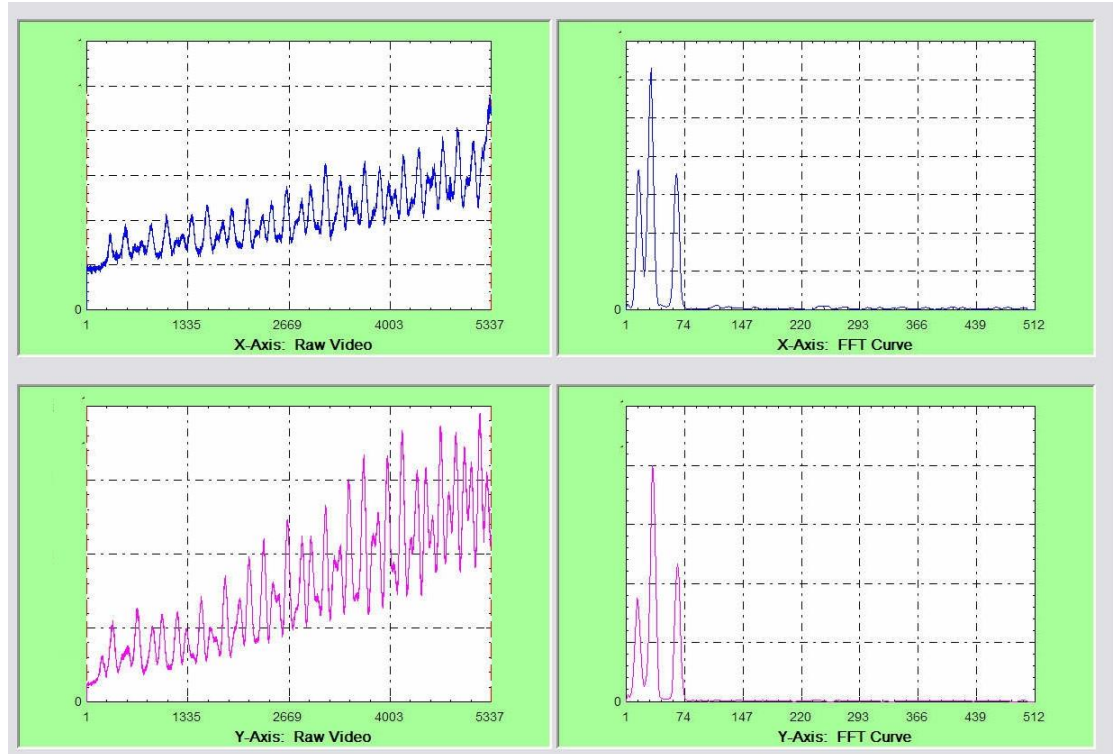


# CMOS-technology with laser light source

## FIBER LASER 6003 AIRLINE



FIBER LASER 6003 AIRLINE



# CMOS-technology with laser light source

## FIBER LASER 6003 AIRLINE

### Working principle

- FIBER LASER 6003

### plus airline detection:

- Interference measurement principle
- Airlines generate additional spectral peak
- Airlines measurable down to 0.5 mm



FIBER LASER 6003 AIRLINE

# CMOS-technology with laser light source

## FIBER LASER 6003 AIRLINE

### Interfaces

- Configurable dry contact
- Serial service port
- RS485 connection to ECOCONTROL



FIBER LASER 6003 AIRLINE

# CMOS-technology with laser light source

## FIBER LASER 6003 CCE



FIBER LASER 6003 CCE

### Working principle

- Featuring all benefits of the FIBER LASER 6003

plus calculation of the coating concentricity:

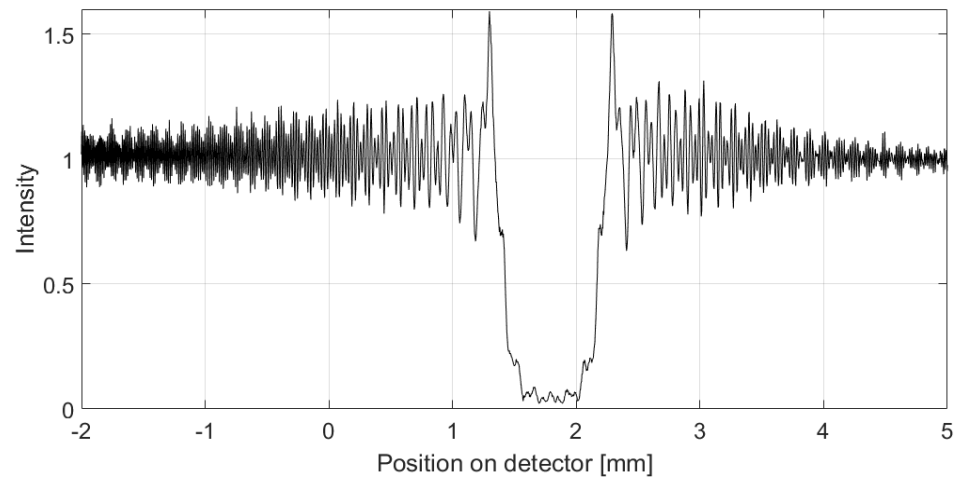
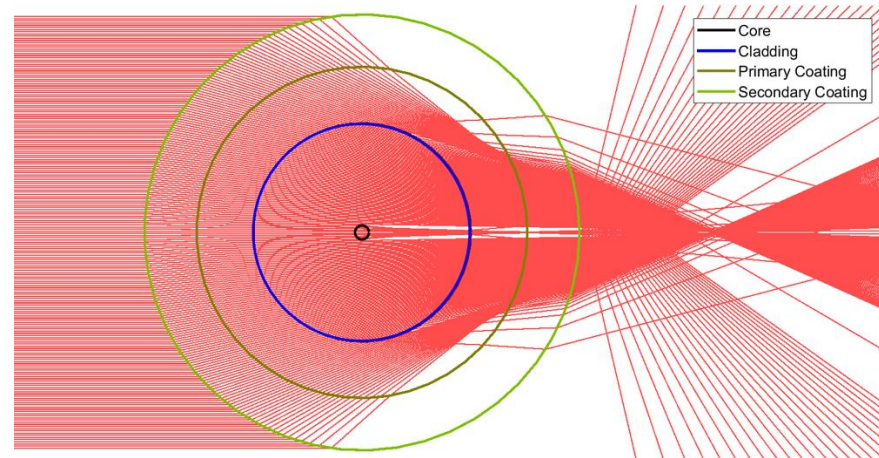
- Transmitted light is refracted depending on the refractive index of the coating and the cladding
- Asymmetries in the coating become visible in the FIBER LASER 6003 video signal
- A symmetry measurement is calculated
- Minimized symmetry measurement value  
→ improves concentricity

# CMOS-technology with laser light source

## FIBER LASER 6003 CCE

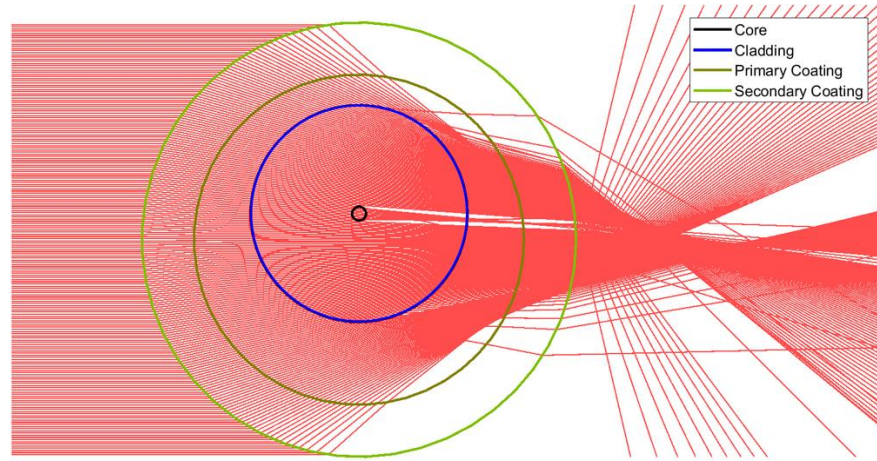


FIBER LASER 6003 CCE



# CMOS-technology with laser light source

## FIBER LASER 6003 CCE



FIBER LASER 6003 CCE

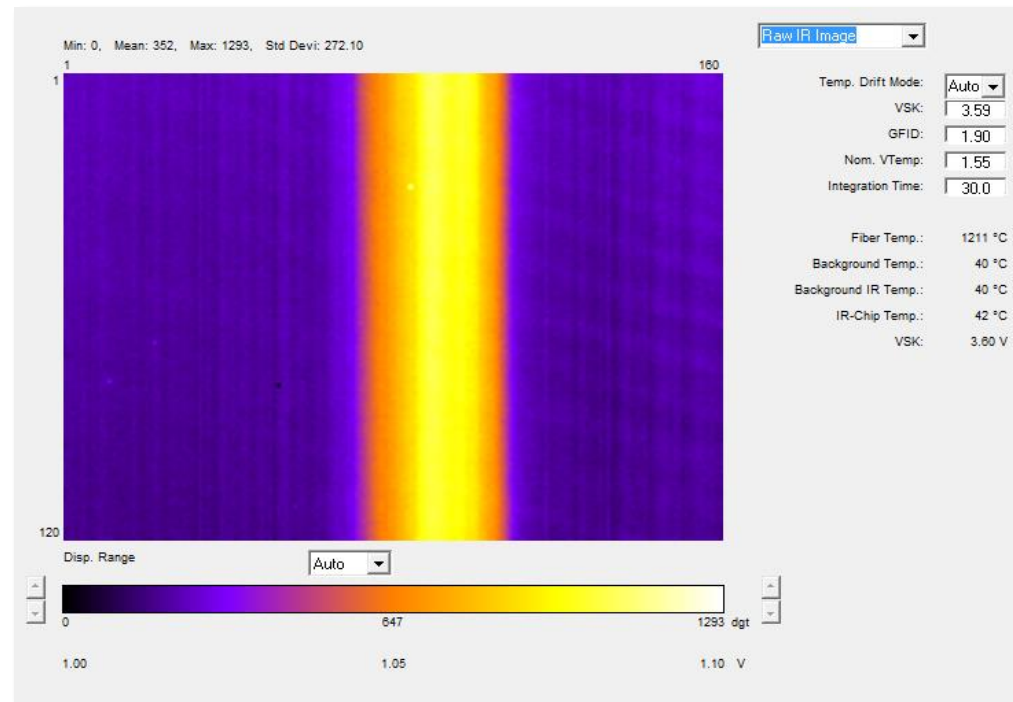
# Fiber temperature measurement

## FIBER TEMP 6003

Hot position



FIBER TEMP 6003





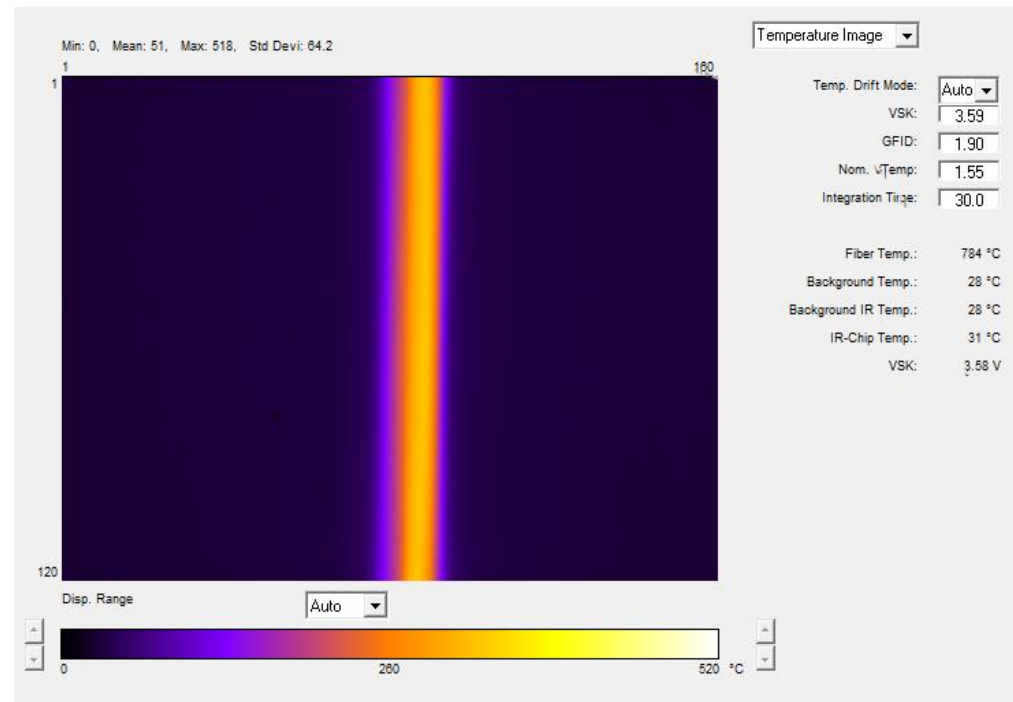
# Fiber temperature measurement

## FIBER TEMP 6003

Cold position



FIBER TEMP 6003



# Fiber temperature measurement

## FIBER TEMP 6003



FIBER TEMP 6003

### Technical data

Product diameter	100 - 500 $\mu\text{m}$
Measurement	cold: 40 - 120 °C hot: 500 – 1,500 °C
Measuring rate	100/s

# Fiber temperature measurement

## FIBER TEMP 6003



FIBER TEMP 6003

### Interfaces

- RS485
- RS232
- LAN
- Analog output (option)
- Profibus-DP, alternatively industrial fieldbus such as Profinet IO, EtherNet/IP, CANopen, DeviceNet (option)

# Fiber temperature measurement

## FIBER TEMP 6003



FIBER TEMP 6003

### Your benefits

- Robust and focus independent temperature measurement
- Factory calibrated
- No moving parts
- **Hot:** Measurement at the hot position for the control of the furnace
- **Cold:** Measurement prior to the coating for optimization of the helium usage

# Fault detection:

## FIBER LUMP 6003/FIBER LUMP 6003 MICRO



FIBER LUMP 6003



FIBER LUMP 6003 MICRO

### Working principle

- Double sensor technology
- High speed measurement
- Multi axis configuration
- Fast alarm output for integration with PLC
- Digital interface available, lump/neckdown
  - type
  - size
  - statistics

# Fault detection: FIBER LUMP 6003/FIBER LUMP 6003 MICRO



FIBER LUMP 6003



FIBER LUMP 6003 MICRO

## Technical data

Axes	3 (FIBER LUMP 6003)
	6 (FIBER LUMP 6003 MICRO)
Product size	100 - 500 $\mu\text{m}$
Min. fault height	5 $\mu\text{m}$
Min. fault length	500 $\mu\text{m}$ (FIBER LUMP 6003)
	50 $\mu\text{m}$ (FIBER LUMP 6003 MICRO)
Speed range	up to 3,000 m/min

# Fault detection:

## FIBER LUMP 6003/FIBER LUMP 6003 MICRO



FIBER LUMP 6003



FIBER LUMP 6003 MICRO

### Interfaces

- RS485 + RS232 service interfaces
- Dry contacts in case of lumps/neckdowns
- Analog inputs (option)
- Profibus-DP, alternatively industrial fieldbus such as Profinet IO, EtherNet/IP, CANopen, DeviceNet (option)



# Fault detection:

## FIBER LUMP 6003/FIBER LUMP 6003 MICRO

### Your benefits



FIBER LUMP 6003



FIBER LUMP 6003  
MICRO

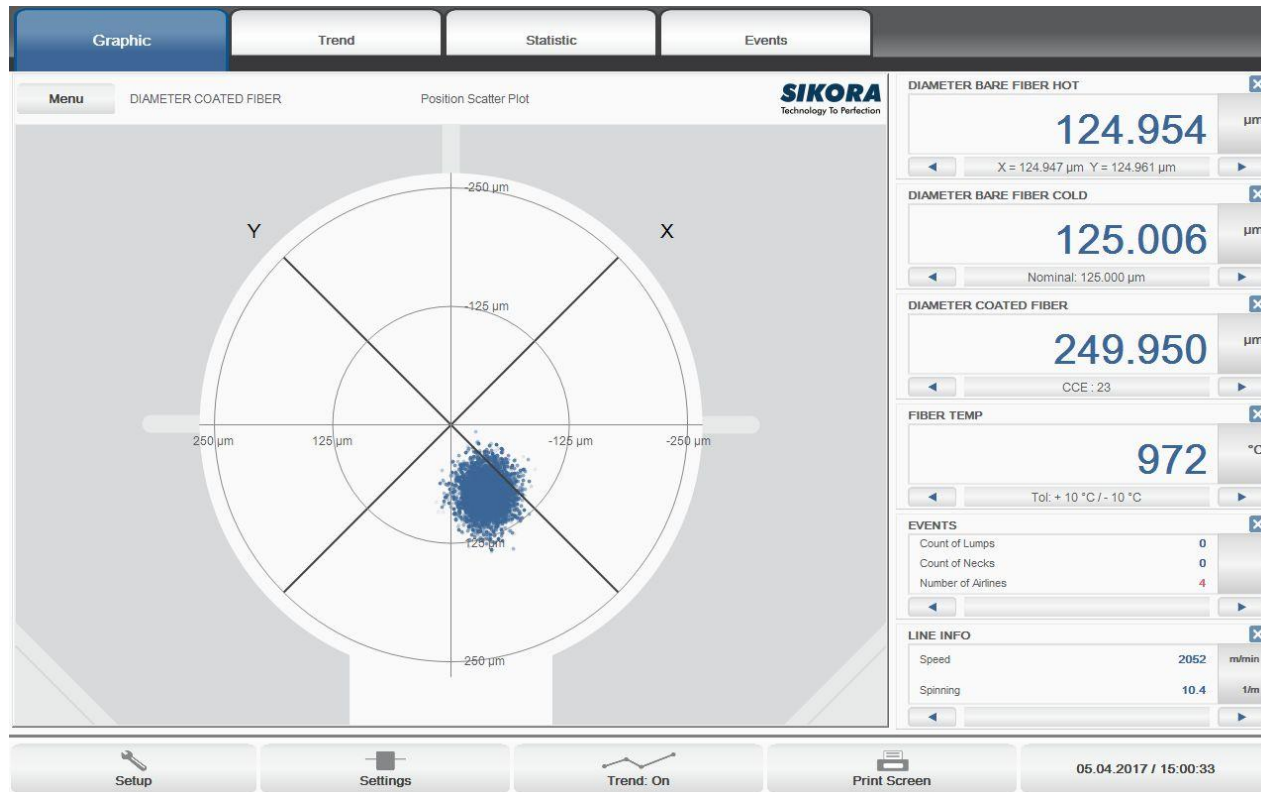
### FIBER LUMP 6003:

- High reliability due to 3-axis double sensor technology and high measuring rate
- Reliable fault detection with a height/depth of  $5\text{ }\mu\text{m}$  and a length of  $500\text{ }\mu\text{m}$

### FIBER LUMP 6003 MICRO:

- Highest reliability due to 6-axis double sensor technology and high measuring rate
- Shadows are eliminated
- Detection of smallest lumps and neckdowns of  $5\text{ }\mu\text{m} \times 50\text{ }\mu\text{m}$
- Reliable fault analysis regarding type, dimension, length and position

# FIBER ECOCONTROL 6000



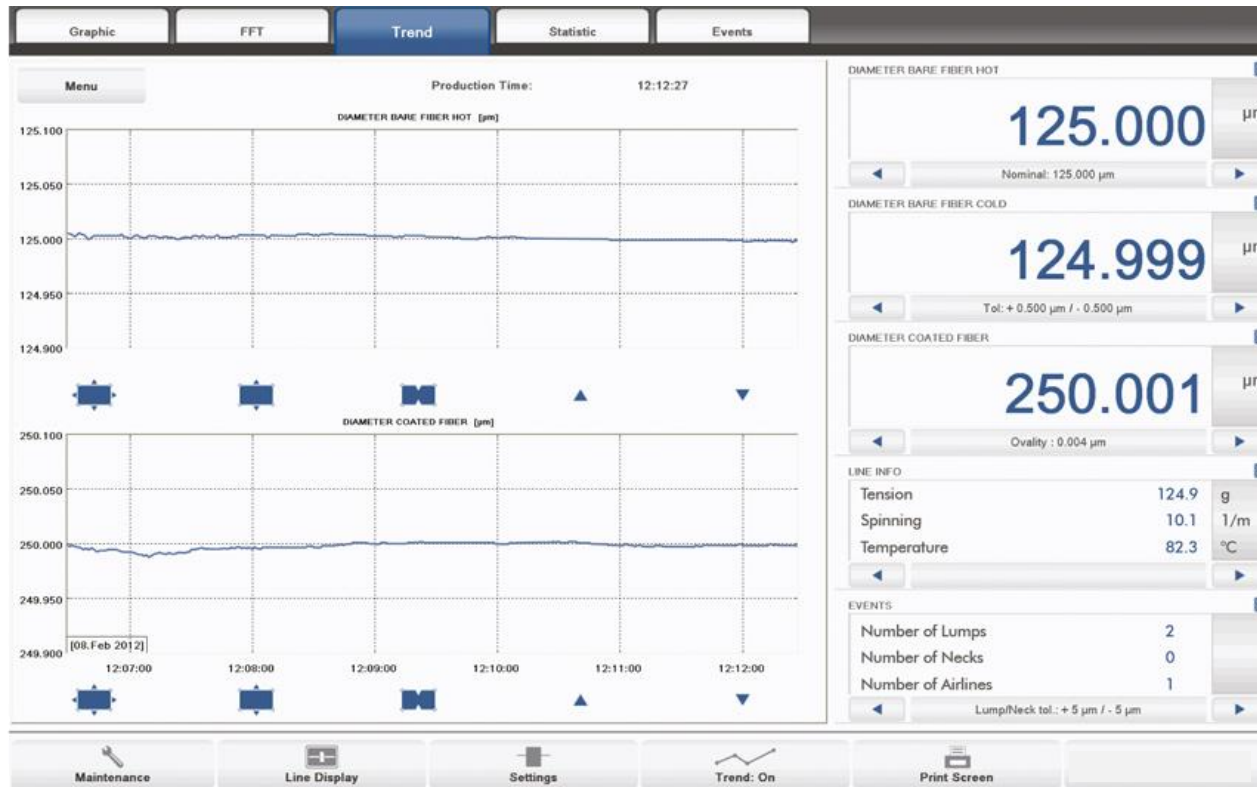
Display of the diameter, position, tension,  
vibration frequency, spinning ...

# FIBER ECOCONTROL 6000



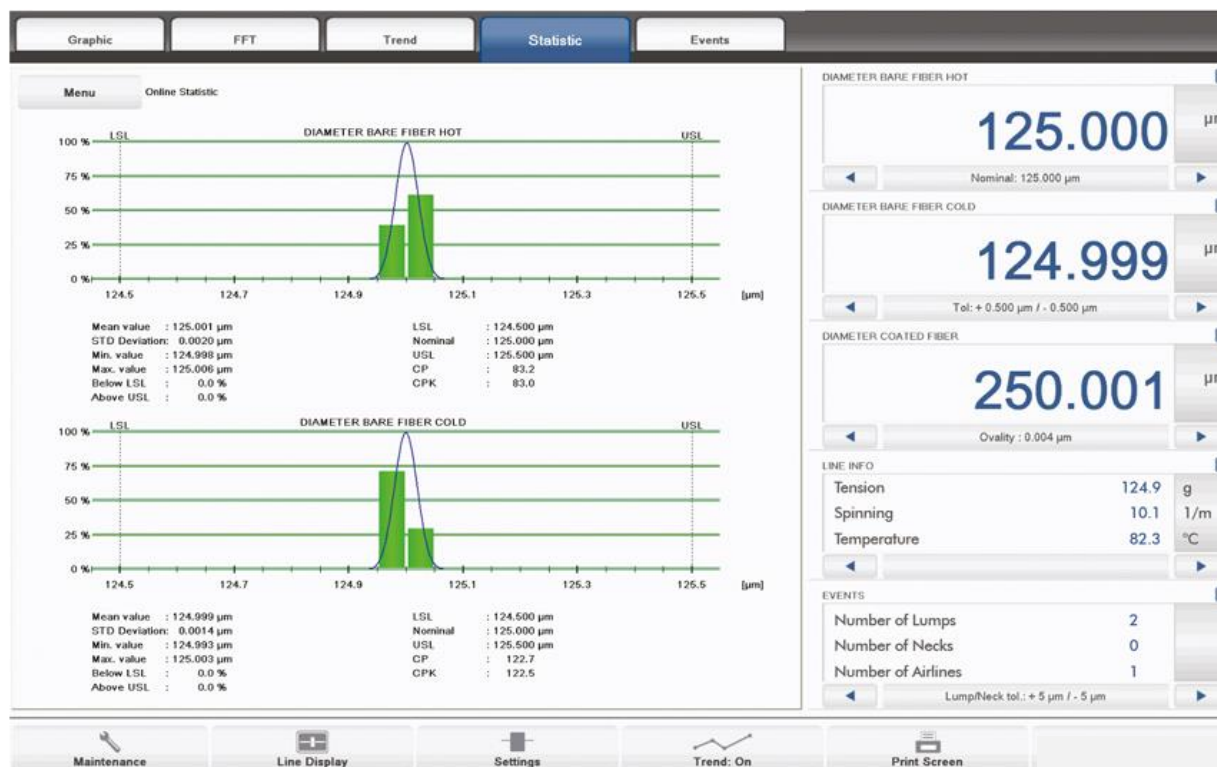
FFT spectrum: periodic data for process variations

# FIBER ECOCONTROL 6000



**Trend recording:** preform movement, process monitoring,  
offline review, product documentation

# FIBER ECOCONTROL 6000



Online statistics: qualification, process monitoring

# FIBER ECOCONTROL 6000

## Connectivity/interfaces

- Analog inputs/outputs (option)
- Contact inputs/outputs
- Communication interface (option)
- LAN (option)
- OPC DA2/OPC UA (option)
- Industrial fieldbus such as Profinet IO, EtherNet/IP, Profibus-DP, CANopen, DeviceNet (option)

# Advanced measuring and control technology for optical fibers

## Technical summary

- Diameter and ovality measurement with high accuracy/repeatability
- Tension calculation
- Spinning measurement
- Position measurement
- Airline detection
- Coating concentricity evaluation
- Analog, serial, LAN, industrial fieldbus, ...



# Advanced measuring and control technology for optical fibers

## SIKORA technology ensures

- Precise measuring values
- Permanent and reliable control of the drawing process
- All relevant data for optimum quality of the fiber
- Process stability
- Efficiency of the drawing tower
- Easy connectivity
- Full digital documentation of the production process
- Life-time calibration
- High availability of 99.8 %

# Measurement of the preform

## Innovative millimeter waves technology:

- Measurement of the diameter and wall thickness

plus

- Distinction between differently doped glasses



We optimize your  
production processes!

Harry Prunk  
Phone: +49 421 48900 0  
E-Mail: [sales@sikora.net](mailto:sales@sikora.net)