



# PRODUCTS

Precision in Measurement

# PRECISION IN MEASUREMENT

Length • Angle • Straightness • Vibration • Temperature

# Content

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*Founded in 1991 with roots originating at the Technical University of Ilmenau, **SIOS Meßtechnik GmbH** is a developer and manufacturer of precision measuring instruments and combines scientific accuracy and quality with industrial efficiency.*

Our close proximity to science and research guarantees a high expertise for today and for the upcoming future. The focus of our measuring instruments is on laser interferometric measuring systems.

Our products provide reliable and highly accurate results for a variety of measurement tasks in science and research, quality control, product development and calibration.

## **Measurement tasks**

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- length
- angle
- straightness
- vibrations
- temperature

Our product range also includes nanometer measurement technology, special measuring workstations and customized measuring solutions.



### INDUSTRIAL PERFORMANCE

#### Precision in Measurement for

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- quality control
- calibration
- OEM applications
- R&D support
- volumetric compensation for machines
- customized solution



### SCIENTIFIC COMPETENCE

#### Precision in Measurement for

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- fundamental research
- traceable applications
- metrological assemblies
- vacuum and cleanroom applications
- dynamic data acquisition
- customized solutions

# Measuring devices and sensors

## Length measurement

Universal length measuring systems of the highest accuracy for measurements and calibrations of guides, measuring workstations and positioning tables, measuring machines and machine tools and for multiple coordinated measurements.

The measuring systems are easy to handle, have integrated alignment aids and are able to work with just a reflective surface as a reflector.

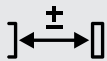


## Laser interferometer model SP 5000 NG

- single measuring beam
- accommodates tilting angle of reflector up to  $\pm 12.5^\circ$
- suitable for combined x-y positioning measurements using multiple sensor heads and plane mirrors
- compact device with system case for free mobility
- OEM and vacuum versions of the device are available upon request



0 m to  $\geq 5$  m



0.15  $\mu\text{m}/\text{m}$



5  $\mu\text{m}^*$

\*rotary point dependent

A modification of the standard device is the SP 15000 NG, which allows an extended measuring range. This measuring system is ideally suited for calibrations and measurements of large positioning units like CMM's or large machine tools. We recommend the use of wireless temperature sensors or the climate measuring station to achieve the best results.



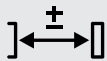
### **Long-Range laser interferometer model SP 15000 NG**

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- for long distance measuring ranges up to 80 m
- accommodates tilting angle of reflector up to  $\pm 22.5^\circ$
- compact device with suitcase for free mobility



$\leq 80 \text{ m}$



$0.15 \mu\text{m/m}$

# Measuring devices and sensors

## Length, differential length, and angle measurement

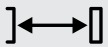
Highly stable laser interferometer with two parallel measuring beams for a wide variety of applications in the field of science and for industrial use.

Differential measurement principle allows for remarkable stability during long-term measurements and enhanced compensation of environmental changes.



### Differential laser interferometer model SP 5000 DI

- ultra-stable, high-resolution, long-term measurement
- beam distance 21 mm (other beam distances on request)
- extremely low temperature sensitivity < 20 nm / K



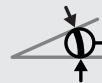
0 m to  $\geq 5$  m



5  $\mu\text{m}$



$\pm 430 \mu\text{rad}$   
with plane mirror  
 $\pm 12.5^\circ$   
with reflector



0.005  $\mu\text{rad}$



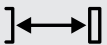
## Length, differential or angle measurement



### Differential laser interferometer model SP 5000 DI/F

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- special design for feedback applications
- beam distance 14 mm (other beam distances upon request)
- extremely low temperature sensitivity  $< 20 \text{ nm / K}$



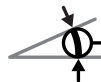
0 m to  $\geq 5 \text{ m}$



5  $\mu\text{m}$



$\pm 430 \mu\text{rad}$   
with plane mirror  
 $\pm 15^\circ$   
with reflector



0.007  $\mu\text{rad}$

# Measuring devices and sensors

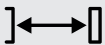
## Length and angle measurement

High-precision laser interferometers with three perfectly parallel aligned and independently working measuring beams for simultaneous measurements of length and angles. Either a mirror or the original SIOS reflector unit be used as a reflector. An alignment aid can be integrated in the sensor to align the beam directions to the direction of target movement.



### Triple beam laser interferometer model SP 5000 TR

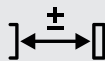
- simultaneous length measurements as well as pitch and yaw angle acquisition with the highest accuracy
- for measuring arrangements free of Abbe error
- beam distances 12 mm
- OEM and vacuum versions of the device are available



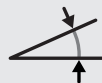
**0 m to  $\geq 5$  m**  
(10 m on request)



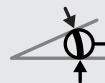
**20  $\mu\text{m}$**



**0.15  $\mu\text{m}/\text{m}$**



**$\pm 12.5^\circ$**   
with reflector  
 **$\pm 430 \mu\text{rad}$**   
with plane mirror



**0.01  $\mu\text{rad}$**

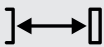
## Length, differential length, and angle measurement

The SP 5000 DI/DS interferometer combines the advantages of a differential interferometer with those of a multi-beam interferometer. For the first time, it combines a highly stable length measurement based on the differential principle with a high-resolution interferometric tilt angle measurement. This makes it possible to detect not only the tiniest movements, but also the smallest tilts over larger areas without the results being subject to thermal and physical environmental influences.



### Displacement angle differential interferometer model SP 5000 DI/DS

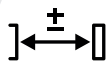
- highly stable differential length and pitch angle measurements
- perfect for XY stages
- beam distances 15 mm (length measurement) and 6 mm (angle measurement)
- extremely low temperature sensitivity  $< 20 \text{ nm / K}$
- OEM and vacuum versions of the device are available



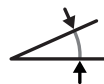
0 m to  $\geq 2$  m



5  $\mu\text{m}$



0.15  $\mu\text{m/m}$



$\pm 430 \mu\text{rad}$   
with plane mirror

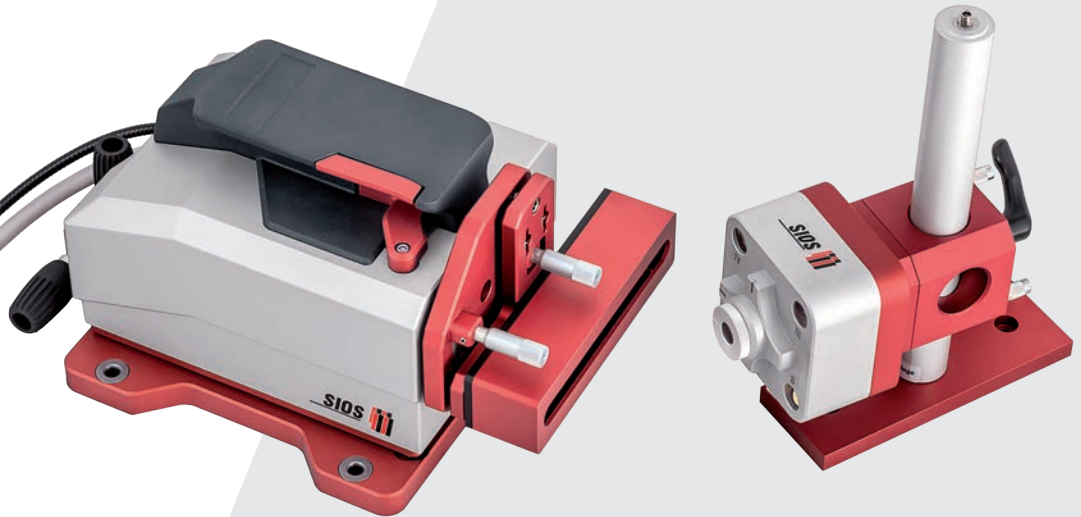


0.02  $\mu\text{rad}$

# Measuring devices and sensors

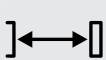
## Displacement, angle, straightness measurement and calibration

High precision laser calibration system with multiple beams for measuring length, pitch angle, yaw angle, roll angle and straightness, for calibration and alignment of axes. Highly demanded in the machine tool field and CMM calibration, up to volumetric calibration. We recommend the use of wireless temperature sensors or the climate measuring station to achieve the best results.

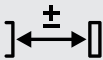


### Calibration laser interferometer model SP 15000 C3/C5/C6

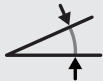
- interferometric measurement for up to 6 DoF simultaneously
- Roll angle sensors optionally available
- many available accessories for attachment of sensor head and optical components
- calibration software according to DIN and ISO standards



up to 50 m



0.2  $\mu\text{m}/\text{m}$



$\pm 5^\circ$



0.005  $\mu\text{rad}$



$\pm 4$  mm over  
6.5 m



10 nm



0.9  $\mu\text{rad}$

## Vibration measurement

Non-contact vibration measurements with focused measurement beam able to detect vibration on almost every surface, rough surfaces included.

Determination of vibration spectra, vibration modes, and resonant frequencies of macro and micro objects.



### Laser interferometric vibrometer model LSV 120 NG

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- working distance fixed at (customer specific) 30 ... 70 mm / 240 mm / 480 mm
- diameter of laser spot 12 ... 30  $\mu\text{m}$  / 100  $\mu\text{m}$  / 200  $\mu\text{m}$
- protected interior optics



0–5 MHz



max. 3 m/s



5  $\mu\text{m}$

# Measuring devices and sensors

Variable measuring distance for easy and fast beam focusing on measurement object surfaces. In combination with a tripod, it's an ideal vibration measuring instrument for usage at different locations.



## Laser interferometric vibrometer model LSV 2500 NG

- working distance continuously adjustable: 240 mm to 2500 mm
- digital and analog data output



0–5 MHz



max. 3 m/s



5  $\mu$ m

## Vibration measurement on micro-objects

Non-contact measurements of the dynamic characteristics of microstructures, MEMS and objects in the micrometer size range. Determination of the vibration modes by surface scanning, calibration of AFM cantilevers .



### Nano Vibration Analyzer NA

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- scan field range: 50 mm x 50 mm (other ranges upon request)
- microscope magnification: 10 x, 50 x (100 x optionally)
- laser spot diameter:  $\leq 10\mu\text{m}$ ,  $\leq 2\mu\text{m}$  (Lens dependent)
- customized design of the portal upon request



0-5 MHz



max. 3 m/s



5  $\mu\text{m}$

# Measuring devices and sensors

## Tactile thickness measurement and calibration

Interferometric precision gauging probe for tactile thickness measurements and calibration of measuring standards with high linearity over the entire measuring range. Also available as a differential probe for highest demand on accuracy and repeatability. The unique interferometric probe builds the basis for customer-specific measuring stations in the optics and semiconductor industry to measure the thickness of lenses, wafers and foils.

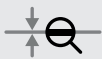


## High linearity probe LM

- linearity  $\leq \pm 2$  nm
- factory fixed measuring force: 0.5 ... 1.5 N
- motorized measuring shaft
- exchangeable commercial probe tips
- standard clamp shaft diameter
- traceable to national standards



20 mm,  
50 mm



0.1 nm



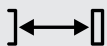
The EPP gauge block calibration system for calibrating gauge blocks uses an LM 20 laser interferometric probe as the upper measuring probe. It has a measuring range of 20 mm and a resolution of 1 nm.

With a calibration procedure, the linear errors of the gauge block tester (misalignment, skewing of the probe, temperature influences) can be determined and corrected.

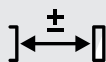


### Gauge block calibration system EPP

- only 15 standard gauge blocks required for the calibration of a 122-piece gauge block set
- calibration of gauge blocks with rectangular cross section in the range from 0.5 to 100 mm, calibration of unusual nominal dimensions and materials possible
- determination of parameters according to ISO 3650



0.5 mm bis 100 mm



$U=0.05 \mu\text{m}+0.5 \cdot 10^{-6} \cdot L$



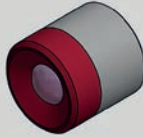
1 nm

# Accessories



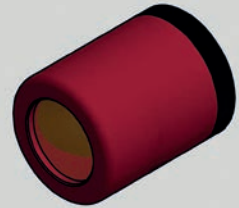
## Ball reflector Ø10 mm

for SP 5000 NG, SP 5000 DI,  
SP 5000 DI/F  
item number A040273



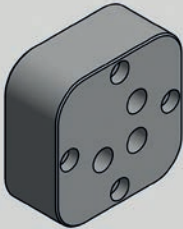
## Ball reflector Ø15 mm

for SP 5000 NG, SP 5000 DI,  
SP 5000 DI/F  
item number A033351



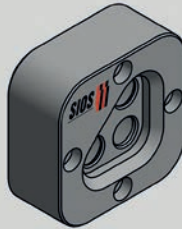
## Hollow reflector Ø 46 mm

for SP 15000 NG  
item number A038752



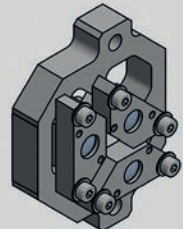
## Triple reflector unit up to 6 m

for SP 5000 TR  
item number A039992



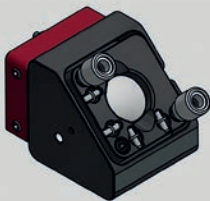
## Triple reflector unit long- range up to 10 m

for SP 5000 TR  
item number A041318



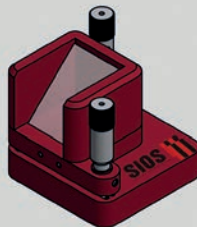
## lightweight version Triple reflector unit

for SP 5000 TR



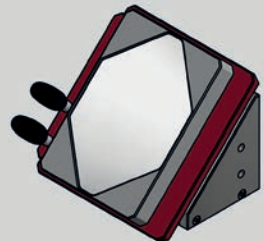
## 90°-beam deflection

for SP 5000 NG  
item number A034219



## Beam deflection mirror unit 90°

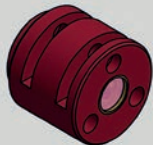
for SP 5000 NG, SP 5000 TR  
item number A040678



## Beam deflection mirror 90°

for SP 15000 C  
item number A040651

Further accessories can be found on the respective product page:  
[www.sios-precision.com/en/precision-measuring-systems](http://www.sios-precision.com/en/precision-measuring-systems)



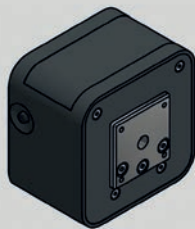
**High-stability beam direction alignment unit**

for SP 5000 NG  
item number A034609



**Reflector unit for compact straightness measurement**

for SP 15000 C5 / C6 NG,  
item number A035245



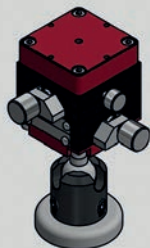
**Roll angle measurement sensor with cable or radio**

for SP 5000 TR, SP 15000 C



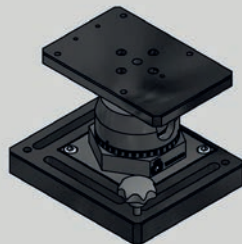
**Reflector mount on permanent magnetic base**

for SP 15000 C  
item number A035443



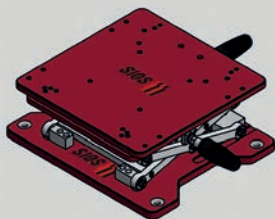
**Reflector mount with articulated ball mount**

for SP 5000 NG, SP 5000 TR  
item number A037044



**Articulation base**

for SP 5000 NG, SP 5000 TR,  
SP 15000 C  
item number A034567



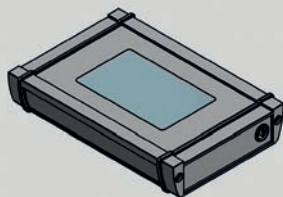
**Adjustment table**

for all SP-models  
item number A032051



**Environmental Correction**

for SP models



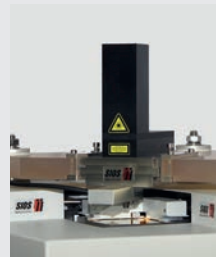
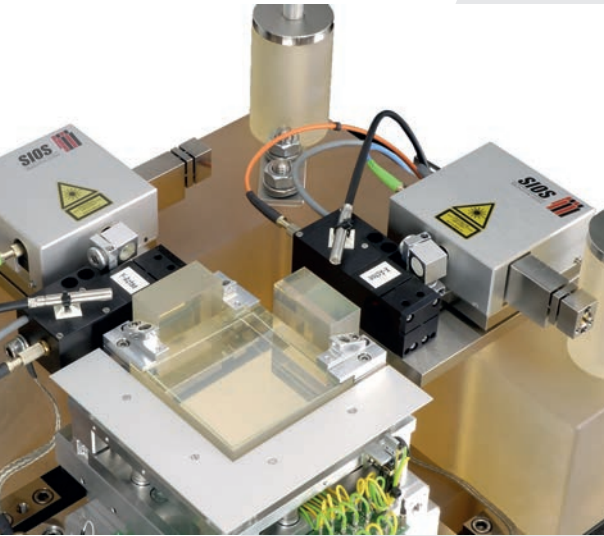
**DU-04 4,5" Display unit**

for all SP-models  
item number A034568

# Nanopositioning

High-precision coordinate measuring system with nanometer accuracy for positioning, manipulation, processing, and measurement of objects and structures in large spatial areas with very high resolution.

Use of 1D-, 2D- and 3D-sensors for various measuring tasks.



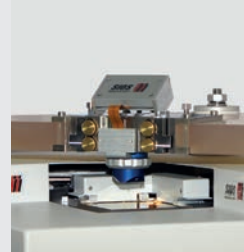
Fixed Focus Sensor



Atomic Force Microscope



White Light Sensor

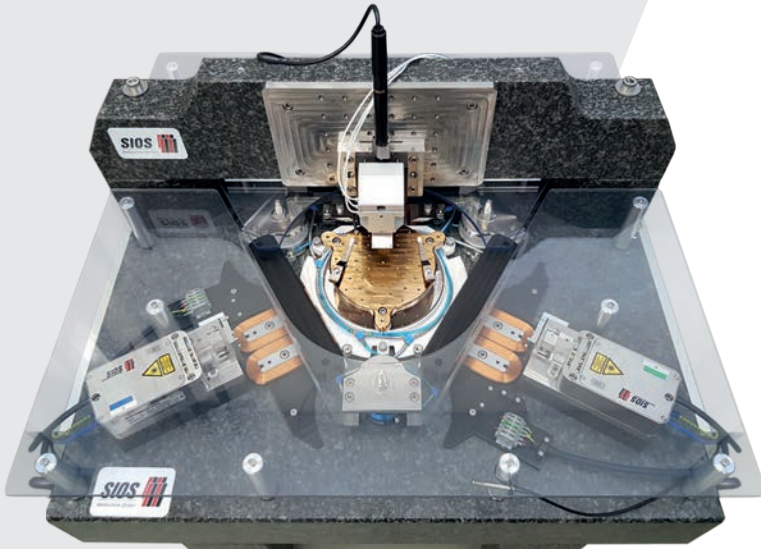


Tactile 3D Sensor

## Nanopositioning and nanomeasuring machine NMM-1

- measuring and positioning range 25 mm x 25 mm x 5 mm (X x Y x Z)
- resolution 0.1 nm
- measurements free of Abbe error on all three coordinate axes
- various probing systems, e.g. fixed focus sensor, AFM, white light sensor, 3D micro probe
- open device architecture enables application of customized sensors

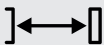
The NPP-1 nanomeasurement and positioning platform allows positioning in a range of about 100 mm. The high resolution of the laser interferometers used for control, the rigid architecture of the positioning arrangement, the air-bearing axes of the positioning system, and an optimized control system allow the position deviations and path fidelity of the movements  $<2$  nm RMS.



### **Nanopositioning platform NPP-1**

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- 2.5 D positioning and measuring system of highest accuracy
- measurement and positioning range: surface  $\varnothing$  100 mm
- control: 3 fiber-coupled differential interferometers
- open device architecture enables application of customer-specific sensors



$\approx 100$  mm



$<0.1$  nm

# Frequency and amplitude stabilized lasers

Highly stable light sources as a measuring standard for laser-optical measuring technology with frequency standards at a wavelength of 632.8 nm.

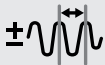
Coupling to a PM fiber in combination with a Faraday isolator is available.

Traceability of laser frequency by an iodine-stabilized HeNe laser is standard for all SIOS stabilized HeNe lasers.

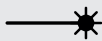


### Frequency stabilized HeNe lasers model SL 02

- compact design with integrated stabilization electronics and small plug-in power supply
- available with one or two polarized longitudinal modes
- fiber coupling upon request



2,5 MHz / 1h



≥ 1.2 mW (1 mode)  
≥ 2.4 mW (2 modes)



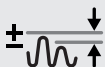
50 mm



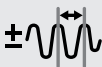
410 mm

### Frequency and amplitude stabilized HeNe lasers model SL 04

- amplitude or frequency stabilization as operating modes
- standardized diameter of laser tube for easy for easy OEM integration or replacement
- fiber coupling upon request



< 0.3%



1 MHz / 1h



≥ 1.2 mW



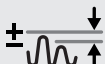
45 mm



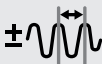
314 mm

### Frequency stabilized HeNe lasers model SL 03 mini

- frequency stabilized
- standardized diameter of laser tube
- compact stabilization electronics and power supply
- fiber coupling upon request



< 0.2%



1 MHz / 1h



≥ 0.5 mW



32 mm



180 mm

# Climate measuring station

High-precision temperature, air pressure and humidity measuring system for measurements and calibrations at laboratories.

The measuring device can be combined with the evaluation electronics of SIOS laser interferometers.



## **Precision climate measuring station model LCS**

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- all sensors are digitally calibrated together with the measuring electronics
- standard configuration: connection for max. 5 wired and 15 wireless temperature sensors and two digital interfaces for air pressure and humidity sensor
- An additional 10 wired sensors can be connected using the LCS extension module.

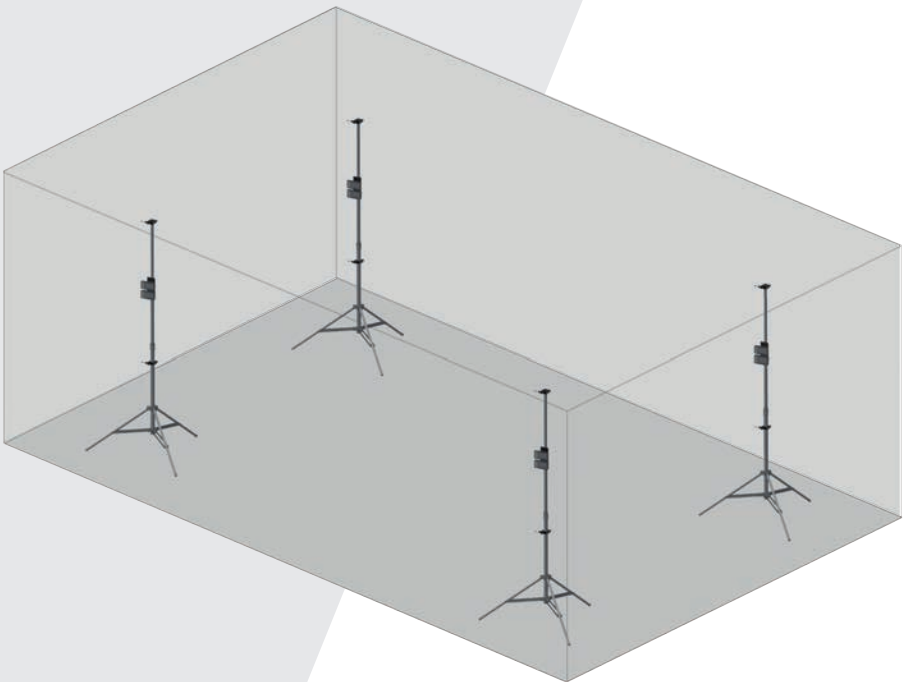


## **LCS-Desk option for room monitoring and qualification**

The LCS climate measuring station can be used to classify and monitor measuring rooms according to VDI/VDE 2627. The optional extension of the LCS-Desk software supports this process.

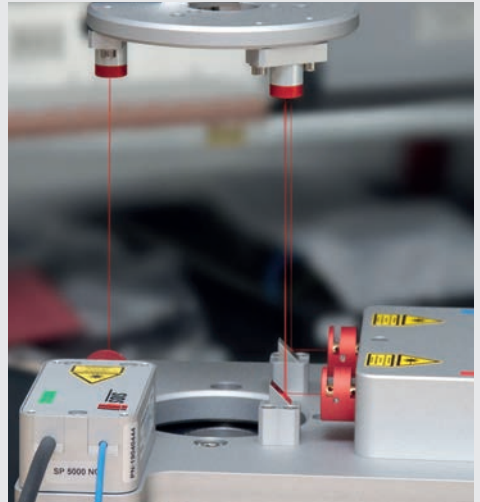
Room classification requires 8 or 9 temperature sensors, which are available in special sets. Pure monitoring, on the other hand, only requires four sensors as per the standard.

For permanent installation of room monitoring, the touchscreen panel PC for wall mounting is ideal. This device comes equipped with a Linux-based operating system and a special touchscreen-capable LCS desk version, ready for immediate use.



# OEM and customized solutions

Since our company was founded, SIOS Meßtechnik GmbH has focused on development of customer-specific high-precision measuring systems. The know-how resulting from our dedication to laser interferometric measurement technology is gives our customers an advantage when looking to solve their own measuring tasks. If you are interested please contact us.



## OEM and customized solutions

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- customized solutions for high accuracy applications and feedback applications
- engineering consultation for measurement techniques and know-how
- sensors for ultra-high vacuum and critical environmental conditions
- fully equipped measurement stations

# Measurement software



## **InfasNTC**

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Software for data acquisition and visualization



## **InfasLM**

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Software for probes



## **InfasVIBRO**

---

Software for vibration measurement



## **InfasTONO**

---

Software for tonometers



## **InfasAXIS**

---

Calibration software according to VDI / ISO standard



## **InfasGAUGE**

---

Software for gauge block calibration



## **InfasALIGN**

---

Fast visualization of all degrees of freedom



## **API**

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SIOS API



## **InfasMTCAL**

---

Calibration and volumetric compensation software



## **NMM Control**

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Software for nano-positioning



## **InfasPOINT**

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Software for the acquisition of individual measuring points



## **LCS-Desk**

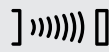
---

Software for recording environmental influences

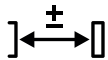
# Explanation of symbols



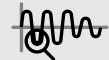
Length measurement range



max. displacement speed



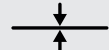
Measurement uncertainty



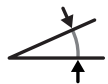
Amplitude resolution



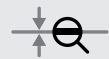
Resolution



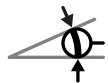
Thickness measurement range



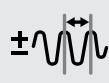
max. tilting angle



Thickness measurement resolution



Angle measurement range



Laser frequency stability



Straightness measurement range, lateral



Laser amplitude stability



Resolution Straightness measurement



Laser output power



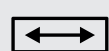
Roll angle measurement resolution



Laser head diameter



Frequency range



Laser head length

Do you need detailed information about our measuring devices and sensors?

You are welcome to download technical data sheets for our products:



[www.sios-precision.com/en/download](http://www.sios-precision.com/en/download)



# Interesting webinars

## Measurement technology knowledge directly from our SIOS experts

SIOS experts impart basic interferometric knowledge, inform about the SIOS product range, demonstrate the appropriate software solutions, present achievable measurement results and show various application examples from industry and science.



[www.sios-precision.com/en/company/webinars](http://www.sios-precision.com/en/company/webinars)

**After a free registration you will receive knowledge on the following topics independent of time and location:**

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- Calibration of positioning axes, CMMs and machine tools
- High precision length measurement
- Nanometrology
- Optical Vibration Measurement from nanometer to picometer
- High precision thickness measurements using tactile probes
- Simultaneous displacement and angle measurement

**We would be pleased to assist you in solving your measuring tasks.**

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