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# Calibration Laser Interferometer

**3 DOF / 5 DOF**  
Simultaneous multi-  
axis measurement



## SP 15000 C - Series

## Design and Operation

The measurement and calibration interferometers SP 15000 C with a measuring range of up to 50 m are designed for high-precision length, angle and straightness measurements on positioning axes. A synchronous, continuous 5 DOF-measurement is possible. The horizontal and vertical components of axis straightness are measured by using the interferometric principle.

The reflector unit is based on a combination of hollow retroreflectors and a rotatable Wollaston prism. Other accessories are the straightness mirror, a 90°-beam deflection mirror unit and various equipment for mounting and alignment.

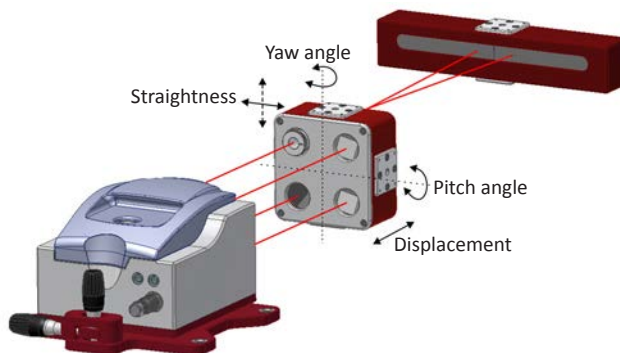
The calibration laser interferometers allow the accurate, dynamic measurement of the properties of linear guides during the assembly and alignment as well as the standardized calibration of machine axes. The measuring and calibration processes can be synchronized with a machine controller. Different triggering options for data acquisition are available. The measured values are transferred to a computer via a fast USB interface. Optional interfaces are available.



## Major Performance Features

- Simultaneous, three-channel length, pitch and yaw angle measurement as well as straightness measurement with highest accuracy
- Fast, simple, robust and reliable
- Beam deflection with an adjustable deflection mirror
- Fiber-coupled sensor head and integrated beam direction detection allows easy handling and alignment
- High precision angle measurements
- The same laser frequency is used in all three length measurement channels

## Measuring principle for SP 15000 C5



## Applications

- Calibration of high-precision axes in measuring and machine tools, as well as coordinate measuring instruments
- Fast and easy alignment of linear guides
- Laserinterferometric measurements on linear guides and translation stages
- Ultraprecise simultaneous length and angle measurement
- Differential measurements

Technical Data			Model SP 15000 C3	Model SP 15000 C5
Length measurement:	Measuring range (on request up to 50 m)	m	15	15
	Resolution	pm	< 20	< 20
Angle measurement:	Measuring ranges of pitch + yaw angles	grad	± 5	± 5
	Resolution	arcsec	< 0.0004	< 0.0004
Straightness measurement:	Measuring range, lateral	mm	-	± 4
	Resolution	nm	-	10
	Axial range (freely selectable)	m	-	0.1...6.5
Measuring uncertainty under stable conditions:	- Length measurement - Angle measurement - Straightness measurement		0.12 ppm ± 0.015% ± 0.0085 arsec ± 0.1% ± 0.1 · M <sup>2</sup> ± 0.1 μm	
Beam separation (horizontal and vertical)		mm	50	
Maximum velocity of the measuring reflector		mm/s	500	
Wavelength of the HeNe laser		nm	632,8	
Frequency stability of the HeNe laser			2 · 10 <sup>-8</sup>	
HeNe laser warm-up time		min	< 20	
Operating temperature range		°C	15...30	
Dimensions (LxWxH)	Sensor head with adjustable mount	mm	192x192x122	
	Reflector unit / Straightness mirror	mm	104x56x104 / -	
	Electronic supply and evaluation unit	mm	450x400x150	
Mass	Sensor head with adjustable mount	kg	3.4	
	Reflector unit / Straightness mirror	kg	0.8 / -	
	Electronic supply and evaluation unit	kg	9.4	
Cable length between sensor head and electronic module (separable)		m	6, optional bis 10	
Line voltage / frequency		VAC/Hz	100...240 / 47...60	
Laser safety class according to EN 60825-1/ANSI Z136.1 (CDRH)			2M / II	

## SIOS software

### Calibration software InfasAXIS

- Reduced measurement time
- Easy handling
- Calibration according to VDI/DGQ 3441, DIN ISO 230 or VDI 2617

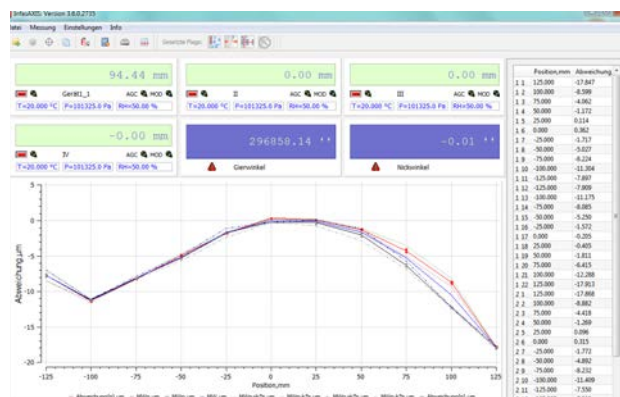
### Alignment software InfasALIGN

- Fast, dynamic measurement of linear guide deviations
- Immediate display of measuring results
- Ideal tool for assembly and alignment of linear guides

### SIOS - Calibration software InfasAXIS

The combination of the optionally available software package InfasAXIS with the calibration interferometer SP 15000 C5 allows the calibration of machine tools, positioning tables etc. in 5 degrees of freedom: position, pitch and yaw angle and straightness in horizontal and vertical direction.

- Database for management of customer and measurement data
- Configuration of measurement (sequence control)
- Export and import of calibration data
- Customer projects for the specific measurement tasks
- Selection of the standard: VDI/DGQ 3441, DIN ISO 230 or VDI 2617
- Output of the calibration protocol

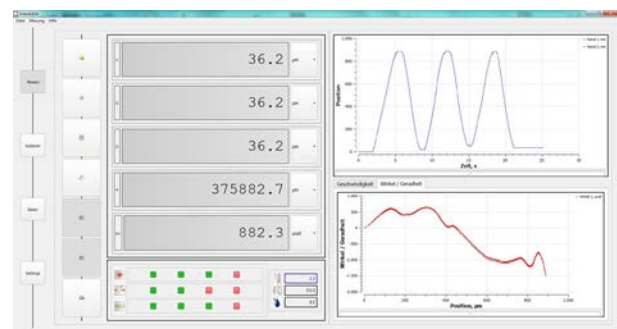


InfasAXIS window

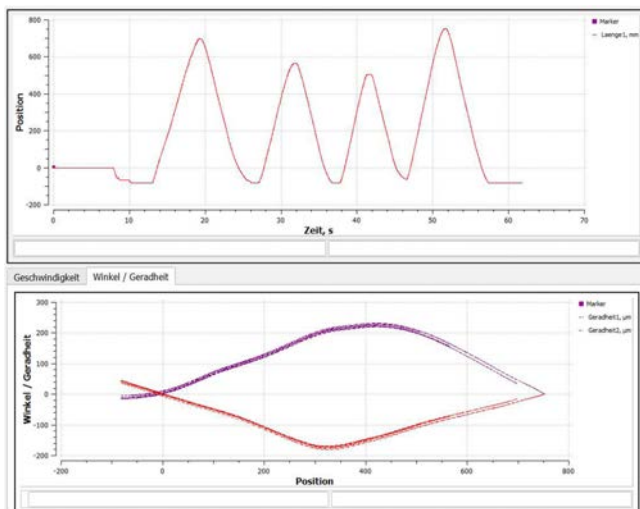
### SIOS - Alignment software InfasALIGN

In combination with the optionally available software InfasALIGN the calibration interferometer SP15000 C becomes an essential measuring tool for highly accurate alignment and adjustment of machine components such as linear guides.

No matter, if the measurement is done in automatic mode or by moving the sliding carriage by hand, the software always provides complete information about position, angle and straightness in seconds. The measured data can be saved and logged.



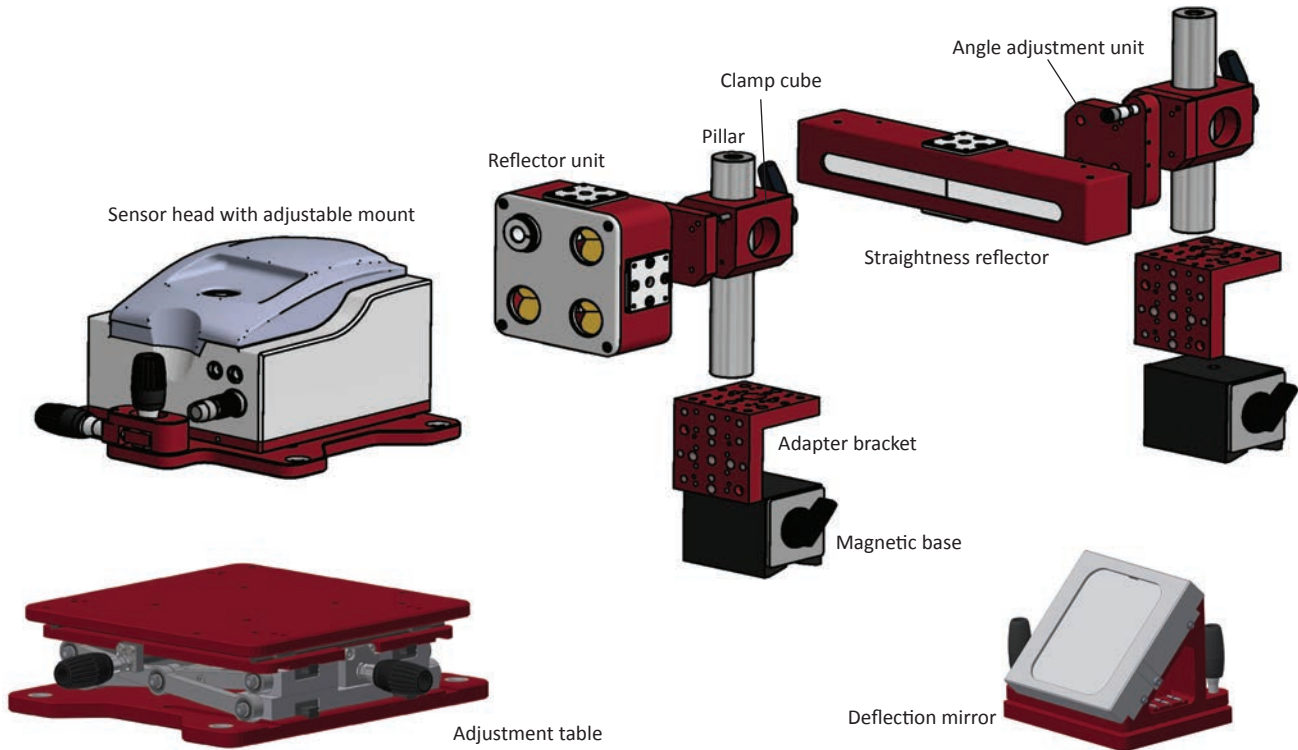
InfasALIGN window



Graphics in InfasALIGN

InfasALIGN provides an immediate overview of the actual state of the linear guide, which is to be aligned. The upper graphic window contains the measurement time and the position along the guide. In the lower window, the guide deviations are shown with respect to the position on the guide. The pitch and yaw angles, the straightness derived from the angle measurement and the interferometric straightness can be displayed separately or simultaneously.

## Extensive adjusting and mounting accessories



### Accessories

With the available range of accessories, the calibration laser interferometer can be installed very quickly and comfortably on measuring and machine tools as well as coordinate measuring devices. The mounting is universal and very robust, which is particularly important for the high measuring accuracy. The optional deflection mirror provides a 90° deflection of the measuring beams to allow vertical length and angle measurements.

### Alignment facilities

Additional sensors allow a monitoring of the alignment state of the interferometer. So the user is able to align the measurement system quick and precise. For measurements with highest accuracy it is possible to align the reflector very precisely to the measuring beams, using the alignment mirror. The alignment mirror can be simply clipped onto the reflector unit.



### Precision climate measuring station LCS



For realizing high-precision interferometric measurements the correction of the laser wave length is essential. The precision climate measuring station of SIOS Meßtechnik GmbH records values of the air and material temperature, the air pressure and the air humidity with highest accuracy. These values are required to correct the wavelength.

Depending on the application wired and wireless sensors can be applied. All measuring probes can be calibrated digitally together with the measuring electronic. So high-accuracy for all measurements is ensured.

The used temperature probe Pt 100 allows a measuring accuracy better than 100 mK, the highly resolving air pressure probe better than  $\pm 50$  Pa.

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