MICRO-EPSILON

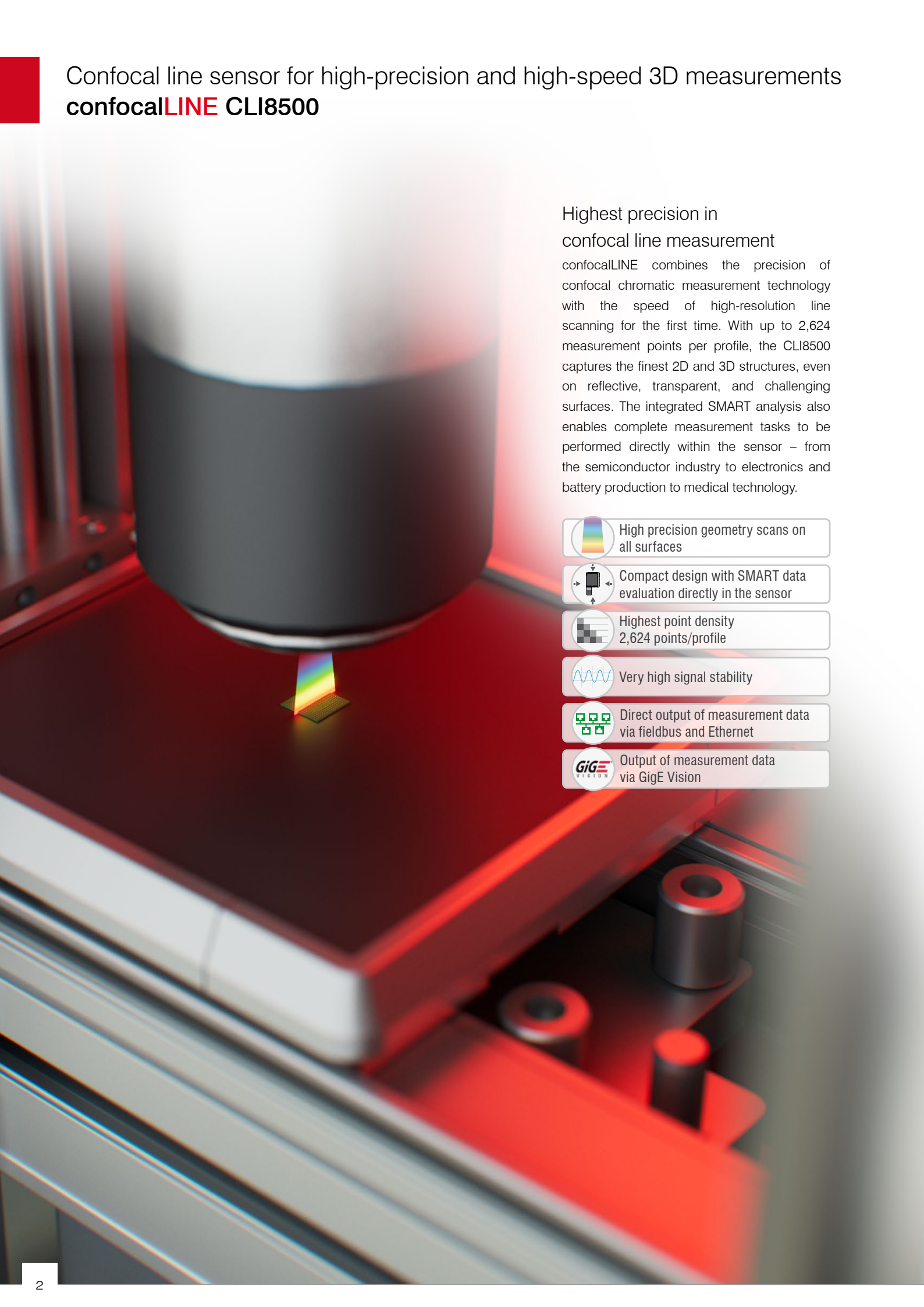
More Precision

confocalLINE

Confocal line sensor for high-precision and high-speed 3D measurements



Confocal line sensor for high-precision and high-speed 3D measurements
confocalLINE CLI8500



Highest precision in confocal line measurement

confocalLINE combines the precision of confocal chromatic measurement technology with the speed of high-resolution line scanning for the first time. With up to 2,624 measurement points per profile, the CLI8500 captures the finest 2D and 3D structures, even on reflective, transparent, and challenging surfaces. The integrated SMART analysis also enables complete measurement tasks to be performed directly within the sensor – from the semiconductor industry to electronics and battery production to medical technology.

- High precision geometry scans on all surfaces
- Compact design with SMART data evaluation directly in the sensor
- Highest point density 2,624 points/profile
- Very high signal stability
- Direct output of measurement data via fieldbus and Ethernet
- Output of measurement data via GigE Vision

More than
10 million
points
per measurement

Innovative technology for high-precision measurements

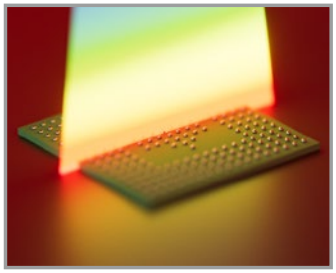
The confocalLINE sensors use the confocal chromatic measuring principle, in which white light is split into its spectral colors by special optics and projected onto the measuring object as a line. Each wavelength of the spectrum corresponds to a defined distance. From the reflected light, the sensor determines the distance to the surface for each measuring point. The 2,624 measuring points per line produce a high-resolution height profile. By combining consecutive profiles, 3D point clouds are generated. This enables surface topographies, edges, steps and gaps to be detected with maximum precision and measuring speed and evaluated directly in the sensor. With transparent and semi-transparent materials, multiple interfaces can also be detected and used, for example, to determine material thicknesses.



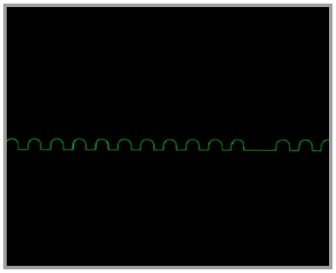
For complex geometries
No shadowing effects

Measurement in any orientation
Large tilt angle along the line up to ±80°

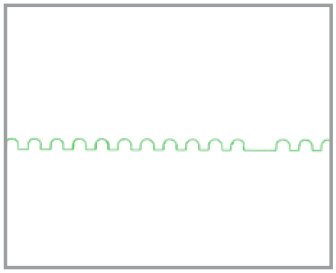
For all surfaces
Reliable measurement of different materials, colors and surfaces



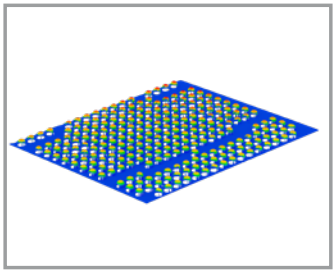
Line projection
Projection of the measuring line onto the measuring object



Sensor matrix (pixels)
The diffusely reflected light is imaged onto the high-resolution sensor matrix.



Calibrated x/z measuring points
Calculation of the z distance coordinate and the x actual position for each measurement point along the line



3D measurement values
3D point clouds can be generated based on the movement of the measuring object or the sensor

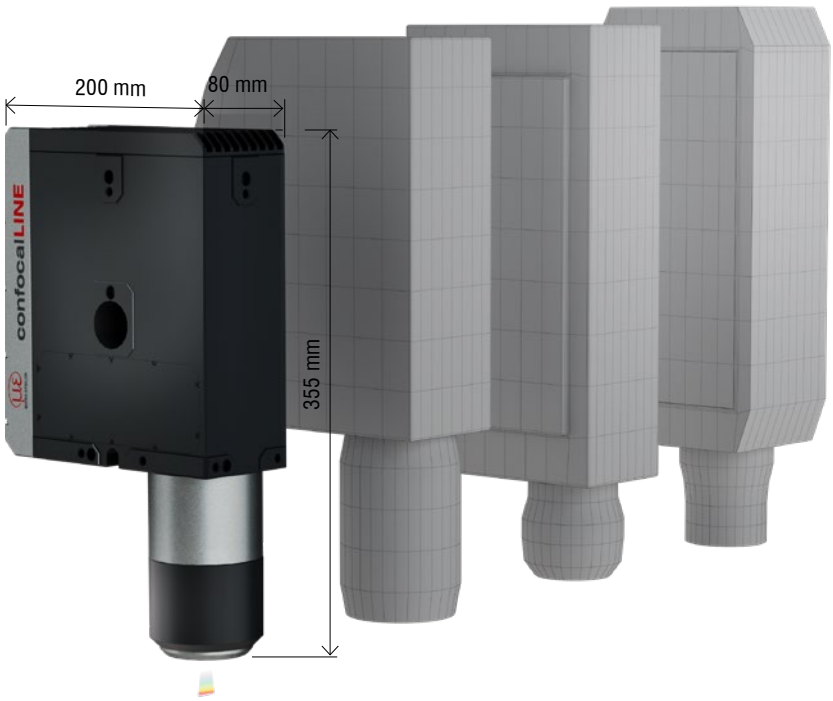
Advantages & outstanding features
confocalLINE CLI8500

10 kHz
Measuring rate

Ultra-fast and reliable on all surfaces

The confocalLINE CLI8500 impresses with its exceptionally high signal stability on a wide variety of surfaces and delivers excellent measurement speed, with up to 10,000 profiles per second. The sensor generates reliable and reproducible measurement results with matte, reflective, and transparent materials – even objects with varying surface properties are reliably detected. This enables stable measurement values and a high level of process reliability in industrial production monitoring.

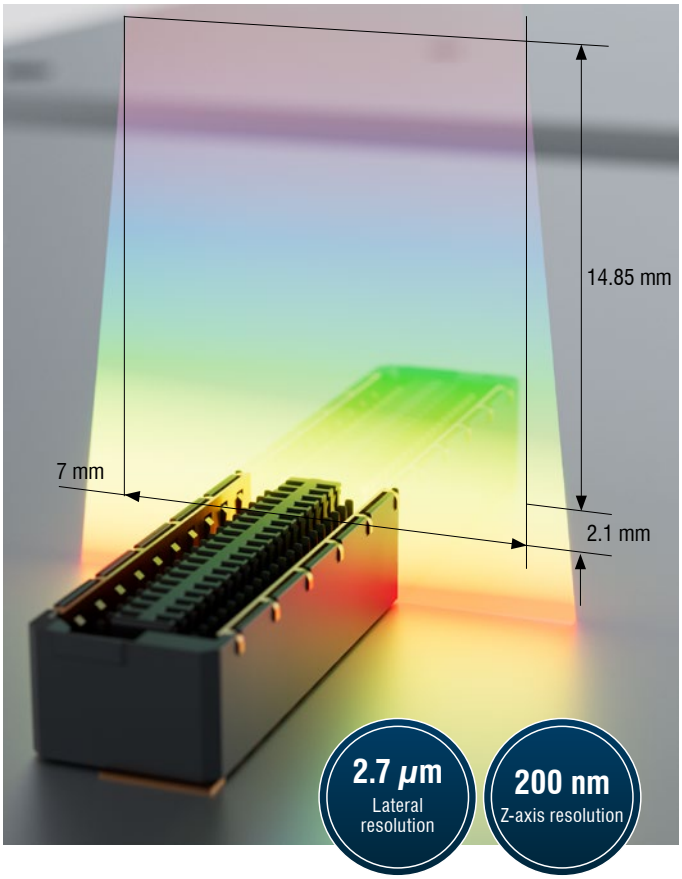




The smallest scanner in its class: compact design with integrated SMART evaluation

With its compact design, the confocalLINE CLI8500 sets new standards. As the sensor requires neither an external controller nor an IPC, it can be easily integrated even in confined installation spaces without the need for a control cabinet. In the SMART version, the measurement programs are executed directly in the sensor and the measurement results are output to the PLC.

EtherCAT® EtherNet/IP® PROFINET® Modbus UDP



Large measuring range with maximum point density

The confocal chromatic line scanners acquire profiles with line lengths of 7 mm along the X-axis. With 2,624 measuring points per profile, they generate high-resolution 2D profile data and precise 3D point clouds – reliably and largely independent of the surface properties. Line-based acquisition enables complete scans to be generated significantly faster than with conventional point sensors.

Maximum precision down to the finest detail

With a lateral resolution of 2.7 µm and a Z-axis resolution of 200 nm, CLI8500 detects the finest structures and height differences with maximum accuracy. Thanks to its high precision, even the smallest measuring objects can be reliably detected and evaluated. The CLI8500 is therefore ideal for numerous measurement tasks with the highest accuracy requirements.

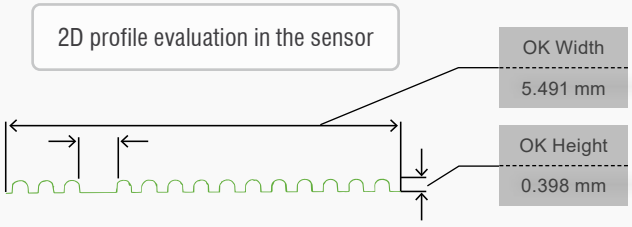
Measurement results or calibrated point clouds – your decision.

The confocalLINE models are used as standalone SMART 3D sensors or as 3D data sources.

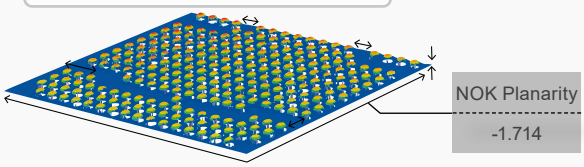
Integrated evaluation in the sensor

The measuring programs, for example, for gap, angle, or height, are configured using the 3DInspect software and saved directly in the sensor. With the automation interface, the scanners operate independently and can be integrated directly into a control system.

2D profile evaluation in the sensor



3D evaluation in the sensor

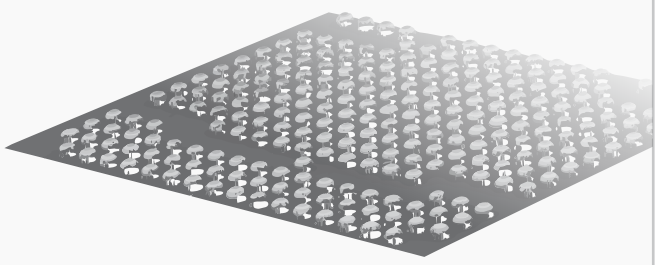


3DInspect

Calibrated point clouds for external analysis

Alternatively, the sensors can output calibrated profile data or point clouds. These are processed further on an external computer using the customer's image processing or analysis software.

External evaluation of point clouds

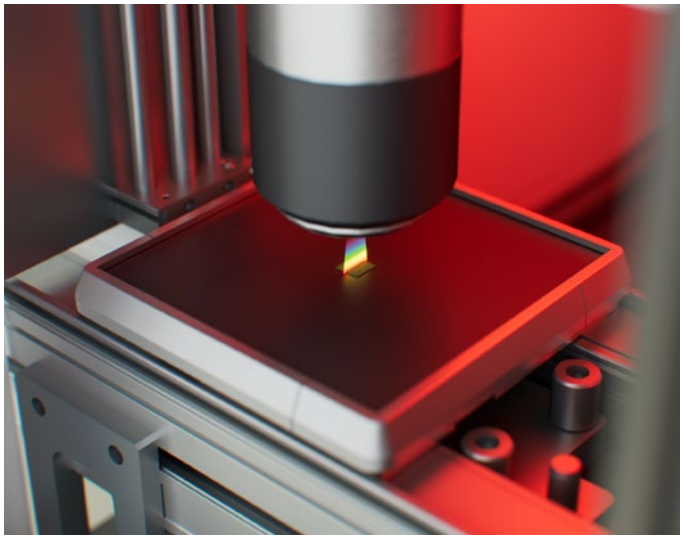


COGNEX® VisionPro HALCON a product of MVTec

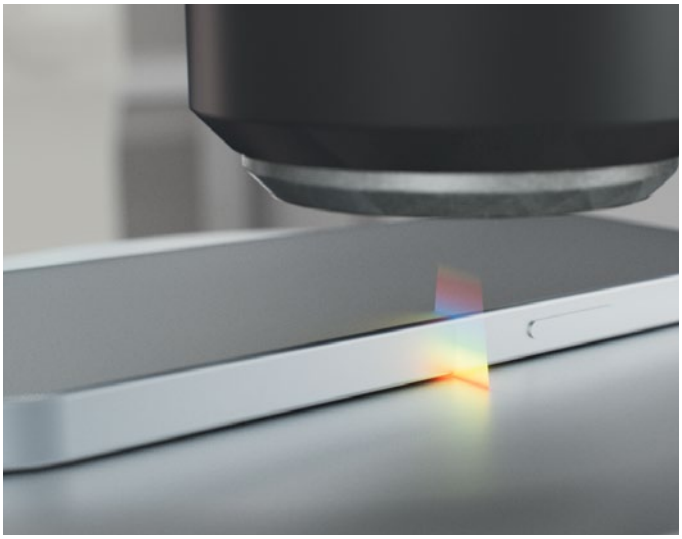
Linux LabVIEW C/C++ python

Application examples
confocalLINE

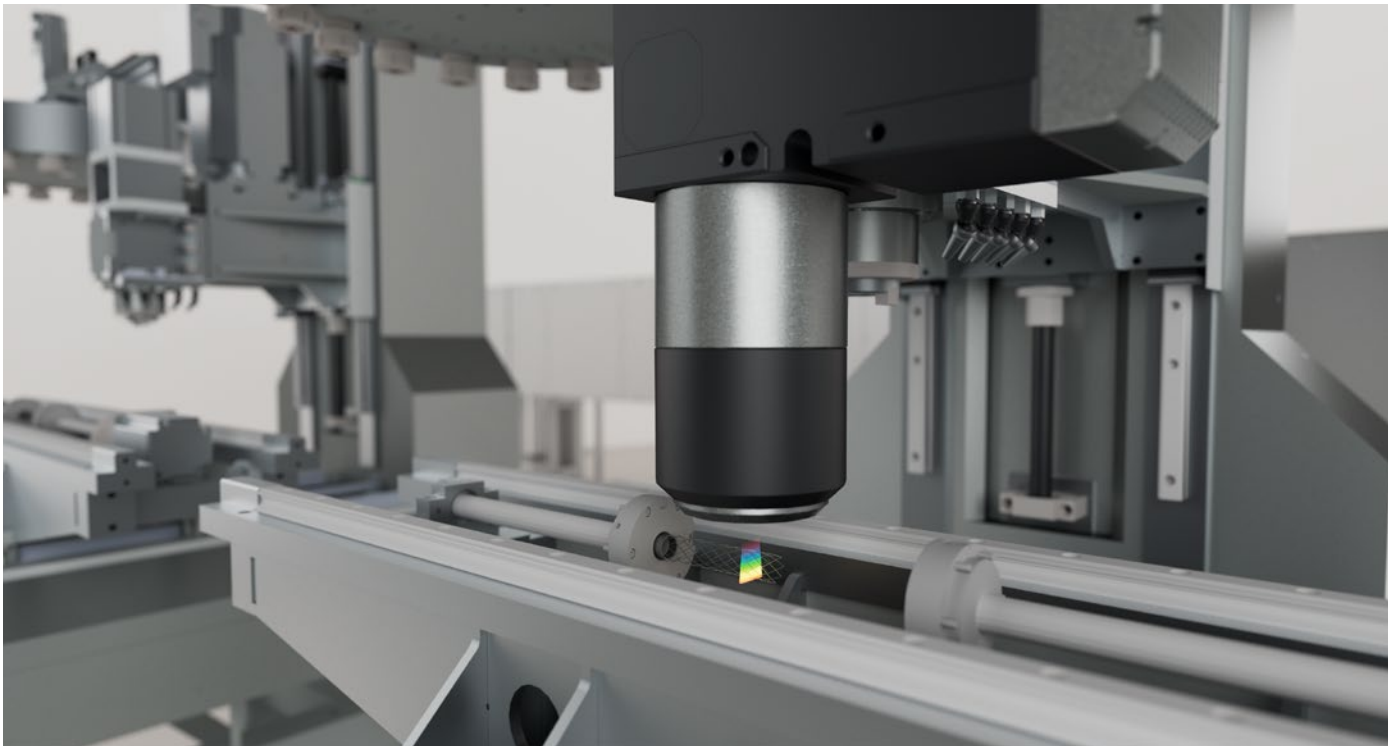
Precise wafer topography measurement
Measuring wafer topographies requires the detection of the finest height differences. The confocalLINE CLI8500 generates a detailed height profile along the measurement line, which can be used to evaluate flatness, waviness, steps, edges, and local defects. The non-contact measurement prevents mechanical stress on the sensitive wafer surface.



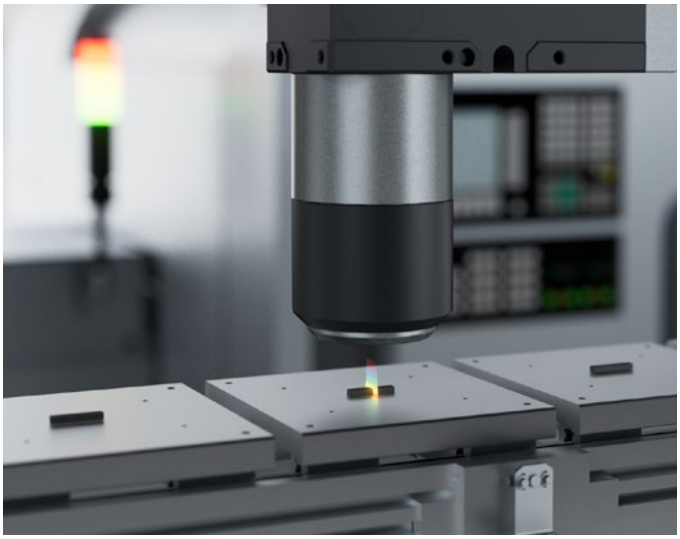
Measurement of BGA radius, height and shape
For BGAs, the individual solder balls are inspected for shape, height, and radius. The CLI8500 measures the profiles of the spherical surfaces and evaluates them for roundness, uniformity, and position. This allows for the early detection of defective solder structures, deviations in ball radius, or uneven heights.



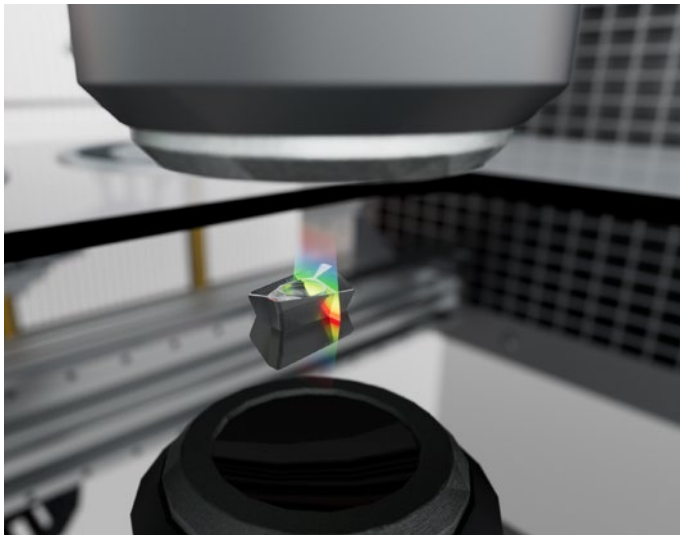
Precise geometric inspection during display assembly
During the assembly of display glass, the surface shape, edges, steps, thickness, and any local deformations are inspected. The CLI8500 is particularly well-suited for reflective and transparent surfaces and enables high-precision geometric measurement during the manufacturing process.



Geometric inspection of medical implants
The CLI8500 captures the surface contours of stents at high resolution, enabling reliable inspection of dimensional accuracy, strut widths, height differences, and potential deformations. At the same time, non-contact measurement prevents mechanical stress on the sensitive structures.



PIN measurement of micro connectors
For micro-connectors, the height, position, flatness, and any possible deformation of the pins must be reliably inspected. To do this, the CLI8500 captures high-resolution height profiles and detects bent, too-tall, or too-short pins directly in the production line. In-line measurement supports reliable quality control before further assembly.



Geometric inspection of indexable inserts
Indexable inserts are replaceable cutting inserts used in machining tools for turning, milling, or drilling. To ensure reliable machining quality, cutting edges, radii, steps, clearance faces, and function-critical geometries must be inspected precisely. The CLI8500 captures these contours in high resolution, allowing for reliable assessment of dimensional accuracy and edge quality.

Technical data
confocalLINE

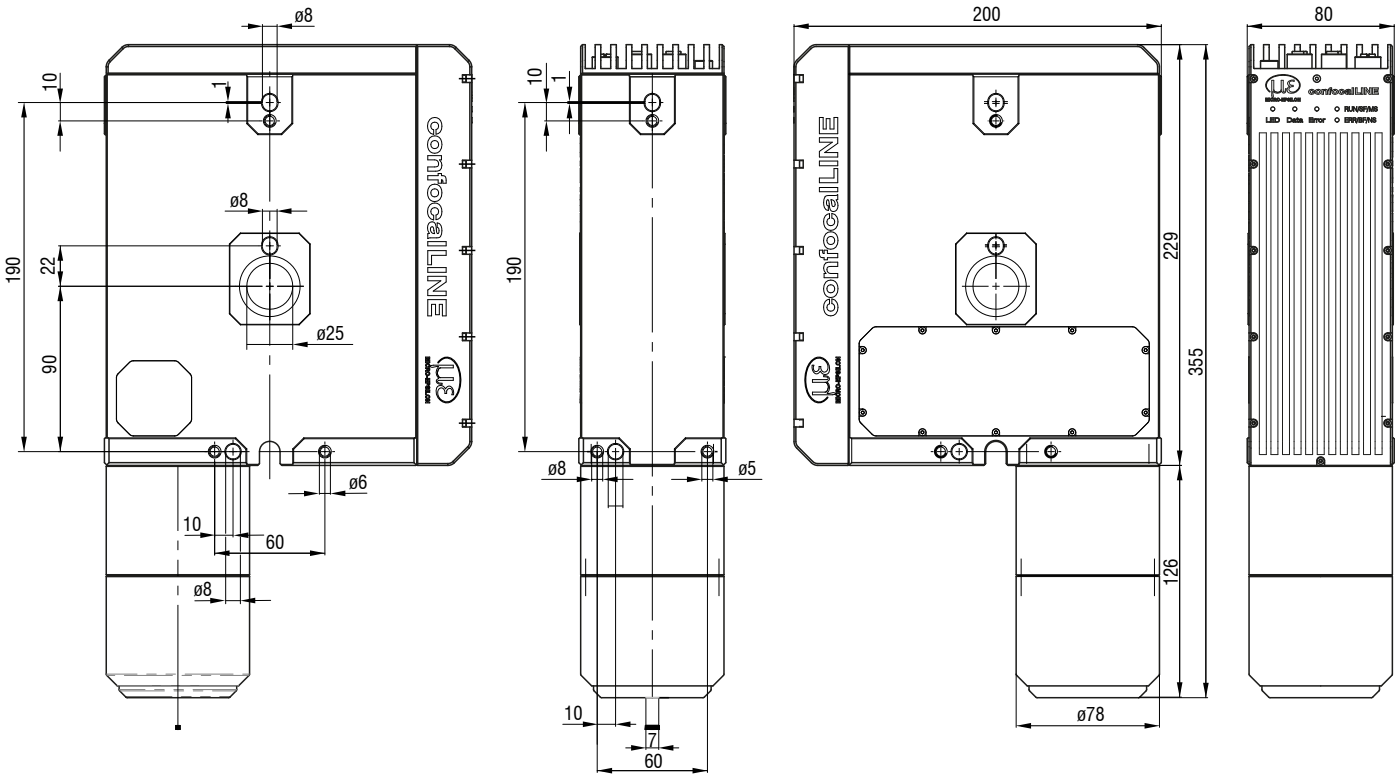
Model		CLI8500-7
Measuring range (z-axis)	Start of measuring range	14.85 mm
	Mid of measuring range	15.9 mm
	End of measuring range	16.95 mm
	Height of measuring range	2.1 mm
	Resolution (z-axis)	200 nm
Line linearity (z-axis) [1]	Displacement and distance	≤ ±0,05 %
Measuring range (x-axis)		7 mm
Resolution (x-axis)		2.7 µm
		2624 points/profile
Profile frequency		≤ 10 kHz
Interfaces	Ethernet GigE Vision	Output of measurement values Sensor control
	Digital inputs	Trigger Encoder Mode switching
	Differential inputs/outputs (I/O; sync)	Trigger Encoder Switch output Synchronization
Output of measurement values		Ethernet (UDP / Modbus TCP); PROFINET; EtherCAT; EtherNet/IP; switch signal
Indicator elements		3 LEDs for status light source, data and error, 2 status LEDs for fieldbus
Light source		Internal white LED
Tilt angle	along the line	±35 ° - ±85 °
Permissible extraneous light [2]	(fluorescent light) [1]	30.000 lx
Protection class (DIN EN 60529)		IP53
Vibration (DIN EN 60068-2-27)		2g / 20 … 500 Hz
Shock (DIN EN 60068-2-6)		15g / 6 ms
Temperature range	Storage	0 .. 50 °C
	Operation	20 ... 30 °C
Weight		8 kg
Supply voltage		Nominal value 24 V (±15 %), 2.5 A

[1] Value after single averaging over the measuring field (2,688 points)

[2] The maximum measurement angle of the sensor at which it produces a usable signal on diffusely reflective surfaces—accuracy decreases as the limits are reached. For surfaces with direct reflection, this value may decrease to as low as ±35°.

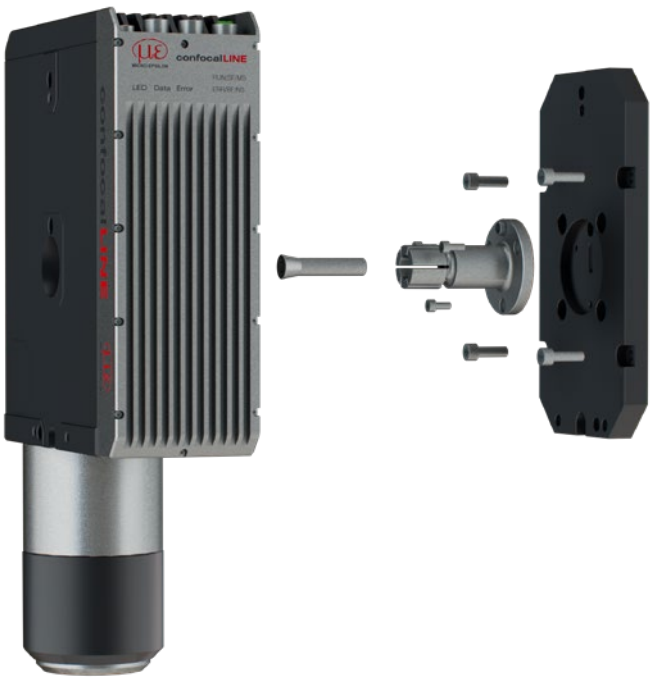
Dimensions
confocalLINE

CLI8500-7



Easy installation

A centering mandrel with an adapter plate is available to ensure simple and repeatable assembly. This makes it easier to align the sensor precisely, ensuring a quick and reliable installation. In addition, the centering mandrel allows the sensor to be mounted at a defined angle. This is particularly advantageous for challenging measurement tasks or special target geometries, as an angled sensor orientation can improve signal stability.

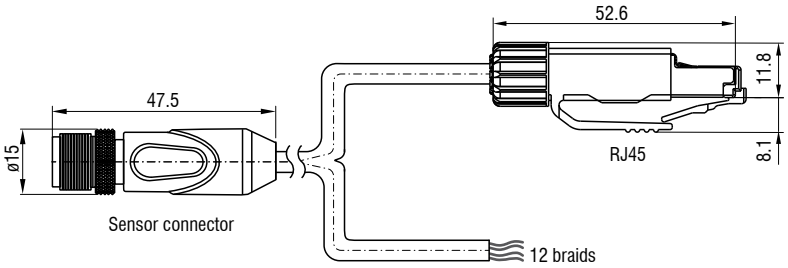


Cables and accessories
confocalLINE

Connection cable

Multifunction cable PCR8500-x/OE-RJ45

Power supply cable suitable for drag chains and robots, digital I/Os, sync, and Industrial Ethernet
Cable length in meters: 2 / 5 / 10 / 15 / 25 / 35

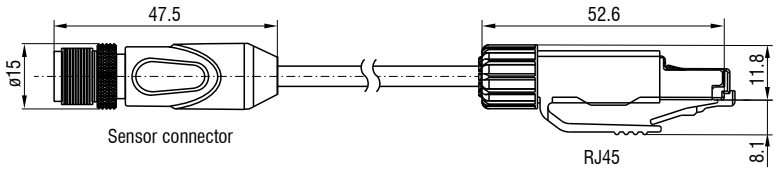


Article no.	Model
29011601	PCR8500-2/OE-RJ45
29011602	PCR8500-5/OE-RJ45
29011603	PCR8500-10/OE-RJ45

Article no.	Model
29011604	PCR8500-15/OE-RJ45
29011606	PCR8500-25/OE-RJ45
29011607	PCR8500-35/OE-RJ45

Ethernet connection cable SCR8500X-x

Cable for parameter setting, measurement value and profile data transmission; suitable for drag chains and robots
Cable length in meters: 2 / 5 / 10 / 15 / 25 / 35



Article no.	Model
29011647	SCR8500X-2
29011648	SCR8500X-5
29011649	SCR8500X-10

Article no.	Model
29011650	SCR8500X-15
29011652	SCR8500X-25
29011653	SCR8500X-35

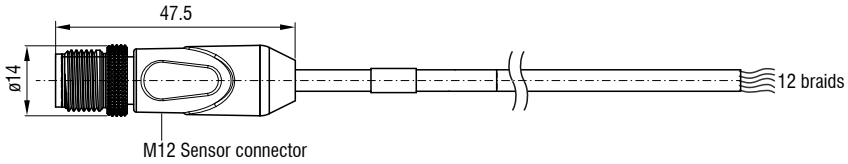
Power supply cable ECR8500-5

Cable suitable for drag chains and robots
3-pin M8 socket to open ends
Cable length in meters: 5

Article no.	Model
29011794	ECR8500-5

PCR3000 Multifunction cable for use with other encoders

Cable suitable for drag chains and robots
Cable length in meters: 2 / 5 / 10 / 15 / 25 / 35



Article no.	Model
29011241	PCR3000-2
29011242	PCR3000-5
29011243	PCR3000-10
29011244	PCR3000-15

Article no.	Model
29011245	PCR3000-20
29011246	PCR3000-25
29011247	PCR3000-35

Other accessories

Adapter plate with clamping mandrel

Sturdy adapter plate for securely mounting the sensor

Article no.	Model
2968007	Adapter plate with clamping mandrel

Software and integration
confocalLINE



SMART

Fast, intuitive path to a high-precision 3D solution

3D DATA

Highest precision with maximum integration flexibility

Direct output of measurement values = Evaluation in the sensor

- Transfer measurement values directly to the PLC
- Sensor control via standard protocols
- OK/NOK result evaluation and output via digital outputs or fieldbus

Recommended tools

3DInspect, ME Modbus Tool

EtherCAT
EtherNet/IP
PROFINET
Modbus
UDP

Integration into image processing = external evaluation

- Standardized interfaces: GenICam / GigE Vision
- Direct connection to compatible vision software
- Output of 3D data

Compatible interfaces & software

COGNEX VisionPro
HALCON a product of MVTec
GENICAM
GiGE VISION

Integration into customer software = external evaluation

- Comprehensive SDK
- Integration examples for various programming languages (e.g., C/C++, C#, or Python)
- LabVIEW driver with example code
- Documentation and support

Supported environments

3D sensor SDK

C/C++ C#/.NET
Linux
LabVIEW

For custom workflows, advanced integrations or special requirements, we will be happy to help you select the right solution.

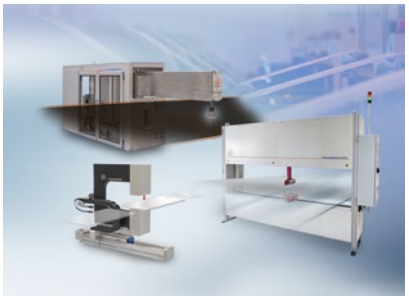
Sensors and Systems from Micro-Epsilon



Sensors and systems for displacement, distance and position



Sensors and measurement devices for non-contact temperature measurement



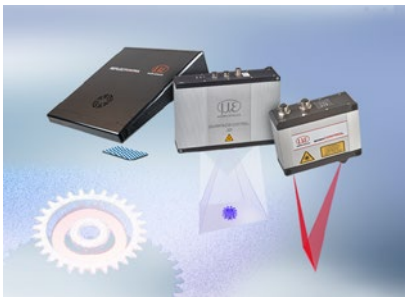
Measuring and inspection systems for metal strips, plastics and rubber



Optical micrometers and fiber optics, measuring and test amplifiers



Color recognition sensors, LED analyzers and inline color spectrometers



3D measurement technology for dimensional testing and surface inspection

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