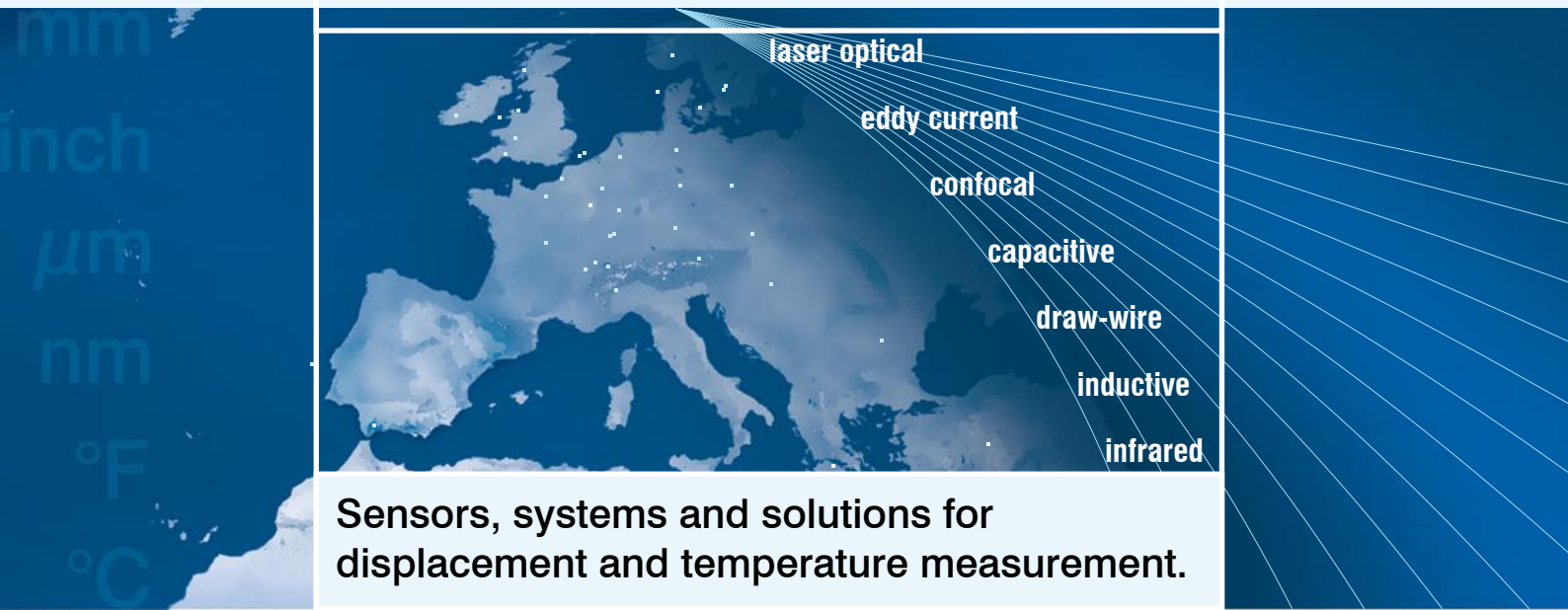




More Precision.



Sensors, systems and solutions for displacement and temperature measurement.

Measurement Product Guide 2010



More precision. Sensors, measurement devices and systems

As a technological leader in its industry, Micro-Epsilon is constantly meeting the challenges of developing high precision sensors, measurement equipment and systems for its customers. This challenge represents the continued drive for high performance in the field of measurement technology.

Behind Micro-Epsilon is a powerful group of companies that provide strategies that focus on different sensor technologies, facilitating the group's leadership in this field. Along with a concentration of expertise in sensors for geometrical and dimensional measurement, our latest technology focuses on non-contact temperature measurement instruments. In combination, the different members of the Micro-Epsilon group interact with one another to meet every challenge and meet every customer requirement.

As well as physical resources, the accumulated knowledge within the company is regarded as the core capability that provides a technological lead and consolidates this for the future. It is only through consistent knowledge management that such sustainable high performance can be achieved and incorporated into all product groups.

From large global corporations through medium-sized companies to engineering service providers - sensors and solutions from Micro-Epsilon are regarded throughout the world as symbolic for reliable measurement results of the highest precision.

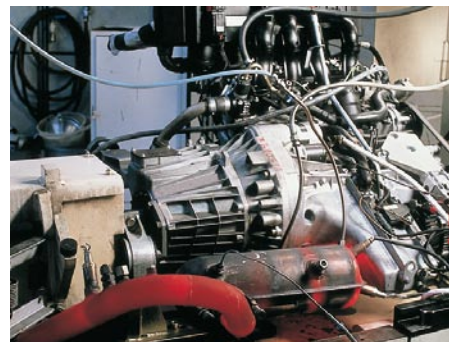
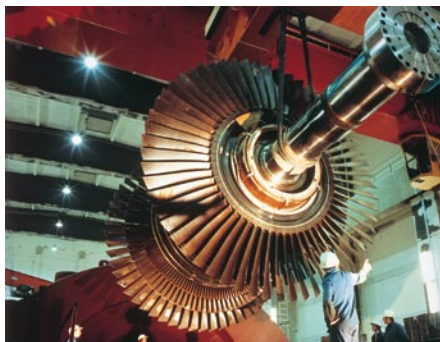


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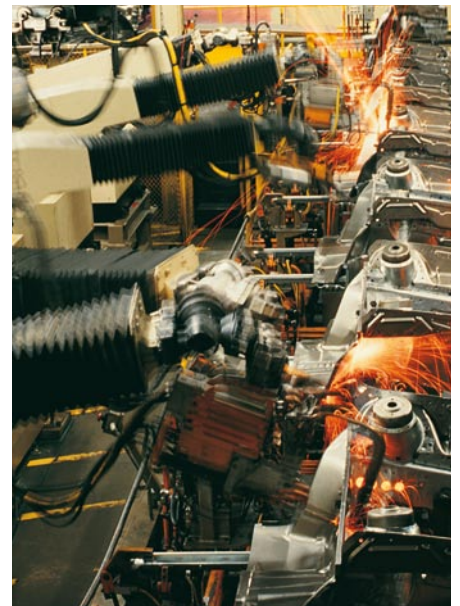
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Application fields

The fields of application and demand for precision sensors and measuring equipment are ever increasing. Whether it is for quality assurance, for applications in maintenance and service, for process and machine monitoring, in automation or in research and development - sensors make a vital contribution to the improvement of products and processes. From machine building, automated production lines in the food and beverage industry, to integrated OEM solutions for automotive and aerospace customers - almost all these fields benefit from the use of Micro-Epsilon sensors. A long list of satisfied customers, including BMW, Schenk, Jaguar Cars, NASA, 3L, Exxon, Siemens, Borg Warner, NIST, MIT, Frito Lay, MRSI, Braun, Newport, Boeing, Amat, GSK, LLNL, L3, Ford and many more, proves the success of these high performance quality products.

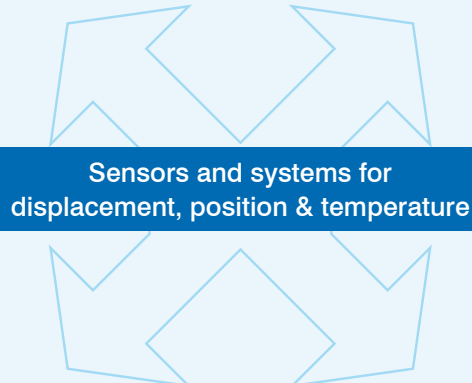


Automation

Quality control
Process monitoring
Process control

OEM-Integration

Finished products
Vehicles
Machines, tools



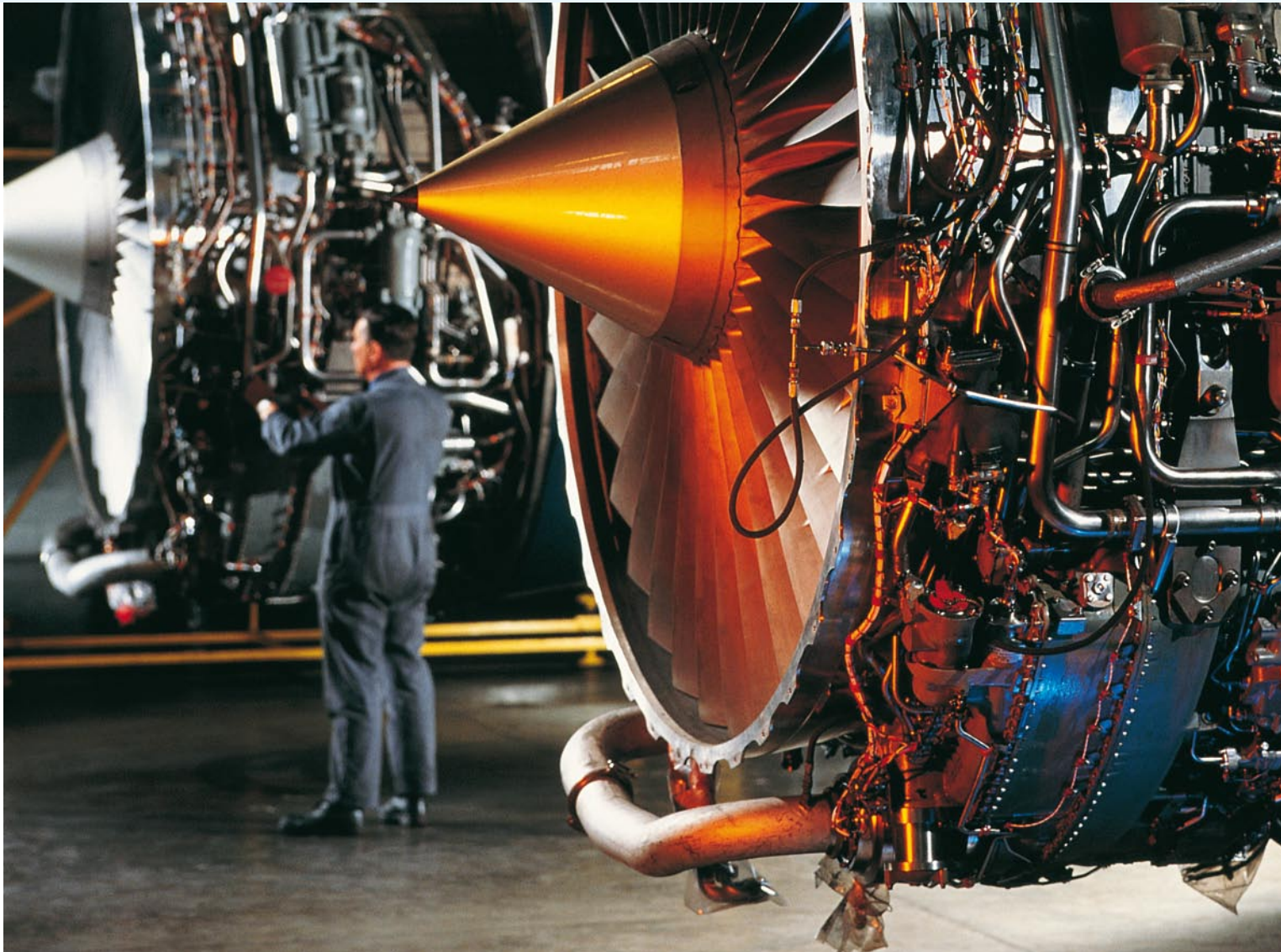
**Sensors and systems for
displacement, position & temperature**

Research and development

Product and process optimisation
Experimentation and testrigs
Fundamental research in industry

Machines and plants

Machine control
Process control
Predictive maintenance





Laser-triangulation: Non-contact displacement and position sensors

The non-contact displacement optoNCDT product group utilises optical triangulation as a measuring principle. A laser diode projects a visible spot of light onto the target surface (laser class 2). The light reflected from this spot is directed through an optical receiving system onto a position-sensitive element. Optical displacement sensors measure with a large reference distance and a very small measuring spot diameter. Nearly all models work with a high resolution CCD- or CMOS-line and a DSP.

Advantages

- Small targets through a tiny spot size
- Long measuring ranges
- Large stand off
- Extreme resolution
- Excellent linearity
- High measuring rates
- Synchronisation of two sensors
- Measurement of shiny metallic and rough surfaces



Largest range in the world

Starting with a low cost entry model through to high precision top end sensors – optoNCDT sensors are mostly used in process automation and quality assurance applications.



Universal controller

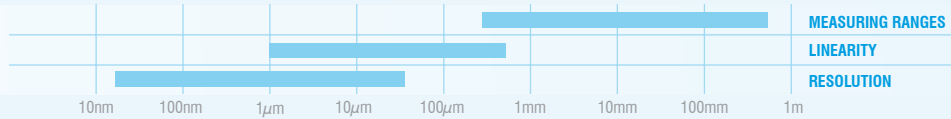
Processing up to six sensor signals. A versatile controller for a wide range of applications that has extensive clearing functions and high speed bus systems.



Sensors with small laser-line compensates for variations in reflections

The LL-series is ideal for metallic shiny or rough surfaces. With a small laser-line, this anti speckle sensor compensates reflection variations.

Performance
optoNCDT



NEW



optoNCDT 1302

Compact Low-Cost CMOS sensor with analogue output

Measuring ranges	20 - 200mm
Linearity	±0.2%
Resolution	0.02%
Measuring rate	750Hz

NEW



optoNCDT 1402

Compact industrial sensor with analogue & digital output

Measuring ranges	5 - 600mm
Linearity	±0.18%
Resolution	0.01%
Measuring rate	1.5kHz

IP69K option with stainless steel housing



optoNCDT 1607

Analogue PSD sensor for high speed measurements

Measuring ranges	0.5 - 200mm
Linearity	±0.2%
Resolution	0.02%
Bandwidth	37kHz (-3dB)



optoNCDT 1700

Intelligent sensor with integrated controller for industrial applications

Measuring ranges	2 - 750mm
Linearity	±0.08%
Resolution	0.005%
Measuring rate	2.5kHz



optoNCDT 1700LL

Sensor with laser-line for shiny metallic and rough surfaces

Measuring ranges	2 - 50mm
Linearity	±0.08%
Resolution	0.005%
Measuring rate	2.5kHz



optoNCDT 1700DR

Designed for use with direct reflective materials

Measuring ranges	2 - 20mm
Linearity	±0.1%
Resolution	0.005%
Measuring rate	2.5kHz



optoNCDT 2200 / 2220

High speed, high performance sensor for extremely precise measurements

Measuring ranges	2 - 200mm
Linearity	±0.03%
Resolution	0.0015%
Measuring rate	10kHz / 20kHz



optoNCDT 2200LL / 2220LL

High speed laser sensor for shiny metallic or rough surfaces

Measuring ranges	2 - 50mm
Linearity	±0.03%
Resolution	0.0015%
Measuring rate	10kHz / 20kHz

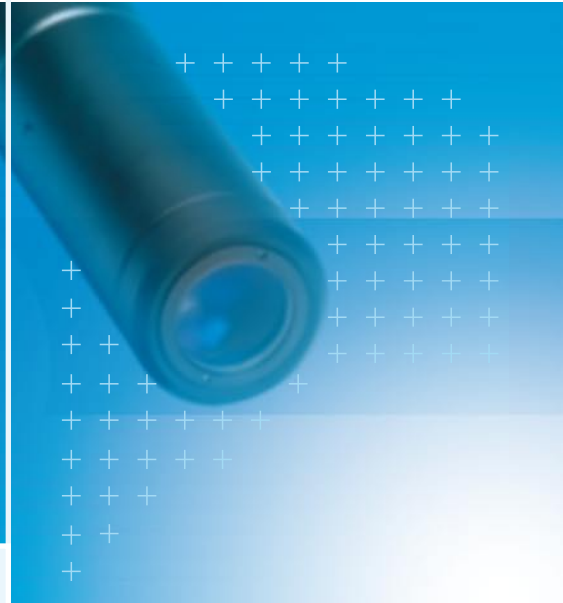
NEW



optoNCDT 1710 / 1810-50 / 2210

Short measurement ranges at long standoff distances

Measuring ranges	10 - 1000mm
Linearity	±0.03%
Resolution	0.005%
Measuring rate	10kHz



Confocal-chromatic principle: Non-contact displacement sensors

The optoNCDT 2401 confocal-chromatic measurement system consists of a controller with an LED-light source and a sensor. Both the sensor and the controller are connected via optical fibre up to a distance of 50m. The distance of the focal point varies due to the chromatic aberration of the sensor optics. A certain distance is assigned to each wavelength in the controller. The reflected light from the target surface is passed to the receiver optics, where the spectral intensity dispersion is evaluated. This unique measuring principle enables displacements and distances to be measured with the highest precision. Both diffuse and specular surfaces can be measured. With transparent materials, a one-sided thickness measurement, or gaps between multiple transparent layers, can be calculated along with the distance measurement using just one sensor.

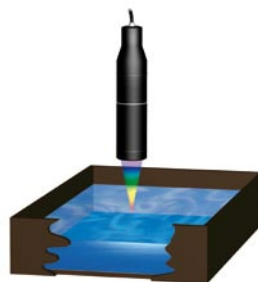
Advantages

- Extreme high resolution
- Target independent measurement
- Tiny, constant measuring spot
- Compact course of beam
- One-sided thickness measurement of transparent materials



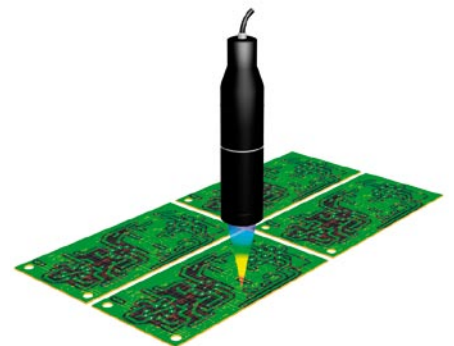
Thickness measurement of sleeves

Two synchronised sensors acquire the bottom thickness of sleeves in a double-sided layout.



Liquid level

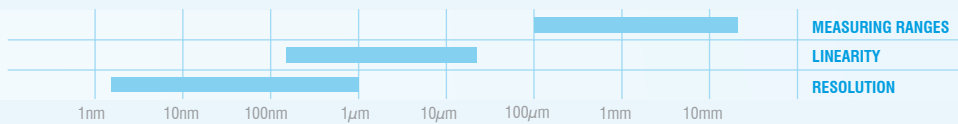
The confocal measurement principle facilitates measurements against reflecting surfaces (glass, mirror), as well as liquids.



Surface scanning

The extreme spatial resolution in x-axis and the submicron accuracy in the z-axis make it a perfect sensor for surface scanning.

Performance
optoNCDT 2401



optoNCDT 2401/2431

Controller with additional external light source for high speed measurements

Linearity	±0.05%
Resolution	0.004%
Measuring rate	2kHz / optional 30kHz

optoNCDT 2400/2401

CCD standard sensors with large stand off distance for standard measurements

Measuring ranges	120µm - 24mm
Small and huge base distances possible	

optoNCDT 2402

Miniature sensors (gradient index lens) for the inspection in tightest spaces

Measuring ranges	400µm - 6.5mm
Sensors with axial and radial (90° deflection) optical path available	



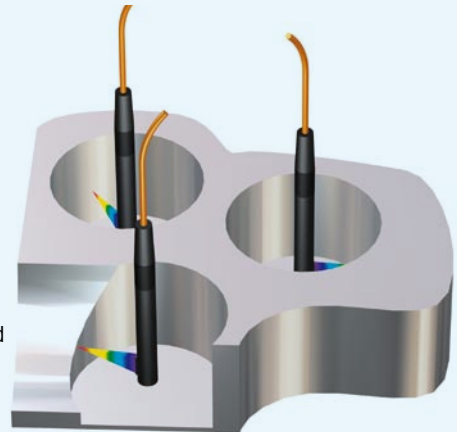
optoNCDT 2403

Confocal hybrid sensors with narrow gradient index lens and relay optics

Measuring ranges	400µm - 10mm
Enlarged base distances	

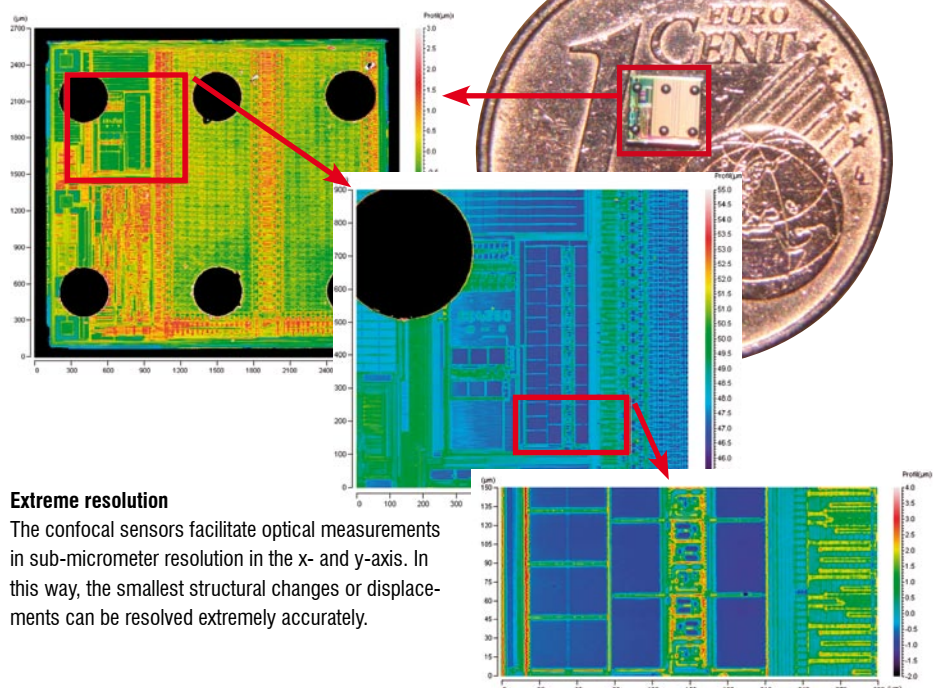
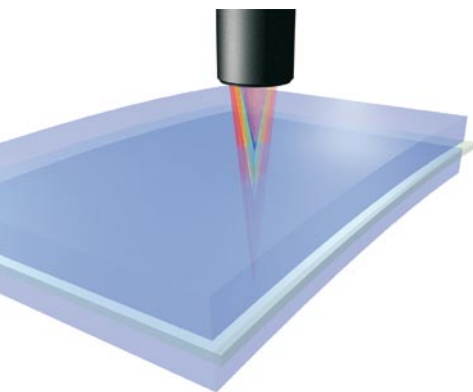
Confocal miniature sensors

Special miniature sensors with a diameter of 4mm measure in confined installation spaces, e.g. in drilled holes and recesses. Furthermore, the 90° version of these sensors enables the inspection of the smallest inner diameter, bores and medical test tubes.



One-sided thickness measurement transparent materials

The unique measurement principle enables a single-side thickness measurement on transparent materials even multilayer materials. Here, just one sensor measures the thickness with nanometer accuracy.



Extreme resolution

The confocal sensors facilitate optical measurements in sub-micrometer resolution in the x- and y-axis. In this way, the smallest structural changes or displacements can be resolved extremely accurately.



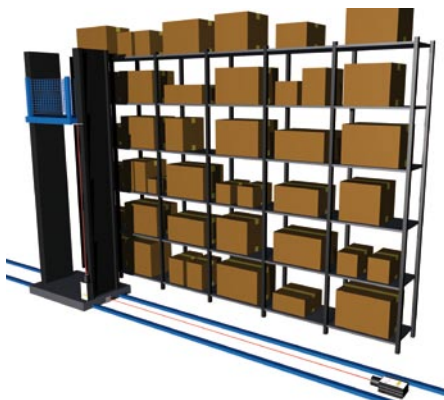
Time of flight principle: Non-contact gauging and distance sensors

Optoelectronic sensors in the optoNCDT ILR series operate according to the Time-of-Flight principle and are designed for non-contact distance and displacement measurements. The 118x Series functions according to the phase comparison principle. In doing so, modulated laser light is permanently transmitted to the object. The receiver compares the phase offset of the transmitted signal with the received signal, enabling the distance to be precisely calculated.

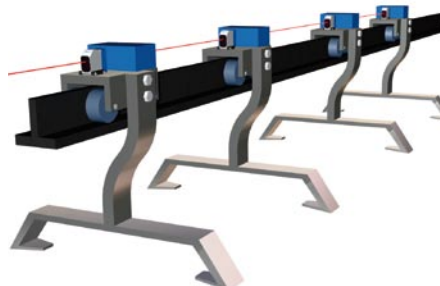
All remaining models in the optoNCDT ILR series operate according to the Time-of-Flight principle. Here, a laser pulse is transmitted and the time it takes for the reflected pulse to arrive back at the sensor is precisely measured. The distance can be measured based on the speed of light and the measured time period. Depending on the application and the required measuring range, the sensors operate on diffuse reflecting surfaces or on a special reflector plate.

Advantages

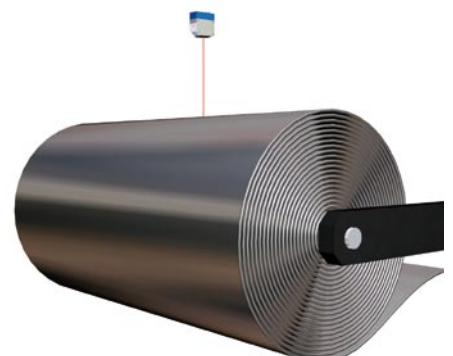
- Extreme long measuring ranges
- Outstanding repeatability
- Fast response time
- Excellent price-performance ratio
- Various interfaces



Position acquisition storage and retrieval units
Fast response time in combination with high measurement accuracy facilitate the exact positioning of storage and retrieval units.

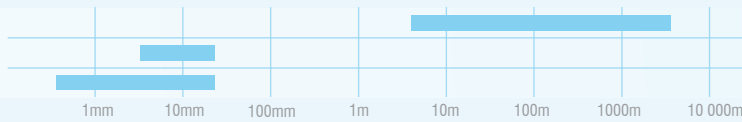


Distance measurement on monorail conveyors
To control the flow of production and to prevent damage to the parts, the spacing between the conveyors is monitored.



Acquisition of coil diameters
The quantities of steel, paper and fabric wound on and off are monitored via the acquisition of coil diameters using laser probes.

Performance
optoNCDT ILR



MEASURING RANGES
LINEARITY
REPEATABILITY



optoNCDT ILR 1020/1100/1150

Gauging sensors

Measuring ranges 0.2 - 10m
Linearity $\pm 8\text{mm}$
Repeatability $\pm 4\text{mm}$
Response time 12ms

optoNCDT ILR 1021/1101/1151

Distance sensors

Measuring ranges 0.2 - 250m
Linearity $\pm 3\text{mm}$
Repeatability $\pm 2\text{mm}$
Response time 12ms

optoNCDT ILR 1181/1182/1183

Distance sensors

Measuring range 0.1 - 150m
Linearity $\pm 2\text{mm}$
Repeatability $< 0.5\text{mm}$
Response time 20ms

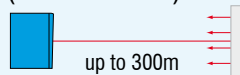


optoNCDT ILR 1191

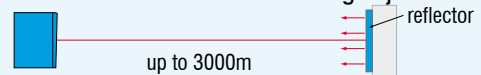
Distance sensors

Measuring range 0.5 - 3000m
Linearity $\pm 20\text{mm}$
Repeatability $< 20\text{mm}$
Response time 0.5ms

Measurements against target
(without reflector)



Measurements against a reflector,
which is installed on the measuring object



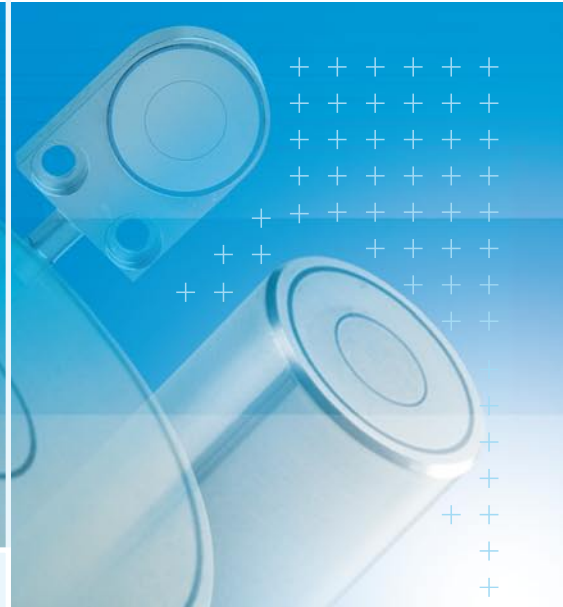
	ILR	1020	1100	1150	1021	1101	1151	1181	1182	1183	1191
Measuring range in gauging mode (without reflector)	6 m	•	•								
	10 m			•							
	30 m							•	•	•	
	300 m										•
Measuring range in reflector mode	30 m				•						
	50 m					•					
	150 m							•	•	•	
	250 m							•			
3000 m										•	

Time-of-Flight sensors are particularly useful in filling level measurement, for safety applications, height measurement of lifting systems, overhead conveyors, crane systems and for positioning lifts. The optoNCDT ILR 1191 is specially designed for outdoor use and in port systems.





Non-contact capacitive displacement and position sensors



Due to the unique active tri-electrode guard-ring-capacitor principle, capacitive displacement sensors are linear for all metals. The sensor acts as an electrode; the opposite electrode is the target.

The measurement technique enables measurements against all conducting and semi-conducting objects. Micro-Epsilon has extended the capacitive measurement principle with some innovative functions, which enable highly linear output characteristics, nanometer-precise resolution and very stable measurements to be obtained. The linear characteristic of the measurement signal is obtained for measurements with respect to target objects of electrically-conducting materials without any additional electronic linearisation.

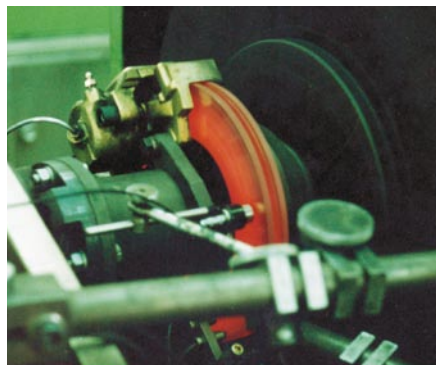
The sensors, which measure without making contact with the target, are ideal for industrial applications in production systems and in-process quality assurance, but are also used for test-rig applications.

Advantages

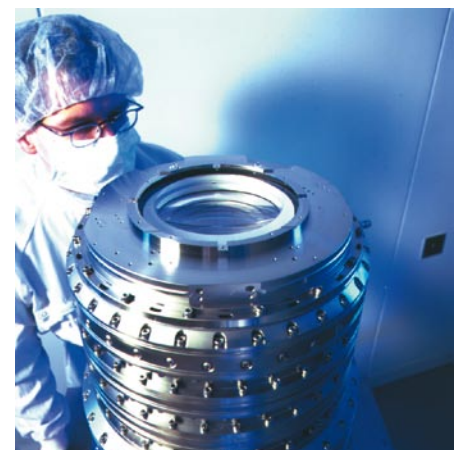
- Superior precision and resolution
- Excellent temperature stability
- Outstanding long-term stability
- Material-independent for metallic targets
- For any conductive target / semi-conductive target



The world's smallest capacitive displacement measurement system: capaNCDT 6019 for OEM applications in machines and equipment.

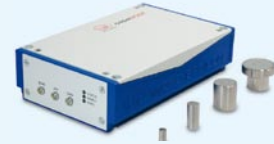
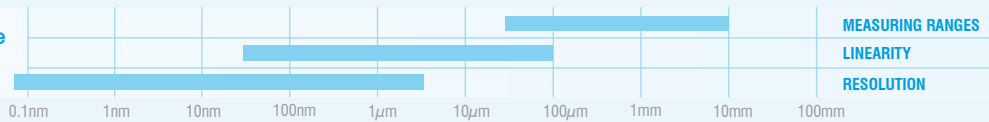


Even under extreme conditions on a test-rig, capacitive sensors supply the highest precision here, the wear on a brake disc is being measured.



Capacitive displacement sensors measure with the highest precision the alignment of the lens system used for semiconductor wafer lithography.

**Performance
capaNCDT**



capaNCDT 6019

Miniature single-channel system
 Measuring ranges 0.2 - 10mm
 Linearity $\pm 1\%$
 Resolution 0.015%
 Bandwidth 500Hz (-3dB)

capaNCDT 6100

Compact single-channel system
 Measuring ranges 0.2 - 10mm
 Linearity $\pm 0.3\% / \pm 0.1\%*$
 Resolution 0.01%
 Bandwidth 2kHz (-3dB)

capaNCDT 6300/6310

High resolution single-channel system
 Measuring ranges 0.05 - 10mm
 Linearity $\pm 0.2\% / \pm 0.1\%*$
 Resolution 0.001%
 Bandwidth 8kHz (-3dB)



capaNCDT 6350

High speed single-channel system
 Measuring ranges 0.2 - 10mm
 Linearity $\pm 0.3\%$
 Resolution 0.005%
 Measuring rate 50kHz



capaNCDT 6500

Modular multi-channel system
 Measuring ranges 0.05 - 10mm
 Linearity $\pm 0.05\%*$
 Resolution 0.000075%
 Bandwidth 8.5kHz (-3dB)

* Sensor and controller are matched

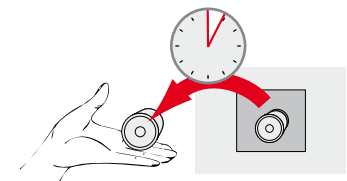
Instant sensor replacement without recalibration

Micro-Epsilon's unique capacitive technology enables the replacement of any capaNCDT sensor in seconds! Replacing sensors with different measuring ranges and any capaNCDT controller can be done without recalibration. Replacing a capaNCDT sensor takes no more than 5 seconds, while other capacitive systems in the market are not designed for replacing components and so individual calibration and linearisation is normally required.

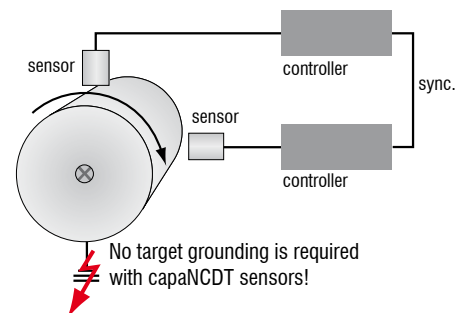
The nominal range of each single probe can be extended two-fold and custom cable lengths are also available.

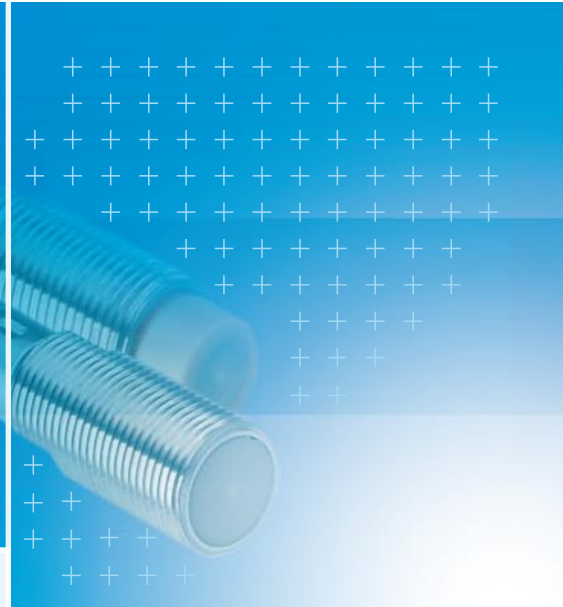
Non-contact target grounding

Target grounding sometimes can be very difficult or even impossible. Unlike conventional systems, due to the unique synchronisation of two Micro-Epsilon sensor systems, the target does not require any electrical grounding. The principle on the right shows two synchronised capaNCDT sensors measuring roller run-out. The target does not need to be grounded because of the unique synchronised, non-contact-grounding technology. At the same time, any interference caused by electrostatic discharge of the target is eliminated.



Instant sensor replacement within 5 seconds!
 Replace any capaNCDT controller and any capaNCDT sensor within seconds without recalibration!





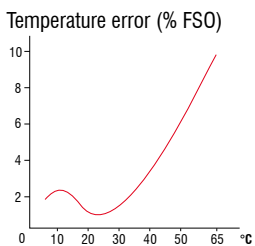
Eddy current principle: Non-contact displacement and position sensors

Eddy current displacement sensors measure distances, displacements, or positions of any electrically-conductive target. The principle enables non-contact and wear free measurements. The measurement objects can have either ferromagnetic or non-ferromagnetic properties. Due to its immunity to oil, dirt, dust, moisture, interference fields, etc. the eddy current principle is ideally suited to applications in harsh industrial environments. Micro-Epsilon's eddy current sensors are the only ones with active temperature compensation and field calibration capabilities.

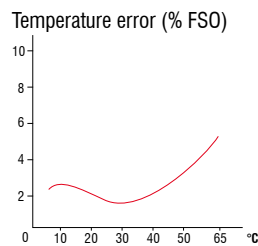
Advantages

- Non-contact and wear free
- Highest resolution and linearity
- Very stable measurements
- High measurement rates
- Excellent temperature range and temperature stability
- For industrial applications

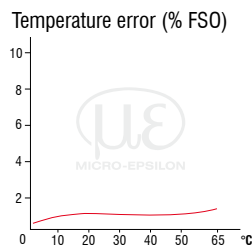
Temperature error by comparison



Common inductive sensor with ferrite core



Common eddy current sensor without temperature compensation

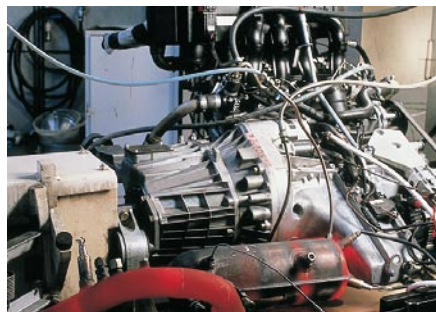


Best practice: eddyNCDT 3010 with temperature compensation



OEM integration in textile machines

Eddy current sensors measure the thickness variation of thread in textile machines.



Application in test rigs

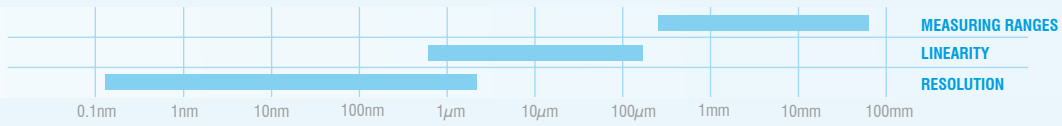
In the automotive industry these systems measure internal dimensional changes inside a running engine.



In-line quality control

Eddy current sensors measure the flatness in rolling mills.

**Performance
eddyNCDT**



eddyNCDT 3010

Low-Cost single channel system for industrial applications

Measuring ranges	0.5 - 15mm
Linearity	±0.25%
Resolution	0.005%
Bandwidth	25kHz (-3dB)

eddyNCDT 3300

Intelligent eddy current system (single-channel) for very precise measurements

Measuring ranges	0.4 - 80mm
Linearity	±0.2%
Resolution	0.005%
Bandwidth	100kHz (-3dB)
Standard and miniature sensors available	

eddyNCDT 3700

Compact eddy current OEM system for differential measurements

Measuring ranges	0.5 - 6mm
Linearity	±5%
Resolution	0.000018%
Bandwidth	10kHz (-3dB)

The largest selection of sensors world-wide

The technological leadership in eddy current sensors, which spans many years, is reflected in the sensor range - more than 400 sensors are available in different versions for the most varied of applications.

Subminiature sensors for confined installation spaces

Apart from standard sensors in popular styles, miniature sensors can also be supplied that achieve high precision measurement results with the smallest possible dimensions. Pressure-resistant versions, screened housings, ceramic types and other special features characterise these sensors, which achieve highly accurate measurement results despite their small dimensions. The miniature sensors are employed in high pressure applications, e.g. in internal combustion engines. The subminiature sensors are matched to the controller of the eddyNCDT 3300 Series.

Suitable for extreme temperatures

The sensors can be used from -50°C up to +235°C. The wide temperature range and the insensitivity to soiling or dust, offers an enormous range of applications in industrial environments.

Whereas most eddy current sensors on the market today exhibit extreme drift with variations in the ambient temperature, Micro-Epsilon's eddyNCDT systems have an active temperature compensation that ensures optimum signal stability. Consequently, measurements can be carried out over large temperature ranges with extreme reliability and accuracy.



World leading technology

The family of EU05 and ES04 miniature eddy current displacement sensors is unbeatable in dimensions. The very fine integral coaxial cable can pass through the eye of a needle. These sensors are ideally suited for measurements in combustion engines.

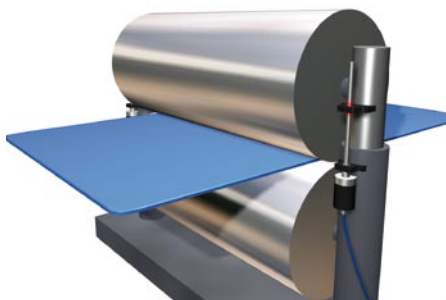


Linear inductive displacement and position sensors

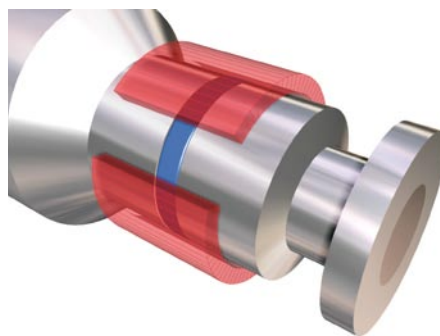
Electromagnetic displacement sensors are used extensively in applications for automated processes, quality assurance, test rigs, hydraulics, pneumatic cylinders, and automotive engineering. The advantages of these displacement sensors are well known and highly valued, and include ruggedness, reliability under harsh conditions, high signal quality and good temperature stability. The electromagnetic sensors of the induSENSOR series are based on the well-proven inductive and eddy current principle. They are used successfully both in single and high volume OEM applications.

Advantages

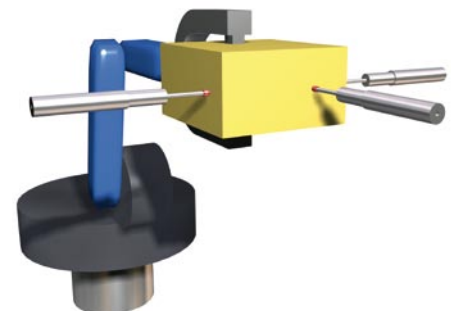
- More than 250 different models with measuring ranges from 1 to 630 mm
- Controller integrated or separate
- High accuracy classes
- Extreme stability and robustness
- Different constructions with plunger, tube or measuring ring
- High temperature stability



In automated production plants, inductive sensors monitor the production tolerance of the products while the process is running.

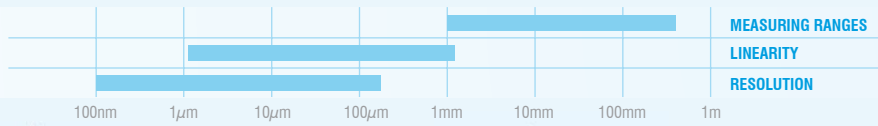


To monitor the clamping position of tools, a VIP series sensor is integrated into the chuck and directly measures the clamping stroke of the drawbar.



Inductive gauging sensors measure the geometry of workpieces in quality assurance and production.

**Performance
induSENSOR**



induSENSOR series VIP

Displacement sensors with integral electronics

Measuring ranges	50 - 150mm
Linearity	±0.25%
Resolution	0.03%
Bandwidth	300Hz (-3dB)
Target	measuring ring

induSENSOR series LVP - DC

Displacement sensors with integral electronics

Measuring ranges	50 - 200mm
Linearity	±0.25%
Resolution	0.03%
Bandwidth	300Hz (-3dB)
Target	plunger

induSENSOR series EDS

Displacement sensors with integral electronics

Measuring ranges	100 - 630mm
Linearity	±0.3%
Resolution	0.05%
Bandwidth	150Hz (-3dB)
Target	tube
Pressure resistance	450bar



induSENSOR series LVDT

Gauging sensor with external electronics

Measuring ranges	±1 - ±10mm
Linearity	±0.15%
Target	plunger with return spring

induSENSOR series LVDT

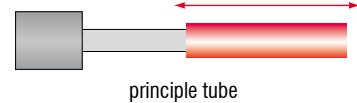
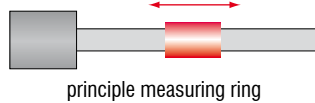
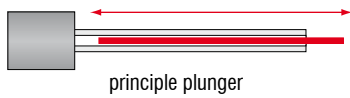
Displacement sensors with external electronics

Measuring ranges	±1 - ±25mm
Linearity	±0.15%
Target	plunger

induSENSOR series LDR

Linear displacement sensors with external electronics of high temperature (up to 160°C)

Measuring ranges	10 - 50mm
Linearity	±0.3%
Target	plunger

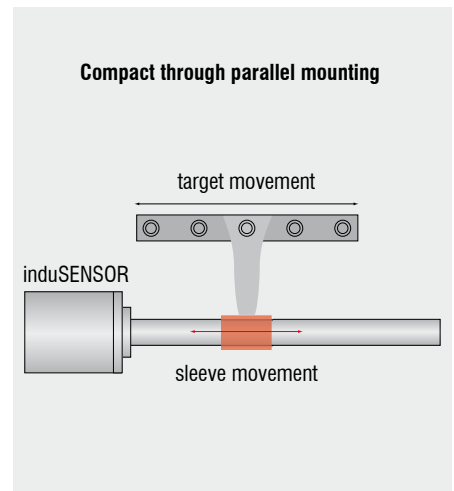


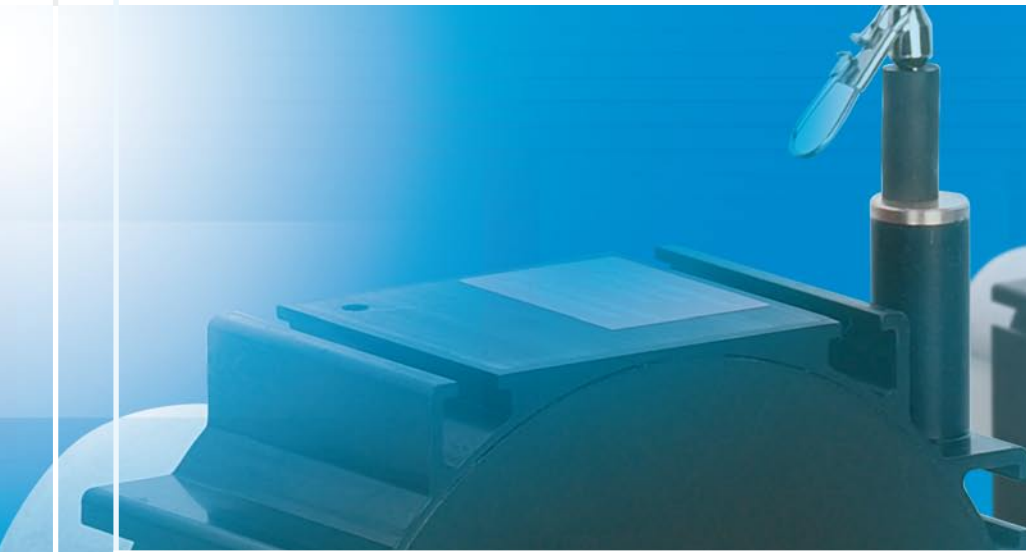
Extended functionality

The induSENSOR product group offers extended functionality and properties as a substantial advantage compared to conventional inductive probes and sensors.

The versions in the series differ from one another in construction, accuracy class and therefore also in their fields of application. The sensors are designed with integral or external electronics and use a plunger, measuring sleeve and measuring tube as the target. As a result, new fields of application are opening up due to the versatile methods of installation. This is particularly noticeable with the VIP Series: the difference from conventional LVDT sensors is that with the VIP Series, the measurement object is mounted parallel to the sensor. Parallel mounting is primarily suitable for confined installation spaces.

Through the short measuring sleeve concept, the sensors can be integrated to form a mechanical unit with dampers, valves, automatic screw driving units, clutches or pedals.





Draw-wire sensors for displacement, position and length

Draw-wire displacement and position sensors are essentially electronic tape measures and measure the linear movement of a component using a wire made of highly-flexible stainless steel strands, which is wound onto a drum by means of a long-life spring motor. The measuring drum is axially coupled with a multi-turn potentiometer, an incremental encoder, or an absolute encoder. With the draw-wire principle, a linear movement is transformed into a rotary movement and then converted into a resistance change or into countable increments.

Advantages

- Very accurate
- Long measuring ranges
- Robust and compact
- Easy installation and handling
- Compact design
- Excellent price/performance ratio



Draw-wire displacement sensors measure the lifting height on forklift trucks. With its compact construction, users can acquire lifting heights of up to 30m.

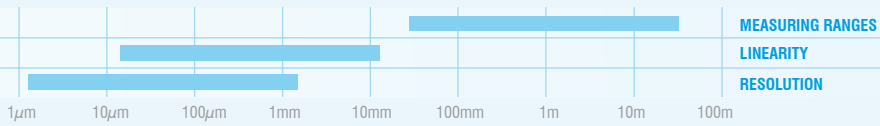


Miniature draw-wire sensors monitor the satellite release process from the Ariane booster rocket.



Draw-wire sensors monitor the height of lifting platforms on automobile production lines.

**Performance
wireSENSOR**



wireSENSOR MK30/MK46/MK77/MK120

OEM miniature sensors

Measuring ranges 50 - 7500mm
Analogue output potentiometer
Digital output encoder

wireSENSOR MPM

Subminiature sensors

Measuring ranges 50 - 250mm
Analogue output potentiometer
Option with wire acceleration up to 100g

wireSENSOR MP/MPW

Miniature sensors

Measuring ranges 100 - 1000mm
Analogue output potentiometer
Option with protection class IP67



wireSENSOR P60/P96

Industrial sensors

Measuring ranges 100 - 3000mm
Analogue outputs potentiometer, voltage, current
Digital outputs HTL, TTL, SSI, PB, CO



wireSENSOR P115

Industrial sensors

Measuring ranges 3 - 15m
Analogue outputs potentiometer, voltage, current
Digital outputs HTL, TTL, SSI, PB, CO



wireSENSOR P200

Longrange sensors

Measuring ranges 30 - 50m
Digital outputs HTL, TTL, SSI, PB, CO

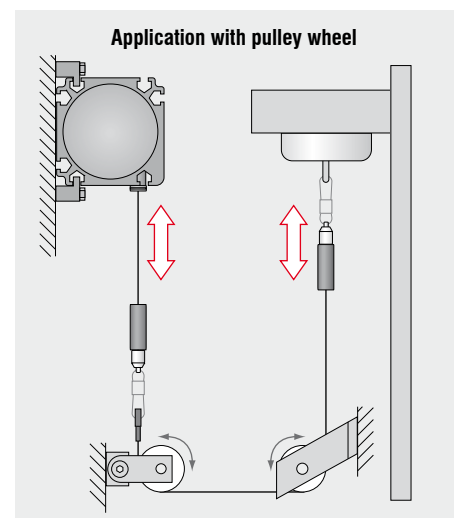
wireSENSOR mechanics

The mechanical options P96, P115 and P200 series are designed for easy mounting of a customer-specific encoder.

Compact, dependable and economical

The different sensor model ranges cover the complete application spectrum of draw-wire sensors. The miniature sensors are very favourably priced and are suitable for integration in tight installation spaces due to the miniaturised design. The industrial sensors are of extremely rugged construction and are employed in applications with large measurement ranges. A clear advantage of this draw-wire measuring principle is that the measuring cable can be diverted over deflection pulleys. This property differentiates draw-wire sensors from other measuring principles which normally only measure on one axis.

The sensor housings are kept extremely compact. The well-conceived sensor design enables large measurement ranges to be realised in a space-saving manner. Since only high quality components are used, the rugged sensors have an extremely long life - even in continuous use under industrial conditions.





Laser-Line Triangulation: Non-contact 2D/3D profile sensor



The scanCONTROL laser-line profile sensor makes use of the triangulation principle for the two-dimensional acquisition of profiles on the most varied of target surfaces. In contrast to familiar point laser sensors, a line optical system projects a laser line onto the surface of the object to be measured. The back-scattered light from the laser line is registered on a sensor matrix. Along with distance information (z-axis), the controller also calculates the true position along the laser line (x-axis) from the camera image and outputs both values in the sensor two-dimensional coordinate system. A moving object or sensor will generate a three-dimensional representation of the object.

scanCONTROL 2800 consists of a compact sensor head and an external controller for high speed applications up to 4kHz. The scanCONTROL 2700 operates using an integral controller and provides all the benefits of a compact solution.

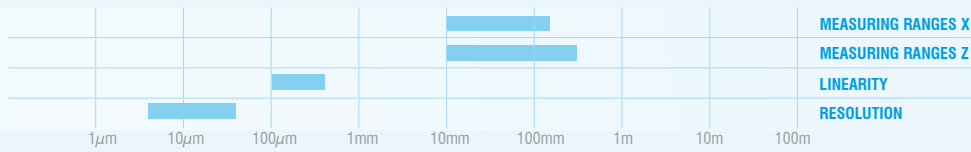
Advantages

- High accuracy and profile frequency
- High performance signal processor
- Trigger and synchronisation options
- Different types for customised integration available
- Complete solution from Micro-Epsilon



scanCONTROL 2710/2810 is designed to measure beading and grooves and is suitable for stationary operations e.g. mounted on a conveyor belt and also for moving targets e.g. on a robot arm. Therefore, different surfaces can be measured with high precision.

Performance scanCONTROL



scanCONTROL 2700/2710

Laser-scanner with integral controller

Measuring ranges

z-axis	25 - 300mm
x-axis	22 - 148mm

Linearity z-axis ±0.2%

Resolution x-axis 640 points/profile

Profile frequency up to 100Hz

Data rate 64,000 points/sec

scanCONTROL 2800/2810

High speed laser profile sensors

Measuring ranges

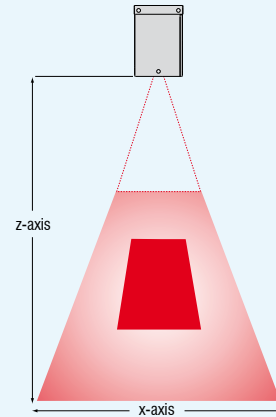
z-axis	10 - 245mm
x-axis	10 - 140mm

Linearity z-axis ±0.2%

Resolution x-axis 1024 points/profile

Profile frequency up to 4000Hz

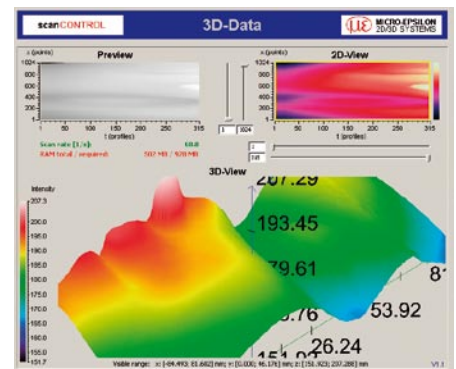
Data rate 265,000 points/sec



scanCONTROL 2700/2800 – The data supplier

The 2700/2800 series provides profile data of the measured surface. For each measurement, a profile consisting of x- and z-coordinates will be submitted, which are, due to the integrated controller already calibrated in mm. To optimise the data transfer a “container” can be defined, which gathers several profiles.

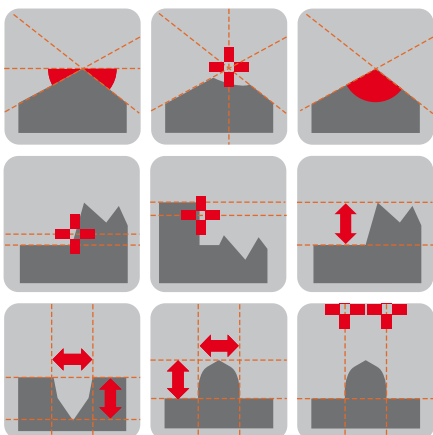
Therefore, the scanCONTROL 2700 and 2800 sensors provide ideal conditions for simple integration into a user’s own software solutions. Besides implementation support using the C/C++-library supplied, the scanCONTROL 3D-Data software also offers the opportunity to visualize surface profiles in 3D and to export measurement data in ASCII/STL.



Screenshot 3D-Data software

scanCONTROL 2710/2810 – The compact solution

With the 2710/2810 sensors, a simple profile analysis and evaluation of measurement results takes place directly in the controller. Measured values and IO/NIO signals will be output via digital and analogue interfaces. The setup software supplied enables the user to add tolerances to values and to assign IO/NIO signals.

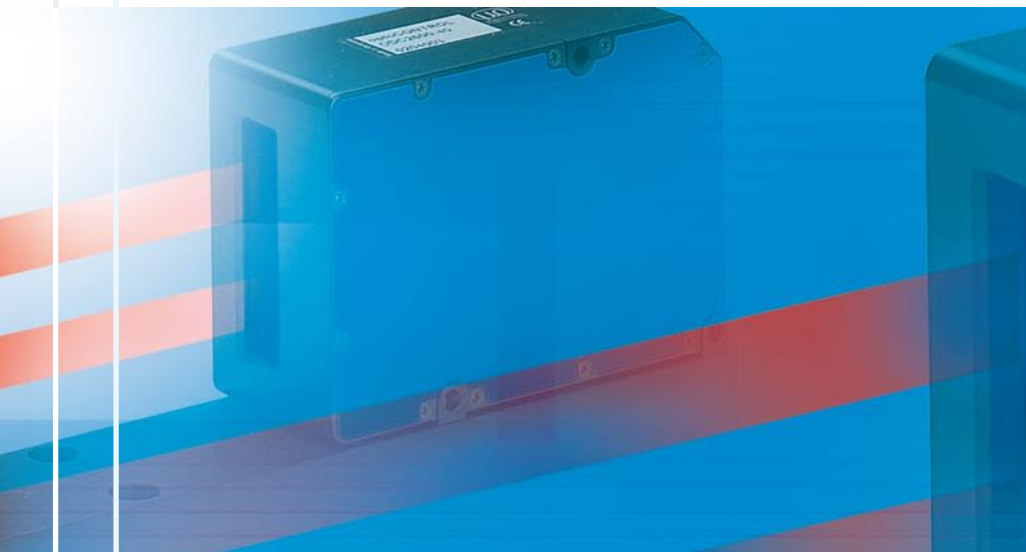


Angle measurement

Edge measurement and positioning

Bead, groove, gap, seam

scanCONTROL 2710/2810 - Applications examples



Thru-Beam principle: Optical micrometer

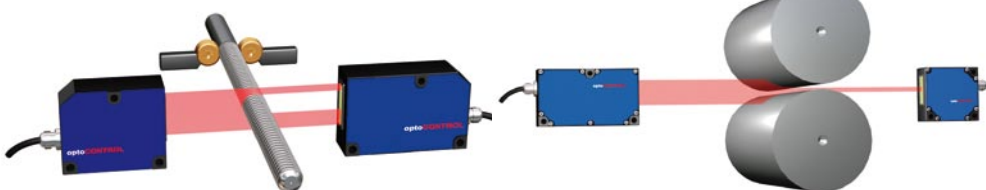
Optical micrometers in the optoCONTROL Series are based on various measuring principles. Apart from the CCD camera technique using laser or LED lighting, the principle of light quantity measurement is used. The micrometers consist of a light source and a receiver or a CCD camera. The light source produces a parallel, continuous light curtain, which is lined up with the receiver. If an object interrupts the light curtain, this shadow or darkening is detected at the receiver unit.

The optoCONTROL 1200 Series acquires the incident quantity of light, whereas the 1202, 2500 and 2600 Series measure the exact shadow via a CCD array. In this way, dimensional quantities such as diameter, gap, position and segment can be acquired.

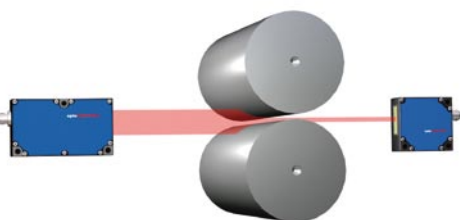
These units use state-of-the-art, high speed CCD cameras with solid state technology, which eliminate measurement errors caused by traditional scanning laser micrometers.

Advantages

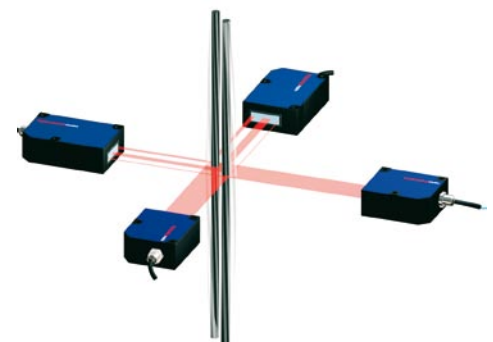
- Various models for different applications
- Laser- or LED light source
- Extremely compact construction
- Very accurate measurements
- High speed measurements



During the stamping of threaded rods, micrometers are used for quality assurance in order to determine the exact thread guidance.



Optical micrometers are used for acquiring roller gaps to ensure a constant gap height.



Synchronised micrometers acquire the vibration of tensioned steel lift cables, in order to control the vibration behaviour.



optoCONTROL 1200

Miniature high-speed micrometer (laser)

Measuring ranges 2 - 30mm
 Linearity $\pm 40\mu\text{m}$ (independent)
 Resolution $10\mu\text{m}$
 Bandwidth 100kHz (-3dB)
 Integrated controller

optoCONTROL 1202

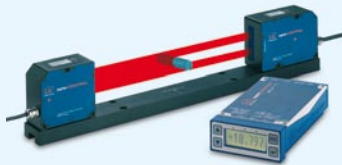
Compact high-speed micrometer with large measuring range (laser)

Measuring ranges 75 and 100mm
 Linearity $\pm 144\mu\text{m}$
 Resolution $30\mu\text{m}$
 Bandwidth 800Hz (-3dB)
 Integrated controller

optoCONTROL 2500

High resolution micrometer (laser)

Measuring ranges 0.5 - 34mm
 Linearity $\pm 10\mu\text{m}$
 Resolution $1\mu\text{m}$
 Measuring rate 2.3kHz
 External controller



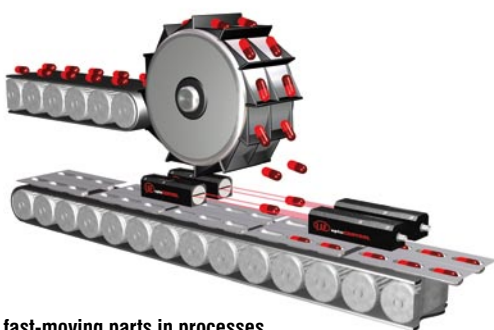
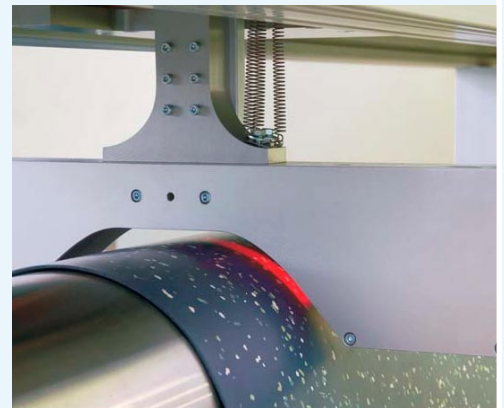
optoCONTROL 2600

High resolution micrometer (LED)

Measuring ranges 0.3 - 40mm
 Linearity $\pm 3\mu\text{m}$
 Resolution $0.1\mu\text{m}$
 Measuring rate 2.3kHz
 External controller

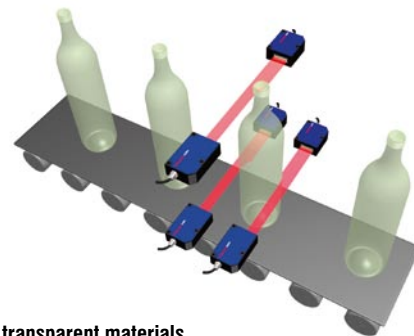
Innovative dual sensor system

To determine material thickness, a sensor system consisting of a micrometer and an eddy current sensor is fitted above a roller. The eddy current sensor measures the reference distance to the roller and the micrometer acquires the web surface. The material thickness is calculated from the combination of the two signals.



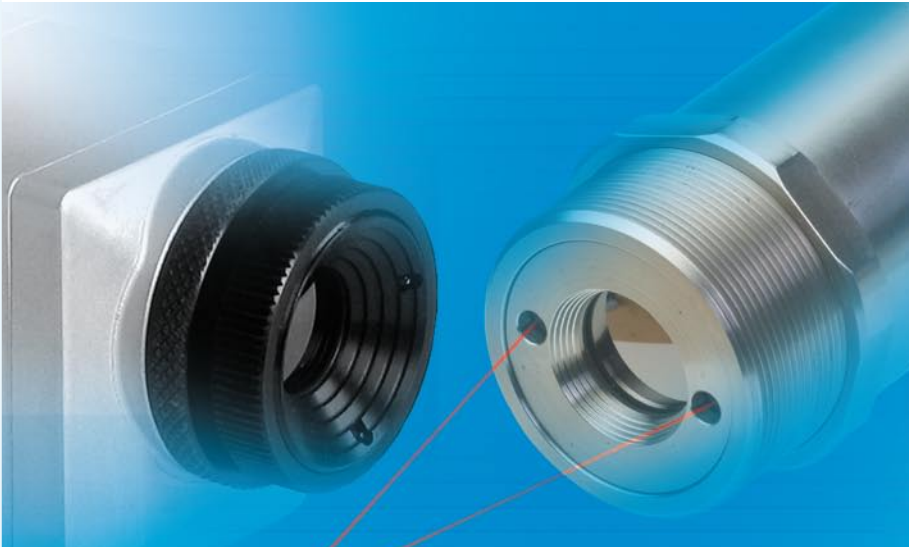
Detecting fast-moving parts in processes

Apart from measurement tasks, the 1200 Series can be employed for ascertaining the presence of components. The versatile concept with enormously high cut-off frequency and compact design opens up numerous fields of application.



Measuring transparent materials

The 2600 Series uses LED light sources to achieve high measurement accuracy. Along with the excellent performance data, the 2600 Series is suitable for measurement against transparent objects, such as glass bottles, bulbs or test tubes. The acquisition of transparent and extremely thin materials is simplified due to the adjustable edge detection threshold.



Non-contact infrared temperature sensors and thermal imagers



Infrared thermometers determine the temperature of objects by non-contact measurement of the infrared radiation emitted by the object's surface. A detector converts the incoming infrared radiation into an electrical signal. This results in an aligned temperature value, which can be used for further processing. The use of either portable or inline infrared thermometry sensors opens up various opportunities to measure and display temperature processes in the fields of quality control, automation systems and maintenance of machines and large plants.

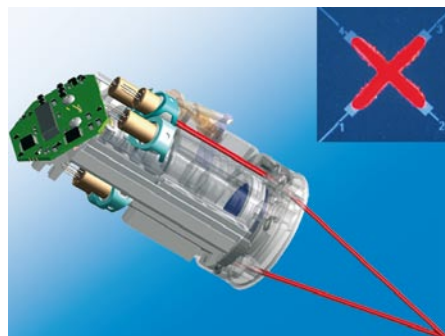
Trend setting infrared sensor technology for process automation

Miniaturized IR sensors thermoMETER combine high accuracy of the sensor parameters, ruggedness up to 250°C ambient temperature, a state of the art stainless steel mechanical design and an affordable price.

New developed IR detectors with high sensitivity and small dimensions make outstanding measuring parameters such as response times of 1ms possible. Sophisticated infrared thermometers support a high quality level in the production process.

Advantages

- Easy to use
- Non-contact measurement without contaminating the object
- Enables inspections of hot, fast moving or hard to reach objects in hazardous environments



Crosshairs precision module

Optomechanical device of the LS and mapping of the laser line generators.



Industrial automation

Control and monitoring of process temperatures and product quality.



Electrical and mechanical maintenance, R&D

Inspections of electrical systems, switch cabinets, bearings and motors.



thermoMETER MS

Portable low-cost IR thermometers
Temperature ranges from -32°C up to 760°C

thermoMETER LS

Portable IR thermometers with laser crosshairs
Temperature ranges from -35°C up to 900°C
Focus of 1mm spot size, 75:1 optics
Crosshairs mark real spot size at any distance



thermoMETER CS / CSmicro / CX

Compact or micro sized IR sensors, low-cost, fully integrated
Temperature range: -30°C to 1600°C
Rugged coated silicon optics
Integrated electronics
Scalable analogue output: 0 - 10V or 0 - 5V
Smallest integration, ideal for OEM
High resolution model available



thermoMETER CTratioM1

Glass fibre ratio thermometer
Temperature range: 700°C to 1800°C
Ambient temperatures up to 250°C continuous without cooling
Insensitive to changes in emissivity of the target
5ms response time for fast readings



thermoMETER CTlaser

Most precise sensor with laser aiming
Temperature range: -50°C to 975°C
Infrared sensors with 75:1 optical resolution
Smallest spot size 0.9mm
Double laser aiming marks real spot location and spot size at any distance
Measuring times from 9 ms

thermoMETER CTlaser M1/M2/M3

For metal processing with reduced wavelength
Temperature range: 50°C to 1800°C

thermoMETER CTlaserGLASS

For glass measurement
Temperature range: 100°C to 1650°C



thermoIMAGER TIM

Thermal imager for industrial applications
Temperature ranges: -20°C to 900°C
Very compact construction
Exchangeable lenses with 9°, 31° and 64°FOV
Power supply and operation via USB 2.0 interface
Excellent thermal sensitivity (NETD) of 0.08 K
Analogue input and output, trigger interface



thermoMETER CT

Most economic and accurate
Temperature range: -50°C to 975°C
One of the smallest infrared sensors worldwide with 22:1 optical resolution
Up to 180°C ambient temperature without cooling

thermoMETER CTM1/M2/M3

For metal processing,
Temperature range: 50°C to 1800°C

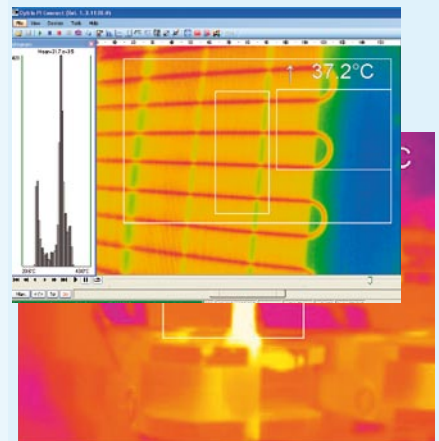
thermoMETER CThot

For extreme environmental conditions up to 250°C ambient temperature without cooling

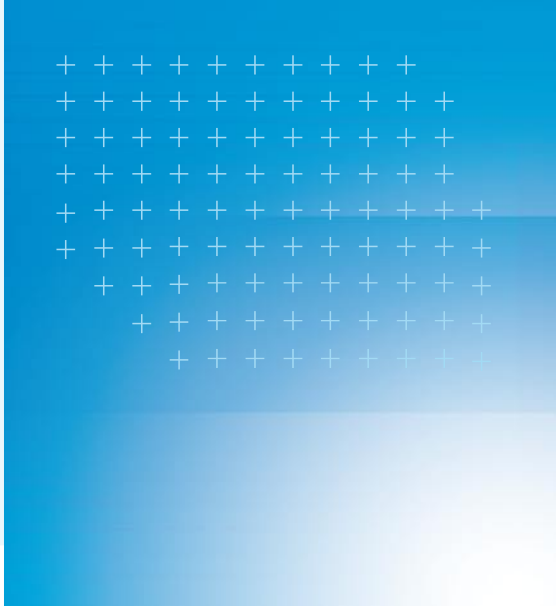
thermoMETER CTXL

For thin plastic film materials from 0°C to 500°C

Non contact temperature measurement from 100°C to 600°C in laser processing applications



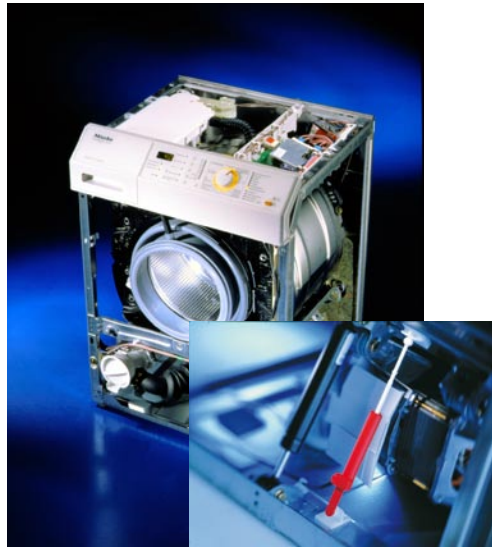
Complex image analysis and process monitoring software with custom configuration



Innovative sensor solutions for specified applications

Apart from standard sensors utilising the various measuring principles, Micro-Epsilon has developed numerous sensor solutions for special applications, which go beyond pure displacement and position measurement.

These application-specific sensors have been developed and optimised for special measurement tasks at the request of customers. These developments incorporate the company's expertise gained from more than thirty years designing, developing and applying sensor systems. Here, the developments always focus on high performance and reliability - at favourable price-performance ratios for OEMs.





ILU-50 OEM sensor

Integrated load and imbalance sensor for washing machines
 Measuring ranges 50mm
 For OEM applications



Sensor system for bore/hole inspection

Measure dimensions of bore holes:
 Diameter, roundness, concentricity,
 ID-profiling, straightness
 Sampling rate of up to 30kHz
 From 4mm bore diameter



DZ 135

Speed sensor for turbochargers - for vehicle and test cell use
 Speed range from 500 to 400,000rpm
 Wide operating temperature range



combiSENSOR

Non-contact displacement and thickness measurement with only one sensor
 In its sensor housing the combiSENSOR combines two measurement principles, e.g. laser and eddy current



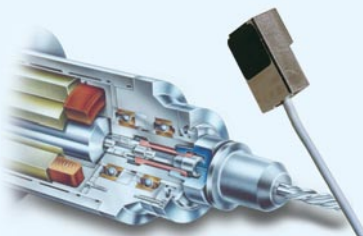
vacCONTROL

Vacuum monitoring system for cans, jars and bottles
 Non-contact principle
 Easy integration in production lines



Sensor in plastic housing with integrated ASIC electronics

Large-scale production system for industrial applications
 High dynamic response
 LED light source



SGS Spindle Growth System

Measurement system developed for measuring the extension of high speed milling spindles
 Measuring ranges 400µm
 Resolution 0.5µm
 High temperature range



NLS Needle Lift System

Miniature sensor system for measuring the needle lift in fuel injectors
 Innovative measurement concept
 Wide temperature range (240°C)
 Extreme pressure environment (2000bar)



idiamCONTROL

Non-contact inspection of extruder bores
 Non-contact and wear-free measurement
 Suitable for all metals without additional calibration
 Exact, non-destructive inspection



Automatic inspection of shiny surfaces



The reflectCONTROL product line is used for the automatic inspection of reflecting surfaces. Based on the principle of deflectometry, the mirror image of a light-dark pattern of the surface to be inspected is recorded by cameras and evaluated. The process is extremely sensitive to differences in the curvature of the target surface structure and can therefore automatically locate and display the smallest defects in an otherwise smooth surface.

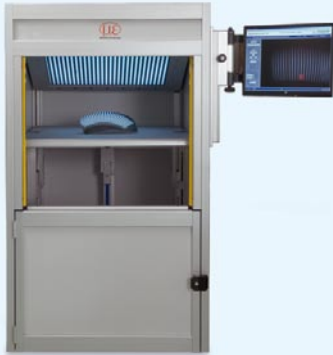
The appropriate system is available for numerous applications: RC-Compact for laboratory applications and routine inspections in production; RC-Robotic if the complexity of the examined parts requires flexible positioning of the sensor unit; and RC-Custom for a customised solution for the application, with complete integration in the respective production environment.

Advantages

- Defects are discovered and classified automatically
- Modular design enables use in the production line and as laboratory equipment
- Provides OK / NOT OK decisions, evaluations and defect reports
- Surface resolution can be adjusted down to the micrometre range



Previous visual inspections are replaced by the completely automatic reflectCONTROL.



RC-Compact

All the required components for rapid inspection are contained in one compact housing.

Inspection of flat and slightly curved parts

Intuitive user interface

Scalable to object sizes and measuring processes

Ideal for small series in the laboratory and production processes

Attractive price/performance ratio

RC-Robotic

This system is for repeatable inspections when the size or geometry of the components to be inspected require flexible positioning of the sensor unit.

Ideal for complex components

Intuitive user interface

Use of several robots simultaneously enables complete scanning in the production cycle

Automatic marking unit option

RC-Mini

Sector-independent solution for the surface inspection of any components.

Customised system based on defined customer requirements

Complete integration in the production line

Freely definable defect classification and evaluation

Optimisation of resolution, field of view and measuring time



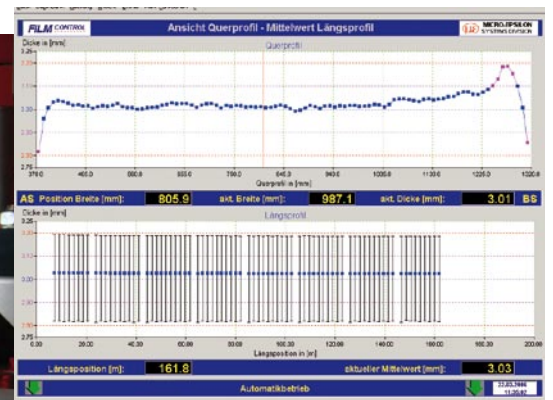
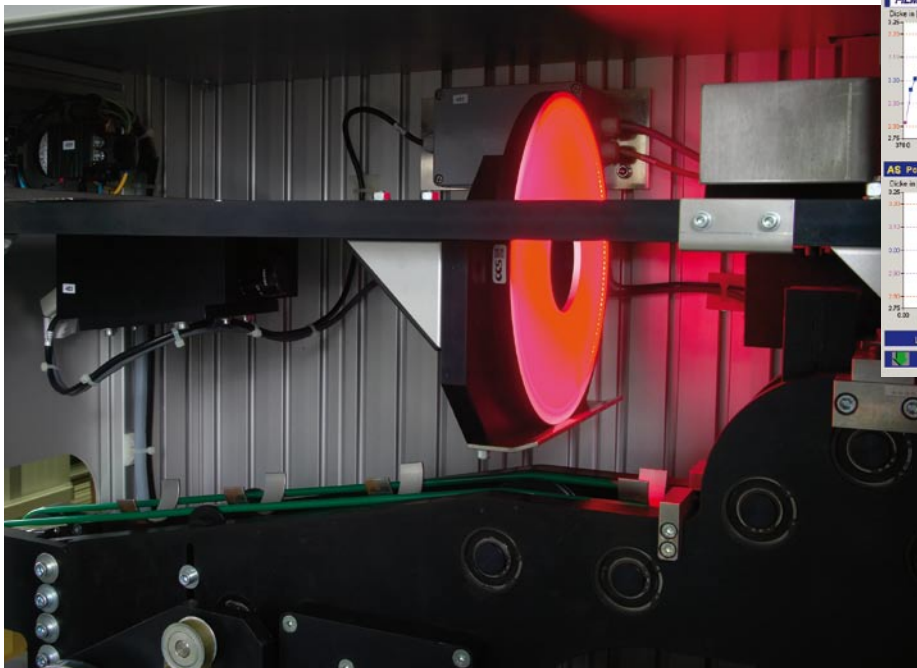
Types of defects detected (extract)

Impressions, contact, inclusions, fluff / hair, adhesive residues, mottles, craters, scratches, paint delamination, paint drops, runs, pinholing, overspray, moulding defects, scoring, shell defects, slide marks, abrasion marks, welding beads, spitters, specks, partial / missing paint, soiling, water droplets.



Measuring systems

System solutions from Micro-Epsilon are measurement systems that go beyond pure sensor systems. In this respect, sensors, software and the mechanical system are blended together to form one integrated overall system, which is used for process monitoring and quality assurance on production lines. The sensor and software modules used originate from the Micro-Epsilon group, enabling optimum and efficient component matching. These turnkey automated measurement systems are integrated into existing or newly-designed process lines to execute fully automated applications, such as thickness measurement, surface inspection and parts classification.



For each measurement task there is a suitable measurement concept. As well as laser sensors, micrometers, eddy current and capacitive sensors, image processing solutions, special combined sensors are also used. The signal representation can be arranged to suit the application requirements. The measurement systems communicate with existing environments over various interfaces and can therefore also be integrated retrospectively into existing production lines.



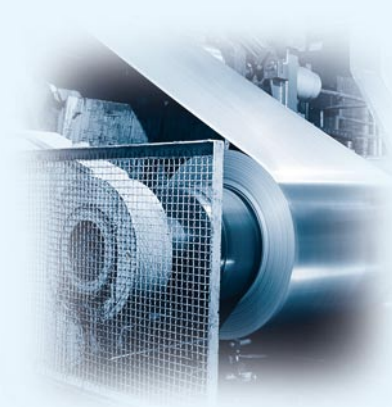
Inspection systems for the glass industry

Systems for quality assurance in glass production: Measurement of surface, contour, curvature and thickness of glass and plates.



Inspection systems for the plastics industry

Inspection systems for non-contact and non-radiating thickness measurement in the production of plastics.



Inspection systems for metal processing

Innovative measurement and inspection systems for thickness, profile and surface measurement of metals.



Inspection systems for rubber and tyres

Measurement and inspection systems for thickness and profile measurement of tyres and other rubber products.



Automotive inspection systems

Inspection systems for quality assurance and production monitoring of single or integrated parts.



Geometrical inspection of silicon ingots

Inspection system for automatic surface inspection and geometrical measurement of ingots prior to the cropping process.



MICRO-EPSILON

Micro-Epsilon Headquarters

Koenigbacher Str. 15 · 94496 Ortenburg / Germany

Phone +49 (0) 8542 / 168-0 · Fax +49 (0) 8542 / 168-90

info@micro-epsilon.com

www.micro-epsilon.com