MICRO-EPSILON

Measurement Product Guide

www.micro-epsilon.com

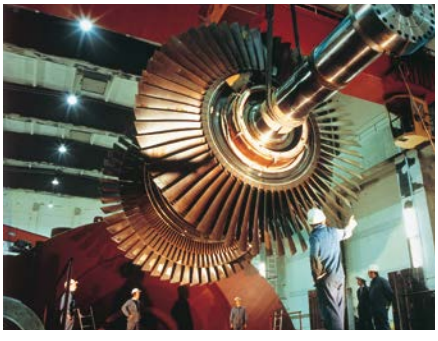
Measure your world with more precision.

As the technological leader, Micro-Epsilon is always pursuing the challenge of developing high precision sensors, measurement equipment and systems. This challenge represents the drive for continued high performance in the field of measurement technology.

Behind Micro-Epsilon there is a strong group of companies providing strategies which emphasize different aspects, facilitating the group‘s leadership in sensor technology. Along with the a concentration of expertise in sensors for geometrical and dimensional quantities, our latest technology focuses on color sensors and non-contact temperature measurement instruments. In combination the members of the company group interact with one another like the gears of an accurately running clock mechanism - with more precision.

Apart from the physical resources, the accumulated knowledge is regarded as the core capability which provides the technological lead and consolidates it 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 groups 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.



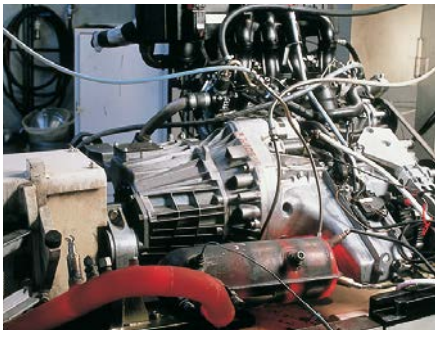


Table of content

Sensors for displacement, distance, length and position

Laser triangulation sensors . . . . . 6 - 7
Confocal-chromatic sensors . . . . . 8 - 9
Gaging and distance sensors . . . . . 10 - 11
Capacitive sensors . . . . . 12 - 13
Eddy current sensors . . . . . 14 - 15
Inductive sensors . . . . . 16 - 17
Magneto-inductive sensors . . . . . 18 - 19
Draw-wire sensors . . . . . 20 - 21

2D/3D sensor systems for dimensional measurement

Laser line profile sensors . . . . . 22 - 23
Optical micrometer and fiber optical sensors . . . . . 24 - 25

Color sensors for various surfaces

Color sensors . . . . . 26 - 27

IR temperature measurement

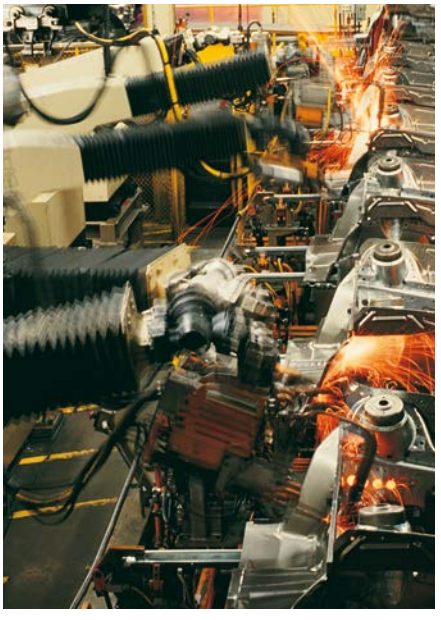
Non-contact stationary IR sensors and portable sensors . . . . . 28 - 29
USB thermal imagers . . . . . 30 - 31

Specific sensor solutions

Application specific and OEM sensor designs . . . . . 32 - 33
Turnkey inspection systems . . . . . 34 - 35

Application fields

The fields of application for sensors and measurement equipment appear to be unlimited. 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 decisive contribution to the improvement of products and processes.
In machine building, in automated production lines and as integrated OEM products Micro- Epsilon sensors proof their excellent performance and reliability. Every industry, chemical, pharmaceutical, construction, food, glass, ceramic, steel, paper, plastic, automotive and mil-aerospace values the benefits from the use of Micro-Epsilon sensors. A long list of satisfied customers, like BMW, Schenk, NASA, 3L, Exxon, Siemens, Borg Warner, NIST, MIT, Frito Lay, MRSI, Newport, Boeing, Amat, GSK, LLNL, L3, Ford and many more proofs the success of these high performance quality products.



Automation

Quality assurance of products

Process monitoring

Process control

OEM-Integration

Finished products

Vehicles

Machines, tools

Sensors and systems for displacement, position, color and temperature

Research and development

Product and process optimization

Experiments and test-rigs

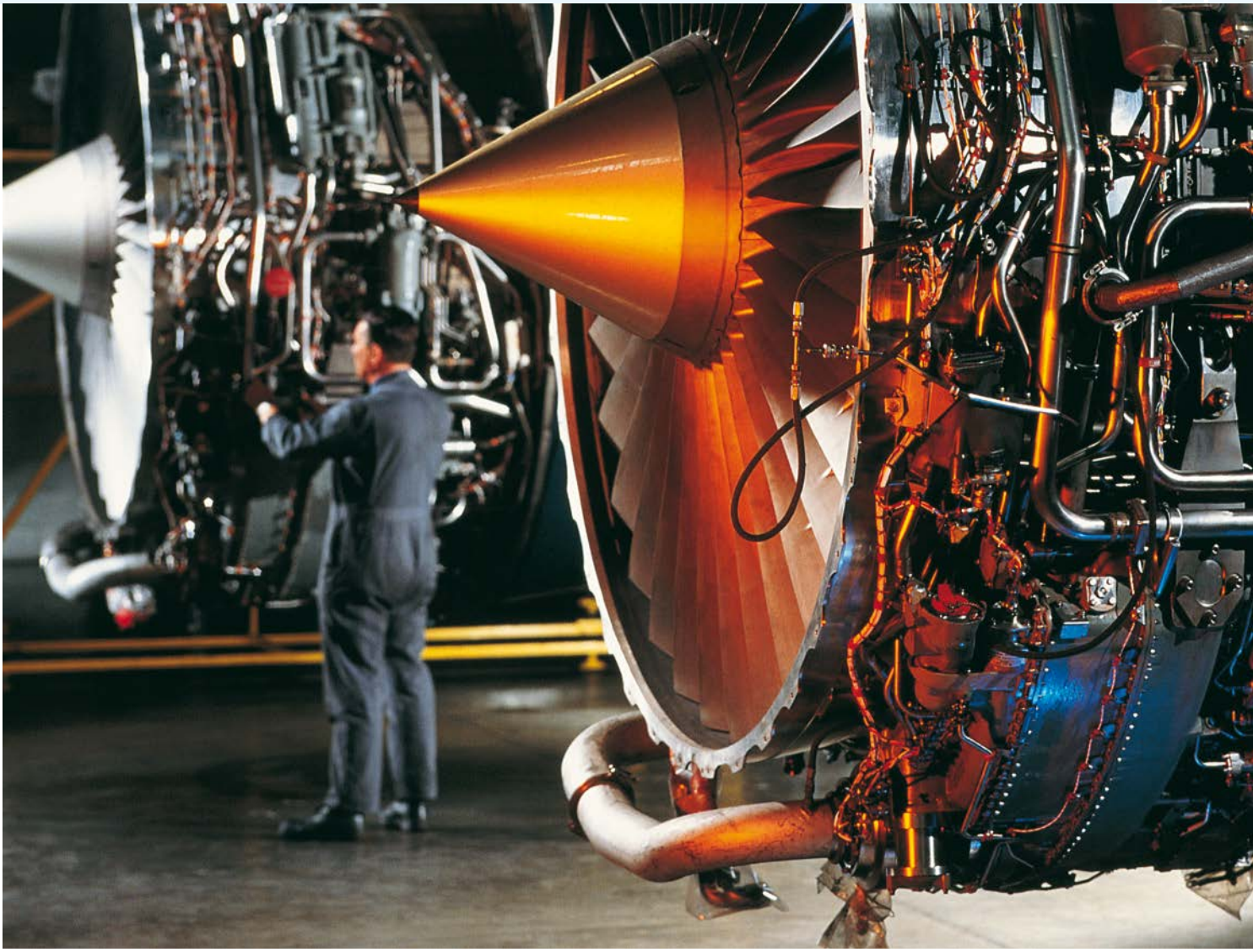
Fundamental research in industry

Machines and factories

Machines control

Factory control

Maintainance



Laser-triangulation: Non-contact displacement and position sensors

The non-contact displacement optoNCDT product group uses 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.

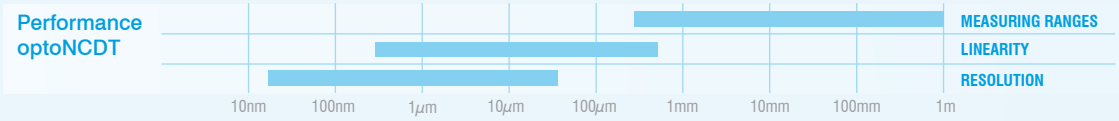
Advantages

- Small targets through tiny spot size
- Long measuring ranges
- Large stand off
- Extreme resolution
- Excellent linearity
- High measuring rate
- Synchronization of multiple sensors
- Measurement of any target

Largest selection worldwide
Starting with a low-cost entry model to the highest precision top class sensor – optoNCDT sensors offer solutions for many measurement applications.

Universal controller
Computing up to six sensor signals. This controller provides comprehensive functionality for complex measurement tasks.

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



optoNCDT 1302
Compact Low-Cost CMOS sensor with analog & digital output

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

optoNCDT 1402 / 1402SC
Compact industrial sensor with analog & digital output

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

IP69K option with stainless steel housing (food grade standard)

optoNCDT 1610/1630
High speed PSD sensor

Measuring ranges	0.5 - 200mm
Linearity	≤0.2%
Resolution	0.01%
Bandwidth	10kHz 100kHz (-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 (anti speckle)

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

optoNCDT 1700BL
Displacement sensor with blue laser technology for metals & organic materials

Measuring ranges	20 - 1000mm
Linearity	≤0.08%
Resolution	0.005%
Measuring rate	2.5kHz

optoNCDT 2300
49 kHz laser displacement sensor for extreme dynamic measurements

Measuring ranges	2 - 200mm
Linearity	≤0.02%
Resolution	0.0015%
Measuring rate	49kHz

No external controller required

optoNCDT 2300LL
Highly dynamic laser sensor for shiny metal surfaces (anti speckle)

Measuring ranges	2 - 50mm
Linearity	≤0.02%
Resolution	0.0015%
Measuring rate	49kHz

No external controller required

optoNCDT 1710 / 1710-50 / 2210
Precise measurement ranges at long standoff distances

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

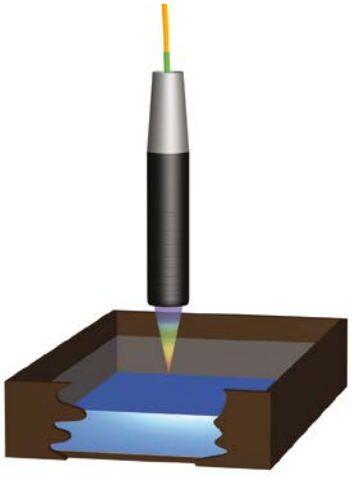
Confocal-chromatic principle: Non-contact displacement sensors

The confocal-chromatic measurement system, confocalDT, consists of a controller with a LED-light source and a sensor. Both, the sensor and the controller are connected via optical fiber up to 50 m. The distance of the focal point varies due to the chromatic aberration of the sensor optic. 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 accomplished along with the distance measurement with just one sensor.

Advantages

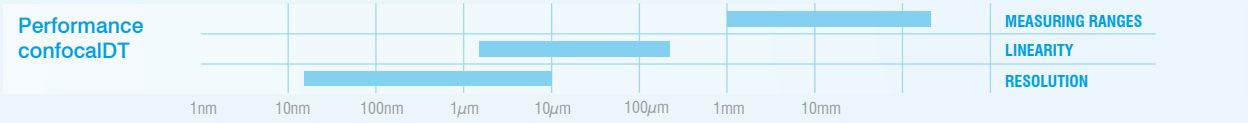
- Extreme high resolution
- Target independent measurement
- Tiny, constant measuring spot
- No shadowing
- One-sided thickness measurement of transparent materials

Thickness measurement of sleeves
Two synchronized 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 scan
The extreme spatial resolution in x-axis and the submicron accuracy in the z-axis make it a perfect sensor for surface scans.



confocalDT 2451/2471
Controller with integrated light source for confocal-chromatic displacement sensors

Linearity	≤0.05%
Resolution	0.004%
Measuring rate	10kHz / optional 70kHz with external light source

IFS 2405
Precison optical lens probes for high precision distance and thickness measurements

Measuring ranges 0.3mm - 30mm

Large base distance and tilt angle

IFS 2402
Miniature sensors (gradient index lens) for the inspection in tightest spaces

Measuring ranges 400µm - 6.5mm

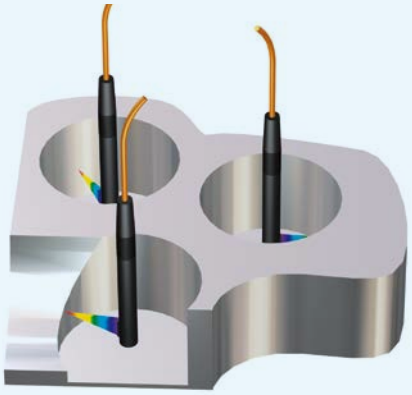
Sensors with axial and radial (90° deflection) optical path available

IFS 2403
Confocal hybrid sensors with narrow gradient index lens and relay optics

Measuring ranges 400µm - 10mm

Miniature size with extra stand off

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.



One-sided thickness measurement transparent materials
The unique measurement principle enables a single-side thickness measurement on transparent materials even multilayer materials. Only one sensor is necessary to measure the thickness of transparent material with extreme accuracy.

boreCONTROL
for non-contact inspection of bores/holes

- Diameter profiling
- Inside surface inspection
- Integrated collision protection
- Precise detection of ID key features
- Optical temperature compensation
- Measuring ranges: 4mm - 16mm

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

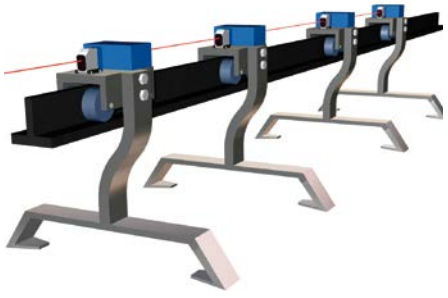
Optoelectronic sensors in the optoNCDT ILR series operate according to the Time-of-Flight principle and are designed for non-contact distance and displacement measurements. The 118x Series functions according to the phase comparison principle. In doing so, modulated laser light is permanently transmitted 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, where a laser pulse is transmitted and the time it takes for the reflected pulse to come back to the receiver 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.

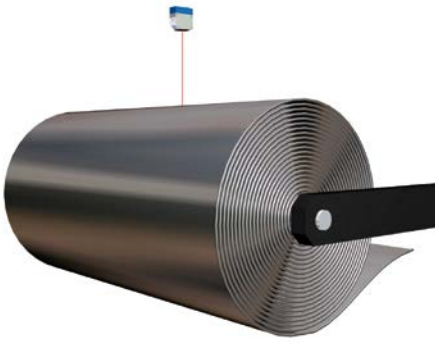
Advantages

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

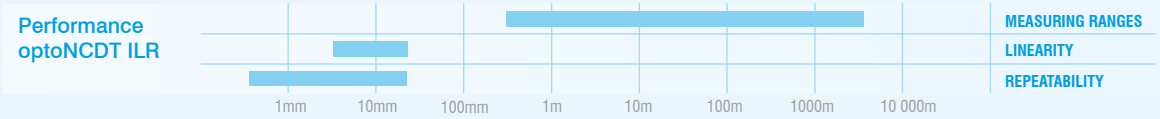
Position acquisition storage and retrieval units
Fast response time in combination with high measurement accuracy facilitate the exact positioning of storage and retrieval units.



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.



optoNCDT ILR 1030/1031
Distance sensors

Measuring ranges	no reflector	0.2 - 15m
	with reflector	0.2 - 50m
Linearity		≤20mm
Repeatability		<5mm
Response time		10ms

optoNCDT ILR 102x/110x/115x
Gaging sensors / Distance sensors

Measuring ranges	Gaging	0.2 - 10m
	with reflector	0.2 - 250m
Linearity	≤3mm	
Repeatability	±2mm	
Response time	12ms	

optoNCDT ILR 1181/1182/1183
Distance sensors

Measuring range	0.1 - 150m
Linearity	≤2mm
Repeatability	<0.5mm
Response time	20ms

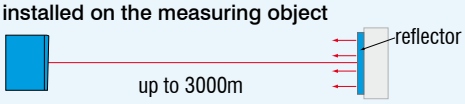
optoNCDT ILR 1191
Distance sensors - also speed measurement

Measuring range	0.5 - 3000m
Linearity	≤20mm
Repeatability	<20mm
Measurement rate	2000Hz

Distance, velocity, temperature and intensity signal

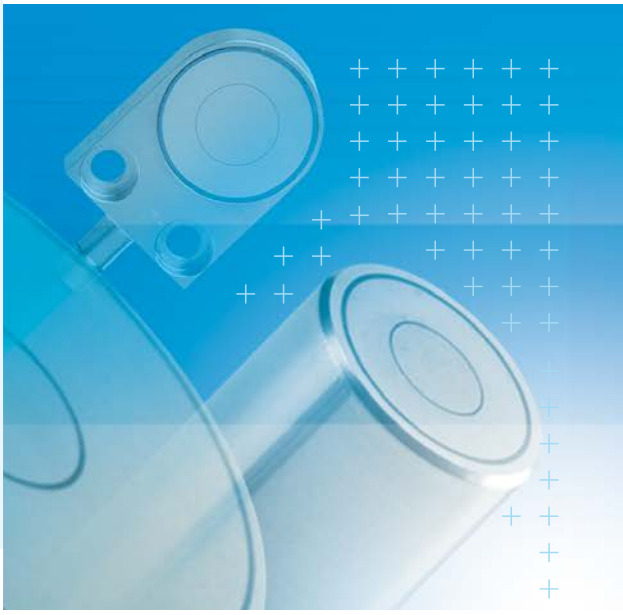
Measurements against target (without reflector)

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



	ILR	1020	1030	1100	1150	1021	1031	1101	1151	1181	1182	1183	1191
Measuring range in gaging mode (without reflector)	6m	•		•									
	8m		•										
	10m				•								
	15m		•										
	50m									•	•	•	
	300m												•
Measuring range in reflector mode	30m					•							
	50m						•	•					
	150m									•	•	•	
	250m								•				
	3000m												•

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 lift positioning. The optoNCDT ILR 1191 is specially designed for outdoor use.



Non-contact capacitive displacement and position sensors

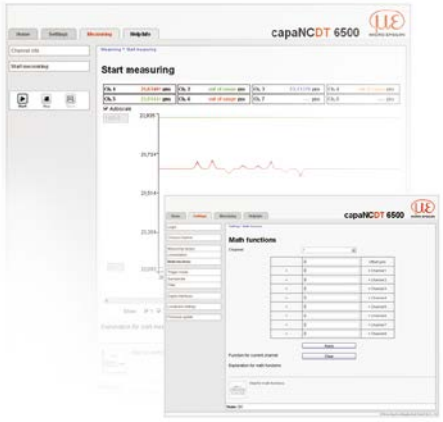
Due to the unique active tri-electrode guard-ring-capacitor principle capacitive displacement sensors are linear for all metals. The sensor acts as an electrode; the opposite electrode is the target.

The measurement technique facilitates exclusively measurements against all conducting and semi-conducting objects. Micro-Epsilon has extended the capacitive measurement principle with 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 linearization.

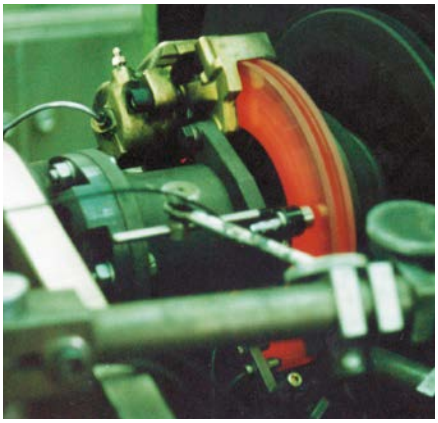
The sensors, which measure without making contact, are ideal for industrial applications in production systems and in-process quality assurance, but are also used for test-rig applications. The capaNCDT system 6300/6310 and 6500 also measure against insulating materials.

Advantages

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

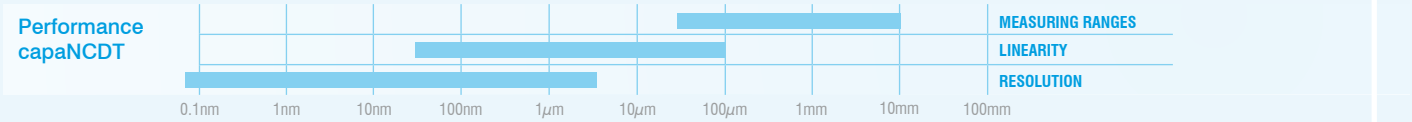


Web interface
Configuration of capaNCDT 6200 and 6500 via web browser interface.



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

Non-contact capacitive displacement sensors measure with highest precision the alignment of the lens system used for wafer lithography.



capaNCDT 6019
Miniature single-channel system

Measuring ranges	0.2 - 10mm
Linearity	≤1%
Resolution	0.015%
Bandwidth	500Hz (-3dB)

capaNCDT 6100
Compact single-channel system

Measuring ranges	0.2 - 10mm
Linearity	≤0.3% / ≤0.1%*
Resolution	0.01%
Bandwidth	2kHz (-3dB)

capaNCDT 6200
Modular multi-channel system

Measuring ranges	0.05 - 10mm
Linearity	≤0.2%
Resolution	0.004%
Bandwidth	5kHz (-3dB)

capaNCDT 6300/6310
High resolution single-channel system

Measuring ranges	0.05 - 10mm
Linearity	≤0.2% / ≤0.1%*
Resolution	0.001%
Bandwidth	8kHz (-3dB)

capaNCDT 6350
High speed single-channel system

Measuring ranges	0.2 - 10mm
Linearity	≤0.3%
Resolution	0.005%
Measuring rate	50kHz

capaNCDT 6500
Modular multi-channel system

Measuring ranges	0.05 - 10mm
Linearity	≤0.05%*
Resolution	0.000075%
Bandwidth	8.5kHz (-3dB)

* Sensor and controller are matched

Large selection of capacitive sensors

Capacitive displacement sensors from Micro-Epsilon are available in many different shapes with various options. The sensors are differentiated by their measuring range, their design and by the technology used to manufacture them. The capacitive sensors are available in a cylindrical design (with integrated cable or connector) or as flat sensors (with integrated cable). The displacement sensors can be exchanged without recalibration for a quick sensor replacement or range change. The majority of sensors can be used in clean rooms as well as in ultra high vacuums environment.

Specific sensors for OEM applications
Micro Epsilon can customize a sensor to fit your individual needs:
- adjusting the body shape and size for mounting
- modify the sensor material
- cable arrangements
- miniaturizing
- cryogenic or high temperature environment
- integrated electronic and sensor for OEM design

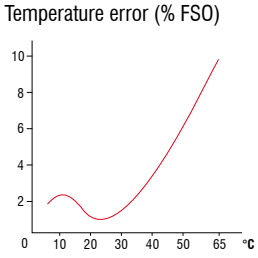
Eddy current principle: non-contact displacement and position sensors

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 may 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 suitable for applications in harsh industrial environments. Micro-Epsilon´s eddy current sensors are the only ones with active temperature compensation and field calibration capability.

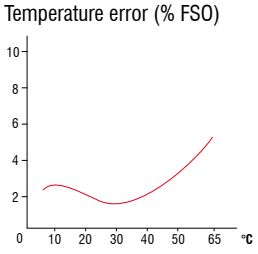
Advantages

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

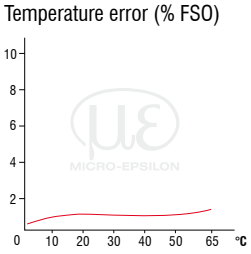
Temperature error by comparison



Common inductive sensor with ferrite core

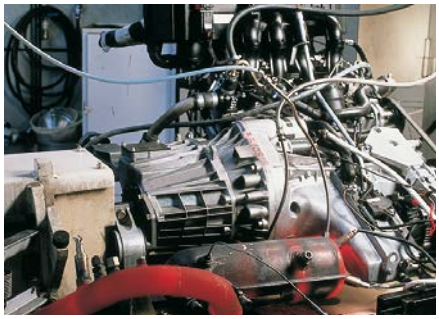


Common eddy current sensor without temperature compensation



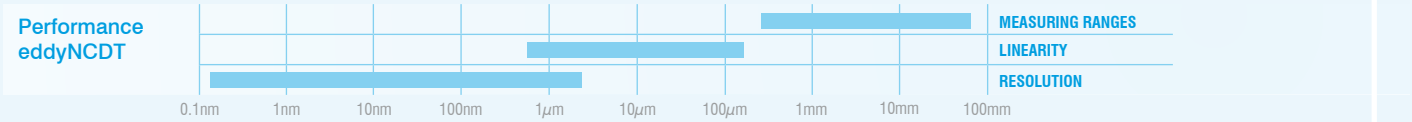
Best practice: eddyNCDT 3010 with temperature compensation

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.



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 3100
Smart eddy current displacement sensor system for industrial applications

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

Configuration via web browser (Ethernet)

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 - 6 mm
Linearity	≤5 %
Resolution	0.000018 %
Bandwidth	10 kHz (-3dB)

Also available as dual differential system

Revolutionary eddy current technology

Our eddyNCDT ECT sensors feature innovative Embedded Coil Technology (ECT). This innovative sensor design helps to achieve outstanding precision, signal stability and robustness. This means that ECT sensors are ideally suited to even the harshest application conditions, such as high vibration environments, high temperatures, electromagnetic fields or vacuums.

Subminiature sensors for confined installation space

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

Smallest sensors worldwide

Suitable for extreme temperatures

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

Whereas currently available eddy current sensors exhibit extreme drift with variations in the ambient temperature, an active temperature compensation with the eddyNCDT sensors ensures the highest signal stability. Consequently, measurements can be carried out over large temperature ranges with extreme signal stability.

Worldwide the largest selection of sensors

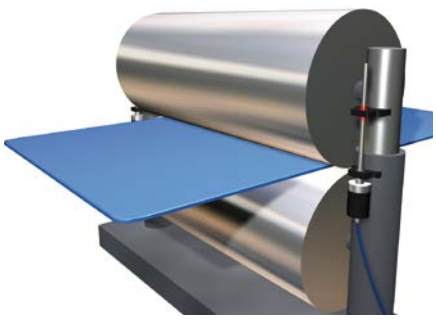
The technological leadership in eddy current sensors, which spans many years, is reflected in the sensor range - more than 400 sensors are available in different versions for the most varied applications.

Linear inductive displacement and position sensors

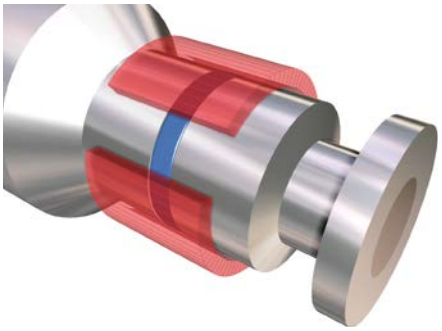
Electromagnetic displacement sensors are used extensively in applications for automated processes, quality assurance, test rigs, hydraulics, pneumatic cylinders, and automotive engineering. The advantages of these displacement sensors are well known and highly valued, and include ruggedness, reliability 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

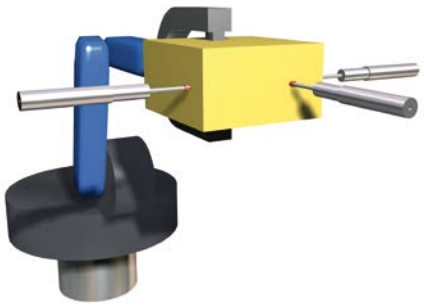
- More than 250 different models with measuring ranges from 1 - 630mm
- Controller integrated or separate
- High accuracy classes
- Extreme stable and robust
- Different constructions with plunger, tube or measuring ring
- High temperature stability



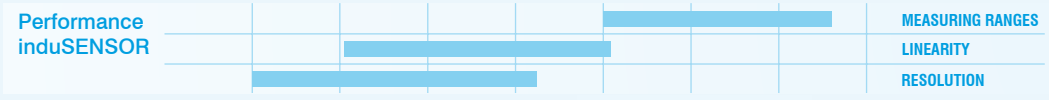
In automated production plants, inductive sensors monitor the production tolerance of the products while the process is running.



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



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



induSENSOR Serie VIP
Displacement sensors with integral electronics

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

induSENSOR Serie LVP - DC
Displacement sensors with integral electronics

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

induSENSOR Serie 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
Gaging sensor with external electronics

Measuring ranges	±1 - ±10mm
Linearity	≤0.3%
Bandwidth	300Hz (-3dB)
Target	plunger with return spring

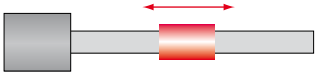
induSENSOR Serie LVDT
Displacement sensors with external electronics

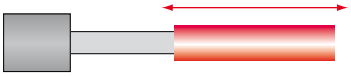
Measuring ranges	±1 - ±25mm
Linearity	≤0.15%
Bandwidth	300Hz (-3dB)
Target	plunger

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

Measuring ranges	10 - 50mm
Linearity	≤0.30%
Bandwidth	300Hz (-3dB)
Target	plunger


principle plunger


principle measuring ring


principle tube

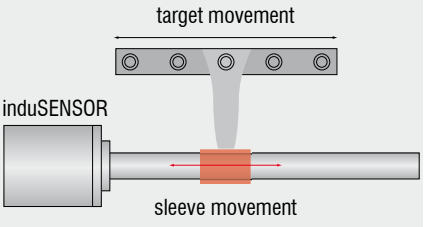
Extended functionality

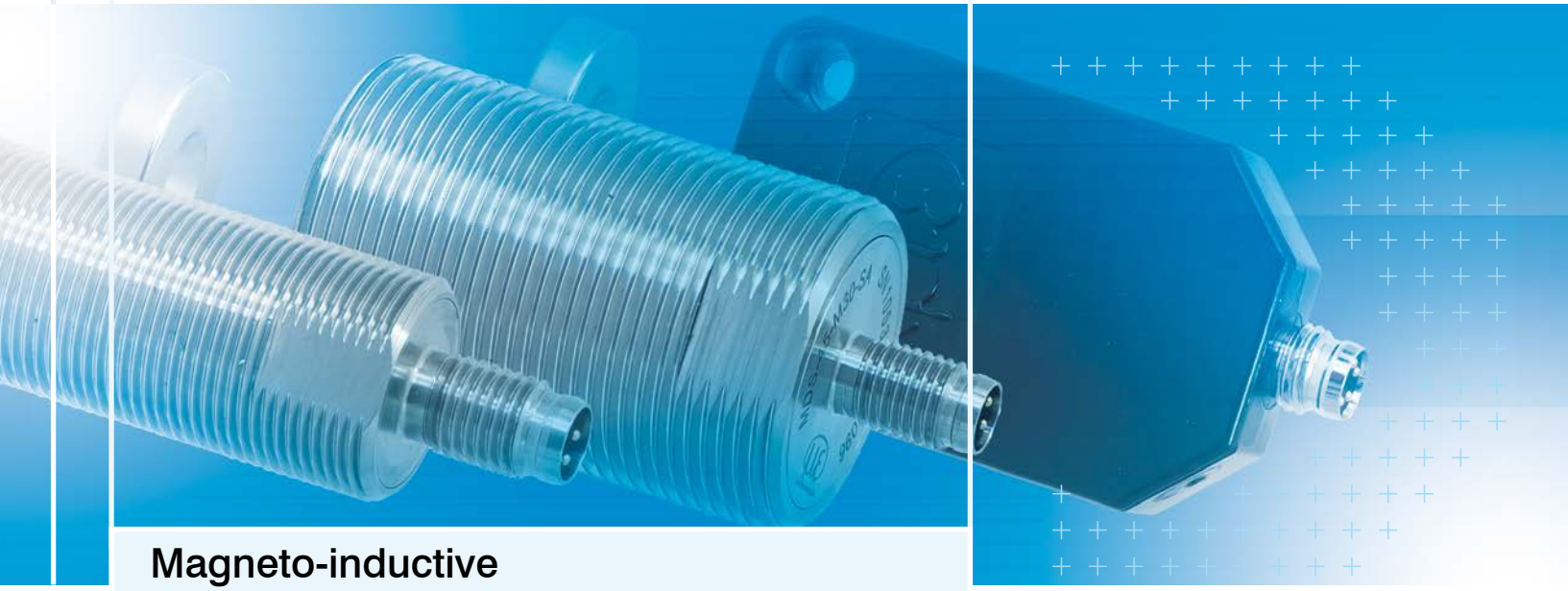
The induSENSOR product group offers extended functions and properties as a substantial advantage compared to common inductive probes and sensors.

The various series differ from one another in construction, accuracy class and therefore also in the field 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 becomes particularly noticeable with the VIP Series: The difference to common 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 concept of the short measuring sleeve, the sensors can be integrated to form a mechanical unit with dampers, valves, automatic screwdriving units, clutches or pedals.

Compact through parallel mounting





Magneto-inductive Displacement Sensors

Magneto-inductive sensors measure distances, positions or displacements of a defined magnetic target. The frontal measuring range is 45mm as standard, but can be adjusted from 20mm to 55mm by changing the magnet. This physical measuring principle means the output signal is linear (2 - 10V and 4 - 20mA) and is independent of the measuring range.

Due to this physical effect, measurements can be taken without any interference from non-ferrous materials between the sensor and the target such as aluminium, plastic or ceramics. This is very useful when measuring in a closed system. A flush mounting option in non-ferrous material is also possible.

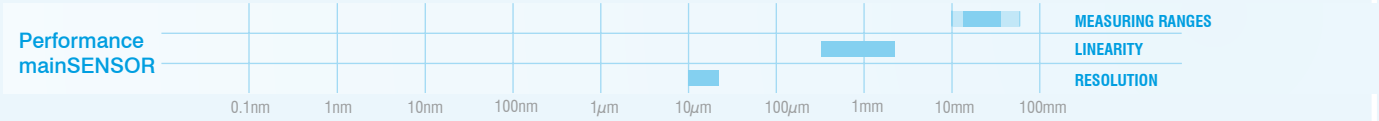
The flexible design offers many options in terms offers of sensor design. The sensor is available as a simple PCB, in a plastic housing or in housings made from stainless steel, which is resistant to most chemicals, oil or dirt.

Advantages

- Large frontal measuring range
- Linear output signal
- High dynamics
- Measuring range adjustable by magnets
- Various shapes / Compact sensor design

OEM integration in damper of washing machines
Magnet integrated in the damper and sensor mounted externally

Application in textile machines
mainSENSOR measures the rotational speed via small magnets on a wheel



MDS-45-M18-SA

Measuring ranges	20 - 55mm
Output	2 - 10V
Linearity	≤3% FSO
Resolution	0.05% FSO
Pressure resistance	100bar (front)
Bandwidth	1kHz (-3dB)

MDS-45-M12-CA

Measuring ranges	20 - 55mm
Output	2 - 10V
Linearity	≤3% FSO
Resolution	0.05% FSO
Axial cable exit	
Bandwidth	1kHz (-3dB)

MDS-45-M30-SA

Measuring ranges	20 - 55mm
Output	2 - 10V / 4 - 20mA
Linearity	≤3% FSO
Resolution	0.05% FSO
Pressure resistance	50bar (front)
Bandwidth	1kHz (-3dB)

MDS-45-K-SA

Measuring ranges	20 - 55mm
Output	2 - 10V / 4 - 20mA
Linearity	≤3% FSO
Resolution	0.05% FSO
Bandwidth	1kHz (-3dB)

MDS-40-OEM

Measuring ranges	20 - 55mm
Output	PWM
Linearity	≤6% FSO
Resolution	0.05% FSO
Quantity	> 5,000pcs / year

Accessories

Measuring ranges of magnets:
20mm, 27mm, 35mm, 45mm, 55mm

Standard cables with
M8x1 connector in different types

Flexible sensor design for OEMs

Due to the flexible sensor design and the significant advantages of this physical measuring principle, various possibilities are available for adjusting the sensor to specific high volume applications. In OEM projects, the requirements of certain applications can be met at a very competitive price level.

- Larger temperature range
- Higher dynamics
- Different housing shapes and materials
- Various output signals
- Special features such as pressure resistance, integrated cables, etc.

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 by means of a wire made of highly-flexible stainless steel strands, which is wound onto a drum by 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.

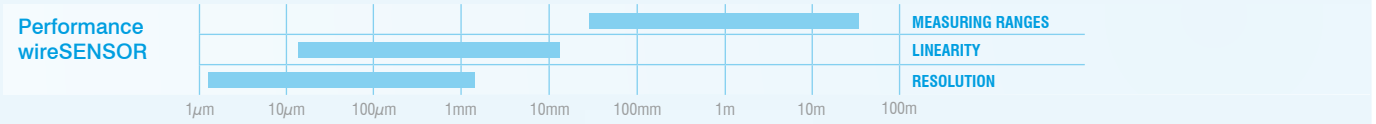
Advantages

- 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 fork-lift trucks. You can acquire a lifting heigths up to 30 m with this compact constuction.

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.



wireSENSOR
MK30/MK46/MK77/MK120/MK88
OEM miniature sensors

Measuring ranges	50 - 7500mm
Analog outputs	potentiometer, voltage, current
Digital output	encoder

wireSENSOR MPM
Subminiature sensors

Measuring ranges	50 - 250mm
Analog output	potentiometer

Option with wire acceleration up to 100g

wireSENSOR MP/MPW
Miniature sensors

Measuring ranges	100 - 1000mm
Analog output	potentiometer

Option with protection class IP 67

wireSENSOR P60/P96
Industrial sensors

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

wireSENSOR P115
Industrial sensors

Measuring ranges	3 - 15m
Analog 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

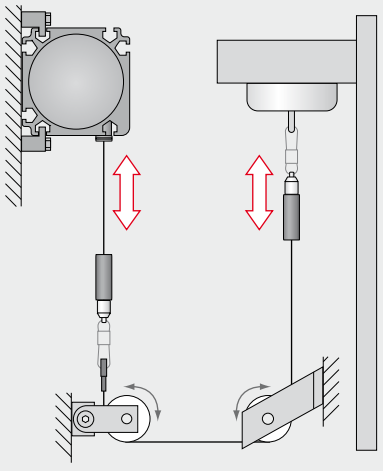
wireSENSOR mechanics
The mechanic options P96, P115 and P200 series are designed for easy mounting of a customer specific encoder.

Compact, dependable and economical

The different sensor model ranges cover the complete application spectrum of draw-wire sensors. The miniature sensors are extremely favorably priced and are suitable for integration in tight installation spaces due to the miniaturized design. The industrial sensors are of extremely rugged construction and are employed in applications with large measurement ranges. A decisive 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 can normally only measure on one axis.

The sensor housings are kept extremely compact. The well conceived sensor design enables large measurement ranges to be realized 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.

Application with pulley wheel

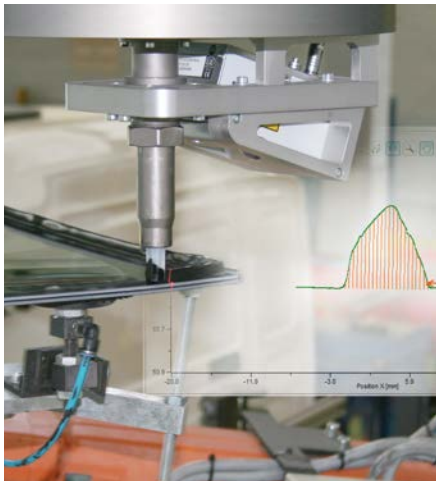


Laser-Line Triangulation: Non-contact 2D/3D profile sensor

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.

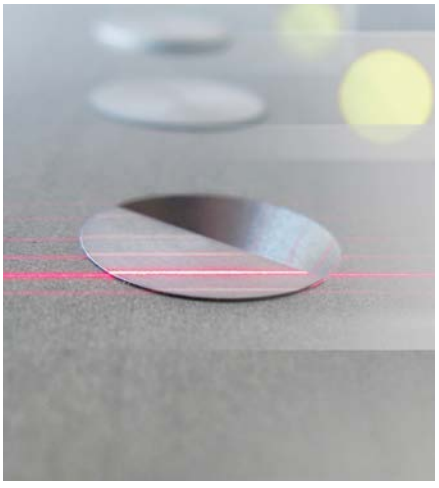
Advantages

- High accuracy and profile frequency
- High performance signal processor
- Trigger and synchronization options
- Different types for customized integration available
- Complete solution from Micro-Epsilon
- Dual 2 in 1 camera: intensity and x, z dimension
- Absolute calibrated dimensional data for x and z throughout the entire field of view



Inspection of adhesive beads on windscreens

Measuring gaps / flushness for vehicle body parts



Rivet verification in aircraft construction

scanCONTROL 26x0
Perfect for automation

Measuring ranges		
	z-axis	up to 265mm
	x-axis	up to 143.5mm
Linearity	z-axis	±0.16%
Resolution	x-axis	640 points/profile
Profile frequency		up to 4000Hz

scanCONTROL 29x0
High End scanner

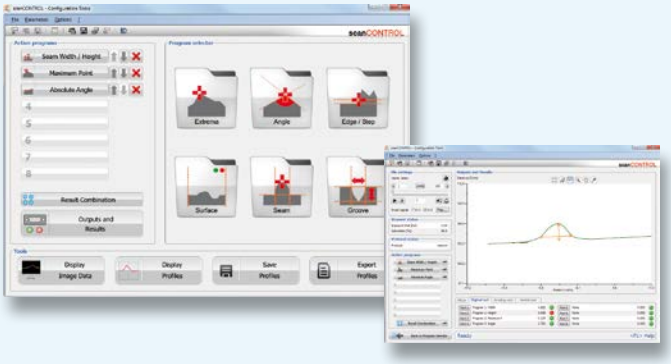
Measuring ranges		
	z-axis	up to 265mm
	x-axis	up to 143.5mm
Linearity	z-axis	±0.16%
Resolution	x-axis	1280 points/profile
Profile frequency		up to 2000Hz

gapCONTROL
Laser scanner with specific software for gap measurements

Measuring ranges		
	z-axis	up to 300mm
	x-axis	up to 148mm
Linearity	z-axis	±0.16%
Resolution	x-axis	up to 1280 points/profile
Measurement rate		up to 200Hz

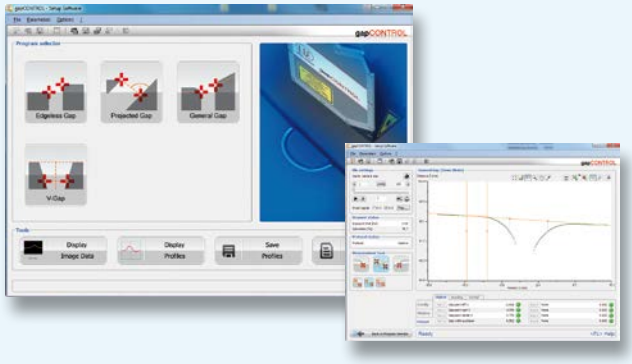
scanCONTROL Configuration Tools

- Plug & Play solution for automation
- Configuring various measuring programs through simple mouse interactions
- Dynamic tracking of evaluations in the profile
- Configuring outputs and displaying measured values
- Output of measured values across a large number of interfaces



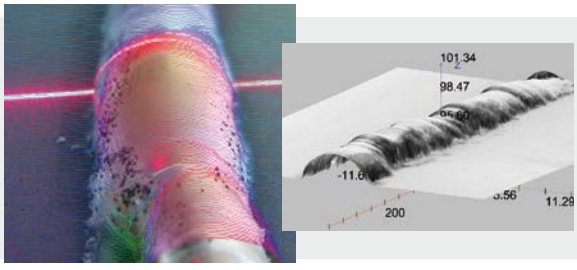
gapCONTROL Setup Software

- Sophisticated software for automated gap/flush measurements
- Evaluation of different gap types
- Simple configuration of measuring tasks
- Configuring outputs and displaying measured values
- Complete, standalone solution with integrated controller



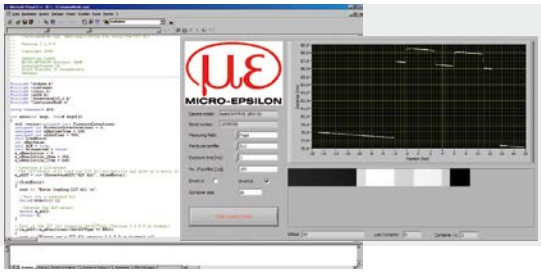
scanCONTROL 3D-View

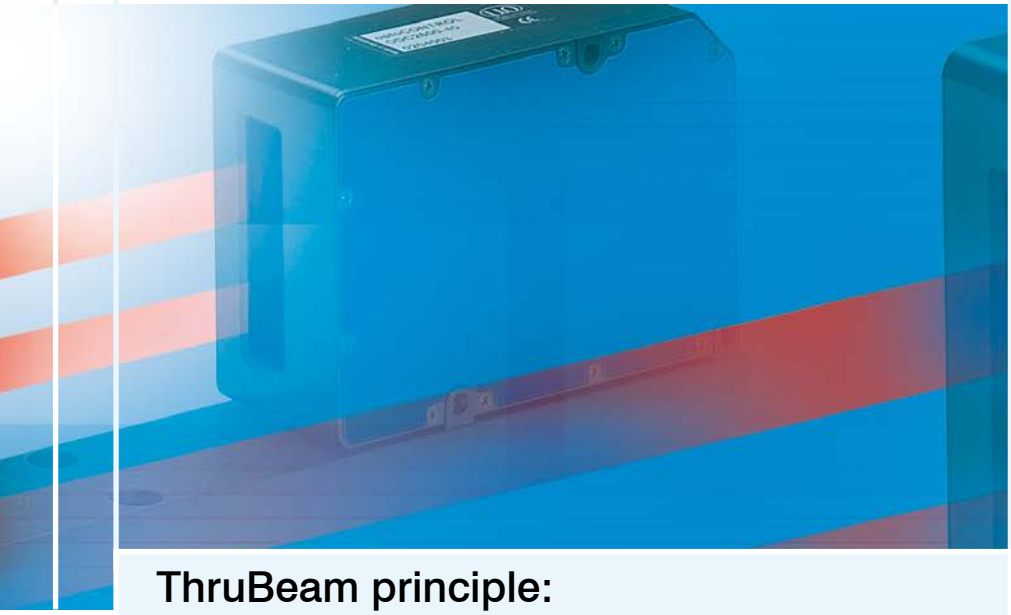
- Can be used with all scanCONTROL sensors
- Viewing online and offline sensor data in 3D
- 2D export of profile sequences (png)
- 3D export (asc,stl) for CAD programs
- Intensity of each point can be displayed and exported



Integrating scanCONTROL in application software

- Ethernet GigE Vision
- LLT.DLL and SDK and library for integration in C/C++ and C#
- Instrument driver for NI LabVIEW using LLT.DLL





ThruBeam principle: optical micrometer

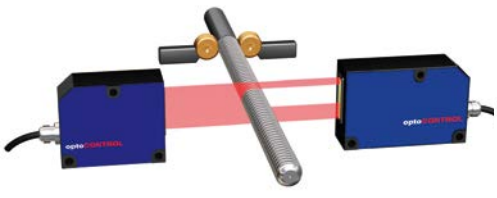
Optical micrometers in the product group optoCONTROL are based on various measuring principles. Apart from the CCD camera technique using laser or LED light, the principle of light quantity measurement is used. The micrometers consist of a light source and a receiver or a CCD camera. The light source 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 Series optoCONTROL 1200 here acquires the incident quantity of light, whereas the Series 1202, 25x0 and 2600 measure the exact shadow via a CCD array. In this way dimensional quantities such as diameter, gap, position and also segment can be acquired. These units use state of the art high speed CCD cameras with solid state technology which eliminates the measurement errors caused by the traditional scanning laser micrometer.

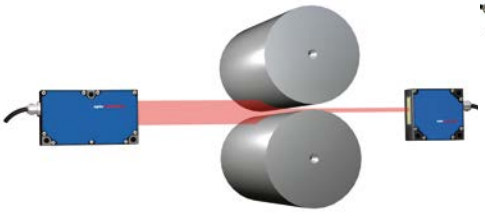
The optoCONTROL CLS-K measuring and test amplifiers are offered as infrared or ultraviolet-light types, starting at a wavelength of 280 nanometres, enabling measuring frequencies up to 4kHz at resolutions starting from 0.1mm.

Advantages

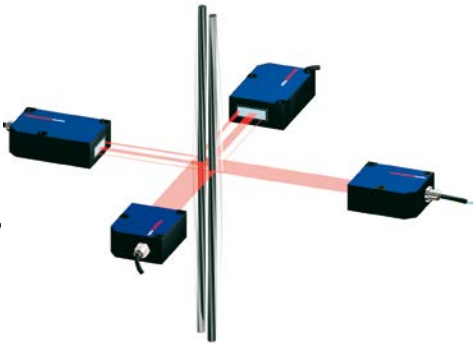
- Various models for different applications
- Laser- or LED light source
- Extreme compact construction
- Very accurate measurements
- High speed measurements
- Perfect detection of edges, gaps, positions and diameters of round objects



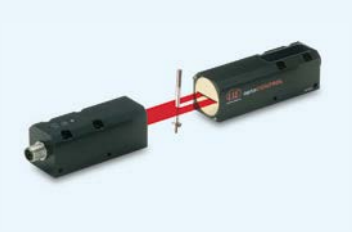
During the stamping of threaded rods, micrometers are used for quality assurance in order to determine the exact thread guidance.



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



Synchronized micrometers acquire the vibration of tensioned steel lift cables in order to control the vibration behavior.



optoCONTROL 1200
Miniature high-speed micrometer (laser)

Measuring ranges	2 - 30mm
Linearity	≤40µm (independent)
Resolution	10µm
Bandwidth	100kHz (-3dB)
Integrated controller	

optoCONTROL 1202
Compact high-speed micrometer with large measuring range (laser)

Measuring ranges	75 and 98mm
Linearity	≤150µm
Resolution	30µm
Bandwidth	800Hz (-3dB)
Integrated controller	

optoCONTROL 1220
Optical online micrometer

Measuring ranges	28mm
Linearity	≤22µm
Resolution	typ. 2µm
Working distance	up to 2,000mm
Integrated controller	

optoCONTROL 2500
High resolution micrometer (laser)

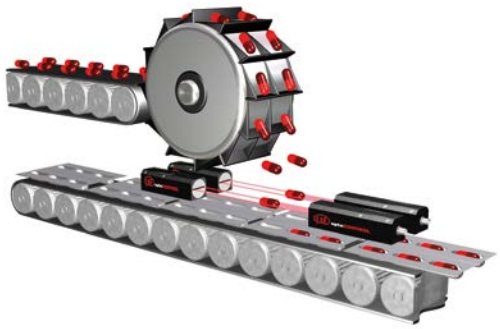
Measuring ranges	34mm
Linearity	≤10µm
Resolution	1µm
Measuring rate	2.3kHz
External controller	

optoCONTROL 2520
Compact laser mikrometer (class 1M)

Measuring ranges	46mm
Linearity	≤20µm
Resolution	1µm
Measuring rate	2.5kHz
Integrated controller (web interface)	

optoCONTROL 2600
High resolution micrometer (LED)

Measuring ranges	40mm
Linearity	≤3µm
Resolution	0.1µm
Measuring rate	2.3kHz
External controller	



Checking for presence in fast processes
Apart form measurement tasks, the Series 1200 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.

optoCONTROL CLS-K
Fibre optic sensors

Applications:
- Edge detection
- Counting tasks
- Glass / Plexiglas detection
- Monitoring and control of the mounting procedure
- Gap detection
- Scanning tasks in potentially explosive atmospheres

Color sensors and LED Analyzers

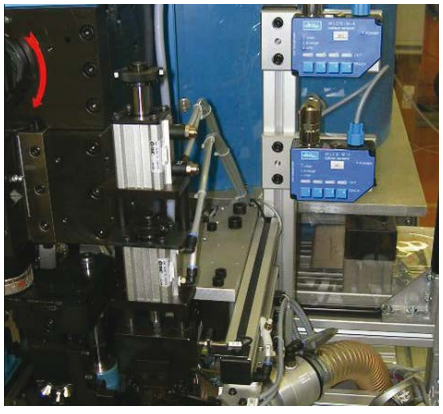
Color recognition sensors of the colorSENSOR series are applied to color detection applications. The sensors compare the current color of the measured object with the target colors that were set up via the sensor's Teach-In function.

colorSENSOR LT sensors operate using optical fibres directly on the target object, which therefore minimises any adverse environmental effects on measurements. The color sensor can be placed at a safe distance using highly developed fibre optics close to the target object. The colorSENSOR OT series enables measurements at longer distances by means of fixed optics.The new non-contact color measurement system, colorCONTROL ACS7000, detects slightest color differences ($\Delta E < 0.08$) with measurement frequencies of up to 2000Hz. The sensors detect all colors in a wide range of applications, including automation technology, packaging systems for pharmaceuticals, quality assurance, painting technology, surface labelling and printing technology.

The LED Analyzer colorCONTROL MFA provides function, color and intensity measurement of LEDs, lamps or illuminants simultaneously during the production process on more than 20 different detection positions.

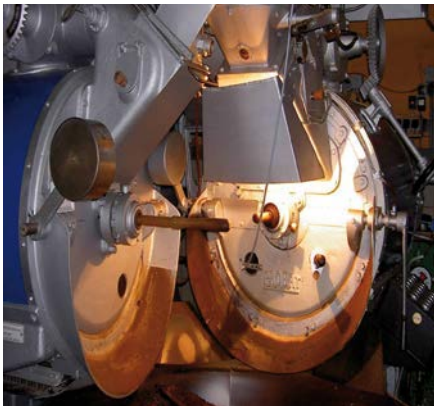
Advantages

- Easy quality control
- Simple and fast set up
- Huge selection of probes to fit your application
- Optical fiber close to the object to be measured
- Measurement at a safe distance from the object if required



Automatic detection of cable strands in the production process. Position, amount and strands differ depending on the cable.

Due to a high rotational speed the wood turns dark. Due to color recognition early in the process, this effect can be compensated for.



In the food processing industry, the degree of burning or browning of e.g. coffee or cookies, can be detected.

colorSENSOR LT
Color recognition using optical fibres close to the target object

Color difference	≥ ΔE 0.8
Software teach	1 - 255 colors can be saved
Button teach	1 - 31 colors can be saved

colorSENSOR OT
Color recognition using fixed optics at a distance from 10 - 800mm

Color difference ≥ ΔE 0.5

Color sensor for different surfaces such as matt, shiny or structured surfaces.

colorCONTROL MFA
Color recognition of LEDs and self-luminous objects

5 to 20 measuring points

Test of function, intensity color

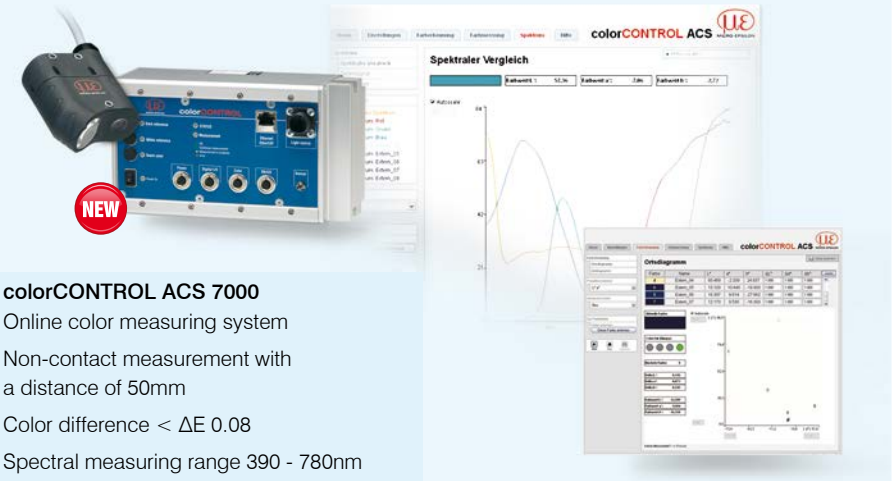
Color test in HSI and RGB

Optical fibers
High precision optical fibers can be adapted to work with colorSENSOR LT color sensors

Ambient temperatures from -40°C to 400°C

Distances from 8 to 200 mm

For detection ranges from 0.6 up to 30mm



colorCONTROL ACS 7000
Online color measuring system

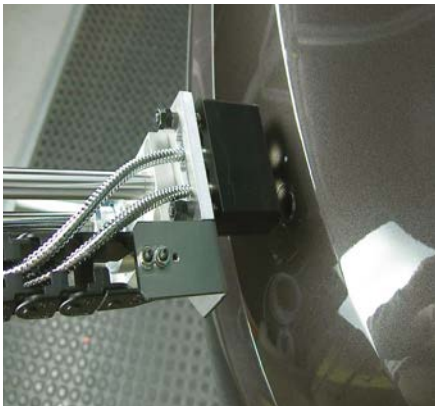
Non-contact measurement with a distance of 50mm

Color difference < ΔE 0.08

Spectral measuring range 390 - 780nm

5nm spectral resolution

Color recognition from a taught reference list



Detection of the color identity of painted attachments or body parts in automotive manufacturing.

Online mesurement of the color gradient of PET and PVC foils/paper.

Measurement of the zinc sheet color.

Non-contact stationary IR sensors and portable sensors

Infrared thermometers determine the temperature of objects by non-contact measurements of the infrared radiation emitted by their surface. A detector converts the incoming infrared radiation into an electrical signal. This results in an accurate temperature value, which can be used for further processing. The use of 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.

Advantages

- Easy to use
- Non-contact measurement without influencing the object
- Enables inspections of hot, fast moving or hard to reach objects in hazardous environments
- Fast detection of weak points in power distribution, machines and production processes

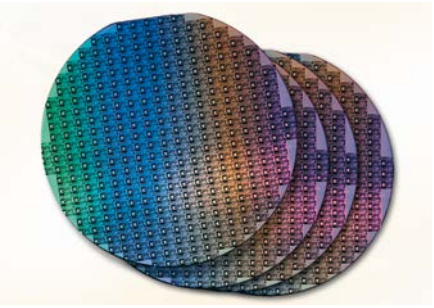
Trend setting infrared sensor technology for process automation

Miniaturized IR sensors thermoMETER combine high accuracy of the sensor parameters, ruggedness up to 250°C (485°F) 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 1 ms possible. Sophisticated infrared thermometers support a high quality level in the production process.

Industrial automation
Control and monitoring of process temperatures and product quality.

Application of glue on paper
Control the temperature of paper web & the application of glue during the manufacturing of corrugated paper.



Electronic Components
Controlling the temperature of electronic components during function test.

thermoMETER CX
Two wire IR sensor for industrial applications

Temperature range: -30°C to 900°C
-22°F to 1652°F

22:1 optical resolution

Power range 5-30V DC

Optional USB programming interface and software

thermoMETER CS / CSmicro / CSLaser
Compact or micro sized IR sensors, low-cost, fully integrated

Temperature range: -40°C to 1600°C
-40°F to 2912°F

Rugged coated silicon optics

Scalable analog output: 0 - 10V or 0 - 5V

High resolution model available

thermoMETER CTratioM1
Glass fibre ratio thermometer

Temperature range: 700°C to 1800°C
1292°F to 3272°F

Ambient temperatures up to 250°C continuous without cooling

Insensitive to changes in target emissivity

5ms response time for fast readings

thermoMETER CTlaser
Most precise sensor with laser aiming

Temperature range: -50°C to 975°C
-58°F to 1787°F

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 9ms

thermoMETER CTlaser M1/M2/M3
For metal processing with reduced wavelength: 50°C to 2200°C
122°F to 3992°F

NEW **thermoMETER CTlaser M5**
For liquid metals: 1000°C to 2000°C
1832°F to 3632°F

thermoMETER CTlaserGLASS
For glass measurement: 100°C to 1650°C
212°F to 3002°F

thermoMETER CTlaserCOMBUSTION
For measurement of flames: 200°C to 1450°C
392°F to 2642°F

thermoMETER MS
Portable low-cost IR thermometers

Temperature range: -32°C up to 760°C
(-26°F up to 1400°F)

Fast 0.3 second scanning of cold and hot spots

Laser sighting with narrow beam aiming for accurate readings

Extremely lightweight

thermoMETER CT
Most economic and accurate

Temperature range: -50°C to 975°C
-58°F to 1787°F

One of the smallest infrared sensors worldwide with 22:1 optical resolution

Up to 180°C ambient temperature without cooling

thermoMETER CTP7
For thin plastic film materials from 0°C to 500°C / 32°F to 932°F

thermoMETER CTM1/M2/M3
For metal processing,
Temperature range: 50°C to 2200°C
122°F to 3992°F

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

thermoMETER CTXL
Non contact temperature measurement from 100°C to 1800°C / 212°F to 3272°F in laser processing applications

thermoMETER LS
Portable IR thermometers with patented laser crosshairs

Temperature range: from -35°C up to 900°C (-31°F up to 1650°F)

Crosshairs mark real spot size at any distance

USB interface and graphic software with oscilloscope function

Adjustable visual and acoustic HIGH-/LOW-alarm

Embedded data logger

USB thermal imagers

Plug&Play thermal imager

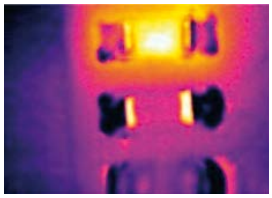
Powered from just one USB cable, the system is truly plug and play. Data is streaming from the camera to the software via USB 2.0. in real time. This process and analysis tool, provided with every camera, enables the user to capture, record and monitor real time thermal process images at 128Hz. The software will store the data to a file, which allows playback at user defined speeds, e.g. in slow motion, frame by frame if required. The image can be viewed and monitored either online with the camera connected, or off line at a later time without the camera being connected. A perfect tool for R&D applications, failure diagnostics or process monitoring.

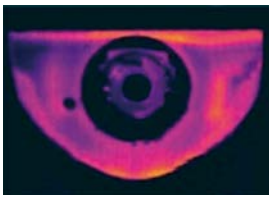
Additionally the software can be used as a runtime application where the user is able to program and configure a custom environment. (multiple monitoring windows, alarms, hot spot localization, line profilen etc.) A programmable process Interface, hard wired input and output, (PIF in) enables external control and communication for the emissivity of the target material, trigger functions, shutter control or alarm outputs and other useful features.

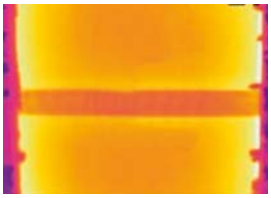
Advantages

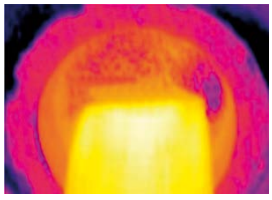
- Easy to use
- Non-contact measurement without influencing the object
- Enables inspections of hot, fast moving or hard to reach objects in hazardous environments
- Fast detection of weak points in power distribution, machines and production processes

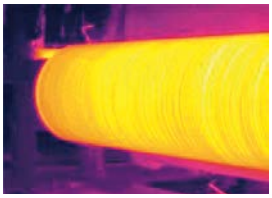
Applications

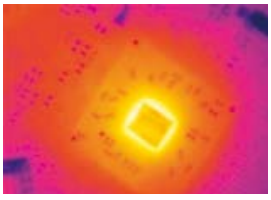

R&D electronic


R&D mechanical components


Production of solar panels


Process control extrusion


Process control calendering


R&D electronic devices

thermoIMAGER TIM 160

Temperature ranges: -20°C to 900°C
-4°F to 1652°F

Excellent thermal sensitivity of 0.08K (NEDT)

Exchangeable lenses with
6°FOV, 23°FOV, 48°FOV or 72° FOV

Real time video recording at 120Hz frame rate with slow motion playback capability

Power supply and operation
via USB 2.0 interface

Extremely lightweight (195g) and rugged (IP67)

Very compact 45x45x62mm

Analogue input and output, trigger interface

Complex image analysis and process monitoring software with custom configuration and SDK

thermoIMAGER TIM 200/230

BI-SPECTRAL technology

Temperature ranges: -20°C to 900°C
-4°F to 1652°F

Excellent thermal sensitivity of 0.08K (NEDT)

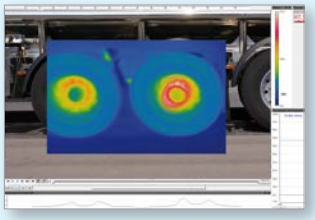
Exchangeable lenses with
6°FOV, 23°FOV, 48°FOV or 72° FOV

Real time video recording at 128Hz frame rate with slow motion playback capability

Power supply and operation
via USB 2.0 interface

Time synchronic visual image recording with 32Hz (640 x 480 pixel)

BI-SPECTRAL technology



Highlighting of critical temperatures

thermoIMAGER TIM 400/450

NEW Detector with 382 x 288 pixels

Temperature ranges: -20°C to 900°C
-4°F to 1652°F

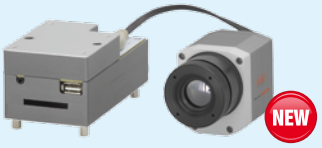
Excellent thermal sensitivity
of 0.08K resp. 0.04K (NETD)

Exchangeable lenses and industrial accessories

Fast real-time thermal imager
with up to 80Hz

Power supply and operation
via USB 2.0 interface

Analog input and output, trigger interface



Special edition:

TIM LightWeight

Miniature lightweight PC for flight applications with thermoIMAGER series

Total weight 350g incl. camera

Recording button on camera housing

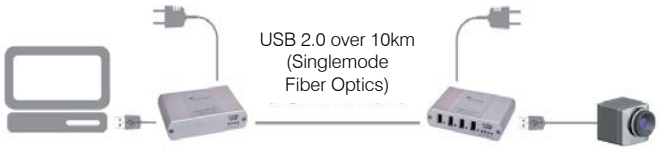
Easy process integration

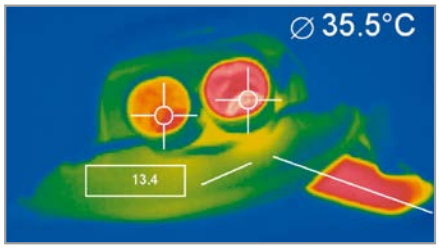
Advanced interface concepts allow the integration within networks and automated systems:

USB cable extension up to 100m (over Ethernet) or 10km (over fiber)

Process interface (PIF) at the camera as analog input/ output (0 to 10V) and digital input (low and high-level)

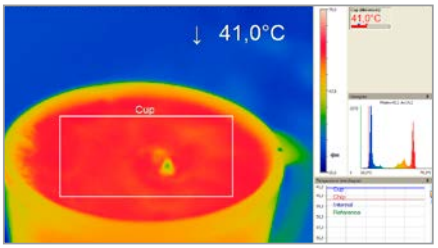
Software interface via Dynamic-link Library (DLL), Computer-Port (ComPort) and LabVIEW





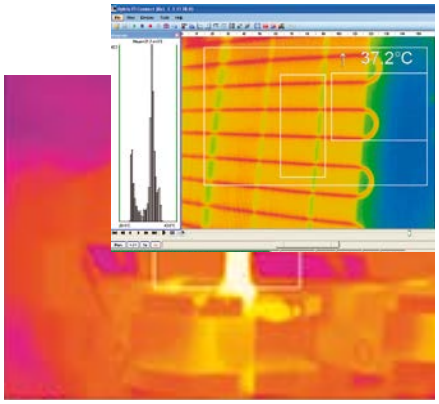
Automatic hot spot detection

Objects can be examinated thermally and hot or cold positions (hot or cold spots) can be found automatically.



Fast measurements

Temperature distributions at surfaces can be captured precisely within an millisecond intervall.



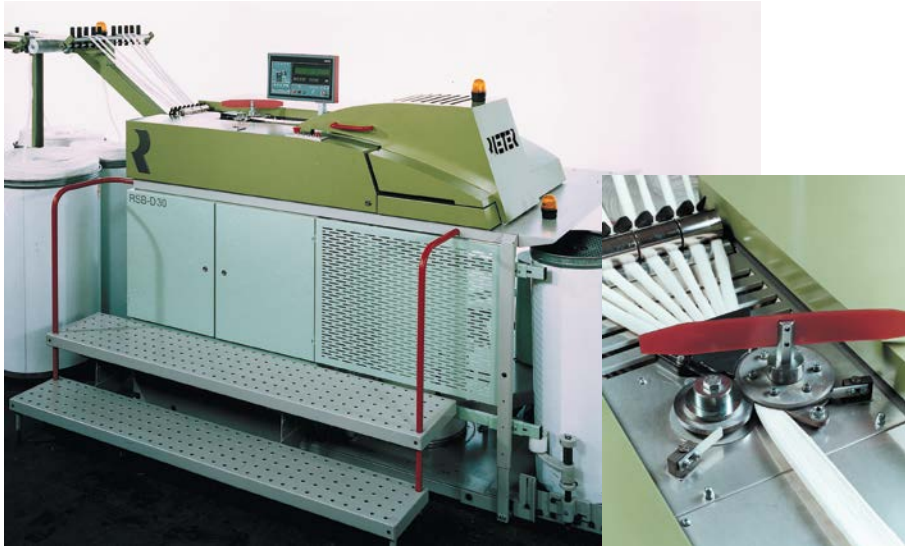
Free software

Complex image analysis and process monitoring software with custom configuration

Innovative sensor solutions for specified applications

Apart from standard sensors utilizing 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 optimized for special measurement tasks at the request of customers. These developments incorporate the expertise from over thirty years of experience in the design and application of sensor systems. Here, the developments always focus on high performance and reliability - and that at favorable OEM conditions.



turboSPEED DZ140

Sensor for measuring the revolutions of turbo-chargers - for vehicle and test cell use.

Optimised for modern, thin blades made from aluminium or titanium.

Speed range from 200 to 400,000rpm

Wide operating temperature range up to 280°C

Large measurement gap between sensor and blade

No rotor modification necessary

ILU-50 sensor

Integrable load and unbalance sensor for washing machine

Measuring range 50mm

For OEM applications

combiSENSOR

Non-contact displacement and thickness measurement with just one sensor

Every combiSENSOR combines two measuring principles in one housing.

Non-contact thickness measurement of plastic films

Non-contact layer thickness measurement of insulator materials

Lateral profile by using a traversing axis

ascoSPEED 5500

Non-contact speed and length sensor for measurements in the metal industry

Measuring ranges 1-3000m/min (adjustable)

LED light source

SGS Spindle Growth System

Measurement system for the thermal extension of highspeed milling spindles

Measuring ranges 500µm

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)

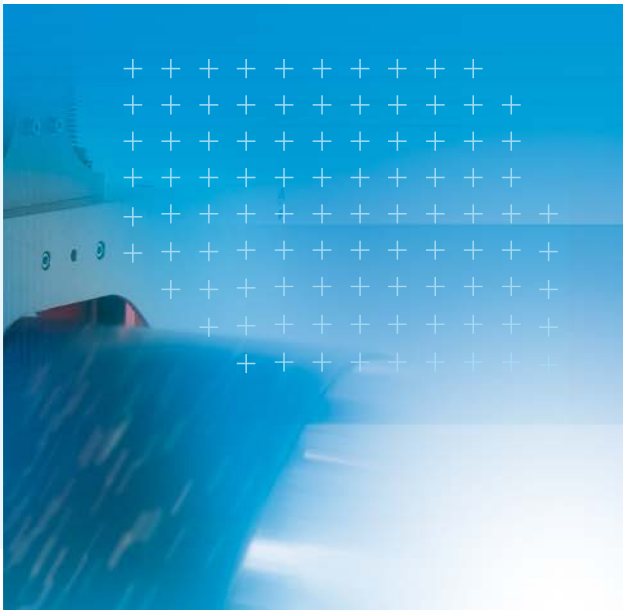
idiamCONTROL

Non-contact inspection of extruder bores

Non-contact and wear-free principle

Suitable for all metals without additional calibration

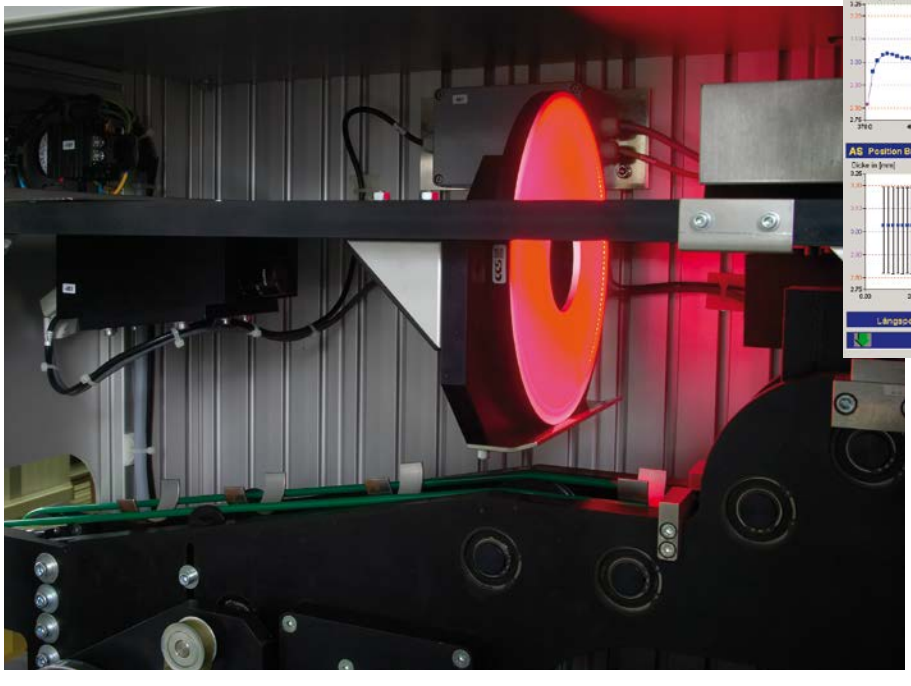
Exact, non-destructive inspection

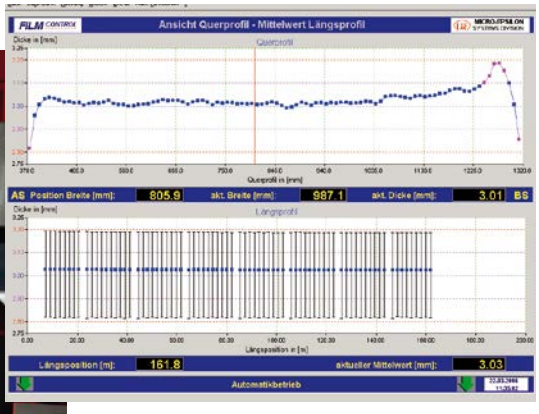


Measuring and inspection systems

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.

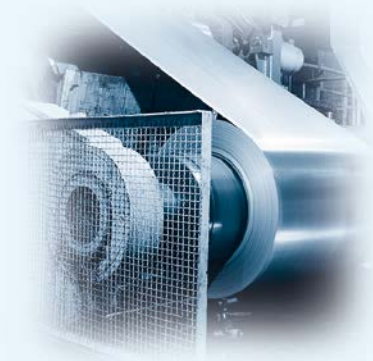
The signal representation can be arranged to suit the application requirements. The measurement systems communicate with existing environments over various interfaces and can therefore also be integrated retrospectively into existing production lines.

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

Measurerment 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

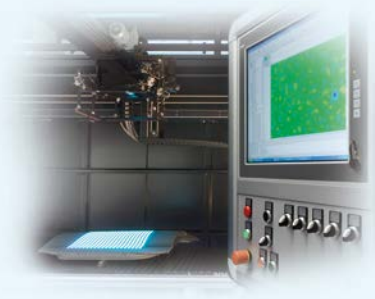
Inspection system for automatic surface inspection and geometrical measurement of ingots prior to the cropping process.

C-Frame

Inspection systems for two-sided thickness measurement of metal or rubber strips. Special feature: Tilt measurement for maximum process stability

reflectCONTROL

This system is used for the automatic inspection of shiny surfaces in the production line, or as a standalone system. reflectCONTROL detects defects, bulges, scratches, etc.



surfaceCONTROL

surfaceCONTROL is used for the 3D surface inspection of matt targets. The 3D surface data is captured in just a few seconds, for carrying out micron-accuracy quality checks.

MICRO-EPSILON

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