### Displacement
- Distance
- Position

### Dimension
- Temperature
- Color

---

*More Precision*

---

**Product Guide**

Sensors and Measuring Systems
As a technology leader of precision sensors, Micro-Epsilon pursues the need to develop high precision sensors, measurement devices and systems. This need is the drive for continuous high performance in measurement technology. As well as sensors for displacement, distance, position, color and temperature, we also focus on 3D sensors. Continuous development efforts, extensive know-how and a wide cooperation network enable us to develop high precision sensors. Further development of measuring techniques and technical innovations is our basis for the creation of sensor products that provide our customers with significant added value.

Why choose Micro-Epsilon?

- More precision and innovation made in Germany
- Wide range of powerful and flexible products which are easy to integrate
- Consultation, development and production from a single source
- Hand in hand with our customers we create quality and solution competence in series & OEM
- Profound knowledge of industries & applications in automation, machine building and machine design
# Contents

<table>
<thead>
<tr>
<th>Sensors for displacement, distance, length and position</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser triangulation sensors</td>
<td>6 - 7</td>
</tr>
<tr>
<td>Confocal sensors for measuring displacement and thickness</td>
<td>8 - 9</td>
</tr>
<tr>
<td>White light interferometer for displacement and thickness measurements</td>
<td>10 - 11</td>
</tr>
<tr>
<td>Laser gauges and distance sensors</td>
<td>12 - 13</td>
</tr>
<tr>
<td>Capacitive displacement sensors</td>
<td>14 - 15</td>
</tr>
<tr>
<td>Eddy current displacement sensors</td>
<td>16 - 17</td>
</tr>
<tr>
<td>Inductive displacement sensors</td>
<td>18 - 19</td>
</tr>
<tr>
<td>Magneto-inductive distance sensors</td>
<td>20 - 21</td>
</tr>
<tr>
<td>Draw-wire displacement sensors</td>
<td>22 - 23</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2D/3D sensor systems for dimensional measurement</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser profile sensors</td>
<td>24 - 25</td>
</tr>
<tr>
<td>Optical micrometers &amp; fiber optic sensors</td>
<td>26 - 27</td>
</tr>
<tr>
<td>3D Measurement &amp; surface inspection</td>
<td>28 - 29</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Color sensors for surfaces and self-luminous objects</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color sensors, color measuring system &amp; LED Analyzers</td>
<td>30 - 31</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Infrared temperature measurement</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>IR temperature sensors</td>
<td>32 - 33</td>
</tr>
<tr>
<td>Thermal imaging cameras</td>
<td>34 - 35</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Application-specific solutions</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Special sensors &amp; OEM sensors</td>
<td>36 - 37</td>
</tr>
<tr>
<td>Measuring &amp; inspection systems</td>
<td>38 - 39</td>
</tr>
</tbody>
</table>
Sensors and measurement devices from Micro-Epsilon are used in numerous industries. Whether it is for quality assurance, applications in maintenance, process and machine monitoring, automation or R&D - sensors make a vital contribution to the improvement of products and processes. From global major groups to medium-sized companies and engineering service providers - sensors and solutions from Micro-Epsilon ensure reliable measurement results with the highest precision all over the world. From machine building and automated production lines in the food industry, to integrated OEM solutions - almost all industries benefit from sensor technologies.

Micro-Epsilon has the experience and the required resources to provide solutions starting from the basic idea through to series production, all from one source – and at a convincing price/performance ratio. A team of specialist development and application engineers implements concepts and designs according to customer-specific requirements. All project members are involved in development, prototype construction and series production.
optoNCDT sensors are designed for both measurement tasks in factory automation and integration into machines and systems. Despite their very compact dimensions, these robust laser sensors have a fully integrated controller. As a result, simple installation and wiring is possible in confined installation spaces or on a robot. Their high performance enables the sensors to provide precise measurement results at a high measuring rate.

- Measurement of displacement, distance and position on numerous surfaces
- Detection of smallest parts due to point-shaped measurement
- Comprehensive product range with numerous measuring ranges
- High resolution and linearity
- Ideal for measurement tasks with high measuring rates
- Numerous interfaces, also for bus connection

Monitoring the metal sheet infeed during pressing
Measuring scribe lines on PCB panels
Distance control with laser welding
### Measuring ranges (mm)

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>optoNCDT 1220/1320</th>
<th>optoNCDT 1420/1420 CL1</th>
<th>optoNCDT 1900</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>25</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Linearity</td>
<td>from 1 µm</td>
<td>from 0.5 µm</td>
<td>from 0.1 µm</td>
</tr>
<tr>
<td>Repeatability</td>
<td>**1 kHz</td>
<td>2 kHz**</td>
<td>Measurement rate</td>
</tr>
</tbody>
</table>

### Measuring ranges (mm)

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>optoNCDT 1750/1750-DR</th>
<th>optoNCDT 1750BL/2300BL/2300-2DR</th>
<th>optoNCDT 1900</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>10</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Linearity</td>
<td>from 0.1 µm</td>
<td>Resolution</td>
<td>0.0015 % FSO</td>
</tr>
<tr>
<td>Repeatability</td>
<td>7.5 kHz</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Measuring ranges (mm)

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>optoNCDT 1710 / 2310</th>
<th>thicknessSENSOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>Linearity</td>
<td>Resolution</td>
<td>Measuring rate</td>
</tr>
<tr>
<td>Repeatability</td>
<td>Measuring width (mm)</td>
<td>200</td>
</tr>
</tbody>
</table>

### optoNCDT 1220/1320
- Compact laser triangulation sensor for high speed, precision measurements
- Measuring ranges (mm): 10 | 25 | 50 | 100
- Linearity: **≤ ±0.1% FSO**
- Repeatability: from 1 µm
- Measuring rate: 1 kHz | 2 kHz

### optoNCDT 1420/1420 CL1
- Smart laser triangulation displacement sensor for fast and precise measurements
- Measuring ranges (mm): 10 | 25 | 50 | 100 | 200 | 500
- Linearity: **≤ ±0.08% FSO**
- Repeatability: from 0.5 µm
- Measuring rate: 4 kHz

### optoNCDT 1900
- Innovative laser sensor for advanced automation
- Measuring ranges (mm): 2 | 10 | 25 | 50 | 100 | 200 | 500
- Linearity: **≤ ±0.02 % FSO**
- Repeatability: from 0.1 µm
- Measuring rate: 10 kHz

### optoNCDT 1750/1750-DR
- Universal sensor with integrated controller for industrial applications
- Measuring ranges (mm): 2 | 10 | 20 | 50 | 100 | 200 | 500 | 750
- Linearity: **≤ ±0.06% FSO**
- Repeatability: from 0.1 µm
- Measuring rate: 7.5 kHz

### optoNCDT 1750BL/2300BL/2300-2DR
- Laser sensor with Blue Laser Technology for metals and organic materials
- Measuring ranges (mm): 2 | 5 | 20 | 50 | 200 | 500 | 750 | 1000
- Linearity: **≤ ±0.03% FSO**
- Resolution: 0.0015 % FSO
- Measuring rate: 49 kHz

### optoNCDT 1900
- Innovative laser sensor for advanced automation
- Measuring ranges (mm): 2 | 10 | 25 | 50 | 100 | 200 | 500
- Linearity: **≤ ±0.02 % FSO**
- Repeatability: from 0.1 µm
- Measuring rate: 10 kHz

### optoNCDT 1710 / 2310
- Long-range sensors for large distances
- Measuring ranges (mm): 10 | 20 | 40 | 50 | 1000
- Linearity: **≤ ±0.03% FSO**
- Resolution: 0.005 % FSO
- Measuring rate: 49 kHz

### thicknessSENSOR
- Sensor for non-contact thickness measurements of strip and plate materials
- Measuring ranges (mm): 10 | 25
- Linearity: **≤ ±0.01 % FSO**
- Measuring rate: 4 kHz
- Measuring widths (mm): 200 | 400
The confocalDT product range stands for the highest precision and dynamics in confocal chromatic measurement technology. The measuring system includes the worldwide fastest controller currently available, which in combination with the sensors enables high precision measurement results in displacement and distance measurement tasks, as well as thickness measurement of transparent objects. A large number of sensors and different interfaces can be used in versatile measurement tasks, e.g., in the semiconductor industry, glass industry, medical engineering and machine building.
confocalDT 2421/2422
Single and dual-channel controller with integrated light source for industrial applications and measuring rates up to 6.5 kHz

confocalDT 2461
High-performance controller with integrated light source for measuring rates up to 25 kHz

confocalDT 2471 HS
High-speed controller with integrated light source for measuring rates up to 70 kHz

Measuring ranges (mm) 0.4 | 1.5 | 2.5 | 3.5
available with axial / radial beam path

IFS2402
Miniature sensors (gradient index lens) for the inspection of smallest inner bodies

Measuring ranges (mm) 0.4 | 1.5 | 2.5 | 3.5
available with axial / radial beam path

IFS2403
Confocal hybrid sensors with narrow gradient index lens and relay lens

Measuring ranges (mm) 0.4 | 1.5 | 4 | 10
Resolution 0.0015 % FSO
available with axial / radial beam path

IFS2404
Confocal chromatic sensors for high precision applications in restricted spaces

Measuring ranges (mm) 2
Resolution (µm) 0.04
available with axial / radial beam path

IFS2405
Standard sensors for precise distance and thickness measurements

Measuring ranges (mm) 0.3 | 1 | 3 | 6 | 10 | 28 | 30
Large offset distance and tilt angle

IFS2406
Confocal chromatic compact sensors for displacement & thickness measurements

Measuring ranges (mm) 2.5 | 3 | 10
available with axial / radial beam path

IFS2407
Confocal sensors for precise displacement, thickness & roughness measurements

Measuring ranges (mm) 0.1 | 0.3 | 0.8 | 3
Small measurement spot and large tilt angle
available with axial / radial beam path
High-precision white light interferometer
for non-contact distance and thickness measurements

interferoMETER

- Absolute distance measurement with nanometer accuracy
- Distance-independent thickness measurements
- Best-in-Class: resolution < 30 picometers and outstanding linearity
- High signal stability due to new evaluation algorithms and active temperature compensation
- Simple parameter set up via web interface
- Numerous interfaces, also for bus connection

The innovative white light interferometers from Micro-Epsilon set a benchmark in high-precision distance and thickness measurements. These sensors enable stable measurement results with sub-nanometer resolution offering a comparatively large measuring range and offset distance. The interferometers are available in 3 series: the IMS5400-DS for high-precision industrial distance measurements, the IMS5400-TH for accurate thickness measurements and the vacuum-suitable IMS6000-DS for distance measurements with picometer resolution.

Inspection of wafer tilt angle
Inspecting the axial runout of hard drives
Thickness measurement of flat glass
Robust sensors and a controller enclosed in metal make the interferometer ideal for integration into production lines and machines. These compact sensors are extremely space-saving and can also be integrated in confined spaces. The controller is installed in the control cabinet via DIN rail mounting and provides very stable measurement results due to active temperature compensation and passive cooling.

**Ease of use via web interface**
Due to a user-friendly web interface, no additional software is necessary to configure the controller and the sensors. The web interface is accessible via Ethernet connection and enables quick and easy setting of, e.g., averaging, measuring rate and presets.

**Absolute measurement of step profiles**
Unlike interferometers based on relative measurements, the IMS-DS also enables the measurement of step profiles. Thanks to the absolute measurement, the scanning is performed with high signal stability and precision. When measuring on moving objects, the differences in height of heels, steps and depressions can thus be reliably detected.

**Thickness measurement of plastic films**

<table>
<thead>
<tr>
<th>Interferometer</th>
<th>Measuring range (mm)</th>
<th>Linearity (nm)</th>
<th>Resolution (nm)</th>
<th>Measuring rate (kHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>InterferoMETER 5400-DS</td>
<td>2.1</td>
<td>&lt; ±50</td>
<td>&lt; 1</td>
<td>up to 6</td>
</tr>
<tr>
<td>InterferoMETER 5400-TH</td>
<td>2.1</td>
<td>&lt; ±100</td>
<td>&lt; 1</td>
<td>up to 6</td>
</tr>
<tr>
<td>InterferoMETER 5600-DS</td>
<td>2.1</td>
<td>&lt; ±10</td>
<td>&lt; 30 pm</td>
<td>up to 6</td>
</tr>
</tbody>
</table>

Integration in industrial environments

Thickness measurement of plastic films
Laser distance sensors
for the precise measurement of large distances

**optoNCDT ILR**
- Precise measurement of displacement, distance & position on different surfaces
- Very large measuring range
- High repeatability
- Fast response time
- Excellent price/performance ratio
- Open interfaces

Optoelectronic optoNCDT ILR sensors are designed for non-contact distance and displacement measurements with large measuring ranges. Depending on the application and the required measuring range, the sensors detect diffuse reflecting surfaces or special reflector plates. Thanks to their robust design, optoNCDT ILR sensors are suitable for measurement tasks indoors and also outdoors.

Position detection for robots
Diameter monitoring on seamless rolled rings
Acquisition of coil diameters
optoNCDT ILR sensors are particularly suitable for filling level measurement, safety applications, height measurement of lifting systems, overhead conveyors, crane systems and for positioning lifts.

<table>
<thead>
<tr>
<th>optoNCDT ILR 1030/ LC1 and 1031/LC1</th>
<th>Measuring range</th>
<th>±20 mm</th>
<th>&lt; 3 mm</th>
<th>10 ms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact laser distance sensors</td>
<td>Linearity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>Repeatability</td>
<td>&lt; 3 mm</td>
<td>&lt; 20 mm</td>
<td>&lt; 300 µm</td>
</tr>
<tr>
<td>Response time</td>
<td>Response time</td>
<td>10 ms</td>
<td>0.5 ms</td>
<td>0.5 ms</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>optoNCDT ILR 1191</th>
<th>Measuring range</th>
<th>±20 mm</th>
<th>&lt; 20 mm</th>
<th>&lt; 200 µm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser distance sensors</td>
<td>Linearity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>Repeatability</td>
<td>&lt; 20 mm</td>
<td>&lt; 200 µm</td>
<td>&lt; 200 µm</td>
</tr>
<tr>
<td>Response time</td>
<td>Response time</td>
<td>0.5 ms</td>
<td>0.5 ms</td>
<td>20 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>optoNCDT ILR 2250</th>
<th>Measuring range</th>
<th>±1 mm</th>
<th>&lt; 300 µm</th>
<th>20 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact laser distance sensors</td>
<td>Linearity</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>Repeatability</td>
<td>&lt; 300 µm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Response time</td>
<td>Response time</td>
<td>0.5 ms</td>
<td>0.5 ms</td>
<td>20 Hz</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Measurement is performed directly onto the target</th>
<th>Measurement against a reflector which is installed on the target</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="#">Illustration of measurement types</a></td>
<td><a href="#">Illustration of measurement types</a></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ILR</th>
<th>1030</th>
<th>1031</th>
<th>1191</th>
<th>2250</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range in gauging mode (without reflector)</td>
<td>8 m</td>
<td>15 m</td>
<td>50 m</td>
<td>100 m</td>
</tr>
<tr>
<td></td>
<td>300 m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring range with reflector</td>
<td>50 m</td>
<td>150 m</td>
<td>3000 m</td>
<td></td>
</tr>
</tbody>
</table>
Capacitive sensors
for non-contact displacement & distance measurements

capaNCDT
- Non-contact measurement of displacement, distance and thickness as well as on electrical conductors and insulators
- Resolution down to the nanometer range
- Temperature stability over a large temperature range
- World’s most modern product portfolio for a wide range of laboratory and industrial applications
- Numerous interfaces, also for bus connection

Capacitive sensors are designed for non-contact displacement and distance measurements with the highest precision and are used for measurement tasks in the laboratory as well as in industrial applications. Their special sensor design, triaxial sensor cables and innovative controller technology result in a perfectly matched measuring system. For this reason, capacitive sensors from Micro-Epsilon stand for the highest precision and signal stability. Even in industrial applications, capacitive sensors achieve resolutions in the submicrometer range.

Measuring the bearing gap in roll drives
Positioning of precision stages
Checking the tilt angle of lens carriers
Large range of capacitive sensors

Capacitive displacement sensors from Micro-Epsilon are available in different designs and versions. They differ with respect to measuring range, design and manufacturing technology. Capacitive sensors are available in a cylindrical design (with integrated cable or socket) or as flat sensors (with integrated cable). These sensors can be exchanged without recalibration; the sensor replacement can be completed rapidly. Most sensors can be used in clean rooms as well as in ultra-high vacuums.

Adaption of sensors to OEM serial applications

- Shape & size
- Sensor material
- Cable
- Vacuum suitability
- Cryogenic or high temperatures
- Integrated controller with sensor for OEM design

Other capacitive sensors for special measurement tasks on page 37
Inductive sensors (eddy current)
for high precision displacement & distance measurements

**eddyNCDT**
- Non-contact and wear-free
- High resolution and linearity
- Stable measurement signals
- High dynamics
- Excellent temperature range and temperature stability
- For industrial applications
- Numerous interfaces, also for fieldbus connection

For many years, Micro-Epsilon has been a pioneer in displacement measurement using eddy current technology. eddyNCDT displacement sensors are designed for non-contact measurement of displacement, distance, position, oscillation, vibrations etc. Considered as extremely robust and precise, eddy current sensors from Micro-Epsilon are preferably used in industrial environments. eddyNCDT sensors are based on the eddy current principle and are used for measurements on metallic targets. They enable non-contact and wear-free measurements without exerting any forces onto the measuring object. The insensitivity to, e.g., oil, dirt, water or electromagnetic interference fields makes eddyNCDT sensors ideal for measurement tasks in which precise measurements are required despite harsh industrial environments.

**Extreme temperature stability**
Eddy current sensors from Micro-Epsilon can be used in a wide temperature range, some models from -50 °C to +350 °C. Their wide temperature range and insensitivity to dirt or dust enable a variety of applications in industrial environments. Active temperature compensation ensures the highest signal stability with fluctuating ambient temperatures.
For special requirements that are not met by standard models, the standard sensors can be modified accordingly. Cost-effective implementation can already be achieved with medium-sized quantities. For special applications where large quantities are required, Micro-Epsilon develops sensors that are precisely tailored to the customer’s requirements.

### Adaption of sensors for small and large series
- Shape & size
- Sensor material
- Cable
- Connector
- Vacuum suitability
- Sensor with integrated controller

### eddyNCDT 3001
Compact eddy current sensor with integrated controller

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>2</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>&lt; ±0.7 % FSO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>0.1 % FSO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency response</td>
<td>5 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### eddyNCDT 3005
Miniature eddy current measuring system ideal for integration into plant and machinery

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>&lt; ±0.25 % FSO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>0.05 % FSO</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency response</td>
<td>5 kHz (-3dB)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### eddyNCDT 3060/3070
A new performance class in inductive displacement measurements

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>0.4</th>
<th>0.8</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>&lt; ±0.1 % FSO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>0.002 % FSO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency response</td>
<td>20 kHz (-3dB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### eddyNCDT 3300
High precision eddy current system for industrial applications

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>0.4</th>
<th>0.8</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>6</th>
<th>8</th>
<th>15</th>
<th>22</th>
<th>40</th>
<th>80</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>&lt; ±0.2 % FSO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>0.005 % FSO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency response</td>
<td>100 kHz (-3dB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Largest sensor range worldwide
Our long-term technology leadership in the field of eddy current sensor technology is reflected by the range of products - more than 400 sensors are available in different designs for different applications. The range includes miniature sensors which achieve high precision measurement results with the smallest possible dimensions.

### Other eddy current sensors for special measurement tasks on page 37
For decades, Micro-Epsilon has been renowned for its inductive displacement sensors and gauges and has extended the range of proven measurement techniques such as, e.g., LVDT by further innovative developments. induSENSOR displacement sensors from Micro-Epsilon are used extensively in applications for automated processes, quality assurance, test rigs, hydraulics, pneumatic cylinders, and building monitoring. Typical measurement tasks require a long service life and reliability.

The induSENSOR models stand out due to their robustness and reliability under harsh conditions. As they provide high signal quality, temperature stability, resistance to shocks and vibrations as well as insensitivity to dirt and humidity, these sensors are the preferred choice for industrial measurement tasks.

induSENSOR systems are universally applicable and have been tried and tested in various industries. When several measuring points are required, the 2-channel controllers or multi-channel systems are used that are equipped with digital interfaces and, in addition, enable integration into fieldbus environments.
For special requirements that are not met by standard models, the standard sensors can be modified accordingly. Cost-effective implementation can already be achieved with medium-sized quantities. For special applications where large quantities are required, Micro-Epsilon develops sensors that are precisely tailored to the customer’s requirements.

Adapted to ambient conditions

Depending on the location of use, environment, and application, different influences prevail to which the sensors are adapted.

- Ambient temperature
- Pressure
- Interference fields
- Dirt, dust, and moisture
- Vibration, shock
- Seawater, IP69K

Miniature sensor controller for inductive displacement sensors

The MSC controllers are designed to be operated with LVDT and LDR measuring gauges and displacement sensors. Due to the robust and compact aluminum housing, the controllers are ideal for industrial measurement tasks. A wide variety of compatible, inductive displacement sensors and gauges combined with an optimized price/performance ratio opens up numerous fields of applications in automation technology and machine building.

---

**InduSensor LVDT series**  
Gauging sensor with external controller

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>±1</th>
<th>3</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>±0.3 % FSO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency response</td>
<td>300 Hz (-3dB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target</td>
<td>Plunger with spring</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**InduSensor LVDT series**  
Displacement sensors with external controller

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>±1</th>
<th>3</th>
<th>5</th>
<th>10</th>
<th>15</th>
<th>25</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>±0.3 % FSO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency response</td>
<td>300 Hz (-3dB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target</td>
<td>Plunger</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**InduSensor LDR series**  
Linear displacement sensors with external controller for high temperatures up to 160 °C

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>±10</th>
<th>±25</th>
<th>±50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>±0.30 % FSO</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency response</td>
<td>300 Hz (-3dB)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target</td>
<td>Plunger</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**InduSensor EDS series**  
Displacement sensors with integral controller

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>75</th>
<th>100</th>
<th>160</th>
<th>200</th>
<th>250</th>
<th>300</th>
<th>370</th>
<th>400</th>
<th>500</th>
<th>630</th>
</tr>
</thead>
<tbody>
<tr>
<td>Linearity</td>
<td>±0.3 % FSO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>0.05 % FSO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency response</td>
<td>150 Hz (-3dB)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Target</td>
<td>Measuring tube</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pressure resistance</td>
<td>450 bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---
mainSENSOR

- Ideal alternative to inductive sensors and proximity sensors
- Linear output signal, high basic sensitivity and temperature stability
- High dynamics
- Measuring range can be adjusted via magnets
- Ideal for customer-specific designs and serial applications

mainSENSOR distance sensors use an innovative measuring principle, which combines the advantages of both inductive and magnetic sensors. Measuring the distance to a magnet which is attached to the measuring object, the sensor outputs a continuous, linear output signal. By using magnets of different strengths, measuring ranges between 20 mm and 55 mm can be achieved. In order to adapt the measuring range, you only have to change the magnet.

Magneto-inductive sensors are frequently used as an alternative to inductive sensors and proximity sensors in process automation, the packaging industry and in machine monitoring. Their sensor design brings numerous application possibilities, especially for OEM series applications. The sensor is available as simple PCB, in a plastic housing or in housings made from stainless steel, which are resistant to many chemicals as well as oil or dirt.
Flexible sensor design for OEM applications

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.

- Improved dynamics
- Different shapes and materials for the housing
- Various output signals
- Special features such as pressure resistance, integrated cables, etc.

### Accessories

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

Power and output cables with M8x1 connector in different types

---

<table>
<thead>
<tr>
<th>MDS-45-M18-SA</th>
<th>MDS-45-M12</th>
<th>MDS-45-M30-SA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>20 - 55 mm*</td>
<td>20 - 55 mm*</td>
</tr>
<tr>
<td>Output</td>
<td>2 - 10 V</td>
<td>2 - 10 V</td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; ±3 % FSO</td>
<td>&lt; ±3 % FSO</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.05 % FSO</td>
<td>0.05 % FSO</td>
</tr>
<tr>
<td>Pressure resistance</td>
<td>up to 400 bar (front)</td>
<td></td>
</tr>
<tr>
<td>Frequency response</td>
<td>3 kHz (-3dB)</td>
<td>3 kHz (-3dB)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MDS-35-M12-HT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
</tr>
<tr>
<td>Output</td>
</tr>
<tr>
<td>Linearity</td>
</tr>
<tr>
<td>Resolution</td>
</tr>
<tr>
<td>Axial cable output or connector</td>
</tr>
<tr>
<td>Frequency response</td>
</tr>
<tr>
<td>Temperature range</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MDS-40-MK</th>
<th>MDS-40-LP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>approx. 40 mm*</td>
</tr>
<tr>
<td>Output</td>
<td>different kinds</td>
</tr>
<tr>
<td>Linearity</td>
<td>&lt; ±3 ... &lt; ±5 % FSO</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.05 % FSO</td>
</tr>
<tr>
<td>Number of pieces</td>
<td>from 1 or 10 pcs. / freely configurable from 200 pcs.</td>
</tr>
<tr>
<td>Pressure resistance</td>
<td>50 bar (front)</td>
</tr>
<tr>
<td>Frequency response</td>
<td>3 kHz (-3dB)</td>
</tr>
</tbody>
</table>

*depends on the magnet
Draw-wire sensors
for displacement, position and length

wireSENSOR
- Measuring displacement, distance and position up to 50,000 mm
- Compact sensor housing combined with a large measuring range
- Ideal for difficult-to-access positions
- Easy, fast and flexible mounting
- Robust design, also for outdoors
- Excellent price/performance ratio
- Ideal for customized OEM series

Draw-wire sensors from Micro-Epsilon enable the measurement of long displacements with a small sensor size. Draw-wire displacement sensors measure the linear movement of a component using a wire made from highly flexible stainless steel strands, which is wound onto a drum by means of a long-life spring motor. The wire is attached directly to the measuring object and can also be guided over deflection pulleys to reach installation spaces that are difficult to access. The winding drum is axially coupled with a multi-turn potentiometer, an incremental encoder, or an absolute encoder.

Different sensor designs range from easy low-cost models to extremely robust designs for industrial applications. wireSENSOR models stand out due to their optimized ratio between measuring range and size, easy installation and handling. Their robust sensor design enables reliable measurements even in challenging ambient conditions.

Synchronization monitoring with draw-wire sensors in telescopic platforms
Measuring the deformation of rotor blades for wind turbines
Vibration monitoring of cranes
wireSENSOR MK30 / MK46 / MK77 / MK60 / MK88 / MK120
OEM miniature sensors with plastic housing

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>50</th>
<th>150</th>
<th>250</th>
<th>500</th>
<th>750</th>
<th>1000</th>
<th>1250</th>
<th>1500</th>
<th>2100</th>
<th>2300</th>
<th>2400</th>
<th>3000</th>
<th>3500</th>
<th>5000</th>
<th>7500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog outputs</td>
<td>Potentiometer, voltage, current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital output</td>
<td>Encoder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

wireSENSOR P60/P96/ P115
Industrial sensors with aluminum housing

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>100</th>
<th>150</th>
<th>300</th>
<th>500</th>
<th>750</th>
<th>1000</th>
<th>1500</th>
<th>2000</th>
<th>2500</th>
<th>3000</th>
<th>4000</th>
<th>5000</th>
<th>7500</th>
<th>10,000</th>
<th>15,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog outputs</td>
<td>Potentiometer, voltage, current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Digital outputs</td>
<td>HTL, TTL, SSI, PB, CO</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

wireSENSOR P200
Long-range industrial sensors with aluminum housing

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>30,000</th>
<th>40,000</th>
<th>50,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital outputs</td>
<td>HTL, TTL, SSI, PB, CO</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

wireSENSOR MT
Miniature draw-wire sensors with aluminum housing

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>40</th>
<th>80</th>
<th>130</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog output</td>
<td>Potentiometer</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Miniature sensor size</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

wireSENSOR K
OEM industrial sensors with plastic housing

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>1500</th>
<th>2500</th>
<th>3500</th>
<th>5000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog outputs</td>
<td>Potentiometer, voltage, current</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ideal for serial applications</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

wireSENSOR mechanics
wireSENSOR mechanics are designed in such a way that they ensure easy mounting of an incremental or absolute encoder. Therefore, the user can individually choose the interface, resolution and connection type. Due to the robust housing, the draw-wire mechanisms are ideal for industrial use.

WDS mechanics
Draw-wire sensor mechanics for encoder installation

<table>
<thead>
<tr>
<th>Measuring ranges (mm)</th>
<th>1,500</th>
<th>3,000</th>
<th>5,000</th>
<th>7,500</th>
<th>10,000</th>
<th>15,000</th>
<th>30,000</th>
<th>40,000</th>
<th>50,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Housing</td>
<td>Plastics / aluminum</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output types</td>
<td>depending on encoder</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Laser scanners from Micro-Epsilon are among the highest performing profile sensors with respect to accuracy and measuring rate. They detect, measure and evaluate profiles on different object surfaces without contact. The available models are suitable for numerous industrial applications. The integrated intelligence in their sensor head (scanCONTROL SMART) solves versatile measurement tasks. Models for the customer’s own programming are available for system integrators. scanCONTROL profile scanners do not require any external controller, which considerably simplifies the installation effort.

Equipped with powerful processors and highly sensitive optical components, these scanners ensure precise profile measurements on almost any type of surface. While they can be integrated in numerous environments, the laser scanners also impress with their compact design which includes an integrated controller.
**scanCONTROL Configuration Tools**
Configuration of different measuring programs by mouse click  
Dynamic tracking of evaluations in the profile  
Parameterizing outputs and displaying measured values  
Output of measured values across a large number of interfaces

**scanCONTROL 25xx**  
Laser scanner for serial applications  
- Measuring range  
  - z-axis up to 265 mm  
  - x-axis up to 143.5 mm  
- Resolution  
  - x-axis 640 points/profile  
- Profile frequency  
  - up to 2,000 Hz

**scanCONTROL 29xx**  
Laser scanner with high precision  
- Measuring range  
  - z-axis up to 265 mm  
  - x-axis up to 143.5 mm  
- Resolution  
  - x-axis 1,280 points/profile  
- Profile frequency  
  - up to 2,000 Hz

**scanCONTROL 30x0**  
High-performance laser scanner  
- Measuring range  
  - z-axis up to 300 mm  
  - x-axis up to 290 mm  
- Resolution  
  - x-axis 2,048 points/profile  
- Profile frequency  
  - up to 10,000 Hz

**scanCONTROL 30x2**  
Powerful 2D/3D laser scanners  
- Measuring range  
  - z-axis up to 300 mm  
  - x-axis up to 290 mm  
- Resolution  
  - x-axis 1,024 points/profile  
- Profile frequency  
  - up to 5,000 Hz

**scanCONTROL 3D-View**  
Can be used with all scanCONTROL sensors  
Offline or real-time display of 3D profiles  
2D export of profile sequences (.png)  
3D export (.asc, .stl) for CAD programs  
Intensity per point can be displayed and exported

**scanCONTROL Software integration**  
Ethernet GigE Vision  
SDK for fast integration in C/C++ (Linux and Windows) or C# (Windows) applications  
Example VIs for NI LabVIEW for integration using LLT.DLL or NI IMAQdx
Optical micrometers & fiber optic sensors

**optoCONTROL**
- Various models for different applications
- Large working distance
- Compact designs with integrated controller
- High accuracy
- Large measuring ranges up to 95 mm
- Detection of edges, gaps, positions and diameters of round objects
- Inspection and detection of position and presence

Optical micrometers are primarily used for production control and quality monitoring, and continuously measure both endless material and single parts. The technologies used are suitable for a wide range of applications. The compact optoCONTROL models are suitable for applications in production lines, as well as for integration in testing machines and automated production systems. The high measuring rates ensure a high and continuous cycle rate in the production process.

All optoCONTROL models work without rotating mirrors and are therefore completely wear-free. The parallel light curtain is created by special optics in the light source. High quality components in the receiving optics, e.g. filters and lenses, enable the high accuracy of the micrometers. This is why optoCONTROL micrometers are particularly suitable for fields where high precision and reliability are required.
optoCONTROL CLS-K
Fiber optic sensors

Applications:
- Edge detection
- Counting tasks
- Assembly control
- Gap recognition
- Scanning tasks in Ex areas
- Presence monitoring and position control
- Recognition of brightness and reflection

optoCONTROL 1200
Compact high-speed micrometer (laser)

- Measuring ranges (mm): 2 | 5 | 10 | 16 | 20 | 30
- Linearity: ±40 µm (independent)
- Resolution: 10 µm
- Frequency response: 100 kHz
- Integrated controller

optoCONTROL 1220
Optical inline micrometer

- Measuring range (mm): 28
- Linearity: ±22 µm
- Resolution: typ. 2 µm
- Working distance: up to 2000 mm
- Integrated controller

optoCONTROL 2500
High-resolution micrometer (laser)

- Measuring range (mm): 34
- Linearity: ±10 µm
- Resolution: 1 µm
- Measuring rate: 2.3 kHz
- External controller

optoCONTROL 2520
Compact laser micrometer (class 1M)

- Measuring range (mm): 46 | 95
- Linearity: ±12 µm
- Resolution: 1 µm
- Measuring rate: 2.5 kHz
- Integrated controller (web interface)

optoCONTROL 2520-46(090) and optoCONTROL 2520-95 (270) micrometers offer a receiver equipped with a lens that is turned by 90°. The flat design of the receiver simplifies the installation process in restricted spaces.

optoCONTROL 2520-46(090) and optoCONTROL 2520-95 (270) micrometers offer a receiver equipped with a lens that is turned by 90°. The flat design of the receiver simplifies the installation process in restricted spaces.

optoCONTROL 2600
High-resolution micrometer (LED)

- Measuring range (mm): 40
- Linearity: ±3 µm
- Resolution: 0.1 µm
- Measuring rate: 2.3 kHz
- External controller

New
With the surfaceCONTROL, reflectCONTROL and scanCONTROL sensor systems, Micro-Epsilon presents a new generation of 3D sensors which are based on a common software platform. These 3D sensors are used for high-resolution geometry and surface measurements and detect the measuring object by scan or by single snapshot, allowing fast inspection of matt and glossy surfaces. In contrast to conventional 3D systems with 2.5D evaluation, Micro-Epsilon’s Valid3D technology enables a complete representation and precise evaluation of the 3D point cloud.

These 3D sensors are used, e.g., for geometric component testing, position determination, presence checks and the measurement of flatness or planarity. Thanks to their high performance, the sensors are used for inline applications, on robots and also for offline inspection.
reflectCONTROL Automotive
Fully automatic surface inspection of painted car bodies
Ideal for large-surface and curved objects
Recognition of defects, inclusions, craters etc.

surfaceCONTROL 2500
3D inspection of large format surfaces
Large measuring fields
Detecting surface shape defects
Detection and evaluation of 3D surface data within a few seconds

surfaceCONTROL 3D 3500
3D sensor for the inspection of geometry, shape and surfaces
Highest precision in z up to < 0.4 µm
Complete 3D images from 0.2 s
Micrometer-accurate snapshots with large measuring fields

reflectCONTROL SENSOR
Complete inspection of reflecting and shiny surfaces
Highest z-accuracy < 1 µm
Detection and evaluation of 3D surface data within a few seconds

3DInspect software for 3D measurement tasks and inspection tasks
3DInspect is a user-friendly software tool for all 3D sensors from Micro-Epsilon. Parameter setting of the sensors and recording of the measurement data are done directly in the 3DInspect software. The 3D point cloud generated in this way can be further processed and exported as desired. High compatibility to image processing environments is enabled via the GenICam standard.

scanCONTROL
Precise laser line scanners for 3D point clouds
Red laser & patented Blue Laser Technology
Up to 2048 points per profile
Measuring rates up to 10,000 kHz
One design for all measuring ranges
Precise color sensors, color measuring systems & LED Analyzers

**colorSENSOR / colorCONTROL**
- Non-contact color measurement for industrial applications
- Precise and fast measurements even on poorly reflecting surfaces
- Numerous sensors for all tasks
- Measurement accuracies ΔE up to 0.08
- Measurement frequencies up to 30 kHz
- Intuitive operation and configuration
- Ethernet and RS232 process interfaces

Color sensors from Micro-Epsilon are used for precise color measurements and color recognition. The sensors measure color values, intensities and functions on different surfaces. As a result, they are used in a variety of applications and stand for high productivity and cost reduction in manufacturing, automation and quality assurance.

colorSENSOR and colorCONTROL sensors are used for numerous measurement tasks. In addition to print mark recognition or batch testing, the sensors are used for measurement tasks that cannot be solved with other measurement processes. For example, the sensors check the presence of transparent coatings or determine the orientation of bottles based on an embossing mark. The MFA LED Analyzer also checks the function, color and intensity of LEDs, lamps or light sources. Thanks to the high accuracy and measuring rate, the range of applications is extremely diverse and can be found in numerous industries.
colorSENSOR CFO
Precise True Color Sensors for industry and automation

| Repeatability | ΔE ≤ 0.3 |
| Measurement speed | max. 30 kHz |
| Color memory | 320 colors in 254 color groups |

Numerous sensors for all surfaces

CFS sensors
with integrated optical glass fibers for adaptation to colorSENSOR CFO controller

| Ambient temperature | -40 ... 400 °C |
| Working distance | 5 ... 320 mm |
| Measurement spot diameter | 0.8 ... 70 mm |

colorSENSOR OT-3-LD
Color sensors with fixed lens for large measurement distances

| Repeatability | ΔE ≤ 0.9 |
| Switching frequency | max. 35 kHz |
| Color recognition from a large distance | up to 900 m |

colorCONTROL MFA
Color recognition of LEDs and self-luminous objects

5 to 495 measuring points

LED tests of function, color and intensity

Color inspection in HSI and RGB color spaces

colorCONTROL ACS7000
Inline color measuring system for non-contact color measurements

| Measurement geometries | Transmission sensor, circular sensor, 30°/0° sensor |
| Repeatability | ΔE ≤ 0.08 |
| Spectral measuring range | 390 ... 780 nm |
| Measuring rate | 2 kHz |

Color recognition from a taught reference list

colorCONTROL MFA
Color recognition of LEDs and self-luminous objects

5 to 495 measuring points

LED tests of function, color and intensity

Color inspection in HSI and RGB color spaces

colorCONTROL ACS7000
Inline color measuring system for non-contact color measurements

| Measurement geometries | Transmission sensor, circular sensor, 30°/0° sensor |
| Repeatability | ΔE ≤ 0.08 |
| Spectral measuring range | 390 ... 780 nm |
| Measuring rate | 2 kHz |

Color recognition from a taught reference list

colorCONTROL MFA
Color recognition of LEDs and self-luminous objects

5 to 495 measuring points

LED tests of function, color and intensity

Color inspection in HSI and RGB color spaces

colorCONTROL ACS7000
Inline color measuring system for non-contact color measurements

| Measurement geometries | Transmission sensor, circular sensor, 30°/0° sensor |
| Repeatability | ΔE ≤ 0.08 |
| Spectral measuring range | 390 ... 780 nm |
| Measuring rate | 2 kHz |

Color recognition from a taught reference list

colorCONTROL MFA
Color recognition of LEDs and self-luminous objects

5 to 495 measuring points

LED tests of function, color and intensity

Color inspection in HSI and RGB color spaces

colorCONTROL ACS7000
Inline color measuring system for non-contact color measurements

| Measurement geometries | Transmission sensor, circular sensor, 30°/0° sensor |
| Repeatability | ΔE ≤ 0.08 |
| Spectral measuring range | 390 ... 780 nm |
| Measuring rate | 2 kHz |

Color recognition from a taught reference list

colorCONTROL MFA
Color recognition of LEDs and self-luminous objects

5 to 495 measuring points

LED tests of function, color and intensity

Color inspection in HSI and RGB color spaces

colorCONTROL ACS7000
Inline color measuring system for non-contact color measurements

| Measurement geometries | Transmission sensor, circular sensor, 30°/0° sensor |
| Repeatability | ΔE ≤ 0.08 |
| Spectral measuring range | 390 ... 780 nm |
| Measuring rate | 2 kHz |

Color recognition from a taught reference list
Infrared pyrometers from Micro-Epsilon determine the object temperature without contact based on the infrared radiation emitted by the object. The thermoMETER series opens up numerous possibilities for measuring and displaying temperature curves in industrial fields of application. As this measurement is a non-contact technology, the pyrometers perform wear-free and can therefore be reliably used over long periods of time. Selectable models and optical systems enable the cameras to be installed in different distances from the surface. This allows for the target to be measured from a safe distance in critical areas of use.

Pioneering infrared technology for industrial applications

thermoMETER pyrometers combine high accuracy with measurements in ambient temperatures of up to 250 °C without cooling. New infrared sensor elements with small dimensions and high sensitivity enable outstanding sensor characteristics with high measurement accuracy and short response time. Temperature sensors are mainly used in machine building, research and development, maintenance and process monitoring.
thermoMETER CS / CSmicro / CSLaser
Compact, miniature and low cost
Temperature ranges from -40 °C to 1600 °C
Robust, silicon-coated lens
Integrated controller
Scalable analog output: 0 - 10V / 0 - 5V
Ideal for OEM, also available as two-wire version and high-resolution models

thermoMETER CTRatioM1/M2
Glass fiber ratio thermometer
Temperature ranges from 250 °C to 3000 °C
Robust and compact pyrometer with motorized focus
Excellent optical resolution
Autonomous operation with automatic spotfinder and direct analog output
For temperature measurements in machine building and in automation

thermoMETER CT Video/CS Video
Infrared temperature sensors with crosshair laser sighting and video module
Temperature ranges from 50 °C to 2200 °C
Parallel use of video module and crosshair laser sighting for measuring field adjustment
Measurement of hot metals, ceramics and composite materials
Automatic snapshot feature for process monitoring and documentation

thermoMETER CTLaser / CTLaserFAST
Precise pyrometer with laser sighting
Temperature ranges from -50 °C to 975 °C
Infrared sensor heads with optical resolution up to 75:1, from a measurement spot of 0.9 mm
Double laser marks the exact spot location from a spot size of 1 mm
Response time from 9 ms

thermoMETER CTLaser M1/M2/M3
Version for metal production with reduced wavelength: 50 °C to 2200 °C
thermoMETER CTLaser M5 (525 nm)
for liquid metals: 1000 °C to 2000 °C
thermoMETER CTLaserGLASS
for measurement of glass: 100 °C to 1650 °C
thermoMETER CTLaserCOMBUSTION
for measurement of flames: 200 °C to 1450 °C

thermoMETER CT / CTfast
Extremely low cost and high accuracy
Temperature ranges from -50 °C to 975 °C
Robust and compact pyrometer with motorized focus
Excellent optical resolution
Autonomous operation with automatic spotfinder and direct analog output
For temperature measurements in machine building and in automation

thermoMETER CTLaser M1/M2/M3
Version for metal production, temperature ranges from 50 °C to 2200 °C
thermoMETER CTM4
Fast measurement of metals and non-metals due to large, short-wave spectral range
thermoMETER CTThot
for difficult ambient conditions up to 250 °C ambient temperature without cooling
thermoMETER CTM-3XL
for laser welding processes from 100 °C to 1800 °C

thermoMETER CTM1/M2/M3
Version for metal production, temperature ranges from 50 °C to 2200 °C
thermoMETER CTM4
Fast measurement of metals and non-metals due to large, short-wave spectral range
thermoMETER CTThot
for difficult ambient conditions up to 250 °C ambient temperature without cooling
thermoMETER CTM-3XL
for laser welding processes from 100 °C to 1800 °C

thermoMETER CTM-3XL
for laser welding processes from 100 °C to 1800 °C

License-free evaluation software
Sensors with digital interfaces include the license-free compactCONNECT software for easy parameter set up, analysis and documentation purposes of measured temperature values.
Compact thermal imaging cameras for industrial measurement tasks

thermoIMAGER

- Compact thermal imaging cameras for non-contact temperature measurement without affecting the object
- Temperature range from -20 °C to 2450 °C
- Monitoring of hot, fast moving or difficult-to-access objects
- Fast recognition of temperature deviations in power distribution systems, machines and production processes
- Powerful software included in delivery
- Software Developer Kit with examples, C, C++, C# included

thermoIMAGER infrared cameras are designed for industrial use. The cameras impress with their compact design and favorable price/performance ratio. They are available with different wavelengths optimized for different industries. Data is streamed in real time from the camera to the software via a USB interface. The powerful process and analysis software is included and enables the acquisition of thermal images at up to 128 Hz. The data can be stored in an image or video file and viewed and analyzed offline without a camera at a later time. In addition, the software can be used as a runtime application where the user is able to program and configure a custom environment (e.g. multiple monitoring windows, alarms, hot spot localization, line profiles). Advanced interface concepts enable integration into networks and automated systems.
thermoIMAGER TIM QVGA-G7 / VGA-G7
Thermal imaging camera for the glass industry
Frame rate up to 125 Hz
Excellent thermal sensitivity (NETD) of 0.13 K
Line scan feature
Ambient temperature up to 70 °C without additional cooling housing, up to 315 °C with cooling housing

thermoIMAGER TIM M1 / TIM M05 / TIM M-08
Thermal imaging camera for hot metal surfaces
Temperature ranges:
450 °C to 1800 °C / 900 °C to 2450 °C
Excellent thermal sensitivity (NETD) of < 1 K
Optical resolution 764 x 480 pixels
Spectral range 0.92 to 1.1 µm / 500 to 540 nm

thermoIMAGER Microscope lens
Thermal imager with microscope lens
Measuring ranges:
-20 °C to 100 °C / 0 °C to 250 °C / 150 °C to 900 °C
Excellent thermal sensitivity (NETD) 90 mK or 120 mK
Optical resolution: 382x288 or 640x480 pixels
Smallest spot size: 42 µm / 28 µm
Spectral range: 7.5 to 13 µm

thermoIMAGER NetPCQ
Embedded, industrial PC solution with passive cooling for thermoIMAGER applications
Supports all thermoIMAGER TIM models
Integrated watchdog feature

Cooling Jacket Advanced
Universal cooling housing up to 315 °C
Ambient temperatures up to 315 °C
Air/water cooling with integrated air purging and optional protective windows
Modular concept for easy fitting of different cameras and lenses
As well as standard sensors based on various measuring principles, Micro-Epsilon has developed numerous sensors for special applications, which go beyond pure displacement and position measurements.

These application-specific sensors were developed for special measurement tasks and have proven themselves there many times. These developments incorporate the many years of know-how that Micro-Epsilon has accumulated in the design and application of sensor technology. High performance, precision and reliability at cost-effective OEM conditions are the main focus.

Rotational speed measurement of turbochargers
Measuring the thermal extension of spindles
Inspection of the inner diameter of extruder housings
Inline yarn thickness measurement
Load detection in washing machines
Non-contact, inline thickness measurement of plastic films
## SGS Spindle Growth System

Sensor system developed for measuring the thermal extension of milling spindles
- Measuring range: 500 µm
- Resolution: 0.5 µm
- High temperature range

## DZ140

Sensor for rotational speed measurement during driving operations and tests
- Optimized for modern, thin blades made from aluminum or titanium
- Speed range: from 200 to 400,000 rpm
- Wide operating temperature range
- Large distance between sensor & blade
- No rotor modification required

## idiamCONTROL

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

## combiSENSOR

One-side thickness measurement of plastic films and coated metals (battery film)
- Thickness of the target: 40 µm to max. 6 mm
- Working distance: 2 to 10 mm
- Resolution: 0.0018 % FSO
- Frequency response: 1 kHz (-3dB)

## capaNCDT MD6-22

Mobile handheld gauge for precise, capacitive gap measurements
- Gap: max. 12 mm
- Linearity: ≤ ±0.2 % FSO
- Resolution: 0.02 % FSO
- Frequency response: 100 Hz (-3dB)

## capaNCDT CST6110

Capacitive rotation speed measuring system for industrial counting tasks
- Material independent rotation speed measurement from 1 ... 400,000 rpm
- Easy integration due to compact sensor size
- Ideal for industrial environments with electromagnetic radiation

## FSC1/7 / FSC1000 / ISC1000

Measuring device for the detection of coating thickness on CFRP and other substrates
- Quick & easy coating thickness measurement
- Non-destructive principle - no influence on coating or substrate
- No coupling medium required
- Configurable, dynamic tilt prevention
- Qualified by renowned aircraft manufacturers
Measuring and testing systems from Micro-Epsilon combine sensors, software and mechanics in an integrated overall solution. The systems are used for process monitoring and quality assurance in the production line and impress with high precision and ease of integration. The sensor and software modules used originate from the Micro-Epsilon group, enabling optimum and efficient component matching.

These measuring and inspection systems are integrated into existing or newly designed production lines to carry out fully automatic applications such as thickness measurements, surface inspections and parts classification. The systems are used, for example, in metal rolling mills, battery production, the plastics industry, and in the manufacture of tires and technical rubber.

The appropriate measurement concept depends on the measurement task. In addition to laser, eddy current, profile and capacitive sensors, micrometers and special combination sensors are used. The latter are free of X-rays or isotope radiation and provide highly accurate readings. Signal processing and output can be arranged to suit the application requirements. The measuring systems communicate with existing environments via various interfaces and can therefore also be retrofitted into existing production lines.
thickn essGAUGE
Sensor system for precise inline thickness measurements
For many types of surfaces / materials due to different sensor technologies
Traversing sensors on linear axis
Fully automatic calibration

thickn essGAUGE laser
Sensor technology used:
Laser triangulation displacement sensors

thickn essGAUGE.confocal
Sensor technology used:
Confocal chromatic displacement sensors

thickn essGAUGE.laser profile
Sensor technology used:
Blue Laser profile sensors

Systems for the preparation area in the rubber and tire production
Profilometer
Color code
Measuring length

Final finishing systems in the rubber and tire production
Tire geometry
Tire marking
Tire identity

Systems for the plastics inspection
C-frames for thickness measurement of flat film
O-frame systems for profile thickness measurement
Reverse-frame systems for the profile measurement of blown films

C-frame for metal thickness measurement
For high speed measurements
Laser point or innovative laser line
All alloys without calibration

Powerful C-frames for harsh environments
Various measuring ranges
Proven protection and cleaning concepts
Several C-frames with only one IPC

O-frame systems for the metals industry
Most modern thickness profile measurement
Without isotopes and X-rays
Measurement independent from strip movement, tilt, surface type and alloys