Optimized displacement sensors **for OEM series applications**

MICRO-EPSILON

More Precision

Contents

More precision
Displacement sensors from Micro-Epsilon for OEM series applications

Shaping the future with sensors
As a leading manufacturer of precision sensors, we are shaping the future with sensors. Our sensors are used where accuracy and performance are crucial to success – in modern machine building and in advanced automation as well as in satellite technology and in the production of next-generation batteries and semiconductors.

Micro-Epsilon offers a wide and powerful product portfolio combined with in-depth technical industry and application knowledge. As a partner, we support our customers with sustainable solutions and long-term cooperation. Thanks to the bundled know-how within the entire Micro-Epsilon group of companies, we can react with highest flexibility to customer requirements in order to realize application solutions with high demands on measurement technology together with you.

Competence and expertise -
the Micro-Epsilon Company Group
With over 27 companies, the Micro-Epsilon Group is a powerful alliance. Each of these companies has a clearly defined focus on development and series production, automation and application consulting. This is to provide our customers with solutions, development, production and service at once – all from a single source.

Made for OEM
For series projects, we offer a large range of measuring techniques, decades of development expertise and production capacities for large quantities. If necessary, we adapt our sensors to the specific requirements of our customers in order to achieve maximum efficiency in technical and economic terms. Our engineering teams coordinate all measurement requirements and relevant components and parts together with you. This way, we ensure optimum function with maximum cost efficiency – from design to series production.

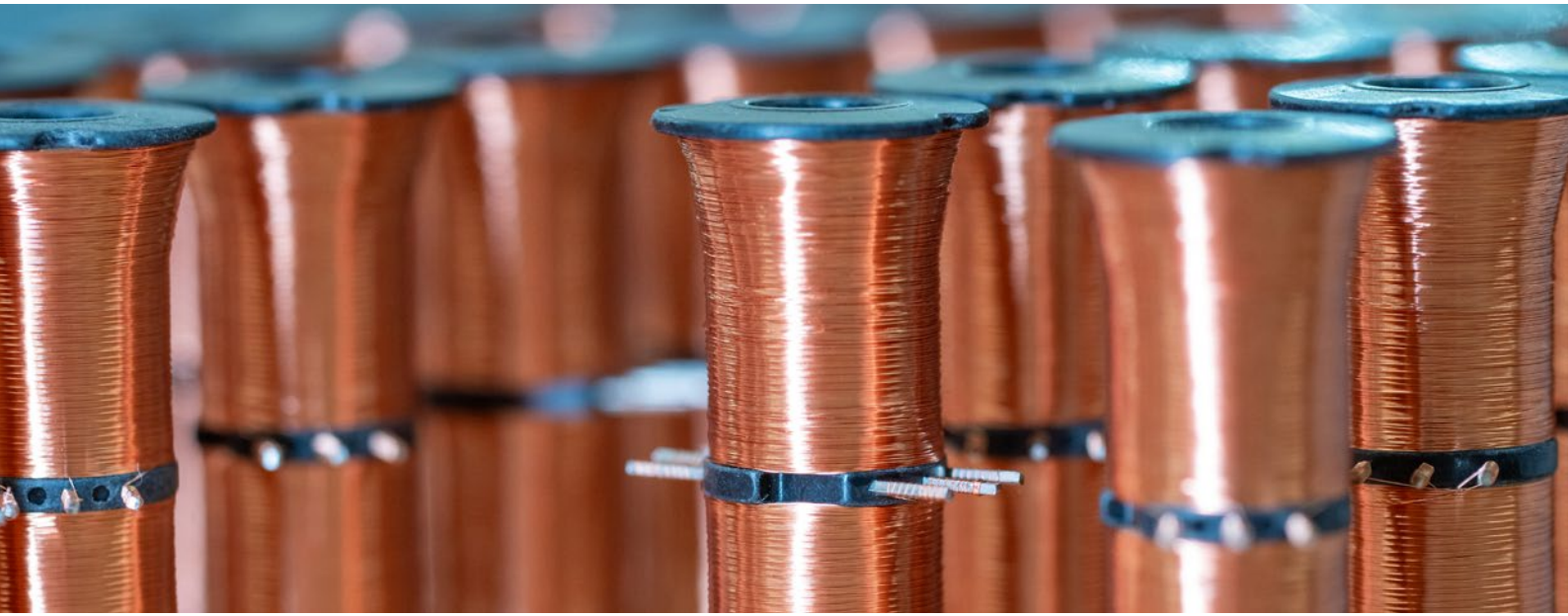
Your advantages
- Consultation, development, production and implementation from a single source
- Solution competence from catalog to OEM series
- Worldwide industry and application support
- Technological expertise from more than 55 years of sensor development with over 400 active patents and patent applications
- Real added value and competitive advantages for your application

From mechanical processing and coil winding to fully automated cleaning: the Micro-Epsilon Group uses modern manufacturing technologies for OEM series production.

Technological expertise for series production

We transform high tech into industrial series products by combining the key competencies in the Micro-Epsilon Group. The accumulation of sophisticated technologies and automated production facilities allow us to create a high-performance portfolio which is also suited for OEM applications with high volumes. We respond quickly to customer requests and offer optimized solutions within a short time – sensors with more precision.

- LTCC
- Assembly (AOI, in-circuit)
- Passivation & coating
- 5-axis precision manufacturing
- Coil winding
- Sensor mounting
- Series production
- Hermeticity
- Vacuum brazing
- Laser welding
- Active soldering
- Vacuum casting
- Simulation
- Adjustment
- Calibration
- Test
- Acceptance
- Burn-in tests
- Qualification
- Packaging
- Cleaning
- Machine building
- Automation
- Software development



Our sensor products are used in numerous industries. They solve measurement tasks with maximum precision and reliability. This is how we increase quality and generate added value for our customers.

We consistently increase our knowledge to optimize our customers' machines, systems and processes. The accumulation of knowledge and experience allows us to speak the language of our customers. In this way, we develop targeted solutions for future-oriented applications.

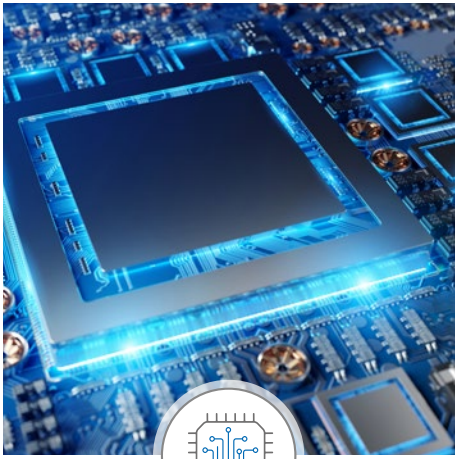
Industry competencies

Aerospace

Machine building

Energy technology

Mobile machinery



Semiconductors

Automation

induSENSOR

Linear inductive displacement sensors

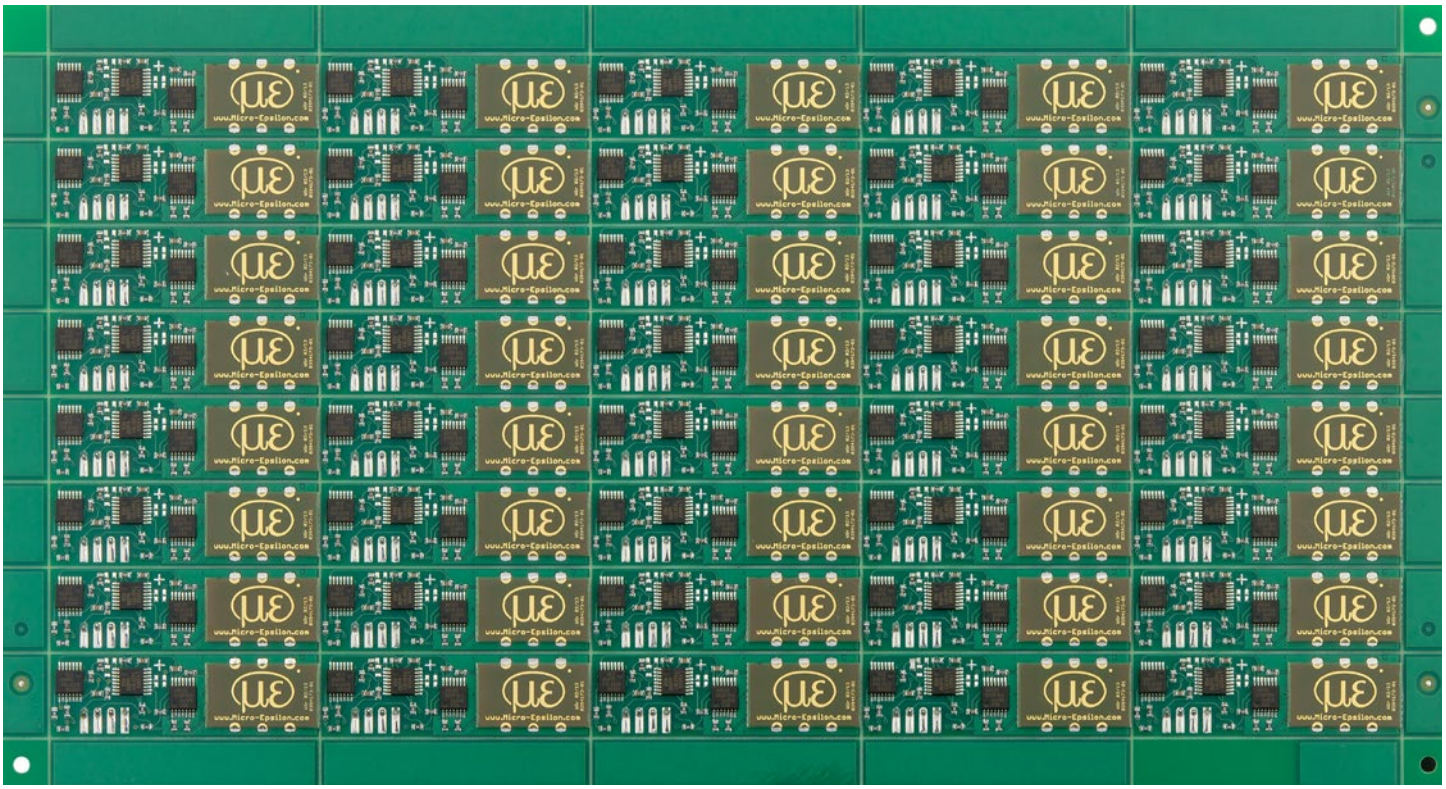
Concepts for cost-optimized series applications

- Simplified sensor systems for low cost series production
- Simple PCB solutions for deep integration
- Modular concepts for high flexibility
- Customized sensor design
- Adapted measuring ranges
- Integrated or external electronics
- Various targets, e.g. as sleeve, plunger, magnet

Also suitable for demanding environments

- Applications with high ambient pressure
- High temperature environments
- Contaminated installation and measuring rooms
- Special requirements for shock and vibration resistance

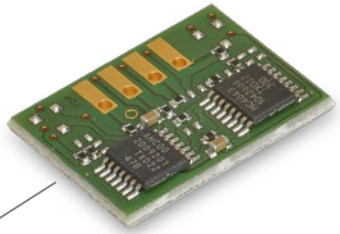
All the sensors shown here are merely examples of the possibilities offered by Micro-Epsilon's wide range of products.



Application examples

Magneto-inductive sensor module

- Low-cost product optimized for controller-based evaluation (rectangular signal/time measurement)
- Distance measurement on magnets
- Reduced to pure measurement technology without protective measures such as EMC, voltage stabilization, housing, etc.
- Measuring range: 40 mm
- Application: e.g. white goods, household appliances, sports equipment, measuring modules
- Usual quantities: > 5,000 pieces / year



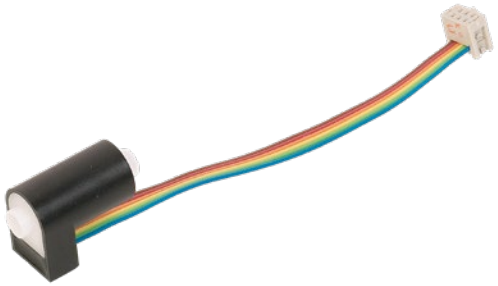
Inductive sensor module

- Low-cost product optimized for controller-based evaluation (rectangular signal / time measurement)
- Distance measurement on metallic conductive targets (aluminum, brass, copper)
- Reduced to pure measurement technology without protective measures such as EMC, voltage stabilization, housing, etc.
- Measuring range: 1.5 mm
- Application: e.g. white goods, household appliances, sports equipment
- Usual quantities: > 20,000 pieces / year

Sensor for valve lift measurement

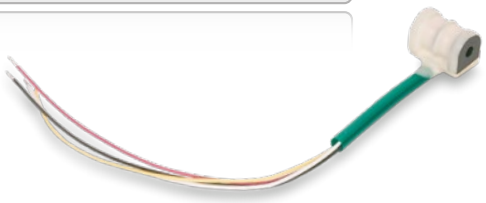
- Optimized for series production
- Deep integration into the overall system with individual form factor
- Only 50 % of the sensor electronics are integrated directly in the sensor, the micro-controller already provided by the customer forms the second half of the sensor electronics. LEDs are also installed on the sensor, which the customer needs for other tasks in the application.
- High vertical range of manufacture at Micro-Epsilon
- Measuring range: 85 mm
- Application: e.g. process valves
- Usual quantities: > 20,000 pieces / year

induSENSOR
Application examples



Sensor for valve lift measurement

- Optimized for series use
- Customers can use their own sensor controller, as the sensor is based on universal LVDT technology
- Plastic injection-molded housing
- Measuring range: 10 mm
- Application: e.g. hydraulic valves
- Usual quantities: > 10,000 pieces / year



Sensor for valve lift measurement

- Optimized for series use
- Customers can use their own sensor controller, as the sensor is based on universal LVDT technology
- No housing – sensor coil immersed
- Measuring range: 2 mm
- Application: e.g. hydraulic valves
- Usual quantities: > 10,000 pieces / year

Inductive displacement measuring system

- Flexible modular concept
- Low cost version of a catalog product (LVDT) with metrologically identical performance and connection to the sensorTOOL software
- Fast time-to-market
- Measuring range: 6 mm
- Application: e.g. machine building, linear integrated measurement tasks
- Usual quantities: > 500 pieces / year

Inductive proximity sensor

- Aviation-certified, hermetically sealed
- Sensor without electronics for determining switching points
- Adapted to electronics from a third-party manufacturer
- Self-locking mounting system
- Measuring range: 4 mm
- Application: e.g. chassis, door lock
- Usual quantities: > 5,000 pieces / year

Spring-loaded inductive displacement sensor

- With miniature, integrated LVDT electronics
- Scope of delivery: complete toolset for end users including sensor and evaluation unit
- Measuring range: 6 mm
- Application: e.g. adjustment tasks for robot axes
- Usual quantities: >1,000 pieces / year

Miniature displacement sensor with external controller

- Miniature variant of a catalog sensor (EDS)
- Pressure up to 350 bar, temperature up to 165 °C
- Optimized in terms of size and weight
- Measuring range: 28 mm
- Application: e.g. miniature actuators, hydraulic cylinders, pneumatics, motor sports, ...

eddyNCDT

Eddy current displacement sensors

Available options

- Changed offset distance and measuring range
- Housing and mounting options for sensor and controller
- Pressure-resistant sensors up to 2000 bar
- Sensors with integrated or external electronics, miniature designs
- Various materials for coil, housing or circuit boards
- Individual cable lengths, special adaptation to your measuring object

Also suitable for particularly demanding environments:

- Applications with high ambient pressure
- High temperature environments
- Vacuum areas up to UHV
- Contaminated installation and measuring rooms
- Special requirements for vibration resistance
- Assembly with ECT technology possible

All the sensors shown here are merely examples of the possibilities offered by Micro-Epsilon's wide range of products.

Application examples

Flexible sensor designs

- The sensor is "just" a coil → Flexible sensor geometries and materials can be implemented
- Professional design, simulation and qualification for optimum sensor geometries and materials
- Example: eddy current sensor with cut-out for combination with optical sensors
- Application: thickness measurement of paint, paper, plastics, in combination with laser triangulation sensor

Universal modular concept

- Standard controllers compatible with customized sensors
- Optimized time-to-market & unit price
- Sophisticated controller technologies available from miniature to smart evaluation units
- Application: textile production, rapid prototyping, condition monitoring

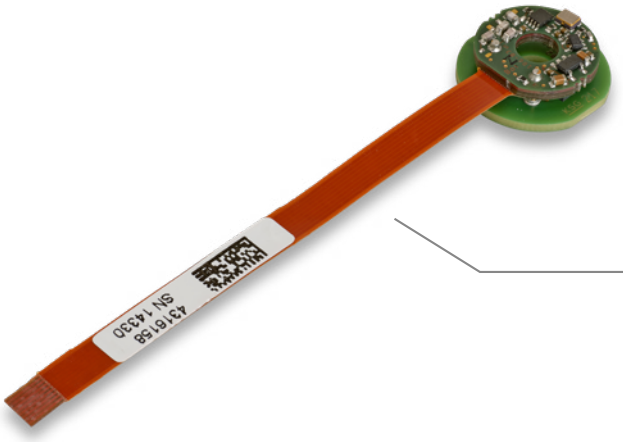
Robust eddy current sensor in injection molding technology

- Robust plastic housing, hermetically sealed
- Pressure up to 100 bar possible
- Dimensional stability up to 250 °C
- Withstands shock and vibration
- Resistance to oil, water, cooling lubricant or similar contact material – high EMC stability
- Best repeatability due to optimized injection molding technology
- Optional: use with or without housing possible
- Application: drive technology and automation, wear measurements, robot positioning

eddyNCDT
Application examples

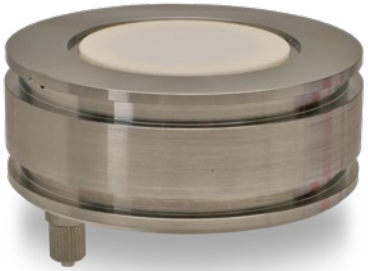
Embedded Coil Technology (ECT) sensors for demanding environments

- Temperature, pressure and media resistance
- Temperature stability up to 350 °C
- Can be used in clean or harsh environments
- Vacuum suitability up to UHV
- Customized geometry adaptations possible
- Applications: alignment of mirror segments on telescopes, semiconductor production in ultra-high vacuum
- High-pressure applications in deep sea, high-temperature applications in material test benches



Cost-optimized and miniature sensors in PCB technology

- 1 or more coils in a small installation space
- Simple sequential measurements (multiplexed)
- For stable measuring environments
- Optional: integrated miniature evaluation electronics included
- Application: valve lift measurement for process gases, e.g. for CVD processes, tilt measurement of plungers

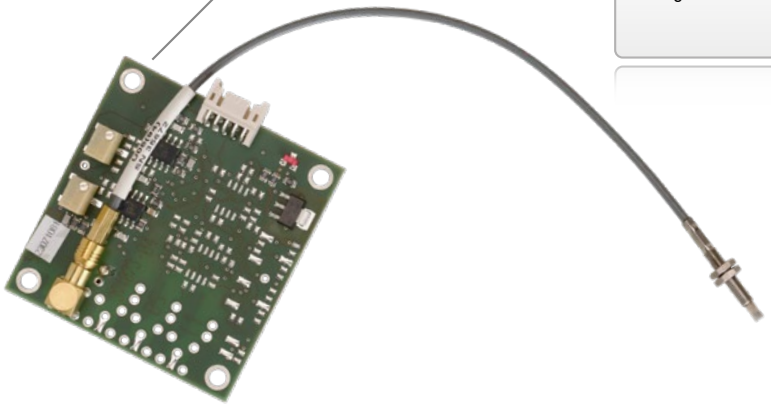


Sensors for every field of application

- Optimal material selection for your application
- Housing materials made of stainless steel, titanium, Inconel, Invar, etc.
- Ceramic cap material
- Cables made of FKM, FFKM, PTFE
- High media resistance to acids, alkalis, abrasive media
- Application: grinding and polishing machines, low outgassing environments (vacuum)

High speed measurements with nanometer resolution

- Flexible frequency response up to 50 kHz (-3dB)
- Deep integration into customer system possible
- Nanometer resolution even with high bandwidth
- Miniature electronics for the best possible machine integration
- 1 to 4 channel applications (single A, B or differential A-B)
- Output signal not linear, but high resolution and speed
- Application: Fast Steering Mirror, engraving heads, high-resolution stages (X, Y, Z, ...)



capaNCDT

Capacitive sensors for displacement, distance & position

Possible modifications

- Sensor design (e.g. flange, thread, ...)
- Cable lengths
- Plugs and couplings
- Sensors with integrated electronics (active sensors)
- Signal output electronics (e.g. analog, Ethernet, EtherCAT, PROFINET, ...)

Also suitable for particularly demanding OEM projects:

- Environments from cryogenic to extremely hot temperatures
- Vacuum ranges up to UHV
- Application in clean rooms (cleanliness requirements, outgassing behavior)
- Maximum self-sufficiency thanks to high long-term stability and maintenance-free base
- Use in magnetic and electric fields
- Product modularity allows individual compilation for evaluation and series requirements at short notice

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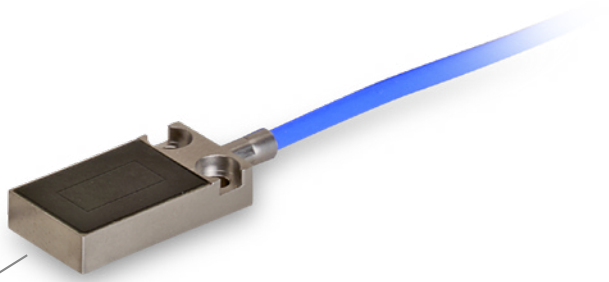
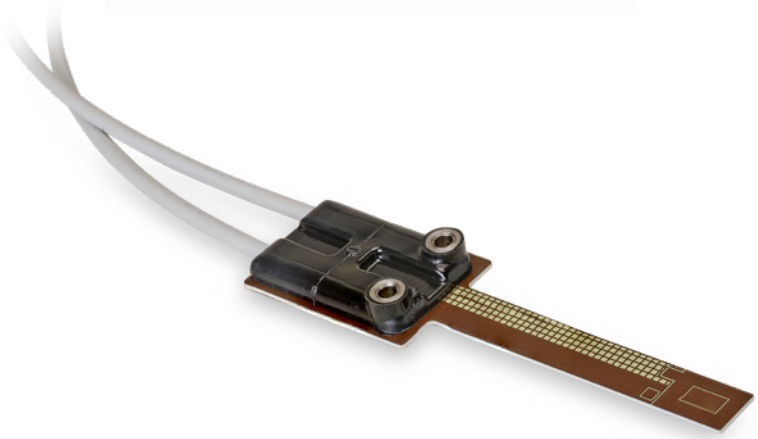
Application examples



Quantity-optimized CSR sensors

- Individual form factor adapted to the space available in the system
  - Rectangular electrode instead of round electrode
  - Version in flat metal housing
- Quantity price-optimized
- 160 °C operating temperature
- Focus on maximum repeatability for the best possible process control
- Suitable for all DT6xxx controllers
- Application: e.g. machine / system leveling, alignment of platforms, parallelism control of platforms



Stable flat sensors for gap measurement

- Gap sensor with ideal measuring field geometry
  Designed for gap measurement
  - two-sided thickness measurement (2 x sensors)
  - sensor thickness only 0.9 mm
- Optimized for control processes (closed-loop processes)
  Suitable for all DT6xxx controllers
- Application: gap measurement of e.g. rollers

Optional accessories

Air purge and stabilization device for CSG1-CRgX capacitive gap sensors

- To remove foreign bodies in the measuring gap

capaNCDT
Application examples

Flex board technology

Provides the necessary flexibility to adapt sensors to curvature and to measure in confined spaces.

Thin flexible sensor

- Can be adapted to a given geometry (roller) - e.g. stator-rotor measurements
- Thickness approx. 1 mm incl. stiffening element with screw holes
- Application: kinetic energy storage - controls the rotation of large accelerated masses in a vacuum for the smallest deviations (imbalance)
- Optional accessories (vacuum feed-throughs)

Thin flex sensor with flex conductor and ccx cable

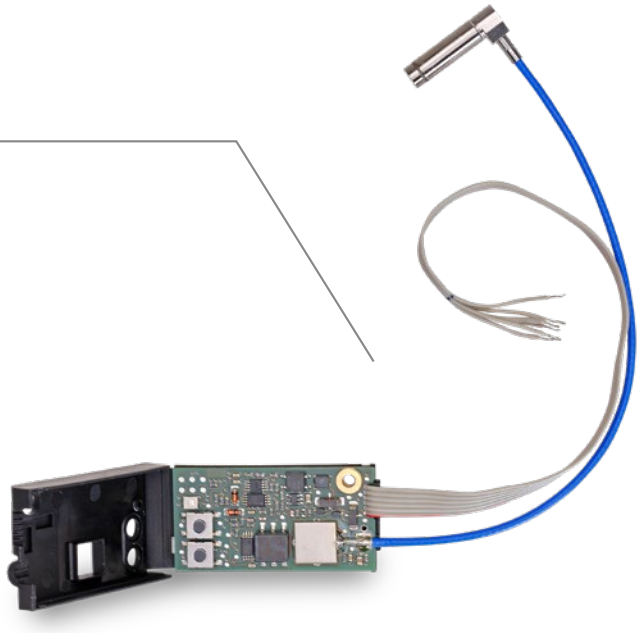
- Optimized for minimum sensor thickness <0.3 mm
- Equipped with fastening wings
- Flex conductor connection for positioning
- Max. total length of sensor incl. flex conductor up to the sensor cable transition: 400 mm
- Application: test bench measurement Gap distances in new high-performance e-motors for the automotive industry

Sensors with desired geometry for simple, targeted integration

- High-precision 500 μm sensor with customized geometry
- Geometry: e.g. flange for simple and ideal positioning in relation to the measuring area
- Application: optical elements (lens systems) are aligned in a vacuum / clean room with the aid of these sensors

Miniature sensor system for complete integration close to the measuring point

- Miniature electronics with a small footprint 50 x 27 x 8.5 mm
- Targeted position control < 0.5 μm with the aid of a switching signal
- Quick teach-in of the switching position via the upper and lower limit buttons
- Control range (measuring range) 500 μm
- Application: system is fully integrated into e.g. surgical microscopes and serves to stabilize the tripods



Shaping the future with sensors - for more than 55 years.

More Precision

Whether it is for quality assurance, predictive maintenance, process and machine monitoring, automation or R&D – sensors from Micro-Epsilon make a vital contribution to the improvement of products and processes. High precision sensors and measuring systems solve measurement tasks in all core industries – from machine building to automated production lines and integrated OEM solutions.

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