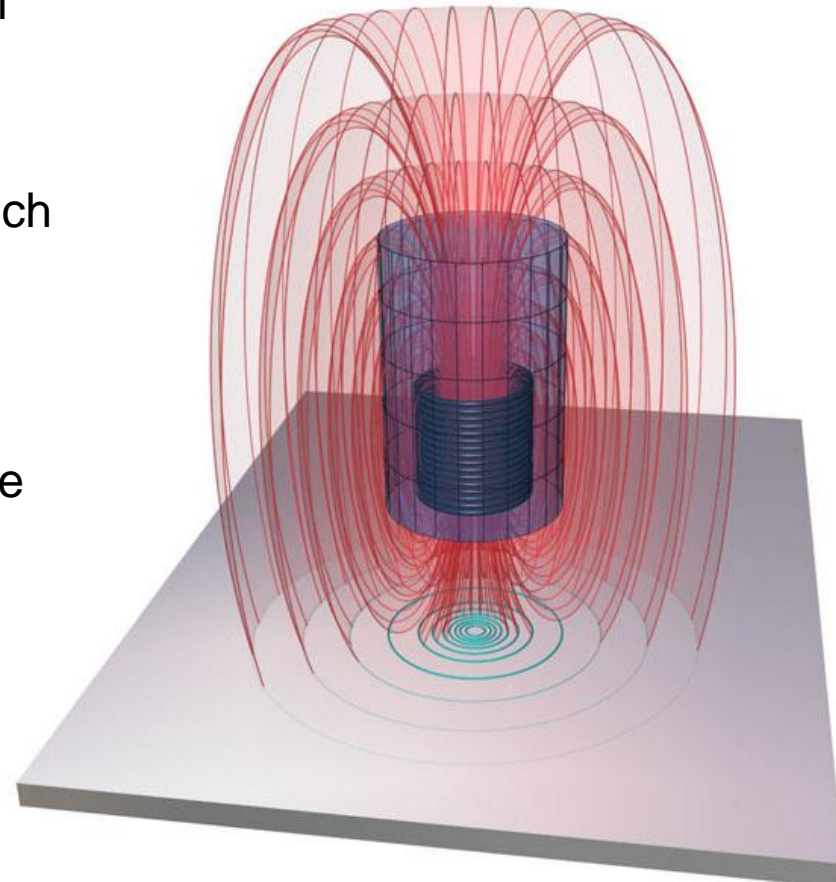


## Measuring principle

- A magnetic field is generated while energising the coil with alternating current
- If there is a magnetically conductive material within the magnetic field, eddy currents are generated which form another field
- This field counteracts the field of the coil which causes a change in the coil impedance
- The impedance can be presented as measuring value on the controller showing a change of the amplitude and the phase of the sensor coil

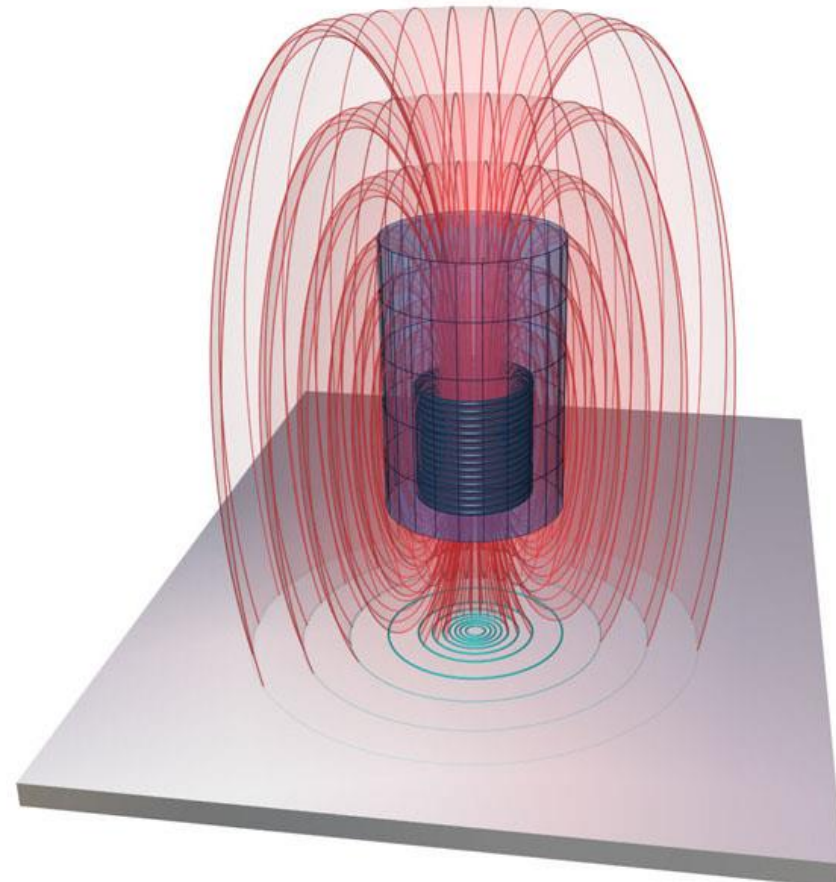


## Benefits of the eddy current measuring principle

- Harsh ambient conditions
- Large temperature range
- High dynamics
- Non-contact and wear-free measurement
- Most compact designs

## Please consider:

- Suitable for measuring ranges <80mm
- For all metallic objects



# Eddy current displacement sensors

## Benefits of eddyNCDT

- More than 300 sensor models
- Measuring ranges from 0.4 to 80mm
- Robust sensors IP 67
- Resistant to high pressure to  $2000 \times 10^5 \text{Pa}$
- Resolution with nanometre-accuracy
- Applicable to OEM solutions

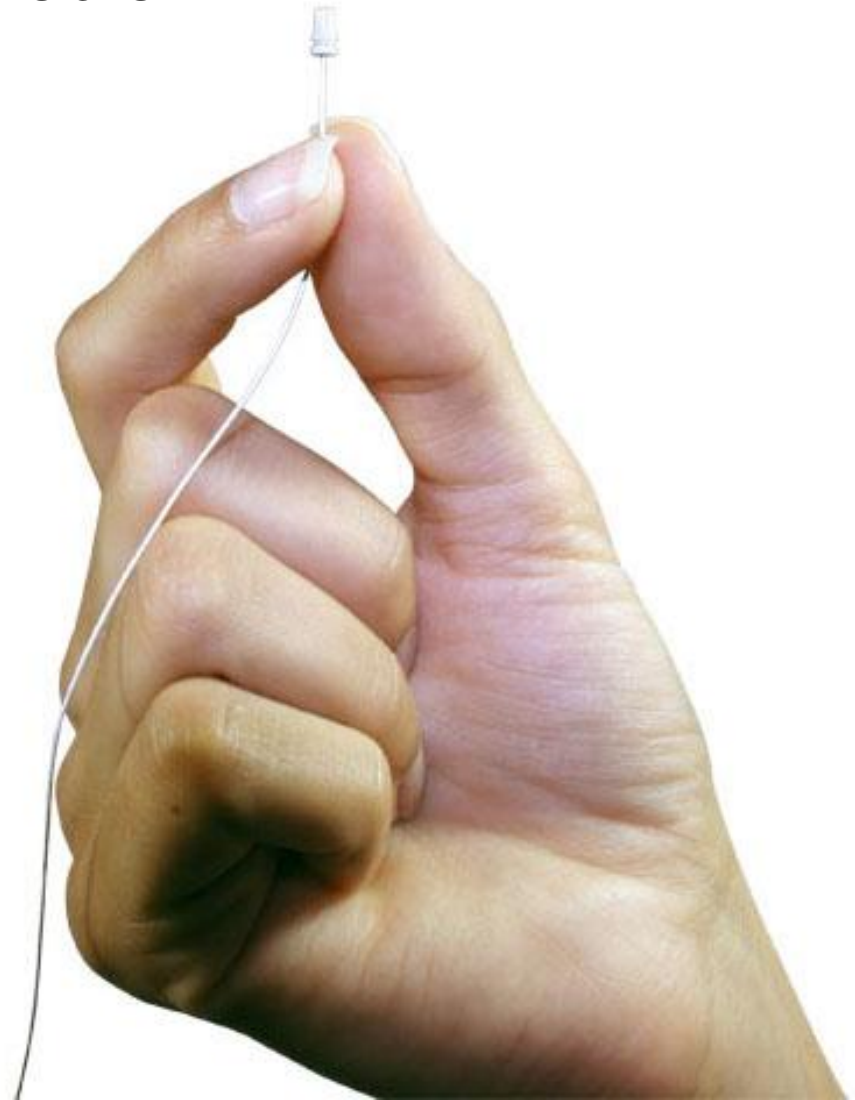


# Miniature eddy current sensors

## World record: Unmatched sensor dimensions

The integrated coaxial cable can be even passed through an eye of a needle.

These sensors are particularly applied for measurements being effected in combustion engines.



# Product overview eddyNCDT

## eddyNCDT 3100

Compact eddy current measuring system

**NEW**

- Measuring ranges 0.8 - 15mm
- Sensors can be easily changed and adjusted
- High-resolution and accuracy for all metallic materials
- Remote control via Ethernet and web browser





## eddyNCDT 3300

Intelligent eddy current system for application in high precision

- Multifunctional controller for simple solutions of demanding applications
- More than 400 sensor models
- Flexible adjustment to measuring objects and mounting conditions

Measuring ranges from 0.4 to 80mm

Linearity 0.2%

Measuring rate 100kHz (-3dB)



## eddyNCDT 3700

Compact OEM eddy current system for differential measurements

- Measuring ranges from 0.5 to 6mm
- Highest resolution (<1nm)
- High dynamics (10kHz (-3dB))
- Exceptional reproducibility (3nm)



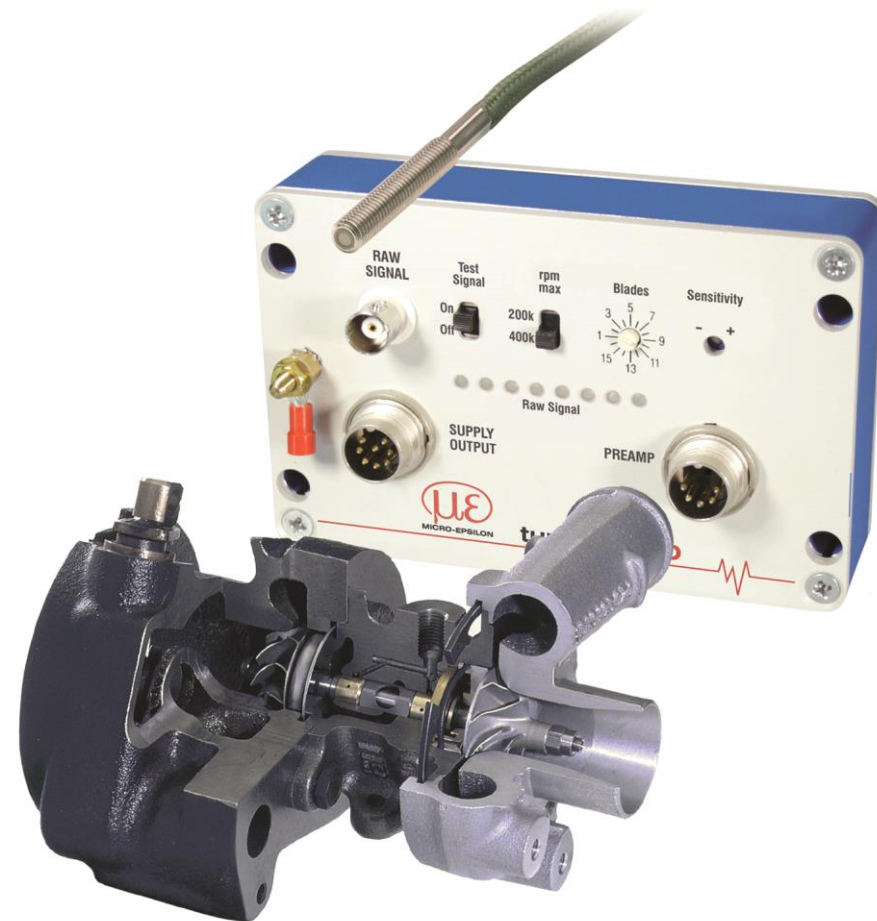
# Eddy current principle: turbo charger-speed

## turboSPEED DZ 136

Measuring system to detect speed in the turbo charger (test station, road trial)

- Speed detection 500 to 400.000r/min
- Miniature sensor  $\varnothing 3\text{mm}$
- Ideal for testers and road trials
- Highest interference resistance and accuracy
- Sensor can be easily changed avoiding further adjustment
- Integrated temperature measurement
- Operating temperature (sensors) to  $285^{\circ}\text{C}$

**NEW**





# Typical applications eddy current

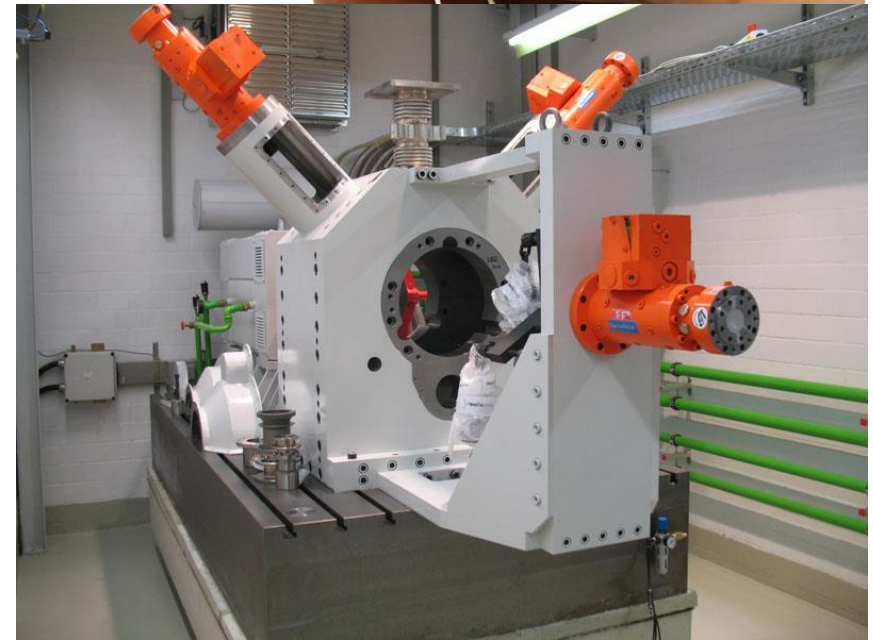
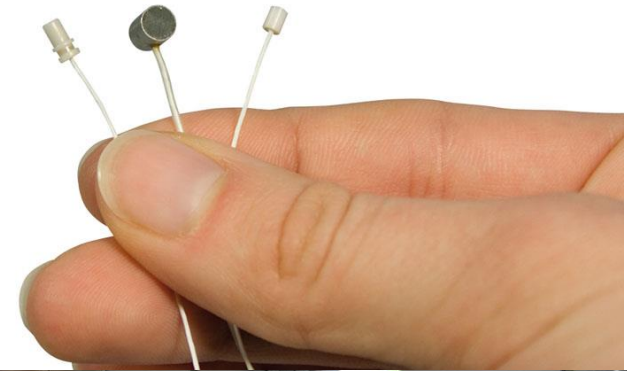
## Distance measurement in tribology testers

Distance between specimen and friction surface

- Very compact sensor design
- Proven application in numerous testers
- High resolution and accuracy
- Resistant to dirt and electromagnetic fields

Ambient conditions:

- Medium: oil, water or air
- High pressures
- Very confined installation possibilities

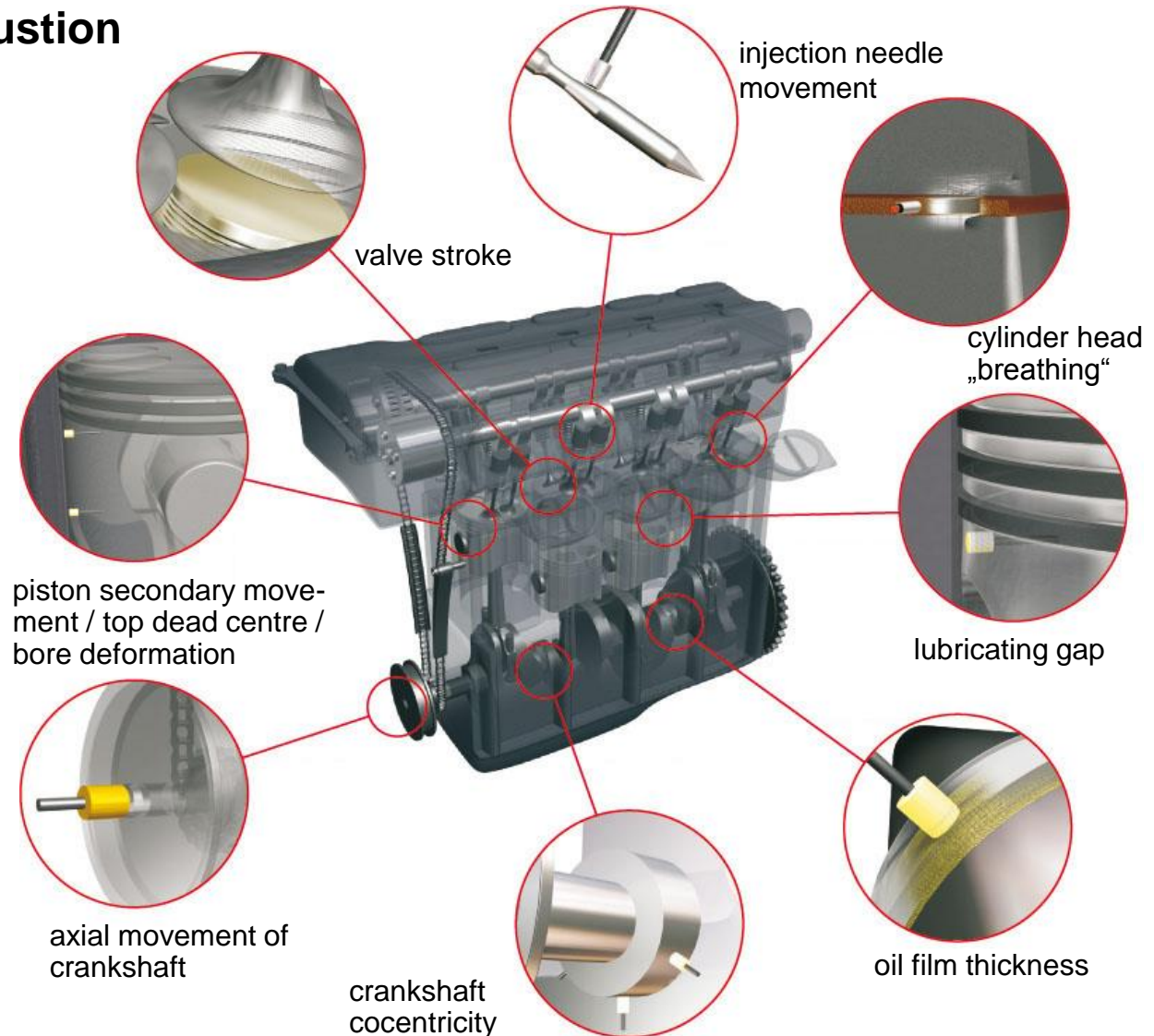


# Typical applications eddy current



MICRO-EPSILON  
MICRO-EPSILON

## Optimising combustion engines



# Typical applications eddy current

## Wobbling on the turbo charger

Shaft movement depending on speed

- Very high dynamics
- Compact sensor design
- Temperature stable to 150°C
- Resistant to oil and dirt

Ambient conditions:

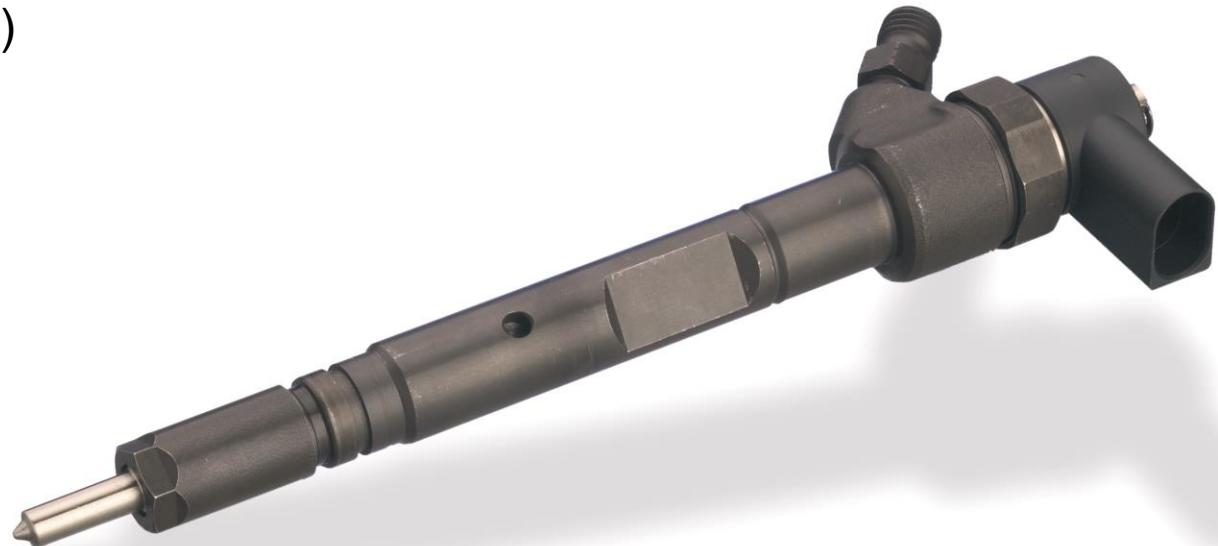
- Medium: air, oil mist
- Temperature to 150°C



## Measurement of injection needle movement

Precise measurement in the Common Rail Injector

- High temperature resistance
- Temperature compensated measurement
- System cannot be affected by electromagnetic fields (magnetic valve)
- Fuel resistance



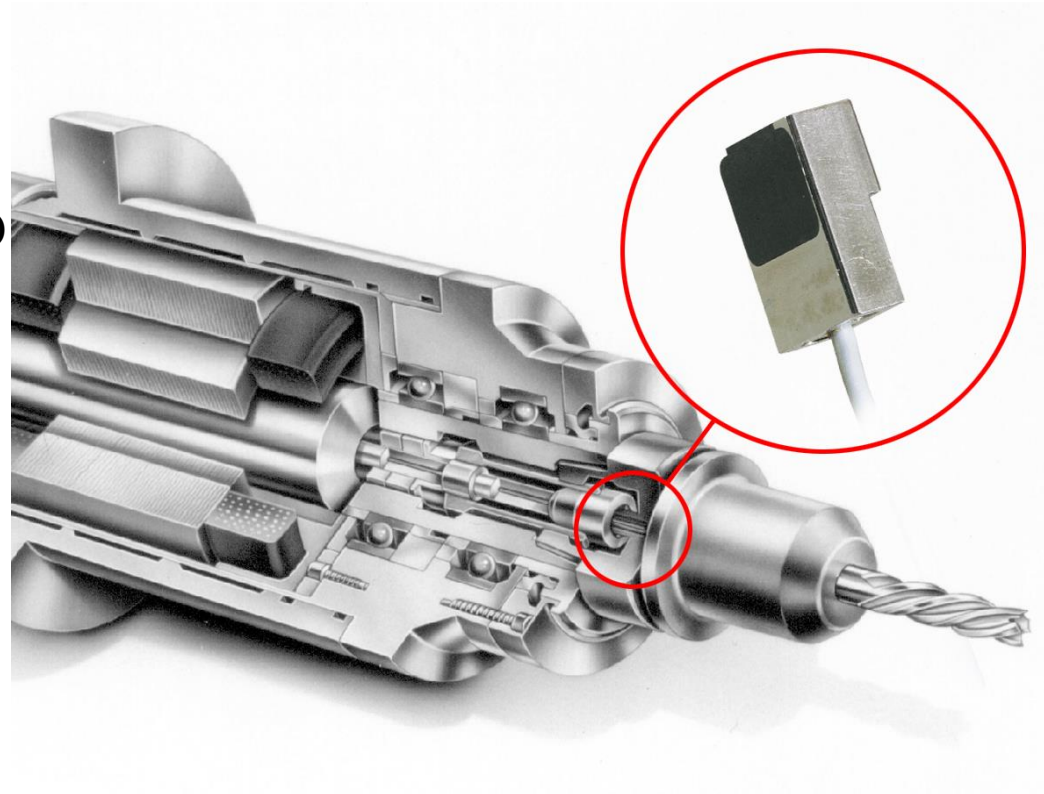


# Typical applications eddy current

## Compensation of the spindle growth

Material-independent displacement measurement in order to detect the spindle growth

- Measuring ranges  $400\mu\text{m}$
- Offset distance approx.  $100\mu\text{m}$
- Temperature stability  $0.01\%$  FSO
- Linearity  $5\mu\text{m}$
- Resolution  $1\mu\text{m}$
- Easy sensor exchange
- Independent of cable length





# Typical applications eddy current

## Sensors for aviation

Position measurement of flaps in the Airbus A350

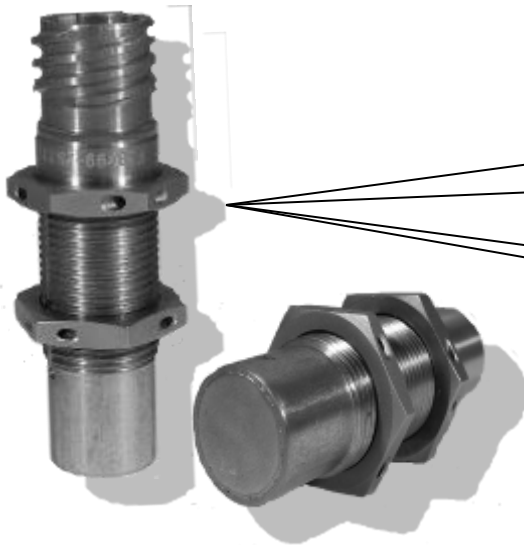


|                   |  |
|-------------------|--|
| Measurement range | 5,0mm                                    |
| Weight            | 39g                                      |
| Mounting          | flange                                   |
| Construction      | stainless steel, stainless               |
| Configuration     | two-wire model, passive proximity sensor |

# Typical applications eddy current

## Sensors for aerospace

Measurements regarding door lock switches, in landing gears and flaps in the Bombardier CSeries (approx. 70 sensors/aircraft)



|                 |                          |
|-----------------|--------------------------|
| Measuring range | 4,0mm                    |
| Weight          | 47g                      |
| Mounting        | thread                   |
| Construction    | stainless steel          |
| Conductor       | MIL-C -38999, series III |

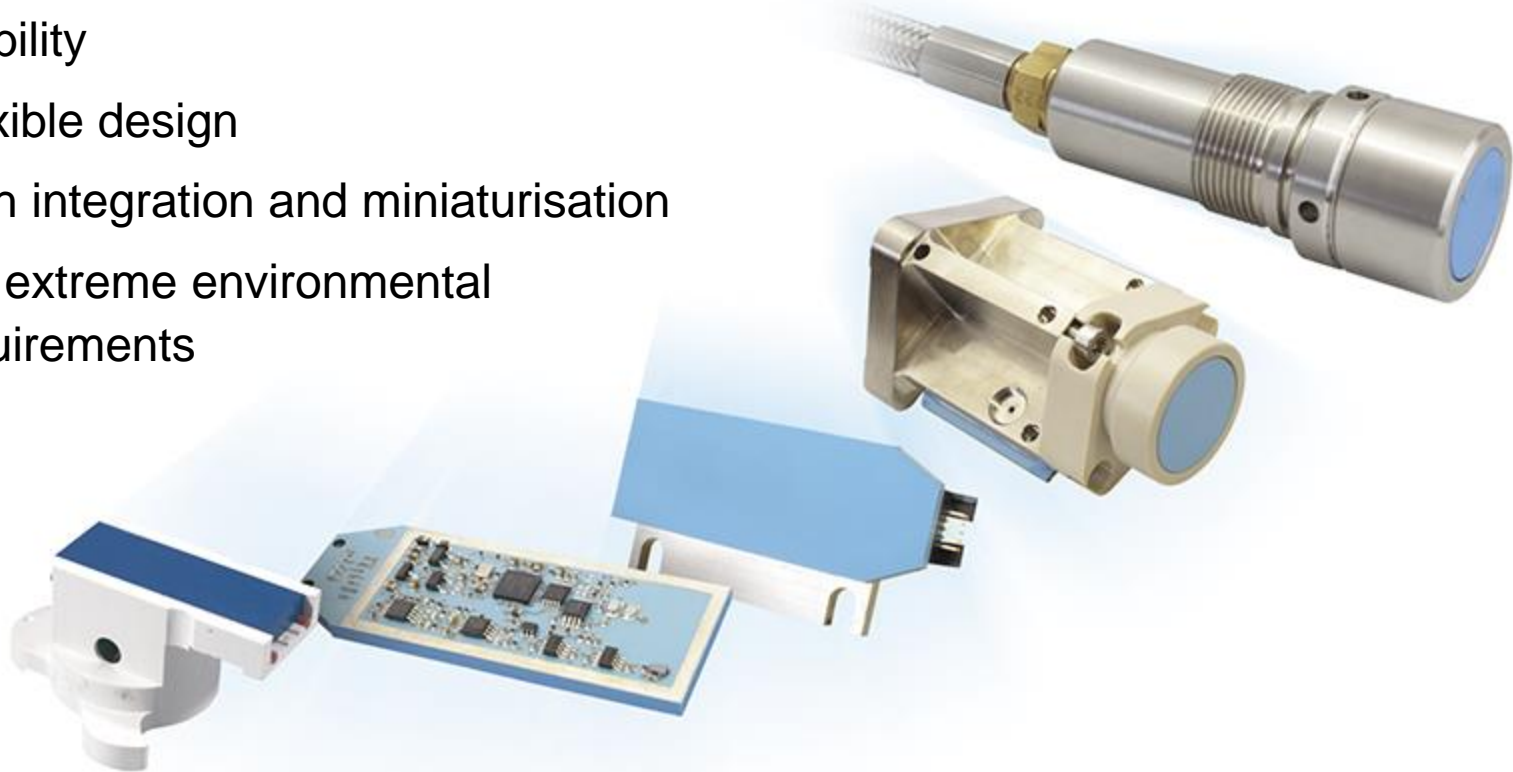
# **Eddy current innovations and novelties**

# ECT - Embedded Coil Technology

**Patented world novelty:**

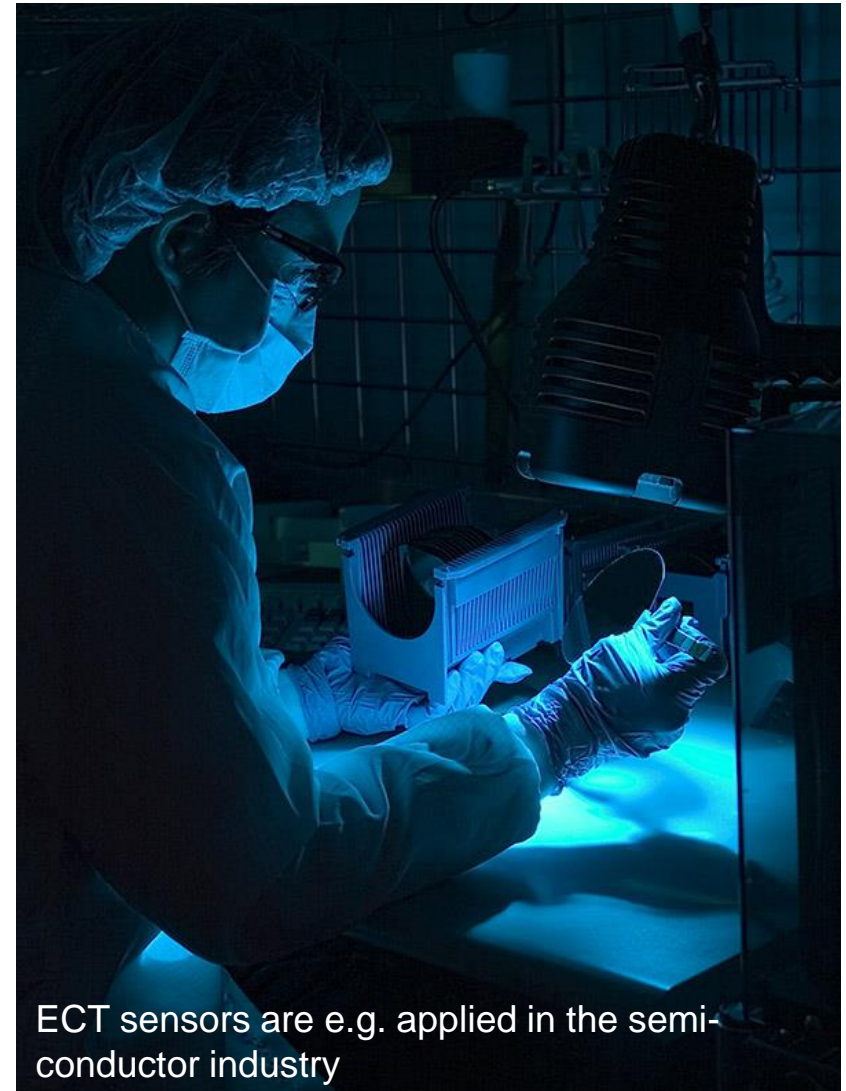
**The new generation of non-contact sensors**

- Temperature resistant
- Stability
- Flexible design
- High integration and miniaturisation
- For extreme environmental requirements



## Benefits

- High temperature resistant (350°C)
- Long-term and temperature stability  
repeatability
- Free shaping (integration of  
electronics and multi-sensors)
- Mechanical stability (pressure- and  
abrasion resistant)
- Vacuum suitable (UHV)
- Hermetically sealed, no outgassing



ECT sensors are e.g. applied in the semiconductor industry



## ECT sensors with integrated electronics

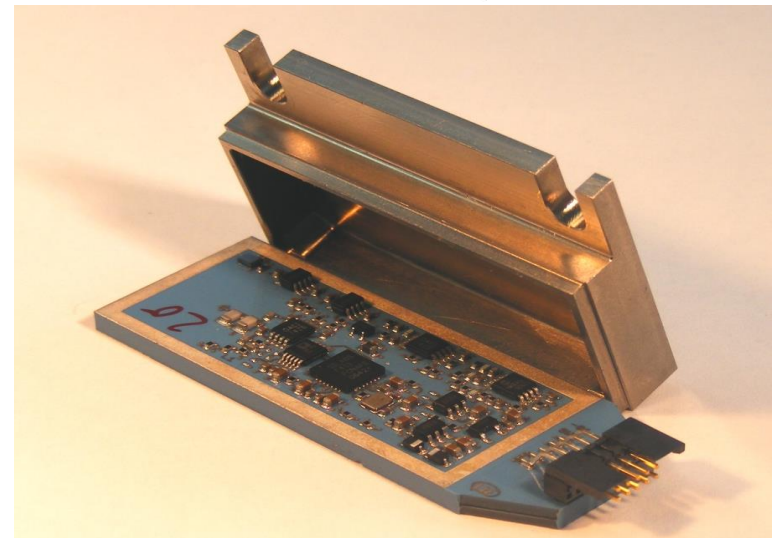
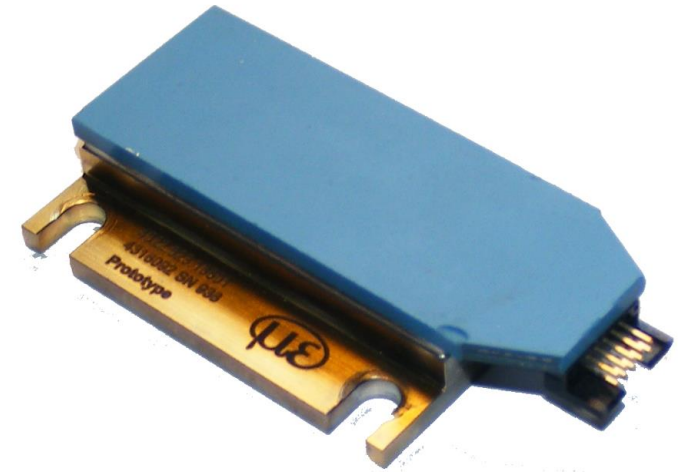
- Extreme EMV stability while avoiding cabling
- Hermetic housing
- Customised design
- Suitable for ultra-clean-vacuum

Measuring range 0.4 ... 5,2mm

Accuracy <0.2 %

Resolution 1 $\mu$ m@1kHz

Target aluminium



# Typical applications eddy current ECT

## Applications in the semiconductor industry Sensors in the immersion lithography machine



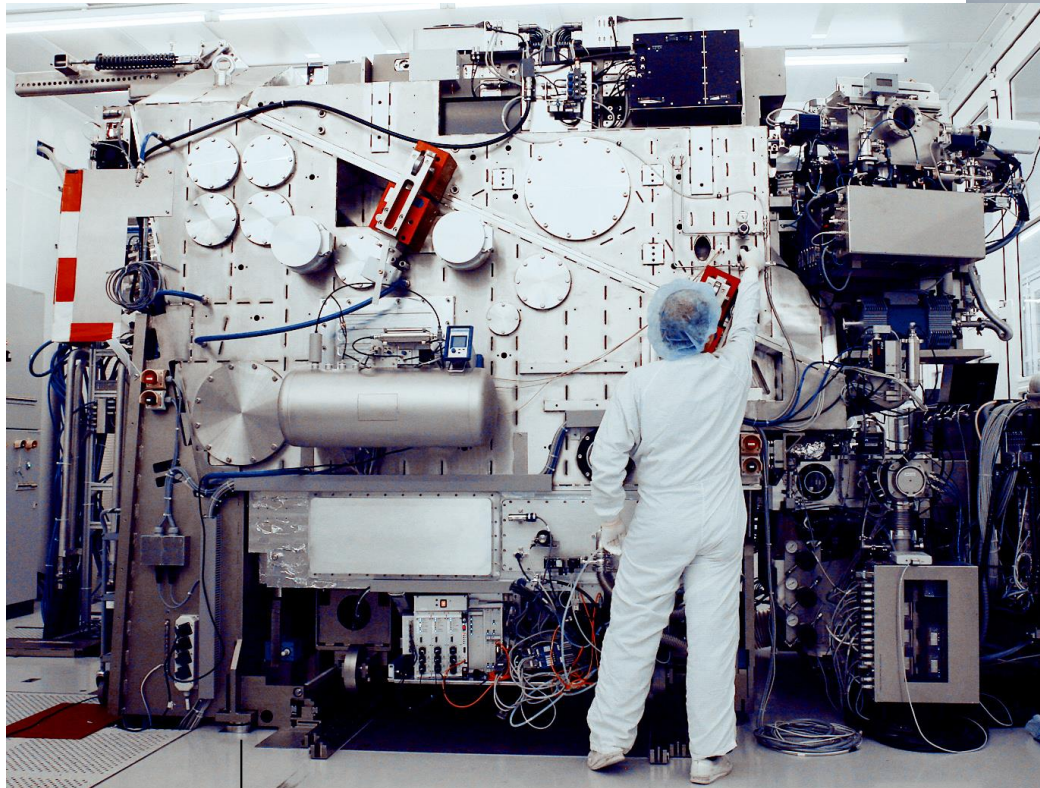
**Lense system**  
capacitive and  
eddy current

**Wafer stage**  
Balance mass  
Linear axis  
Long Stroke  
Short Stroke

# Typical applications eddy current ECT

## Applications in the semiconductor industry

Air bearing controlling in the active attenuator



air bearing



|                 |             |
|-----------------|-------------|
| Measuring range | 0 ... 5,0mm |
| Linearity       | 15µm        |
| Resolution      | <1µm        |
| Bandwidth       | 50Hz        |
| Repeatability   | < 2µm       |



# Typical applications eddy current ECT

## Mirror adjustment in the telescope

Adjustment of single mirror elements to each other

- High long-term stability
- Independent of air humidity
- Extreme temperature stability
- Easy mounting

|                       |         |
|-----------------------|---------|
| Measuring range       | 2mm     |
| Resolution            | <5nm    |
| Temperature stability | <50nm/K |

