Eddy current sensors for displacement, distance, and position

Non-contact eddy current sensors or inductive measurement systems also known as oscillation sensors, flatness sensor, position sensor, dislocation sensor, displacement sensor, distance sensor, small miniature sensors for measurement in motors, heavy industry, heat resistant, stable, robust, industry sensor, measurement system for motor optimisation, top dead centre of the piston, dislocation Needle Lift, fuel injection, spindle movement, thermal drift, axial movement of crankshaft, speed sensor for turbo chargers, gap, measurement system for elongation, also for customer-specific OEM sensors, automotive engineering test and test-rigs, automotive sensors

Eddy current and inductive measurement system and sensors with micrometer resolution for linear measurement and displacement, distance and position

Highest resolution
High repeatability
Ideal for OEM

non-contact eddy-current displacement and position measurement

OEM-Sensor-System eddyNCDT 3700
The measurement principle
Non-contact displacement sensors, series NCDT 3700 are based on the eddy current principle and are used for measurements against electrically conductive, non-ferromagnetic materials. A high frequency alternating current is fed through a coil embedded in a sensor housing. The electromagnetic field from the coil induces eddy currents in the conductive target. As a consequence, the alternating current resistance of the coil changes. This change of impedance produces an electrical signal proportional to the distance of the target to the sensor.

Highest resolution
Measurement results down to 0.09 nanometers (0.00000000009 m) have been established with eddyNCDT displacement sensors in the series 3700. The system has been specifically developed and rated for applications with high and ultra-high requirements of resolution.

Designed for OEMs
eddyNCDT 3700 is intended for use in production systems for machine monitoring as a customized system for OEM applications, particularly when extreme resolution is demanded. Due to the high repeatability the system can be further optimized by computed linearization. Positioning and closed-loop control tasks are solved with the highest precision.

TYPICAL APPLICATIONS:
- **Wafer**: Positioning in semiconductor manufacture
- **Photolithography**: Positioning of the exposure unit
- **VLT telescope**: Mirror positioning
- **Microscopy**: Positioning of the optical system
- **Target tracking**: Positioning of the optical system
- **Air-gap monitoring** in magnetic bearings
- **Spindle movement** in machine tools
- **Alignment** of stepper systems

ADVANTAGES
- extremely high resolution
- miniaturized design
- low current consumption
- versatile OEM system
- stable eddy current technique
## Technical data

### Sensor identification

For fastest order processing we need the exact sensor identification.

**eddyNCDT3701:**
- Single-channel system: one sensor; one output signal

**eddyNCDT3702:**
- Dual-channel system: two sensors; two separate, independent output signals

**eddyNCDT3703:**
- Differential system: two sensors; differential output

### Technical Data Table

<table>
<thead>
<tr>
<th>Model</th>
<th>Measuring range 1)</th>
<th>Reference distance / SMR</th>
<th>Sensor model 2)</th>
<th>Measurement target</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mm</td>
<td>mm</td>
<td>U1 U3 U6</td>
<td>non-ferromagnetic metal (reference: aluminum)</td>
</tr>
<tr>
<td></td>
<td>inch</td>
<td>inch</td>
<td>U1 U3 U6</td>
<td></td>
</tr>
<tr>
<td>DT3701-U1-A-C3</td>
<td>1 3 6</td>
<td>0.1 0.12 0.24</td>
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<td>0.1 0.3 1.0</td>
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<td>DT3701-U6-A-C3</td>
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<td>DT3702-U1-A-C3</td>
<td>1 3 6</td>
<td>0.04 0.12 0.24</td>
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<td>DT3702-U3-A-C3</td>
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<tr>
<th>Model</th>
<th>Frequency response (-3 dB)</th>
<th>Temperature range</th>
<th>Temperature stability (midrange)</th>
<th>Sensor cable length</th>
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<tr>
<td></td>
<td>10 kHz</td>
<td>controller: 10...60 °C (50...140 °F) / sensor/cable: -50...150 °C (-58...302 °F)</td>
<td>% FSO / °C</td>
<td>3 m ± 0.45 m (10 ft ± 1.5 ft)</td>
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<td>controller: 10...60 °C (50...140 °F): 0.025 % FSO / °C (0.014 % FSO / °F)</td>
<td>% FSO / °F</td>
<td>0.05 0.09 0.025</td>
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<td>sensors 0...100 °C (32...212 °F)</td>
<td>% FSO / °C</td>
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<tr>
<th>Model</th>
<th>Power supply</th>
<th>Electromagnetic compatibility</th>
<th>Vibration controller</th>
<th>Shock controller</th>
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<td>12.5...30 V / 30 mA</td>
<td>acc. EN 60068-2-6 (noise)</td>
<td>EN 60068-2-29 (permanent shock)</td>
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<td>12.5...30 V / 50 mA</td>
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<td></td>
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<td></td>
<td>12.5...30 V / 30 mA</td>
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</table>

All data apply for aluminum at 20 °C.

FSO = Full Scale Output  SMR = Start Measuring Range
1) Smaller / larger measuring range for OEM applications on request.
2) Matched sensor designs for OEM applications on request (more than 500 different sensor models available).
3) -2.5 ... 0 V / -2.5 ... 2.5 V / -2.5 ... 5 V / -2.5 ... 10 V / 0 ... 2.5 V / 0 ... 5 V / 4 ... 20 mA for OEM on request.

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**eddyNCDT3701:**
- Single-channel system: one sensor; one output signal

**eddyNCDT3702:**
- Dual-channel system: two sensors; two separate, independent output signals

**eddyNCDT3703:**
- Differential system: two sensors; differential output

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### Sensor Identification Diagram

- **electronics**
  - 1 = single-channel system
  - 2 = dual-channel system
  - 3 = differential system

- **sensor**
  - A = non-ferromagnetic

- **cable length** in m
**Dimensions and mounting** Dimensions in mm (inch), not to scale - all inches are rounded

**Mounting instructions**

Standard mounting of the sensor and ideal target size

The unshielded sensors U1, U3 and U6 are designed with a coil located directly behind the face of a non-metallic cylinder. They provide maximum sensitivity in non-flush installations. In the radial environment any metallic components must be kept away.

**Sensors**

- **U1**
  - Thread M5 x 0.8
  - Front face Ø4 mm (.16")
  - Wrench size 8 mm (.31")
  - Length 20 mm (.79")
  - Integral cable 3 m

- **U3**
  - Thread M12 x 1
  - Front face Ø9 mm (.35")
  - Wrench size 19 mm (.75")
  - Length 20 mm (.79")
  - SMC-plug connection

- **U6**
  - Thread M18 x 1
  - Front face Ø14 mm (.55")
  - Wrench size 27 mm (1.06")
  - Length 25 mm (.98")
  - SMC-Plug connection

**Accessories:**

- **PC 3701-3** for DT 3701 and DT 3703
  - Supply and output cable, 3 m long

- **PC 3702-3** for DT 3702

- **MC 25D** Micrometer calibration device
  - Adjustment range 0 to 25 mm (0 to .98 "), Readout 1 µm

- **PS 2010** Power supply unit mounting on DIN rail (DIN 50022)
  - Input 115/230 VAC switchable
  - Output 24 VDC / 2.5 A
  - L/B/H 120 x 20 x 40 mm (4.72 x 0.79 x 1.57 ")

- **DD 800** Digital display unit, programable

**Notes:**

- Dimensions and mounting instructions are not to scale.
- All inches are rounded.
- Modifications reserved / Y9761134-B020018JKR

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