More Precision

induSENSOR // Linear inductive displacement sensors
LVDT displacement sensors have a plunger which moves freely in the sensor housing. The plunger is joined to the object by a thread to transfer the movement of the measurement object. The measurement process in the sensor takes place without contact and is therefore wear-free. The displacement sensors are mainly used to measure and monitor movements, displacements, positions, strokes, deflections, dislocations, etc. in vehicles, machines and systems.

The high sensor resolution is limited only by the noise in the sensor electronics. A further advantage of the symmetrically constructed sensors in the LVDT series is the zero point stability of the systems. The sensors are supplied with an excitation frequency of 1 to 5 kHz depending on the measuring range and an excitation amplitude of 2.5 to 5 V eff. Matched sensor electronics are available in this respect.

With appropriate setting possibilities for the excitation frequency and amplitude, the sensors can also be operated with alternative electronics.

### Article designation

<table>
<thead>
<tr>
<th>DT</th>
<th>A-</th>
<th>10-</th>
<th>D-</th>
<th>3-</th>
<th>CA-</th>
<th>W</th>
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<tr>
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<td>Options (on request):</td>
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<td></td>
<td>W Welded sensor housing (water proof up to 5 bar)</td>
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<td>P Pressure-resistant sensors housing with tightness test (up to 100 bar)</td>
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<td>F Pressure-resistant mounting flange O-ring seal</td>
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<td></td>
<td>H High-temperature sensor models up to 200 °C with integral Teflon cable (only for sensor models with -CA/-CR connections)</td>
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<td></td>
<td>CA integral cable (3 m)</td>
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<td></td>
<td>SA plug-in connection</td>
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<td>Radial connections</td>
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<td>SR plug-in connection</td>
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<tr>
<td>Linearity:</td>
<td>5 (± 0.5 %)</td>
<td>3 (± 0.3 %)</td>
<td>1.5 (± 0.15 %)</td>
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<td></td>
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<tr>
<td>Function:</td>
<td>displacement sensor</td>
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<tr>
<td>Measuring range in mm</td>
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</tr>
<tr>
<td>Excitation</td>
<td>AC</td>
<td></td>
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</table>

**Principle:** Differential Transformer (LVDT)
### Model Specifications

<table>
<thead>
<tr>
<th>Model</th>
<th>DTA-1D-</th>
<th>DTA-3D-</th>
<th>DTA-5D-</th>
<th>DTA-10D-</th>
<th>DTA-15D-</th>
<th>DTA-25D-</th>
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<tr>
<td>Connection</td>
<td>CA</td>
<td>SA</td>
<td>CA</td>
<td>SA</td>
<td>CA</td>
<td>CR</td>
</tr>
<tr>
<td>Measuring range</td>
<td>± 1 mm</td>
<td>± 3 mm</td>
<td>± 5 mm</td>
<td>± 10 mm</td>
<td>± 15 mm</td>
<td>± 25 mm</td>
</tr>
<tr>
<td>Linearity</td>
<td>Standard ± 0.5 %</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>Standard ± 0.3 %</td>
<td>6 µm</td>
<td>18 µm</td>
<td>30 µm</td>
<td>60 µm</td>
<td>90 µm</td>
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<td></td>
<td>Option ± 0.15 %</td>
<td>3 µm</td>
<td>9 µm</td>
<td>15 µm</td>
<td>-</td>
<td>on request</td>
</tr>
<tr>
<td>Excitation frequency</td>
<td>5 kHz</td>
<td>2 kHz</td>
<td>1 kHz</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Excitation amplitude</td>
<td>5 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td>2.5 V&lt;sub&gt;eff&lt;/sub&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity</td>
<td>133 mV/Vmm</td>
<td>85 mV/Vmm</td>
<td>53 mV/Vmm</td>
<td>44 mV/Vmm</td>
<td>45 mV/Vmm</td>
<td>33 mV/Vmm</td>
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<tr>
<td>Temperature range</td>
<td>-20 °C to +80 °C</td>
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<td></td>
<td></td>
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<tr>
<td>Storage temperature</td>
<td>-40 °C to +80 °C</td>
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<tr>
<td>Temperature stability</td>
<td>±70 ppm/°C</td>
<td>±150 ppm/°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zero</td>
<td></td>
<td>70 ppm/°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. temp. error</td>
<td></td>
<td>150 ppm/°C</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensor housing</td>
<td>stainless steel including magnetic shielding</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum cable bending radius</td>
<td>20 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outer diameter (cable)</td>
<td>-4.6 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Protection class</td>
<td>IP 67</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Shock</td>
<td>40 g, 1000 shocks / axis</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Vibration</td>
<td>100 g, 3 shocks / direction</td>
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<tr>
<td>Suitable controller</td>
<td>MSC7401 (pages 10 - 11)</td>
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</tr>
</tbody>
</table>

### Sensor Types

- **Type - CA** with integral cable
- **Type - SA** with axial plug connection
- **Type - CR** with integral cable (radial)
- **Type - SR** with radial plug connection
- **Type - SA** with axial plug connection

### Basic Model

<table>
<thead>
<tr>
<th>Model</th>
<th>DTA-1D-</th>
<th>DTA-3D-</th>
<th>DTA-5D-</th>
<th>DTA-10D-</th>
<th>DTA-15D-</th>
<th>DTA-25D-</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection</td>
<td>CA</td>
<td>SA</td>
<td>CA</td>
<td>SA</td>
<td>CA</td>
<td>CR</td>
</tr>
<tr>
<td>Housing length</td>
<td>40 mm</td>
<td>40 mm</td>
<td>57 mm</td>
<td>57 mm</td>
<td>73 mm</td>
<td>87 mm</td>
</tr>
<tr>
<td>Plunger length</td>
<td>19 mm</td>
<td>29 mm</td>
<td>30 mm</td>
<td>35 mm</td>
<td>35 mm</td>
<td>35 mm</td>
</tr>
<tr>
<td>Housing diameter</td>
<td>10 mm</td>
<td>20 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:**

- 1) Higher temperatures on request
- 2) Higher pressures on request
- 3) Determined according to box method (-40 ... +80 °C)
- 4) Plunger in zero position (± 10% of measuring range ± 1 mm)

### Female Connector Dimensions

- **Female connector dimensions apply for all models**

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**Figures:**

- Diagrams of sensor types with measuring ranges up to ±10 mm (inner diameter 2.7 mm; plunger diameter 2 mm)
- Diagrams of sensor types with measuring ranges ±15 mm and ±25 mm (inner diameter 4.8 mm; plunger diameter 4 mm)

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**Dimensions:**

- Outer diameter (cable) ~4.6 mm
- Minimum cable bending radius 20 mm
- Housing diameter 10 mm
- Housing length 40 mm
- Plunger length 19 mm
- Female connector dimensions apply for all models

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**Cables:**

- Outer diameter ~4.6 mm
- Minimum cable bending radius 20 mm
- Housing diameter 10 mm

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**Suitable Controller:**

- MSC7401 (pages 10 - 11)
The new MSC7401 controller is designed to be operated with LVDT and LDR measuring gauges and displacement sensors. Due to its robust aluminum housing protected to IP67, this single-channel controller is predestined for industrial measurement tasks. A large variety of compatible, inductive displacement sensors and gauges from Micro-Epsilon combined with an optimized price/performance ratio opens up numerous fields of applications in automation technology and machine building. The controller is easily set up using buttons or software.

Exemplary configuration
MSC7401 with DTA-5G8-3-CA gauge:

<table>
<thead>
<tr>
<th>Technical Data</th>
<th>Channel with DTA-5G8-3-CA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>± 5 mm</td>
</tr>
<tr>
<td>Linearity</td>
<td>30 µm</td>
</tr>
<tr>
<td>Resolution</td>
<td>~1.2 µm</td>
</tr>
<tr>
<td>Output</td>
<td>analog</td>
</tr>
</tbody>
</table>
**Model**  | **MSC7401 Miniature sensor controller**
---|---
Power supply | 5 V \(...\) 14 V \(...\) 30 V
Protection | reverse polarity protection, overvoltage protection
Sensor principle | full-bridge sensor/LVDT (DTA series) and half-bridge sensor (LDR series)
Input impedance (sensor) | > 100 kOhm
Gain | adjustable via buttons or software
Zero | 
Output signal (adjustable) | (0)2 \(...\) 10 VDC / 0.5 \(...\) 4.5 V / 0 \(...\) 5 V (Ra > 1 kOhm) or (0)4 \(...\) 20 mA (load < 500 Ohm)

### Resolution

<table>
<thead>
<tr>
<th><strong>Resolution</strong></th>
<th><strong>DTA series</strong></th>
<th><strong>LDR series</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>12 bits</td>
<td>(0.024 % FSO) at 50 Hz</td>
<td>(0.048 % FSO) at 300 Hz</td>
</tr>
<tr>
<td>13 bits</td>
<td>(0.012 % FSO) at 50 Hz</td>
<td></td>
</tr>
</tbody>
</table>

### Linearity

- **DTA series**: ±100 ppm FSO/K
- **LDR series**: ±125 ppm FSO/K

### Frequency response

- (only adjustable via software): 300 Hz (-3dB)

### Storage

-40 \(...\) +85 °C

### Operation

-40 \(...\) +85 °C

### Temperature stability

- **DTA series**: ±100 ppm FSO/K
- **LDR series**: ±125 ppm FSO/K

### Protection class

IP67

### Weight

approx. 200 g

### Housing material

aluminum die casting

### Connection

**Sensor connector:**
- M12x1.5 cable gland; WS15
- Clamping range 1mm...5mm
- Alternative (option 010):
  - M9 5-pole socket, series 712 (Binder)

**Supply and signal connector:**
- M16x1.5 cable gland; WS19
- Clamping range 4.5mm...10mm
- Alternative (option 010):
  - M12x1 plug; 5 poles

**Connector power supply:** M12x1 plug (5 poles); sensor: M9 socket; 5 poles (Binder)

### EMC

DIN EN 61326-1; DIN EN 61326-2-3

### Vibration

DIN EN 60068-2-6

### Shock

DIN EN 60068-2-27 (40g, 6ms, 1000 per axis)

- FSO = Full Scale Output
- 1) Restricted with load and signal span
- 2) Noise: AC RMS measurement via RC low-pass filter of the 1st order with fc = 5 kHz

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**Updated Diagram:**

- Sensor connector:
  - M12x1.5 cable gland; WS15
  - Clamping range 1mm...5mm
  - Alternative (option 010):
    - M9 5-pole socket, series 712 (Binder)
- Supply and signal connector:
  - M16x1.5 cable gland; WS19
  - Clamping range 4.5mm...10mm
  - Alternative (option 010):
    - M12x1 plug; 5 poles
General accessories
2960031 MC25D Digital micrometer calibration fixture
2420062 PS2020 Power supply on DIN rail, input 100 - 240 VAC, output 24 VDC / 2.5 A
2984026 Function and linearity inspection certificate incl. protocol with listed measurement data of the linearity inspection and documentation
2213034 IP7001 single-channel USB/RS485 converter

Accessories for LDR series
Connection cables
0157047 C7210-5/3 Sensor cable, 5 m, with cable connector
0157048 C7210/90-5/3 Sensor cable, 5 m, with 90° cable connector

Supply cable
2901087 PC710-6/4 Supply/output cable, 6 m

Spare plungers
0800136 LDR-10 Spare plunger
0800137 LDR-25 Spare plunger
0800138 LDR-50 Spare plunger

Service
Connector installation and adjustment

Accessories for EDS series
Service
2985001 Function and linearity inspection for EDS series incl. pressure inspection and documentation without recalibration

Connection cables
0157043 C703-5 VIP/LVP/EDS 7-pin connection cable for S series, 5 m
2902084 C703-5/U VIP/LVP/EDS 7-pin connection cable for S series, 5 m for voltage output 1 - 5 V
0157050 C703/90-5 VIP/LVP/EDS 7-pin connection cable for S series, 5 m with 90° cable connector
2901143 C705-5 VIP/LVP/EDS 5-pin connection cable for F series, 5 m
2901160 C705-15 VIP/LVP/EDS 5-pin connection cable for F series, 15 m

Installation ring
0483326 EDS mounting ring
Accessories for LVDT series

Sensor cables

- 2902004 C701-3: Sensor cable, 3 m, with cable connector and tin-plated free ends
- 2902013 C701-6: Sensor cable, 6 m, with cable connector and tin-plated free ends
- 2902009 C701/90-3: Sensor cable, 3 m, with 90° cable connector and tin-plated free ends
- 2213034 IF7001: Single-channel USB/RS485 converter for MSC7xxx

Service

- 2981010: Connector installation and calibration

Connection cables

- 2901087 FC710-6/4: Supply/output cable, 6 m, open ends
- 29011154 PC5/5-IWT: Supply/output cable, 5 m, open ends/M12

Spare plungers

- 0800001 DTA-1D: Spare plunger
- 0800002 DTA-3D: Spare plunger
- 0800003 DTA-5D: Spare plunger
- 0800004 DTA-10D: Spare plunger
- 0800005 DTA-15D: Spare plunger
- 0800006 DTA-25D: Spare plunger

Flanges

- 0483090.01 DTA-F10: Mounting flange, slotted for DTA-1D, DTA-3D, DTA-5D, DTA-10D
- 0483083.02 DTA-F20: Mounting flange, slotted for DTA-15D, DTA-25D

Probe tips

- 0459002: Type 2
- 0459001: Type 2 (hard metal)
- 0459003: Type 11
- 0459004: Type 13

Standard probe tip: type 2  Option: type 11  Option: type 13

Flange DTA-F10

Flange DTA-F20
High performance sensors made by Micro-Epsilon

Sensors and systems for displacement and position

Sensors and measurement devices for non-contact temperature measurement

2D/3D profile sensors (laser scanner)

Optical micrometers, fiber optic sensors and fiber optics

Color recognition sensors, LED analyzers and color inline spectrometer

Measurement and inspection systems