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

**Principle:** Differential Transformer (LVDT)
Model DTA-1D- DTA-3D- DTA-5D- DTA-10D- DTA-15D- DTA-25D-

Connection CA SA CA SA CA SA CA CR SA SR CA CR SA SR

Measuring range ± 1 mm ± 3 mm ± 5 mm ± 10 mm ± 15 mm ± 25 mm

Linearity Standard ± 0.5 % - - - - - 300 µm

Standard ± 0.3 % 6 µm 18 µm 30 µm 60 µm 90 µm on request

Option ± 0.15 % 3 µm 9 µm 15 µm - - -

Excitation frequency 5 kHz 2 kHz 1 kHz

Excitation amplitude 5 V_{eff} 2.5 V_{eff}

Sensitivity 133 mV/V\text{mm} 85 mV/V\text{mm} 53 mV/V\text{mm} 44 mV/V\text{mm} 45 mV/V\text{mm} 33 mV/V\text{mm}

Temperature range -20 ... +80 °C \text{1)}

Storage temperature -40 ... +80 °C

Temperature stability \text{2)}

Sensor housing stainless steel including magnetic shielding

Minimum cable bending radius 20 mm

Outer diameter (cable) - 4.6 mm

Protection class IP 67 \text{3)}

Shock 40 g, 1000 shocks / axis

Vibration 10 ... 58 Hz ± 1.5 mm / 58 ... 500 Hz ± 20 g

Suitable controller MSC7401 (pages 10 - 11)

FSO = Full Scale Output

1) Higher temperatures on request

2) Higher pressures on request

3) Determined according to box method (-40 ... +80 °C)

Sensor types with measuring range up to ± 10 mm (inner diameter 2.7 mm; plunger diameter 2 mm)

Sensor types with measuring range ± 15 mm and ± 25 mm (inner diameter 4.8 mm; plunger diameter 4 mm)

Type - CA with integral cable

Type - CR with integral cable (radial)

Type - SR with radial plug connection

Type - SA with axial plug connection

Basic model DTA-1D- DTA-3D- DTA-5D- DTA-10D- DTA-15D- DTA-25D-

Connection CA SA CA SA CA SA CA CR SA SR CA CR SA SR

Housing length L 40 mm 40 mm 57 mm 57 mm 73 mm 73 mm 87 mm 87 mm 106.5 mm 143.5 mm

Plunger length \text{1)} 19 mm 29 mm 30 mm 35 mm 51 mm 62 mm

Housing diameter 10 mm 20 mm

\text{1)} Plunger in zero position (±10% of measuring range ±1 mm)

Female connector 90° dimensions apply for all models

~40

~63

Female connector dimensions apply for all models

~40

~36
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

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power supply</td>
<td>5 V ... 14 V ... 30 V</td>
</tr>
<tr>
<td>Protection</td>
<td>reverse polarity protection, overvoltage protection</td>
</tr>
<tr>
<td>Sensor principle</td>
<td>full-bridge sensor/LVDT (DTA series) and half-bridge sensor (LDR series)</td>
</tr>
<tr>
<td>Input impedance (sensor)</td>
<td>&gt; 100 kOhm</td>
</tr>
<tr>
<td>Gain</td>
<td>adjustable via buttons or software</td>
</tr>
<tr>
<td>Zero</td>
<td></td>
</tr>
<tr>
<td>Output signal (adjustable)</td>
<td>(0)2 ... 10 VDC / 0.5 ... 4.5 V / 0 ... 5 V (Ra &gt; 1 kOhm) or (0)4 ... 20 mA (load &lt; 500 Ohm)</td>
</tr>
<tr>
<td>Resolution 1)</td>
<td>DTA series 13 bits (0.012 % FSO) at 50 Hz</td>
</tr>
<tr>
<td></td>
<td>12 bits (0.024 % FSO) at 300 Hz</td>
</tr>
<tr>
<td></td>
<td>LDR series 12 bits (0.024 % FSO) at 50 Hz</td>
</tr>
<tr>
<td></td>
<td>11 bits (0.048 % FSO) at 300 Hz</td>
</tr>
<tr>
<td>Linearity</td>
<td>0.02 % FSO</td>
</tr>
<tr>
<td>Frequency response</td>
<td>(only adjustable via software)</td>
</tr>
<tr>
<td></td>
<td>300 Hz (-3dB)</td>
</tr>
<tr>
<td>Storage</td>
<td>-40 ... +85 °C</td>
</tr>
<tr>
<td>Operation</td>
<td>-40 ... +85 °C</td>
</tr>
<tr>
<td>Temperature stability</td>
<td>DTA series ±100 ppm FSO/K</td>
</tr>
<tr>
<td></td>
<td>LDR series ±125 ppm FSO/K</td>
</tr>
<tr>
<td>Protection class</td>
<td>IP67</td>
</tr>
<tr>
<td>Weight</td>
<td>approx. 200 g</td>
</tr>
<tr>
<td>Housing material</td>
<td>aluminum die casting</td>
</tr>
<tr>
<td>Connection</td>
<td>Cable gland: screw terminal; AWG 16 to AWG 24; with ferrule up to AWG 28</td>
</tr>
<tr>
<td></td>
<td>Connector: power supply: M12x1 plug (5 poles); sensor: M9 socket; 5 poles (Binder)</td>
</tr>
<tr>
<td>EMC</td>
<td>DIN EN 61326-1; DIN EN 61326-2-3</td>
</tr>
<tr>
<td>Vibration</td>
<td>DIN EN60068-2-6</td>
</tr>
<tr>
<td>Shock</td>
<td>DIN EN 60068-2-27 (40g, 6ms, 1000 per axis)</td>
</tr>
<tr>
<td></td>
<td>DIN EN 60068-2-27 (100g, 6ms, 3 per axis)</td>
</tr>
</tbody>
</table>

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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![Diagram of the sensor controller](image-url)
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 IF7001 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 PC710-6/4 Supply/output cable, 6 m, open ends
29011154 PC5/5-WT 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
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