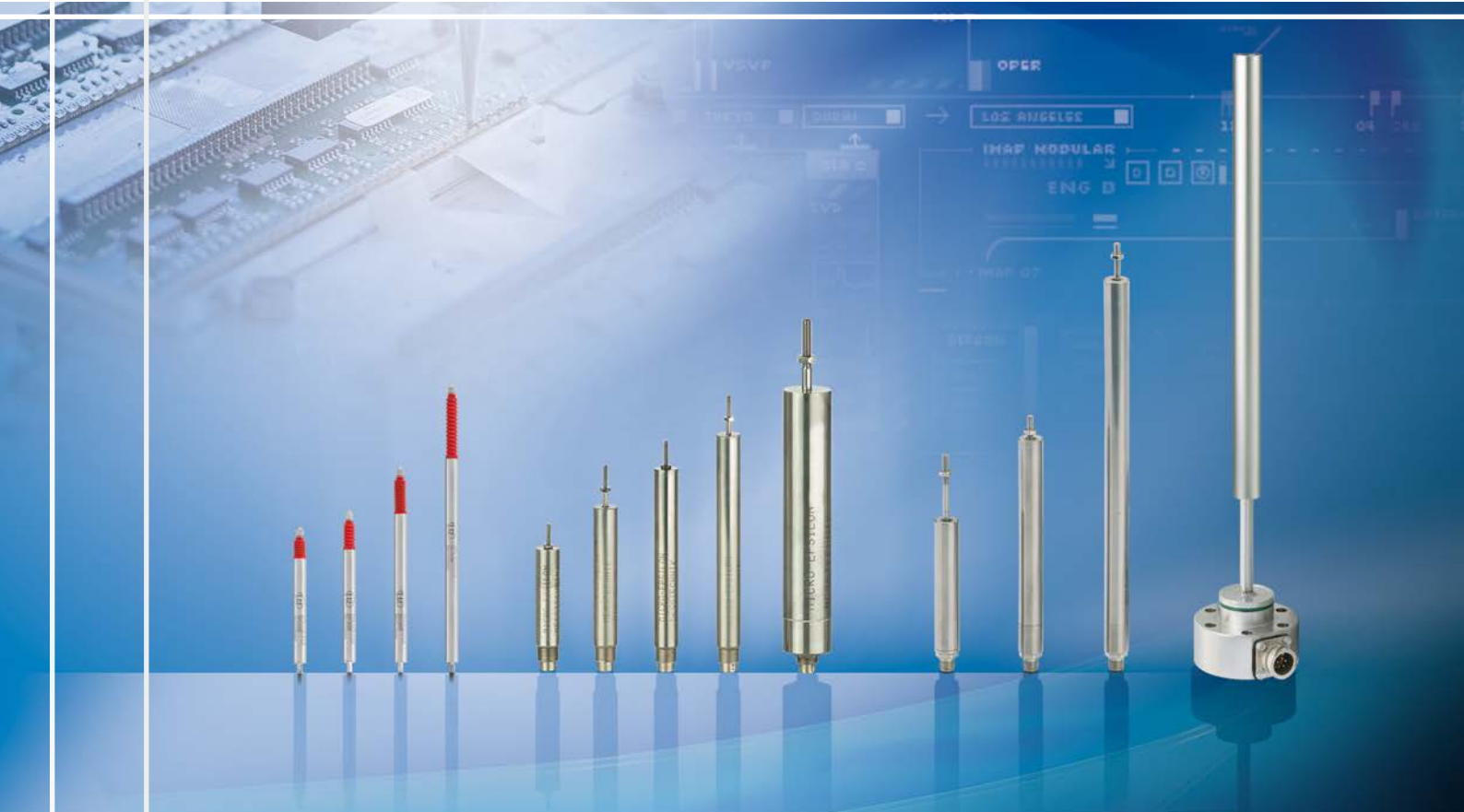


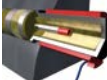


# More Precision

**induSENSOR** // Linear inductive displacement sensors





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### Inductive displacement sensors with more precision

Electromagnetic displacement sensors from Micro-Epsilon are used extensively in applications for automated processes, quality assurance, test rigs, hydraulics, pneumatic cylinders, and automotive engineering. The advantages of these displacement sensors are well known and highly valued, and include ruggedness, reliability under harsh conditions, high signal quality and good temperature stability. The electromagnetic sensors of the induSENSOR series are based on the well-proven inductive and eddy current principle. They are used successfully both in single and high volume OEM applications.

|                          |                    | LVDT<br>Gauges | LVDT<br>Displacement Sensors | LDR Sensors | EDS Sensors |
|--------------------------|--------------------|----------------|------------------------------|-------------|-------------|
| Measurement principle    | LVDT               | ■              | ■                            |             |             |
|                          | LDR                |                |                              | ■           |             |
|                          | EDS                |                |                              |             | ■           |
| Controller               | integrated         |                |                              |             | ■           |
|                          | external           | ■              | ■                            | ■           |             |
| Measuring range          | up to 5mm          | ■              | ■                            | ■           |             |
|                          | up to 20mm         | ■              |                              |             |             |
|                          | up to 50mm         |                | ■                            | ■           |             |
|                          | up to 100mm        |                |                              |             | ■           |
|                          | up to 150mm        |                |                              |             | ■           |
|                          | up to 200mm        |                |                              |             | ■           |
|                          | up to 300mm        |                |                              |             | ■           |
|                          | up to 400mm        |                |                              |             | ■           |
|                          | up to 630mm        |                |                              |             | ■           |
| Target                   | plunger            |                | ■                            | ■           |             |
|                          | gauge              | ■              |                              |             |             |
|                          | pipe               |                |                              |             | ■           |
| Max. ambient temperature | up to 85°C         | ■              |                              |             | ■           |
|                          | up to 150°C        |                | ■                            | ■           |             |
|                          | Option up to 200°C |                | ■                            |             |             |
| Max. ambient pressure    | ≤ 100bar           |                | ■                            |             |             |
|                          | ≤ 450bar           |                |                              |             | ■           |
| Output signal            | 4 ... 20mA         | ■              | ■                            | ■           | ■           |
|                          | 0.5 ... 4.5VDC     |                |                              |             | ■           |
|                          | 0/2 ... 10VDC      | ■              | ■                            | ■           |             |



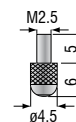
- Proven LVDT technology
- Measuring ranges  $\pm 1 \dots \pm 10\text{mm}$
- Excellent price/performance ratio, especially for high volume applications
- Sensor diameter  $\varnothing 8\text{mm}$
- Version with pneumatic push

LVDT gauging sensors DTA-xG8 are primarily used for the measurement and inspection of work-piece geometry (length, width, diameter, thickness, depth, height).

These new gauges are available in two basic versions: feather or pneumatic. The entire housing has a diameter of 8mm. All gauges include a cable that extends axially from the housing. Due to its special design, this series offers a very attractive price/performance ratio, especially for high volumes.

#### Probe tips

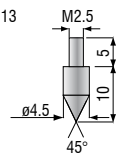
Standard: type 2



Option: type 11



Option: type 13



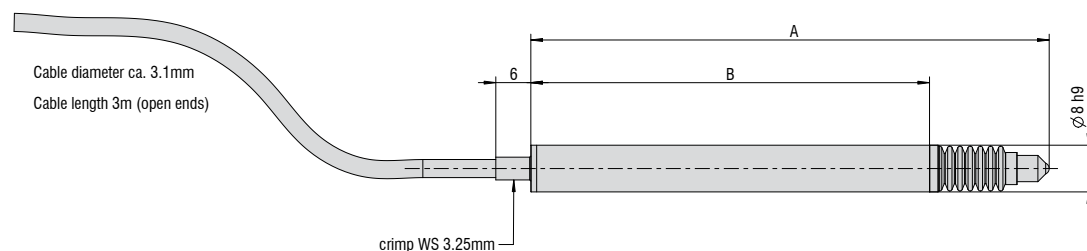
#### Article

| DT | A- | 5- | G8- | 3- | CA- | V                                             |
|----|----|----|-----|----|-----|-----------------------------------------------|
|    |    |    |     |    |     | Gauging sensor option:<br>pneumatic push      |
|    |    |    |     |    |     | Connection (axial):<br>CA integral cable (3m) |
|    |    |    |     |    |     | Linearity: 3 ( $\pm 0.3\%$ )                  |
|    |    |    |     |    |     | Function: gauging sensor                      |
|    |    |    |     |    |     | Measuring range $\pm \text{mm}$               |
|    |    |    |     |    |     | Excitation AC                                 |
|    |    |    |     |    |     | Principle: differential transformer (LVDT)    |

| Model                      | DTA-1G8                                                    | DTA-3G8    | DTA-5G8    | DTA-10G8   | DTA-1G8-V   | DTA-3G8-V  | DTA-5G8-V  | DTA-10G8-V |
|----------------------------|------------------------------------------------------------|------------|------------|------------|-------------|------------|------------|------------|
| Measuring range            | ±1mm                                                       | ±3mm       | ±5mm       | ±10mm      | ±1mm        | ±3mm       | ±5mm       | ±10mm      |
| Linearity                  | 0.3 % FSO                                                  |            |            |            |             |            |            |            |
| Repeatability              | 0.15µm                                                     | 0.45µm     | 0.75µm     | 1.5µm      | 0.15µm      | 0.45µm     | 0.75µm     | 1.5µm      |
| Temperature stability      | 250ppm/°C                                                  |            |            |            |             |            |            |            |
| Temperature range          | -20...+80 °C (without bellows) / 0...+80 °C (with bellows) |            |            |            |             |            |            |            |
| Diameter                   | 8h9mm                                                      |            |            |            |             |            |            |            |
| Sensor material            | stainless steel / FPM                                      |            |            |            |             |            |            |            |
| Connection / pin connector | open ends                                                  |            |            |            |             |            |            |            |
| Protection class sensor    | IP65 (with bellows) / IP54 (without bellows)               |            |            |            |             |            |            |            |
| Cable output               | axial                                                      |            |            |            |             |            |            |            |
| Sensor cable length        | 3m                                                         |            |            |            |             |            |            |            |
| Life cycle MTBF            | 5 million cycles                                           |            |            |            |             |            |            |            |
| Sensitivity                | 133 mV/mm/V                                                | 85 mV/mm/V | 53 mV/mm/V | 44 mV/mm/V | 133 mV/mm/V | 85 mV/mm/V | 53 mV/mm/V | 44 mV/mm/V |
| Electronics                | MSC710 (page 8 - 9)                                        |            |            |            |             |            |            |            |

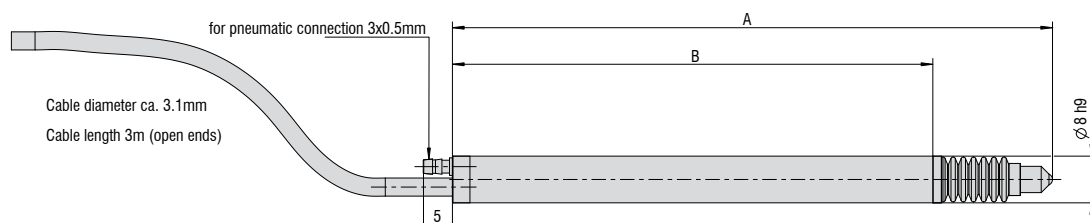
FSO = Full Scale Output

#### DTA-xG8-3-CA



| Model         | A (zero position) | B       |
|---------------|-------------------|---------|
| DTA-1G8-3-CA  | 83mm              | 64.3mm  |
| DTA-3G8-3-CA  | 89mm              | 68.3mm  |
| DTA-5G8-3-CA  | 118mm             | 89.5mm  |
| DTA-10G8-3-CA | 155mm             | 121.7mm |

#### DTA-xG8-3-CA-V



| Model           | A (zero position) | B       |
|-----------------|-------------------|---------|
| DTA-1G8-3-CA-V  | 95mm              | 76.3mm  |
| DTA-3G8-3-CA-V  | 103mm             | 82.3mm  |
| DTA-5G8-3-CA-V  | 134mm             | 105.3mm |
| DTA-10G8-3-CA-V | 170.8mm           | 137.3mm |



- Proven LVDT technology
- Measuring ranges  $\pm 1 \dots \pm 25\text{mm}$
- Extremely accurate also under difficult ambient conditions
- Long-term stability
- Wear-free

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.

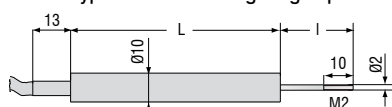
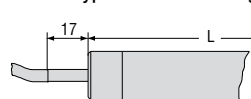
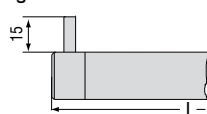
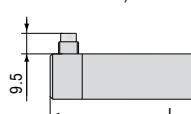
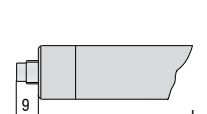
The high sensor resolution is limited only by the noise in the sensor electronics. A further advantage of the symmetrically constructed sensors in the LVDT series is the zeropoint stability of the systems. The sensors are supplied with an excitation frequency of 1 to 5 kHz depending on the measurement range and an excitation amplitude of 2.5 to 5Veff. 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

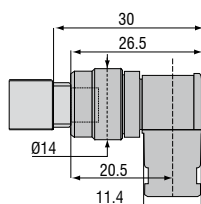
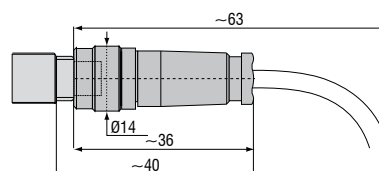
| DT                                         | A-            | 10-                      | D-                            | 3-                                                                        | CA-                                                                                                                                                                                                                                                                         | W                                                                 |
|--------------------------------------------|---------------|--------------------------|-------------------------------|---------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
|                                            |               |                          |                               |                                                                           | Options:<br>W welded/sealed housing (water proof up to 5bars)<br>P pressure resistant housing (up to 100bar)<br>F pressure resistant mounting flange O-ring seal<br>H high temperature sensor up to 200°C with integral teflon cable<br>(only for connection types -CA/-CR) |                                                                   |
|                                            |               |                          |                               |                                                                           | Connection axial<br>CA integral cable (3m)<br>SA plug connection                                                                                                                                                                                                            | Connection radial<br>CR integral cable (3m)<br>SR plug connection |
|                                            |               |                          |                               | Linearity: 5 ( $\pm 0.5\%$ )    3 ( $\pm 0.3\%$ )    1,5 ( $\pm 0.15\%$ ) |                                                                                                                                                                                                                                                                             |                                                                   |
|                                            |               |                          | Function: displacement sensor |                                                                           |                                                                                                                                                                                                                                                                             |                                                                   |
|                                            |               | Measuring range $\pm$ mm |                               |                                                                           |                                                                                                                                                                                                                                                                             |                                                                   |
|                                            | Excitation AC |                          |                               |                                                                           |                                                                                                                                                                                                                                                                             |                                                                   |
| 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       | SA | CA       | CR | SA | SR | CA       | CR | SA | SR |
| Measuring range              | ±1mm                                         |     | ±3mm     |    | ±5mm     |    | ±10mm    |    | ±15mm    |    |    |    | ±25mm    |    |    |    |
| Linearity                    | standard ±0.5%                               | -   | -        |    | -        |    | -        |    | -        |    |    |    | 300 μm   |    |    |    |
|                              | standard ±0.3%                               | 6μm | 18μm     |    | 30μm     |    | 60μm     |    | 90μm     |    |    |    | 150μm    |    |    |    |
|                              | optional ±0.15%                              | 3μm | 9μm      |    | 15μm     |    | 30μm     |    | 45μm     |    |    |    | -        |    |    |    |
| Excitation frequency         | 5kHz                                         |     |          |    |          |    | 2kHz     |    | 1kHz     |    |    |    |          |    |    |    |
| Excitation amplitude         | 5Veff                                        |     |          |    |          |    |          |    | 2.5Veff  |    |    |    |          |    |    |    |
| Sensitivity                  | 133mV/Vmm                                    |     | 85mV/Vmm |    | 53mV/Vmm |    | 44mV/Vmm |    | 45mV/Vmm |    |    |    | 33mV/Vmm |    |    |    |
| Temperature range            | -20°C...80°C                                 |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
| Storage temperature          | -40°C ... +80°C / +120°C                     |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
| Temperature stability        | zero ±50ppm/°C                               |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
|                              | sensitivity ±100ppm/°C                       |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
| Housing                      | stainless steel including magnetic shielding |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
| Minimum cable bending radius | 20mm                                         |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
| Outer diameter cable         | ~4.6mm                                       |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
| Protection class             | IP 67                                        |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
| Shock                        | 40g, 1000 shocks / axis                      |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
|                              | 100g, 3 shocks / direction                   |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
| Vibration                    | 10Hz ... 58Hz ±1.5mm / 58Hz ... 500Hz ±20g   |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |
| Electronics                  | MSC710 (page 8 - 9)                          |     |          |    |          |    |          |    |          |    |    |    |          |    |    |    |

FSO = Full Scale Output

**Sensor types with measuring range up to  $\pm 10\text{mm}$**  (inner diameter  $\phi 2.7\text{mm}$ )**Type-CA** with integral cable**Type-SA** with axial plug connection**Sensor types with measuring range  $\pm 15\text{mm}$  and  $\pm 25\text{mm}$**  (inner diameter  $\phi 4.8\text{mm}$ )**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       | SA   | CA       | CR | SA | SR | CA       | CR | SA | SR |
| Length of housing L               | 40mm    | 40mm | 57mm    | 57mm | 73mm    | 73mm | 87mm     | 87mm | 106.5mm  |    |    |    | 143.5mm  |    |    |    |
| Length of plunger l <sup>1)</sup> | 19mm    |      | 29mm    |      | 30mm    |      | 35mm     |      | 51mm     |    |    |    | 62mm     |    |    |    |
| Housing diameter                  | 10mm    |      |         |      |         |      |          |      | 20mm     |    |    |    |          |    |    |    |

<sup>1)</sup> Plunger in zero position ( $\pm 10\%$  of measuring range  $\pm 1\text{mm}$ )**Female connector 90°**  
dimensions apply  
for all models**Female connector 90°**  
dimensions apply  
for all models

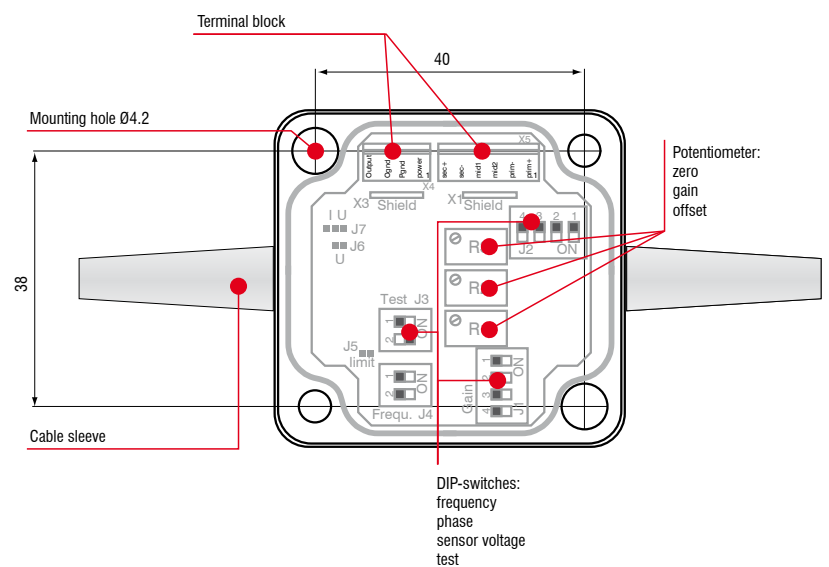
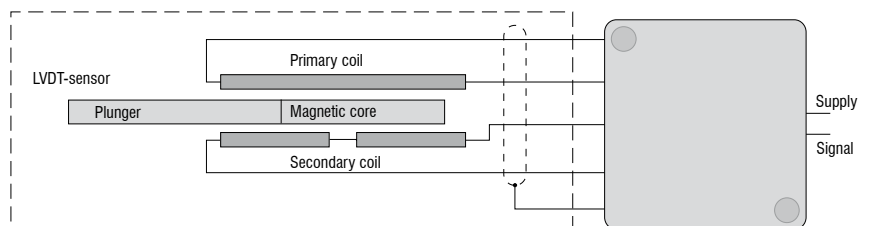




- Excellent linearity and resolution
- Zero and gain adjustable coarse/fine
- Excitation frequency 1 ... 10kHz (selectable)
- Compact and robust EMI-proofed housing

The MSC710 is a single-channel miniature sensor controller for the operation of inductive displacement sensors based on the LVDT principle (Linear Variable Differential Transformer). Its compact, but rugged design, makes it suitable for both industrial and laboratory applications.

Easily accessible and simple to operate, by using DIP-switches. The electronic unit can be matched to a wide range of sensors.





| Model                               |           | MSC710-U                                            | MSC710-I                         |
|-------------------------------------|-----------|-----------------------------------------------------|----------------------------------|
| Power supply                        |           | 18 ... 30 VDC (18 ... 45mA)                         |                                  |
| Protection                          |           | Reverse polarity protection, overvoltage protection |                                  |
| Sensor principle                    |           | for LVDT sensors                                    |                                  |
| Sensor excitation                   |           | 150 ... 400mV                                       |                                  |
|                                     |           | 1/2/5kHz (selectable by DIP-switches)               |                                  |
| Input impedance                     | sensor    | 10kOhm                                              |                                  |
| Range                               | gain      | -20 ... +350% (trimpot)                             |                                  |
|                                     | zero      | ±50% (trimpot)                                      |                                  |
| Output signal                       |           | 2 ... 10 VDC ( $R_a > 1k\Omega$ )                   | 4 ... 20mA (load $< 500\Omega$ ) |
| Noise                               |           | $< 1.5mV_{eff}^*$                                   | $< 3\mu A_{eff}^*$               |
|                                     |           | $< 15mV_{ss}$                                       | $< 30\mu A_{ss}$                 |
| Linearity                           |           | $< 0.02\%$ FSO                                      |                                  |
| Frequency response                  |           | 300Hz (-3dB)                                        |                                  |
| Temperature range                   | storage   | -40°C ... +85°C                                     |                                  |
|                                     | operating | 0°C ... +70°C                                       |                                  |
| Temperature stability               |           | ±100ppm / °C                                        |                                  |
| Protection class                    |           | IP 65                                               |                                  |
| Weight                              |           | 80g                                                 |                                  |
| Housing material                    |           | ABS-plastic                                         |                                  |
| Electromagnetic compatibility (EMC) |           | EN 61326-1:2006 (spurious emission)                 |                                  |
|                                     |           | EN 61326-2-3:2006 (immunity to interference)        |                                  |
| Vibration                           |           | EN 60068-2-64 (noise)                               |                                  |
| Shock                               |           | EN 60068-2-29 (continuous shock)                    |                                  |

FSO = Full Scale Output

\* RMS AC-Measuring, Frequency 3 Hz ... 300 Hz



- No wear and no maintenance
- Excellent temperature stability
- Operating temperature range up 160°C
- Compact design - short installed length
- Small sensor diameter
- High measurement signal quality

The specific sensor configuration of the linear displacement sensors in the LDR series is characterised by a short, compact design with small diameter. Three connections are required as an interface to the sensor. The compact design and the small sensor diameter facilitate the installation of the measurement systems in locations where space is restricted.

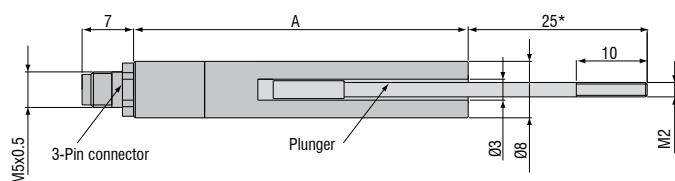
#### **Fields of use and applications**

The inexpensive LDR sensors are also particularly suitable for large-scale installation under restricted spatial conditions and in industrial environments with a high measuring rate.

| Model                                               | LDR-10-                                                           |                                                                                                                         | LDR-25-               |           | LDR-50-              |                                        |
|-----------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------------|-----------|----------------------|----------------------------------------|
| Connection                                          | SA                                                                | CA                                                                                                                      | SA                    | CA        | SA                   | CA                                     |
| Measuring range                                     | 10mm                                                              |                                                                                                                         | 25mm                  |           | 50mm                 |                                        |
| Measuring principle                                 | LDR - sensor                                                      |                                                                                                                         |                       |           |                      |                                        |
| Linearity                                           | typ. $\pm 0.30\%$ FSO                                             |                                                                                                                         | typ. $\pm 0.35\%$ FSO |           | typ. $\pm 0.7\%$ FSO |                                        |
|                                                     | $\pm 0.030\text{mm}$                                              |                                                                                                                         | $\pm 0.088\text{mm}$  |           | $\pm 0.35\text{mm}$  |                                        |
|                                                     | max. $\pm 0.50\%$ FSO                                             |                                                                                                                         |                       |           |                      |                                        |
| Excitation frequency                                | 16kHz                                                             |                                                                                                                         | 12kHz                 |           | 8kHz                 |                                        |
| Excitation amplitude                                | $1V_{\text{eff}}$                                                 |                                                                                                                         | $1V_{\text{eff}}$     |           | $2.6V_{\text{eff}}$  |                                        |
| Sensitivity                                         | 51mV/Vmm                                                          |                                                                                                                         | 21mV/Vmm              |           | 5.5mV/Vmm            |                                        |
| Temperature range                                   | SA                                                                | storage: $-40^{\circ}\text{C} \dots +80^{\circ}\text{C}$ / operation: $-15^{\circ}\text{C} \dots +80^{\circ}\text{C}$   |                       |           |                      |                                        |
|                                                     | CA                                                                | storage: $-40^{\circ}\text{C} \dots +160^{\circ}\text{C}$ / operation: $-40^{\circ}\text{C} \dots +160^{\circ}\text{C}$ |                       |           |                      |                                        |
| Temperature stability                               | zero                                                              | $\pm 30\text{ppm} / ^{\circ}\text{C}$                                                                                   |                       |           |                      | $\pm 40\text{ppm} / ^{\circ}\text{C}$  |
|                                                     | sensitivity                                                       | $\pm 100\text{ppm} / ^{\circ}\text{C}$                                                                                  |                       |           |                      | $\pm 150\text{ppm} / ^{\circ}\text{C}$ |
| Housing (material)                                  | ferromagnetic stainless steel                                     |                                                                                                                         |                       |           |                      |                                        |
| Weight sensor (without plunger)                     | 9g                                                                | 24g                                                                                                                     | 14g                   | 28g       | 23g                  | 37g                                    |
| Weight plunger                                      | 1.5g                                                              |                                                                                                                         | 2.2g                  |           | 3.5g                 |                                        |
| Sensor cable - minimum bending radius fixed / moved | 8 / 15mm                                                          | 10 / 30mm                                                                                                               | 8 / 15mm              | 10 / 30mm | 8 / 15mm             | 10 / 30mm                              |
| Outer cable diameter                                | 3.1mm                                                             | 1.8mm                                                                                                                   | 3.1mm                 | 1.8mm     | 3.1mm                | 1.8mm                                  |
| Protection class                                    | IP 67                                                             |                                                                                                                         |                       |           |                      |                                        |
| Shock                                               | 40g, 3000 shocks / axis                                           |                                                                                                                         |                       |           |                      |                                        |
|                                                     | 100g radial, 300g axial                                           |                                                                                                                         |                       |           |                      |                                        |
| Vibration                                           | 5Hz ... 44Hz $\pm 2.5\text{mm}$ / 44Hz ... 500Hz $\pm 20\text{g}$ |                                                                                                                         |                       |           |                      |                                        |
| Electric connection                                 | SA                                                                | 3-pin connector (accessory cable, article 0157047/047, 3 or 5m)                                                         |                       |           |                      |                                        |
|                                                     | CA                                                                | integral axial cable (shielded), 2m                                                                                     |                       |           |                      |                                        |
| Electronics                                         | MSC7210 (page 12 - 13)                                            |                                                                                                                         |                       |           |                      |                                        |

FSO = Full Scale Output SA = connector axial CA = cable axial

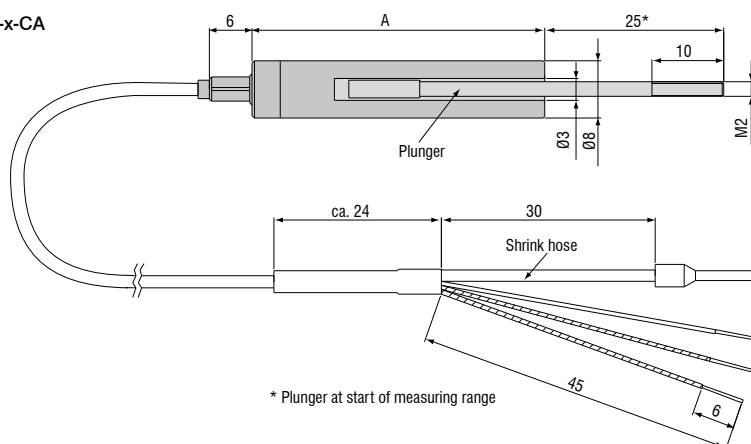
#### LDR-x-SA



\* Plunger at start of measuring range

| Model     | A     |
|-----------|-------|
| LDR-10-SA | 47mm  |
| LDR-25-SA | 73mm  |
| LDR-50-SA | 127mm |

#### LDR-x-CA



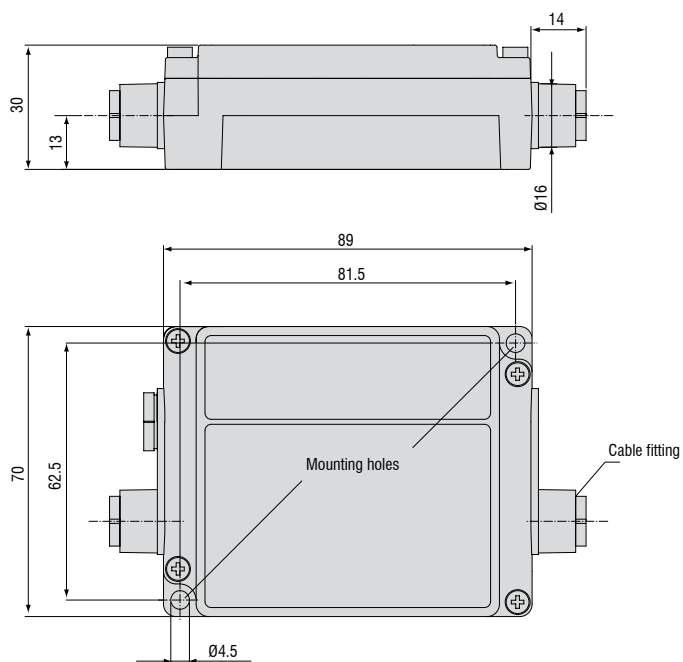
\* Plunger at start of measuring range

| Model     | A     |
|-----------|-------|
| LDR-10-CA | 41mm  |
| LDR-25-CA | 67mm  |
| LDR-50-CA | 121mm |



- Rugged die-cast housing
- For all sensors in the LDR series
- Adjustable excitation frequency  
4 ... 33kHz
- Zero point and gain can be adjusted
- High resolution and linearity

The MSC7210 is a single-channel electronic unit for the operation of inductive displacement transducers according to the LDR principle. The zero point and gain can be set over a wide range using trimming potentiometers. Due to the small size, the electronic unit is versatile in mounting.



| Model                               | MSC7210-U                                       | MSC7210-I                       |
|-------------------------------------|-------------------------------------------------|---------------------------------|
| Power supply                        | 18 ... 30VDC                                    |                                 |
| Protection                          | polarity reversal and overvoltage protection    |                                 |
| Sensor principle                    | LDR sensor                                      |                                 |
| Sensor excitation                   | 1000 ... 2600mV                                 |                                 |
|                                     | 4 bis 33kHz (16 steps selectable via DIPswitch) |                                 |
| Range                               | gain                                            | -20 ... +270% FSO (trimpot)     |
|                                     | zero                                            | ± 70% FSO (trimpot)             |
| Output signal                       | 2 ... 10VDC                                     | 4 ... 20mA                      |
| Noise                               | $< 1.5\text{mV}_{\text{eff}}^*$                 | $< 3\mu\text{A}_{\text{eff}}^*$ |
|                                     | $< 15\text{mV}_{\text{ss}}$                     | $< 30\mu\text{A}_{\text{ss}}$   |
| Linearity                           | $\pm 0.02\%$ FSO                                |                                 |
| Frequency response                  | 300Hz                                           |                                 |
| Temperature range                   | storage                                         | -40°C ... +85°C                 |
|                                     | operating                                       | 0°C ... +70°C                   |
| Temperature stability               | $\pm 100\text{ppm} / ^\circ\text{C}$            |                                 |
| Housing material                    | zinc die cast                                   |                                 |
| Electromagnetic compatibility (EMC) | EN 61326-1:2006 (spurious emission)             |                                 |
|                                     | EN 61326-2-3:2006 (immunity to interference)    |                                 |
| Protection class                    | IP 65                                           |                                 |
| Shock                               | test signal: half sine wave                     |                                 |
|                                     | peak acceleration 15g                           |                                 |
|                                     | shock duration 6ms                              |                                 |
|                                     | test axes x, y, z                               |                                 |
|                                     | No. of impacts per axis: 1000                   |                                 |
| Vibration                           | test signal: sine - sweep                       |                                 |
|                                     | frequency: 20 ... 500Hz                         |                                 |
|                                     | test axes x, y, z                               |                                 |
|                                     | No. of frequency cycles per axis: 10            |                                 |
| Sensor connection                   | plugable screw clamp 4-pin                      |                                 |
| Signal/supply connection            | plugable screw clamp 5-pin                      |                                 |

FSO = Full Scale Output

\* RMS AC measurement, frequency 3Hz ... 300Hz



- *Measurement ranges 75 ... 630mm*
- *Linearity  $\pm 0.3\%$  FSO*
- *Integrated microelectronics*
- *High pressure resistance*
- *Oil resistant and maintenance-free*
- *Short offset ranges*

The sensor elements of the EDS series are protected by a pressure resistant stainless steel housing. The sensor electronics and signal conditioning are completely integrated in a sensor flange.

As a target an aluminium sleeve is used which is integrated into the piston rod and is passed without making contact and wearfree over the sensor rod.

Due to the use of the eddy current principle, no permanent magnets need to be mounted inside the cylinder.

Due to the rugged design of the long-stroke sensors of the EDS series, these sensor systems have proven themselves, not only through the integration in hydraulic and pneumatic cylinders, but especially under harsh industrial conditions.

#### Typical applications

Long-stroke sensors in the EDS series are designed for industrial use in hydraulic and pneumatic cylinders for the displacement and position measurement of pistons or valves, e.g. for the measurement of

- displacement, distance, position, gap
- deflection
- movement, stroke
- filling level, immersion depth, spring travel

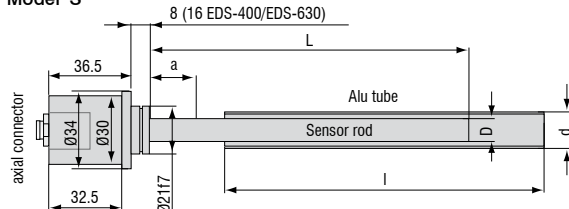


EDS series: integration in a hydraulic cylinder

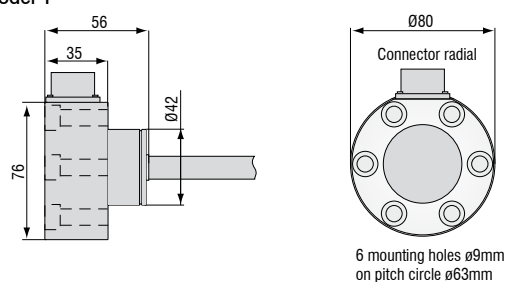
| Model                               |           | EDS-75                                                                              | EDS-100 | EDS-160 | EDS-200 | EDS-250 | EDS-300 | EDS-400 | EDS-500 | EDS-630 |
|-------------------------------------|-----------|-------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| Connection                          |           | S                                                                                   | S, F    | S, F    | S       | S, F    | S, F    | S, F    | S       | S, F    |
| Measuring range                     |           | 75mm                                                                                | 100mm   | 160mm   | 200mm   | 250mm   | 300mm   | 400mm   | 500mm   | 630mm   |
| Linearity                           | ±0.3% FSO | 0.23mm                                                                              | 0.3mm   | 0.48mm  | 0.6mm   | 0.75mm  | 0.9mm   | 1.2mm   | 1.5mm   | 1.89mm  |
| Resolution                          | 0.05% FSO | 0.038mm                                                                             | 0.05mm  | 0.08mm  | 0.1mm   | 0.125mm | 0.15mm  | 0.2mm   | 0.25mm  | 0.315mm |
| Temperature range                   |           | -40°C ... +85°C                                                                     |         |         |         |         |         |         |         |         |
| Temperature stability               |           | ±200ppm / °C                                                                        |         |         |         |         |         |         |         |         |
| Frequency response (-3 dB)          |           | 150Hz                                                                               |         |         |         |         |         |         |         |         |
| Output                              |           | 4 - 20mA                                                                            |         |         |         |         |         |         |         |         |
| Output load                         |           | 500Ω                                                                                |         |         |         |         |         |         |         |         |
| Power supply                        |           | 18 - 30VDC                                                                          |         |         |         |         |         |         |         |         |
| Current consumption                 |           | max. 40mA                                                                           |         |         |         |         |         |         |         |         |
| Connector                           | model S   | 7-pin connector (sensor cable as an option) options radial or axial output          |         |         |         |         |         |         |         |         |
|                                     | model F   | 5-pin radial bayonet-connector with mating plug                                     |         |         |         |         |         |         |         |         |
| Pressure resistance                 |           | 450bar (sensor rod, flange)                                                         |         |         |         |         |         |         |         |         |
| Protection class                    |           | IP 67                                                                               |         |         |         |         |         |         |         |         |
| Electromagnetic compatibility (EMC) |           | EN 61326-1:2006 (spurious emission)<br>EN 61326-2-3:2006 (immunity to interference) |         |         |         |         |         |         |         |         |
| Shock <sup>1)</sup>                 |           | 40g, 3000 shocks / axis<br>100g radial, 300g axial                                  |         |         |         |         |         |         |         |         |
| Vibration                           |           | 5Hz ... 44Hz ±2.5mm<br>44Hz ... 500Hz ±23g                                          |         |         |         |         |         |         |         |         |
| Material                            |           | V4A-Steel 1.4571                                                                    |         |         |         |         |         |         |         |         |

FSO = Full Scale Output <sup>1)</sup> Half sinusoid 6 ms

### Model S



### Model F



### Article

| EDS- | 300- | S- | SA7- | I |                                                                                   |
|------|------|----|------|---|-----------------------------------------------------------------------------------|
|      |      |    |      |   | Electrical output                                                                 |
|      |      |    |      |   | SR = connector, radial (model F)<br>SA7 = connector, axial (model S)              |
|      |      |    |      |   | Models: S = compact design with alu cap<br>F = flange housing with mounting holes |
|      |      |    |      |   | Measuring range in mm                                                             |

| Meas. range | Sensor rod |    | Alu tube        |               | Offset |
|-------------|------------|----|-----------------|---------------|--------|
|             | L          | D  | l               | d             |        |
| 75          | 110        | 10 | 110             | 16            | 15     |
| 100         | 140        | 10 | 140             | 16            | 20     |
| 160         | 200        | 10 | 200             | 16            | 20     |
| 200         | 240        | 10 | 240             | 16            | 20     |
| 250         | 290        | 10 | 290             | 16            | 20     |
| 300         | 340        | 10 | 340             | 16            | 20     |
| 400         | 450        | 12 | 450 (S) 460 (F) | 18 (S) 26 (F) | 25     |
| 500         | 550        | 12 | 550             | 18            | 25     |
| 630         | 680        | 12 | 680 (S) 690 (F) | 18 (S) 26 (F) | 25     |





*The LVP-3, LVP-14 and LVP-25 sensors are modified versions of the standard LVP sensors.*

*They are designed for specific application areas, and operated with external electronics in contrast to the standard LVP series.*

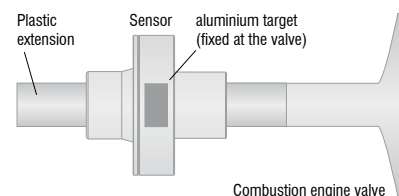
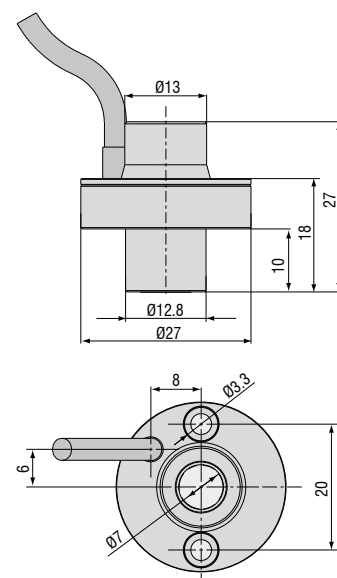
#### Valve stroke sensor in stainless steel housing

Future generations of engines will be able to dispense with mechanical camshafts. The displacement of the electromechanically or electrohydraulically driven inlet and outlet valves of internal combustion engines is acquired by the displacement sensor of the product line LVP-14-F-5-CR and fed into the control circuit. In this way a variable inlet and outlet control of the valves can be realised. Ultimately, the fuel consumption is reduced, emission values are improved and the engine power characteristic is matched to the individual driving situation.

| Model                        | LVP-14-F-5-CR                                |
|------------------------------|----------------------------------------------|
| Article                      | 2616078                                      |
| Measuring range              | 14mm                                         |
| Target (optional)            | article 0482273                              |
| Linearity                    | 0.5% FSO (0.07mm)                            |
| Housing                      | stainless steel                              |
| Temperature stability sensor | $\pm 100\text{ppm} / ^\circ\text{C}$         |
| Temperature range sensor     | $-30^\circ\text{C} \dots +150^\circ\text{C}$ |
| Protection class sensor      | IP 67                                        |

| Controller         | MSC739VS-U      |
|--------------------|-----------------|
| Article            | 4111009         |
| Power supply       | +10...16VDC     |
| Output             | 1...9VDC        |
| Resolution         | 0,02% FSO       |
| Frequency response | 20kHz (-3dB)    |
| Dimensions         | 150 x 64 x 54mm |

FSO = Full Scale Output

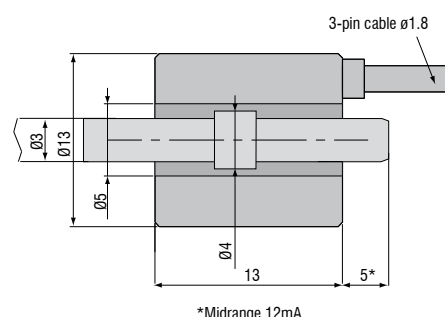


### Sensor for needle stroke movements

The compact displacement sensor LVP-3- Z13-5-CA is suitable for acquiring small measurement ranges with high accuracy. The large free hole for the passage of the core also facilitates large excessive strokes. The measurement object, realised as a simple aluminium ring, is mounted on the rod, plunger, pin, needle or other similar part to be measured. In a typical application the displacement sensor LVP-3-Z13-5-CA is used in automatic glue application guns. The continuously measuring sensor monitors the switching point, also for wear of the needle seating. Additionally, the continuous measurement offers the option of checking the needle for the correct stroke position. The small, compact sensor is easy to integrate even in tight installation spaces.

| Model                        | LVP-3-Z13-CA                                        |
|------------------------------|-----------------------------------------------------|
| Article                      | 2617014                                             |
| Measuring range              | 3mm                                                 |
| Target (included)            | ø3 x 30 long with thread M3 and alu sleeve ø4 x 3.3 |
| Linearity                    | typ. 0.3% FSO (9µm)                                 |
| Housing                      | stainless steel                                     |
| Temperature stability sensor | ±100ppm / °C                                        |
| Temperature range sensor     | -40°C ... +150°C                                    |
| Protection class sensor      | IP 67                                               |
| Electronics                  | series MSC7210 (page 12 - 13)                       |

FSO = Full Scale Output



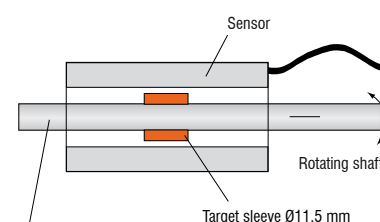
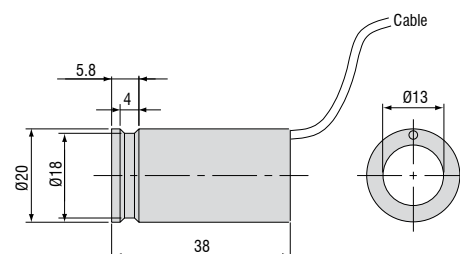
### Sensor for the acquisition of displacement on rotating shafts

Analogue sensors from the series LVP offer a significant improvement to monitor the clamping position of tools. The sensor is integrated into the chuck and directly measures the clamping stroke of the drawbar. It can be universally used with the most varied types of tool due to an extremely compact design. The sensor supplies an analogue signal according to the stroke motion of the drawbar when clamping the tool. Consequently, continuous monitoring is possible without the switching point having to be laboriously set mechanically. The miniaturised sensor electronic unit is supplied with 24 VDC and can either be accommodated at the point of measurement or in the control cabinet.



| Model                        | LVP-25-Z20-5-CA-AC                                                                |
|------------------------------|-----------------------------------------------------------------------------------|
| Article                      | 2617008                                                                           |
| Measuring range              | 25mm                                                                              |
| Target (included)            | article 0482218 for shaft diameter 8mm<br>article 0482219 for shaft diameter 10mm |
| Resolution                   | 0.01mm                                                                            |
| Linearity                    | typical ±1% FSO (0.25mm)                                                          |
| Dynamics                     | 150Hz (-3dB)                                                                      |
| Housing                      | stainless steel                                                                   |
| Temperature stability sensor | < ±0.01% FSO / °C                                                                 |
| Temperature range            | -40° C ... +150° C                                                                |
| Protection class sensor      | IP 67                                                                             |
| Medium                       | air, oil                                                                          |
| Electronics                  | series MSC7210 (page 12 - 13)                                                     |

FSO = Full Scale Output



Pull rod material  
31CrMoV9, no. 1.8519.05

**General accessories**

|         |        |                                                                                                                                                           |
|---------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------|
| 2960031 | MC25D  | digital micrometer calibration fixture                                                                                                                    |
| 2420062 | PS2020 | power supply on DIN rail,<br>input 100 - 240VAC, output 24VDC / 2.5A                                                                                      |
| 2984026 |        | certificate function and linearity inspection certificate incl.<br>protocol with listed measurement data of the linearity inspection<br>and documentation |

**Accessories LDR series****Connection cable**

|         |              |                                            |
|---------|--------------|--------------------------------------------|
| 0157047 | C7210-5/3    | sensor cable, 5m, with cable connector     |
| 0157048 | C7210/90-5/3 | sensor cable, 5m, with 90° cable connector |

**Supply cable**

|         |           |                         |
|---------|-----------|-------------------------|
| 2901087 | PC710-6/4 | supply/output cable, 6m |
|---------|-----------|-------------------------|

**Plunger**

|         |        |         |
|---------|--------|---------|
| 0800136 | LDR-10 | plunger |
| 0800137 | LDR-25 | plunger |
| 0800138 | LDR-50 | plunger |

**Accessories EDS series****Service**

|         |  |                                                                                                                       |
|---------|--|-----------------------------------------------------------------------------------------------------------------------|
| 2985001 |  | Function and linearity inspection for EDS series incl. pressure<br>inspection and documentation without recalibration |
|---------|--|-----------------------------------------------------------------------------------------------------------------------|

**Connection cable**

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



Linearity inspection certificate

## Accessories LVDT series

### Sensor cable

|         |           |                                                               |
|---------|-----------|---------------------------------------------------------------|
| 2902004 | C701-3    | sensor cable 3m, with connector and tin-plated free ends      |
| 2902013 | C701-6    | sensor cable, 6m, with connector and tin-plated free ends     |
| 2902009 | C701/90-3 | sensor cable, 3m, with 90° connector and tin-plated free ends |
| 2966002 | MSC710    | connector set for supply/output cable                         |
| 2981010 |           | connector mounting and calibration of MSC710                  |

### Connection cable

|         |           |                          |
|---------|-----------|--------------------------|
| 2901087 | PC710-6/4 | supply/output cable, 6 m |
|---------|-----------|--------------------------|

### Plunger

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

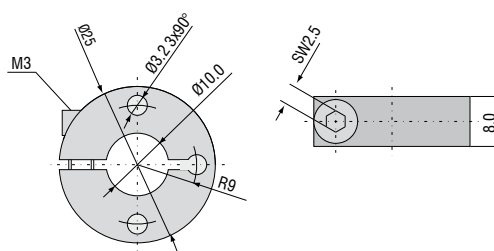
### Flange

|            |         |                                                              |
|------------|---------|--------------------------------------------------------------|
| 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                |

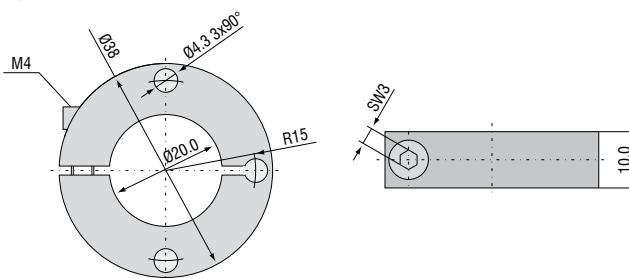
### Probe tips

|         |                    |
|---------|--------------------|
| 0459002 | type 2             |
| 0459001 | type 2 hard metall |
| 0459003 | type 11            |
| 0459004 | type 13            |

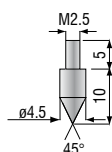
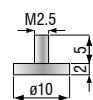
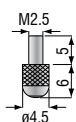
Flange DTA-F10



Flange DTA-F20



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



Micro-Epsilon also develops sensors for special requirements that are not met by the standard models, the inductive sensors from the standard range can be suitably modified. A commercial implementation can already be achieved with medium-sized quantities (depending on the type and number of changes). The standard induSENSOR models form the basis for the modifications.

#### Environmental conditions

Depending on the location, environment, and application, different circumstances occur that require adapted sensors:

- Ambient temperature
- Pressure
- Interference fields
- Dirt, dust, and moisture
- Vibration, shock
- Seawater, IP69K



#### Basic types

Three basic types are available. Measuring ranges and target versions can be combined, based on these technologies.

| Technology | Measuring range | Target              |
|------------|-----------------|---------------------|
| ① EDS      | to 800 mm       | pipe                |
| ② LDR      | to 150 mm       | plunger / probe tip |
| ③ LVDT     | to $\pm 100$ mm | plunger / probe tip |





#### Measuring range / sensor geometry

The installation environments often require an adjustment of the sensor geometry, of the measuring range, and of the protection class. These adjustments include changes to the measuring range, sensor length and width, pressure resistance, target shape, flange and material.



#### Electronics

The electronics is used for control purposes and for processing the signals from the inductive sensors.

Depending on the requirements, the electronics can be integrated in the sensor or remote. The range of functions of the electronics are specifically defined, and range from simple signal output to complex arithmetic.

#### Possible electronics concepts

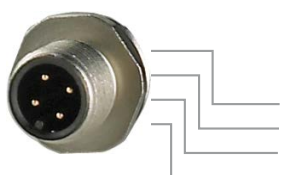
- Integrated electronics
- External electronics



#### Type of connection and cables

The type of connection and cable can be defined depending on the requirements.

- Connector for plugs
- Integrated cable with plug
- Integrated cable with open ends

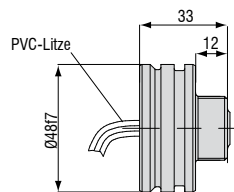


#### Output signal

Depending on the type of integration, one or more output signal types are required. Many types of output are available in combination with the electronics used.

#### Output signals

- Current
- Voltage
- Switching outputs
- Others on request

**EDS-260-Z-LA-I -3L**

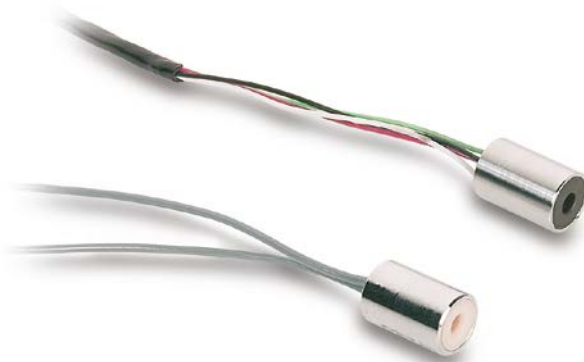
Eddy current long-stroke sensor

Measuring range 260mm  
 Nonlinearity  $< \pm 0.3\%$   
 Power supply 18 ... 30Vdc  
 Output 4 ... 20mA  
 Temperature range  $-40 \dots +85^{\circ}\text{C}$   
 Special sealing flange

**EDS-200-F2-CA10-I-METSO**

Eddy current long-stroke sensor

Measuring range 200mm  
 Output 4 ... 20mA  
 Integrated cable 10m  
 Special sealing flange

**DTA-1D-CA-U**

Miniature sensor with axial cable output

Measuring range  $\pm 1\text{mm}$   
 Outer diameter 10mm  
 Sensor cable length 850mm

**DTA-6D-20 (07)**

Inductive LVDT displacement sensor

Measuring range  $\pm 2 \dots \pm 8 \text{ mm}$   
 Connection 140mm flat cable and IDC (insulation displacement connectors) RM 2.54

**DTA-15D-5-CA(03)**

Pressure-tight LVDT sensor with welded flange

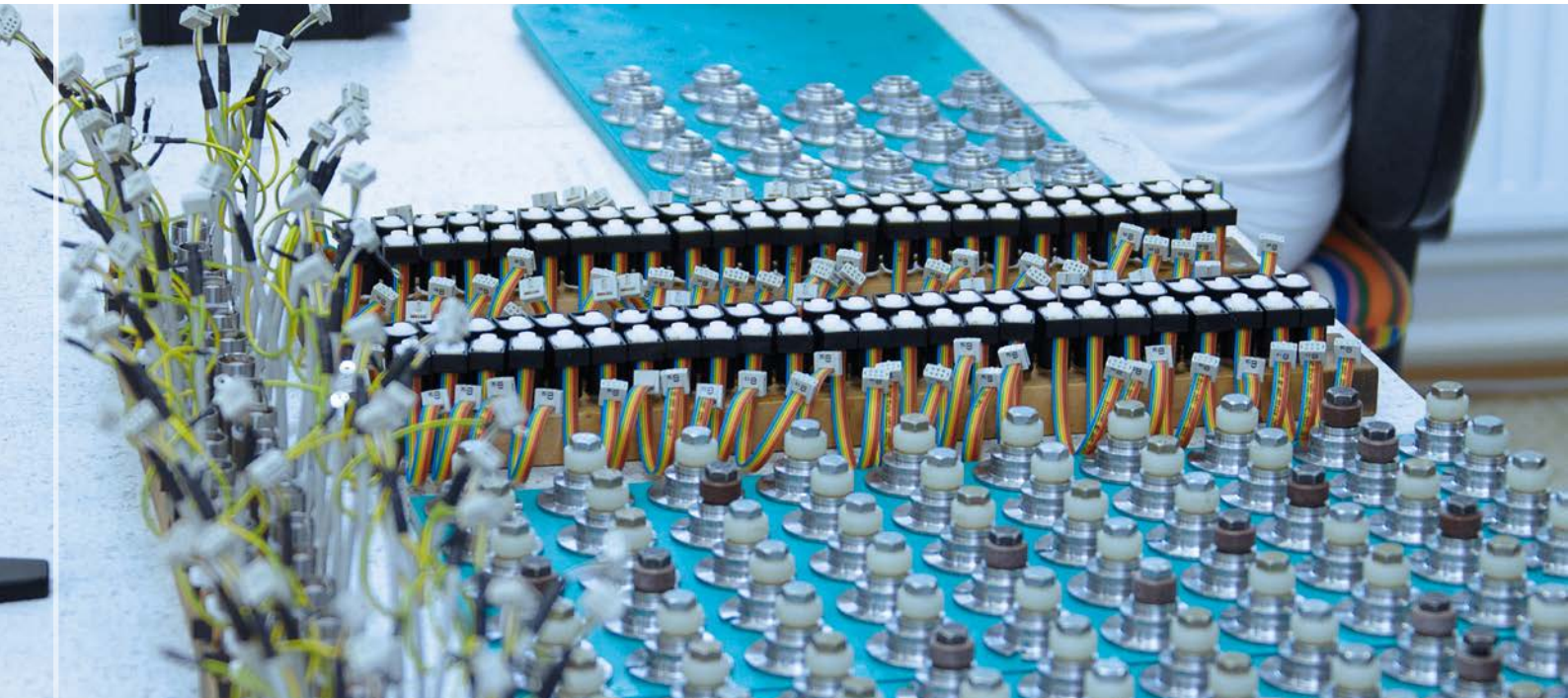
Measuring range  $\pm 16 \text{ mm}$   
 Pressure resistance pressed, up to 350bar (2min.)  
 with mounting flange  
 Connection flat cable axial connector,  
 approx. 140mm long with plug

**EDS-330-F-SRB-I(06)**

Eddy current long-stroke sensor

Measuring range 330mm  
 Output 4 - 20mA  
 Power supply 18 - 30Vdc  
 Flange housing 150mm diameter





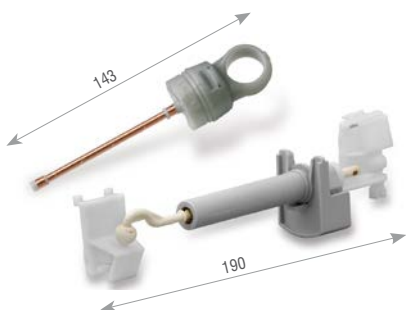
For exceptional applications with large quantities, Micro-Epsilon develops sensors that are precisely tailored to customer requirements. The geometry, electronics and packaging are customised to suit the requirements concerned. Thanks to the high production capacity at Micro-Epsilon, large quantities can be made cost-effectively.

#### **Areas of application**

Customized OEM displacement sensors are often developed for areas of applications where the highest standards apply, such as:

- Applications with high atmospheric pressure
- Environments with high temperatures
- Vacuum
- Explosive hazard environments
- Contaminated installation and measurement rooms

## Realised OEM examples



**DRA-25D-20-SR-02 / ILU-50-0-10-SR**  
Inductive differential inductor (plunger)

- Loading and unbalance detection in washing machines
- Installation integrated into damper or external
- Measuring range 50mm
- External electronics



**LDR-85-BUE**  
Wear-free inductive displacement sensor

- Position measurement of valves
- Measuring range 85mm
- Integrated electronics



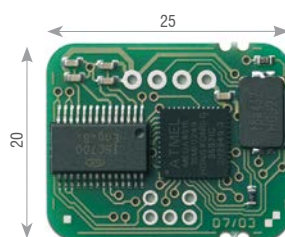
**KRS 719-400**  
Miniaturised LVDT displacement sensor

- For use in textile machines
- External electronics
- Measuring range 2mm
- Shielded sensor



**DTA-3D-5-CR5-G-HP**  
Inductive displacement sensor

- Detection of the shaft position with hermetically sealed pumps
- Measuring range 6mm
- ATEX / FM certification



**ISC7001**  
Subminiature sensor controller

- Subminiature design 20x25mm
- Interfaces 0.5 - 4.5V, PWM (10bit), UART
- Resolution 11bit



**DTA-1D-20-DDV.02**  
LVDT displacement sensor with coated coil

- Measurement of a hydraulic valve position
- External electronics
- Measuring range 2mm
- Dipped paint seal



### KTL gauging sensors

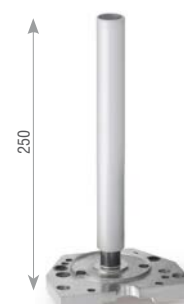
Calibration of robots

- Speed measurement
- Switching output



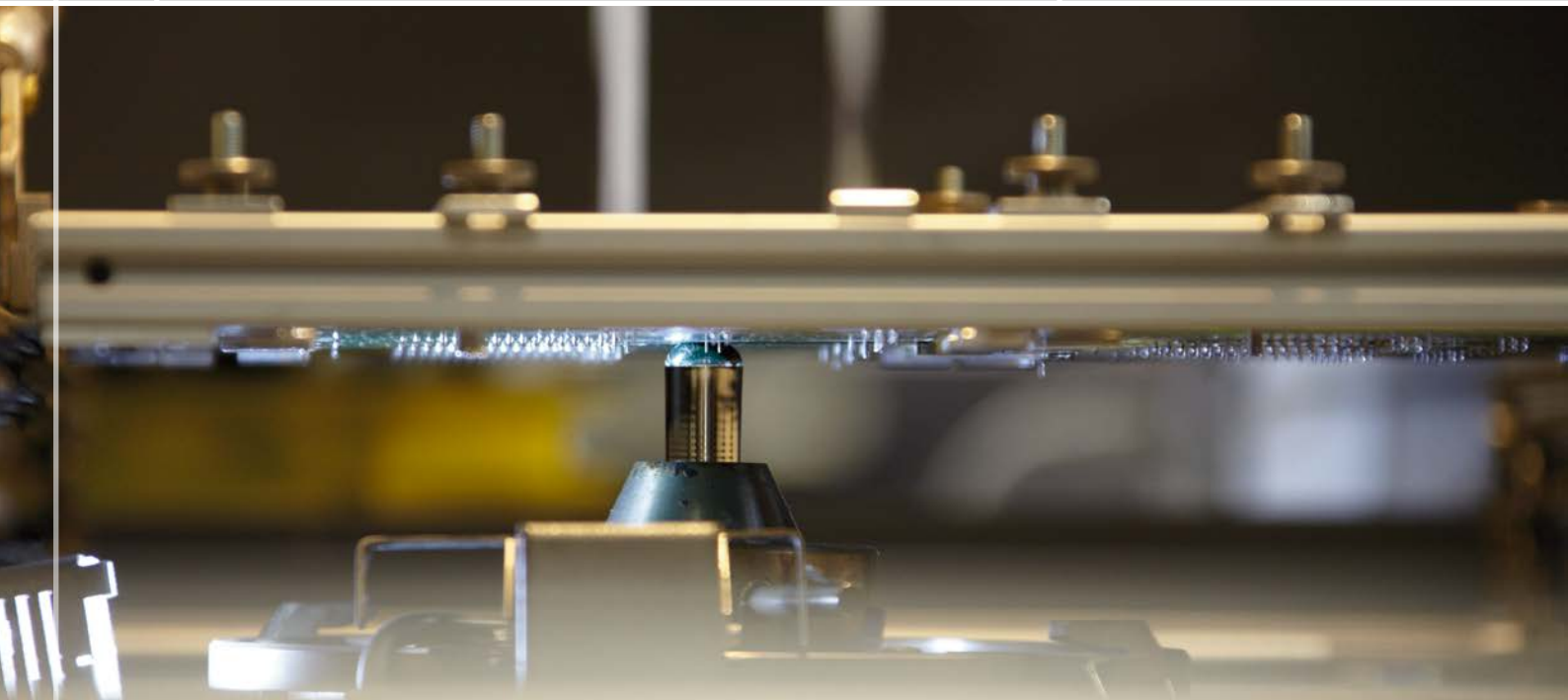
**EDS-28-G-CA-U**  
Rugged inductive miniature sensor with in the cable integrated electronics

- Miniature actor for formula 1
- Measuring range 28mm
- Pressure resistance up to 350bar



**EDS/GPS-180-ZA-I(02)**  
Eddy current long-stroke sensors with integrated electronics

- Measuring the piston position in the glass production
- Measuring range 180mm
- High shock- and vibration-resistance

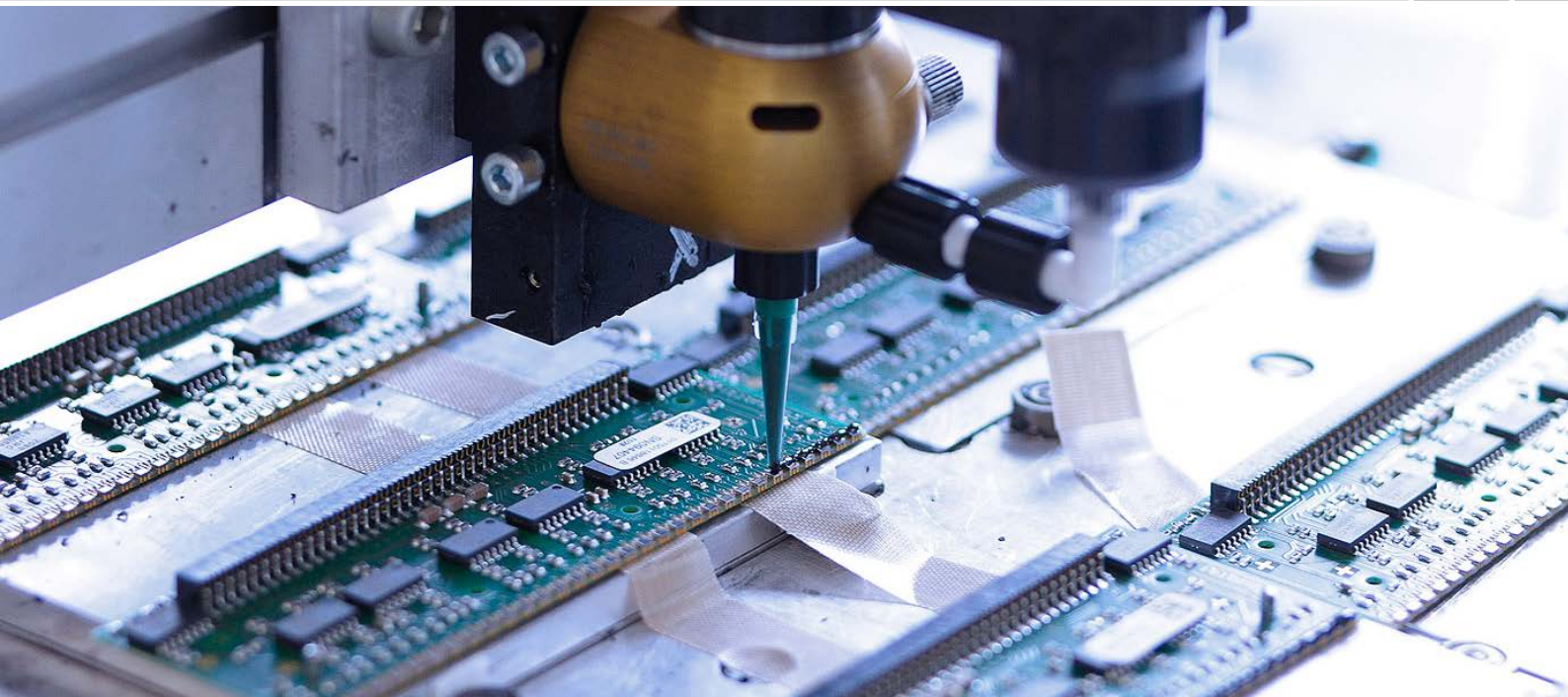


Micro-Epsilon has all the required resources available to supply solutions starting from the idea through to large-scale production, all from one source - and at competitive prices. A cohesive process as a better path to large-scale production. Together with a team of engineers and customer support staff, performance specifications are converted into concepts and designs according to customized requirements. All project participants are integrated into the process. Together with us, you can speed up your development process, prototype building and large-scale production. In achieving this, the complete material logistics is included in the process from an early stage. A total of over 2,000 man-years of engineering experience and more than 300 staff are available to you.

At Micro-Epsilon's head office, development projects are initiated and major projects coordinated. The development and marketing of specific sensors for OEM customers in large quantities takes place in direct contact with the development and product specialists.

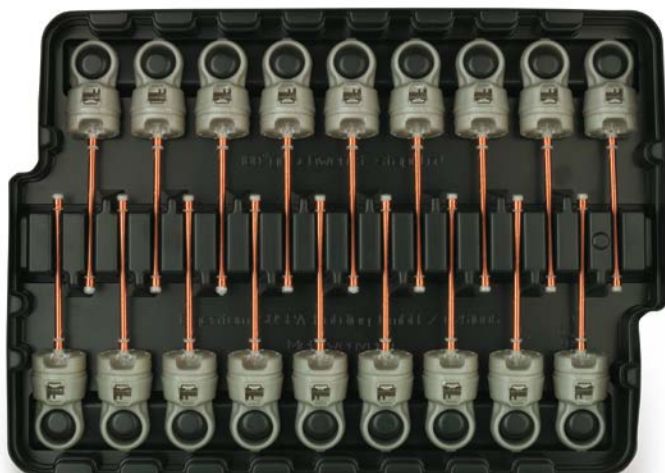
For the large-scale production of the electronics, modern and automated production systems for screen and silk-screen printing are available with vision systems, automatic SMD assembly up to BF 0402, reflow soldering in computer controlled convection ovens, CFC-free washing in multi-compartment washing systems, automatic die bonding and laser trimming.





With production capacities of more than one million sensors p.a. and by utilising internal company resources, the sensors are very economical. The production equipment available includes the following:

- CNC lathes and milling machines
- Fully automatic four-spindle winding machine
- Arc welding equipment for welding the coil wires
- Varnish dip system for protecting the coil
- Automatic inspection system for testing the coil parameters
- Laser welding and marking systems



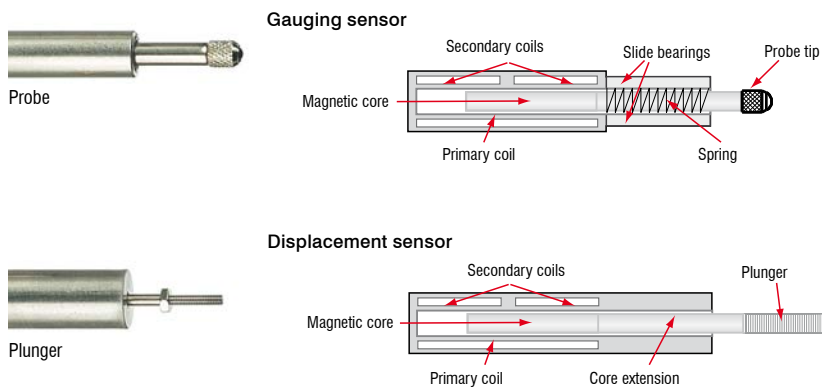
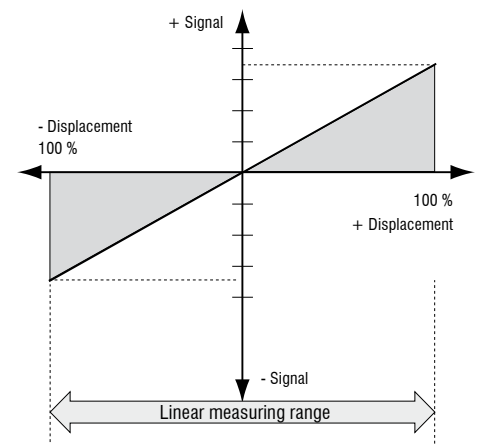
All production systems are supplied in ergonomic and assembly-friendly packaging units. In this respect environmentally friendly and economical reusable packaging is used. Within the scope of Total Quality Management a 100% check is integrated for numerous measurement and inspection processes.

### LVDT gauges and LVDT displacement sensors

LVDT displacement sensors and gauges (Linear Variable Differential Transformer) are constructed with a primary and two secondary coils, which are arranged symmetrically to the primary winding. As a measurement object, a rod shaped magnetic core can be moved within the differential transformer. An electronic oscillator supplies the primary coil with an alternating current of constant frequency. The excitation is an alternating voltage with an amplitude of a few volts and a frequency between 1 and 10 kHz.

Depending on the core position alternating voltages are induced in the two secondary windings. If the core is located in its "zero position", the coupling of the primary to both secondary coils is equally large. Movement of the core within the magnetic field of the coil causes a higher voltage in one secondary coil and a lower voltage in the second coil. The difference between the two secondary voltages is proportional to the core displacement. Due to the differential design of the sensor, the LVDT series has an output signal which is very stable.

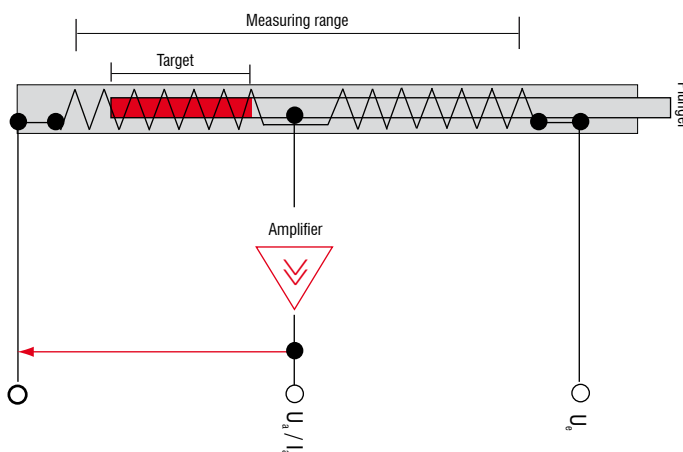
Signal LVDT



### LDR displacement sensors

The inductive sensors in the LDR series are constructed as half-bridge systems with centre tap. An unguided plunger moves in the interior of the sensor coil, which consists of symmetrically constructed winding compartments. The plunger is joined to the moving measurement object via a thread. Due to the movement of the plunger within the coil, an electrical signal is produced which is proportional to the displacement covered. The specific sensor configuration facilitates a short, compact design with a small diameter. Three connections are required as an interface to the sensor.

Block diagram LDR series



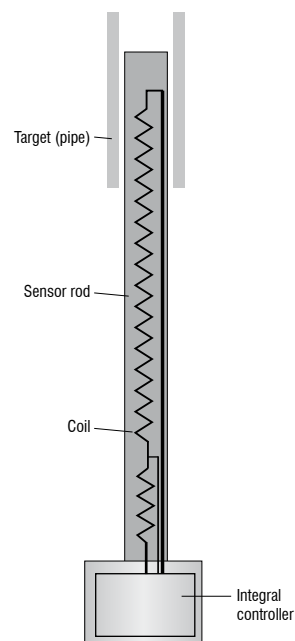
### EDS long-stroke sensors

The measurement principle of the EDS series is based on eddy current effect. An aluminium (ferrous) sleeve which can be moved along the housing without making contact is used as the target. If both coils are supplied with an alternating current, then two orthogonal magnetic fields are produced in the sleeve. The measurement coil, wound in one layer, produces a field which has a magnetic coupling with the target.

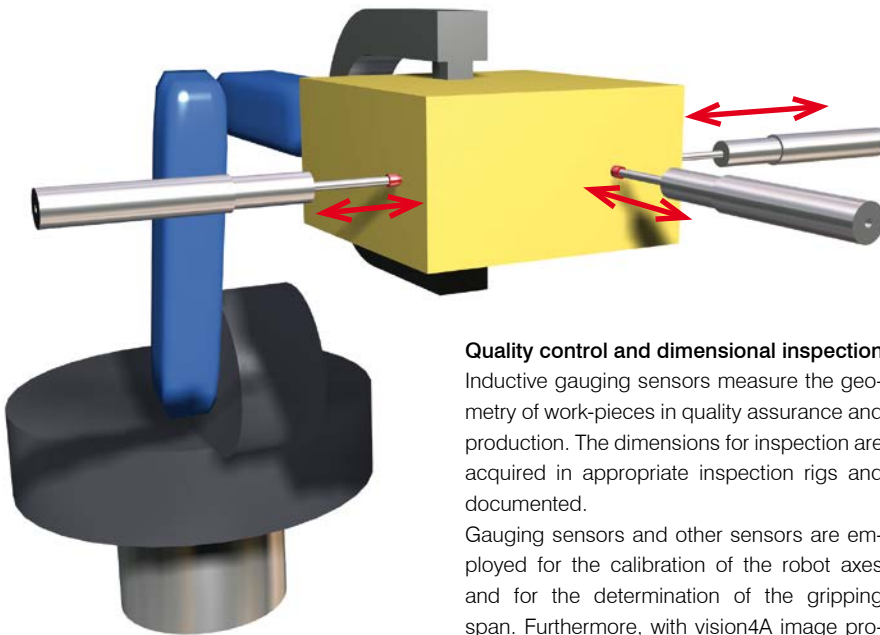
The displacement sensor uses a ferrous target sleeve of soft magnetic material, a measurement coil and a compensation coil. The coils are mounted inside a pressurised stainless steel housing. The eddy currents then arising in the target form a magnetic field which influences the measurement coil impedance. This changes linearly with the target position. The magnetic field of the compensation coil has in contrast no coupling with the target and the impedance of the compensation coil is largely independent of the target position.

The electronic circuit generates a signal from the ratio of the impedance of the measurement coil and the compensation coil and converts the sleeve position into a linear electrical output signal of 4 - 20mA. In achieving this, the temperature effects and the temperature gradient are essentially eliminated.

Block diagram EDS series



Sensors are the eyes and ears of a technical system. The values or states you acquire are processed in the controller or evaluated and appropriate further steps initiated. With the aid of sensors the measurement object is deflected, moved, set, guided, bent, panned, positioned, tilted, displaced or centred. The following overview shows a small extract of the possibilities for the application of the product group induSENSOR. With inductive sensors in applications, process times are shortened, operational readiness is extended, operational safety is increased, production yield is improved, setting up times are shortened and there is a gain in convenience.



#### Quality control and dimensional inspection

Inductive gauging sensors measure the geometry of work-pieces in quality assurance and production. The dimensions for inspection are acquired in appropriate inspection rigs and documented.

Gauging sensors and other sensors are employed for the calibration of the robot axes and for the determination of the gripping span. Furthermore, with vision4A image processing systems the position of the handling object in space is acquired.

The deflection of the probe tip in 3D coordinate machines is compensated using inductive sensors from Micro-Epsilon.

- *Construction*
- *Automotive*
- *Facility management*
- *Household appliances*
- *Hydraulics*
- *Measurement systems*
- *Medical engineering*
- *Production plants*
- *Process technology*
- *Inspection and testing systems*
- *Quality control*
- *Machine tools*

#### Hydraulic and pneumatic cylinders

##### Railway engineering

When taking a bend, the coach body on the vehicle is then tilted towards the inside of the bend with the aid of hydraulic cylinders. This tilt is acquired with sensors in the EDS series.

##### Automobile construction

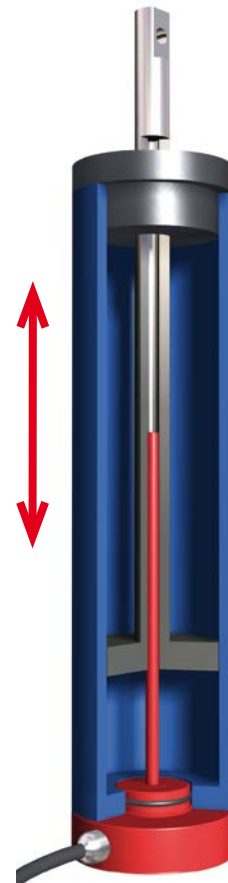
Deflection of hydraulic suspension in commercial vehicles, position of convertible top cylinders as well as pedal and clutch displacements are typical applications..

##### Heavy industry

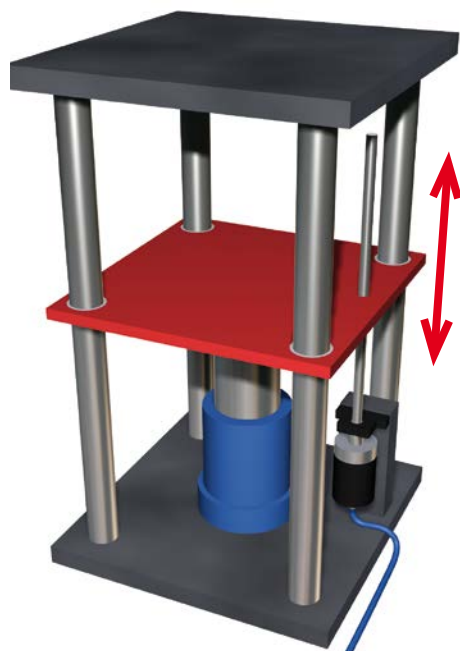
The EDS series is used for the crusher gap control on rock crushers.

##### Aerospace

In the dynamic control and navigation of aircraft various sensors in the LVDT series are employed as key elements. Typical applications are in navigation, cockpit simulators, the mechanical turbine control, antenna positioning, flaps control, rudder trimming, pedal positioning and in the undercarriage.







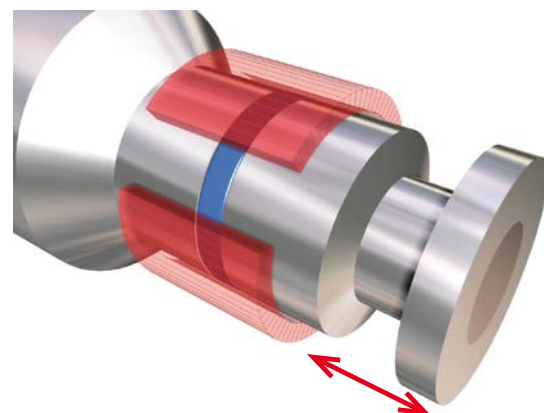
### Inspection and testing systems

In inspection and testing systems inductive sensors acquire deflection, oscillation and vibration of the measurement positions.

In particular, the sensors of the VIP series are suitable for the measurement range from 50 to 200mm. The requirements with regard to a small installation volume, wide useful measurement range and insensitivity to measurement object lateral variations are optimally fulfilled by sensors in the VIP series.

### Construction

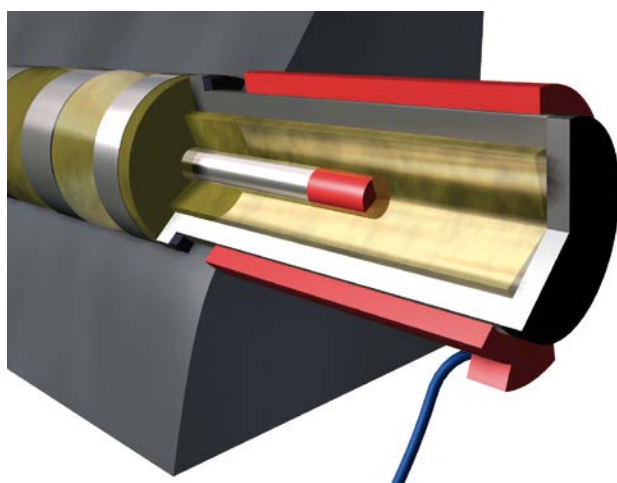
Inductive sensors from Micro-Epsilon are used for continuous measurements in civil engineering. The sensors acquire the movement of bridge elements or the walls of buildings with the change of seasons and during renewal.



### Machine tools, production automation, Measurement with respect to rotating shafts

To monitor the clamping position of tools a sensor in the VIP series is integrated into the chuck and directly measures the clamping stroke of the drawbar. It can be universally used with the most varied types of tool due to an extremely compact sensor design.

In automatic screwdrivers inductive sensors from Micro-Epsilon continuously measure the penetration depth from 0 to 70 mm, thus monitoring screw joints with different depths on the same station.



### Hydraulic valve

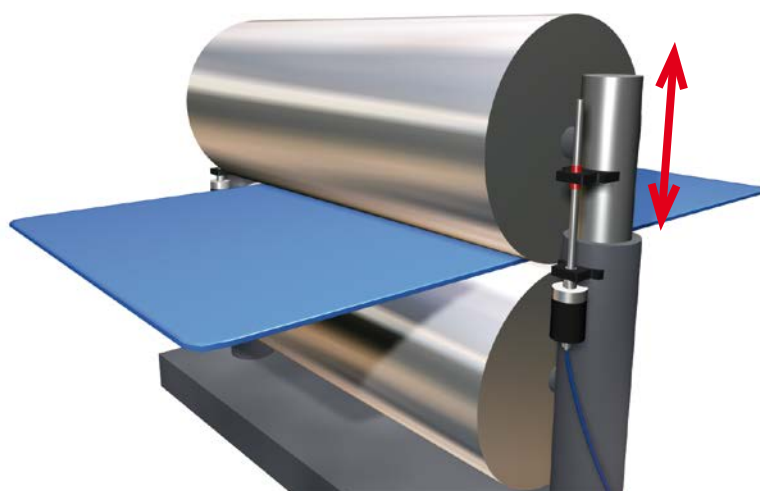
With the classical LVDT sensors and innovative sensors in the VIP series, Micro-Epsilon offers a wide selection of systems for the measurement of the piston position on hydraulic and solenoid valves. The sensors in the VIP series are particularly characterized by the small installation space and the high cut-off frequency.

### Dosing valve

In automatic dosing valves inductive sensors monitor the position of the dosing needle and ensure uniform dosing quality.

### Process valve

To control and block the flow of gases and liquids the spindle drives of process valves are fitted with Micro-Epsilon displacement sensors.



### Production plants

In automated production plant, inductive sensors from Micro-Epsilon monitor the production tolerance of the products while the process is running. Other fields of application lie in the continuous acquisition of flap positions and slide settings.



## 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