

# Linear encoders without bearings incremental

## System for linear motion feedback

### Sensor head with magnetic tape

#### MIL10



MIL10

#### Features

- Sensor head with magnetic tape
- Robust magnetic sensing method
- Output signals A 90° B with index signal
- Output circuits: HTL/push-pull and TTL/RS422
- Resolution up to 5 µm (4-times evaluation)
- Non-contact, wear-free sensing system
- High resistance to dirt and vibrations

#### Technical data - electrical ratings

|                       |   |
|-----------------------|---|
| Short-circuit proof   | Yes   |
| Initializing time     | ≤50 ms after power on<br>(see general informations)                                   |
| Resolution            | 5 µm (4-times evaluation)<br>10 µm (4-times evaluation)<br>25 µm (4-times evaluation) |
| Interpolation         | 20-fold, 50-fold, 100-fold  |
| Output signals        | A+, B+, R+, A-, B-, R-  |
| Reference signal      | Index signal, width 90°   |
| Output frequency      | ≤350 kHz  |
| System accuracy       | ±(0.02 mm + 0.04 mm x<br>magnetic tape length (m))                                    |
| Duty cycle            | 40...60 %   |
| Sensing method        | Magnetic  |
| Output stages         | HTL/push-pull<br>TTL/RS422  |
| Interference immunity | DIN EN 61000-6-2  |
| Emitted interference  | DIN EN 61000-6-4  |
| Approvals             | CE, UL  |

#### Technical data - electrical ratings (HTL)

|                             |                  |
|-----------------------------|------------------|
| Voltage supply              | 10...30 VDC      |
| Reverse polarity protection | Yes              |
| Consumption typ.            | 20 mA (w/o load) |

#### Technical data - electrical ratings (TTL)

|                               |  |
|-------------------------------|--|
| Voltage supply                | 5 VDC ±5 %                                   |
| Consumption typ.              | 30 mA (w/o load)                             |
| Recommended cable termination | On control side each channel<br>pair 120 Ohm |

#### Technical data - mechanical design

|                          |  |
|--------------------------|--|
| Dimensions (sensor head) | 10 x 15 x 45.5 mm  |
| Protection DIN EN 60529  | IP 66, IP 67   |
| Movement speed           | <5 m/s (resolution 5 µm)<br><10 m/s (resolution 10 µm)<br><25 m/s (resolution 25 µm)     |
| Working distance         | 0.1...0.6 mm   |
| Material                 | Housing: zinc diecast, plated  |
| Operating temperature    | -40...+85 °C   |
| Relative humidity        | EN 60068-2-78:2010<br>EN 60068-2-30:2005<br>93 % condensation permitted                  |
| Resistance               | DIN EN 60068-2-6<br>Vibration 30 g, 10-2000 Hz<br>DIN EN 60068-2-27<br>Shock 500 g, 6 ms |
| Weight approx.           | 130 g  |
| Connection               | Cable 2 m<br>Cable 0.3 m with connector M12  |

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## Part number

MIL10-S2. 

|  |  |   |  |  |    |
|--|--|---|--|--|----|
|  |  | . |  |  | .A |
|--|--|---|--|--|----|

Reference signal

- N Without reference signal
- P Index signal (pole-periodic)

Resolution

- 0005 5  $\mu\text{m}$  (4-times evaluation)
- 0010 10  $\mu\text{m}$  (4-times evaluation)
- 0025 25  $\mu\text{m}$  (4-times evaluation)

Voltage supply / output stages

- E 4.75...5.25 VDC / TTL/RS422, 6 channel
- N 10...30 VDC / HTL/push-pull, 6 channel

Connection

- L Cable 2 m
- C Cable 0.3 m with connector M12, 8-pin, pin terminals, CCW

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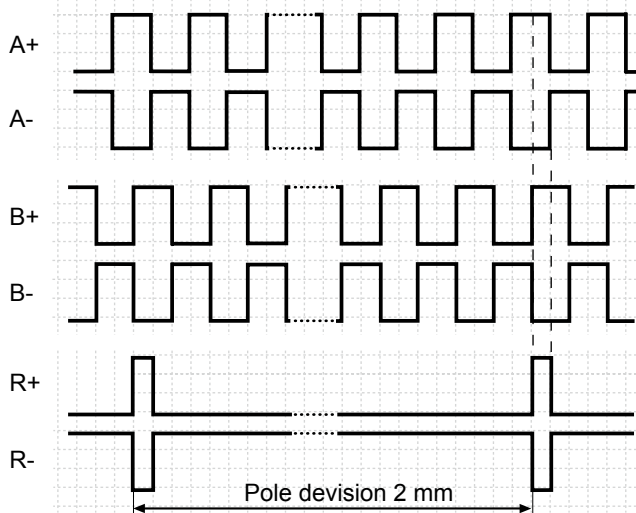
##### Accessories

###### Connectors and cables

|          |   |
|----------|---|
| 10146775 | Female connector M12, 8-pin, straight, without cable                          |
| 11170528 | Female connector M12, 8-pin, straight, shielded, 5 m cable (ESG 34FH0500GVS)  |
| 11177375 | Female connector M12, 8-pin, straight, shielded, 10 m cable (ESG 34FH1000GVS) |
| 11091511 | Female connector M12, 8-pin, straight, shielded, 20 m cable                   |

##### Output signals

Signal A leads to signal B by 90° in the moving direction shown below.



##### Trigger level

| Outputs           | HTL/push-pull |
|-------------------|---------------|
| Output level High | >+Vs -2.2 V   |
| Output level Low  | <0.7 V        |
| Load              | ≤20 mA        |

| Outputs           | TTL/RS422 |
|-------------------|-----------|
| Output level High | >2.4 V    |
| Output level Low  | <0.7 V    |
| Load              | ≤20 mA    |

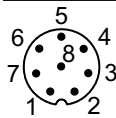
##### General information

The initializing time of the sensor is 50 ms. Output signals may not be processed during this time.

##### Terminal assignment

###### Cable or cable 0.3 m with connector M12

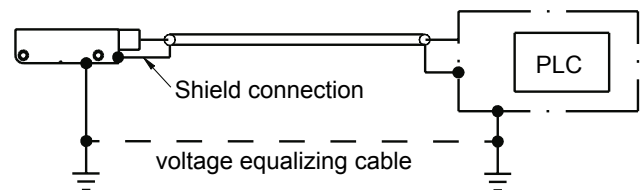
| Connector | Core colour | Signals              |
|-----------|-------------|----------------------|
| Pin 1     | white       | 0 V                  |
| Pin 2     | brown       | +Vs                  |
| Pin 3     | green       | A+                   |
| Pin 4     | yellow      | A-                   |
| Pin 5     | grey        | B+                   |
| Pin 6     | pink        | B-                   |
| Pin 7     | blue        | R+ (zero pulse)      |
| Pin 8     | red         | R- (zero pulse inv.) |



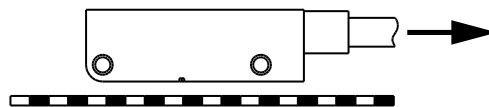
Cable screen: connected to sensor housing or connector M12 and sensor housing.

Cable data: PUR 4 x 2 x 0.14 mm<sup>2</sup>, shielded  
 Bending radius: >50 mm (fix) / >100 mm (cable chain)  
 Outer diameter: 6.3 mm

##### Recommended grounding concept



##### Rotational or linear direction



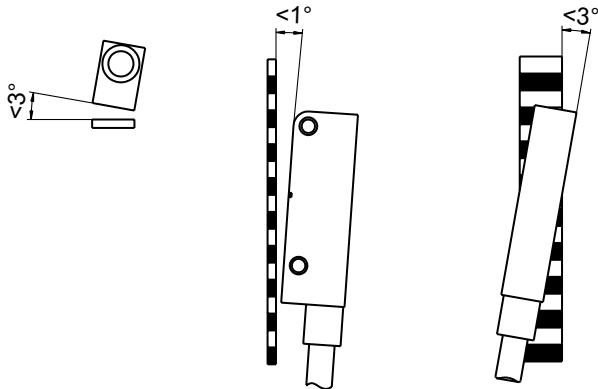
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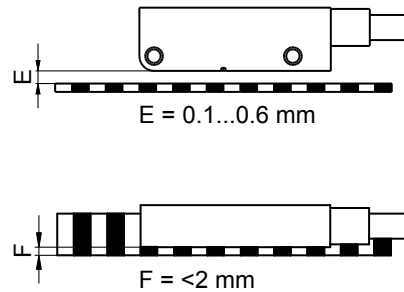
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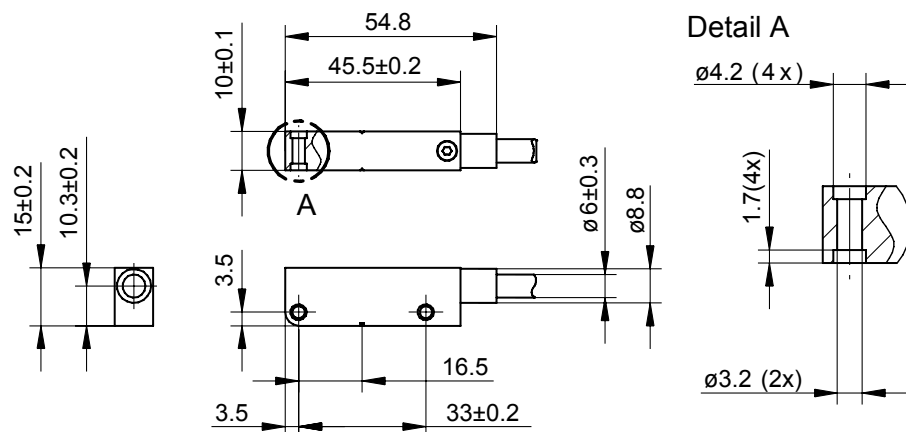
## Angular misalignment



## Working distance



## Dimensions



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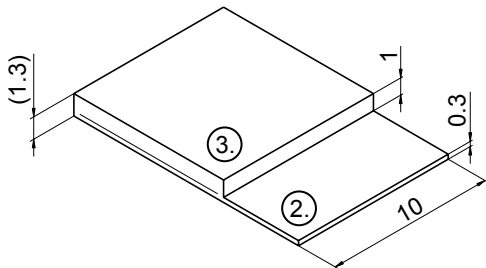
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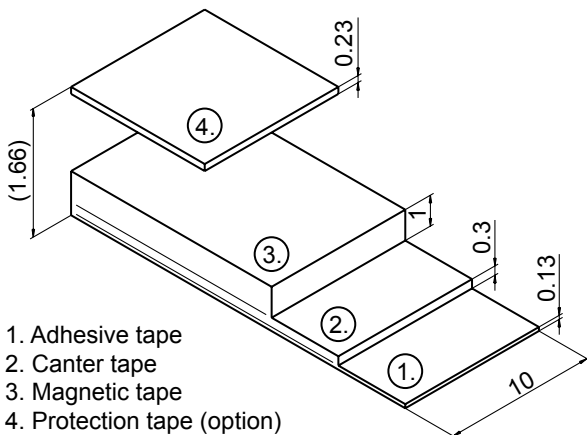
#### MIL10

##### Magnetic tapes

##### Layers – magnetic tape



##### Layers – magnetic tape self-adhesive



1. Adhesive tape
2. Canter tape
3. Magnetic tape
4. Protection tape (option)

##### Technical data - magnetic tape

|                 |  |
|-----------------|--|
| Measuring range | <50 m  |
| Pole length     | 2 mm   |
| Precision class | ±40 μ (further upon request)                         |
| Tape width      | 10 mm  |
| Material        | Elastomer bounded tape on an stainless steel support |
| Mounting        | Self-adhesive or self-mounting                       |
| Bending radius  | Min. 75 mm   |

##### Part number

|          |  |
|----------|--|
| 10128662 | MIL10-M402.00050.P10NN<br>Magnetic tape 50 mm                    |
| 10128663 | MIL10-M402.00150.P10NN<br>Magnetic tape 150 mm                   |
| 10128664 | MIL10-M402.00300.P10NN<br>Magnetic tape 300 mm                   |
| 11177271 | MIL10-M402.00500.P10NN<br>Magnetic tape 500 mm                   |
| 11181983 | MIL10-M402.01000.P10NN<br>Magnetic tape 1 m                      |
| 11177272 | MIL10-M402.05000.P10NN<br>Magnetic tape 5 m                      |
| 11177273 | MIL10-M402.10000.P10NN<br>Magnetic tape 10 m                     |
| 11177274 | MIL10-M402.25000.P10NN<br>Magnetic tape roll 25 m                |
| 11177276 | MIL10-M402.00050.P10TN<br>Magnetic tape 50 mm, self-adhesive     |
| 11173414 | MIL10-M402.00150.P10TN<br>Magnetic tape 150 mm, self-adhesive    |
| 11177277 | MIL10-M402.00300.P10TN<br>Magnetic tape 300 mm, self-adhesive    |
| 11177278 | MIL10-M402.00500.P10TN<br>Magnetic tape 500 mm, self-adhesive    |
| 11177279 | MIL10-M402.01000.P10TN<br>Magnetic tape 1 m, self-adhesive       |
| 11177290 | MIL10-M402.05000.P10TN<br>Magnetic tape 5 m, self-adhesive       |
| 11177291 | MIL10-M402.10000.P10TN<br>Magnetic tape 10 m, self-adhesive      |
| 11177292 | MIL10-M402.25000.P10TN<br>Magnetic tape roll 25 m, self-adhesive |

Tolerance: ≤500 mm: ±0.5 mm; 500...1000 mm: ±2 mm  
>1000 mm: 0/+50 mm

On request:

Protection tape self-adhesive, stainless steel, 0.3 mm thick