Special Features

- Compact design for tight spaces
- Touchless magnetostrictive measurement technology
- Operating pressure up to 350 bar, peaks up to 450 bar
- Non-contacting position detection with ring-shaped position marker
- Unlimited mechanical life
- No velocity limit for position marker
- Absolute output
- Outstanding accuracy performance up to 0.04 %
- Wide range of supply voltage
- Optimized for use in industrial applications
- Other configurations see separate data sheets

Applications

- Manufacturing Engineering
- Level measurement
- Actuators

The absolute linear transducer TM1 enables a compact and cost-effective position measurement. It consists of a stainless steel flange welded to a pressure-resistant rod and can therefore be used under harsh environmental conditions. The magnetostrictive measuring technology offers excellent accuracy for measuring lengths up to 2000 mm. The passive ring-shaped position marker allows a mechanically decoupled measurement.

Description

<table>
<thead>
<tr>
<th>Material</th>
<th>Range: SS 1.4307 / AISI 304L</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range cover: AlSiMgBi</td>
</tr>
<tr>
<td></td>
<td>Rod: SS 1.4571 / AISI 316Ti</td>
</tr>
<tr>
<td></td>
<td>Sealing: O-ring FKM 80, Supporting ring: PTFE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mounting</th>
<th>Plugged and secured in position with set screw M5 ISO 4026</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical connection</td>
<td>Connector M12x1, A-coded / Connector system M12x1, A-coded with lead wires</td>
</tr>
</tbody>
</table>

Mechanical Data

<table>
<thead>
<tr>
<th>Dimensions</th>
<th>See dimension drawing</th>
</tr>
</thead>
</table>

Applications

- Manufacturing Engineering
- Level measurement
- Actuators
Ordering Specifications

Preferred types printed in bold

Interface

CANopen

Interface parameters
1: 1x position, 1x speed

Baud rate
1: 1000 kbaud
2: 800 kbaud
3: 500 kbaud
4: 250 kbaud
5: 125 kbaud
7: 50 kbaud

Electrical connection
106: Connector M12x1, 5-pin
468: Plug system M12x1, 5-pin, with lead wires 80 mm*
472: Plug system M12x1, 5-pin, with lead wires 120 mm*
476: Plug system M12x1, 5-pin, with lead wires 150 mm*
480: Plug system M12x1, 5-pin, with lead wires 200 mm*
484: Plug system M12x1, 5-pin, with lead wires 240 mm*
* Only for installation in a cylinder

Series

Mechanical version
307: Plug-in flange Ø 48 mm with internal thread M4x6 at rod end, additional length 7.5 mm

Electrical measuring range
Standard lengths 0050 up to 2000 mm in 25 mm-steps
Other lengths on request
Drawing

TM1_305_1

With internal thread M4x6

Electrical thru-pole

Position marker

TM1_305_4

M24x1.5

M22

M12x1

M12x1

L = 120mm; 35
L = 120mm; 65

Φ48 Φ32

Φ10

24.8 ±0.1

24.8 ±0.1

Φ29.8

24.8 ±0.1

Φ29.8

24.8 ±0.1

24.8 ±0.1

24.8 ±0.1

24.8 ±0.1

L = 120mm; 42.5
L = 120mm; 105

M4 / 6 deep

CAD data see
www.novotechnik.de/en/download/cad-data/
### Technical Data

**Type**

<table>
<thead>
<tr>
<th>CANopen</th>
</tr>
</thead>
<tbody>
<tr>
<td>TM1--305-6---</td>
</tr>
</tbody>
</table>

#### Measured variables
- Position, speed and temperature

#### Electrical measuring range (dim. L)
- 0 ... 50 mm up to 0 ... 2000 mm

#### Measuring range speed
- 25 ... 1000 mm/s

#### Protocol
- CANopen protocol to CiA DS-301 V4.2.0, Device profile DS-406 V3.2 Encoder Class C2, LSS services to CiA DS-305 V1.1.2

#### Programmable parameters
- Position, speed, cams, working areas, temperature, node ID, baud rate

#### Node ID
- 1 ... 127 (default 127)

#### Baud rate
- 50 ... 1000 kbaud

#### Update rate (output)
- 1 kHz (internal measuring rate 0.5 kHz)

#### Resolution
- 0.1 mm

#### Absolute linearity
- ± 0.04 %FS (min. 300 µm)

#### Tolerance of electric zero point
- ± 1 mm

#### Repeatability
- ± 0.1 mm

#### Hysteresis
- ± 0.1 mm

#### Temperature error
- ± 15 ppm/K (min. 0.01 mm/K)

#### Supply voltage U_B
- 12/24 VDC (8 ... 34 VDC)

#### Power drain w/o load
- < 1.0 W

#### Overvoltage protection
- 40 VDC (max. 60 W)

#### Polarity protection
- yes (supply lines and outputs)

#### Short circuit protection
- yes (all outputs vs. GND and supply voltage)

#### Insulation resistance (500 VDC)
- ≥ 10 MΩ

#### Bus termination internal
- w/o (internal load resistance 120 Ω on request)

### Environmental Data

#### Max. operational speed
- Mechanically unlimited

#### Vibration IEC 60068-2-6
- 20 g, 10 ... 2000 Hz, A_max = 0.75 mm

#### Shock IEC 60068-2-27
- 100 g, 11 ms (single hit)

#### Protection class DIN EN 60529
- IP67 (Connector system M12, fastened, when correctly fitted in cylinder: IP69)

#### Operating temperature
- -40 ... +105°C (-40 ... +85°C for connector system M12)

#### Operating humidity
- 0 ... 95 % R.H. (no condensation)

#### Working pressure
- ≤ 350 bar

#### Pressure peaks
- ≤ 450 bar

#### Burst pressure
- > 700 bar

#### Life
- Mechanically unlimited

#### Functional safety
- If you need assistance in using our products in safety-related systems, please contact us

#### MTTF (IEC 60050)
- 391 years

#### Traceability
- Serial number on type labeling, production batch of the sensor assembly and relevant sensor components

### EMC Compatibility

- **EN 61000-4-2 ESD (contact/air discharge)**
  - 4 kV, 8 kV

- **EN 61000-4-3 Electromagnetic fields (RF)**
  - 10 V/m

- **EN 61000-4-4 Fast transients (burst)**
  - 1 kV

- **EN 61000-4-6 Cond. disturbances (RF fields)**
  - 10 V eff.

- **EN 55016-2-3 Radiated disturbances**
  - Industrial and residential area
  - Only for connector system M12: Data applies only inside a cylinder.

- The EMC measurements are conducted in a reference cylinder. The EMC properties can deviate when using different cylinders.

FS = Full scale: Signal span according to electrical measuring range
## Connection Assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Connector code 106</th>
<th>Plug system code 4_</th>
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</thead>
<tbody>
<tr>
<td>Supply voltage Ub</td>
<td>Pin 2</td>
<td>Pin 2</td>
</tr>
<tr>
<td>GND</td>
<td>Pin 3</td>
<td>Pin 3</td>
</tr>
<tr>
<td>CAN_H</td>
<td>Pin 4</td>
<td>Pin 4</td>
</tr>
<tr>
<td>CAN_L</td>
<td>Pin 5</td>
<td>Pin 5</td>
</tr>
<tr>
<td>Do not connect</td>
<td>Pin 1</td>
<td>Pin 1</td>
</tr>
</tbody>
</table>

Connect cable shielding to protection earth

![Pin assignment diagram](image)
Position Markers

Z-TH1-P18
Ring position marker for fixation with screws M3
Material PA6-GF
Weight approx. 12 g
Operating temp. -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque max. 100 Ncm
P/N 400005697 Pack. unit [pcs] 1

Z-TH1-P19
Ring position marker for fixation with screws M4, optionally with or without spacer
Material PA6-GF, Spacer: POM-GF
Weight approx. 14 g
Operating temp. -40 ... +100°C
Surface pressure max. 40 N/mm²
Fastening torque max. 100 Ncm
P/N 400005698 Spacer Pack. unit [pcs] 1
P/N 400107117 incl. Pack. unit [pcs] 1

Z-TH1-P30
Ring position marker for mounting via lock washer and retaining ring
Material NdFeB bonded (EP)
Weight approx. 5 g
Operating temp. -40 ... +100°C
Surface pressure max. 10 N/mm²
P/N 400106139 Pack. unit [pcs] 1

Z-TH1-P25
U-shaped position marker for fixation with M4 screws
Caution: for dimension of electrical zero point please follow the user manual!
Material PA6-GF
Operating temp. -40 ... +105°C
Surface pressure max. 40 N/mm²
Fastening torque max. 100 Ncm
P/N 400105076 Pack. unit [pcs] 1
Position Markers

Z-TH1-P32
Ball-type floating position marker
Material  SS 1.4571 / AISI 316Ti
Weight  approx. 42 g
Operating temp.  -40 ... +100°C
Compression strength  ≤ 40 bar
Density  720 kg/m³
Immersion depth in water  36.7 mm
P/N  400105703
Pack. unit [pcs]  1

Z-TH1-P21
Cylinder floating position marker
Material  SS 1.4404 / AISI 316L
Weight  approx. 20 g
Operating temp.  -40 ... +100°C
Compression strength  ≤ 8 bar
Density  740 kg/m³
Immersion depth in water  approx. 26.6 mm
P/N  400056044
Pack. unit [pcs]  1

Floating Position Marker - Installation Recommendation
When using floating position markers, we recommend to secure the marker against loss with a washer at the rod end. For this purpose, a sensor version with inner thread at the rod end is required (s. ordering code).
**Connector System M12**

**EEM-33-49/50/51**

M12x1 Mating female connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), open ended

- **Plug housing**: TPU
- **Cable sheath**: PUR, Ø = 6.7 mm
- **Lead wires**: PE, 2x0.25 mm² + 2x0.34 mm²

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type</th>
<th>Length</th>
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<tbody>
<tr>
<td>400106368</td>
<td>EEM-33-49</td>
<td>2 m</td>
</tr>
<tr>
<td>400106371</td>
<td>EEM-33-50</td>
<td>5 m</td>
</tr>
<tr>
<td>400106372</td>
<td>EEM-33-51</td>
<td>10 m</td>
</tr>
</tbody>
</table>

**EEM-33-52**

M12x1 Mating female/male connector, 5-pin, straight, A-coded, with molded cable, IP67, shielded (shield on knurl), CAN-Bus

- **Plug housing**: PUR
- **Cable sheath**: PUR, Ø = 6.7 mm
- **Lead wires**: PE, 2x0.25 mm² + 2x0.34 mm²

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type</th>
<th>Length</th>
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<tbody>
<tr>
<td>400106373</td>
<td>EEM-33-52</td>
<td>5 m</td>
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</tbody>
</table>

**EEM-33-45**

M12x1 splitter / T-connector, 5-pin, A-coded, IP68, 1:1 connection, female - male - female, CAN-Bus

- **Plug housing**: PUR, -25 ... +85°C

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>400056145</td>
<td>EEM-33-45</td>
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</table>

**EEM-33-47**

M12x1 terminating resistor, 5-pin, A-coded, IP67, 120 Ω resistance, CAN-Bus

- **Plug housing**: PUR, -25 ... +85°C

<table>
<thead>
<tr>
<th>P/N</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>400056147</td>
<td>EEM-33-47</td>
</tr>
</tbody>
</table>

**Additional Information**

- **Protection class**: IP67 DIN EN 60529
- **Electromagnetic Compatibility (EMC)** and shield systems
- **Very good resistance to oils, coolants and lubricants**
- **Suitable for applications in draglines**
- **UL - approved**
- **CAN-Bus**
The specifications contained in our datasheets are intended solely for informational purposes. The documented specification values are based on ideal operational and environmental conditions and can vary significantly depending on the actual customer application. Using our products at or close to one or more of the specified performance ranges can lead to limitations regarding other performance parameters. It is therefore necessary that the end user verifies relevant performance parameters in the intended application. We reserve the right to change product specifications without notice.