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

Material
Flange: SS 1.4307 / AISI 304L
Flange cover: AlSiMgBi
Rod: SS 1.4571 / ASI 316Ti
Sealing: O-ring FKM 80, Supporting ring: PTFE

Mounting
Plugged and secured in position with set screw M5 ISO 4026

Electrical connection
Connector M12x1, A-coded / Connector system M12x1, A-coded with lead wires

Mechanical Data
Dimensions
See dimension drawing
# Ordering Specifications

**Preferred types printed in bold**

<table>
<thead>
<tr>
<th>Supply voltage Ub</th>
<th>8: Ub = 24 VDC</th>
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<tbody>
<tr>
<td><strong>Output signal</strong></td>
<td>2: 4 ... 20 mA</td>
</tr>
<tr>
<td><strong>Output characteristic</strong>:</td>
<td>1: Rising output characteristic, seen from flange</td>
</tr>
<tr>
<td></td>
<td>2: Falling output characteristic, seen from flange</td>
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</tbody>
</table>

**Electrical connection**

- **104**: Connector M12x1, 4-pin
- **438**: Plug system M12x1, 4-pin, with lead wires 80 mm*
- **442**: Plug system M12x1, 4-pin, with lead wires 120 mm*
- **446**: Plug system M12x1, 4-pin, with lead wires 155 mm*
- **450**: Plug system M12x1, 4-pin, with lead wires 200 mm*
- **454**: Plug system M12x1, 4-pin, with lead wires 240 mm*

* Only for installation in a cylinder

<table>
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</tbody>
</table>

**Series**

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

**Electrical measuring range**

- Standard lengths 0000 up to 2000 mm in 25 mm-steps
- Other lengths on request
TM1_---305---1

With internal thread M4x6

Electrical feed point

Position marker

M12x1

M24x1,5

\( \phi 29,8 \)

\( \phi 10 \)

L = 120mm

L = 100mm

L = 42,5

L = 36

L = 10

L = 120mm

L = 120mm

\( \phi 45 \)

CAD data see www.novotechnik.de/en/download/cad-data/
Type | TM1-...-305-82-...
---|---
Output signal | 4 ... 20 mA
Burden | U_l ≤ 500 Ω, U_b ≤ 250 Ω
Sampling rate / Update rate | 0.5 kHz
Electrical measuring range (dim. L) | 0 ... 50 mm up to 0 ... 2000 mm
Absolute linearity | ≤ ±0.04 %FS (min. 300 µm)
Tolerance of zero point | ±1 mm
Resolution | ≤ 0.1 mm
Repeatability | ≤ ±0.1 mm
Hysteresis | ≤ ±0.1 mm
Temperature error typ. | 50 ppm/K (min. 0.01 mm/K)
Supply voltage U_b | 12/24 VDC (8 ... 32 VDC)
Supply voltage ripple | ≤ 10% U_b
Power drain w/o load | < 1 W
Overvoltage protection | 36 VDC (permanent)
Polarity protection | yes (36 VDC)
Short circuit protection | yes (output vs GND and supply voltage up to 36 VDC)
Insulation resistance (500 VDC) | ≥ 10 MΩ

Environmental Data
Max. operational speed | Mechanically unlimited
Vibration IEC 60068-2-6 | 20 g, 10 ... 2000 Hz, Amax = 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 (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) | 355 years

EMC Compatibility
EN 61000-4-2 ESD (contact/air discharge) | 4 kV, 8 kV
EN 61000-4-3 Electromagnetic fields (RFI) | 10 V/m
EN 61000-4-4 Fast transients (burst) | 1 kV
EN 61000-4-6 Conduct. disturbances (RF fields) | 10 V/m, on
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</th>
<th>Plug system code</th>
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</thead>
<tbody>
<tr>
<td>U_b</td>
<td>Pin 1</td>
<td>Pin 1</td>
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<tr>
<td>GND</td>
<td>Pin 3</td>
<td>Pin 3</td>
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<tr>
<td>Signal output</td>
<td>Pin 2</td>
<td>Pin 2</td>
</tr>
<tr>
<td>Do not connect</td>
<td>Pin 4</td>
<td>Pin 4</td>
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</tbody>
</table>

Connect cable shielding to protection earth
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 of mounting: max. 100 Ncm
P/N: 400005697
Pack. unit [pcs]: 1

Z-TH1-P19
Z-TH1-PD19 With spacer
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: 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 of mounting: 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

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**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

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**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-33-32/62/97**
M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, shielded, IP67, open ended
Plug housing: PA
Cable sheath: PUR, Ø = max. 6 mm, 
-25 ... +80°C (moved)
-50 ... +80°C (fixed)
Lead wires: PP, 0.34 mm²

<table>
<thead>
<tr>
<th>P/N</th>
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<tr>
<td>400005609</td>
<td>EEM-33-62</td>
<td>5 m</td>
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<td>400005690</td>
<td>EEM-33-97</td>
<td>10 m</td>
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</tbody>
</table>

**EEM-33-33/63/99**
M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, shielded, IP67, open ended
Plug housing: PA
Cable sheath: PUR, Ø = max. 6 mm, 
-25 ... +80°C (moved)
-50 ... +80°C (fixed)
Lead wires: PP, 0.34 mm²

<table>
<thead>
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<td>400005696</td>
<td>EEM-33-99</td>
<td>10 m</td>
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</tbody>
</table>

- **IP67**: Protection class IP67 DIN EN 60529
- **IP68**: Protection class IP68 DIN EN 60529
- **UL**: UL - approved
- **C**: Suitable for applications in dry atmospheres
- **UL**: UL - approved
- **CAN**: 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.