NOVOSTRICTIVE
Transducer
Touchless
TM1
Screw flange
4 ... 20 mA
Mobile Applications

Special Features
• For integration in pneumatic and hydraulic cylinders
• Touchless magnetostrictive measurement technology
• Operating pressure up to 350 bar, peaks up to 450 bar
• Ring-shaped position marker does not contact sensor
• 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 mobile applications with highest EMC requirements such as ISO pulses and high interferences to ISO 11452, exceeds E1 requirements
• Other configurations see separate data sheets

Applications
Hydraulic or pneumatic cylinders in
• Agricultural and forestry machinery
• Construction machines
• Vehicles with loading and unloading devices
• Vehicles with extension arms

The absolute position transducer can be used directly in-cylinder and thus enables a compact and cost-effective position measurement. The sensor consists of a stainless steel flange welded to a pressure tight rod and can therefore be used in harsh environments. 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 / AISI 316Ti
Sealing: O-ring NBR 90 SH A

Mounting
Screwed into cylinder via bushing M18x1.5 for screw plug hole per ISO 6149

Electrical connection
Cable 3x 0.5 mm² (AWG 20), PUR, unsheathed / Connector M12x1, A-coded

Mechanical Data
Dimensions
See dimension drawing
### Ordering Specifications

Preferred types printed in bold

| T | M | 1 | 0 | 5 | 0 | 0 | 3 | 0 | 6 | 8 | 2 | 1 | 1 | 0 | 4 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

**Supply voltage U_b**
- 8: U_b = 12/24 VDC

**Output signal**
- 2: 4 \(\ldots\) 20 mA

**Output characteristic**
- 1: Rising output characteristic, seen from flange
- 2: Falling output characteristic, seen from flange

**Electrical connection**
- 104: Connector M12x1, 4-pin
- 251: Cable, 3-pole, unshielded, A = 1 m
- 253: Cable, 3-pole, unshielded, A = 3 m
- 255: Cable, 3-pole, unshielded, A = 5 m

**Series**

- 306: Screw flange M18x1.5
- 308: Screw flange M18x1.5 with internal thread M4x6 at rod end, additional length 7.5 mm

**Mechanical version**

- 306: Screw flange M18x1.5

**Electrical measuring range**

- Standard lengths 0000 up to 2000 mm in 25 mm-steps
- Other lengths on request
Technical Data

Type: TM1-...-306-82...

Output signal: 4 ... 20 mA

Burden: @Ub 24 V: ≤ 500 Ω, @Ub 12 V: ≤ 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 electric 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 Ub: 12/24 VDC (8 ... 32 VDC)

Supply voltage ripple: ≤ 10% Ub

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

Operating temperature: -40 ... +105°C

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

ISO 10605 ESD (Handling/Component): 8 kV / 15 kV

ISO 11452-2 Radiated HF-fields: 100 V/m

ISO 11452-4 BIC (Bulk current injection): 200 mA

EN 61000-6-2 Transient Emissions: Level 4

ISO 7637-4: Pulses on output lines: Level 1/2

ISO 7637-3: Pulses on supply lines: (1, 2a, 2b, 3a, 3b) Level 4

ISO 7637-2 Pulses on supply lines: (1a, 1b) Fast Level 2

ISO 114982 Agriculture/forestry machines

IS 85859 Construction machinery

EN 14982 Agricultural/forestry machines

Exceeds E1 requirements

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>Cable code</th>
<th>Connector code</th>
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<tbody>
<tr>
<td>Supply voltage Ub</td>
<td>BN</td>
<td>Pin 1</td>
</tr>
<tr>
<td>Signal output</td>
<td>GN</td>
<td>Pin 2</td>
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<tr>
<td>Do not connect</td>
<td>-</td>
<td>Pin 4</td>
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</table>
Technical Data
Output Characteristics

Output characteristic

Output characteristic
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: Pack. unit [pcs]
400056697 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 | Spacer | Pack. unit [pcs]
--- | --- | ---
400056698 | 1
400107117 | incl. 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: Pack. unit [pcs]
400106139 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 ... +125°C
Surface pressure: max. 40 N/mm²
Fastening torque of mounting: max. 100 Ncm

P/N: Pack. unit [pcs]
400105076 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

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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 approx. 26.6 mm in water

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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).

**Z-TH1-M01**
Lock nut ISO 8675, M18x1.5-A2

<table>
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### Connector System M12

**EEM-33-35/36/37**
- M12x1 Mating female connector, 4-pin, straight, A-coded, with molded cable, not shielded, IP67, open ended
- Plug housing: PA
- Cable sheath: PUR, Ø = max. 6 mm, -40 ... +85°C (fixed)
- Lead wires: PP, 0.34 mm²

<table>
<thead>
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<th>Type</th>
<th>Length</th>
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<td>4000056136</td>
<td>EEM-33-36</td>
<td>5 m</td>
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<tr>
<td>4000056137</td>
<td>EEM-33-37</td>
<td>10 m</td>
</tr>
</tbody>
</table>

**EEM-33-38/39/40**
- M12x1 Mating female connector, 4-pin, angled, A-coded, with molded cable, not shielded, IP67, open ended
- Plug housing: PA
- Cable sheath: PUR, Ø = max. 6 mm, -40 ... +85°C (fixed)
- Lead wires: PP, 0.34 mm²

<table>
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<th>Length</th>
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<td>4000056139</td>
<td>EEM-33-39</td>
<td>5 m</td>
</tr>
<tr>
<td>4000056140</td>
<td>EEM-33-40</td>
<td>10 m</td>
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</tbody>
</table>

**EEM-33-89**
- M12x1 Mating female connector, 4-pin, angled, A-coded, with coupling nut, screw termination, IP67, not shieldable
- Operating temp. -25 ... +90°C
- Plug housing: PBT
- For wire gauge: 6 ... 8 mm, max. 0.75 mm²

<table>
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<td>EEM-33-89</td>
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</table>

**Protection class**
- IP67: Protection class IP67 DIN EN 60529
- IP68: Protection class IP68 DIN EN 60529

**Very good Electromagnetic Compatibility (EMC) and shield systems**

**Very good resistance to oils, coolants and lubricants**

**Suitable for applications in rough environments**

**UL - approved**

**CAN-Bus**
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