Short Stroke Transducer
potentiometric
with integrated signal processing
25 mm up to 150 mm
Series TE1

Applications
• Measuring / control technology
• Manufacturing Engineering
  Woodwork machines
  Riveting machines
  Packaging machines
  Welding machines
• Assembly / Test devices
• Medical appliances
• Building technology

Special features
• Extremely compact design 18 x 18 mm
• Long life up to 100 million movements
• Outstanding linearity up to ±0.075 %
• Repeatability to ±0.002 mm
• Models with push rod or spring-loaded with internal return spring
• Actuating shaft with double-sided support
• Compatible to standard probe tips
• Insensitive to shock and vibration
• Optionally cable or plug connection
• Special ball-coupling eliminates lateral forces
• High operational speeds - up to 10 m/s
• Integrated signal processing for normalized output signals current or voltage
• Low temperature coefficient < 20 ppm/K
• Series T/TS TR/TRS without integrated signal processing in same design see separate data sheet
• Inductive series LS1 in same design see separate data sheet

Compact transducer with proven conductive-plastic technology and integrated signal processing.
The model with push rod and ball coupling enables a backlash- and lateral force-free operation even with parallel and angular displacement of transducer and measuring direction. Characteristic for the robust design is the double-sided support of the actuating rod. For the spring-loaded type, this bearing allows high lateral forces on the tip of the rod which may occur during scanning of cams or wedge plates.

The linear transducer with integrated signal processing (4 ... 20 mA or 0 ... 10 V) is connected directly to the analog inputs of the controller.
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### Description

**Housing**
- aluminum AlMgSi, anodized

**Mounting**
- adjustable clamps 2 x Z-45 and 4 x cylinder screw M4x10 (included in delivery)

**Actuating rod**
- stainless steel AISI 303, 1.4305
  - spring-loaded type: with anti-twist safeguard, internal thread M2,5x6

**Ball coupling for push rod type**
- hardened ball with spring pressure on carbide plate (included in delivery)

**Probe tip for spring-loaded type**
- stainless steel with external thread M2.5 and pressed in hardened metal ball (included in delivery)

**Bearings**
- double-sided DU glide bearings

**Resistance element**
- conductive-plastic

**Wiper**
- precious-metal multi-finger wiper, elastomer clamped

**Electrical connections**
- 3-pin connector M8x1, shielded
- 3-pole cable, PVC insulated, 0.14 mm² (AWG 26), shielded, 2 m length

### Mechanical Data

<table>
<thead>
<tr>
<th>Mechanical Data</th>
</tr>
</thead>
</table>

**Maximum permitted torque for mounting screws**
- 140 Ncm

**Push rod type**

<table>
<thead>
<tr>
<th>Housing (dimension A)</th>
<th>TE1-0025-101</th>
<th>TE1-0050-101</th>
<th>TE1-0075-101</th>
<th>TE1-0100-101</th>
<th>TE1-0150-101</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>88</td>
<td>113</td>
<td>138</td>
<td>188</td>
<td>±1 mm</td>
</tr>
</tbody>
</table>

**Mechanical stroke (dimension B)**
- 30 mm

**Maximum operational speed**
- 10 m/s

**Weight**

<table>
<thead>
<tr>
<th>Weight with connector</th>
<th>183</th>
<th>202</th>
<th>222</th>
<th>245</th>
<th>328</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight of shaft with coupling and wiper</td>
<td>138</td>
<td>157</td>
<td>177</td>
<td>201</td>
<td>280</td>
</tr>
</tbody>
</table>

**Operating force (horizontally)**
- 0.30 N

**Max. displacements of ball coupling**
- ±1 mm parallel offset, ±2.5° angular offset

### Spring-loaded type

<table>
<thead>
<tr>
<th>Housing (dimension A)</th>
<th>TE1-0025-102</th>
<th>TE1-0050-102</th>
<th>TE1-0075-102</th>
<th>TE1-0100-102</th>
</tr>
</thead>
<tbody>
<tr>
<td>63</td>
<td>34.4</td>
<td>134.4</td>
<td>166</td>
<td>±1 mm</td>
</tr>
</tbody>
</table>

**Mechanical stroke (dimension B)**
- 30 mm

**Flange nut (dimension C)**
- 12 mm

**Excess length of push rod in and position (dimension D)**
- 32 mm

**Weight**

<table>
<thead>
<tr>
<th>Weight with cable</th>
<th>174</th>
<th>197</th>
<th>238</th>
<th>294</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight with connector</td>
<td>128</td>
<td>152</td>
<td>183</td>
<td>248</td>
</tr>
</tbody>
</table>

**Operating force extended (horizontally)**
- 2.5 N

**Operating force retracted (horizontally)**
- 5.0 N

**Operating force to end stop**
- max. 5 N

**Operating frequency (maximum)**
- 18 Hz

### Environmental Data

**Temperature range TE1**
- -40 ... +85 °C

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

**Vibration (IEC 60068-2-6)**
- 5 ... 2000 Hz
  - Amax = 0.75 mm
  - amax = 20 g

**Shock (IEC 60068-2-27)**
- 50 g
  - 11 (single hit) ms

**Life**
- > 100x10⁶ movem.

**Protection class (DIN EN 60529)**
- IP40

*) Data refer to critical application "probe tip upwards"
### Connection assignment

<table>
<thead>
<tr>
<th>Signal</th>
<th>Cable code 202</th>
<th>Connector code 101</th>
<th>Connector with cable EEM 33-56 /-57 /-58 /-59 /-60 /-61</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage Ubus</td>
<td>GN pin 1</td>
<td>BN</td>
<td></td>
</tr>
<tr>
<td>Signal output</td>
<td>WM pin 4</td>
<td>BK</td>
<td></td>
</tr>
<tr>
<td>GND</td>
<td>BN pin 3</td>
<td>BU</td>
<td></td>
</tr>
</tbody>
</table>

### Rising characteristic output

- **Signal**
  - Rod fully extended
  - Max.
  - Min.
  - Electr. measuring range
  - Mechanical stroke (dimension B)

### Kabel 2 m lang
- Kabel 2 m long

### CAD data see
### Technical Data

#### Electrical Data

<table>
<thead>
<tr>
<th>Type</th>
<th>TE1-0025</th>
<th>TE1-0050</th>
<th>TE1-0075</th>
<th>TE1-0100</th>
<th>TE1-0150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measuring range</td>
<td>25</td>
<td>50</td>
<td>75</td>
<td>100</td>
<td>150</td>
</tr>
<tr>
<td>Independent linearity</td>
<td>0.2 0.15</td>
<td>0.1 0.075</td>
<td>0.075 0.075</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Absolute linearity</td>
<td>0.275 0.225</td>
<td>0.175 0.15</td>
<td>0.15 0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Repeatability</td>
<td>0.002  ±mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resolution</td>
<td>unlimited</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic (electrically)</td>
<td>&gt; 10 kHz</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Tolerance of elec. zero point</td>
<td>typ. ± 1.0 mm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output signal</td>
<td>0 ... 10 V (load ≥ 10 kΩ, residual voltage ≤ 10 mV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>voltage or current</td>
<td>10 ... 0 V (load ≥ 10 kΩ, residual voltage ≤ 10 mV)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 ... 20 mA (burden ≤ 500 Ω)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 ... 4 mA (burden ≤ 500 Ω)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short circuit protection</td>
<td>yes, all outputs vs. GND and Uab</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage Uab</td>
<td>16 ... 30 V</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supply voltage ripple</td>
<td>max. 10 % Vss</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Power consumption without load</td>
<td>&lt; 1 W</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature coefficient</td>
<td>&lt; 20 ppm/K</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Overvoltage protection</td>
<td>&lt; 36 (permanent)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Reverse protection</td>
<td>yes, supply lines</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Insulation resistance (500 VDC)</td>
<td>&gt; 10 MΩ</td>
<td></td>
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</tbody>
</table>

#### Environmental Data

- **MTTF (ISO 13849-1, parts count method, w/o load):** 25 Jahre
- **Functional safety:** If you need assistance in using our products in safety-related systems, please contact us
- **EMC compatibility:**
  - EN 61000-4-2 Electrostatic discharge (ESD) 4 kV, 8 kV
  - EN 61000-4-3 Electromagnetic fields 10 V/m
  - EN 61000-4-4 Fast transients (Burst) 1 kV
  - EN 61000-4-6 Conducted disturbances, induced by RF-fields 10 V eff.
  - EN 61000-4-8 Power frequency magnetic fields 30 A/m
  - EN 55016-2-3 Radiated disturbances class B

*) Other linearities on request

### Ordering specifications

#### Preferred types printed in bold

<table>
<thead>
<tr>
<th>Series</th>
<th>Te</th>
<th>E</th>
<th>0</th>
<th>1</th>
<th>0</th>
<th>0</th>
<th>1</th>
<th>0</th>
<th>2</th>
<th>4</th>
<th>1</th>
<th>1</th>
<th>0</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>TE1</strong></td>
<td>0025 mm up to 0150 mm</td>
<td><strong>TE1</strong></td>
<td>0102</td>
<td>101</td>
<td>01</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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</tr>
<tr>
<td><strong>Series</strong></td>
<td><strong>Electrical measuring range</strong></td>
<td><strong>Mechanical versions</strong></td>
<td></td>
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</tbody>
</table>

#### Electrical interface

- **4: Analog interface**

#### Output signal analog interface 4 ...

- **1: Voltage output**
  - 1: 0 V ... 10 V (actuating rod extended = 0 V)
  - 2: 10 V ... 0 V (actuating rod extended = 10 V)

- **2: Current output**
  - 1: 4 mA ... 20 mA (actuating rod extended = 4 mA)
  - 2: 20 mA ... 4 mA (actuating rod extended = 20 mA)

### Electrical connection

- **101: Connector M8x1, 3-pin, axial output**
- **202: Cable, 3-pole, 2 m, shielded**
**Note:** The protection class is valid only in locked position with its plugs. The application of these products in harsh environments must be checked in particular cases.
Accessories
Sensor mounting
Signal processing

**Roller head**, hardened steel.
Mounting via external thread M2.5 at push rod. Lock with knurled screw.

Type Z-R50, P/N 005678

**Clamps**
4 single clamps, anodized aluminum, with screw M4x10 - 4.8 tinned, for lower total height

Type Z-FTI-B01, P/N 059010

**Multifunctional Display**
Microprocessor-controlled measuring devices for direct connection of potentiometric sensors or sensors with standardized analog output signals.
- accuracy up to 0.1%
- display range -99 999...999 999
- good cost/value ratio

Type MAP-40 _ _ _ _ _ _ _ _ _ _ _ _ _
Detailed data see separate Data sheet MAP-4000

**Multifunctional displays**
Microprocessor-controlled measuring devices with galvanic isolation for direct connection of potentiometric sensors or sensors with standardized analog output signals.
- accuracy up to 0.01%
- display range -9 999...40 000

Type MAP-3(4) _ _ _ _ _ _ _ _ _ _ _ _ _
Detailed data see separate Data sheet MAP-300/400