Throttle Position Sensor in Hall Effect Technology  
Hollow and D-Shaft Versions

**FEATURES**
- Accurate linearity down to: ± 0.5 %
- Easy mounting principle
- Non contacting technology: Hall effect
- Model dedicated to all applications in harsh environments
- Spring loaded types available

**QUICK REFERENCE DATA**
- Sensor type: ROTATIONAL, single turn hall effect
- Output type: Wires
- Market appliance: Industrial
- Dimensions: 47 mm x 22 mm

**ELECTRICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>STANDARD</th>
<th>SPECIAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical angle</td>
<td>90°, 120°, 180°, 270°, 360°</td>
<td>Any other angle upon request</td>
</tr>
<tr>
<td>Linearity</td>
<td>± 1 %</td>
<td>± 0.5 %</td>
</tr>
<tr>
<td>Supply voltage</td>
<td>5 V&lt;sub&gt;DC&lt;/sub&gt; ± 10 %</td>
<td>Other upon request</td>
</tr>
<tr>
<td>Supply current</td>
<td>10 mA typical / 16 mA max.</td>
<td>16 mA for PWM output</td>
</tr>
<tr>
<td>Output signal</td>
<td>Analog ratiometric 10 % to 90 % of V&lt;sub&gt;supply&lt;/sub&gt; or PWM 1 kHz, 10 % to 90 % duty cycle</td>
<td>Other upon request</td>
</tr>
<tr>
<td>Over voltage protection</td>
<td>+20 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Reverse voltage protection</td>
<td>-10 V&lt;sub&gt;DC&lt;/sub&gt;</td>
<td></td>
</tr>
<tr>
<td>Load resistance recommended</td>
<td>Min. 1 kΩ for analog output and PWM output</td>
<td>&lt; 0.3°</td>
</tr>
<tr>
<td>Hysteresis static (D-shaft version)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MECHANICAL SPECIFICATIONS**

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mechanical travel</td>
<td>360° continuous, stops upon request: 124° ± 3°</td>
</tr>
<tr>
<td>Bearing type</td>
<td>Sleeve bearing</td>
</tr>
<tr>
<td>Standard</td>
<td>IP 50; other on request</td>
</tr>
<tr>
<td>Weight</td>
<td>19 g ± 2 g hollow shaft model/22 g ± 2 g D-shaft model</td>
</tr>
</tbody>
</table>

**ORDERING INFORMATION/DESCRIPTION**

<table>
<thead>
<tr>
<th>981HE 0 A 1 W A 1F16 XXXX BO 10 ε1</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEL FEATURES LINEARITY ELECTRICAL ANGLE OUTPUT TYPE OUTPUT SIGNAL SHAFT TYPE SPECIAL REQUEST PACKAGING LEAD FINISH</td>
</tr>
<tr>
<td>0: continuous rotation A: ± 1 %</td>
</tr>
<tr>
<td>1: mechanical stops B: ± 0.5 %</td>
</tr>
<tr>
<td>2: spring return CW C: 90°</td>
</tr>
<tr>
<td>3: spring return CCW D: 180°</td>
</tr>
<tr>
<td>For 1, 2, 3: max. electrical angle is: 120°</td>
</tr>
<tr>
<td>Shaft length from mounting face (standard: 16 mm)</td>
</tr>
<tr>
<td>8H00 hollow shaft 8H01 hollow D-shaft model</td>
</tr>
</tbody>
</table>

**SAP PART NUMBERING GUIDELINES**

<table>
<thead>
<tr>
<th>981HE 1 B 9 Z C 8H01 XXXX</th>
</tr>
</thead>
<tbody>
<tr>
<td>MODEL MECHANICAL FEATURES LINEARITY ELECTRICAL ANGLE OUTPUT TYPE OUTPUT SIGNAL SHAFT TYPE SPECIAL REQUEST</td>
</tr>
</tbody>
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Revision: 27-Mar-18  
For technical questions, contact: sferprecisionpot@vishay.com  
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**V_{OUT ANALOG}**

![Diagram of V_{OUT ANALOG} showing Diag High Level at 90% and Diag Low Level at 10% across different positions (0 to Theta) with CW and CCW orientations.]

**V_{OUT PWM}**

![Diagram of V_{OUT PWM} showing V_{out} (\% V_{supply}) with Duty Cycle = T_{high} / T, T low, and T: periodicity.]

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### Diagnostic Modes

<table>
<thead>
<tr>
<th>FAILURE</th>
<th>$V_{\text{out ANALOG}}^{\text{Rpull-up}}$</th>
<th>$V_{\text{out ANALOG}}^{\text{Rpull-down}}$</th>
<th>$V_{\text{out PWM}}^{\text{Rpull-up} = 1 , \text{k} \Omega}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Broken GND</td>
<td>Diagnostic high area</td>
<td>Diagnostic low area</td>
<td>$&gt; 97 % V_{\text{supply}}$ without modulation</td>
</tr>
<tr>
<td>2: Broken $V_{\text{out}}$</td>
<td>Diagnostic high area</td>
<td>Diagnostic low area</td>
<td>$&gt; 97 % V_{\text{supply}}$ without modulation</td>
</tr>
<tr>
<td>3: Broken $V_{\text{supply}}$</td>
<td>Diagnostic high area</td>
<td>Diagnostic low area</td>
<td>$&gt; 97 % V_{\text{supply}}$ without modulation</td>
</tr>
<tr>
<td>Over voltage $V_{\text{supply}} &gt; 7 , \text{V}$</td>
<td>Diagnostic high area</td>
<td>Diagnostic low area</td>
<td>$&gt; 97 % V_{\text{supply}}$ without modulation</td>
</tr>
<tr>
<td>Under voltage $V_{\text{supply}} &lt; 2.7 , \text{V}$</td>
<td>Diagnostic high area</td>
<td>Diagnostic low area</td>
<td>$&gt; 97 % V_{\text{supply}}$ without modulation</td>
</tr>
</tbody>
</table>

**Diagram:**

- $V_{\text{pull-up}}$ can be independent to $V_{\text{supply}}$
- Cut off

### Environmental Specifications

- **Vibrations**: 20 g from 10 Hz to 2000 Hz, EN 60068-2-6
- **Shocks**: 3 shocks/axis; 50 g half sine 11 ms, EN 60068-2-7
- **Operating temperature range**: -45 °C to +125 °C
- **Life (in cycles)**: > 5M for hollow shaft model / > 10M for D-shaft model
- **Rotational speed (max.)**: 120 rpm
- **Immunity to radiated electromagnetic disturbances**: 200 V/m 150 kHz/1 GHz, IEC 62132-2 part 2 (level A)
- **Immunity to power frequency magnetic field**: 200 A/m 50 Hz / 60 Hz, EN 61000-4-8 (level A)
- **Radiated electromagnetic emissions**: 30 MHz / 1 GHz < 30 dBuV/m, EN 61000-6-4 (level A)
- **Electrostatic discharges**: Contact discharges: ± 8 kV
  Air discharges: ± 15 kV, EN 61000-4-2

### Materials

- **Housing**: Thermoplastic housing
- **Shaft**: Stainless steel
- **Output**: 3 lead wires

**Note**
- Nothing stated herein shall be construed as a guarantee of quality or durability
VARIOUS POSSIBLE TYPES OF MODEL 981 HE IN D-SHAFT VERSION

1. 981 HE D-Shaft
   Spring return CCW
   Shaft: Ø 6.35 flatted length 16 mm FMF
   Model: 981HE-3-x-x-W-x-1F16

2. 981 HE D-Shaft
   Spring return CW
   Shaft: Ø 6.35 flatted 16 mm FMF
   Model: 981HE-2-x-x-W-x-1F16

3. 981 HE D-Shaft
   Continuous rotation
   Shaft: Ø 6.35 flatted 16 mm FMF
   Model: 981HE-0-x-x-W-x-1F16

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Standard</th>
<th>Option</th>
<th>Wires</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>36</td>
<td>38</td>
<td>Yellow GND (-)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Red Signal</td>
</tr>
<tr>
<td>B</td>
<td>47</td>
<td>48</td>
<td>Green VCC (+)</td>
</tr>
</tbody>
</table>

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VARIOUS POSSIBLE TYPES OF MODEL 981 HE IN HOLLOW SHAFT VERSION

4. 981 HE Hollow shaft
   Spring return CCW
   Shaft: Ø 8
   Model: 981HE-3-x-x-W-x-8H00

5. 981 HE Hollow shaft
   Spring return CW
   Shaft: Ø 8
   Model: 981HE-2-x-x-W-x-8H00

6. 981 HE Hollow D-Shaft Continuous rotation
   Shaft: Ø 8
   Model: 981HE-0-x-x-W-x-8H01

7. 981 HE Hollow D-Shaft CW
   Shaft: Ø 8
   Model: 981HE-1-x-x-W-x-8H01

End shaft recommended

Ø 7.8 ± 0.1

Mounting face

7 max.

Mechanical stop

“0 position”

Prog CW: 10 %
Prog CCW: 90 %

Direction of running

Mechanical stroke

2° Typ.

“0 position”: 120°

− Mounting face

Ø 6.54 ± 0.05

2° Typ.

“0 position”: 120°

− Mounting face

Ø 8 h9 ± 0.05

2° Typ.

“0 position”: 10 %

Direction of running

Mechanical stroke

2° Typ.

“0 position”: 120°

− Mounting face

Ø 8 ± 0.1

2 min.

End shaft recommended

Ø 7.8 ± 0.1

Mounting face

7 max.

Mechanical stop

“0 position”

Prog CW: 90 %
Prog CCW: 10 %

Direction of running

Mechanical stroke

2° Typ.

“0 position”: 120°

− Mounting face

Ø 6.54 ± 0.05

2° Typ.

“0 position”: 120°

− Mounting face

Ø 8 h9 ± 0.05

2° Typ.

“0 position”: 10 %

Direction of running

Mechanical stroke

2° Typ.

“0 position”: 120°

− Mounting face

Ø 8 ± 0.1

2 min.

End shaft recommended

Ø 7.8 ± 0.1

Mounting face

7 max.

Mechanical stop

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Prog CW: 10 %
Prog CCW: 90 %

Direction of running

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Ø 8 h9 ± 0.05

2° Typ.

“0 position”: 10 %

Direction of running

Mechanical stroke

2° Typ.

“0 position”: 120°

− Mounting face

Ø 8 ± 0.1

2 min.

End shaft recommended

Ø 7.8 ± 0.1

Mounting face

7 max.

Mechanical stop

“0 position”

Prog CW: 90 %
Prog CCW: 10 %

Direction of running

Mechanical stroke

2° Typ.

“0 position”: 120°

− Mounting face

Ø 6.54 ± 0.05

2° Typ.

“0 position”: 120°

− Mounting face

Ø 8 h9 ± 0.05

2° Typ.

“0 position”: 10 %

Direction of running

Mechanical stroke

2° Typ.

“0 position”: 120°

− Mounting face

Ø 8 ± 0.1

2 min.
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