BEI Sensors' Model 9960 Hall effect rotary position sensors are available in numerous standard configurations with fast, one week delivery. Available configurations include 7 termination options, single or dual outputs and 24 active electrical angles. With 360 degree turn capability, the 9960 can be used over a large range of rotary motion making it extremely versatile.

Packaged in a highly sealed (IP69K) housing and utilizing non-contacting Hall effect technology makes the 9960 an exceptionally rugged and reliable sensor. Model 9960 is ideal for a variety of applications in harsh environments, including steering and pedal positioning for construction, agriculture and mining vehicles, marine steering and speed control, wheel and throttle position for material handling equipment, and valve position for process control.

**9960 Series Ordering Options**

For assistance, call 800.350.2727

![Diagram of 9960 Series Hall Effect Rotary Position Sensor](image)

**Product shown with flying lead connector. Multiple termination options available. See ordering options.**

### Mechanical Specifications

- **Mechanical Travel:** continuous 360 degree and option for 180 degree mechanical stops
- **Actuation Torque:** 0.056 N-m maximum
- **Weight:** 80 g (w/6" cable)
- **Mounting:** 30mm mounting center
- **Drive:** blade
- **Termination:** flying leads, wire harness w/connector or integral connector (see ordering options)

### Electrical Specifications

- **Electrical Angle:** 15-360° in 15° increments
- **Input Voltage:** 5VDC +/−5%, 15-30VDC or 9-30VDC
- **Input Current:** (per channel) 16mA maximum except for Current Loop option at 36mA max
- **Overvoltage:** 5V Input: 20VDC
  - 0-30V Input: 70V per ISO 7637-2
- **Output Signal:**
  - Analog: 1) ratiometric 5% to 95% or 10% to 90%
    - 2) non-ratiometric 0-10VDC, 0-5VDC, 0.5-4.5VDC
  - PWM: duty cycle 5% to 95% or 10% to 90%
    - Current: 4-20 mA (3-wire)
- **Minimum Load Resistance:** 10kΩ resistive
- **Resolution:** 0.088 degrees (12-bit)
- **Accuracy:** +/-0.6% of Active Electrical Angle

### Environmental Specifications

- **Sealing:** IP69K
- **Side Load:** 1kg (1 million cycles)
- **Vibration:** 10G peak, 10-2000 Hz
- **Shock:** 5Gs, half sine pulse, 11 m sec duration
- **EMC:** 200 V/m
- **External Magnetic Susceptibility:** 20G
- **Operating Temperature:** -40°C to +125°C
- **Storage Temperature:** -55°C to +150°C

### 9960 Series Configuration Options

**Input/Output (I/O):**

- **5 VDC IN, Ratiometric Voltage OUT**
  - 5A = SENSOR1: 5% to 95%; SENSOR2: 95% to 5%
  - 5B = SENSOR1: 95% to 5%; SENSOR2: 5% to 95%
  - 5C = SENSOR1: 10% to 90%; SENSOR2: 90% to 10%
  - 5D = SENSOR1: 90% to 10%; SENSOR2: 10% to 90%
  - 5X1 = SENSOR1 and SENSOR2: Programmable
- **5 VDC IN, PWM OUT**
  - 5E = SENSOR1: 5% to 95%; SENSOR2: 95% to 5%
  - 5F = SENSOR1: 95% to 5%; SENSOR2: 5% to 95%
  - 5G = SENSOR1: 10% to 90%; SENSOR2: 90% to 10%
  - 5H = SENSOR1: 90% to 10%; SENSOR2: 10% to 90%
  - 5X2 = SENSOR1 and SENSOR2: Programmable
- **9-30 VDC IN, VOLTAGE OUT**
  - 9L = SENSOR1: 0-5 VDC, SENSOR2: 5-0 VDC
  - 9M = SENSOR1: 0-5 VDC, SENSOR2: 2-4.5 VDC
  - 9N = SENSOR1: 4.5-5.0 VDC, SENSOR2: 0-5 VDC
  - 9R = SENSOR1: 4.5-5.0 VDC, SENSOR2: 0.5-4.5 VDC
  - 9X2 = SENSOR1 and SENSOR2: Programmable
- **9-30 VDC IN, CURRENT OUT**
  - 9J = SENSOR1: 4-20 mA; SENSOR2: 2-0 mA
  - 9K = SENSOR1: 20-4 mA; SENSOR2: 4-20 mA
  - 9X1 = SENSOR1 and SENSOR2: Programmable

**PWM Frequency:**

- (Used with SE, SF, SG and 5X2 I/O options only; leave blank for other output options)
  - P1 = 100 Hz
  - P2 = 200 Hz
  - P3 = 500 Hz
  - P4 = 1000 Hz

**Cable Length:**

- 150 = 150mm (~6 inches)
- 300 = 300mm (~12 inches)
- 450 = 450mm (~18 inches)

**Number of Outputs and Termination Options:**

- **SL** = Single Output, Flying Leads
- **DL** = Dual Output, Flying Leads
- **SA** = Single Output, Cable w/Tyco AMP Superseal 1.5 Series
- **DA** = Dual Output, Cable w/Tyco AMP Superseal 1.5 Series
- **SD** = Single Output, Cable w/Deutsch DT04 Series
- **DD** = Dual Output, Cable w/Deutsch DT04 Series
- **SN** = Single Output, Cable w/Packard Electric Metripack 150 Series
- **DM** = Dual Output, Cable w/Packard Electric Metripack 150 Series
- **SW** = Single Output, Integral 3-Pin Weatherpack Connector (No Cable Length Necessary)

* SINGLE OUTPUTS: 3-PIN, DUAL OUTPUTS: 6-PIN

---

Tel: 805-968-0782 /800-350-2727 | Fax: 805-968-3154 /800-960-2726 | 7230 Hollister Ave., Goleta, CA 93117-2807 | www.beisensors.com

Specification No.: 02133 Rev. 4-17-2013
**Dimensions**

- 2X Ø 0.5
- 2.16±0.15
- 0.53±0.15
- 19
- 38
- 3

**Output Example**

*(Option 5A with 90° active electrical angle shown)*

**Pin Out Drawings**

**Connector Pin Out**

<table>
<thead>
<tr>
<th>Dwg 1</th>
<th>Dwg 2</th>
<th>Dwg 3</th>
<th>Dwg 4</th>
<th>Dwg 5</th>
<th>Dwg 6</th>
<th>Dwg 7</th>
<th>Flying Lead</th>
<th>Flying Lead</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Connector Part Numbers and Mates**

<table>
<thead>
<tr>
<th>Dwg 1</th>
<th>Connector</th>
<th>Mates to</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Deutsch: DT04-6P</td>
<td>DT06-6S</td>
</tr>
<tr>
<td>2</td>
<td>Deutsch: DT04-3P</td>
<td>DT06-3S</td>
</tr>
<tr>
<td>3</td>
<td>Amp Supersafe: 1.5:282108-1</td>
<td>282090-1</td>
</tr>
<tr>
<td>4</td>
<td>Amp Supersafe: 1.5:282105-1</td>
<td>282087-1</td>
</tr>
<tr>
<td>5</td>
<td>Packard Electric Metripack 150.2</td>
<td>12162210</td>
</tr>
<tr>
<td>6</td>
<td>Packard Electric Metripack 150.2</td>
<td>12162182</td>
</tr>
<tr>
<td>7</td>
<td>Packard Electric Weather Pack</td>
<td>12015793</td>
</tr>
</tbody>
</table>