Model 7290E Variable capacitance accelerometer

Features

- DC response
- 2, 10, 30, 50 and 100 g full scale ranges
- Motion, low frequency, tilt
- 10K g shock survivability
- Precision digital temperature compensation

Description

The Endevco® model 7290E Microtron® accelerometer family utilizes unique variable capacitance microsensors. The accelerometers are designed for measurement of relatively low level accelerations in aerospace and automotive environments. Typical applications require measurement of whole body motion immediately after the accelerometer is subjected to a shock motion, and in the presence of severe vibrational inputs. State-of-the-art digital temperature compensation electronics provide for precise compensation over a wide temperature range.

Gas damping and internal overrange stops enable the anisotropically-etched silicon microsensors to withstand high shock and acceleration loads.

The accelerometer is available with a choice of two power options. One option (R) allows for operation from 9.5 V to 18.0 V. The second option (U) allows for operation over a range of 12.5 V to 36 V. The 7290E provides both a differential and single ended output. The differential output has a range of ±2 V and is DC coupled. The single ended output is 0.5 V to 4.5 V with 2.5 V of bias voltage. Frequency response is controlled by the near-critically damped sensors. The use of gas damping results in very small thermally induced changes in frequency response.

Endevco three-channel systems, model 136 or 436 are recommended as signal conditioner and power supply.

U.S. Patents 4,574,327, 4,609,968 and 4,999,735
**Model 7290E**  
**Variable capacitance accelerometer**

### Specifications

All values are typical at +75°F (+24°C) and 15 Vdc excitation unless otherwise stated. Calibration data, traceable to the National Institute of Standards, (NIST), is supplied.

#### Dynamic characteristics

<table>
<thead>
<tr>
<th>Units</th>
<th>7290E-2</th>
<th>-5</th>
<th>-10</th>
<th>-30</th>
<th>-50</th>
<th>-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range</td>
<td>g</td>
<td>±2</td>
<td>±5</td>
<td>±10</td>
<td>±30</td>
<td>±50</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>mV/g</td>
<td>1000 ±50</td>
<td>400 ±20</td>
<td>200 ±10</td>
<td>66 ±4</td>
<td>40 ±2</td>
</tr>
<tr>
<td>Frequency response (± 5%)</td>
<td>Hz</td>
<td>0 to 15</td>
<td>0 to 30</td>
<td>0 to 500</td>
<td>0 to 1000</td>
<td>0 to 2000</td>
</tr>
<tr>
<td>Mounted resonance frequency</td>
<td>Hz</td>
<td>1300</td>
<td>1600</td>
<td>3000</td>
<td>5500</td>
<td>6000</td>
</tr>
<tr>
<td>Non-linearity and hysteresis [1]</td>
<td>% FSO typ (max)</td>
<td>±0.20 (±0.50)</td>
<td>±0.20 (±0.50)</td>
<td>±0.20 (±0.50)</td>
<td>±0.20 (±0.50)</td>
<td>±0.20 (±0.50)</td>
</tr>
<tr>
<td>Transverse sensitivity</td>
<td>% (max)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Zero measurand output</td>
<td>mV</td>
<td>±50</td>
<td>±50</td>
<td>±50</td>
<td>±50</td>
<td>±50</td>
</tr>
<tr>
<td>Damping ratio</td>
<td></td>
<td>4.0</td>
<td>2.5</td>
<td>0.7</td>
<td>0.7</td>
<td>0.6</td>
</tr>
<tr>
<td>Damping ratio change</td>
<td>%/°C</td>
<td>+0.08</td>
<td>+0.08</td>
<td>+0.08</td>
<td>+0.08</td>
<td>+0.08</td>
</tr>
<tr>
<td>Thermal zero shift (max)</td>
<td></td>
<td>±1.0</td>
<td>±1.0</td>
<td>±1.0</td>
<td>±1.0</td>
<td>±1.0</td>
</tr>
<tr>
<td>Thermal sensitivity shift (max)</td>
<td>%</td>
<td>±1.0</td>
<td>±1.0</td>
<td>±1.0</td>
<td>±1.0</td>
<td>±1.0</td>
</tr>
<tr>
<td>Overrange (determined by electrical clipping or mechanical stops, whichever is smaller)</td>
<td>g</td>
<td>±2.4</td>
<td>±2.4</td>
<td>±2.4</td>
<td>±2.4</td>
<td>±2.4</td>
</tr>
<tr>
<td>Electrical clipping</td>
<td></td>
<td>4</td>
<td>12</td>
<td>30</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>Mechanical stops, typical</td>
<td>µs</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
<td>&lt; 10</td>
</tr>
<tr>
<td>Recovery time</td>
<td></td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Threshold (resolution) [2]</td>
<td>Equiv. g's</td>
<td>0.0015</td>
<td>0.00125</td>
<td>0.0025</td>
<td>0.0075</td>
<td>0.013</td>
</tr>
<tr>
<td>Base strain sensitivity, max</td>
<td>Equiv. g's</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>Magnetic susceptibility (at 100 gauss, 60 Hz)</td>
<td>Equiv. g's</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Warm-up time (to within 1%)</td>
<td>ms</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
</tbody>
</table>

#### Electrical characteristics

**Excitation voltage**  
9.5 to 18.0 Vdc  
12.5 to 36.0 Vdc

**Current drain**  
8.5 mA typ, 10 mA max

**Output impedance/load**  
100 ohms max/10K ohms resistance minimum, 0.1 μF capacitance maximum

**Residual noise**  
100 μV rms typ, 0.5 μV rms max, 0.5 to 100 Hz  
500 μV rms typ, 1.0 μV rms max, 0.5 Hz to 10 kHz

#### Physical characteristics

**Case material**  
Anodized aluminum alloy

**Electrical connections**  
Integral cable, four conductor No. 28 AWG, Teflon® insulated leads, braided shield, Hyperflex™ jacket

**Mounting/torque**  
Two holes for 4-40 or M3 mounting screws / 6 lbf-in (0.68 Nm)

**Weight**  
10 grams without cable (cable weighs 9 grams/meter)

#### Environmental characteristics

**Acceleration limits (in any direction)**

<table>
<thead>
<tr>
<th>Static</th>
<th>Vibration</th>
<th>Shock</th>
<th>Zero shift</th>
<th>Temperature</th>
<th>Humidity/altitude</th>
<th>ESD sensitivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>20 000 g</td>
<td>100 g sinusoidal 20 - 2000 Hz / 40 g rms random 20 - 2000 Hz</td>
<td>5000 g (150 μs haversine pulse) for -2, -5 and -10; 10 000 g (80 μs haversine pulse) for -30, -50, -100 and -150</td>
<td>0.1% FSO typical at 5000 g</td>
<td>-65°F to +250°F [-55°C to +121°C]</td>
<td>Unaffected. Unit is epoxy sealed.</td>
<td>Unit meets Class 2 requirements of MIL-STD-883, Method 3015</td>
</tr>
</tbody>
</table>

[1] Applies to California facility

[2] See Notes 1 and 2 for limitations and notes on damping ratio change and threshold resolution.
Specifications
All values are typical at +75°F (+24°C) and 15 Vdc excitation unless otherwise stated. Calibration data, traceable to the National Institute of Standards, (NIST), is supplied.

Calibration
Sensitivity [measured with 15 Vdc excitation] 1 g and 5 Hz for -2 and -5
Frequency response 1 g, 1 to 100 Hz for -2 and -5,
10 g, 20 to 10 000 Hz for all other ranges
Zero measurand output measured at room temp
Transverse sensitivity measured at 1 g

Accessories

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
<th>7290E</th>
</tr>
</thead>
<tbody>
<tr>
<td>EHW265</td>
<td>Size 4, flat washers [2]</td>
<td>Included</td>
</tr>
<tr>
<td>EH702</td>
<td>4-40 x 7/16 inch cap screws [2]</td>
<td>Included</td>
</tr>
<tr>
<td>EHM464</td>
<td>Hex key wrench</td>
<td>Included</td>
</tr>
<tr>
<td>7990</td>
<td>Triaxial mounting block</td>
<td>Optional</td>
</tr>
</tbody>
</table>

Notes:
1. Full scale output (FSO) is nominally 4 volts.
2. Threshold = (max. residual noise; 0.5 to 100 Hz) / sensitivity
3. Maintain high levels of precision and accuracy using Endevco’s factory calibration services.
4. Model number definition:

7290E-X-X-XXX-ZZZ
- Cable length in inches (i.e. 7290E-X-X-XXX-120 has a length of 120 inches)
- Denotes range in g’s
  -2
  -5
  -10
  -30
  -50
  -100
- Output options
  D = Differential output
  S = Single ended output
- Supply voltage options
  R = 9.5 V to 18.0 V
  U = 12.5 V to 36 V
- Basic model number

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