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Amplified Low Pressure Sensors

1 mbar (0.4 in H2O) to 60 in H2O Pressure Sensors

Features

- 0 to 1 mbar to 0 to 60 in H2O Pressure Ranges
- Ratiometric 4V Output
- Temperature Compensated
- Calibrated Zero and Span

Applications

- Medical Instrumentation
- Environmental Controls
- HVAC

General Description

The Amplified line of low pressure sensors are based upon a proprietary technology to reduce all output offset or common mode errors. This model provides a ratiometric 4-volt output with superior output offset characteristics. Output offset errors due to change in temperature, stability to warm-up, stability to long time period, and position sensitivity are all significantly reduced when compared to conventional compensation methods. In addition the sensor utilizes a silicon, micromachined, stress concentration enhanced structure to provide a very linear output to measured pressure.

These calibrated and temperature compensated sensors give an accurate and stable output over a wide temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

The output of the device is ratiometric to the supply voltage over a supply voltage range of 4.5 to 5.5 volts.

Physical Dimensions

<table>
<thead>
<tr>
<th>Pinout:</th>
</tr>
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<tbody>
<tr>
<td>Pin 1: Vs</td>
</tr>
<tr>
<td>Pin 2: Gnd</td>
</tr>
<tr>
<td>Pin 3: Vout</td>
</tr>
<tr>
<td>Pin 4: Do Not Connect</td>
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</table>

Equivalent Circuit

<table>
<thead>
<tr>
<th>Approvals</th>
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<tbody>
<tr>
<td>As Is</td>
</tr>
<tr>
<td>As Is</td>
</tr>
<tr>
<td>As Is</td>
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<td>As Is</td>
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</table>
### Pressure Sensor Ratings

<table>
<thead>
<tr>
<th>Supply Supply Voltage VS</th>
<th>±4.5 to +5.5 Vdc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common-mode pressure</td>
<td>-10 to +10 psig</td>
</tr>
<tr>
<td>Lead Temperature, max (soldering 2-4 sec.)</td>
<td>250°C</td>
</tr>
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### Environmental Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Supply Voltage VS</th>
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<tbody>
<tr>
<td>Temperature Ranges</td>
<td></td>
</tr>
<tr>
<td>Compensated</td>
<td>5 to 50°C</td>
</tr>
<tr>
<td>Operating</td>
<td>-25 to 85°C</td>
</tr>
<tr>
<td>Storage</td>
<td>-40 to 125°C</td>
</tr>
<tr>
<td>Humidity Limits</td>
<td>0 to 95% RH</td>
</tr>
<tr>
<td>(non condensing)</td>
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### Standard Pressure Ranges

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Pressure</th>
<th>Nominal Span</th>
<th>Proof Pressure</th>
<th>Burst Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 MBAR-D-4V</td>
<td>±1 mbar</td>
<td>4 V</td>
<td>100 InH2O</td>
<td>200 InH2O</td>
</tr>
<tr>
<td>1 INCH-D-4V</td>
<td>±1 InH2O</td>
<td>4 V</td>
<td>100 InH2O</td>
<td>200 InH2O</td>
</tr>
<tr>
<td>1 INCH-G-4V</td>
<td>0 - 1 InH2O</td>
<td>4 V</td>
<td>100 InH2O</td>
<td>200 InH2O</td>
</tr>
<tr>
<td>2.5 INCH-D-4V</td>
<td>±2.5 InH2O</td>
<td>4 V</td>
<td>200 InH2O</td>
<td>300 InH2O</td>
</tr>
<tr>
<td>2.5 INCH-G-4V</td>
<td>0 - 2.5 InH2O</td>
<td>4 V</td>
<td>200 InH2O</td>
<td>300 InH2O</td>
</tr>
<tr>
<td>5 INCH-D-4V</td>
<td>± 5 InH2O</td>
<td>4 V</td>
<td>200 InH2O</td>
<td>300 InH2O</td>
</tr>
<tr>
<td>5 INCH-G-4V</td>
<td>0 - 5 InH2O</td>
<td>4 V</td>
<td>200 InH2O</td>
<td>300 InH2O</td>
</tr>
<tr>
<td>10 INCH-D-4V</td>
<td>±10 InH2O</td>
<td>4 V</td>
<td>200 InH2O</td>
<td>300 InH2O</td>
</tr>
<tr>
<td>10 INCH-G-4V</td>
<td>0 - 10 InH2O</td>
<td>4 V</td>
<td>200 InH2O</td>
<td>300 InH2O</td>
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<tr>
<td>20 INCH-D-4V</td>
<td>±20 InH2O</td>
<td>4 V</td>
<td>300 InH2O</td>
<td>500 InH2O</td>
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<tr>
<td>20 INCH-G-4V</td>
<td>0 - 20 InH2O</td>
<td>4 V</td>
<td>300 InH2O</td>
<td>500 InH2O</td>
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<td>30 INCH-D-4V</td>
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<td>4 V</td>
<td>500 InH2O</td>
<td>800 InH2O</td>
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<tr>
<td>30 INCH-G-4V</td>
<td>0 - 30 InH2O</td>
<td>4 V</td>
<td>500 InH2O</td>
<td>800 InH2O</td>
</tr>
<tr>
<td>40 INCH-G-4V</td>
<td>0 - 40 InH2O</td>
<td>4 V</td>
<td>500 InH2O</td>
<td>800 InH2O</td>
</tr>
<tr>
<td>60 INCH-G-4V</td>
<td>0 - 60 InH2O</td>
<td>4 V</td>
<td>500 InH2O</td>
<td>800 InH2O</td>
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### Performance Characteristics for: 1 MBAR-D-4V

<table>
<thead>
<tr>
<th>Parameter, Note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±1.0 mbar</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Span, Note 5</td>
<td>±1.80</td>
<td>±2.0</td>
<td>±2.20</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.00</td>
<td>2.25</td>
<td>2.50</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), Note 2</td>
<td>±120 mV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, Note 3</td>
<td>±20 mV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±40 mV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±20 mV</td>
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<td></td>
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</tr>
<tr>
<td>Linearity, hysteresis error, Note 4</td>
<td>0.05</td>
<td>0.25</td>
<td></td>
<td>%FSS</td>
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<tr>
<td>Span Temperature Shift (5°C-50°C), Note 2</td>
<td>±4 %FSS</td>
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</table>
### Performance Characteristics for 1 INCH-D-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±1.0</td>
<td>±1.0</td>
<td>±2.10</td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±60</td>
<td>±60</td>
<td>±60</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±10</td>
<td>±10</td>
<td>±10</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±10</td>
<td>±10</td>
<td>±10</td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>0.25</td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td>±2</td>
<td>±2</td>
<td>±2</td>
<td>%FSS</td>
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</table>

### Performance Characteristics for 1 INCH-G-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>3.90</td>
<td>4.0</td>
<td>4.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±60</td>
<td>±60</td>
<td>±60</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±10</td>
<td>±10</td>
<td>±10</td>
<td>mV</td>
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<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±15</td>
<td>±15</td>
<td>±15</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±10</td>
<td>±10</td>
<td>±10</td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>0.25</td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td>±2</td>
<td>±2</td>
<td>±2</td>
<td>%FSS</td>
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### Performance Characteristics for 2.5 INCH-D-4V

<table>
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<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±2.5</td>
<td>±2.5</td>
<td>±2.10</td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±60</td>
<td>±60</td>
<td>±60</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>mV</td>
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<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>0.25</td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td>±2</td>
<td>±2</td>
<td>±2</td>
<td>%FSS</td>
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### Performance Characteristics for 2.5 INCH-G-4V

<table>
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<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>±5.0</td>
<td>5.0</td>
<td>inH2O</td>
<td></td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero gage pressure</td>
<td>±0.15</td>
<td>±0.25</td>
<td>±0.35</td>
<td>V</td>
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<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±0.60</td>
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<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>±0.05</td>
<td>±0.25</td>
<td>% FSS</td>
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<td>Span Temperature Shift (5°C-50°C), note 2</td>
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### Performance Characteristics for 5 INCH-D-4V

<table>
<thead>
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<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±5.0</td>
<td>5.0</td>
<td>inH2O</td>
<td></td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>±2.15</td>
<td>±2.25</td>
<td>±2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±0.40</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>±0.05</td>
<td>±0.25</td>
<td>% FSS</td>
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</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td>±1</td>
<td>% FSS</td>
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### Performance Characteristics for 5 INCH-G-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>±5.0</td>
<td>5.0</td>
<td>inH2O</td>
<td></td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero gage pressure</td>
<td>±0.15</td>
<td>±0.25</td>
<td>±0.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±0.40</td>
<td>mV</td>
<td></td>
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</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>±0.05</td>
<td>±0.25</td>
<td>% FSS</td>
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</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td>±1</td>
<td>% FSS</td>
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### Performance Characteristics for: 10 INCH-D-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±10.0</td>
<td></td>
<td></td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
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<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td></td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td></td>
<td></td>
<td></td>
<td>%FSS</td>
</tr>
</tbody>
</table>

### Performance Characteristics for: 10 INCH-G-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>10.0</td>
<td></td>
<td></td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>3.90</td>
<td>4.0</td>
<td>4.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td></td>
<td>±20</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td></td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td></td>
<td></td>
<td></td>
<td>%FSS</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 20 INCH-D-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±20.0</td>
<td></td>
<td></td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td></td>
<td>±20</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td></td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td></td>
<td></td>
<td></td>
<td>%FSS</td>
</tr>
</tbody>
</table>
### Performance Characteristics for 30 INCH-G-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>±30.0</td>
<td>30.0</td>
<td>4.0</td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>mV</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td>0.05</td>
<td>0.25</td>
<td>±1</td>
<td>%FSS</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 30 INCH-D-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±30.0</td>
<td>30.0</td>
<td>4.0</td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±20</td>
<td>±20</td>
<td>±20</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td>±5</td>
<td>±5</td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>±1</td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td>±1</td>
<td>±1</td>
<td>±1</td>
<td>%FSS</td>
</tr>
</tbody>
</table>
### Performance Characteristics for 40 INCH-G-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>40.0</td>
<td></td>
<td></td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>3.9</td>
<td>4.0</td>
<td>4.1</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td></td>
<td></td>
<td>±20</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td></td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td></td>
<td></td>
<td>±1</td>
<td>%FSS</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 60 INCH-G-4V

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>60.0</td>
<td></td>
<td></td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>3.9</td>
<td>4.0</td>
<td>4.1</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td></td>
<td></td>
<td>±20</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td></td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Temperature Shift (5°C-50°C), note 2</td>
<td></td>
<td></td>
<td>±1</td>
<td>%FSS</td>
</tr>
</tbody>
</table>

**Pressure Response:** for any pressure applied the response time to get to 90% of pressure applied is typically less than 500 microseconds.

### Specification Notes

- **note 1:** All parameters are measured at 5.0 volt excitation, for the nominal full scale pressure and room temperature unless otherwise specified. Pressure measurements are with positive pressure applied to Port B.
- **note 2:** Shift is relative to 25°C.
- **note 3:** Shift is within the first hour of excitation applied to the device.
- **note 4:** Measured at one-half full scale rated pressure using best straight line curve fit.
- **note 5:** The span is the algebraic difference between full scale output voltage and the offset voltage.

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**Amplified Very Low Pressure Sensors**

**Features**

- 0.25 and 0.50 in H2O Pressure Ranges
- Ratiometric 4V Output
- Temperature Compensated
- Calibrated Zero and Span

**Applications**

- Medical Breathing
- HVAC

**General Description** (generic product)

The Amplified line of low pressure sensors is based upon a proprietary technology to reduce all output offset or common mode errors. This model provides a ratiometric 4-volt output with superior output offset characteristics. Output offsets result due to change in temperature, stability to warm-up, stability to long time period, and position sensitivity are all significantly reduced when compared to conventional compensation methods. In addition the sensor utilizes a silicon, micromachined, stress concentration enhanced structure to provide a very linear output to measured pressure.

These calibrated and temperature compensated sensors give an accurate and stable output over a wide temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

The output of the device is ratiometric to the supply voltage over a supply voltage range of 4.5 to 5.5 volts.

**Physical Dimensions**

![Physical Dimensions Diagram]

**Equivalent Circuit**

![Equivalent Circuit Diagram]
### Pressure Sensor Ratings

<table>
<thead>
<tr>
<th>Parameter, NOTE 1</th>
<th>Operating Range, differential pressure</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5 to 50° C</td>
<td>±0.25</td>
<td>±2.20</td>
<td>H2O</td>
</tr>
</tbody>
</table>

### Environmental Specifications

#### Temperature Ranges

- **Compensated**: 5 to 50° C
- **Operating**: -25 to 85° C
- **Storage**: -40 to 125° C
- **Humidity Limits**: 0 to 95% RH (non-condensing)

### Performance Characteristics for: 0.25 INCH-D-4V

<table>
<thead>
<tr>
<th>Parameter, NOTE 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±1.80</td>
<td>±2.0</td>
<td>±2.20</td>
<td>volt</td>
</tr>
<tr>
<td>Output Span, NOTE 5</td>
<td>±1.80</td>
<td>±2.0</td>
<td>±2.20</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>±2.0</td>
<td>±2.5</td>
<td>±2.50</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), NOTE 2</td>
<td>±50</td>
<td>±50</td>
<td>±50</td>
<td>mvolt</td>
</tr>
<tr>
<td>Offset Warm-up Shift, NOTE 3</td>
<td>±20</td>
<td>±50</td>
<td>±50</td>
<td>mvolt</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1±g)</td>
<td>±40</td>
<td>±100</td>
<td>±100</td>
<td>mvolt</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±20</td>
<td>±50</td>
<td>±50</td>
<td>mvolt</td>
</tr>
<tr>
<td>Linearity, hysteresis error, NOTE 4</td>
<td>0.05</td>
<td>0.25</td>
<td>±0.25%</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (5°C-50°C), NOTE 2</td>
<td>±4</td>
<td>±4</td>
<td>±4</td>
<td>%span</td>
</tr>
</tbody>
</table>

### Performance Characteristics for: 0.5 INCH-G-4V

<table>
<thead>
<tr>
<th>Parameter, NOTE 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>±3.80</td>
<td>±4.00</td>
<td>±4.20</td>
<td>H2O</td>
</tr>
<tr>
<td>Output Span, NOTE 5</td>
<td>±3.80</td>
<td>±4.00</td>
<td>±4.20</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero gage pressure</td>
<td>±1.00</td>
<td>±2.0</td>
<td>±2.50</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), NOTE 2</td>
<td>±50</td>
<td>±50</td>
<td>±50</td>
<td>mvolt</td>
</tr>
<tr>
<td>Offset Warm-up Shift, NOTE 3</td>
<td>±20</td>
<td>±50</td>
<td>±50</td>
<td>mvolt</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1±g)</td>
<td>±40</td>
<td>±100</td>
<td>±100</td>
<td>mvolt</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±20</td>
<td>±50</td>
<td>±50</td>
<td>mvolt</td>
</tr>
<tr>
<td>Linearity, hysteresis error, NOTE 4</td>
<td>0.05</td>
<td>0.25</td>
<td>±0.25%</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (5°C-50°C), NOTE 2</td>
<td>±4</td>
<td>±4</td>
<td>±4</td>
<td>%span</td>
</tr>
</tbody>
</table>

### Specification Notes

**NOTE 1**: All parameters are measured at 5.0 volt excitation, for the nominal full scale pressure and room temperature unless otherwise specified. **Pressure measurements are with positive pressure applied to Port B.**

**NOTE 2**: Shift is relative to 25°C.

**NOTE 3**: Shift is within the first hour of excitation applied to the device.

**NOTE 4**: Measured at one-half full scale rated pressure using best straight line curve fit.

**NOTE 5**: The voltage added to the offset voltage at full scale pressure. **Nominally the output voltage range is 0.25 to 4.25 volts for minus to plus full scale pressure.**

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Miniature Amplified Low Pressure Sensors

Low Pressure (0.5" H₂O to 30" H₂O) Sensors

Features

- 0 to 0.5" H₂O to 0 to 30" H₂O Pressure Ranges
- Temperature Compensated
- Calibrated Zero and Span

Applications

- Medical Instrumentation
- Environmental Controls
- HVAC

General Description

The Miniature Amplified Output pressure sensor is based upon a proprietary technology to reduce all output offset or common mode errors. This model provides a calibrated amplified output with superior output offset characteristics. Output offset errors due to change in temperature, stability to warm-up, stability to long time period, and position sensitivity are all significantly reduced when compared to conventional compensation methods. In addition the sensor utilizes a silicon, micromachined, stress concentration enhanced structure to provide a very linear output to measured pressure.

These calibrated and temperature compensated sensors give an accurate and stable output over a wide temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

The output of the device is ratiometric to the supply voltage and operation from any D.C. supply voltage between 4.5 and 5.5

Physical Dimensions

<table>
<thead>
<tr>
<th>Pin</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.010</td>
<td>0.25</td>
<td>0.254</td>
<td>6.45</td>
<td>0.386</td>
</tr>
<tr>
<td>0.084</td>
<td>2.12</td>
<td>0.084</td>
<td>2.12</td>
<td>0.025</td>
</tr>
<tr>
<td>0.070</td>
<td>1.78</td>
<td>0.046</td>
<td>1.16</td>
<td>0.040</td>
</tr>
<tr>
<td>0.040</td>
<td>0.100</td>
<td>2.54</td>
<td>0.082</td>
<td>2.09</td>
</tr>
</tbody>
</table>

Product Label Placement on Backside Lid

D1 version, D2 version, G version

Pin 1: Vs
Pin 2: Gnd
Pin 3: Vout
Pin 4: Do Not Connect

Equivalent Circuit

NOTES
1) Dimensions are in inches [mm].
2) For suggested pad layout, see drawing: PAD-01

Approvals

<table>
<thead>
<tr>
<th>MKT DATE</th>
<th>MFG DATE</th>
<th>ENG DATE</th>
<th>QA DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>As Is</td>
<td>As Is</td>
<td>As Is</td>
<td>As Is</td>
</tr>
<tr>
<td>With Change</td>
<td>With Change</td>
<td>With Change</td>
<td>With Change</td>
</tr>
</tbody>
</table>

DS-0101 Rev B
### Pressure Sensor Characteristics Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±0.5</td>
<td>±0.5</td>
<td>±0.5</td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>-</td>
<td>-</td>
<td>±120</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>-</td>
<td>±10</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>-</td>
<td>±10</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>-</td>
<td>0.05</td>
<td>0.25</td>
<td>%FSS</td>
</tr>
<tr>
<td>Span Shift (5°C-50°C), note 2</td>
<td>-</td>
<td>-</td>
<td>±2</td>
<td>%FSS</td>
</tr>
</tbody>
</table>

### Standard Pressure Ranges

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Pressure</th>
<th>Nominal Span</th>
<th>Proof Pressure</th>
<th>Burst Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 INCH-Dx-4V-MINI</td>
<td>±0.5 inH2O</td>
<td>4 V</td>
<td>100 inH2O</td>
<td>200 inH2O</td>
</tr>
<tr>
<td>1 INCH-Dx-4V-MINI</td>
<td>±1 inH2O</td>
<td>4 V</td>
<td>100 inH2O</td>
<td>200 inH2O</td>
</tr>
<tr>
<td>1 INCH-G-4V-MINI</td>
<td>0 - 1 inH2O</td>
<td>4 V</td>
<td>100 inH2O</td>
<td>200 inH2O</td>
</tr>
<tr>
<td>5 INCH-Dx-4V-MINI</td>
<td>±5 inH2O</td>
<td>4 V</td>
<td>200 inH2O</td>
<td>300 inH2O</td>
</tr>
<tr>
<td>5 INCH-G-4V-MINI</td>
<td>0 - 5 inH2O</td>
<td>4 V</td>
<td>200 inH2O</td>
<td>300 inH2O</td>
</tr>
<tr>
<td>10 INCH-Dx-4V-MINI</td>
<td>±10 inH2O</td>
<td>4 V</td>
<td>200 inH2O</td>
<td>300 inH2O</td>
</tr>
<tr>
<td>10 INCH-G-4V-MINI</td>
<td>0 - 10 inH2O</td>
<td>4 V</td>
<td>200 inH2O</td>
<td>300 inH2O</td>
</tr>
<tr>
<td>20 INCH-Dx-4V-MINI</td>
<td>±20 inH2O</td>
<td>4 V</td>
<td>300 inH2O</td>
<td>500 inH2O</td>
</tr>
<tr>
<td>20 INCH-G-4V-MINI</td>
<td>0 - 20 inH2O</td>
<td>4 V</td>
<td>300 inH2O</td>
<td>500 inH2O</td>
</tr>
<tr>
<td>30 INCH-Dx-4V-MINI</td>
<td>±30 inH2O</td>
<td>4 V</td>
<td>500 inH2O</td>
<td>800 inH2O</td>
</tr>
<tr>
<td>30 INCH-G-4V-MINI</td>
<td>0 - 30 inH2O</td>
<td>4 V</td>
<td>500 inH2O</td>
<td>800 inH2O</td>
</tr>
</tbody>
</table>

For differential pressure D1 is the package with two pressure ports the same side, D2 has two ports the opposite sides.

### Environmental Specifications

<table>
<thead>
<tr>
<th>Temperature Ranges</th>
<th>Compensated</th>
<th>5 to 50°C</th>
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<tbody>
<tr>
<td>Operating</td>
<td>-25 to 85°C</td>
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</tr>
<tr>
<td>Storage</td>
<td>-40 to 125°C</td>
<td></td>
</tr>
<tr>
<td>Humidity Limits</td>
<td>0 to 95% RH</td>
<td>(non condensing)</td>
</tr>
</tbody>
</table>

For differential pressure D1 is the package with two pressure ports the same side, D2 has two ports the opposite sides.
### Performance Characteristics for 1 INCH-Dx-4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>-</td>
<td>±5.0</td>
<td>-</td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>-</td>
<td>-</td>
<td>±60</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>-</td>
<td>±10</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>-</td>
<td>±10</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>-</td>
<td>0.05</td>
<td>0.25</td>
<td>%FSS</td>
</tr>
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<td>Span Shift (5°C-50°C), note 2</td>
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### Performance Characteristics for 1 INCH-G-4V-MINI

<table>
<thead>
<tr>
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<th>Maximum</th>
<th>Units</th>
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<td>Output Span, note 5</td>
<td>3.90</td>
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<td>4.10</td>
<td>V</td>
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<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
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</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
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<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
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<td>±10</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>-</td>
<td>±10</td>
<td>-</td>
<td>mV</td>
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<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>-</td>
<td>0.05</td>
<td>0.25</td>
<td>%FSS</td>
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<tr>
<td>Span Shift (5°C-50°C), note 2</td>
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### Performance Characteristics for 5 INCH-Dx-4V-MINI

<table>
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<tr>
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<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>-</td>
<td>±5.0</td>
<td>-</td>
<td>inH2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
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<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>-</td>
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<td>mV</td>
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<td>Offset Warm-up Shift, note 3</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
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### Performance Characteristics for: 5 INCH-G-4V-MINI

<table>
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<th>Parameter, NOTE 1</th>
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<td>Operating Range, gage pressure</td>
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<td>Output Span, NOTE 5</td>
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<td>4.0</td>
<td>4.10</td>
<td>V</td>
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<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
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<tr>
<td>Offset Position Sensitivity (±1g)</td>
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<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>-</td>
<td>0.05</td>
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<tr>
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### Performance Characteristics for: 10 INCH-Dx-4V-MINI

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<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
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<td>Offset Temperature Shift (5°C-50°C), NOTE 2</td>
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<td>mV</td>
</tr>
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<td>Offset Position Sensitivity (±1g)</td>
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<td>-</td>
<td>mV</td>
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<tr>
<td>Offset Long Term Drift (one year)</td>
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<td>-</td>
<td>mV</td>
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### Performance Characteristics for: 10 INCH-G-4V-MINI

<table>
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<th>Maximum</th>
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<td>V</td>
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<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>V</td>
</tr>
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<td>Offset Temperature Shift (5°C-50°C), NOTE 2</td>
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<td>Offset Warm-up Shift, NOTE 3</td>
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<td>±5</td>
<td>-</td>
<td>mV</td>
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<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
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<tr>
<td>Linearity, hysteresis error, NOTE 4</td>
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<td>0.05</td>
<td>0.25</td>
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</tr>
<tr>
<td>Span Shift (5°C-50°C), NOTE 2</td>
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<td>%FSS</td>
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### Performance Characteristics for 20 INCH-Dx-4V-MINI

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<td>±2.10</td>
<td>V</td>
</tr>
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<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
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<td>Offset Temperature Shift (5°C-50°C), note 2</td>
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<td>mV</td>
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<td>Offset Warm-up Shift, note 3</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>-</td>
<td>±5</td>
<td>-</td>
<td>mV</td>
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<td>Linearity, hysteresis error, note 4</td>
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### Performance Characteristics for 20 INCH-G-4V-MINI

<table>
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<th>Parameter, note 1</th>
<th>Minimum</th>
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<th>Maximum</th>
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<tr>
<td>Operating Range, gage pressure</td>
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<td>Output Span, note 5</td>
<td>3.90</td>
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</tr>
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<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
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<td>Offset Warm-up Shift, note 3</td>
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<td>mV</td>
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<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>-</td>
<td>±5</td>
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<td>mV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>-</td>
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<td>mV</td>
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<tr>
<td>Linearity, hysteresis error, note 4</td>
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<tr>
<td>Span Shift (5°C-50°C), note 2</td>
<td>-</td>
<td>-</td>
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<td>%FSS</td>
</tr>
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</table>

### Performance Characteristics for 30 INCH-Dx-4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
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<th>Maximum</th>
<th>Units</th>
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</thead>
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<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>V</td>
</tr>
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<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>V</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
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<td>mV</td>
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<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>-</td>
<td>±5</td>
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<td>Offset Position Sensitivity (±1g)</td>
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<td>mV</td>
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<tr>
<td>Offset Long Term Drift (one year)</td>
<td>-</td>
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<td>mV</td>
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<tr>
<td>Linearity, hysteresis error, note 4</td>
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<td>0.25</td>
<td>%FSS</td>
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<tr>
<td>Span Shift (5°C-50°C), note 2</td>
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<td>%FSS</td>
</tr>
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</table>
Performance Characteristics for 30 INCH-G-4V-MINI

<table>
<thead>
<tr>
<th>Parameter, NOTE 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
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<tbody>
<tr>
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<tr>
<td>Output Span, NOTE 5</td>
<td>3.9</td>
<td>4.0</td>
<td>4.1</td>
<td>V</td>
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<tr>
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<td>0.25</td>
<td>0.35</td>
<td>V</td>
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<tr>
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<td>±20</td>
<td>mV</td>
</tr>
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<td>Offset Warm-up Shift, NOTE 3</td>
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<td>mV</td>
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<tr>
<td>Offset Position Sensitivity (±1g)</td>
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<td>mV</td>
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<tr>
<td>Offset Long Term Drift (one year)</td>
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<td>-</td>
<td>mV</td>
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<tr>
<td>Linearity, hysteresis error, NOTE 4</td>
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<td>0.25</td>
<td>%FSS</td>
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<tr>
<td>Span Shift (5° C-50° C), NOTE 2</td>
<td>-</td>
<td>-</td>
<td>±1</td>
<td>%FSS</td>
</tr>
</tbody>
</table>

Pressure Response: for any pressure applied the response time to get to 90% of pressure applied is typically less than 500 microseconds.

Specification Notes

NOTE 1: All parameters are measured at 5.0 volt excitation, for the nominal full scale pressure and room temperature unless otherwise specified.

Pressure measurements are with positive pressure applied to the B-port.

NOTE 2: Shift is relative to 25°C.

NOTE 3: Shift is within the first hour of excitation applied to the device.

NOTE 4: Measured at one-half full scale rated pressure using best straight line curve fit.

NOTE 5: The voltage added to the offset voltage at full scale pressure. Nominal output voltage range is 0.25 to 4.25 volts for minus to plus full scale pressure.

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The Miniature Amplified Output pressure sensors is based upon a proprietary technology to reduce all output offset or common mode errors. This model provides a calibrated amplified output with superior output offset characteristics. Output offset errors due to change in temperature, stability to warm-up, stability to long time period, and position sensitivity are all significantly reduced when compared to conventional compensation methods. In addition the sensor utilizes a silicon, micromachined, stress concentration enhanced structure to provide a very linear output to measured pressure.

These calibrated and temperature compensated sensors give an accurate and stable output over a wide temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

The output of the device is ratiometric to the supply voltage and operation from any D.C. supply voltage between 4.5 and 5.5 volts.
### Pressure Sensor Characteristics Maximum Ratings

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Pressure</th>
<th>Nominal Span</th>
<th>Proof Pressure</th>
<th>Burst Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 INCH-Dx-P4V-MINI</td>
<td>±1 In H2O</td>
<td>4 V</td>
<td>100 In H2O</td>
<td>200 In H2O</td>
</tr>
<tr>
<td>1 INCH-G-P4V-MINI</td>
<td>0 - 1 In H2O</td>
<td>4 V</td>
<td>300 In H2O</td>
<td>200 In H2O</td>
</tr>
<tr>
<td>5 INCH-Dx-P4V-MINI</td>
<td>±5 In H2O</td>
<td>4 V</td>
<td>200 In H2O</td>
<td>300 In H2O</td>
</tr>
<tr>
<td>5 INCH-G-P4V-MINI</td>
<td>0 - 5 In H2O</td>
<td>4 V</td>
<td>200 In H2O</td>
<td>300 In H2O</td>
</tr>
<tr>
<td>10 INCH-Dx-P4V-MINI</td>
<td>±10 In H2O</td>
<td>4 V</td>
<td>200 In H2O</td>
<td>300 In H2O</td>
</tr>
<tr>
<td>10 INCH-G-P4V-MINI</td>
<td>0 - 10 In H2O</td>
<td>4 V</td>
<td>200 In H2O</td>
<td>300 In H2O</td>
</tr>
<tr>
<td>20 INCH-Dx-P4V-MINI</td>
<td>±20 In H2O</td>
<td>4 V</td>
<td>300 In H2O</td>
<td>500 In H2O</td>
</tr>
<tr>
<td>20 INCH-G-P4V-MINI</td>
<td>0 - 20 In H2O</td>
<td>4 V</td>
<td>300 In H2O</td>
<td>500 In H2O</td>
</tr>
<tr>
<td>30 INCH-Dx-P4V-MINI</td>
<td>±30 In H2O</td>
<td>4 V</td>
<td>500 In H2O</td>
<td>800 In H2O</td>
</tr>
<tr>
<td>30 INCH-G-P4V-MINI</td>
<td>0 - 30 In H2O</td>
<td>4 V</td>
<td>500 In H2O</td>
<td>800 In H2O</td>
</tr>
<tr>
<td>60 INCH-Dx-P4V-MINI</td>
<td>±60 In H2O</td>
<td>4 V</td>
<td>500 In H2O</td>
<td>800 In H2O</td>
</tr>
</tbody>
</table>

For differential pressure D1 is the package with two pressure ports the same side, D2 has two ports the opposite sides.

### Environmental Specifications

<table>
<thead>
<tr>
<th>Temperature Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensated</td>
</tr>
<tr>
<td>Operating</td>
</tr>
<tr>
<td>Storage</td>
</tr>
<tr>
<td>Humidity Limits</td>
</tr>
</tbody>
</table>

(non condensing)

### Standard Pressure Ranges

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Pressure</th>
<th>Nominal Span</th>
<th>Proof Pressure</th>
<th>Burst Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 INCH-Dx-P4V-MINI</td>
<td>±1 In H2O</td>
<td>4 V</td>
<td>100 In H2O</td>
<td>200 In H2O</td>
</tr>
<tr>
<td>1 INCH-G-P4V-MINI</td>
<td>0 - 1 In H2O</td>
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<td>200 In H2O</td>
</tr>
<tr>
<td>5 INCH-Dx-P4V-MINI</td>
<td>±5 In H2O</td>
<td>4 V</td>
<td>200 In H2O</td>
<td>300 In H2O</td>
</tr>
<tr>
<td>5 INCH-G-P4V-MINI</td>
<td>0 - 5 In H2O</td>
<td>4 V</td>
<td>200 In H2O</td>
<td>300 In H2O</td>
</tr>
<tr>
<td>10 INCH-Dx-P4V-MINI</td>
<td>±10 In H2O</td>
<td>4 V</td>
<td>200 In H2O</td>
<td>300 In H2O</td>
</tr>
<tr>
<td>10 INCH-G-P4V-MINI</td>
<td>0 - 10 In H2O</td>
<td>4 V</td>
<td>200 In H2O</td>
<td>300 In H2O</td>
</tr>
<tr>
<td>20 INCH-Dx-P4V-MINI</td>
<td>±20 In H2O</td>
<td>4 V</td>
<td>300 In H2O</td>
<td>500 In H2O</td>
</tr>
<tr>
<td>20 INCH-G-P4V-MINI</td>
<td>0 - 20 In H2O</td>
<td>4 V</td>
<td>300 In H2O</td>
<td>500 In H2O</td>
</tr>
<tr>
<td>30 INCH-Dx-P4V-MINI</td>
<td>±30 In H2O</td>
<td>4 V</td>
<td>500 In H2O</td>
<td>800 In H2O</td>
</tr>
<tr>
<td>30 INCH-G-P4V-MINI</td>
<td>0 - 30 In H2O</td>
<td>4 V</td>
<td>500 In H2O</td>
<td>800 In H2O</td>
</tr>
<tr>
<td>60 INCH-Dx-P4V-MINI</td>
<td>±60 In H2O</td>
<td>4 V</td>
<td>500 In H2O</td>
<td>800 In H2O</td>
</tr>
</tbody>
</table>

### Equivalent Circuit

For differential pressure D1 is the package with two pressure ports the same side, D2 has two ports the opposite sides.

![Equivalent Circuit Diagram]

Minature Amplified Low Pressure Sensors
### Performance Characteristics for 1 INCH-Dx-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>volt</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>±60</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±10</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±10</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±10</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
<td></td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), note 2</td>
<td>±2</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Performance Characteristics for 1 INCH-G-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>3.90</td>
<td>4.0</td>
<td>4.10</td>
<td>volt</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero pressure</td>
<td>±60</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±10</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±10</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±10</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
<td></td>
</tr>
<tr>
<td>Span Shift (5°C-50°C), note 2</td>
<td>±2</td>
<td>%span</td>
<td></td>
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</table>

### Performance Characteristics for 5 INCH-Dx-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>volt</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>±60</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±10</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±10</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±10</td>
<td>mvol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
<td></td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), note 2</td>
<td>±1</td>
<td>%span</td>
<td></td>
<td></td>
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</table>
### Performance Characteristics for: 5 INCH-G-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, NOTE 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td></td>
<td>5.0</td>
<td></td>
<td>mbar</td>
</tr>
<tr>
<td>Output Span, NOTE 5</td>
<td>3.90</td>
<td>4.0</td>
<td>4.10</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25°C-85°C), NOTE 2</td>
<td></td>
<td></td>
<td>±40</td>
<td>mvolts</td>
</tr>
<tr>
<td>Offset Warm-up Shift, NOTE 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Linearity, hysteresis error, NOTE 4</td>
<td>0.05</td>
<td>0.25</td>
<td>±1</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), NOTE 2</td>
<td>±1</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Performance Characteristics for: 10 INCH-Dx-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, NOTE 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±10.0</td>
<td></td>
<td></td>
<td>mbar</td>
</tr>
<tr>
<td>Output Span, NOTE 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25°C-85°C), NOTE 2</td>
<td>±20</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Offset Warm-up Shift, NOTE 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Linearity, hysteresis error, NOTE 4</td>
<td>0.05</td>
<td>0.25</td>
<td>±1</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), NOTE 2</td>
<td>±1</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Performance Characteristics for: 10 INCH-G-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, NOTE 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>10.0</td>
<td></td>
<td></td>
<td>mbar</td>
</tr>
<tr>
<td>Output Span, NOTE 5</td>
<td>3.90</td>
<td>4.0</td>
<td>4.10</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25°C-85°C), NOTE 2</td>
<td>±20</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Offset Warm-up Shift, NOTE 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvolts</td>
</tr>
<tr>
<td>Linearity, hysteresis error, NOTE 4</td>
<td>0.05</td>
<td>0.25</td>
<td>±1</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), NOTE 2</td>
<td>±1</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Performance Characteristics for 20 INCH-Dx-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±20.0</td>
<td>±2.0</td>
<td>±2.10</td>
<td>*H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25°C-85°C), note 2</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvol</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvol</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvol</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td></td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), note 2</td>
<td>±1</td>
<td></td>
<td></td>
<td>%span</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 20 INCH-G-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td>20.0</td>
<td></td>
<td></td>
<td>*H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>3.90</td>
<td>4.0</td>
<td>4.1</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero pressure</td>
<td>0.15</td>
<td>0.25</td>
<td>0.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25°C-85°C), note 2</td>
<td>3.90</td>
<td>4.0</td>
<td>4.1</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvol</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvol</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvol</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td></td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), note 2</td>
<td>±1</td>
<td></td>
<td></td>
<td>%span</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 30 INCH-Dx-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>±30.0</td>
<td>±2.0</td>
<td>±2.10</td>
<td>*H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±1.90</td>
<td>±2.0</td>
<td>±2.10</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25°C-85°C), note 2</td>
<td>2.15</td>
<td>2.25</td>
<td>2.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvol</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvol</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td></td>
<td></td>
<td>mvol</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
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<td>%fs</td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), note 2</td>
<td>±1</td>
<td></td>
<td></td>
<td>%span</td>
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</table>
Performance Characteristics for 30 INCH-G-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, NOTE 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, gage pressure</td>
<td></td>
<td>30.0</td>
<td></td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, NOTE 5</td>
<td></td>
<td>3.9</td>
<td></td>
<td>4.0</td>
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<tr>
<td>Offset Voltage @ zero pressure</td>
<td></td>
<td>0.15</td>
<td></td>
<td>0.25</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25°C-85°C), NOTE 2</td>
<td></td>
<td></td>
<td></td>
<td>±20</td>
</tr>
<tr>
<td>Offset Warm-up Shift, NOTE 3</td>
<td></td>
<td></td>
<td></td>
<td>±5</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td></td>
<td></td>
<td></td>
<td>±5</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td></td>
<td></td>
<td></td>
<td>±5</td>
</tr>
<tr>
<td>Linearity, hysteresis error, NOTE 4</td>
<td></td>
<td>0.05</td>
<td></td>
<td>0.25</td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), NOTE 2</td>
<td></td>
<td></td>
<td></td>
<td>±1</td>
</tr>
</tbody>
</table>

Performance Characteristics for 60 INCH-Dx-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
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<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td></td>
<td>±60.0</td>
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<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td></td>
<td>±1.90</td>
<td></td>
<td>±2.0</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td></td>
<td>2.15</td>
<td></td>
<td>2.25</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25°C-85°C), note 2</td>
<td></td>
<td></td>
<td></td>
<td>±20</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td></td>
<td></td>
<td></td>
<td>±5</td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td></td>
<td></td>
<td></td>
<td>±5</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td></td>
<td></td>
<td></td>
<td>±5</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td></td>
<td>0.05</td>
<td></td>
<td>0.25</td>
</tr>
<tr>
<td>Span Shift (-25°C-85°C), note 2</td>
<td></td>
<td></td>
<td></td>
<td>±1</td>
</tr>
</tbody>
</table>

Pressure Response: for any pressure applied the response time to get to 90% of pressure applied is typically less than 100 useconds.

Specification Notes

NOTE 1: ALL PARAMETERS ARE MEASURED AT 5.0 VOLT EXCITATION, FOR THE NOMINAL FULL SCALE PRESSURE AND ROOM TEMPERATURE UNLESS OTHERWISE SPECIFIED. PRESSURE MEASUREMENTS ARE WITH POSITIVE PRESSURE APPLIED TO THE FRONT PORT.
NOTE 2: SHIFT IS RELATIVE TO 25°C.
NOTE 3: SHIFT IS WITHIN THE FIRST HOUR OF EXCITATION APPLIED TO THE DEVICE.
NOTE 4: MEASURED AT ONE-HALF FULL SCALE RATED PRESSURE USING BEST STRAIGHT LINE CURVE FIT.
NOTE 5: THE VOLTAGE ADDED TO THE OFFSET VOLTAGE AT FULL SCALE PRESSURE. NOMINALLY THE OUTPUT VOLTAGE RANGE IS 0.25 TO 4.25 Volts FOR MINUS TO PLUS FULL SCALE PRESSURE.

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cm H₂O calibrated for Medical applications

**Features**

- cm H₂O Pressure Ranges
- Matched pressure port volumes
- Temperature Compensated
- Calibrated Zero and Span

**Applications**

- Medical Instrumentation
- Respiratory Breathing

**General Description**

The Miniature Amplified Output pressure sensors is based upon a proprietary technology to reduce all output offset or common mode errors. This model provides a calibrated amplified output with superior output offset characteristics. Output offset errors due to change in temperature, stability to warm-up, stability to long time period, and position sensitivity are all significantly reduced when compared to conventional compensation methods. In addition the sensor utilizes a silicon, micromachined, stress concentration enhanced structure to provide a very linear output to measured pressure.

These calibrated and temperature compensated sensors give an accurate and stable output over a wide temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

The output of the device is ratiometric to the supply voltage and operation from any D.C. supply voltage between 4.5 and 5.5 volts.

**Physical Dimensions**

---

**cm H₂O Pressure Ranges**

<table>
<thead>
<tr>
<th>Pressure Range</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(2.5)</td>
</tr>
</tbody>
</table>

**Matched pressure port volumes**

<table>
<thead>
<tr>
<th>Port Volume</th>
<th>Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>A-port</td>
<td>(15.7)</td>
</tr>
<tr>
<td>B-port</td>
<td>(12.7)</td>
</tr>
</tbody>
</table>

**Temperature Compensated**

**Calibrated Zero and Span**

---

**All Sensors** DS-0097 Rev A
## Pressure Sensor Characteristics Maximum Ratings

<table>
<thead>
<tr>
<th>Supply Voltage VS</th>
<th>+4.5 to +75.5Vdc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common-mode pressure</td>
<td>+75.5Vdc</td>
</tr>
<tr>
<td>Lead Temperature (soldering 2-4 sec.)</td>
<td>10 psig 250°C</td>
</tr>
</tbody>
</table>

## Environmental Specifications

<table>
<thead>
<tr>
<th>Temperature Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compensated</td>
</tr>
<tr>
<td>Operating</td>
</tr>
<tr>
<td>Storage</td>
</tr>
<tr>
<td>Humidity Limits</td>
</tr>
</tbody>
</table>

### Standard Pressure Ranges

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Pressure</th>
<th>Compensated Range</th>
<th>Proof Pressure</th>
<th>Burst Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 cmH2O-D1-4V-MINI</td>
<td>-0.2 to 5 cmH2O</td>
<td>5 to 50° C</td>
<td>50 cmH2O</td>
<td>200 cmH2O</td>
</tr>
<tr>
<td>20 cmH2O-D1-4V-MINI</td>
<td>-0.2 to 20 cmH2O</td>
<td>5 to 50° C</td>
<td>100 cmH2O</td>
<td>300 cmH2O</td>
</tr>
<tr>
<td>120 cmH2O-D1-4V-MINI</td>
<td>-10 to 120 cm H2O</td>
<td>5 to 50° C</td>
<td>300 cmH2O</td>
<td>600 cmH2O</td>
</tr>
<tr>
<td>5 cmH2O-D1-P4V-MINI</td>
<td>-0.2 to 5 cmH2O</td>
<td>-25 to 85° C</td>
<td>50 cmH2O</td>
<td>200 cmH2O</td>
</tr>
<tr>
<td>20 cmH2O-D1-P4V-MINI</td>
<td>-0.2 to 20 cmH2O</td>
<td>-25 to 85° C</td>
<td>100 cmH2O</td>
<td>300 cmH2O</td>
</tr>
<tr>
<td>120 cmH2O-D1-P4V-MINI</td>
<td>-10 to 120 cm H2O</td>
<td>-25 to 85° C</td>
<td>300 cmH2O</td>
<td>600 cmH2O</td>
</tr>
</tbody>
</table>

### Specification Notes

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### Equivalent Circuit

![Equivalent Circuit](image)

---

Miniature Amplified Medical Range Pressure Sensors

PC-0001 Rev E

23
### Performance Characteristics for 5 cmH2O-D1-4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, pressure</td>
<td>-0.2</td>
<td>5</td>
<td></td>
<td>cmH2O</td>
</tr>
<tr>
<td>Output Voltage, @5 cmH2O</td>
<td>4.40</td>
<td>4.5</td>
<td>4.6</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @ zero pressure</td>
<td>0.30</td>
<td>0.35</td>
<td>0.40</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @-0.2 cmH2O</td>
<td>0.13</td>
<td>0.18</td>
<td>0.23</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±15</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±15</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±20</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>±0.25</td>
<td>%fs</td>
<td></td>
</tr>
<tr>
<td>Span Shift (5°C-50°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Performance Characteristics for 20 cmH2O-D1-4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, pressure</td>
<td>-0.2</td>
<td>20</td>
<td></td>
<td>cmH2O</td>
</tr>
<tr>
<td>Output Voltage, @20 cmH2O</td>
<td>4.40</td>
<td>4.5</td>
<td>4.6</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @ zero pressure</td>
<td>0.30</td>
<td>0.35</td>
<td>0.40</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @-0.2 cmH2O</td>
<td>0.25</td>
<td>0.30</td>
<td>0.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
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<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±10</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±10</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±10</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>±0.25</td>
<td>%fs</td>
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</tr>
<tr>
<td>Span Shift (5°C-50°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
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</table>

### Performance Characteristics for 120 cmH2O-D1-4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, pressure</td>
<td>-10</td>
<td>120</td>
<td></td>
<td>cmH2O</td>
</tr>
<tr>
<td>Output Voltage, @120 cmH2O</td>
<td>4.40</td>
<td>4.5</td>
<td>4.6</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @ zero pressure</td>
<td>0.30</td>
<td>0.35</td>
<td>0.40</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @-10 cmH2O</td>
<td>0.23</td>
<td>0.28</td>
<td>0.33</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (5°C-50°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±15</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±15</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±20</td>
<td>mV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>±0.25</td>
<td>%fs</td>
<td></td>
</tr>
<tr>
<td>Span Shift (5°C-50°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Performance Characteristics for 5 cmH2O-D1-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, pressure</td>
<td>-0.2</td>
<td>5</td>
<td>cmH2O</td>
<td></td>
</tr>
<tr>
<td>Output Voltage, @ 5 cmH2O</td>
<td>4.40</td>
<td>4.5</td>
<td>4.6</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @ zero pressure</td>
<td>0.30</td>
<td>0.35</td>
<td>0.40</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @-0.2 cmH2O</td>
<td>0.13</td>
<td>0.18</td>
<td>0.23</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25 to 85°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±15</td>
<td>mvolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±15</td>
<td>mvolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±20</td>
<td>mvolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>±0.25</td>
<td>%fs</td>
<td></td>
</tr>
<tr>
<td>Span Shift (-25 to 85°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Performance Characteristics for 20 cmH2O-D1-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, pressure</td>
<td>-0.2</td>
<td>20</td>
<td>cmH2O</td>
<td></td>
</tr>
<tr>
<td>Output Voltage, @ 20 cmH2O</td>
<td>4.40</td>
<td>4.5</td>
<td>4.6</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @ zero pressure</td>
<td>0.30</td>
<td>0.35</td>
<td>0.40</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @-0.2 cmH2O</td>
<td>0.25</td>
<td>0.30</td>
<td>0.35</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25 to 85°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±10</td>
<td>mvolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±10</td>
<td>mvolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±10</td>
<td>mvolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>±0.25</td>
<td>%fs</td>
<td></td>
</tr>
<tr>
<td>Span Shift (-25 to 85°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Performance Characteristics for 120 cmH2O-D1-P4V-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, pressure</td>
<td>-10</td>
<td>120</td>
<td>cmH2O</td>
<td></td>
</tr>
<tr>
<td>Output Voltage, @120 cmH2O</td>
<td>4.40</td>
<td>4.5</td>
<td>4.6</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @ zero pressure</td>
<td>0.30</td>
<td>0.35</td>
<td>0.40</td>
<td>volt</td>
</tr>
<tr>
<td>Output Voltage @-10 cmH2O</td>
<td>0.23</td>
<td>0.28</td>
<td>0.33</td>
<td>volt</td>
</tr>
<tr>
<td>Offset Temperature Shift (-25 to 85°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±15</td>
<td>mvolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Position Sensitivity (±1g)</td>
<td>±15</td>
<td>mvolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±20</td>
<td>mvolt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>±0.25</td>
<td>%fs</td>
<td></td>
</tr>
<tr>
<td>Span Shift (-25 to 85°C), note 2</td>
<td>±1.0</td>
<td>%span</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Millivolt Output Pressure Sensors

Features

- 0 to 0.5" H₂O to 0 to 30" H₂O Pressure Ranges
- Temperature Compensated
- Calibrated Zero and Span

Applications

- Medical Instrumentation
- Environmental Controls
- HVAC

General Description

The Millivolt Output pressure sensor is based upon a proprietary technology to reduce all output offset or common mode errors. This model provides a calibrated millivolt output with superior output offset characteristics. Output offset errors due to change in temperature, stability to warm-up, stability to long time period, and position sensitivity are all significantly reduced when compared to conventional compensation methods. In addition, the sensor utilizes a silicon, micromachined, stress concentration enhanced structure to provide a very linear output to measured pressure.

These calibrated and temperature compensated sensors give an accurate and stable output over a wide temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

The output of the device is ratiometric to the supply voltage and operation from any D.C. supply voltage up to +16 V is acceptable.

Physical Dimensions

Equivalent Circuit

Pin 1: N/C
Pin 2: +V supply
Pin 3: +Voutput
Pin 4: -Vsupply
Pin 5: -Voutput
Pin 6: N/C

Input Resistance 4.5 k ohm
Output Resistance 1.5 k ohm
### Pressure Sensor Ratings

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>0.5</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, @ 0.5&quot;H2O, note 5</td>
<td>9.0</td>
<td>10.0</td>
<td>11.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±500</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-50°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±250</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>--</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>--</td>
<td>±5.0</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
</tr>
<tr>
<td>Full Scale Shift (0°C-50°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 0.5 INCH-D-MV

### Environmental Specifications

<table>
<thead>
<tr>
<th>Temperature Ranges</th>
<th>Compensated</th>
<th>Operating</th>
<th>Storage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 50(70)° C</td>
<td>-25 to 85° C</td>
<td>-40 to 125° C</td>
<td></td>
</tr>
<tr>
<td>Humidity Limits</td>
<td>0 to 95% RH (non condensing)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Standard Pressure Ranges

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Pressure</th>
<th>Nominal Span</th>
<th>Proof Pressure</th>
<th>Burst Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5 INCH-D-MV</td>
<td>0 - 0.5&quot; H2O</td>
<td>10mV</td>
<td>100 &quot;H2O</td>
<td>200 &quot;H2O</td>
</tr>
<tr>
<td>1 INCH-D-MV</td>
<td>0 - 1&quot; H2O</td>
<td>10 mV</td>
<td>100 &quot;H2O</td>
<td>200 &quot;H2O</td>
</tr>
<tr>
<td>2 INCH-D-MV</td>
<td>0 - 2&quot; H2O</td>
<td>10mv</td>
<td>100 &quot;H2O</td>
<td>200 &quot;H2O</td>
</tr>
<tr>
<td>5 INCH-D-MV</td>
<td>0 - 5&quot; H2O</td>
<td>20 mV</td>
<td>200 &quot;H2O</td>
<td>300 &quot;H2O</td>
</tr>
<tr>
<td>10 INCH-D-MV</td>
<td>0 - 10&quot; H2O</td>
<td>20 mV</td>
<td>200 &quot;H2O</td>
<td>300 &quot;H2O</td>
</tr>
<tr>
<td>20 INCH-D-MV</td>
<td>0 - 20&quot; H2O</td>
<td>20 mV</td>
<td>200 &quot;H2O</td>
<td>500 &quot;H2O</td>
</tr>
<tr>
<td>30 INCH-D-MV</td>
<td>0 - 30&quot; H2O</td>
<td>20 mV</td>
<td>200 &quot;H2O</td>
<td>800 &quot;H2O</td>
</tr>
</tbody>
</table>

## Performance Characteristics for 1 INCH-D-MV

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>1.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, @ 1&quot;H2O, note 5</td>
<td>9.0</td>
<td>10.0</td>
<td>11.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±500</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-50°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±250</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>--</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>--</td>
<td>±5.0</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
</tr>
<tr>
<td>Full Scale Shift (0°C-50°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
</tbody>
</table>
### Performance Characteristics for 2 INCH-D-MV

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>2.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>9.0</td>
<td>10.0</td>
<td>11.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±500</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-50°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±250</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>--</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>--</td>
<td>±50</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
</tr>
<tr>
<td>Full Scale Shift (0°C-50°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 5 INCH-D-MV

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>5.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±500</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-50°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±150</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>--</td>
<td>±50</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>--</td>
<td>±10</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>--</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
</tr>
<tr>
<td>Full Scale Shift (0°C-50°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 10 INCH-D-MV

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>10.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±500</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±150</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>--</td>
<td>±5</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>--</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
</tr>
<tr>
<td>Full Scale Shift (0°C-70°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
</tbody>
</table>
## Performance Characteristics for 20 INCH-D-MV

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>20.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±500</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±150</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>--</td>
<td>±5</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>--</td>
<td>±5</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
</tbody>
</table>

## Performance Characteristics for 30 INCH-D-MV

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>30.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±500</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>--</td>
<td>--</td>
<td>±150</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>--</td>
<td>±5</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>--</td>
<td>±5</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>0.05</td>
<td>0.25</td>
<td>%fs</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>--</td>
<td>±200</td>
<td>uV</td>
</tr>
</tbody>
</table>

### Specification Notes

**Note 1:** All parameters are measured at 12.0 volt excitation, for the nominal full scale pressure and room temperature unless otherwise specified. Pressure measurements are with positive pressure applied to Port B.

**Note 2:** Shift is relative to 25°C.

**Note 3:** Shift is within the first hour of excitation applied to the device.

**Note 4:** Measured at one-half full scale rated pressure using best straight line curve fit.

**Note 5:** The voltage added to the offset voltage at full scale pressure.

**Pressure Response:** For any pressure applied the response time to get to 90% of pressure applied is typically less than 100 usecords.

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Miniature Low Pressure Sensors

Low Pressure (1" H₂O to 30" H₂O) Sensors

Features

- 0 to 1" H₂O to 0 to 30" H₂O Pressure Ranges
- Matched pressure port volumes
- Temperature Compensated
- Calibrated Zero and Span

Applications

- Medical Instrumentation
- Environmental Controls
- HVAC

General Description

The Millivolt Output pressure sensors is based upon a proprietary technology to reduce all output offset or common mode errors. This model provides a calibrated millivolt output with superior output offset characteristics. Output offset errors due to change in temperature, stability to warm-up, stability to long time period, and position sensitivity are all significantly reduced when compared to conventional compensation methods. In addition the sensor utilizes a silicon, micromachined, stress concentration enhanced structure to provide a very linear output to measured pressure.

These calibrated and temperature compensated sensors give an accurate and stable output over a wide temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

The output of the device is ratiometric to the supply voltage and operation from any D.C. supply voltage up to +16 V is acceptable.

Equivalent Circuit

Input Resistance 4.5 kΩ
Output Resistance 1.5 kΩ
## Pressure Sensor Characteristics Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply Voltage, Vs</td>
<td>16 Vdc</td>
<td>10 psig</td>
<td>250 °C</td>
<td></td>
</tr>
<tr>
<td>Common-mode pressure</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lead Temperature (soldering 2-4 sec.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Standard Pressure Ranges

#### Single in Line Packages-SIP

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Pressure</th>
<th>Two Ports Same Side</th>
<th>Part Number</th>
<th>Two Ports Opposite Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 INCH-G-MV-MINI</td>
<td>0 - 1 &quot;H2O</td>
<td>1 INCH-D2-MV-MINI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 INCH-G-MV-MINI</td>
<td>0 - 2 &quot;H2O</td>
<td>2 INCH-D1-MV-MINI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 INCH-G-MV-MINI</td>
<td>0 - 5 &quot;H2O</td>
<td>5 INCH-D1-MV-MINI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 INCH-G-MV-MINI</td>
<td>0 - 10 &quot;H2O</td>
<td>10 INCH-D1-MV-MINI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 INCH-G-MV-MINI</td>
<td>0 - 20 &quot;H2O</td>
<td>20 INCH-D1-MV-MINI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 INCH-G-MV-MINI</td>
<td>0 - 30 &quot;H2O</td>
<td>30 INCH-D1-MV-MINI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Dual in Line Packages

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Pressure</th>
<th>Two Ports Same Side</th>
<th>Part Number</th>
<th>Two Ports Opposite Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 INCH-GDIP-MV-MINI</td>
<td>0 - 2 &quot;H2O</td>
<td>1 INCH-D2DIP-MV-MINI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 INCH-GDIP-MV-MINI</td>
<td>0 - 5 &quot;H2O</td>
<td>2 INCH-D1DIP-MV-MINI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 INCH-GDIP-MV-MINI</td>
<td>0 - 10 &quot;H2O</td>
<td>5 INCH-D1DIP-MV-MINI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20 INCH-GDIP-MV-MINI</td>
<td>0 - 20 &quot;H2O</td>
<td>10 INCH-D1DIP-MV-MINI</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 INCH-GDIP-MV-MINI</td>
<td>0 - 30 &quot;H2O</td>
<td>20 INCH-D1DIP-MV-MINI</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Environmental Specifications

<table>
<thead>
<tr>
<th>Temperature Ranges</th>
<th>Compensated</th>
<th>Operating</th>
<th>Storage</th>
<th>Humidity Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 to 50(70) °C</td>
<td>-25 to 85 °C</td>
<td>-40 to 125 °C</td>
<td>0 to 95% RH (non condensing)</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 1 INCH-D2-MV-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>1.0</td>
<td></td>
<td>12.0</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, @ 1 &quot;H2O, note 5</td>
<td>8.0</td>
<td>10</td>
<td>±500</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>±250</td>
<td></td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-50°C), note 2</td>
<td>±50</td>
<td></td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>±100</td>
<td></td>
<td>±300</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±200</td>
<td></td>
<td>±300</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>±0.5</td>
<td>%fs</td>
</tr>
</tbody>
</table>
### Performance Characteristics for 2 INCH-Dx-MV-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
</tr>
<tr>
<td>Output Span, note 5</td>
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<td>±500</td>
<td>±500</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-50°C), note 2</td>
<td>±150</td>
<td>±150</td>
<td>±150</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±100</td>
<td>±100</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>0.05</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (0°C-50°C), note 2</td>
<td>±200</td>
<td>±200</td>
<td>±200</td>
<td>uV</td>
</tr>
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</table>

### Performance Characteristics for 5 INCH-Dx-MV-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>5.0</td>
<td>5.0</td>
<td>5.0</td>
<td>mV</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±500</td>
<td>±500</td>
<td>±500</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-50°C), note 2</td>
<td>±150</td>
<td>±150</td>
<td>±150</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±100</td>
<td>±100</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>0.05</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (0°C-50°C), note 2</td>
<td>±200</td>
<td>±200</td>
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<td>uV</td>
</tr>
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### Performance Characteristics for 10 INCH-Dx-MV-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>10.0</td>
<td>10.0</td>
<td>10.0</td>
<td>mV</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>±500</td>
<td>±500</td>
<td>±500</td>
<td>uV</td>
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<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>±150</td>
<td>±150</td>
<td>±150</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±100</td>
<td>±100</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>0.05</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (0°C-70°C), note 2</td>
<td>±200</td>
<td>±200</td>
<td>±200</td>
<td>uV</td>
</tr>
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</table>
### Performance Characteristics for 20 INCH-Dx-MV-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td></td>
<td>30.0</td>
<td>50</td>
<td>°H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>±500</td>
<td>±150</td>
<td>±50</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>±50</td>
<td>±5</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>±5</td>
<td>±100</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td>±100</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td>±100</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>±200</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (0°C-70°C), note 2</td>
<td></td>
<td></td>
<td>±200</td>
<td>uV</td>
</tr>
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</table>

### Performance Characteristics for 30 INCH-Dx-MV-MINI

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
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</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td></td>
<td>30.0</td>
<td>50</td>
<td>°H2O</td>
</tr>
<tr>
<td>Output Span, note 5</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>±500</td>
<td>±150</td>
<td>±50</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>±50</td>
<td>±5</td>
<td>±100</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>±5</td>
<td>±100</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>±5</td>
<td>±100</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>±5</td>
<td>±100</td>
<td>±200</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>0.05</td>
<td>0.25</td>
<td>±200</td>
<td>%fs</td>
</tr>
<tr>
<td>Span Shift (0°C-70°C), note 2</td>
<td></td>
<td></td>
<td>±200</td>
<td>uV</td>
</tr>
</tbody>
</table>

### Specification Notes

**NOTE 1:** All parameters are measured at 12.0 VOLT excitation, for the nominal full scale pressure and room temperature unless otherwise specified. Pressure measurements are with positive pressure applied to the B-PORT configuration.

**NOTE 2:** Shift is relative to 25°C.

**NOTE 3:** Shift is within the first hour of excitation applied to the device.

**NOTE 4:** Measured at one-half full scale rated pressure using best straight line curve fit.

**NOTE 5:** The voltage added to the offset voltage at full scale pressure.
Physical Dimensions

Dual in Line (SDXL)**

Two Pressure Port Same Side

Two Pressure Port Two Sides

Dual in Line (DIP)

**SDXL ORDERING INFORMATION

<table>
<thead>
<tr>
<th>One Port</th>
<th>Two Ports Same Side</th>
<th>Two Ports Opposite Side</th>
</tr>
</thead>
<tbody>
<tr>
<td>Part Number</td>
<td>Operating Pressure</td>
<td>Part Number</td>
</tr>
<tr>
<td>2 INCH-GDIP-MV-SDXL</td>
<td>0 - 2 &quot;H2O</td>
<td>2 INCH-D1DIP-MV-SDXL</td>
</tr>
<tr>
<td>5 INCH-GDIP-MV-SDXL</td>
<td>0 - 5 &quot;H2O</td>
<td>5 INCH-D1DIP-MV-SDXL</td>
</tr>
<tr>
<td>10 INCH-GDIP-MV-SDXL</td>
<td>0 - 10 &quot;H2O</td>
<td>10 INCH-D1DIP-MV-SDXL</td>
</tr>
<tr>
<td>20 INCH-GDIP-MV-SDXL</td>
<td>0 - 20 &quot;H2O</td>
<td>20 INCH-D1DIP-MV-SDXL</td>
</tr>
<tr>
<td>30 INCH-GDIP-MV-SDXL</td>
<td>0 - 30 &quot;H2O</td>
<td>30 INCH-D1DIP-MV-SDXL</td>
</tr>
</tbody>
</table>
Offset Compensated Pressure Sensors

Features

- 0 to 1 "H2O to 0 to 30 "H2O Pressure Ranges
- 0.5 % linearity
- Offset Compensated

Applications

- Medical Instrumentation
- Environmental Controls
- HVAC

General Description

The Miniature BASIC series pressure sensors are based upon a proprietary technology to reduce the size of the sensor and yet maintain a high level of performance. The technology is currently being patented. Output offset errors due to change in temperature, stability to warm-up, stability to long time period, and position sensitivity are all significantly reduced when compared to conventional compensation methods. In addition the sensor utilizes a silicon, micromachined, stress concentration enhanced structure to provide a very linear output to measured pressure.

These offset compensated sensors give an accurate and stable output over a wide temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

The output of the device is ratiometric to the supply voltage and operation from any D.C. supply voltage up to +6V is acceptable.

Physical Dimensions

Equivalent Circuit

| Input Resistance | 1.66 k ohm |
| Output Resistance | 1.66 k ohm |
| TCR | 2600 ppm/°C |
| TCS | -2200 ppm/°C |

Approvals
### Pressure Sensor Characteristics Maximum Ratings

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>1.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, @ 1 &quot;H2O, note 5</td>
<td>4.0</td>
<td>7.0</td>
<td>14.0</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±10</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>--</td>
<td>±0.1</td>
<td>--</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>±10</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>±15</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>±80</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>0.1</td>
<td>±0.5</td>
<td>%/fs</td>
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</table>

### Environmental Specifications

<table>
<thead>
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<th>Temperature Ranges</th>
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<td>Compensated</td>
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<tr>
<td>Operating</td>
</tr>
<tr>
<td>Storage</td>
</tr>
<tr>
<td>Humidity Limits</td>
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<td>(non condensing)</td>
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</table>

### Standard Pressure Ranges

#### Single in Line Packages-SIP

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Operating Pressure</th>
<th>Part Number</th>
<th>Part Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 INCH-G-BASIC</td>
<td>0 - 1 &quot;H2O</td>
<td>1 INCH-D1-BASIC</td>
<td>1 INCH-D2-BASIC</td>
</tr>
<tr>
<td>5 INCH-G-BASIC</td>
<td>0 - 5 &quot;H2O</td>
<td>5 INCH-D1-BASIC</td>
<td>5 INCH-D2-BASIC</td>
</tr>
<tr>
<td>10 INCH-G-BASIC</td>
<td>0 - 10 &quot;H2O</td>
<td>10 INCH-D1-BASIC</td>
<td>10 INCH-D2-BASIC</td>
</tr>
<tr>
<td>20 INCH-G-BASIC</td>
<td>0 - 20 &quot;H2O</td>
<td>20 INCH-D1-BASIC</td>
<td>20 INCH-D2-BASIC</td>
</tr>
<tr>
<td>30 INCH-G-BASIC</td>
<td>0 - 30 &quot;H2O</td>
<td>30 INCH-D1-BASIC</td>
<td>30 INCH-D2-BASIC</td>
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</tbody>
</table>

### Performance Characteristics for 1 INCH-x-BASIC

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>5.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, @ 5 &quot;H2O, note 5</td>
<td>15</td>
<td>22.5</td>
<td>30</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±10</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>--</td>
<td>±0.1</td>
<td>--</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>±10</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>±15</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
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<td>±80</td>
<td>--</td>
<td>uV</td>
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<td>%/fs</td>
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### Performance Characteristics for 5 INCH-x-BASIC

<table>
<thead>
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</thead>
<tbody>
<tr>
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<td>15</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, @ 5 &quot;H2O, note 5</td>
<td>15</td>
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<td>30</td>
<td>mV</td>
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<td>Offset Voltage @ zero differential pressure</td>
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</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>--</td>
<td>±0.1</td>
<td>--</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
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<td>±10</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
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<td>uV</td>
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<tr>
<td>Offset Long Term Drift (one year)</td>
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<td>uV</td>
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<tr>
<td>Linearity, hysteresis error, note 4</td>
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<td>±0.5</td>
<td>%/fs</td>
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</table>
### Performance Characteristics for 10 INCH-x-BASIC

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
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<th>Maximum</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
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<td>--</td>
<td>&quot;H2O</td>
</tr>
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<td>Output Span, @ 10 &quot;H2O, note 5</td>
<td>15</td>
<td>30</td>
<td>45</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
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<td>±10</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
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<td>±0.1</td>
<td>--</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
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<td>±10</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
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<td>±10</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
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<td>±80</td>
<td>--</td>
<td>uV</td>
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<tr>
<td>Linearity, hysteresis error, note 4</td>
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<td>±0.5</td>
<td>%fs</td>
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### Performance Characteristics for 20 INCH-x-BASIC

<table>
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<th>Maximum</th>
<th>Units</th>
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<tbody>
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<td>20.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, @ 20 &quot;H2O, note 5</td>
<td>15</td>
<td>30</td>
<td>45</td>
<td>mV</td>
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<tr>
<td>Offset Voltage @ zero differential pressure</td>
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<td>±10</td>
<td>mV</td>
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<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
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<td>±0.1</td>
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<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>±10</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>±5</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>±80</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>0.1</td>
<td>±0.5</td>
<td>%fs</td>
</tr>
</tbody>
</table>

### Performance Characteristics for 30 INCH-x-BASIC

<table>
<thead>
<tr>
<th>Parameter, note 1</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Range, differential pressure</td>
<td>--</td>
<td>30.0</td>
<td>--</td>
<td>&quot;H2O</td>
</tr>
<tr>
<td>Output Span, @ 30 &quot;H2O, note 5</td>
<td>15</td>
<td>30</td>
<td>45</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Voltage @ zero differential pressure</td>
<td>--</td>
<td>--</td>
<td>±10</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C), note 2</td>
<td>--</td>
<td>±0.1</td>
<td>--</td>
<td>mV</td>
</tr>
<tr>
<td>Offset Warm-up Shift, note 3</td>
<td>--</td>
<td>±10</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>--</td>
<td>±5</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Offset Long Term Drift (one year)</td>
<td>--</td>
<td>±80</td>
<td>--</td>
<td>uV</td>
</tr>
<tr>
<td>Linearity, hysteresis error, note 4</td>
<td>--</td>
<td>0.05</td>
<td>±0.5</td>
<td>%fs</td>
</tr>
</tbody>
</table>

### Specification Notes

**Note 1:** All parameters are measured at 4.5 volt excitation, for the nominal full scale pressure and room temperature unless otherwise specified. Pressure measurements are with negative pressure applied to the TOP-PORT (the only port for the single port configuration).

**Note 2:** Shift is relative to 25°C.

**Note 3:** Shift is within the first hour of excitation applied to the device.

**Note 4:** Measured at one-half full scale rated pressure using best straight line curve fit.

**Note 5:** The voltage added to the offset voltage at full scale pressure.

**Pressure Response:** For any pressure applied the response time to get to 90% of pressure applied is typically less than 100 microseconds.

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**Surface Mount Basic Pressure Sensors**

---

### Features

- 10 inH₂O Full Scale to 100 psi Full Scale Pressures
- 0.5 % linearity
- Small LCC Footprint
- ROHS Compliant

### Applications

- Medical Instrumentation
- Environmental Controls
- HVAC

---

### General Description

The BASIC Series of pressure sensors use a silicon micromachined (MEMS) pressure sensor in the most basic configuration. The package is a ceramic surface mount configuration to provide the smallest footprint possible.

Best temperature compensation is realized when the sensor has a constant current excitation.

This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like.

Specifications are written for constant voltage of 3.0 volts.

The output of the device is ratiometric to the supply voltage.

---

### Physical Dimensions

**LP Package**

- Dimensions: inch [mm]
- Part Marking
- Back Side (Common to LP and LF Packages)

**LF Package**

- Dimensions: inch [mm]
- Part Marking

---

### Equivalent Circuit

- PINOUT
- PART MARKING

---

### Approvals

<table>
<thead>
<tr>
<th>MKT</th>
<th>DATE</th>
<th>MFG</th>
<th>DATE</th>
<th>ENG</th>
<th>DATE</th>
<th>QA</th>
<th>DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>As Is</td>
<td>As Is</td>
<td>With Change</td>
<td>As Is</td>
<td>As Is</td>
<td>With Change</td>
<td>As Is</td>
<td>As Is</td>
</tr>
</tbody>
</table>
### Pressure Sensor Characteristics Maximum Ratings

<table>
<thead>
<tr>
<th>Supply Voltage VS</th>
<th>Voltage: 6 Vdc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Temperature</td>
<td>270°C</td>
</tr>
</tbody>
</table>

### Standard Pressure Ranges

<table>
<thead>
<tr>
<th>Port Number</th>
<th>Non-port Number</th>
<th>Operating Pressure</th>
<th>Sensitivity (1)</th>
<th>Proof Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>BST-L10G-LP</td>
<td>BST-L10G-LF</td>
<td>0 - 10 inH2O</td>
<td>2.0 ±0.24</td>
<td>3 PSI</td>
</tr>
<tr>
<td>BSM-001G-LP</td>
<td>BSM-001G-LF</td>
<td>0 - 1 PSI</td>
<td>21.0 ±2.50</td>
<td>5 PSI</td>
</tr>
<tr>
<td>BSM-005G-LP</td>
<td>BSM-005G-LF</td>
<td>0 - 5 PSI</td>
<td>10.5 ±1.30</td>
<td>15 PSI</td>
</tr>
<tr>
<td>BSM-015G-LP</td>
<td>BSM-015G-LF</td>
<td>0 - 15 PSI</td>
<td>5.3 ±0.64</td>
<td>45 PSI</td>
</tr>
<tr>
<td>BSM-015A-LP</td>
<td>BSM-015A-LF</td>
<td>0 - 15 PSIA</td>
<td>5.3 ±0.64</td>
<td>30 PSI</td>
</tr>
<tr>
<td>BSM-030G-LP</td>
<td>BSM-030G-LF</td>
<td>0 - 30 PSI</td>
<td>2.6 ±0.30</td>
<td>100 PSI</td>
</tr>
<tr>
<td>BSM-100G-LP</td>
<td>BSM-100G-LF</td>
<td>0 - 100 PSI</td>
<td>1.1 ±0.13</td>
<td>200 PSI</td>
</tr>
</tbody>
</table>

### Environmental Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature Ranges</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Operating</td>
<td>-25 to 85°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>-40 to 125°C</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Humidity Limits</td>
<td>0 to 95% RH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(non condensing)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Common Performance Characteristic

<table>
<thead>
<tr>
<th>Parameter (1)</th>
<th>Minimum</th>
<th>Nominal</th>
<th>Maximum</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offset Voltage</td>
<td></td>
<td>±5</td>
<td>±25</td>
<td>mv</td>
</tr>
<tr>
<td>Temperature Effect on Offset (2)</td>
<td></td>
<td>±3</td>
<td>--</td>
<td>µV/V/°C</td>
</tr>
<tr>
<td>Temperature Effect on Resistance (2,6)</td>
<td>2300</td>
<td>2600</td>
<td>3300</td>
<td>ppm/°C</td>
</tr>
<tr>
<td>Temperature Effect on Span (2,6)</td>
<td>-8700</td>
<td>-6000</td>
<td>-8700</td>
<td>ppm/°C</td>
</tr>
<tr>
<td>Linearity error (4,6)</td>
<td></td>
<td>±0.2</td>
<td>±0.5</td>
<td>% FSS</td>
</tr>
<tr>
<td>Hysteresis error (6)</td>
<td></td>
<td>±0.01</td>
<td>±0.05</td>
<td>% FSS</td>
</tr>
<tr>
<td>Position Sensitivity (BST-L10G-xx) (6)</td>
<td></td>
<td>±0.01</td>
<td>±0.03</td>
<td>% FSS</td>
</tr>
<tr>
<td>Input Resistance (6)</td>
<td>2.7</td>
<td>3.3</td>
<td>4.0</td>
<td>kohms</td>
</tr>
<tr>
<td>Output Resistance (6)</td>
<td>2.7</td>
<td>3.3</td>
<td>4.0</td>
<td>kohms</td>
</tr>
<tr>
<td>Long term stability of span (3)</td>
<td></td>
<td>0.1</td>
<td>--</td>
<td>% FSS</td>
</tr>
</tbody>
</table>

### Specification Notes

NOTE 1: All parameters are measured at 3.0 volt excitation, for the nominal full scale pressure and room temperature unless otherwise specified. Pressure measurements are with positive pressure to the single port configuration.

NOTE 2: Shift is relative to 25°C.

NOTE 3: Shift is within the first year of operation.

NOTE 4: Measured at one-half full scale rated pressure using best straight line curve fit.

NOTE 5: The voltage added to the offset voltage at full scale pressure.

NOTE 6: Parameter is characterized and not 100% tested. Minimum and Maximum values indicated as a design reference.

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BLV Series Low Voltage Pressure Sensors

Features
- 0 to 1 "H2O to 0 to 30 "H2O Pressure Ranges
- uPower Low Supply Voltage (0.9V to 1.8V)
- 90% Less Power Than Mini-Basic Series
- 0.3% Linearity
- Improved Front to Back Linearity
- Excellent Position Sensitivity
- Improved Warm-Up Shift Distribution
- Parylene Coating Available Upon Request

Applications
- Medical Instrumentation
- Environmental Controls
- HVAC
- Portable / Hand Held Devices

General Description
The BLV Series Basic Sensor is based on All Sensors’ CoBeam™ Technology. The device provides a high output signal at a low operating voltage and reduces the overall supply voltage while maintaining comparable output levels to traditional equivalent basic sensing elements. This lower supply voltage gives rise to improved warm-up shift while the CoBeam™ Technology itself reduces package stress susceptibility resulting in improved overall long term stability. The technology also vastly improves position sensitivity compared to conventional single die devices.

This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like. The output is also ratiometric to the supply voltage and is operable from 0.9 to 1.8 volts DC.

Standard Pressure Ranges

<table>
<thead>
<tr>
<th>Device</th>
<th>Operating Range</th>
<th>Proof Pressure</th>
<th>Burst Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLV-L01D</td>
<td>±1 inH2O</td>
<td>100 inH2O</td>
<td>300 inH2O</td>
</tr>
<tr>
<td>BLV-L05D</td>
<td>±5 inH2O</td>
<td>200 inH2O</td>
<td>300 inH2O</td>
</tr>
<tr>
<td>BLV-L10D</td>
<td>±10 inH2O</td>
<td>200 inH2O</td>
<td>300 inH2O</td>
</tr>
<tr>
<td>BLV-L20D</td>
<td>±20 inH2O</td>
<td>200 inH2O</td>
<td>500 inH2O</td>
</tr>
<tr>
<td>BLV-L30D</td>
<td>±30 inH2O</td>
<td>200 inH2O</td>
<td>800 inH2O</td>
</tr>
</tbody>
</table>

Equivalent Circuit

Pressure Sensor Maximum Ratings

<table>
<thead>
<tr>
<th>Supply Voltage (Vs)</th>
<th>6 Vdc</th>
</tr>
</thead>
<tbody>
<tr>
<td>Common Mode Pressure</td>
<td>5 psig</td>
</tr>
<tr>
<td>Lead Temperature (soldering 2-4 sec.)</td>
<td>270 °C</td>
</tr>
</tbody>
</table>

Environmental Specifications

<table>
<thead>
<tr>
<th>Temperature Ranges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating</td>
</tr>
<tr>
<td>Storage</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Humidity Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 95% RH (non condensing)</td>
</tr>
</tbody>
</table>

Approvals

All Sensors DS-0275 Rev A
## Performance Characteristics for BLV Series

All parameters are measured at 1.8 volt excitation and room temperature unless otherwise specified. Pressure measurements are with positive pressure applied to PORT B (the only port for the single port configuration).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Span</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L01D @ 1 inH2O</td>
<td>4.5</td>
<td>8.0</td>
<td>11.5</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L05D @ 5 inH2O</td>
<td>13.5</td>
<td>24.0</td>
<td>34.5</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L10D @ 10 inH2O</td>
<td>18.0</td>
<td>32.0</td>
<td>46.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L20D @ 20 inH2O</td>
<td>22.0</td>
<td>38.0</td>
<td>55.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L30D @ 30 inH2O</td>
<td>25.0</td>
<td>42.0</td>
<td>60.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>Offset Voltage @ Zero Diff. Pressure</td>
<td></td>
<td></td>
<td>±10</td>
<td>mV</td>
<td></td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C)</td>
<td>-</td>
<td>-25.0</td>
<td></td>
<td>uV/°C</td>
<td>1</td>
</tr>
<tr>
<td>Offset Warm-up Shift</td>
<td>-</td>
<td>±20.0</td>
<td>±100</td>
<td>uV</td>
<td>2</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>-</td>
<td>±20.0</td>
<td></td>
<td>uV</td>
<td></td>
</tr>
<tr>
<td>Offset Long Term Drift (One Year)</td>
<td>-</td>
<td>±120</td>
<td></td>
<td>uV</td>
<td></td>
</tr>
<tr>
<td>Linearity, Hysteresis Error</td>
<td>-</td>
<td>0.10</td>
<td>±0.30</td>
<td>%FSS</td>
<td>3</td>
</tr>
<tr>
<td>Response Time (10% to 90% Pressure Response)</td>
<td>-</td>
<td>100</td>
<td>±0.30</td>
<td>%FSS</td>
<td>3</td>
</tr>
<tr>
<td>Front to Back Linearity</td>
<td>-</td>
<td>0.25</td>
<td></td>
<td>%FSS</td>
<td>5</td>
</tr>
<tr>
<td>Temperature Effect on Resistance (0°C-70°C)</td>
<td>-</td>
<td>2800</td>
<td></td>
<td>ppm/°C</td>
<td>-</td>
</tr>
<tr>
<td>Temperature Effect on Span (0°C-70°C)</td>
<td>-</td>
<td>-1900</td>
<td></td>
<td>ppm/°C</td>
<td>-</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>-</td>
<td>3.0</td>
<td></td>
<td>k ohm</td>
<td></td>
</tr>
<tr>
<td>Output Resistance</td>
<td>-</td>
<td>3.0</td>
<td></td>
<td>k ohm</td>
<td></td>
</tr>
</tbody>
</table>

### Specification Notes

**Note 1:** Shift is relative to 25°C.

**Note 2:** Shift is within the first hour of excitation applied to the device.

**Note 3:** Measured at one-half full scale rated pressure using best straight line curve fit.

**Note 4:** The span is the algebraic difference between full scale output voltage and the offset voltage.

**Note 5:** Front-Back Linearity computed as: \( \text{LinFB} = \left( \frac{\text{Span Front}}{\text{Span Back}} - 1 \right) \times 100\% \)

### How To Order

**Example:** BLV-L10D-B1NS-N

BLV Series Low Voltage Pressure Sensors
Suggested Pad Layout

Package Characteristics

<table>
<thead>
<tr>
<th>Package ID</th>
<th>Approximate Port Volume</th>
<th>Weight</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1NS</td>
<td>Port A 181 Port B 176 mm³</td>
<td>1.2</td>
<td>Grams</td>
</tr>
<tr>
<td>B2NS</td>
<td>Port A 181 Port B 176 mm³</td>
<td>1.2</td>
<td>Grams</td>
</tr>
<tr>
<td>BGNS</td>
<td>Port A 1.5 Port B 176 mm³</td>
<td>0.9</td>
<td>Grams</td>
</tr>
</tbody>
</table>

Product Labeling

All Sensors
BLV-L01D
B1NS-N
R9J21-3

Company
Part Number
Lot Number

Device Label

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BLVR Series Low Voltage Pressure Sensors

**Features**
- 0 to 1 inH2O to 0 to 30 inH2O Pressure Ranges
- Low Supply Voltage (1.8V to 3.3V)
- 40% Less Power Than Mini-Basic Series
- 0.3% Linearity
- Improved Front to Back Linearity
- Offset Compensated
- Superior Position Sensitivity
- Improved Warm-Up Shift Distribution
- Parylene Coating Available Upon Request

**Applications**
- Medical Instrumentation
- Environmental Controls
- HVAC
- Portable / Hand Held Devices

**General Description**

The BLVR Series Basic Sensor is based on a Dual Die Reference technology to reduce all output offset or common mode errors. It also incorporates All Sensors CoBeam² Technology to reduce the overall supply voltage while maintaining comparable output levels to traditional equivalent basic sensing elements. This lower supply voltage gives rise to improved warm-up shift while the CoBeam² Technology itself reduces package stress susceptibility resulting in improved overall long term stability. The technology also vastly improves position sensitivity to nearly unmeasurable levels.

This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like. The output is also ratiometric to the supply voltage and is operable from 1.8 to 3.3 volts DC.

<table>
<thead>
<tr>
<th>Standard Pressure Ranges</th>
<th>Equivalent Circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Device</strong></td>
<td><strong>Operating Range</strong></td>
</tr>
<tr>
<td>BLVR-L01D</td>
<td>±1 inH2O</td>
</tr>
<tr>
<td>BLVR-L05D</td>
<td>±5 inH2O</td>
</tr>
<tr>
<td>BLVR-L10D</td>
<td>±10 inH2O</td>
</tr>
<tr>
<td>BLVR-L20D</td>
<td>±20 inH2O</td>
</tr>
<tr>
<td>BLVR-L30D</td>
<td>±30 inH2O</td>
</tr>
</tbody>
</table>

**Pressure Sensor Maximum Ratings**

| Supply Voltage (Vs) | 6 Vdc |
| Common Mode Pressure | 5 psig |
| Lead Temperature (soldering 2-4 sec.) | 270°C |

**Environmental Specifications**

| Temperature Ranges | -25 to 85°C |
| Storage | -40 to 125°C |
| Humidity Limits | 0 to 95% RH (non condensing) |

**Approvals**

| All Sensors | DS-0280 Rev A |
Performance Characteristics for BLVR Series

All parameters are measured at 3.3 volt excitation and room temperature unless otherwise specified. Pressure measurements are with positive pressure applied to PORT B (the only port for the single port configuration).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Span</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L01D @ 1 inH2O</td>
<td>4.5</td>
<td>8.0</td>
<td>11.5</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L05D @ 5 inH2O</td>
<td>13.5</td>
<td>24.0</td>
<td>34.5</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L10D @ 10 inH2O</td>
<td>18.0</td>
<td>32.0</td>
<td>46.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L20D @ 20 inH2O</td>
<td>22.0</td>
<td>38.0</td>
<td>55.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L30D @ 30 inH2O</td>
<td>25.0</td>
<td>42.0</td>
<td>60.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>Offset Voltage @ Zero Diff. Pressure</td>
<td>-</td>
<td>-</td>
<td>±8.0</td>
<td>mV</td>
<td>-</td>
</tr>
<tr>
<td>Offset Temperature Shift (0°C-70°C)</td>
<td>-</td>
<td>±0.1</td>
<td>-</td>
<td>mV</td>
<td>1</td>
</tr>
<tr>
<td>Offset Warm-up Shift</td>
<td>-</td>
<td>±10</td>
<td>±80</td>
<td>uV</td>
<td>2</td>
</tr>
<tr>
<td>Offset Position Sensitivity (1g)</td>
<td>-</td>
<td>±0.2</td>
<td>-</td>
<td>uV</td>
<td>-</td>
</tr>
<tr>
<td>Offset Long Term Drift (One Year)</td>
<td>-</td>
<td>±80</td>
<td>-</td>
<td>uV</td>
<td>-</td>
</tr>
<tr>
<td>Linearity, Hysteresis Error</td>
<td>-</td>
<td>0.1</td>
<td>±0.3</td>
<td>%FSS</td>
<td>3</td>
</tr>
<tr>
<td>Response Time (10% to 90% Pressure Response)</td>
<td>-</td>
<td>100</td>
<td>±0.3</td>
<td>%FSS</td>
<td>3</td>
</tr>
<tr>
<td>Front to Back Linearity</td>
<td>-</td>
<td>0.25</td>
<td>-</td>
<td>%FSS</td>
<td>5</td>
</tr>
<tr>
<td>Temperature Effect on Resistance (0°C-70°C)</td>
<td>-</td>
<td>2800</td>
<td>-</td>
<td>ppm/°C</td>
<td>-</td>
</tr>
<tr>
<td>Temperature Effect on Span (0°C-70°C)</td>
<td>-</td>
<td>-1900</td>
<td>-</td>
<td>ppm/°C</td>
<td>-</td>
</tr>
<tr>
<td>Input Resistance</td>
<td>-</td>
<td>1.5</td>
<td>-</td>
<td>k ohm</td>
<td>-</td>
</tr>
<tr>
<td>Output Resistance</td>
<td>-</td>
<td>1.5</td>
<td>-</td>
<td>k ohm</td>
<td>-</td>
</tr>
</tbody>
</table>

Specification Notes

NOTE 1: Shift is relative to 25°C.
NOTE 2: Shift is within the first hour of excitation applied to the device.
NOTE 3: Measured at one-half full scale rated pressure using best straight line curve fit.
NOTE 4: The span is the algebraic difference between full scale output voltage and the offset voltage.
NOTE 5: Front-back linearity computed as: \[ \text{Lin FB} = \left( \frac{\text{Span Front}}{\text{Span Back}} - 1 \right) \times 100\% \]

How To Order

BLVR-          -          -

Pressure Range

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>L01D</td>
<td>1 inH2O</td>
</tr>
<tr>
<td>L05D</td>
<td>5 inH2O</td>
</tr>
<tr>
<td>L10D</td>
<td>10 inH2O</td>
</tr>
<tr>
<td>L20D</td>
<td>20 inH2O</td>
</tr>
<tr>
<td>L30D</td>
<td>30 inH2O</td>
</tr>
</tbody>
</table>

Package

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1NS</td>
<td>Two Ports Same Direction</td>
</tr>
<tr>
<td>B2NS</td>
<td>Two Ports Opposite Direction</td>
</tr>
<tr>
<td>BGNS</td>
<td>One Port</td>
</tr>
</tbody>
</table>

Coating

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>No Coating</td>
</tr>
<tr>
<td>P</td>
<td>Parylene Coating</td>
</tr>
</tbody>
</table>

(Consult with factory for parylene coating)

Example: BLVR-L10D-B1NS-N

BLVR Series Low Voltage Pressure Sensors
**Suggested Pad Layout**

```
PAD-01
```

**Package Characteristics**

<table>
<thead>
<tr>
<th>Package ID</th>
<th>Approximate Port Volume</th>
<th>Weight</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>B1NS</td>
<td>181 173 mm³</td>
<td>1.2</td>
<td>Grams</td>
</tr>
<tr>
<td>B2NS</td>
<td>181 173 mm³</td>
<td>1.2</td>
<td>Grams</td>
</tr>
<tr>
<td>BGNS</td>
<td>1.5 173 mm³</td>
<td>0.9</td>
<td>Grams</td>
</tr>
</tbody>
</table>

**Product Labeling**

- **All Sensors**
- **BLVR-L01D**
- **B1NS-N**
- **R9J21-3**

---

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MLV Series Low Voltage Pressure Sensors

Features
- 1 to 30 inH2O Pressure Ranges
- 5V Operation
- High Output
- Low Power Consumption
- Excellent Position Sensitivity
- Low Warm-Up Shift
- Enhanced Front to Back Linearity
- Protective Parylene Coating Option

Applications
- Medical Breathing
- Environmental Controls
- HVAC
- Industrial Controls
- Portable/Hand-Held Equipment

General Description

The MLV Series Compensated Sensor is based on All Sensors’ CoBeam™ Technology. The device provides a high output signal at a low operating voltage while maintaining comparable output levels to traditional equivalent compensated millivolt sensors operating at higher voltages. This lower supply voltage gives rise to improved warm-up shift while the CoBeam™ Technology itself reduces package stress susceptibility resulting in improved overall long term stability. The technology also vastly improves position sensitivity compared to conventional single die devices.

These calibrated and compensated sensors give an accurate and stable output over a wide temperature range. This series is intended for use with non-corrosive, non-ionic working fluids such as air, dry gases and the like. A protective parylene coating is optionally available for moisture/harsh media protection. The output is also ratiometric to the supply voltage and designed to operate at 5.0 volts DC.

<table>
<thead>
<tr>
<th>Standard Pressure Ranges</th>
<th>Equivalent Circuit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Device</strong></td>
<td><strong>Operating Range</strong></td>
</tr>
<tr>
<td>MLV-L01D</td>
<td>±1 inH2O</td>
</tr>
<tr>
<td>MLV-L02D</td>
<td>±2 inH2O</td>
</tr>
<tr>
<td>MLV-L05D</td>
<td>±5 inH2O</td>
</tr>
<tr>
<td>MLV-L10D</td>
<td>±10 inH2O</td>
</tr>
<tr>
<td>MLV-L20D</td>
<td>±20 inH2O</td>
</tr>
<tr>
<td>MLV-L30D</td>
<td>±30 inH2O</td>
</tr>
</tbody>
</table>

Supply Voltage (Vs) | 12 Vdc
Common Mode Pressure | 10 psig
Lead Temperature (soldering 2-4 sec.) | 270 °C

Temperature Ranges
- Compensated | 0°C to 50°C
- Operating | -25°C to 85 °C
- Storage | -40°C to 125 °C

Humidity Limits
- 0 to 95% RH (non condensing)

<table>
<thead>
<tr>
<th>Pressure Sensor Specifications</th>
<th>Environmental Specifications</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply Voltage (Vs)</strong></td>
<td><strong>Temperature Ranges</strong></td>
</tr>
<tr>
<td><strong>Common Mode Pressure</strong></td>
<td>Compensated</td>
</tr>
<tr>
<td><strong>Lead Temperature (soldering 2-4 sec.)</strong></td>
<td>Operating</td>
</tr>
<tr>
<td></td>
<td>-25°C to 85 °C</td>
</tr>
<tr>
<td></td>
<td>Storage</td>
</tr>
<tr>
<td></td>
<td>-40°C to 125 °C</td>
</tr>
<tr>
<td></td>
<td>Humidity Limits</td>
</tr>
<tr>
<td></td>
<td>0 to 95% RH (non condensing)</td>
</tr>
</tbody>
</table>

Approvals

| All Sensors | DS-0274 Rev A |
### Performance Characteristics for MLV Series

All parameters are measured at 5.0 volt excitation and room temperature unless otherwise specified. Pressure measurements are with positive pressure applied to PORT B (the only port for the single port configuration packages).

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Output Span</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>L01D @ 1 inH2O</td>
<td>6.0</td>
<td>7.0</td>
<td>8.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L02D @ 2 inH2O</td>
<td>9.0</td>
<td>10.0</td>
<td>11.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L05D @ 5 inH2O</td>
<td>14.0</td>
<td>15.0</td>
<td>16.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L10D @ 10 inH2O</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L20D @ 20 inH2O</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td>L30D @ 30 inH2O</td>
<td>19.0</td>
<td>20.0</td>
<td>21.0</td>
<td>mV</td>
<td>4</td>
</tr>
<tr>
<td><strong>Span Temperature Shift (0°C to 50°C)</strong></td>
<td>-</td>
<td>-</td>
<td>±250</td>
<td>uV</td>
<td>1</td>
</tr>
<tr>
<td><strong>Offset Voltage @ Zero Diff. Pressure</strong></td>
<td>-</td>
<td>-</td>
<td>±500</td>
<td>uV</td>
<td>-</td>
</tr>
<tr>
<td><strong>Offset Temperature Shift (0°C to 50°C)</strong></td>
<td>L01D, L02D, L05D</td>
<td>-</td>
<td>-</td>
<td>±250</td>
<td>uV</td>
</tr>
<tr>
<td>L10D, L20D, L30D</td>
<td>-</td>
<td>-</td>
<td>±200</td>
<td>uV</td>
<td>1</td>
</tr>
<tr>
<td><strong>Offset Warm-up Shift</strong></td>
<td>-</td>
<td>-</td>
<td>±50.0</td>
<td>uV</td>
<td>2</td>
</tr>
<tr>
<td><strong>Offset Position Sensitivity (1g)</strong></td>
<td>L01D</td>
<td>-</td>
<td>-</td>
<td>±20.0</td>
<td>uV</td>
</tr>
<tr>
<td>L02D</td>
<td>-</td>
<td>-</td>
<td>±15.0</td>
<td>uV</td>
<td>6</td>
</tr>
<tr>
<td>L05D, L10D, L20D, L30D</td>
<td>-</td>
<td>-</td>
<td>±10.0</td>
<td>uV</td>
<td>6</td>
</tr>
<tr>
<td><strong>Offset Long Term Drift (One Year)</strong></td>
<td>L01D, L02D, L05D</td>
<td>-</td>
<td>±150</td>
<td>uV</td>
<td>-</td>
</tr>
<tr>
<td>L10D, L20D, L30D</td>
<td>-</td>
<td>±100</td>
<td>uV</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Linearity, Hysteresis Error</strong></td>
<td>-</td>
<td>0.10</td>
<td>0.30</td>
<td>%FSS</td>
<td>3</td>
</tr>
<tr>
<td><strong>Response Time (10% to 90% Pressure Response)</strong></td>
<td>-</td>
<td>500</td>
<td>uS</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>Front to Back Linearity</strong></td>
<td>-</td>
<td>0.75</td>
<td>-</td>
<td>%FSS</td>
<td>5</td>
</tr>
<tr>
<td><strong>Input Resistance</strong></td>
<td>-</td>
<td>12.0</td>
<td>-</td>
<td>k ohm</td>
<td>-</td>
</tr>
<tr>
<td><strong>Output Resistance</strong></td>
<td>-</td>
<td>3.0</td>
<td>-</td>
<td>k ohm</td>
<td>-</td>
</tr>
</tbody>
</table>

### Specification Notes

**NOTE 1:** Shift is relative to 25°C.

**NOTE 2:** Shift is within the first hour of excitation applied to the device.

**NOTE 3:** Measured at one-half full scale rated pressure using best straight line curve fit.

**NOTE 4:** The span is the algebraic difference between full scale output voltage and the offset voltage.

**NOTE 5:** Front-Back Linearity computed as: $\text{Lin FB} = \left( \frac{\text{Span Front}}{\text{Span Back}} - 1 \right) \times 100$

**NOTE 6:** Parameter is characterized and not 100% tested.
How To Order

A Package
Example: MLV-L02D-A6BF-N

E Package
Example: MLV-L02D-E1ND-N

TABLE 1: Available E-Series Package Configurations

<table>
<thead>
<tr>
<th>Port Orientation</th>
<th>Non-Barbed Lid</th>
<th>Barbed Lid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Lead Style</td>
<td>Lead Style</td>
</tr>
<tr>
<td></td>
<td>SIP</td>
<td>DIP</td>
</tr>
<tr>
<td>Dual Port Same Side</td>
<td>E1NS</td>
<td>E1ND</td>
</tr>
<tr>
<td>Dual Port Opposite Side</td>
<td>E2NS</td>
<td>E2ND</td>
</tr>
<tr>
<td>Single Port (Gage)</td>
<td>EGN5</td>
<td>EGNED</td>
</tr>
</tbody>
</table>

NOTE 1) Parylene Coating: Parylene coating provides a moisture barrier and protection form some harsh media. Consult factory for applicability of Parylene for the target application and sensor type.
Package Drawings

A6 Package (Without Options)

NOTES
1) Dimensions are in inches [mm].
2) For suggested pad layout, see drawing: PAD-09

Pinout
1) N/C
2) Vs
3) +Out
4) Gnd
5) -Out
6) N/C

A-Package: Port Cut Options

Example: MLV-L10D-A6xAF-N

Port Cut Options

A- No Port Cut Configuration
B- Two Ports Cut 0.085" Configuration
C- Two Ports Cut 0.100" Configuration
D- Two Ports Cut 0.150" Configuration
E- Port A cut 0.080" Configuration
F- Port A Cut 0.370" Configuration
A-Package: Port Fitting Options

Example: MLV-L10D-A6DxF-N

### Port Fitting Options

NOTE: Port Cut Configuration "D" Shown As Reference.

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Port Fitting Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>A- No Fittings Configuration</td>
<td>![Diagram A]</td>
</tr>
<tr>
<td>B- Barb Fitting Port A Only Configuration</td>
<td>![Diagram B]</td>
</tr>
<tr>
<td>C- Barb Fitting Port B Only Configuration</td>
<td>![Diagram C]</td>
</tr>
<tr>
<td>D- Barb Fitting Ports A and B Configuration</td>
<td>![Diagram D]</td>
</tr>
</tbody>
</table>

A-Package: Lead Bend Options

Example: MLV-L10D-A6AAx-N

### Lead Bend Options

<table>
<thead>
<tr>
<th>Lead Bend Options</th>
<th>Example: MLV-L10D-A6AAx-N</th>
</tr>
</thead>
<tbody>
<tr>
<td>F- Flat (Straight) Configuration</td>
<td>![Diagram F]</td>
</tr>
<tr>
<td>R- Right Angle 0.100° Configuration</td>
<td>![Diagram R]</td>
</tr>
<tr>
<td>J- Jogged Bend Configuration</td>
<td>![Diagram J]</td>
</tr>
<tr>
<td>Q- Right Angle 0.075° Configuration</td>
<td>![Diagram Q]</td>
</tr>
</tbody>
</table>
MLV Series Low Voltage Pressure Sensors

**E1NS Package**

![Diagram of E1NS Package]

**NOTES**
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-01

**Pinout**
1) Gnd
2) +Out
3) Vs
4) -Out

**E1BS Package**

![Diagram of E1BS Package]

**NOTES**
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-01

**Pinout**
1) Gnd
2) +Out
3) Vs
4) -Out
NOTES
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-01

Pinout
1) Gnd
2) +Out
3) Vs
4) -Out

Pinout
1) Gnd
2) +Out
3) Vs
4) -Out

NOTES
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-01
EGNS Package

NOTES
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-01

Pinout
1) Gnd
2) +Out
3) Vs
4) -Out

EGBS Package

NOTES
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-01

Pinout
1) Gnd
2) +Out
3) Vs
4) -Out

MLV Series Low Voltage Pressure Sensors
E1ND Package

Pinout
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

NOTES
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-03

E1BD Package

Pinout
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

NOTES
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-03
E2ND Package

**Pinout**
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

**NOTES**
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-03

---

E2BD Package

**Pinout**
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

**NOTES**
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-03
**EGND Package**

![EGND Package Image]

**NOTES**
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-03

**Pinout**
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

---

**EGBD Package**

![EGBD Package Image]

**NOTES**
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-03

**Pinout**
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect
E1NJ Package

**Pinout**
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

**NOTES**
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-10

E2NJ Package

**Pinout**
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

**NOTES**
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-10

MLV Series Low Voltage Pressure Sensors
**EGNJ Package**

![Diagram of EGNJ Package]

**DETAIL A**

**SCALE 4 : 1**

NOTEs

1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-10

**Pinout**

1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

---

**EGBJ Package**

![Diagram of EGBJ Package]

**DETAIL A**

**SCALE 4 : 1**

NOTEs

1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-10

**Pinout**

1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect
EGNL Package

Absolute devices are without port hole.

NOTES
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-03

Pinout
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

EGBL Package

Absolute devices are without port hole.

NOTES
1) Dimensions are in inches [mm]
2) For suggested pad layout, see drawing: PAD-03

Pinout
1) Gnd
2) +Out
3) Vs
4) -Out
5) Do Not Connect
6) Do Not Connect
7) Do Not Connect
8) Do Not Connect

MLV Series Low Voltage Pressure Sensors
Suggested Pad Layout

PAD-01

$\phi 0.035-0.039$ inch (Finished Size)

PAD-03

$\phi 0.035-0.039$ inch (Finish Size)

PAD-10

[2.54] 0.090
[1.27] 0.090
[2.54] 0.100
[16] 0.630

[2.29] 0.590

Package Characteristics

Approximate Port Volume

<table>
<thead>
<tr>
<th>Package ID</th>
<th>Port A</th>
<th>Port B</th>
<th>Units</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>A6AAx</td>
<td>132</td>
<td>33.6</td>
<td>mm³</td>
<td>1</td>
</tr>
<tr>
<td>A6BAx</td>
<td>119</td>
<td>20.3</td>
<td>mm³</td>
<td>1</td>
</tr>
<tr>
<td>A6CAx</td>
<td>119</td>
<td>20.5</td>
<td>mm³</td>
<td>1</td>
</tr>
<tr>
<td>A6DAx</td>
<td>120</td>
<td>21.3</td>
<td>mm³</td>
<td>1</td>
</tr>
<tr>
<td>A6EAx</td>
<td>119</td>
<td>33.6</td>
<td>mm³</td>
<td>1</td>
</tr>
<tr>
<td>A6FAx</td>
<td>125</td>
<td>33.6</td>
<td>mm³</td>
<td>1</td>
</tr>
<tr>
<td>E1Nx</td>
<td>174</td>
<td>168</td>
<td>mm³</td>
<td>-</td>
</tr>
<tr>
<td>E2Nx</td>
<td>174</td>
<td>168</td>
<td>mm³</td>
<td>-</td>
</tr>
<tr>
<td>EGNx</td>
<td>1.4</td>
<td>168</td>
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Weight

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<tr>
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<tr>
<td>8.9 Grams</td>
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<tr>
<td>9.2 Grams</td>
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</tr>
<tr>
<td>1.2 Grams</td>
<td>-</td>
</tr>
<tr>
<td>1.2 Grams</td>
<td>-</td>
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<tr>
<td>0.9 Grams</td>
<td>-</td>
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</tbody>
</table>

Package Notes

Note 1: Add 4.5 mm³ per port with barb fitting.
Note 2: Add 0.15 gram per barb fitting.

Product Labeling

Example Device Label

All Sensors  
MLV-L02D  
A6AAF-N  
R9J21-3  
Company  
Part Number  
Lot Number

All Sensors reserves the right to make changes to any products herein. All Sensors does not assume any liability arising out of the application or use of any product or circuit described herein, neither does it convey any license under its patent rights nor the rights of others.
Definition of Terms

**Absolute Pressure**: Pressure measured relative to a vacuum. Usually expressed in pounds per square inch absolute (psia).

**Altimetric Pressure Transducer**: A barometric pressure transducer used to determine altitude from the pressure altitude profile.

**Auto-Referencing**: A technique for eliminating errors by sampling one or more reference pressures, then correcting the output signal function.

**Barometric Pressure Transducer**: An absolute pressure transducer measuring the local ambient pressure.

**Best Straight Line (BSL)**: The best straight line chosen such that the true transducer response curve contains three points of equal maximum deviation.

**Burst Pressure**: The maximum pressure that may be applied to the sensor without causing the sensor catastrophic failure.

**Common-Mode Error**: An error that is independent of the major input variable (input pressure). For All Sensors transducers, all offset errors are common-mode errors.

**Common Mode Pressure**: The maximum pressure that may be applied to both sides of the diaphragm simultaneously with causing changes in performance to the specifications. Patent US 6,023,978 (Dauenhauer et al.): some of the products manufactured by All Sensors Corporation are licensed for use of the Honeywell US patent 6,023,978. This patent describes a technique for compensating piezo resistive pressure sensors using dual die compensation with electrical cross coupling and pneumatic cross coupling.

**Differential Pressure**: The pressure difference measured between two pressure sources. Usually expressed in pounds per square inch differential (psid). When one source is a perfect vacuum, the pressure difference is called absolute pressure. When one source is the local ambient, the pressure is called gage pressure.

**Differential Pressure Transducer**: A device that measures the differential pressure between two pressure sources piped to its inputs.

**Error Band**: The deviation of transducer response from its BSL, defined by lines on either side of its BSL and including the maximum deviation measured for a given normal mode or common mode error.

**Full-Scale**: The algebraic difference between endpoints. Where one endpoint is actual offset voltage and the other endpoint is the upper limit of the range.
**Full Scale Shift:** The shift in sensor output voltage sensitivity to pressure over the temperature range specified. This is equivalent to temperature coefficient of sensitivity. The characteristic of this transfer curve is very close to a second order equation for the basic piezo resistive sensing element. For the millivolt output devices, this is compensated with passive resistors; and for amplified output device, it is ASIC compensated with a second order curve fit to the data taken for each part over the pressure and temperature ranges specified. The characteristic of this transfer curve does not change with any other conditions.

**Gage Pressure:** Pressure measured relative to ambient pressure (psig).

**Hysteresis of Pressure:** Pressure hysteresis is measured as the maximum difference between the output at reference conditions before and after a pressure cycle.

**Interchangeability:** The error band defined by the maximum signal deviation obtained when a transducer is replaced by any other transducer of the same type with equivalent pressure inputs and temperature ranges.

**Linearity:** The maximum deviation of measured output at constant temperature (25°C) from "best straight line" determined by three points (offset pressure, full-scale pressure, and one-half full-scale pressure) where Y = measured value for each device.

**Linearity, Hysteresis Error:** The error in the output voltage response to pressure over the full operating pressure range relative to the ideal output voltage response; the deviation from a first order transfer curve response of output signal to pressure. This error is a function of pressure and not a function of temperature. This error is computed by measuring pressure at three pressure points; zero pressure. Full scale pressure and one half full scale pressure and computed on the basis of a "best straight line" curve fit to the measured data.

**Minimum/Maximum:** Are the guaranteed limits for the specification. These limits are generally one hundred percent tested with a guard band between the test limits and the specification limits.

**Most Probable Error:** The error band obtained by computing the square root of the sum of the squares of all applicable errors specified for the transducer.

**Nominal:** A useless piece of information that will only get designers into trouble if used for anything. It is the average value for a specification from product manufactured during the first production run. It may, or may not be indicative of product built at any other time. DESIGNERS BEWARE: USE AT YOUR OWN RISK. However, All Sensors will generally provide product tested, or guaranteed, to a limit other than specified upon customer request.

**Normal Mode Error:** An error that is a function of (and usually assumed to be proportional to) the major input variable (input pressure). For All Sensors transducers, all span errors are normal mode errors.

**Offset Calibration:** The error band defined by the maximum error in calibrating the offset voltage.
**Offset Error:** The common-mode error band defined by the maximum deviation of offset voltage from its specified value. It may include calibration, temperature, repeatability and stability errors.

**Offset Long Term Drift:** The change in offset voltage that may occur over the time specified. Possible causes to this characteristic for piezo resistive pressure sensors have been studied for decades. There is, to date, no conclusive single cause or main causes to the error. Because most of All Sensors low pressure sensors use dual die electrical cross coupling compensation, there is inherent offset long term drift compensation. Products All Sensors tests for warm-up shift will generally identify any offset long term drift problems and would be rejected.

**Offset Position Sensitivity:** The change in offset voltage due to a change in position of the sensor. Sensors for measuring pressure exceeding 15 psi have virtually no position sensitivity. Because the diaphragm of the sensor has mass, and because the mass to diaphragm thickness ratio increases as the pressure range decreases, the sensitivity to position increases as the pressure range decreases. Because most of All Sensors low pressure sensors use dual die electrical cross coupling compensation there is inherent offset position sensitivity compensation in even the most basic sensors.

**Offset Repeatability:** The error band expressing the ability of the transducer to reproduce the offset voltage, measured at 25°C, after exposure to any other temperature and pressure within the specified range.

**Offset Stability:** The error band expressing the ability of the transducer to maintain the offset voltage with constant pressure and temperature.

**Offset Temperature Coefficient:** The error band defined by the maximum deviation in offset voltage as the temperature is varied from 25°C to any other temperature within the specified range.

**Offset Temperature Shift:** The change in output offset voltage over the specified temperature range. For non amplified sensors the specification limits are tested at three temperature points; 25°C, temperature maximum, temperature minimum, and back to 25°C. For amplified pressure sensors there are many more data points measured and the compensation is mathematically fit to the data points. There is generally no consistent equation to describe the offset temperature shift characteristic. Because most of All Sensors low pressure sensors use dual die electrical cross coupling compensation there is inherent offset temperature shift compensation in even the most basic sensor.

**Offset Voltage:** The output voltage when the sensor has zero differential pressure across the diaphragm. For absolute pressure sensors there is zero differential pressure across the diaphragm when the sensor is at absolute pressure of zero. For gage or differential pressure sensors there is zero differential pressure when both sides of the diaphragm are subject to the same pressure.

**Offset Warm-up Shift:** The change in output offset voltage that may occur when power is applied to the sensor during the first hour of operation. All Sensors tests all low pressure sensors
for this parameter. Because most of the companies low pressure sensors use dual die electrical cross coupling compensation there is inherent offset warm-up shift compensation in even the most basic sensors.

**Operating Range:** The pressure range over which the sensor has been tested. For sensors with millivolt output this range can generally be extended to at least twice the range specified with only minor degradation to specifications. For amplified output sensors the range can be extended only ten percent before the output is "railed" to the output voltage limit.

**Output Span:** Is the output voltage for the specified operating pressure range. For sensors without internal voltage reference the span is ratiometric to the supply voltage of the sensor. Changes in the supply voltage to the sensor with result in a change in output span for the pressure applied. The span is the difference in output voltage at full scale pressure from the offset voltage.

**Over-Pressure – Maximum:** The maximum normal mode (measured) pressure that can be applied without changing the transducer's performance or accuracy beyond the specified limits. This would be applied to either port of a differential transducer. This is also called "proof pressure".

**Overall Accuracy – Calibrated:** The combined error band relative to the BSL with forced reference unique to one specific transducer. It excludes offset and sensitivity calibration errors. It includes all other offset and span errors: temperature, repeatability, stability, linearity and hysteresis.

**Overall Accuracy – Interchangeable:** The combined error band relative to an ideal transducer response characteristic. It excludes stability errors because stability error is already included in specified calibration error. It includes all other offset and span errors: calibration, temperature, repeatability, linearity and hysteresis.

**Proof Pressure:** is the maximum pressure that may be applied to the sensor without causing any changes in performance to the specifications.

**Reference Pressure:** The pressure used as a reference in measuring transducer errors.

**Reference Temperature:** The temperature used as reference in measuring transducer errors.

**Repeatability:** The error band expressing the ability of the transducer to reproduce an output signal parameter (such as offset or span), at specified pressures and temperature, after exposure to any other pressure and temperature within the specified range.

**Sensitivity:** The ratio of output signal voltage change to the corresponding input pressure change. Sensitivity is determined by computing the ratio of span to the specified input pressure range.

**Sensitivity Calibration:** The error band defined by the maximum error in calibrating sensitivity.
**Span**: The arithmetic difference in transducer output signal measured at the specified minimum and maximum operating pressures.

**Span Error**: The normal mode error band defined by the maximum deviation of span from its specified value. It may include sensitivity calibration temperature, linearity, hysteresis, repeatability and stability deviations.

**Span Repeatability**: The error band expressing the ability of a transducer to reproduce its span, measured at 25°C, after exposure to any other pressure and temperature within the specified range.

**Span Temperature Coefficient**: The error band defined by the maximum deviation of the span as the temperature is varied from 25°C to any other temperature within the specified range.

**Span Stability**: The error band expressing the ability of the transducer to maintain the span voltage at any pressure within the specified range with temperature held constant.

**Stability**: The error band expressing the ability of a transducer to maintain the value of an output parameter (such as offset or span) with constant temperature and pressure inputs.

**Temperature Coefficient (TC)**: The error band resulting from maximum deviation of a transducer output parameter (such as offset or span) as temperature is varied from 25°C to any other temperature within the specified range. It is usually measured in (ppm/°C or µV/V/°C).

**Vacuum**: A perfect vacuum is the absence of gaseous fluid.

**Vacuum Range**: The range of absolute pressures between a perfect vacuum (0 psia) and one standard atmosphere (14.697 psia).

**Vacuum Transducer**: A transducer scaled for pressure measurement in the vacuum range. This is usually an absolute transducer, but sometimes a gage transducer.

**Worst-Case Error**: The error band obtained by simple addition of all applicable errors specified for the transducer.
TECHNICAL NOTE: ACCURACY VERSUS RESOLUTION

PURPOSE: To describe the difference between “accuracy” and “resolution” for silicon based pressure sensors.

APPLICATION: Any application.

DISCUSSION AS REPORTED:
Silicon based pressure sensor inherently have infinite resolution. The limit to the practical use of this limitless resolution is based upon many factors associated with the compensation and amplification of the output signal and the accuracy demanded by the application.

All the figures show an output signal where the output of the sensor is displayed as a signal quantized (stepped) by an analog to digital converter after some amplification of the pressure sensor signal. For ease of display the steps are relative to each other and not representative of a typical system. For instance a relatively low accuracy system would be an 8-bit system resulting in quantization of the signal into 256 steps ($2^8$). As a practical matter for today’s sensors and added electronics the limit to the resolution with accuracy acceptable to most applications is roughly one part in sixty thousand, or a 16-bit system ($2^{16}$). For such a system the analog to digital converter would be somewhere between 18-bits to 24-bits.

Figure 1: Provides an example of a sensor signal with both a large offset error and a sensitivity error but having high resolution. It’s difficult to imagine an application where such a signal would be of practical use.

![Figure 1](image-url)
Figure 2: Displays the same output signal as figure 1 but with low resolution.

Figure 3: Displays a low resolution output but having high accuracy.
Figure 4: Displays a high resolution output signal having high accuracy.
Sensor Amplifier A/D Converter

Digital Output
Analog Signal

Increased Resolution

Perfect (Ideal) Sensor
Low Accuracy
High Resolution

PC-0001 Rev E

Accuracy vs Resolution

71
TECHNICAL NOTE: NOISE DISCUSSION

PURPOSE: To determine the limitation to sensor resolution with regard to electrical noise present in the sensor. This test was done on an experimental 10 INCH TE device but is representative of other sensors manufactured by All Sensors.

APPLICATION: Breathing monitor where resolution of 1 in 60,000 is desired.

DISCUSSION AS REPORTED:
I decided to go back in the production area and take a look at a basic device with our manufacturing Kiethley DMM (and Kiethley software). It turns out we can get data with that program over an IEEE bus at a rate of 41Hz (24mS per sample)....not the data rate of your target system but faster than the over-sampled digital device...

I used coax lead clips (coax cable with about 2" and 4" lead clips (not really so good but available) for measuring.

The background noise was measured with the clip leads connected together.

Here are some graphs...normalized to the sensor FS sensitivity...the sensor was a 10 INCH TE device, single die.

1) Background noise levels (three runs of 1000 data points)...
2) Sensor output (2 runs of 1000 points)...

The background level is pretty close to the sensor noise level so here's some FFT info....X-axis is frequency (Hz), Y-axis is noise level relative to full scale (like percentage but MathCAD doesn't have axis format display options)...

3) Background level (using CFFT function in MathCAD)
4) Sensor runs (CFFT)

5) Averages of the three background runs compared to average of both sensor runs...
For the last graph above (#6), note the magnitude in the 0.1 Hz~0.02 Hz can be construed with noise where it may actually be small temperature shift or warm-up shift. I let the sensor stabilize for about 10 minutes before running the data but regardless, there is no temperature compensation done on the device.

The only conclusion that I can come up with is that the sensor noise is not significantly greater than the Keithley background noise. I guess this is good news in itself.
TECHNICAL NOTE: ZMD ASIC COMPENSATED COMPARED TO ALL SENSORS COMPENSATION

PURPOSE: To compare competitor pressure sensors amplified and compensated using the ZMD ASIC to All Sensors pressure sensors using another approach for amplification and compensation.

APPLICATION: Any application where a true pressure signal capture is necessary without distortion by the pressure sensor.

DISCUSSION AS REPORTED:
In each of the pictures below of waveforms captured on a Tektronix oscilloscope the lower waveform is the signal to reproduced by the sensor. The top waveform is the output of the pressure sensor. It is important to note the time scale of each picture to get the true measure of the comparisons.

PICTURE 1: DISPLAY: STEP RESPONSE OF A COMPETITORS PRESSURE SENSOR WITH INTERNAL ZMD ASIC COMPENSTATION. TIME SCALE 1 msec/division.
PICTURE 2: STEP RESPONSE OF AN ALL SENSORS 5 INCH-D1-4V-MINI.
TIME SCALE: 250 usec/division...
CONCLUSION: ALL SENSORS RESPONSE IS ABOUT TEN TIMES FASTER THAN COMPETITORS.
PICTURE 3: COMPETITOR SENSOR 100 HZ RESPONSE.
NOTE: SIGNIFICANT QUANTIZATION DISTORTION AND A GROUP DELAY OF 3 msec.
PICTURE 4: COMPETITOR SENSOR 500 HZ RESPONSE.
NOTE: 37 HZ OUTPUT OF THE SENSOR DUE TO ALIASING OF THE INPUT SIGNAL AS A RESULT OF THE ASIC SAMPLING RATE. AGAIN A SIGNIFICANT DISTORTION OF THE SIGNAL.
PICTURE 5: 500 HZ RESPONSE OF ALL SENSORS PRESSURE SENSOR 5 INCH-D1-4V-MINI.
NOTE: NEGLIGIBLE ATTENUATION AND A GROUP DELAY OF 200 usec.
CONCLUSION: FOR APPLICATIONS REQUIRING A PRESSURE SENSOR TO PROVIDE A TRUE SIGNAL REPRESENTATION OF THE MEASURED SIGNAL PRESSURE SENSORS WITH ZMD ASIC COMPENSATION WOULD BE UNACCEPTABLE.
Purpose: To demonstrate how pressure measurements can be made using All Sensors Digital Pressure Sensor with All Sensors Evaluation Board. For this Discussion Hyperterminal is used to acquire data from the EV Board to a PC

Application: Ideal for engineers to collect data in lab evaluation

Discussion as Reported:

Overview of Digital Output Sensors

All Sensors Digital Output Sensors use proprietary surface mapping technology to produce a fully digital output that virtually eliminates all repeatable errors over temperature and pressure. These sensors provide 12 bit serial output (14 bit in High resolution mode) with a nominal accuracy of 0.5% which includes the combined effects of offset and span shifts over temperature, linearity, hysteresis, offset and span calibration (for some digital sensors nominal accuracy is 0.25%). Typically, all combined errors over temperature are less than 0.1%. In addition to synchronous communications, the digital output pressure sensors incorporates a bi-directional, TTL level, asynchronous serial interface mode (hardware selectable 9,600 or 19,200). This mode includes a command set that allows the host to select resolution mode and make minor adjustments to offset.

These sensors are available in -40 to 125C (Military Grade) and -20 to 85C (Industrial Grade) temperature compensated range. For detailed sensor performance and command set refer to sensor datasheet.

Overview of Digital Evaluation Board

All Sensors Digital Evaluation Board converts CMOS/TTL compatible sensor signals to RS232 levels for serial computer interfacing. This unit is packaged in a sturdy housing from which the sensor pressure ports are easily accessible. The DB-9 connector brings ease of mobility and reduces hassle of connecting wires. EV Board used in conjunction with a digital sensor is an ideal way for engineers to collect data before completing the prototype process by specifying the necessary sensor and collecting data using their PC or Laptop. All Sensors is currently developing software which can be used with the EV Board to collect data in desired pressure units, sampling controls, operating mode controls and the ability to store, track and chart data.
Taking Measurements using Hyperterminal

Connect the EV Board to a windows based machine via RS232 Serial cable. Run “Hyperterminal” application and create a new connection

1) From the drop down list under “Connect using” select COM port EV Board is connected to
2) “Configure” COM port and as necessary modify “Bits per second” to 19200 and “Flow control” to None. If JP2 on EV Board is selected for 9,600 modify “Bits per second” to 9600

3) Select File -> Properties-> Settings-> “ASCII Setup”. Check “Append Line feeds to incoming line ends” 

Not required, but will help preserve each command entered. This can be useful when saving a log of telnet session.
4) On the main screen, type any of the commands listed under “Command Summary Table in part Datasheet”.

If the sensor does not respond to commands listed in the part datasheet verify the following:

- Sensor is mounted in the correct orientation on the EV Board.
- Baud Rate selected for COM Port and EV Board is the same. By default Baud Rate on EV Board is set to 19,200bps.
• EV Board is connected to COM port as selected in HyperTerminal.

**Converting Digital Output to Pressure Units:**

The output acquired using HyperTerminal is an 8 character ASCII string which represents a hexadecimal value. The first 4 characters encode a pressure reading while the remaining is reserved for error codes. To get a reading in pressure units, the acquired data must be converted into decimal format (Digital Output) and scaled by Digital Span (depends on operating resolution) using the following formulas:

\[
P_{\text{out}} = \text{Digital Output} \times \left( \frac{\text{FSO} \times \text{Units}}{10,000} \right) \quad \text{(Low Resolution Mode)}
\]

\[
P_{\text{out}} = \text{Digital Output} \times \left( \frac{\text{FSO} \times \text{Units}}{32,767} \right) \quad \text{(High Resolution Mode)}
\]

Consult to part datasheet for FSO and units. If FSO is not listed in the datasheet, as a rule of thumb FSO will be the higher limit of the operating pressure. For example, in case of BARO-D-DO sensor (DS-0010) FSO will be 1100 and units will be mBar.

Written by:
Usman Bhatti
Application Engineer
How to minimize warm-up drift in pressure sensors

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Director New Products
All Sensors Corp.
Morgan Hill, Calif.
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Edited by Leslie Gordon, Medical Design

Warm-up drift in pressure sensors makes their readings vary until systems reach operating temperature. It’s usually of little concern. However, such drift is unacceptable in hospital respirators, spirometry equipment, neonatal monitors, and similar devices requiring high accuracy at all times. Examining a basic piezoresistive pressure sensor helps to understand the effect of warm-up drift.

The sensor is made of a body, or “die,” and a thin silicon diaphragm with four piezoresistors on the surface. The piezoresistors change resistance in response to stress. They are generally arranged in a bridge configuration and are precisely located on the diaphragm surface to maximize the response to diaphragm deflection. This in turn maximizes the response to a pressure differential across the diaphragm.

**Warm-up shift**

There are two primary sources of warm-up drift in a basic pressure sensor. One is the warm-up shift of the sensing element. While the system is reaching operating tempera-
ture, surface temperature and resultant thermal hot spots (surface contribution) on the
die and diaphragm surface cause an imbalance in the resistor bridge. The temperature
rise of the resistor-sensing element is proportional to the dissipated power and therefore
proportional to the square of the excitation voltage of the sensor ($\Delta T \alpha V^2$).

Thus, reducing the excitation voltage by a factor of two reduces the sensing element
temperature rise by a factor of four and, consequently, the warm-up surface condition is
reduced by a factor of four. Since the signal level of the sensor is also reduced by a factor
of two (with the reduced supply voltage), the overall effect is a reduction in surface contribution warm-up error by a factor of two. However, reducing the sensor power supply adversely affects the system electronic noise level.

An alternate and preferred approach to reducing supply voltage modulates the sensor supply as required by the system bandwidth. In other words, apply power to the sensor only when needed. This reduces power to the sensor to the time average (duty-cycle) applied and, hence, reduces warm-up drift. The method is slightly more sophisticated but can provide excellent results and without affecting system noise level.

Here the period, \( p \), between power pulses for an application is the time the power is off plus the time the power is on. This is the time required to have all signals stabilize and the sensor to take a reading.

For example, consider a device that requires readings every 500 ms, has a settling time of 4 ms, and has a signal-acquisition time of 1 ms. The average power to the sensor is only about 1% \( (1 \text{ ms} + 4 \text{ ms})/500 \text{ ms} \) of the power applied as compared to a non-modulated system.
Of course, the period depends on an application’s sampling requirements. It’s important that \( p \) and on time \( t \) remain constant because of subtle surface charges. However, this is a minor constraint considering the benefits of modulating the sensor supply.

**Temperature-compensation technique**

Another source of warm-up drift is actually more a perceived characteristic and is related to the system’s temperature-compensation technique. Systems often have an external temperature sensor for use in calibrating the pressure sensor for the effects of temperature. Such dual-sensor systems have a temperature gradient between the external device and the surface temperature of the diaphragm. The time it takes for a temperature gradient to stabilize is perceived as warm-up drift.

Minimizing this effect is accomplished by using the sensor resistance (bridge resistance-change with temperature) as the temperature-sensing element. Here the pressure-sensor bridge replaces what would normally be a thermistor (a type of resistor used to measure temperature changes) in a circuit that effectively becomes a Wheatstone bridge.

The sensor bridge has a high positive temperature coefficient of resistance (TCR) so an increase in temperature causes an increasingly negative charge in the signal output voltage \( V_t \) of the temperature-monitoring portion of the circuit. The change in \( V_t \) relative to the reference voltage \( V_{ref} \) is an effective measurement of the sensor temperature itself. The system electronics uses this measurement as the calibration-temperature reference for the pressure sensor. This eliminates the perceived warm-up drift because an external temperature sensor is not involved, so there is no thermal gradient. The good news is that modulating supply and temperature-compensation methods can be used together to almost eliminate the effect of warm-up drift.
### Pressure Unit Conversion Constants

( Most commonly used - per international conventions; * = exact conversion factor )

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<th>TO OBTAIN</th>
<th>Pounds Per Square Inch</th>
<th>in. H2O (at 39.2°F)</th>
<th>in. Hg (at 32°F)</th>
<th>Kilopascal (Pa = N/m²)</th>
<th>Millibar</th>
<th>cm H2O (at 4°C)</th>
<th>mm Hg (at 0°C) (Torr)</th>
<th>kgf/cm²</th>
<th>Atmosphere (standard)</th>
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<tbody>
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