Functional Advantages and Design Considerations

Schaevitz® pressure sensors integrate the latest sensing technologies with proven design and engineering techniques. Utilizing silicon piezoresistive, foil strain gauge and Linear Variable Differential Transformer (LVDT) technologies, the Schaevitz® diversified family of pressure measurement products meets a wide variety of application requirements.

Our pressure transducers perform in demanding environments such as power plants, water treatment facilities, aircraft and marine hydraulic systems, nuclear testing, flight-qualified systems, and a number of energy management and climate control systems.

A broad offering of standard pressure products enables us to satisfy most pressure sensing needs. Many Schaevitz® pressure products are available with selected options that provide custom features within the cost parameters of standard catalog products. We also have the engineering expertise to develop special sensor configurations for volume applications.

All Schaevitz® pressure sensors are covered by a one year warranty. The quality inherent in Schaevitz® pressure instruments is derived from time proven designs, carefully chosen materials for construction, state-of-the-art assembly techniques, and computer controlled testing methods. Our facilities in England, China and the USA are ISO 9001 approved.
What is the operating pressure range or required overrange for the application?
As well as taking into account the normal working pressure of the sensor, you should review the maximum possible overrange to which a sensor is likely to be subjected in your application. In addition, the type of pressure measurement may affect the sensor life. For instance, continual pressure cycling of high pressure may cause fatigue and decrease the life cycle. Contact an application engineer for assistance with special applications.

Note that pressure spikes several times higher than the system pressure may occur in fluid systems. If a fluid flow is abruptly stopped, a pressure spike will occur.

Schaevitz® Sensors cover pressure ranges from 0.07 psi to 10,000 psi (5 mbar to 700 bar) full range. High overload protection has become a very important factor in sensor performance. Schaevitz® strain gauge sensors, with a built in positive overload stop, take 500% overload as standard. In high fatigue areas, special units are offered to withstand hostile environments.

What pressure reference is required?
- Vented Gauge (V)
  The measurement is referenced to the atmospheric pressure. Zero is set at atmospheric pressure.
- Sealed Gauge (S)
  The measurement is referenced to a sealed internal reference pressure. Zero is set at atmospheric pressure.
- Absolute Pressure (A)
  Measurement is referenced to an internally sealed vacuum. Zero is usually set at absolute zero (vacuum).
- Differential Pressure (D)
  Measurement is the difference between two unknown pressures. Measurement can be unidirectional where the pressure of one port is always higher than the pressure on the other port or bidirectional where the higher pressure may change from port to port. In differentials, consideration should also be given to media being measured, i.e., is it dry or wet.

What are the pressure interface requirements?
Schaevitz® pressure sensors are available with a large selection of pressure ports for various applications. Refer to individual product pages for pressure port selection.

What are the electrical interface requirements?
Schaevitz® pressure sensors are available with a large selection of amplifiers for various applications as well as unamplified units with millivolt output. Pressure sensors with Intrinsic Safety Approval, BASEFA, are available on select models.

What is the pressure media and operating environment?
You must determine the suitability of a transducer for liquids or gases and its ability to withstand corrosion. Also, consideration must be given to areas like vibration, shock, etc.

Schaevitz® standard transducers are made using 316L, 17-4 pH, 17-7 pH stainless steel and can withstand most dry gases and pressure media such as lubrication oil, hydraulic oil, harsh chemicals, etc. Where the media is known to be corrosive, such as subsea environments, chemical processes, and some food processes, Schaevitz® sensors can be manufactured from Hastelloy® C276 or Inconel 625.

What is the operating temperature range?
There are two factors when determining operating temperature range of the pressure sensor: what is the media temperature and to what temperature is the complete sensor exposed? If the media temperature is excessively high, this may be reduced by fitting a standoff pipe between the media and the sensor. Temperature compensation of Schaevitz® sensors is normally up to a maximum of 185°F (85°C) and operating temperature range from -40°F to 250°F (-40°C to 120°C).

Thermal considerations
Thermal errors can easily grow and exceed other parameters. Schaevitz® has spent considerable engineering efforts to minimize these errors. Our higher end products are market leaders.

Our strain gauge units are compensated down to ±0.015%/°C without digital compensation. Our P9000 Series has a thermal error as small as ±0.004%/°C. Please note that these values are Zero and Span combined. Some competitors specify the error separately for span and zero in which case the error is twice as large.

Piezoresistive silicon gages do not have the same linear thermal error as foil strain gauge transducers. We are therefore compensating them differently. Our PS10,000, TITAN, PS3300 and Ares Series have a digital compensation that corrects the thermal error at many temperature points within the compensated temperature range. Thermal errors for our silicon based products are as low as 0.2% (typ) for our PS10,000 and 0.8% (typ) for our Titan and PS3300. This is the maximum error over the full temperature range from -15°F to 185°F (-25°C to 85°C).

Pressure Units Conversion Chart

<table>
<thead>
<tr>
<th></th>
<th>Atmosphere</th>
<th>psi</th>
<th>Bar</th>
<th>in H₂O</th>
<th>mm Hg</th>
<th>Pascal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 atmosphere</td>
<td>1</td>
<td>14.70</td>
<td>1.013</td>
<td>406.8</td>
<td>760</td>
<td>10130</td>
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<tr>
<td>psi</td>
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<td>1</td>
<td>0.069</td>
<td>27.68</td>
<td>51.72</td>
<td>6890</td>
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<tr>
<td>1 bar</td>
<td>0.987</td>
<td>14.5</td>
<td>1</td>
<td>401.5</td>
<td>750</td>
<td>10000</td>
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<tr>
<td>1 inch water</td>
<td>0.0025</td>
<td>0.036</td>
<td>0.0025</td>
<td>1</td>
<td>1.87</td>
<td>249.1</td>
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<td>1 mm Hg</td>
<td>0.0013</td>
<td>0.019</td>
<td>0.0013</td>
<td>0.535</td>
<td>1</td>
<td>133.3</td>
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<tr>
<td>1 Pascal</td>
<td>9.87 x 10⁴</td>
<td>1.45 x 10⁴</td>
<td>10⁻⁵</td>
<td>4.02 x 10⁻³</td>
<td>7.5 x 10⁻³</td>
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</tr>
</tbody>
</table>
Schaevitz® Pressure Sensor Technology

Selection Overview

Schaevitz® pressure transducers have been designed for use in typical transducer environments. However, some applications will require a very specialized or nonstandard transducer. In these applications the flexibility inherent in Schaevitz® transducers allows for complicated parameters to be easily met. Many of the specials which have been manufactured are available for use by any customer. The exact part number for a special transducer is supplied by our factory.

Silicon-Based Transducers

PS3300 Series

The PS3300 is a low cost, high reliability OEM pressure transducer featuring an ASIC (application specific integrated circuit) and silicon sensor in a rugged stainless steel package that meets IP65 and NEMA 4 specifications.

- Unique modular design using “smart” signal conditioning electronics
- Available from 15 psi FS to 6000 psi FS (1 to 400 Bar)
- High interchangeability
- Standard and custom options available in OEM quantities

PS10,000 Series

The strong history of industrial packaging capabilities from Schaevitz® coupled with the latest in silicon sensing technologies results in the innovative PS10,000 industrial pressure transducer.

- 0.05% accuracy typical (0.1% max)
- 5 psi to 10,000 psi pressure range F.S.
- Rugged stainless steel all welded construction
- NEMA 4X (IP65) media isolated
- High interchangeability
- Advanced digital compensation
- Frequency response 1000 Hz -3dB
- CE certified

Differential Pressure

P2100 Series

These transducers are designed for differential pressure measurement of wet/wet media. The P2100 Series offers full range outputs from 10 psi D to 2500 psi D. They are ideally suited for highly corrosive fluids, but also have applications where size and weight are at a premium.

LVDT-Based for Low Pressure

P3000 Series

The P3000 Series are rugged and reliable devices for the measurement of low pressures, either vented gauge or wet/dry differential pressures, in a variety of fluid media.

Foil Strain Gauge

P200 Series

The P 200 Series are lower cost, compact package size, general purpose sensors.

- Available in pressure ranges from 100 to 10,000 psi (7 to 700 bar)

P900 Series

P900 Series premium grade sensors provide highly precise measurement of absolute, vented gauge, or sealed gauge pressures over wide temperature ranges.

- All-welded construction provides high reliability and stability
- Senses small changes of applied pressure
- Range of electrical inputs and outputs
Foil Strain Gauge

P1200 Series

Page 186
The P1200 Series provide high accuracy pressure measurement of liquids and gases.
- Available in pressure ranges from 100 to 10,000 psi (7 to 700 bar)

P1400 Series

Page 188
The P1400 Series provide highly precise measurement of wet/dry differential pressures over wide temperature ranges.
- Available in pressure ranges from 7 to 1,000 psi (1 to 35 bar)

P1500 Series

Page 192
The P1500 Series provide high performance, precise measurement of absolute or vented gauge pressures over wide temperature ranges.
- Available in pressure ranges from 0-1.5 to 5 psi (0-100 to 350 mbar)

P1600 Series

Page 196
The P1400 Series provide highly precise measurement of wet/dry differential pressures over wide temperature ranges.
- Available in pressure ranges from 0-1.5 to 5 psi (0-100 to 350 mbar)

P9000 Series

Page 200
The P9000 Series unique design utilizes the proven reliability of strain gauge technology and innovative digital compensation electronics.
- Available in pressure ranges from 75 psi to 10,000 psi (5 bar to 700 bar)

Foil Strain Gauge

TITAN Series

Page 204
TITAN Series are high accuracy OEM pressure transducers. With all wetted parts made of 316L stainless steel it can measure most media. TITAN guarantees high interchangeability.
- Available from 15 to 6,000 psi (1 to 400 bar)
- Accuracy of 0.025%

Ares Sensors

Page 208
The Ares Series are differential and gauge pressure transducers suitable for low pressures of dry non-corrosive/conductive media. The transducer is based on our strong capability to combine piezoresistive sensors with rugged electronics in small packages.
- Very low pressure ranges
- Small size
- PCB mountable

Specialized Applications

Steel Mill P981 Series

Page 211
These media isolated pressure transducers are designed specifically for harsh environments found in steel and aluminum rolling mill applications.

Subsea Pressure Sensors

Page 213
Schaevitz® Sensors has a long term field-proven record for specialized pressure sensors designed for the offshore oil and gas drilling industry.