

Pressure Transducers

Rick Sellens

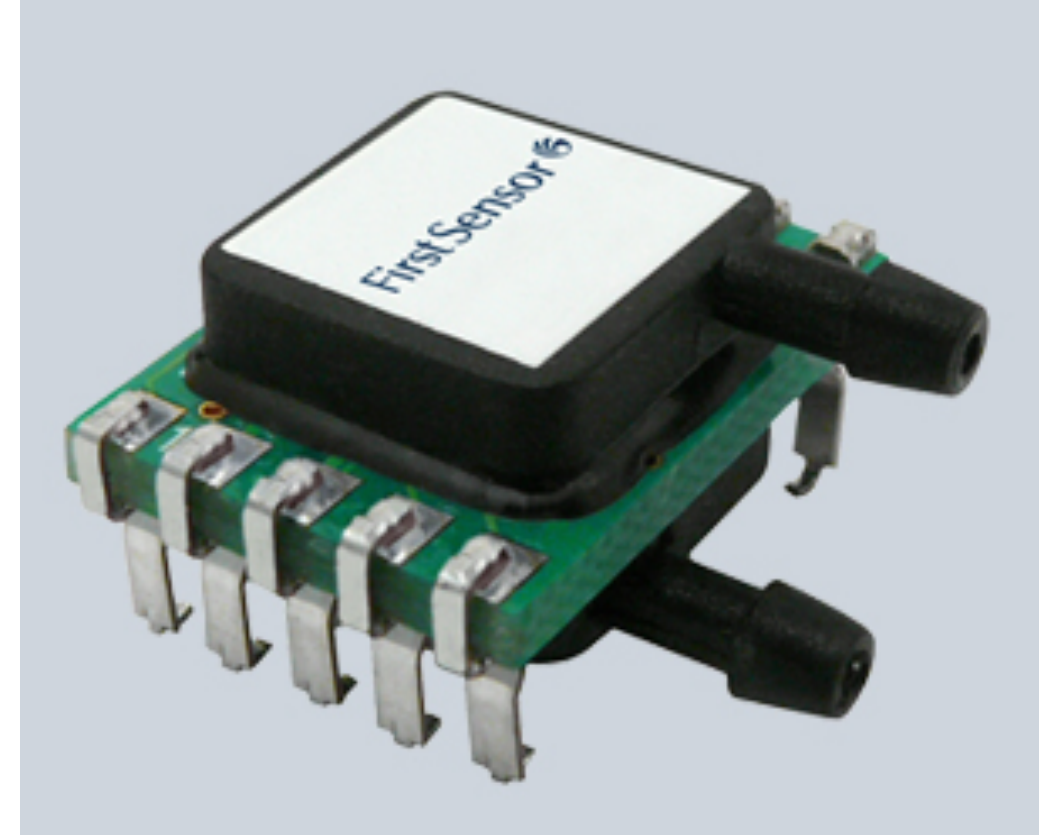
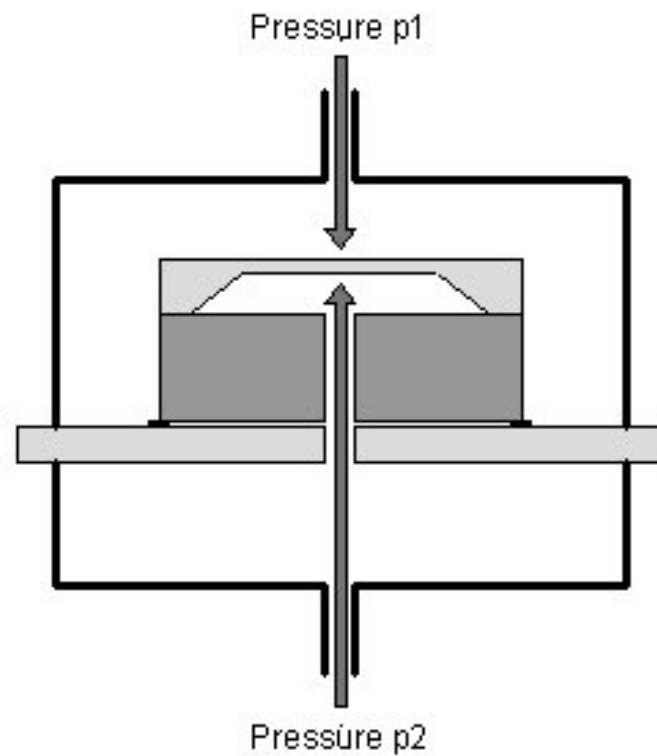


Figure 4: Principle of a differential pressure sensor (piezoresistive technology)

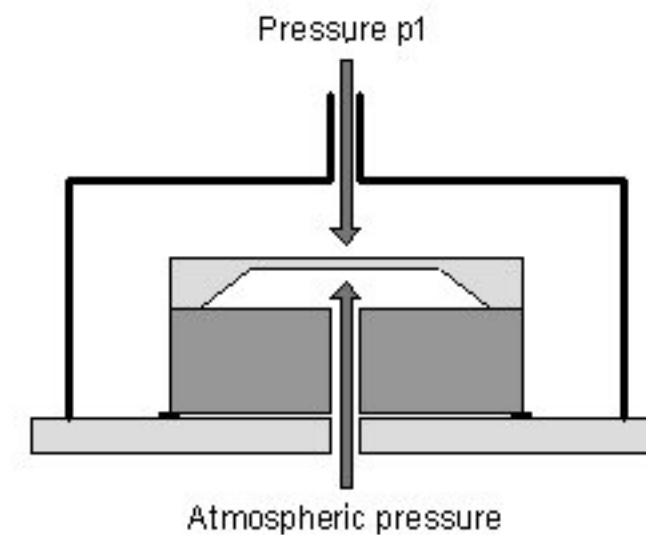
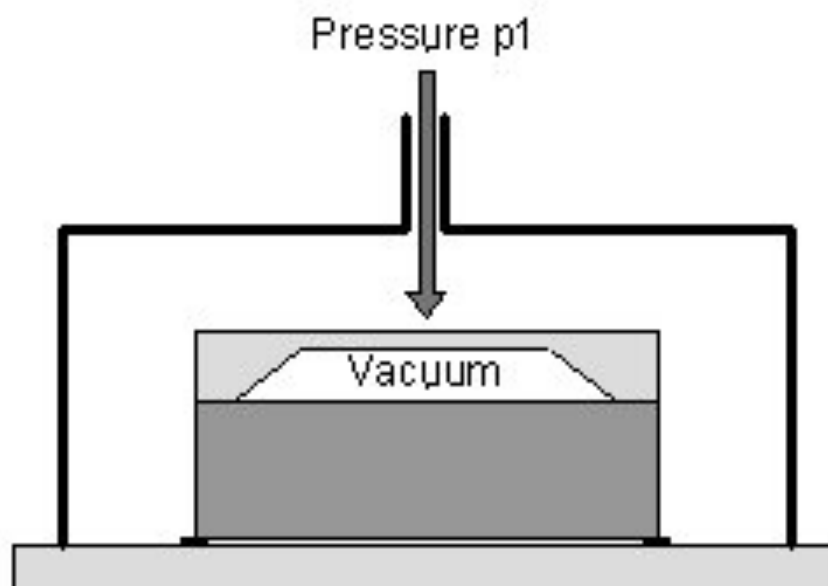


Figure 3: Principle of a gage pressure sensor

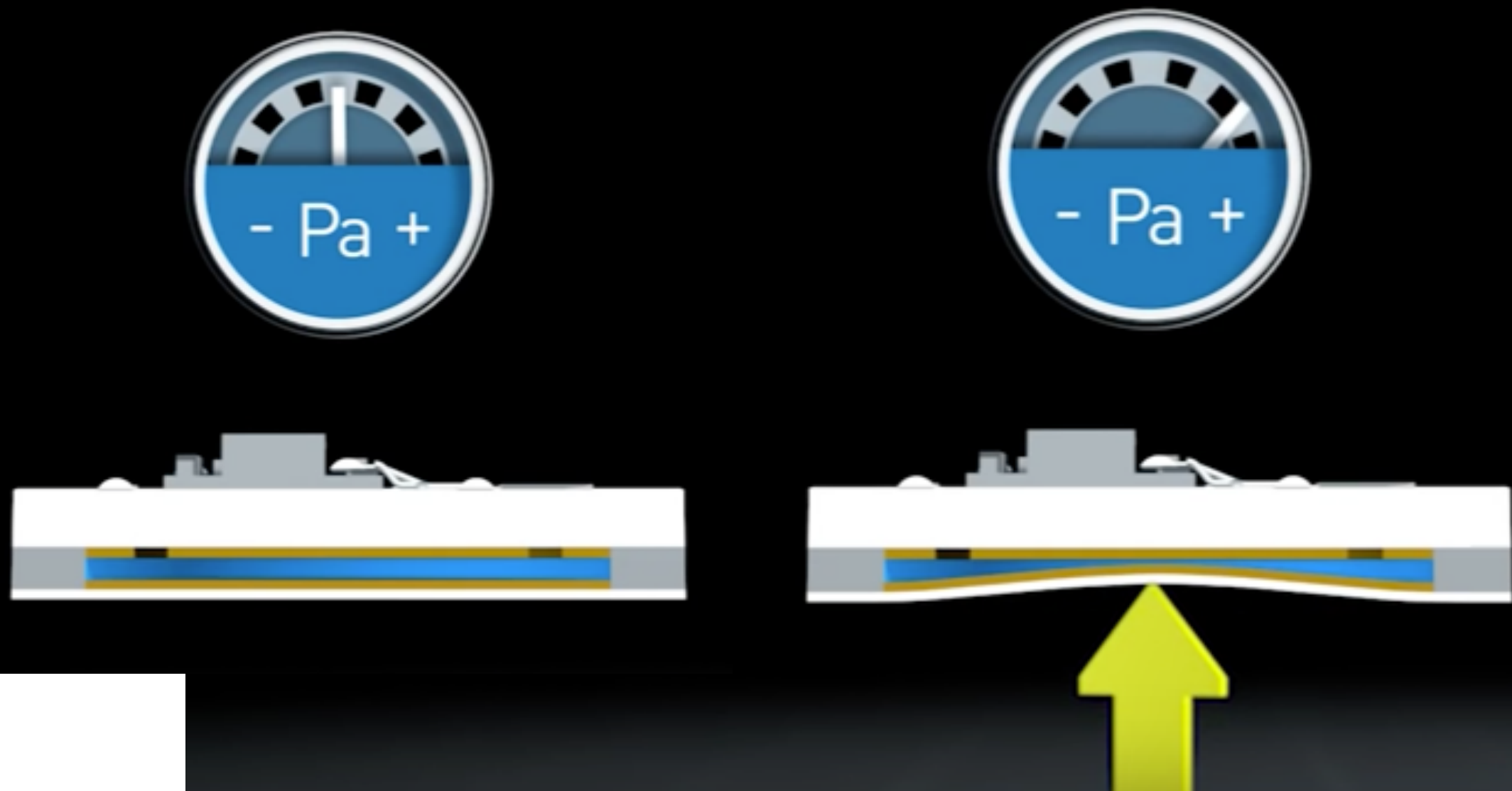
Figure 2: Principle of an absolute pressure sensor (piezoresistive technology)

<http://www.first-sensor.com/en/products/pressure-sensors/pressure-sensors-and-transmitters/pressure-types.html>

Diaphragm Deforms, changing Capacitance

One way to detect pressure, requires an external RC circuit to detect electronic resonance

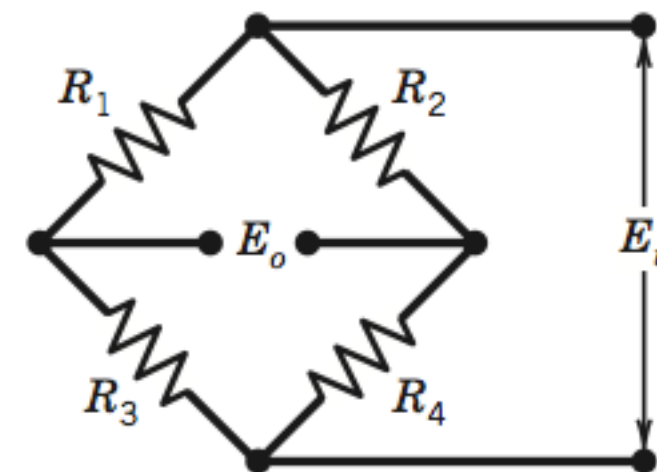
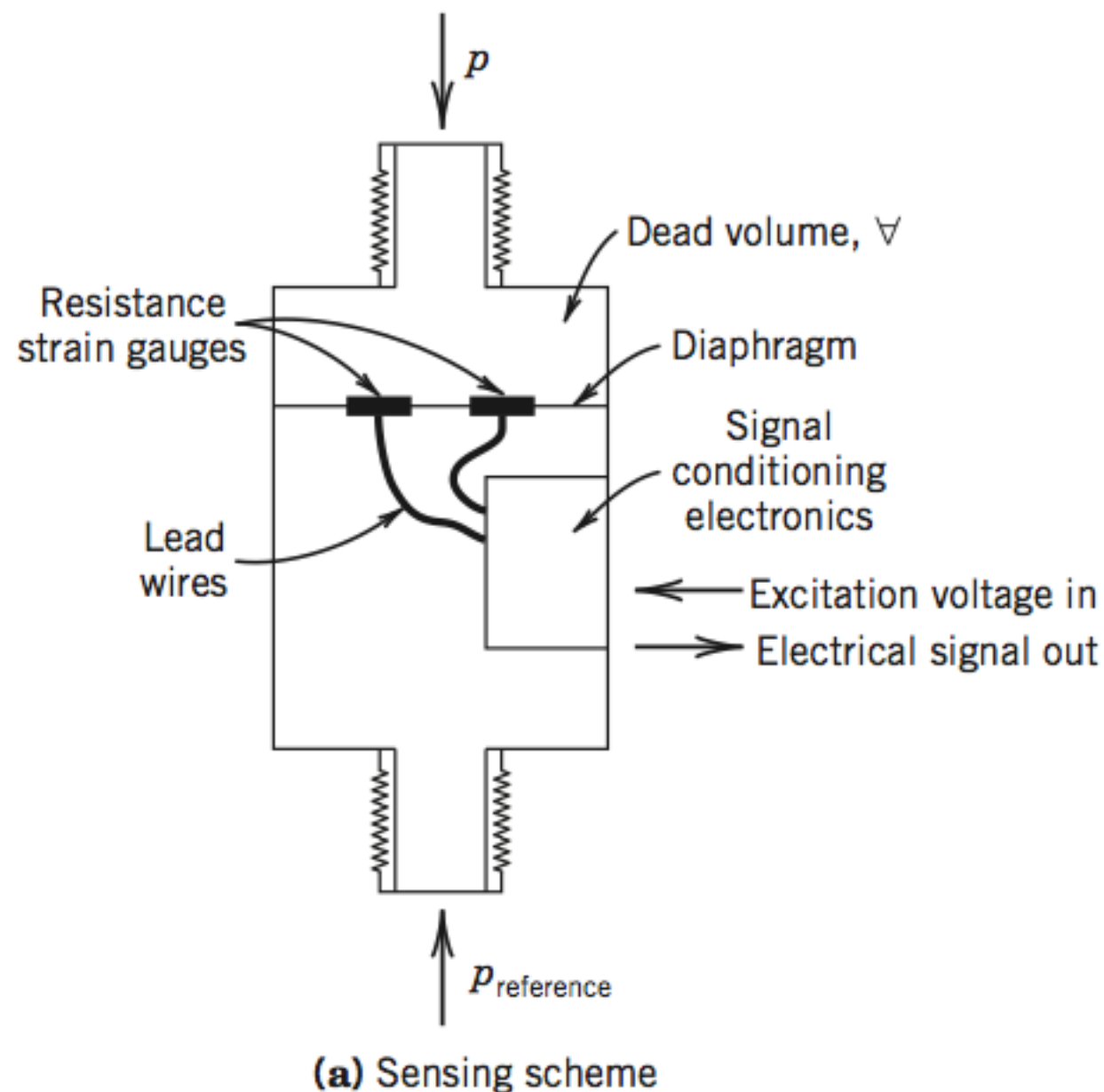
Endress+Hauser Pressure Measurement



Resistive Sensors rely on Strain Gauge Concepts

Large metal diaphragms with separate strain gauges pretty much obsolete

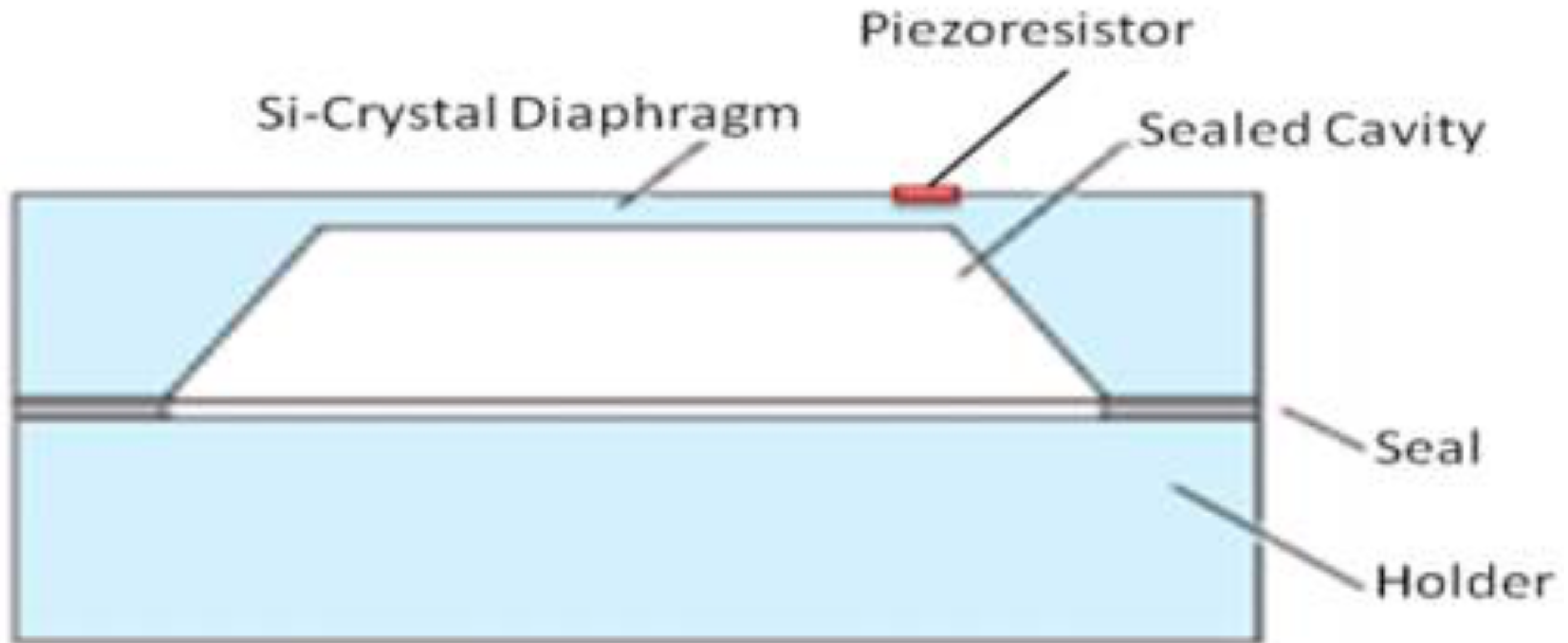
9.4 Pressure Transducers 407



(b) Bridge-strain gauge circuit for pressure diaphragms.

Figure 9.12 Diaphragm pressure transducer using four active resistance strain gauges.

Silicon diaphragm sensor follows the same approach, but much smaller and cheaper



Piezoresistive Pressure Transmitter

Type 4264A...

for Test & Measurement Applications

Type 4264A... series is a small, compact differential pressure transmitter that complements the Type 4260/62A... series of versatile high performance pressure transmitters operating in harsh test environments where temperature extremes, high vibration and shock levels are present.

- Pressure ranges from 0,1 ... 10 bar differential, uni- and bi-directional
- Small and compact
- 0,05 %FS accuracy, available
- 0,1 %FS stability per year
- Temperature compensated $-40 \dots 125 \text{ }^{\circ}\text{C}$
- 300 % proof pressure
- Fast response time
- mV, V and mA electrical output options
- Many different voltage output options available:
1 ... 5, 0,5 ... 4,5, 0 ... 10 etc... (3 and 4-wire)
- Intrinsically Safe

up to 2 kHz

Applications

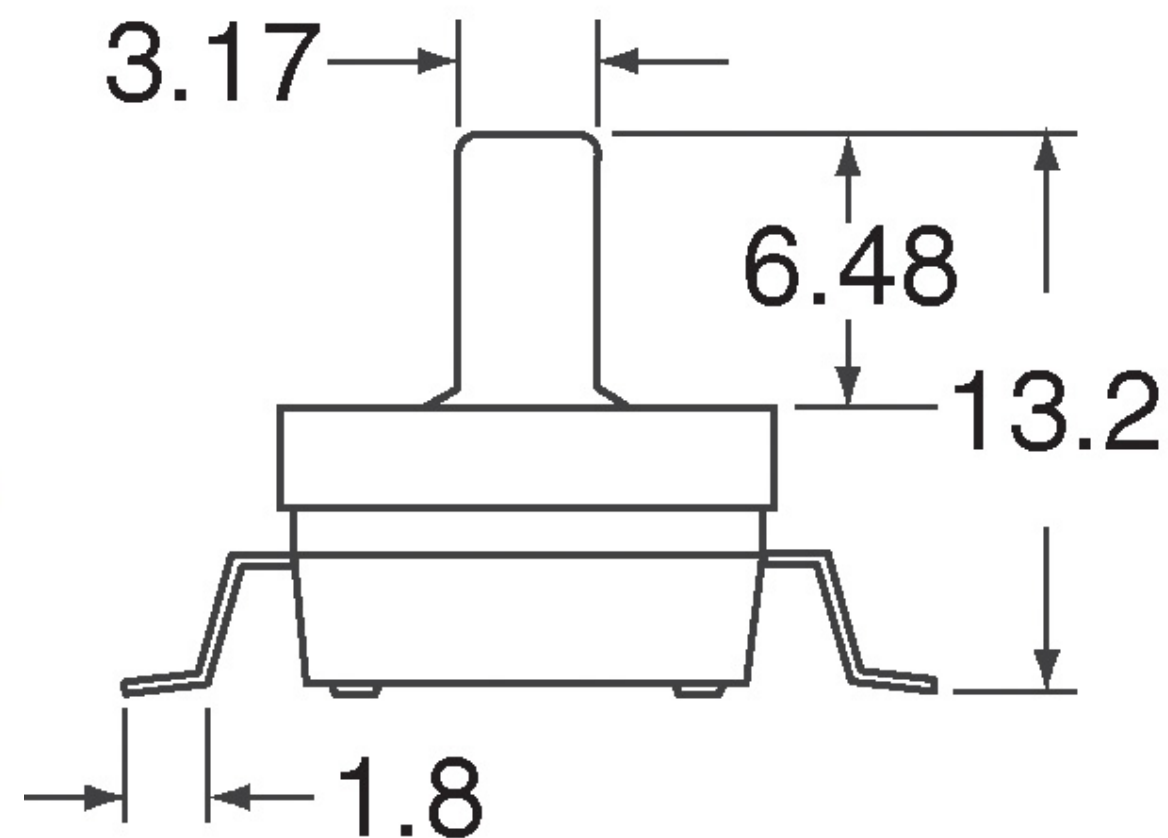
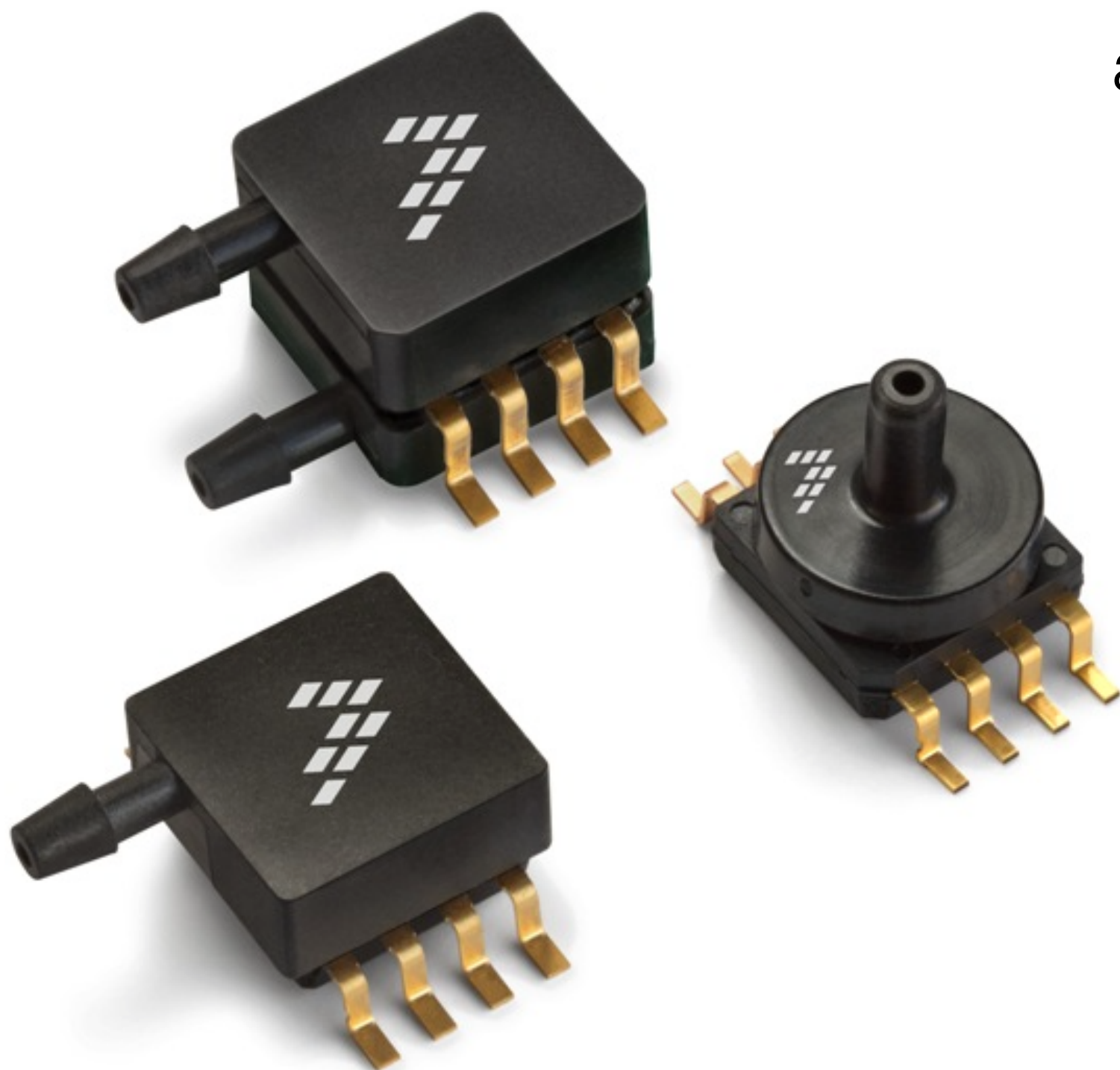
Type 4264A... series from Kistler is well suited for demanding differential pressure applications in the R&D, engine test, road test, component test and for general test applications supporting the automotive, aerospace and industrial markets.



MPxx5004, 0 to 3.92 kPa, Differential and Gauge, Integrated Pressure Sensor

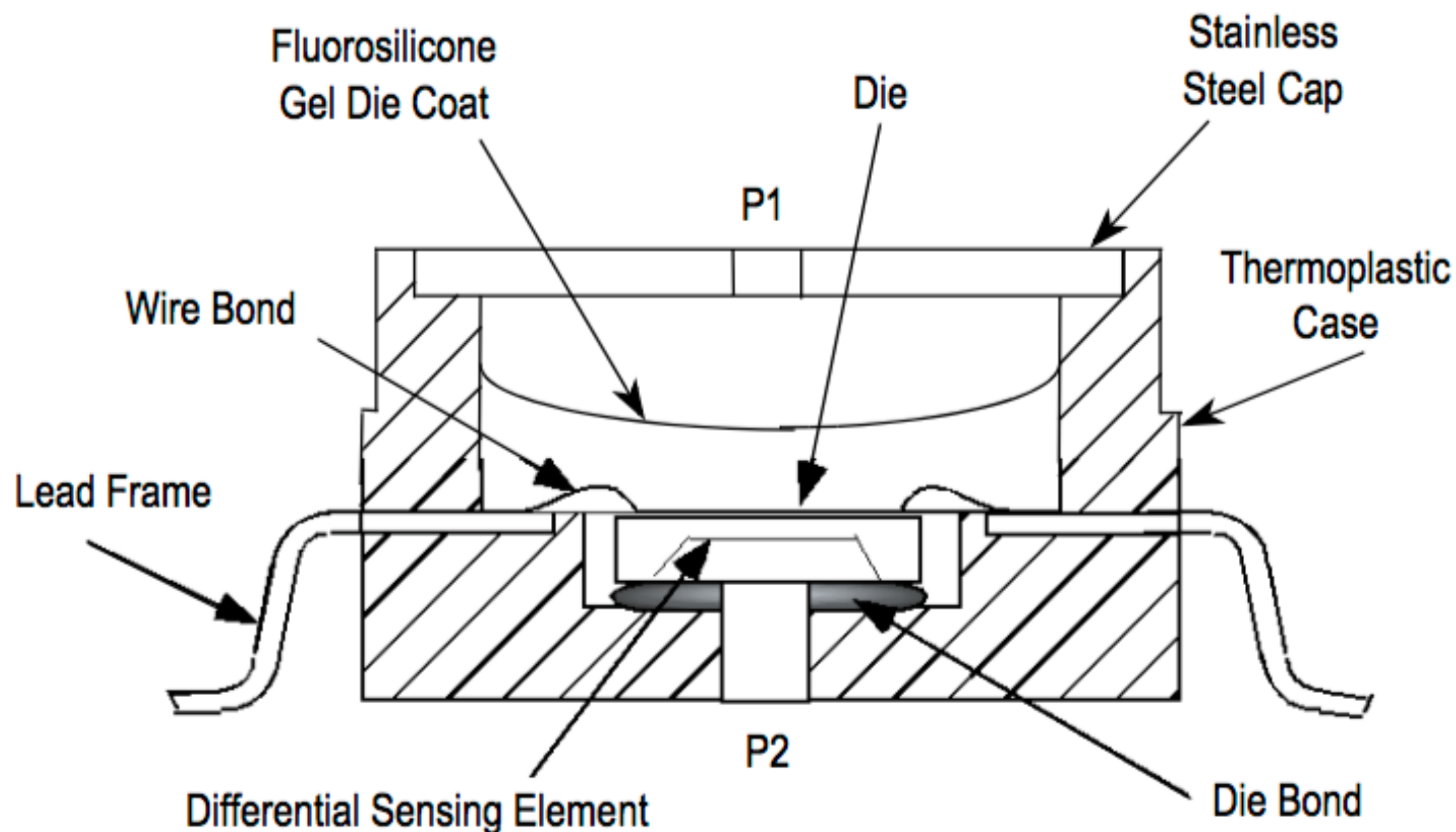


around CAD\$ 15

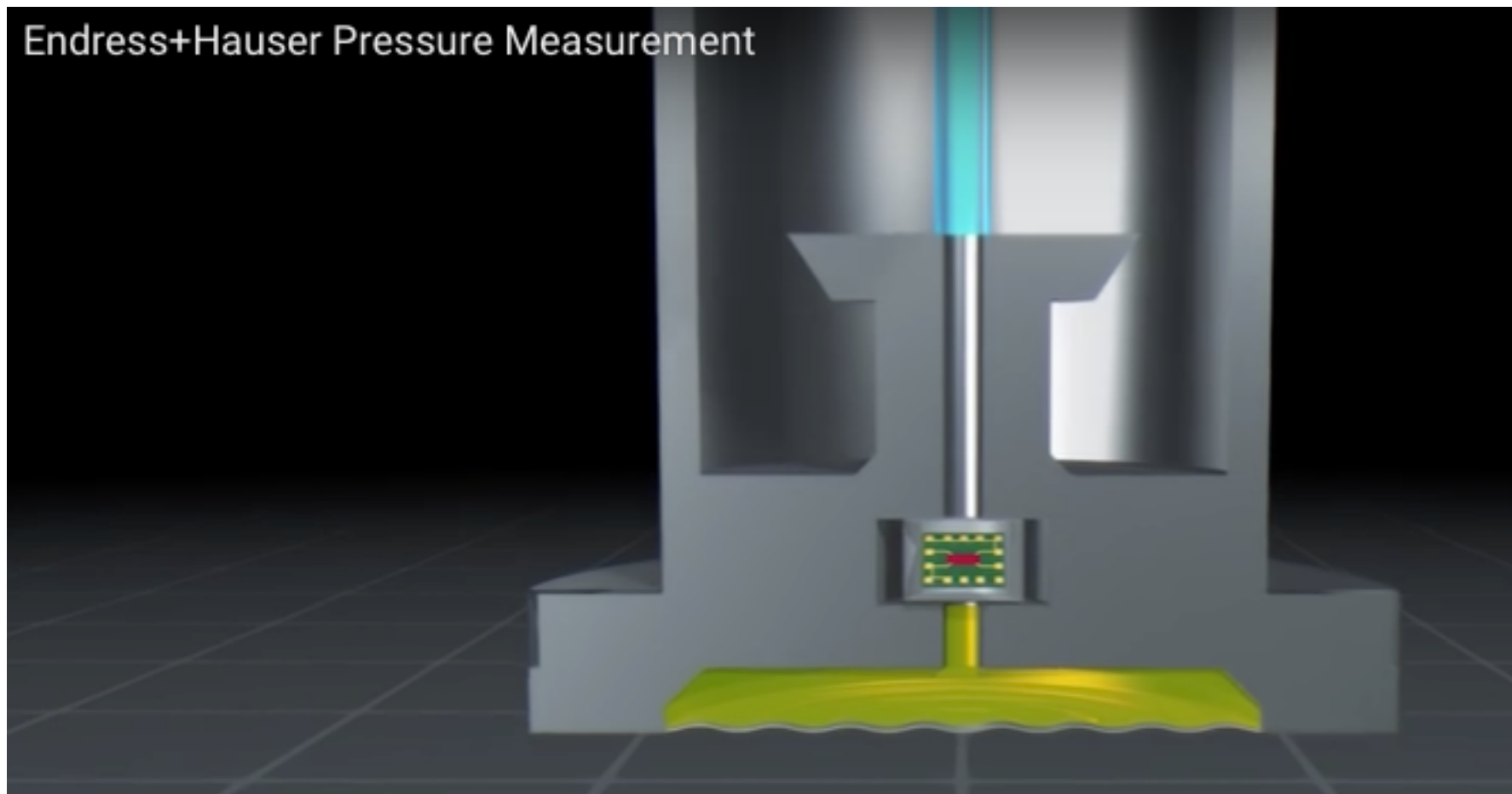




MPxx5004, 0 to 3.92 kPa, Differential and Gauge, Integrated Pressure Sensor



Isolate from process with oil



Slows down the response by adding mass

Potential loss of sensitivity due to stiffness of process diaphragm

Small mass and very small displacement gives very fast response

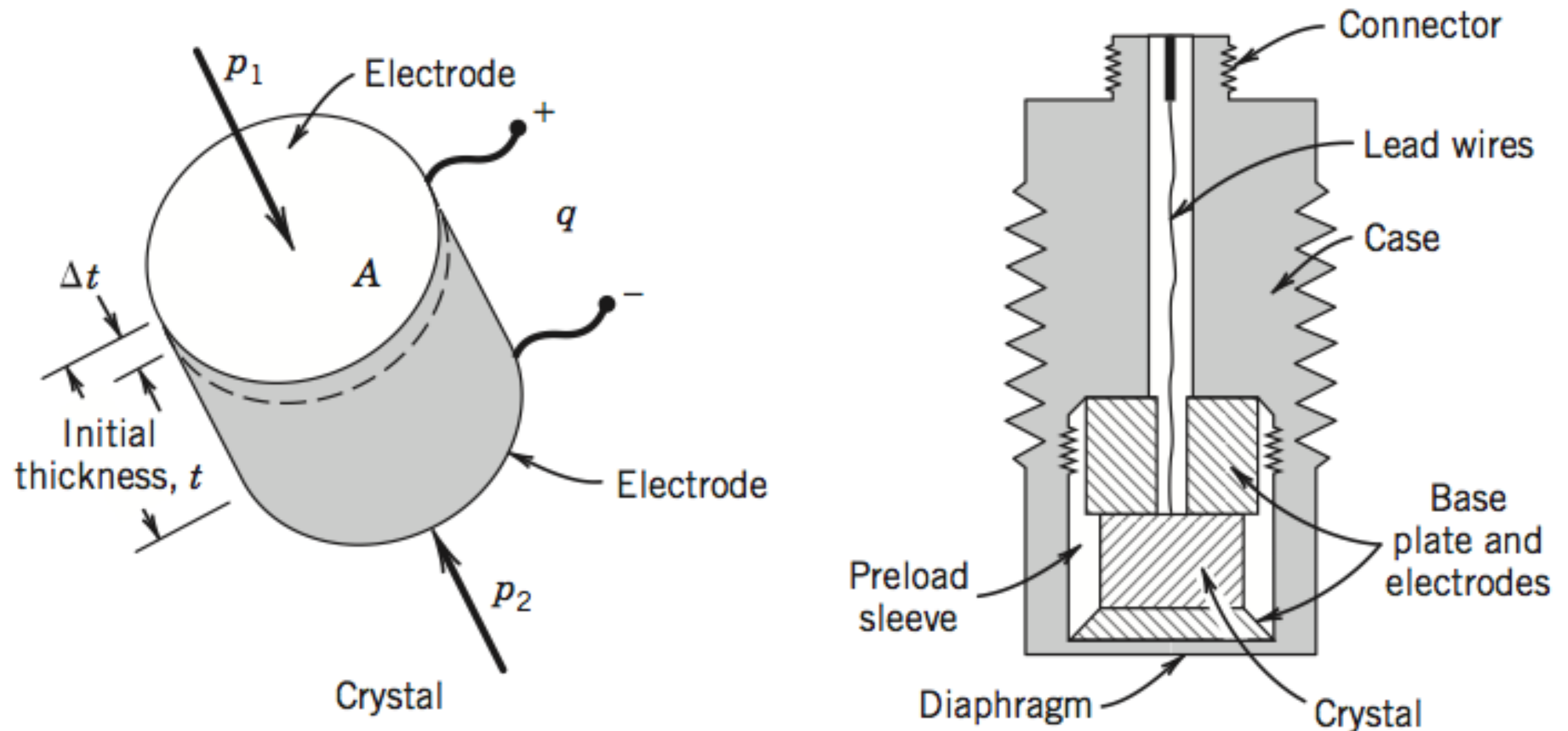
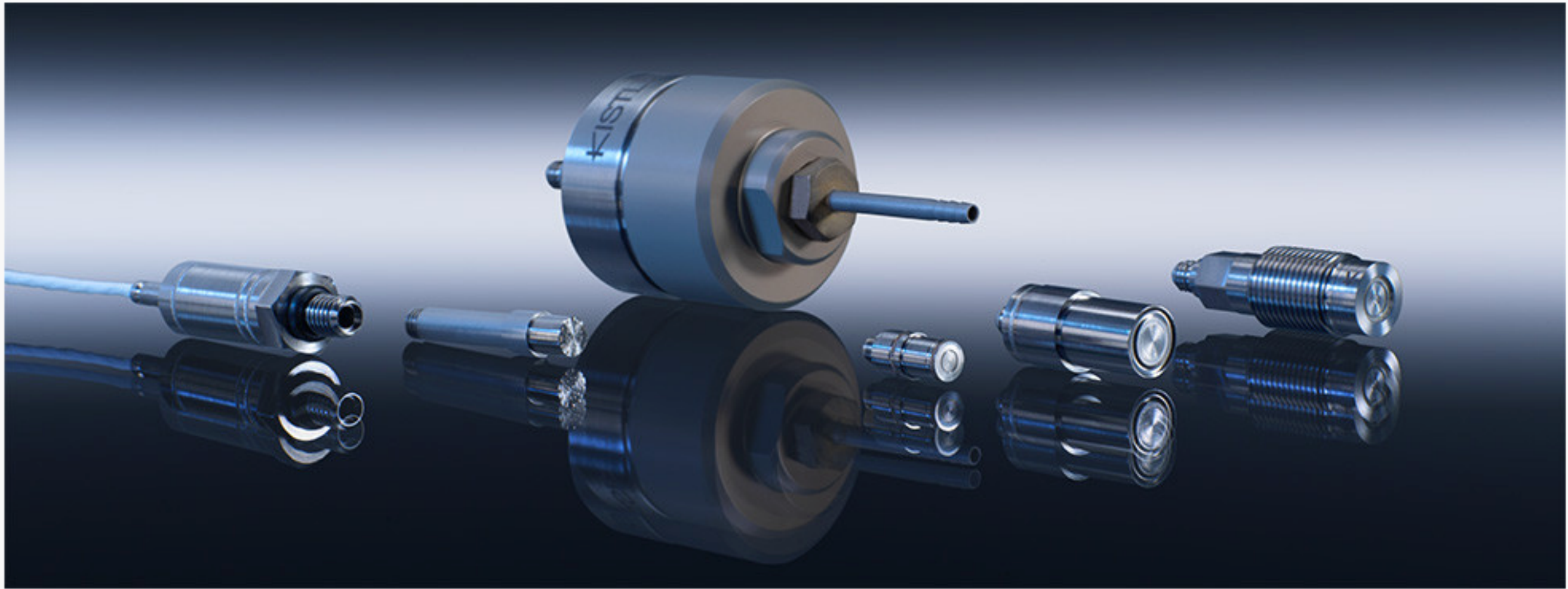


Figure 9.14 Piezoelectric pressure transducer.

Quartz crystal charge changes when the crystal lattice deforms



Pressure Sensors from Kistler

[CONTACT](#)

Natural
Frequency over
215 kHz

IC Engine - in cylinder

Ballistics, Blast Waves, Explosions

Piezoelectric Pressure Sensor (PE - 250 bar / 3625 psi) Type 601CAA

Sensor Properties:

- High Sensitivity (37 pC/bar / 2.5 pC/psi)
- High natural frequency (>215 kHz)
- Small size (diameter = 5.5 mm / 0.216 in)

