Pressure Sensors and Transmitters

For Test, Measurement, Monitoring, Research & Development

Typical Applications

Combustion
- Combustion Profiles
- Compression
- Fuel Burn Instabilities
- Fuel Injection
- Knock Detection

Explosives Testing
- Air Blast
- Ballistics
- Bubble Energy
- Closed Bombs
- Impulse
- Propellant Studies
- Shock Waves
- Time-of-arrival
- Underwater Blast

Process Monitoring
- Compressor Tuning & Monitoring
- Engine Test Stands
- Gas & Stream Turbine Performance
- Hydraulic Systems
- Liquid Level
- Pump Monitoring
- Surges
- Valve Dynamics
- Wind Tunnels

Product Testing
- Cavitations
- Flow Instabilities
- Fluctuations
- Fluid Pulsations
- Hydraulic Pulsations
- Pneumatic Pulsations
- Turbulence
- Water Hammer

Pressure Sensors and Transmitters

PCB® offers a wide variety of pressure sensors to satisfy a multitude of dynamic and static pressure measurement requirements. Piezoelectric, strain gage, thin film, and piezoresistive sensing technologies are offered. Whether it's a pharmaceutical injection design application, an explosives test, or a combustion instability study of a rocket motor, we can help with sensors, that are off-the-shelf or custom designed for the specific application.

Differences between static and dynamic pressure sensors.

Static pressure sensors most often use strain gage, piezoresistive, or capacitive sensing technologies. Such devices are capable of measuring slowly changing or static pressures and are ideal for many process monitoring requirements. Although some specialty silicon based sensors can achieve higher frequencies and faster rise times, most static pressure sensors have a response limited to about 1000 Hz and a respective 1 msec rise time. Potentially damaging pressure changes that occur faster than this can be missed by these sensors.

Dynamic pressure sensors are characterized by their ability to respond within microseconds and achieve frequencies well beyond 100k Hz. They most often use piezoelectric quartz sensing technology, however, other piezoelectric crystals may be used depending upon the application. Since piezoelectric sensors are AC coupled devices, they do not measure static pressure. This property provides these sensors with the unique ability to monitor low level dynamic pressures while being subjected to a high static background pressure level. Piezoelectric pressure sensors have no moving parts, are rigid, linear, durable, and extremely repeatable. They can withstand high static loads, yet accurately respond to small pressure fluctuations.

Dynamic General Purpose ICP® Pressure Sensors

- Adapt to any size mounting port
- Durable, welded, hermetically sealed construction
- Fast response, small size
- Ranges from 50 to 30k psi (345 to 207 MPa)
- Resolutions to 1 mpsi (0.007 kPa)
- Resonant frequencies to 500k Hz
- Rigid quartz sensing elements

Series 111, 112 & 113
- Probe-style pressure sensors

Series 101 & 102
- Probe installed into thread adaptors with ground isolation

Threaded Style
- With lock nut for flush diaphragm installations

Model 108A02
- High range with durable, monolithic diaphragm withstands many repetitive cycles

Series 105C
- Miniature ICP® styles for fuel injection studies
- Measurements on hydraulic systems such as steering, braking & clutch

Dynamic Combustion Studies & Engine Design

Model 175A01
- Engine cylinder pressure
- 4000 psi (275 bar)
- 1.5 pC/psi (22 pC/bar)
- Hermetic sealing

Series 106B, 116B
- High temperatures to +750 °F (+400 °C)
- Series 116B charge output styles for exhaust pulsation studies & flue gas flow anomalies
- High sensitivity, high resolution
- 1 to 100 psi (6.895 to 689.5 kPa)
- ICP® resolution to 0.02 mpsi (0.00013 kPa)

Series 122 & 123
- Rocket engine test sensors for burn instability detection
- Available with Helium purging & water cooling
- 1 to 5000 psi (6.895 kPa to 34.5 MPa)

Dynamic Turbine Monitoring

- Measure high-intensity acoustics & pulsations
- Measure combustion instability & onset of compressor surge
- Detect pressure fluctuations in turbines, pumps, furnaces & pipes

Series 171
- Sensitivities to 1200 pC/psi (174 pC/kPa)
- Ranges from 10 to 600 psi (70 to 4140 kPa)
- High temperatures to +500 °F (+260 °C)
- Case isolated; rugged, 2-pin MIL connector

Series 176
- Sensitivities to 17 pC/psi (2.5 pC/kPa)
- 20 psi (140 kPa) dynamic, 400 psi (2760 kPa) static
- High temperatures to +1,000 °F (+535 °C)
- Low-noise, in-line differential charge amplifier
- Case isolated

Dynamic Reciprocating Engine Monitoring

- Continuously monitor combustion pressure in diesel or gas engines
- Allows for engine turning and load balancing via cylinder pressure
- Frequency response tailored for stable output during engine power adjustments
- Integral charge amplifier at end of cable

Series 105
- Small and robust enough to fit inside engine
- Ranges to 3600 psi (250 bar)
- High temperatures to +570 °F (+300 °C)
- M5 floating nut with 4.2 mm front seal

Series 175
- Ranges to 4000 psi (275 bar)
- High temperatures to +600 °F (+315 °C)
- M14 thread

Dynamic Explosion, Blast & Shock Wave Testing

- Atmospheric re-entry studies
- Detdetonations
- Shock tube research

Series 137
- ICP® free-field blast pencil probes
- Ranges from 50 to 5000 psi (3.5 to 350 bar)
- Rise time <4 µsec
- Resonant frequency >500k Hz

Series 138
- ICP® underwater blast explosion pressure probes
- Ranges from 1000 to 50k psi (70 to 3500 bar)
- Rise time <1.5 µsec
- Resonant frequency >1M Hz

Series 132
- Shock wave time-of-arrival ICP® microsensors
- 50 psi (3.5 bar) range
- Rise time <3 µsec
- Resonant frequency >1M Hz
- 0.124" (3.15 mm) diameter diaphragm

Series 134
- Designed for reflected shock wave pressure measurement
- Unique non-resonating design, Tourmaline sensing element
- Pressure ranges from 1000 to 20k psi (70 to 1380 bar)
- Rise time ≤ 0.2 µsec
- +5,000 °F flash temperature (+2,760 °C)

Dynamic Ballistics Testing

- Ammunition testing
- Propellant studies

Series 117
- Conformal ballistics pressure sensors
- Diaphragm curvatures to match any cartridge diameter
- Measures pressure without modifying cartridge cases
- SAAMI approved

Series 108, 109, 118, 119, 165 & 167
- Case mouth & shot shell ballistic pressure sensors
- Ranges to 120k psi (827 MPa)
- Variety of configurations to match existing test barrel ports
- Acceleration compensated versions

Static Pressure Transducers and Transmitters

Pressure sensors for static, or slowly changing, pressure measurements use highly stable, thin-film, piezoresistive sensing elements. These elements are constructed without use of adhesives or fluid filling. The results are robust units, possessing the accuracy required for testing applications, yet which are economically attractive for rigorous industrial process control requirements. A variety of process fittings, electrical connections, output signal formats, accuracies, and full-scale ranges are available. These units are ideally suited for process monitoring and control, liquid level measurements, hydraulic system performance studies and test cell requirements.

Series 1500

- DC to ≤ 1 msec response time
- 17-4 stainless steel wetted parts
- Accuracies of 0.1%, 0.25%, or 0.5% full-scale
- All welded construction with no adhesives, seals, or fluid filling
- Amplified 0 to 5 VDC or 0 to 10 VDC outputs
- Loop-powered, 4-20 mA versions
- Gage, absolute, or compound pressure versions
- Ranges from 10 to 6000 psi (0.7 to 400 bar)
- Temperature range of -40 to +250 °F (-40 to +125 °C)
- Variety of connectors, submersible cables & process fittings

Intrinsically Safe Pressure Sensors

Sensors that offer intrinsically safe certifications are widely used on pumps, compressors, power generation equipment, and other machinery operating in hazardous environments. PCB® can also assist with providing many other styles of dynamic and static pressure sensors with hazardous area approvals. Piezoelectric pressure sensors offer the capability to detect and monitor dynamic pressure spikes, pulsations, and surges in gaseous or liquid media.

Dynamic Intrinsically Safe Monitoring

- ATEX Certifications
  - Ex ia IIC T4
  - Ex nL IIC T4
- CSA (Canada & US) Certifications
  - Division 1; Class 1; Group A, B, C & D; Temperature Code T4
  - Division 2; Class 1; Group A, B, C & D; Temperature Code T4

CE ATEX

C SP® US Ex

Series 102

- Ranges 50 to 5000 psi (345 to 345 MPa)
- Invar ablative coated diaphragm
- Ground isolated
- +250 °F (+121 °C)
- 1/8" NPT process fitting
- 10-32 connector

Series 121

- Ranges 50 to 5000 psi (345 to 345 MPa)
- 316 stainless steel diaphragm
- Case isolated
- +250 °F (+121 °C)
- 1/4" NPT process fitting
- Robust 2-pin MIL connector