

Force, Load, and Strain

Sensors for Testing, Process Monitoring, Research & Development

Typical Applications

Product Testing

- Aerospace Structural Testing
- Automotive Ride Simulation
- Cable Tension
- Durability Testing
- Ejection Forces
- Endurance Testing
- Engine & Machinery Mount Analysis
- Fatigue Testing
- Force Limited Vibration Testing
- Fracture Analysis
- Impact & Drop Testing
- Life Cycle Testing
- Material Penetration Studies
- Materials Strength Testing
- Reaction Forces

Process Control & Quality Assurance

- Bearing Assembly & Test
- Clinching, Riveting, Orbital Forming
- Crimping
- Dynamic Balancing
- Machine Tool Cut Force Monitoring
- Machine Tool Wear Monitoring
- Metal Forming Press Monitoring
- Piercing & Punching
- Spot Welding
- Stamping
- Tablet Presses
- Wire Bonding

Research & Education

- Biomechanics
- Sports Therapy
- Robotics



Force, Load, and Strain – sensors for testing, monitoring, and process control

PCB® offers a vast selection of quartz piezoelectric and strain gage sensors for dynamic force, dynamic strain, and static load measurement requirements. The variety of available configurations supports a multitude of installation options. Whether it's a mechanical component durability test, assembly force control requirement, or an end-of-line quality check, we can help with sensors that are off-the-shelf or custom designed for the specific application.

Features and benefits of piezoelectric and strain gage force sensors.

Piezoelectric force sensors are well suited for measuring dynamic and quasi-static force. They feature high stiffness, fast response, and repeatable performance, permitting them to capture high frequencies and follow fast transient events such as impacts. The high stiffness allows them to survive repetitive cycles without fatigue. Quasi-static applications may include slow acting press or mechanical linkage forces acting in a cyclic manner during a production process.

Strain gage force sensors, or load cells, are well suited for measuring slowly changing or static force. They possess DC response and are appropriate for static applications. Fatigue rated versions are constructed of high-grade steel for surviving many repetitive cycles encountered during product durability testing. Strain gage load cells are not suitable for capturing frequencies in excess of several hundred Hz. They are also typically larger than similarly ranged piezoelectric force sensors.

Dynamic Force Sensors

- Piezoelectric quartz sensing elements
- Solid-state construction with stainless steel durability
- High stiffness for fast transient response & high frequency response
- Survive repetitive cycles without fatigue
- Hermetically sealed for use in harsh environments
- Much smaller than comparably ranged strain gage load cells
- Offered in both ICP® & charge output designs



Ring Configurations

- Install beneath a base or platform between plates, or in line with linkages & actuators
- Compression ranges from 10 to 100k lb (45 to 450k N)
- Resolution to 0.0002 lb (0.00045 N)
- Variety of sizes to fit most installations



Impact Configurations

- Compression ranges from 10 to 50k lb (45 to 220k N)
- Resolution to 0.0002 lb (0.00045 N)



General Purpose Configurations

- Compression, tension & impact
- Ranges from 10 to 5000 lb (45 to 22k N)
- Resolution to 0.0001 lb (0.00045 N)



Link Configurations

- Install in linkages or actuators
- Tension and compression ranges from 10 to 50k lb (45 to 220k N)
- Resolution to 0.0002 lb (0.00045 N)
- Variety of sizes to fit most installations



Multi-component Configurations

- Simultaneous measurements in three orthogonal directions
- Available in ring or link configurations
- Variety of sizes to fit most installations
- Compression ranges from 1000 to 10k lb (4500 to 45k N)
- Resolution to 0.002 lb (0.009 N)

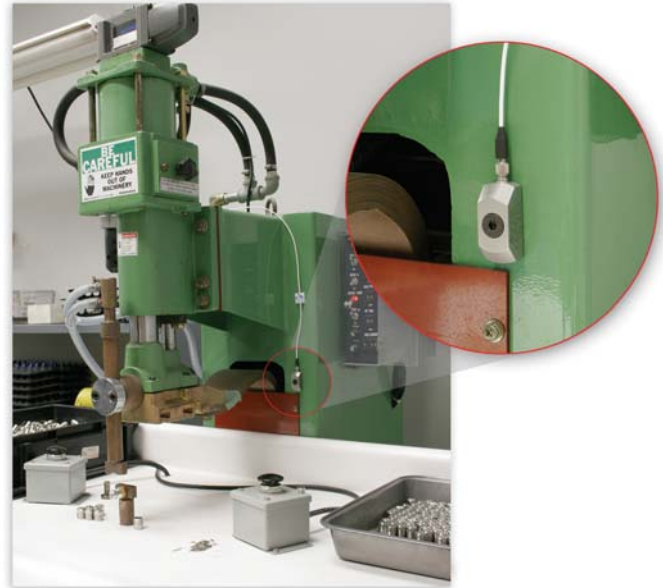
Dynamic ICP® Strain Sensors

M240 ICP® Strain Sensors are ideal for industrial applications that require the measurement of repetitive strain curves such as monitoring forces experienced during manufacturing, assembly, on-line processes, quality assurance, or end-of-line product testing.

In typical applications, upper and lower control limits are set to follow a desired force curve for the process, and if the actual force curve deviates from the control limits, the process is shut down. This prevents acceptance of non-conforming parts as finished goods. Mounted on a C-frame press or actuator with a single screw simplifies installation and keeps the sensor out of the machine tooling.

Optional JM240 ground isolated version available for resistance spot welding machines. For research and development applications or when a mounting screw is not permissible, the Model 740B02 allows for adhesive mounting.

- Measure longitudinal strain on machinery structures
- Offers indirect measurement of clamping & press forces
- Automates machinery processes for improved end product quality
- Detects tool wear
- High stiffness for repeatability
- Robust construction
- Easy to install



Series M240

- Ranges from 50 to 300 $\mu\epsilon$
- 0.004 Hz low frequency response
- Resolution to 0.0001 $\mu\epsilon$
- ICP® or charge output



Model 740B02 ICP® Dynamic Strain Sensor

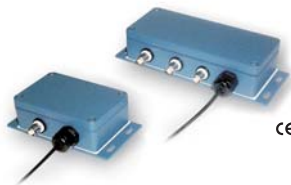
- 50 mV/ $\mu\epsilon$
- 0.5 to 100k Hz
- 0.5 gm
- Integral cable
- Ideal for dynamic fatigue & structural health studies

ICP® & Charge Output Sensor Signal Conditioners



Model 410A01

- Delivers excitation power for ICP® sensors
- Provides +10 V peak hold & ± 10 V analog output signals
- Remote reset for synchronizing with machine cycles
- Eight gain settings
- 24V DC powered
- DIN rail



Series 421A11 & 421A31

- Condition charge output sensors in harsh industrial environments
- ± 5 V analog output
- Long discharge time constant for quasi-static & low frequency measurements
- Offered in single or three-channel configurations
- 24V DC powered



Series 421A25

- Condition charge output sensors in harsh industrial environments
- Long discharge time constant for quasi-static & low frequency measurements
- ± 10 V Analog, +10 V peak & two alarm outputs for monitoring applications
- 24V DC powered

Strain Gage Load Cells

- Combined accuracies to 0.07%
- General purpose & fatigue rated designs
- Variety of configurations & mounting schemes



Series 1100 & 1200 General Purpose Low Profile

- Capacities from 25 to 200k lb (110 to 900k N)



Series 1400 Fatigue Rated

- Over 100 million fully reversed cycles guaranteed
- Capacities from 250 to 100k lb (1100 to 450k N)



Series 1300 Rod Ends

- Capacities from 1000 to 20k lb (4450 to 89k N)
- Male & female rod ends

Strain Gage Signal Conditioners

- Provide necessary strain gage bridge excitation
- Variety of configurations
- Shunt calibration feature



Series 8159

- Panel meter/controller
- AC-powered
- ± 10 V & 4-20 mA outputs
- Four set points with open collector outputs



Series 8162

- Rugged in-line style
- DC-powered
- ± 5 V, ± 10 V & 4-20 mA outputs



Series 8161

- DIN rail style
- DC-powered
- ± 5 V, ± 10 V & 4-20 mA outputs



Series 8160

- In-line style
- DC-powered
- ± 5 V, ± 10 V & 4-20 mA outputs