



**SHORT FORM CATALOG**

Including



**Piezoelectric Accelerometers**



**Capacitive Accelerometers**



**Industrial Accelerometers**



**Torque Sensors**



**Measurement Microphones**



**Signal Conditioning Electronics**



**Dynamic Pressure Sensors**



**Pressure Transducers and Transmitters**



**Dynamic Force Sensors**



**Load Cells**



**TOTAL CUSTOMER SATISFACTION GUARANTEED**

# Total Customer Satisfaction

PCB® Piezotronics, Inc. guarantees Total Customer Satisfaction. If, at any time, for any reason, you are not completely satisfied with any PCB product, PCB will repair, replace, or exchange it at no charge. You may also choose, within the warranty period, to have your purchase price refunded.

## Toll-Free Customer Service

PCB offers direct, toll-free telephone numbers for customer use. See the adjacent page for the toll-free number of the division in which your product interest lies or use our general toll-free number, 800-828-8840. Feel free to call to discuss application requirements, request product literature, request price quotations, place orders, inquire about order status, expedite orders, troubleshoot equipment, or arrange for returns. International customers are invited to call 716-684-0001. In addition, we can be reached by e-mail at [info@pcb.com](mailto:info@pcb.com). Our fax number is: 716-684-0987. We look forward to hearing from you.

## 24-hour SensorLine™

PCB offers to all customers, at no charge, 24-hour emergency phone support. This service makes product or application support available to our customers, day or night, seven days per week. To reach a PCB SensorLine™ customer service representative, call 716-684-0001.

## Worldwide Web - [www.pcb.com](http://www.pcb.com)

Products are featured on PCB's web site — [www.pcb.com](http://www.pcb.com). The web site offers customers educational and technical information, as well as the latest product releases. Additionally, industrial sensors are featured with the ability to place an on-line order at [www.imi-sensors.com](http://www.imi-sensors.com). You may also contact us via e-mail at: [info@pcb.com](mailto:info@pcb.com).

## ISO 9001 Certification

PCB Piezotronics, Inc. is registered by the Underwriters Laboratory, Inc. as an ISO 9001 facility and maintains a quality assurance system dedicated to resolving any concern to ensure Total Customer Satisfaction. PCB also conforms to the former MIL-STD-45662 and MIL-Q-9858.

## ISO 9001 and ISO 10012-1 Compliant Calibration Facility

All PCB sensors are calibrated with full traceability to N.I.S.T. (National Institute of Standards & Technology) to ensure conformance to published specifications. Certificates of calibration are furnished that include actual measured data. Calibration systems utilized are kept in full compliance with ISO 9001 and ISO 10012-1 standards. Calibration methods are accredited by A2LA to ISO 17025 standards.

## Delivery Policy

PCB is committed to making every effort possible to accommodate all delivery requests. Our extensive in-house production capabilities permit us to manufacture most products to order in a timely fashion. In the event that a specific model is unavailable in the time frame that you need, we can usually offer a comparable unit, for sale or loan, to satisfy your urgent requirements. Many products are available, from stock, for immediate shipment. Standard cable assemblies and accessory hardware items are always stocked for immediate shipment and PCB never requires a minimum order amount. If you have urgent requirements, call a factory representative and every effort will be made to fulfill your needs.

## Custom Products

PCB prides itself on being able to respond to customers' needs. Heavy investment in machinery, capabilities, and personnel allow us to design, test, and manufacture products for specialized applications. Please contact a PCB customer service representative to discuss your special needs.

## CE Marking CE

Many PCB products are designed, tested, and qualified to bear CE marking in accordance with European Union EMC Directive. Products that have earned this qualification are so indicated by the CE logo.

## Warranty

Instrumentation provided by PCB is covered by a limited warranty against defective material and workmanship for a period of one year. Contact PCB for a complete statement of our warranty.

## Accuracy of Information

PCB has made a reasonable effort to ensure that the specifications contained in this catalog were correct at the time of printing. In the interest of continuous product improvement, PCB reserves the right to change product specifications without notice at any time. Dimensions and specifications in this catalog may be approximate and for reference purposes only. Before installing sensors, machining any surfaces, or tapping any holes, contact a PCB application specialist to obtain a current installation drawing and the latest product specifications.

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### PCB PIEZOTRONICS<sup>INC.</sup> VIBRATION DIVISION

and support of shock and vibration sensors, microphones, impact hammers, piezoelectric actuators, and dynamic strain sensors for acceleration measurements and structural testing requirements.

The Vibration Division of PCB Piezotronics, Inc. specializes in the development, application, and support of shock and vibration sensors, microphones, impact hammers, piezoelectric actuators, and dynamic strain sensors for acceleration measurements and structural testing requirements.

Environmental stress screening  
Floor and foundation vibrations  
Geological exploration & mapping  
Modal analysis  
Structural testing  
NVH/noise vibration and harshness  
Package testing

Pile driver monitoring  
Shock and pyroshock measurements  
Ride quality monitoring  
Squeak and rattle detection  
Vibration control  
Sound level measurements  
Array measurements

### IMI SENSORS A PCB PIEZOTRONICS DIV.

The IMI Sensors Division of PCB Piezotronics, Inc. specializes in the development, application, and support of industrial vibration sensors, meters, and accessories for machinery condition monitoring and predictive maintenance requirements.

Balancing  
Bearing analysis  
Diagnostics of rotating machinery  
Gearbox analysis  
Hull vibration monitoring  
Machinery condition monitoring

Machinery mount monitoring  
Machinery vibration monitoring  
Predictive maintenance  
Shaft alignment  
Slurry pulsation monitoring

### PCB PIEZOTRONICS<sup>INC.</sup> FORCE / TORQUE DIVISION

and support of piezoelectric and strain gage force sensors, load cells, and torque sensors for a wide range of research, test, measurement, monitoring, and control requirements.

The Force / Torque Division of PCB Piezotronics, Inc. specializes in the development, application,

Automotive ride simulator measurements  
Biomechanics  
Brake torque measurements  
Cold forming operations monitoring  
Composites testing and evaluation  
Compression force measurement  
Crash testing  
Crimping  
Drop testing

Electric motor testing  
Engine dynamometers  
Force press monitoring  
Impact measurements  
Materials testing  
Stamping operations monitoring  
Torque measurements  
Weighing

### PCB PIEZOTRONICS<sup>INC.</sup> PRESSURE DIVISION

application, and support of piezoelectric and resistive pressure sensors, transducers, and transmitters for dynamic and static pressure test, measurement, monitoring, and control requirements.

The Pressure Division of PCB Piezotronics, Inc. specializes in the development,

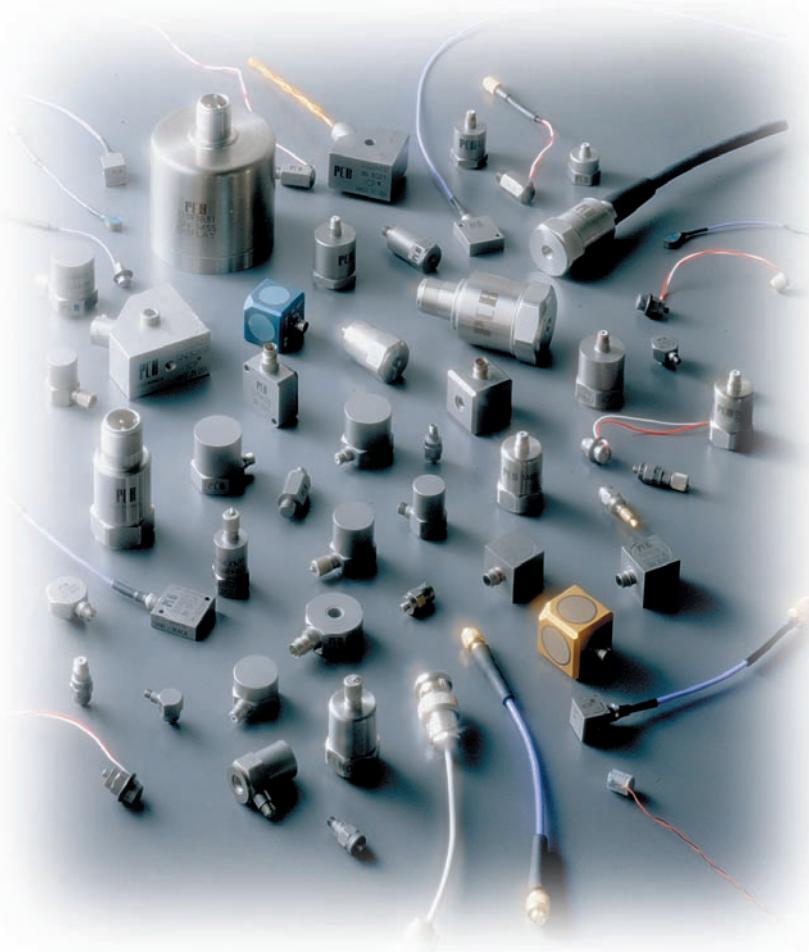
Acoustics  
Ballistics  
Blast & explosion  
Combustion measurement and monitoring  
Exhaust noise & pulsation studies  
Explosive studies  
Fluid borne noise

High intensity sound measurements  
Hydraulic pressure studies  
Level measurements  
Liquid depth measurements  
Pneumatic pressure studies  
Process monitoring & control  
Shock wave measurements

### PCB PIEZOTRONICS<sup>INC.</sup> ELECTRONICS DIVISION

The Electronics Division of PCB Piezotronics, Inc. specializes in the development, application, and support of signal conditioners, cables, and accessories for a wide variety of sensor interfacing requirements.

# Acceleration, Shock, and Vibration Sensors



## A FULL RANGE OF ACCELERATION, SHOCK, AND VIBRATION SENSORS FOR TEST, MEASUREMENT, CONTROL, AND R&D APPLICATIONS

- ICP® and Charge-Output Piezoelectric Accelerometers
- Capacitive Accelerometers with DC Response
- Triaxial and Single Axis Configurations
- High-Amplitude Shock Accelerometers
- Low-Amplitude Seismic Accelerometers
- Structural Test Styles with Simplified Mounting
- Accelerometers for Extreme Environments

PCB's piezoelectric accelerometers feature precision quartz and ceramic shear-mode sensing elements to reduce the effects of base strain and thermal transients. Most contain built-in microelectronic signal conditioning circuitry (ICP® accelerometers) in order to provide a high-quality, low-noise, low-impedance output signal.

All accelerometers are packaged in lightweight titanium or aluminum housings that are precision laser welded to provide a hermetic seal.

### PRECISION ICP® ACCELEROMETERS

- Excellent long-term stability and accuracy
- Impervious to base strain and thermal transient errors
- Ideal for general purpose use
- Low noise floor imparts high resolution
- Ideal for low-amplitude vibration measurements



**Model 353B16**  
10 mV/g  
1 mV/(m/s<sup>2</sup>)  
0.7 to 20k Hz  
1.5 grams



**Model 355B12**  
10 mV/g  
1 mV/(m/s<sup>2</sup>)  
0.6 to 15k Hz  
2.3 grams



**Model 352C23**  
5 mV/g  
0.5 mV/(m/s<sup>2</sup>)  
1.5 to 15k Hz  
0.2 grams



**Model 352C44**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.5 to 10k Hz  
3 grams  
Ground isolated



**Model 352C68**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.3 to 12k Hz  
2 grams



**Model 352A21**  
10 mV/g  
1 mV/(m/s<sup>2</sup>)  
0.7 to 13k Hz  
0.6 grams



**Model 352C03**  
100 mV/g  
1 mV/(m/s<sup>2</sup>)  
0.3 to 15k Hz  
5.8 grams



**Model 352C33**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.3 to 15k Hz  
5.8 grams

# Vibration Sensors and Microphones

## TRIAXIAL ICP® ACCELEROMETERS

- Highly sensitive shear-mode sensing elements
- Measurements from 0.00004 to 500 g



**Model 354C10**

10 mV/g  
1 mV/(m/s<sup>2</sup>)  
2 to 8000 Hz  
Thru-Hole Mounting  
5 grams



**Model 356B21**

10 mV/g  
1 mV/(m/s<sup>2</sup>)  
2 to 10k Hz  
4 grams



**Model 356A33**

10 mV/g  
1 mV/(m/s<sup>2</sup>)  
2 to 7000 Hz  
5.3 grams



**Model 356A15**

100 mV/g  
10 mV/(m/s<sup>2</sup>)  
1 to 6500 Hz  
10.5 grams

**TEDS**  
CIRCUITRY  
COMPATIBLE

## ACCELEROMETERS FOR AUTOMOTIVE DESIGN, TESTING, AND EVALUATION

- Modal and Structural Analysis
- Road Response and Ride Simulation Measurements
- NVH Measurements
- Squeak and Rattle Detection
- Drivetrain Testing
- Automotive Component Tests
- Dynamometer Testing
- Body-In-White Tests
- Human Vibration Studies



## MEASUREMENT MICROPHONES

- Precision sound level measurements
- Array measurements
- Near-field acoustic holography
- Sound pressure mapping
- Engine noise analysis



**TEDS**  
CIRCUITRY  
COMPATIBLE

**Model 130D20**  
**ICP® Array Microphone**  
45 mV/Pa  
1/4 in diameter  
Omni directional  
10 to 15k Hz  
>122 dB



**TEDS**  
CIRCUITRY  
COMPATIBLE

**Model 426D01**  
**ICP® Microphone Preamp**  
<5 µV noise floor  
For 1/2 in diameter mics  
Reduces cost  
8 to 50 kHz  
Operates from ICP® sensor signal conditioners



**Model 377A01**  
**Microphone Cartridge**  
4 mV/Pa  
1/4 in diameter  
Free-field response  
4 to 100k Hz  
>166 dB range



**Model 377A02**  
**Microphone Cartridge**  
50 mV/Pa  
1/2 in diameter  
Free-field response  
3.15 to 20k Hz  
>148 dB range



**Model 377A40**  
**Microphone Cartridge**  
14.5 mV/Pa  
1/2 in diameter  
Free-field response  
3.15 to 40k Hz  
>160 dB range



**Model 377A41**  
**Microphone Cartridge**  
44.5 mV/Pa  
1/2 in diameter  
Free-field response  
3.15 to 20k Hz  
>146 dB range

# Acceleration, Shock, and Vibration Sensors



## MODAL ARRAY VIBRATION SENSING SYSTEMS

- Simplify and Expedite Large-Channel Modal Tests
- Intelligent Cable Management Reduces Tangles
- Innovative Sensor Mounting Technique Speeds Installation and Channel Verification
- Transducer Electronic Data Sheet (TEDS), Optional EPROM within Sensor Stores Calibration Information for Simplified Channel Management (Complies with IEEE P1451.4)
- Ideal for Body-In-White and Aerospace GVT

### STRUCTURAL TEST ICP® ACCELEROMETERS

- Convenient installation configurations
- Lowest cost per channel
- Optional TEDS "smart" sensor (IEEE P1451.4) compatibility
- Supported with a wide variety of available patch panels, multichannel signal conditioners, and bank switching systems

**TEDS**  
CIRCUITRY  
COMPATIBLE



**Model 333B**  
100 mV/g  
10 mV/(m/s²)  
2 to 1000 Hz  
Plug-in socket

**Model 333B32**  
100 mV/g  
10 mV/(m/s²)  
0.5 to 3000 Hz  
Mounts on any face

**Model 333B52**  
1000 mV/g  
102 mV/(m/s²)  
0.5 to 3000 Hz  
Mounts on any face

### TRIAXIAL ICP® ACCELEROMETERS FOR STRUCTURAL TESTING



**Model 356A17**  
500 mV/g  
51 mV/(m/s²)  
0.3 to 4000 Hz  
9.3 grams

**TEDS**  
CIRCUITRY  
COMPATIBLE

**Model 356B18**  
1000 mV/g  
102 mV/(m/s²)  
0.3 to 5000 Hz  
25 grams



### ACCELEROMETERS FOR AEROSPACE TESTING

- MIMO (Multiple Input / Multiple Output) Modal Analysis
- GVT (Ground Vibration Testing)
- Flight-Qualified Vibration Sensors
- Aerospace Vehicle Structural Testing
- Cryogenic Pump Vibration Testing
- Structural Integrity Tests
- Flight Flutter

# Impact Hammers, Actuators, and Calibration Instruments

## ACCELEROMETERS FOR ENVIRONMENTAL TESTING

- Environmental Stress Screening
- Shaker Control
- Component Testing
- Vibration Stress Screening
- Combined Environment Qualification
- Thermal / Vibration Chambers



### HALT – HASS – ESS ACCELEROMETERS

- Survive extreme temperature limits and rapid thermal cycling
- Survive extreme, random vibration levels
- High performance shear mode designs
- Charge mode and ICP® types

**Model 300A12**

Charge mode kit includes  
accelerometer, cable,  
and charge converter  
10 mV/g system sensitivity  
1 mV/(m/s<sup>2</sup>)  
10 to 10k Hz  
-100 to +500 °F  
-73 to +260 °C



**Model 320C20**

Quartz element  
10 mV/g  
1 mV/(m/s<sup>2</sup>)  
1.5 to 10k Hz  
-100 to +325 °F  
-73 to +163 °C

**Model 352B30**

Ceramic element  
10 mV/g  
1 mV/(m/s<sup>2</sup>)  
10 to 6000 Hz  
-65 to +250 °F  
-54 to +121 °C



### HANDHELD SHAKER

- Battery or line powered
- Tests accelerometers weighing up to 210 grams
- Auto shut-off

**Model 394C06**

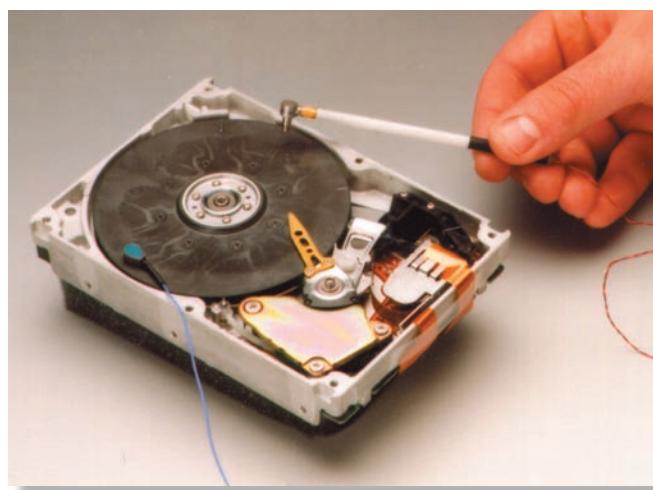
1 g (9.81 m/s<sup>2</sup>) pk or rms  
159.2 Hz



## MODALLY TUNED® ICP® IMPACT HAMMERS AND KITS

- Structural Stimulus and Impulse Response Measurements
- Investigation of Machinery Vibration Problems
- Resonance Determination
- Modal Analysis
- "Bump" Testing

Typical Hammer Kit



**Model 086C03**

10 mV/lb (2.2 mV/N) sensitivity  
8000 Hz frequency range  
0.34 lb (0.16 kg) hammer mass

# Vibration Sensors for Simulated and Extreme Environments



## SHOCK ACCELEROMETERS

- Pyroshock Studies
- Pile Driver Monitoring
- Metal-to-Metal Impacts
- Space Vehicle Separation Studies
- Package and Drop Testing
- Ballistic Projectile Impacts
- Payload Survivability Testing
- Package Durability Testing



**Model 350B21**  
0.05 mV/g  
0.005 mV/(m/s<sup>2</sup>)  
1 to 10k Hz  
100,000 g range



**Model 350B02**  
0.1 mV/g  
0.01 mV/(m/s<sup>2</sup>)  
4 to 10k Hz  
50,000 g range



**Model 350B03**  
0.5 mV/g  
0.05 mV/(m/s<sup>2</sup>)  
0.4 to 10k Hz  
10,000 g range

## SHOCK ACCELEROMETERS

- Measurements to 100,000 g (1,000,000 m/s<sup>2</sup>)
- Optional built-in electrical and mechanical filtering
- Individually qualified with high-amplitude Hopkinson Bar test
- ICP® and charge mode versions



## HIGH-TEMPERATURE ACCELEROMETERS

- High-Temperature Vibration and Shock Measurements
- Environmental Chambers
- Engine Vibration Measurements
- Hot Machinery
- Thermodynamic and Heat Transfer Equipment
- Motor, Pump, and Compressor Vibration Studies



**Model 357B71**  
10 pC/g  
1.02 pC/(m/s<sup>2</sup>)  
Response to 2000 Hz  
-65 to +900 °F  
-54 to +482 °C



**Model 357B61**  
10 pC/g  
1 pC/(m/s<sup>2</sup>)  
Response to 5000 Hz  
-65 to +900 °F  
-54 to +482 °C



**Model 356A71**  
10 pC/g  
1 pC/(m/s<sup>2</sup>)  
Response to 7000 Hz  
-95 to +490 °F  
-70 to +254 °C



**Model 357A09**  
1.7 pC/g  
0.17 pC/(m/s<sup>2</sup>)  
Response to 13k Hz  
-100 to +350 °F  
-73 to +177 °C



**Model 357B03**  
10 pC/g  
1 pC/(m/s<sup>2</sup>)  
Response to 12k Hz  
-95 to +500 °F  
-71 to +260 °C

## CHARGE OUTPUT ACCELEROMETERS

- Compatible with charge amplifiers and in-line charge converters
- Extended operating temperature ranges to 900 °F (482 °C)
- Highly sensitive, shear-mode, ceramic sensing elements

# Seismic, Low Frequency, and DC Acceleration Sensors

## SEISMIC ICP® ACCELEROMETERS

- Structural Testing of Bridges and Civil Structures
- Floor and Foundation Vibration Monitoring
- Semiconductor Manufacturing
- Earthquake Detection
- Building Vibration Monitoring
- Optical Instruments and Robotics
- Site Surveys for Sensitive Equipment or Processes



## FEATURES AND BENEFITS OF SEISMIC ICP® ACCELEROMETERS

- Detect the slightest motion with highly sensitive sensing elements
- Sensitivities from 1000 mV/g to 10 V/g  
100 mV/(m/s<sup>2</sup>) to 1 V/(m/s<sup>2</sup>)
- Measurements as low as 0.000001 g  
0.0000098 m/s<sup>2</sup>



**Model 393B05**  
10 V/g  
1.0 V/(m/s<sup>2</sup>)  
0.5 to 750 Hz  
4 µg resolution



**Model 393A03**  
1000 mV/g  
102 mV/(m/s<sup>2</sup>)  
0.3 to 4000 Hz  
10 µg resolution



**Model 393B31**  
10 V/g  
1.0 V/(m/s<sup>2</sup>)  
0.07 to 300 Hz  
1 µg resolution

## DC RESPONSE CAPACITIVE ACCELEROMETERS

- Ride Analysis
- Structural Analysis
- Robotics
- Uniform and Low-Frequency Acceleration
- Inclination or Tilt
- Slow-Rotating Machinery
- Foundation Monitoring
- Platform Motion Control
- Space Vehicle Stability Control



**Model 080A152**  
Easy mount clip



**Model 3701D3FA20G**  
20 g (196 m/s<sup>2</sup>) range  
0 to 500 Hz

**Model 3701G3FA3G**  
3 g (29 m/s<sup>2</sup>) range  
0 to 150 Hz



**Series 3703**  
Triaxial capacitive  
accelerometers  
Integral cable or  
9-pin connectors



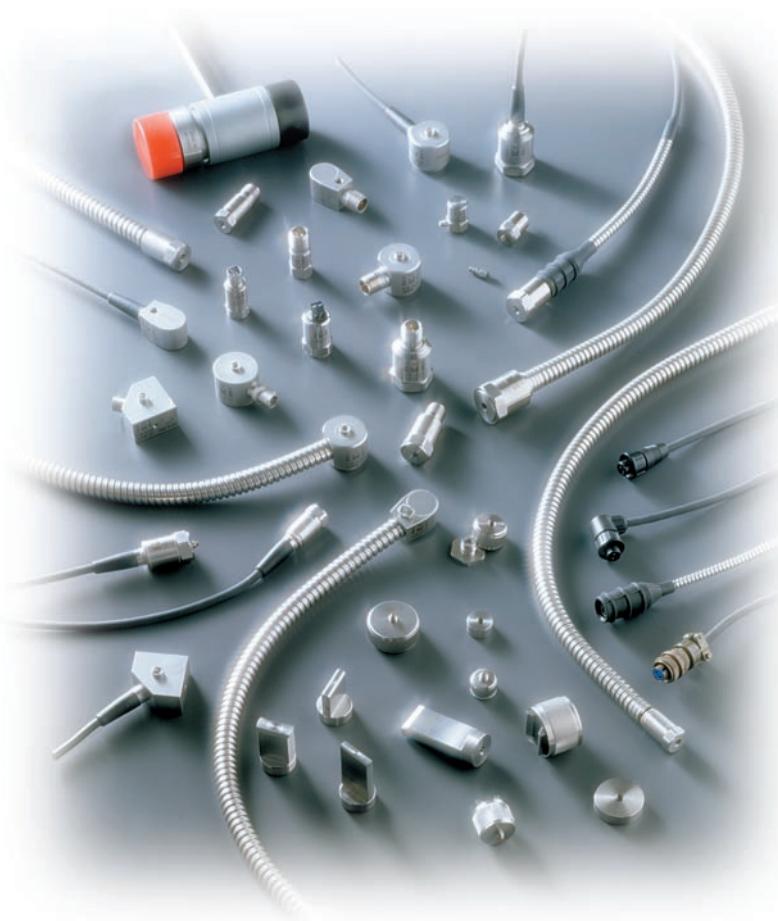
**Model 3801D3FB20G**  
20 g (196 m/s<sup>2</sup>) range  
0 to 400 Hz  
Ryton housing  
Low cost

## FEATURES AND BENEFITS OF CAPACITIVE ACCELEROMETERS

- Highly stable, capacitive sensing element
- Shock protection to 3000 g (30k m/s<sup>2</sup>)
- Electrically ground isolated
- Response from DC to 1000 Hz for low-frequency, uniform, and static acceleration measurements
- Measurements from 30 µg to 200 g (300 µm/s<sup>2</sup> to 2000 m/s<sup>2</sup>)
- Laser welded, hermetically sealed housings
- Lightweight titanium construction
- As low as 5 VDC excitation for battery-operated use
- Single axis, triaxial, and integral cable versions

Capacitive accelerometers utilize an opposed plate capacitor as their sensing element. A capacitance shift, caused by the deflection of a spring-mass as it is influenced by acceleration, provides precision measurements at low amplitude levels and low frequencies to DC. This design is inherently rugged, stable, and immune to cross axis influences.

# Industrial Accelerometers



**IMI SENSORS DIVISION SPECIALIZES IN  
RUGGED SENSORS AND INSTRUMENTATION THAT  
ENDURE HARSH, INDUSTRIAL ENVIRONMENTS**

- Industrial Accelerometers
- Industrial Velocity Sensors
- Swivel Mount, Easy-to-Install Sensors
- 4-20 mA Output Vibration Sensors
- 4-20 mA Vibration Transmitters
- Accelerometers with Temperature Output
- Intrinsically Safe Sensors and Enclosures
- Collection Point Switch Boxes

## PREDICTIVE AND PREVENTIVE MAINTENANCE

- IMI vibration sensors are used to detect imbalance, misalignment, bearing vibrations, gearbox vibrations, and looseness for machinery diagnostic and predictive maintenance requirements
- Condition monitoring with IMI vibration sensors promotes increased productivity and cost savings due to reduced downtime

### LOW-COST INDUSTRIAL ICP® ACCELEROMETERS

- Ideal for permanent installations and use with continuous, on-line monitoring systems
- Promotes safety when installed in hazardous or inaccessible locations
- Connect through junction box for route-based data collection schemes
- NIST traceable, single point calibration at 100 Hz



**Small Size, Low Cost  
Model 608A11**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.5 to 10k Hz  
30 to 600k cpm



**Triaxial, Low Cost  
Model 604A31**  
100 mV/g (all axes)  
10 mV/(m/s<sup>2</sup>)  
0.4 to 5000 Hz  
26 to 300k cpm



**Small Size, Low Cost  
Model 603C01**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.5 to 10k Hz  
30 to 600k cpm



**Low-Profile, Low Cost  
Model 602C01**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.5 to 8000 Hz  
30 to 480k cpm



**Quartz, Low Cost  
Model 627A01**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.3 to 10k Hz  
20 to 600k cpm

## SWIVEL MOUNT ACCELEROMETERS

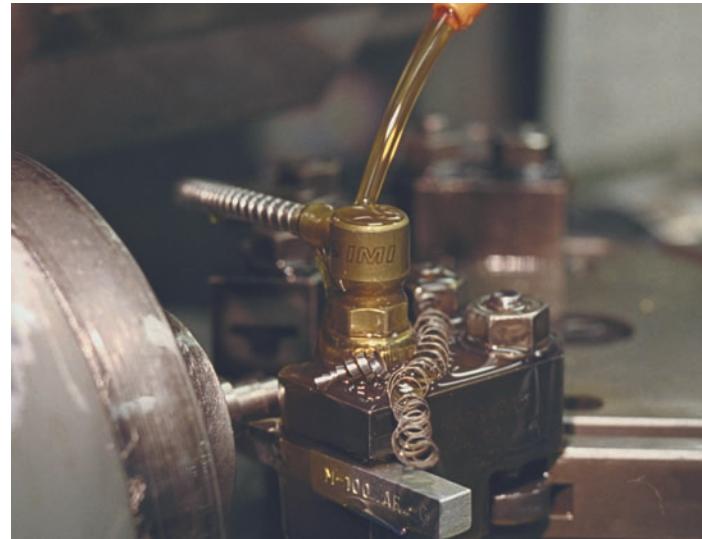
- Easy-to-Install, Patent Pending, Swivel Mount Design
- Cable Rotates Into Any Desired Orientation
- Less Costly Than Ring Style Sensors
- Ideal for Permanent Installations
- Electrically Protected From Saturation Problems
- Excellent for Use on High-Speed Rotating Machinery and Spindles



**Model 607A01 Swiveler®**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.5 to 10k Hz  
30 to 600k cpm



**Model 607A11 Swiveler®**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.5 to 10k Hz  
30 to 600k cpm



**Model 607A61 Spindler®**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.5 to 10k Hz  
30 to 600k cpm

## PRECISION INDUSTRIAL ICP® ACCELEROMETERS

- Ideal for roving use with route-based data collection schemes
- Utilize for effective machinery analysis and fault diagnostics
- Available with velocity output, temperature output, and hazardous area approvals (intrinsically safe)
- NIST traceable calibration through full frequency range



**Ceramic, General Purpose**  
**Model 625B01**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.2 to 10.5k Hz  
12 to 630k cpm



**Ceramic, High Sensitivity**  
**Model 622A02**  
500 mV/g  
51 mV/(m/s<sup>2</sup>)  
0.2 to 6000 Hz  
12 to 360k cpm



**Quartz, General Purpose**  
**Model 624A01**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.8 to 10k Hz  
48 to 600k cpm

**Ceramic, General Purpose**  
**Model 622A01**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.2 to 10k Hz  
12 to 600k cpm



**Quartz, General Purpose**  
**Model 628F01**  
100 mV/g  
10 mV/(m/s<sup>2</sup>)  
0.3 to 12k Hz  
20 to 720k cpm

## DC RESPONSE, INDUSTRIAL CAPACITIVE ACCELEROMETERS

- Ideal for vibration measurements on slow, rotating machinery
- Monitor vibration of large structures such as bridges, buildings, foundations, and floors
- Well suited for large fans, air handling equipment, cooling towers, and paper machine rolls



**Series 650**  
**Industrial Capacitive Accelerometers**  
Sensitivities from 10 to 1000 mV/g  
1 to 100 mV/(m/s<sup>2</sup>)  
Frequencies from DC to 1000 Hz  
DC to 60k cpm

# Vibration Indicators, Alarms, and 4-20 mA Vibration Transmitters

## INDICATORS/ALARMS FOR VIBRATION MONITORING

- Panel-Mount Vibration Indicators with Alarm Relays
- Time-Delayed Relay Action Eliminates False Triggering
- DIN-Rail Mount Alarm Modules, Sensor Signal Conditioners, and Power Supplies
- Enclosure Assemblies Fabricated to Meet Specific Requirements
- Interface to Existing Alarm, Control, and Monitoring Equipment
- Permit Vibration Monitoring by the Process Control Technician



**Model 682A03 ICP® Sensor to 4-20 mA Transmitter**

Provides constant current ICP® sensor excitation  
Adjustable low-pass and high-pass filtering  
Peak or rms proportional 4-20 mA output  
Selectable acceleration, velocity, or displacement output signal  
24 VDC powered, DIN rail mounted  
4-20 mA output proportional to temperature "TO" sensor option output



**Model 682A04 Relay Alarm Module**

Accepts 4-20 mA signal input  
Provides two, 5 A, Form C alarm relays  
DIN rail mount



**Series 683A Indicators/Alarms**

24 VDC excitation for 4-20 mA sensors  
Highly visible, fully scalable LED display  
Up to four, programmable, set point relays  
Time-delay eliminates false alarm trips  
User-friendly, menu-driven, set up



**Series 684A Alarm Module Enclosure**

For use with Series 683A Indicator/Alarm Module  
Accommodates up to 3 individual meters  
BNC output connections for analysis of dynamic signals  
NEMA-4X (IP66) enclosure

## 4-20 mA OUTPUT VIBRATION SENSOR TRANSMITTERS

- Loop Powered
- Install Permanently for Round-the-Clock Monitoring
- Acceleration or Velocity Output Signal Versions
- Interface Directly with PLC, DCS, Alarm, and SCADA Systems
- Effective Machinery Vibration Monitoring with Less Operator Training



**Series 640 Sensor Transmitters**

4-20 mA output  
2-wire, loop powered  
Acceleration or velocity output signal versions  
Optional analog output for frequency analysis  
Intrinsically safe models available



**Model 689B01 Vibration Signal Transmitter**

24 VDC powered  
Accepts input from ICP® accelerometers  
4-20 mA output proportional to peak velocity  
Analog output signal for diagnostics and analysis  
Enclosures containing multiple units are available

# Embeddable Accelerometers and Accessories

## Low Cost, EMBEDDABLE ACCELEROMETERS

- Choice of Standard TO-5 or TO-8 Transistor-Style Packages
- Choice of Charge Mode Piezoelectric or Voltage Mode ICP® Types
- Mountable via Adhesive or Soldering and Choice of Either Integral Cable or Solder Pin Electrical Connections
- Variety of Sensitivities to Accommodate a Wide Variety of Applications
- Broad Bandwidth, High Shock Survivability, and Wide Operating Temperature Range



Series 660 Embeddable Accelerometers



## SWITCH BOX ENCLOSURES, CABLES, MOUNTING HARDWARE, AND ACCESSORIES

- Simplify data collection by routing sensor cables to one central location
- Promote data collection safety by keeping workers out of hazardous areas
- Access more data points in less time



**Model 691B42 Rotary Switch Box**

For use with data collectors that supply ICP® sensor power  
12 input channels via terminal strip  
BNC output connections for vibration and temperature signals  
Versions to accommodate up to 48 channels  
NEMA-4X (IP66) enclosure



**Model 691B47 Rotary Switch Box**

For use with data collectors that supply ICP® sensor power  
16 input channels via terminal strip  
BNC output connections for vibration signal  
NEMA-4X (IP66) enclosure



**Model 691A50/12 BNC Termination Box**

For use with data collectors that supply ICP® sensor power  
12 input channels via terminal strip  
12 output channels via BNC's  
NEMA-4X (IP66) enclosure



**Magnetic Mounting Bases**

For temporary installations during route data collection  
Styles for flat or curved surface mounting  
Versions to accommodate virtually any size sensor



**Model 050FV010CV Cable Assemblies**

Styles for virtually any installation requirement  
Versions to interface with most data collectors  
Shielded cables for noise immunity



**Model 687A01 Portable Vibration Meter**

Measures overall rms vibration levels in g or in/sec pk  
3 1/2 digit LCD display  
Includes accelerometer, installation magnet, and headphones for audible monitoring of structure borne noise

# Load Cells



## STRAIN GAGE LOAD CELLS

- Accuracies to 0.07%
- General Purpose and Fatigue Rated Designs
- Variety of Configurations and Mounting Schemes
- Custom Engineered Units for Specialized Applications

## LOAD CELL APPLICATIONS

- Weighing
- Dynamometers
- Static Material Test Machines
- Automotive Ride Simulators
- Steering Column Impact Tests
- Brake Pedal Effort Studies
- Seat Belt Testing
- Crash Barriers

PCB's strain gage load cells are meticulously designed to meet the stringent demands of R & D and test application requirements. Robust construction and high stiffness impart high accuracy and repeatability.



**Series 1400 Fatigue Rated**  
Over 1 million fully reversed cycles  
Capacities from 250 lb to 250k lb FS  
1100 N to 250k N FS  
Accuracies to 0.07%  
Optional metric and rod-end mount versions



**Series 1100 and 1200 General Purpose**  
Capacities from 5 lb to 500 lb FS  
22 N to 500 N FS  
Accuracies to 0.07%  
Optional metric and rod-end mount versions



**Series 1300 Small Diameter**  
Capacities from 1000 to 50k lb FS  
4450 N to 2.2M N FS  
Tapped hole, rod-end, and metric versions



**Series 1500 S-Beam**  
Low cost  
Capacities from 100 lb to 10k lb FS  
445 N to 45k N FS  
Accuracies to 0.07%  
Optional metric and rod-end mount versions



**Series 1123 Ultra High Precision**  
High accuracy for demanding testing requirements  
Dual-bridge design offers two, redundant output channels  
High output sensitivity, high stiffness  
Robust construction  
Capacities to 150,000 lb (675k N)

## TORQUE SENSOR APPLICATIONS

- Engine Dynamometers
- Electric Motor Testing
- Automotive Ride Simulators
- Hydraulic Pump Testing
- Fan Testing
- Steering Wheel Effort Studies
- Brake Torque Measurements

PCB offers a variety of reliable strain gage torque sensors for both rotating torque and reaction torque measurements. A choice of signal transmission technologies assures the best suited approach for satisfying specific needs.



Photo courtesy of Mustang Dynamometer



### Series 5300 TORKDISC®

Compact and lightweight  
Non-contact, digital telemetry signal transmission  
Capacities from 1000 in-lb to 660k in-lb FS  
113 N-m to 74.5k N-m FS  
Immune to RF interference

## TORQUE SENSORS

- Reaction Torque and Rotating Torque Types
- Rotating Transformer, Slip Ring and Digital Telemetry Styles
- Shaft, Flange, and Spline Mounting Configurations
- Multicomponent Torque and Thrust Sensors
- Custom Engineered Units for Specialized Applications



### Series 4100 Rotary Transformer Torque Sensor

Less noise and maintenance than slip ring types  
Capacities from 50 in-oz to 100k in-lb FS  
0.0353 N-m to 11.3k N-m FS  
Accuracies to 0.07%  
Shaft, flange and spline end versions



### Series 6100 Torque - Thrust Sensor

Measure torque and thrust simultaneously  
Fatigue rated to over 10 million cycles  
Capacities from 500 in-lb/500 lb to 100k in-lb/200k lb FS  
56.5 N-m/22.24 N to 11.3k N-m/445k N FS

# Dynamic Force Sensors



## A BROAD SELECTION OF DYNAMIC COMPRESSION, TENSION, AND IMPACT SENSORS FOR TEST, MEASUREMENT, CONTROL, AND R&D APPLICATIONS

- General Purpose Designs
- Ring, Link, and Impact Configurations
- Multi-Axis Types
- Charge Output and ICP® Sensor Versions
- Miniature and High Sensitivity

PCB's dynamic force sensors feature rugged, solid-state construction for durability and long life in repetitive crimping, forming, pressing, punching, and other similar operations. Each sensor has both a high resonant frequency and the ability to measure quasi-static events, making the sensors ideally suited for measuring forces across a varied range of amplitudes and frequencies.

## MATERIALS AND PRODUCT TESTING

- Package Drop Testing
- Product Durability Studies
- Crash Testing
- Fracture Analysis
- Penetration Testing
- Reaction Forces
- Materials Strength and Break-Point Tests
- Fatigue Testing



### Series 208C

Ranges from 10 lb to 5000 lb FS  
45 N to 22k N FS  
Resolution to 0.0001 lb (0.00045 N)  
Small size: 5/8 hex x 0.625 in (16 mm) height  
Threaded ends for tension or compression installations

*Shown with removable impact cap*

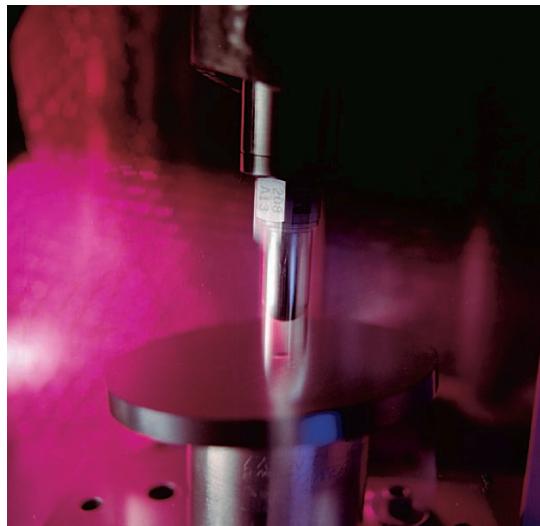
*Shown with removable impact cap*



**Penetration Style**  
with smooth body and hemispherical impact cap for materials testing requirements



**Axial Connector Styles**  
keep connector out of harms way



## GENERAL PURPOSE DYNAMIC ICP® FORCE SENSORS

- Dynamic compression, tension, and impact
- Welded, hermetically sealed, submersible construction
- Fast response time accurately captures force transients

# Dynamic Force Sensors

## MANUFACTURING AND QUALITY CONTROL

- Wire Harness Crimp Monitoring
- Punch and Tablet Presses
- Stamping and Crimping
- Feedback Control of Production Processes
- Machinery Balancing
- Metal Forming Operations
- Product Quality Assurance



CE

### Series 200 Impact Styles

Compression ranges from 10 lb to 50k lb FS  
45 N to 220k N FS



CE

### Series 220 Link Styles

Compression ranges from 10 lb to 50k lb FS  
45 N to 220k N FS  
Tension ranges from 10 lb to 30k lb FS  
45 N to 130k N FS  
Resolution to 0.0002 lb (0.0009 N)  
Variety of sizes to fit most installations



CE

### Series 201 Ring Styles

Ranges from 10 lb to 100k lb FS  
45 N to 450k N FS  
Resolution to 0.0002 lb (0.0009 N)  
Variety of sizes to fit most installations



### Series 260 3-Component

Ranges from 1000 lb to 10k lb FS  
4500 N to 45k N FS



## MULTI-COMPONENT DYNAMIC FORCE SENSORS

- Simultaneous measurements in three orthogonal directions
- Versatile mounting arrangements
- Welded, hermetically sealed, submersible construction
- ICP® and charge output versions



## COMPRESSION, TENSION, AND IMPACT FORCE MEASUREMENTS

- Machine Tool Monitoring
- Force-Limiting Vibration Testing
- Engine and Machinery Mount Monitoring
- Crash Testing
- Biomechanics
- Collision and Drop Testing

# Dynamic Pressure Sensors



## DYNAMIC PRESSURE SENSORS

- General Purpose
- High Sensitivity
- High Frequency
- Shock Wave / Blast / Explosion
- Ballistics
- Engine Combustion
- High Temperature
- Cryogenic
- Sub-Miniature
- Rocket Motor
- Intrinsically Safe Sensors
- Heavy-Duty Industrial
- Power Generation
- Automotive Test

PCB's dynamic pressure sensors utilize piezoelectric sensing technology and feature extremely fast rise times due to their inherent stiffness. Each sensor encompasses wide dynamic amplitude and frequency ranges and is uniquely suited for measuring small fluctuations in the presence of high static pressures.

### GENERAL PURPOSE DYNAMIC ICP® PRESSURE SENSORS

- Variety of mounting configurations with probe, adaptor, and clamp nut components
- Welded, hermetically sealed, stainless steel construction
- Extremely fast response with resonant frequencies to 500k Hz



**Typical Series 111, 112, and 113 Probe Style Sensors**  
Ranges from 50 psi to 20k psi FS  
3.5 bar to 1380 bar FS  
Resolution to 0.001 psi (0.00007 bar)  
Resonant frequency to 500k Hz



**Probe Style Sensor**  
installed into thread adaptor



**Straight Thread and Pipe Thread Adaptors**  
permit installation of probe style sensors into  
a variety of pressure ports



**Threaded Adaptor**  
with lock nut for flush  
mount installations

# Dynamic Pressure Sensors

## EXPLOSION, BLAST, AND SHOCK WAVE PRESSURE SENSORS

- Free-Field Blast
- Underwater Blast
- Closed Bomb Tests
- Shock Wave and Time-of-Arrival
- Shock Tube Research
- Detonations
- Atmospheric Re-Entry Studies



### Series 137 Free-Field Blast Pressure Probes

Ranges from 50 psi to 5000 psi FS  
3.5 bar to 350 bar FS

Rise time <4 psec  
Resonant frequencies beyond 500k Hz



CE

### Series 138 Underwater Blast Pressure Probes

Ranges from 1000 psi to 50k psi FS  
70 bar to 3500 bar FS

Rise time <1.5 psec  
Resonant frequencies beyond 1M Hz



### Series 132 High Frequency Micro-Sensors

Respond to shock waves for time-of-arrival measurements  
50 psi (3.5 bar) range FS

Rise time <0.5 psec  
Resonant frequencies beyond 1M Hz  
0.125 in (3.18 mm) diameter diaphragm



## BALLISTICS PRESSURE SENSORS

- Ammunition Testing
- SAAMI-Approved Conformal Ballistics Sensors
- Weapons Testing
- Propellant Studies
- Projectile Velocity Measurements
- High-Frequency Detonations



### Series 117 Conformal Ballistics Pressure Sensors

match diameter of ammunition cartridges to measure generated pressure without modifying cartridge cases

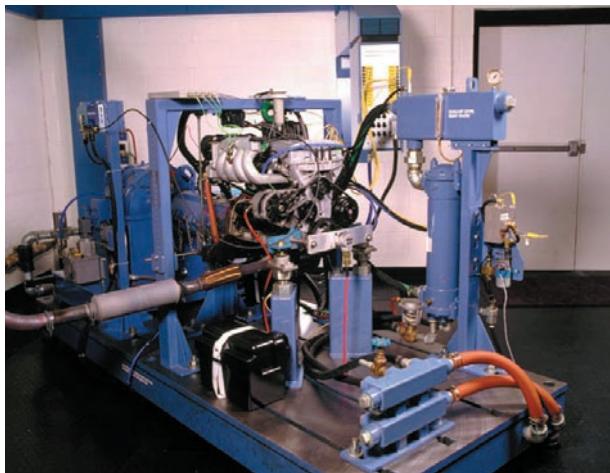
Patented in the USA and other countries



### Series 118, 119, and 165 Case-Mouth Ballistics Pressure Sensors

available in a variety of mechanical configurations to retrofit into existing machined ports

# Dynamic Pressure Sensors



## AUTOMOTIVE AND ENGINE PRESSURE TEST SENSORS

- Engine Combustion
- Cylinder Compression
- Fuel Injection
- Intake and Exhaust Pulsations
- Knock / Timing
- Braking Systems
- Rocket Engines
- Aircraft Engines



**Series 116B High Temperature, High Sensitivity Pressure Sensor**  
Suitable for exhaust pulsation studies



**Model 105C43 Fuel Injection Pressure Sensor**

**Series 105 Miniature ICP® Pressure Sensors**  
Diaphragms as small as 0.099 inch  
Ranges from 100 to 30K psi FS  
Suitable for injector and steering system pulsation studies

## HIGH INTENSITY ACOUSTICS, HYDRAULICS, AND PNEUMATICS

- Jet Engine Noise
- Pump and Compressor Monitoring
- Water Hammer Detection
- HVAC Equipment
- Air Turbulence
- Pressure Pulsations and Surges



**Series 103 Microphones**  
Flutter testing  
High intensity acoustic studies  
Wind tunnel testing



**Model 106B High Intensity, ICP® Sound Pressure Sensor**  
Measures low pressure acoustics in pneumatic and hydraulic environments



**Series 123 and 124 Rocket Engine Test Sensors**  
Water-cooled  
Helium-cooled  
For qualification and stability testing



**Series 121A Industrial Pressure Sensors**  
Rugged design  
Suitable for detecting pumping pulsations and water hammer problems

# Pressure Transducers and Transmitters

## PRESSURE TRANSDUCERS AND TRANSMITTERS

- Monitor Heavy Equipment and Industrial Processes for Feedback and Control Purposes
- Acquire Precise Data for Research, Development, and Laboratory Test Applications
- Check the Performance of Distribution Stations, HVAC Equipment, and Hydraulic Systems
- Obtain Accurate Liquid-Level / Depth Measurements in Tanks, Reservoirs, Sumps, and Bore Holes

PCB's pressure transducers and transmitters utilize a highly stable, atomically-fused, thin-film sensing element without use of adhesives or fluid filling. The result is a robust sensor that possesses the accuracy necessary for rigorous testing requirements yet is economically attractive for use in process control applications.



### SERIES 1500 PRESSURE TRANSDUCERS AND TRANSMITTERS

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



# Sensor Signal Conditioners



- Battery-Powered Signal Conditioners
- Line-Powered Signal Conditioners
- Multi-Channel Signal Conditioners
- Charge Amplifiers
- In-Line Charge and Voltage Amplifiers
- Meters and Monitors
- Capacitive Sensor Signal Conditioners
- Modular Signal Conditioners
- Computer Control
- TEDS Option

## SENSOR SIGNAL CONDITIONERS

- Prepare sensor signals for input to readout devices and data acquisition equipment
- Condition signals with gain, filtering, rms conversion, and integration
- Optional versions offer output switching, computer control, AC or DC coupling, TEDS capability, and more



**Model 482A21**  
ICP® sensor signal conditioner  
Unity gain  
AC/DC (optional) powered



**Model 442B06**  
ICP® sensor signal conditioner  
Selectable AC or DC coupled output  
Gain x1, x10, x100  
Single channel, line powered



**Model 443B02**  
Charge amplifier and ICP® sensor signal conditioner  
Keypad or RS-232 controlled  
Variable gain, filtering, and integration  
TEDS Read/Write



**Model 480E09**  
ICP® sensor signal conditioner  
Gain x1, x10, x100  
Battery powered



**Model 478A01**  
Capacitive accelerometer signal conditioner  
Unity gain  
DC offset adjust



**Model 481A02**  
ICP® sensor signal conditioner  
Gain x1, x10, x100  
Sixteen channel  
Rack mount, line powered  
Optional voltage signal and charge mode sensor versions

## IN-LINE CHARGE CONVERTERS

- Powered by ICP® sensor signal conditioners
- Convert charge sensor signals to low impedance voltage signals
- Drive signals over long cable lengths



**Model 422E12**   **Model 422E13**  
10 mV/pC      1 mV/pC

# Sensor Signal Conditioners



## CONSTANT-CURRENT SIGNAL CONDITIONERS

- Battery and Line Powered
- Single and Multi-Channel
- Optional Gain and Integration
- AC and DC Coupled Output
- Optional Output Channel Switching



## MODULAR SIGNAL CONDITIONERS

- Pre-Configured Versions
- Custom Tailored Systems
- Single and Multi-Channel Plug-In Modules
- Unity and Adjustable Gain Versions
- AC and DC Coupled Output
- 16 Channel Bank Switching
- Smart Sensor TEDS Compatible (IEEE P1451.4)
- TEDS Option



## MULTI-CHANNEL SIGNAL CONDITIONERS

- Up to 16 Channels Per Unit
- ICP®, Voltage, or Charge Sensor Inputs
- Optional Gain and Integration
- Optional Low-Pass, Anti-Alias Filtering
- Optional Output Channel Switching
- Optional Computer Control

# Stock Cables and Accessories

## ACCESSORIES

PCB offers a wide variety of cables, connectors, and mounting hardware. Shown below are several stock accessory items. In addition to those listed, PCB has many other options available, including custom-built cables. Consult a factory application engineer for complete details on available accessories.



### ADHESIVE MOUNTING BASES

- |        |   |
|--------|---|
| 080A   | 0.5" hex x 0.187" (4.75 mm) thk, accepts 10-32 stud |
| 080A12 | 0.75" hex x 0.20" (5 mm) thk, accepts 10-32 stud    |
| 080A15 | 0.318" hex x 0.125" (3.2 mm) thk, accepts 5-40 stud |

### MAGNETIC MOUNTING BASES

- |        |  |
|--------|--|
| 080A27 | 0.75" hex x 0.27" (6.85 mm) thk, high-strength magnetic base with integral 10-32 threaded stud |
| 080A30 | 0.375" hex x 0.23" (5.8 mm) thk, high-strength miniature magnet, accepts 5-40 stud             |



### MOUNTING STUDS

- |        |                                |
|--------|--------------------------------|
| 081B05 | 10-32 to 10-32 with shoulder   |
| 081A08 | 10-32 to 1/4-28 adaptor stud   |
| 081B20 | 1/4-28 to 1/4-28 with shoulder |



### CONNECTOR ADAPTORS

- |        |   |
|--------|---|
| 070A02 | Scope Input Adaptor: 10-32 coaxial jack to BNC plug                         |
| 070A05 | 10-32 Coaxial Feed-Thru Connector: 10-32 coaxial jack to 10-32 coaxial jack |
| 070B09 | Solder Connector Adaptor: 10-32 coaxial plug to solder terminals            |
| 070A08 | Cable Adaptor: 10-32 coaxial jack to BNC jack                               |



### TRIAXIAL MOUNTING ADAPTORS

- |        |  |
|--------|--|
| 080C10 | Anodized AL, 0.87" cube, accepts 10-32 stud  |
| 080B11 | Anodized AL, 1.25" cube supplied with 10-32 cap screws for block and sensor mounting |
| 080B16 | Anodized AL, 0.37" cube, accepts 5-40 stud   |

## STOCK CABLES

### Series 002 General Purpose White Coaxial Cable

### Series 003\* Low-Noise Blue Coaxial Cable

### 10-32 COAXIAL PLUG TO BNC PLUG



- |              |                |               |                |
|--------------|----------------|---------------|----------------|
| 3 ft (0.9 m) | 002C03, 003C03 | 10 ft (3.0 m) | 002C10, 003C10 |
| 5 ft (1.5 m) | 002C05, 003C05 | 20 ft (6.1 m) | 002C20, 003C20 |

### 10-32 COAXIAL PLUG TO 10-32 COAXIAL PLUG



- |              |                |               |                |
|--------------|----------------|---------------|----------------|
| 3 ft (0.9 m) | 002A03, 003A03 | 10 ft (3.0 m) | 002A10, 003A10 |
| 5 ft (1.5 m) | 002A05, 003A05 | 20 ft (6.1 m) | 002A20, 003A20 |

### Series 012\* RG-58/U Coaxial Cable

### BNC PLUG TO BNC PLUG



- |               |        |                |        |
|---------------|--------|----------------|--------|
| 3 ft (0.9 m)  | 012A03 | 20 ft (6.1 m)  | 012A20 |
| 10 ft (3.0 m) | 012A10 | 50 ft (15.2 m) | 012A50 |

### Series 010\* Triaxial Cable

### 4-PIN PLUG TO THREE BNC PLUGS



- |               |        |               |        |
|---------------|--------|---------------|--------|
| 5 ft (1.5 m)  | 010G05 | 15 ft (4.6 m) | 010G15 |
| 10 ft (3.0 m) | 010G10 | 20 ft (6.1 m) | 010G20 |

\*Maintains CE conformance







# Worldwide Offices

## Worldwide Headquarters

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Oceana Sensor Technologies, Inc. — [www.oceanasensor.com](http://www.oceanasensor.com)  
Phone: (757) 426-3678

STI Technologies, Inc. — [www.sti-tech.com](http://www.sti-tech.com)  
Phone: (585) 424-2010

IMI Sensors Division — [www.imi-sensors.com](http://www.imi-sensors.com)  
Toll-Free: (800) 959-4464

The Modal Shop, Inc. — [www.modalshop.com](http://www.modalshop.com)  
Toll Free: (800) 860-4867



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ISO 9001 CERTIFIED

A2LA ACCREDITED to ISO 17025

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