Vibration, Shock & Acceleration
Accelerometers for Test, Measurement & Research & Development

Typical Applications

Product Testing
- Appliance Design
- Drop Testing
- Modal Analysis
- Package Testing
- Quality Assurance
- Shaker Control
- Sporting Equipment
- Structural Testing
- Vibration Control
- Vibration Stress Screening

Automotive & Transportation
- Balancing
- Body-in-white
- Crash Testing
- Drive Train Performance
- Dynamometer Testing
- NVH Studies
- Ride Simulation
- Road Response
- Squeak & Rattle Detection

Aerospace & Aviation
- Flight Flutter
- Flight Testing
- Ground Vibration Testing (GVT)
- HUMS
- Jet Engine Testing
- Landing Gear Response
- Launch Vehicle Monitoring
- Simulated Pyroshock

Research & Education
- Animal Studies
- Environmental Simulation
- Impact & Penetration Studies
- Seismic Monitoring
Vibration, Shock & Acceleration

PCB® offers a vast selection of accelerometers to accommodate anything from routine measurement tasks to extraordinary testing requirements. Whether it’s a cell phone quality assurance test or continuous monitoring of an aircraft engine, we can help, with sensors which are off-the-shelf or custom designed for a specific application.

What are ICP® sensors?
Integrated Circuit Piezoelectric (ICP®) sensors contain built-in microelectronic signal conditioning circuitry – yet operate over just two wires. This circuitry requires constant current excitation and serves to convert the high-impedance charge signal generated by the piezoelectric crystal into a low-impedance voltage signal, for ease of signal transmission and analysis. Low-cost coaxial or two-wire cables may be utilized with ICP® sensors. Signal fidelity is relatively unaffected by contamination or moisture. ICP® sensors offer trouble-free operation in dirty, industrial environments or submerged in liquids.

Generally, ICP® sensors are more cost effective and easier to use than charge output piezoelectric sensors; however, their temperature range is limited by the survivability of the built-in microelectronic circuitry.

General Purpose ICP® Accelerometers

- Lightweight titanium or aluminum construction
- Shear mode sensing geometry
- Resistant to base strain & thermal transient effects
- Laser-welded
- Hermetically sealed (most models)
- Adhesive & stud mount styles

Model 352A73
- 5 mV/g
- 0.51 mV/(m/s²)
- 1.5 to 25kHz
- 0.3 gm
- Attached cable

Model 352C22
- 10 mV/g
- 1.0 mV/(m/s²)
- 0.7 to 13kHz
- 0.5 gm
- 3-56 coaxial connector

Model 352A21
- 10 mV/g
- 1.0 mV/(m/s²)
- 0.7 to 13kHz
- 0.6 gm
- 3-56 coaxial connector

Model 353B17
- 10 mV/g
- 1.0 mV/(m/s²)
- 0.7 to 20kHz
- 1.7 gm
- Integral cable

Model 352C65
- 100 mV/g
- 10.2 mV/(m/s²)
- 0.3 to 12kHz
- 2.0 gm
- 5-44 coaxial connector

Model 352A73
- 10 mV/g
- 1.0 mV/(m/s²)
- 1.5 to 25kHz
- 0.3 gm
- 3-56 coaxial connector

Model 353B33
- 100 mV/g
- 10.2 mV/(m/s²)
- 0.7 to 6500Hz
- 27 gm
- 10-32 coaxial connector

Model 352C33
- 100 mV/g
- 10.2 mV/(m/s²)
- 0.5 to 10kHz
- 5.8 gm
- 10-32 coaxial connector

Model 352C44
- 100 mV/g
- 10.2 mV/(m/s²)
- 0.5 to 10kHz
- 3.0 gm
- 10-32 coaxial connector

Model 355B03
- 100 mV/g
- 10.2 mV/(m/s²)
- 0.6 to 12kHz
- 10 gm
- 10-32 coaxial connector
**Triaxial ICP® Accelerometers**
- Measure in three orthogonal directions
- Lightweight titanium construction
- Shear mode sensing geometry
- Single-point hookup for cable or connector

**Model 356A01**
- 5 mV/g
- 0.51 mV/(m/s²)
- 2 to 8000 Hz
- 1.0 gm
- Integral cable

**Model 356A15**
- 100 mV/g
- 10.2 mV/(m/s²)
- 1.4 to 6500 Hz
- 10.5 gm
- 1/4-28, 4-pin connector

**Model 356B21**
- 10 mV/g
- 1.02 mV/(m/s²)
- 2 to 10kHz
- 4 gm
- 8-36, 4-pin connector

**Model 356A34**
- 50 mV/g
- 5.1 mV/(m/s²)
- 0.7 to 5000 Hz
- 6.6 gm
- 1/4-28, 4-pin connector

**Model 356A17**
- Triaxial ICP® accelerometer
- 500 mV/g
- 51 mV/(m/s²)
- 0.3 to 4000 Hz
- 1/4-28, 4-pin connector

**Model 356B18**
- Triaxial ICP® accelerometer
- 1000 mV/g
- 102 mV/(m/s²)
- 0.3 to 5000 Hz
- 25 gm
- 1/4-28, 4-pin connector

**Structural Testing & Modal Analysis Products**
- ICP® accelerometers with excellent phase characteristics & lightweight construction to minimize mass loading effects
- Intelligent mounting, signal conditioning, & cable routing schemes
- TEDS options — sensors with on-board memory, which report their identity & sensitivity
- Ideal for large channel count and MIMO tests

**Model 333B32**
- Single axis ICP® accelerometer
- 100 mV/g
- 10.2 mV/(m/s²)
- 0.5 to 3000 Hz
- 4.0 gm
- 10-32 coaxial connector

**Model 333B52**
- Single axis ICP® accelerometer
- 1000 mV/g
- 102 mV/(m/s²)
- 0.5 to 3000 Hz
- 7.5 gm
- 10-32 coaxial connector

**Model 333B**
- Single axis ICP® accelerometer
- 100 mV/g
- 10.2 mV/(m/s²)
- 2 to 1000 Hz
- Plug-in socket base

**Model 086C03**
- Modally Tuned® ICP® Impact Hammer
- 10 mV/lbf
- 2.25 mV/N
- Frequencies to 8000 Hz
- 0.16 kg hammer mass
High Temperature, Charge Output Accelerometers

- Engines
- Environmental chambers
- Gas turbines
- Radioactive environments

Model 357B06
- Through-hole mounted
- 5 pC/g
- 0.51 pC/(m/s²)
- Response to 15k Hz
- 2.3 gm
- -65 to +500 °F
- -54 to +260 °C

Model 357A09
- 1.7 pC/g
- 0.17 pC/(m/s²)
- Response to 13k Hz
- 0.6 gm
- -100 to +350 °F
- -73 to +177 °C

Model 357B81
- 20 pC/g
- 2.04 pC/(m/s²)
- Response to 9000 Hz
- 50 gm
- -65 to +500 °F
- -54 to +260 °C

Model 357B53
- Radiation-hardened
- 100 pC/g
- 10.2 pC/(m/s²)
- Response to 3500 Hz
- 51 gm
- -95 to +500 °F
- -71 to +260 °C

Model 357B03
- 10 pC/g
- 1.02 pC/(m/s²)
- Response to 12k Hz
- 11 gm
- -95 to +500 °F
- -71 to +260 °C

Model 357B61
- Radiation-hardened
- 10 pC/g
- 1.02 pC/(m/s²)
- Response to 5000 Hz
- 30 gm
- -65 to +900 °F
- -54 to +482 °C

Model 357C72
- Differential Output
- 50 pC/g
- 5.1 pC/(m/s²)
- Response to 2500 Hz
- 110 gm
- -65 to +900 °F
- -54 to +482 °C

Model 340A50
- Triaxial, miniature
- 2.7 pC/g
- 0.28 pC/(m/s²)
- Response to 10k Hz
- 11.0 gm
- -94 to +500 °F
- -70 to +260 °C
Vibration, Shock & Acceleration

Shock ICP® Accelerometers
- Individually qualified with high-amplitude Hopkinson Bar test
- Versions with internal filters for resonance suppression

Low Temperature ICP® Accelerometers
- Cryogenic pump testing
- Liquefied gas delivery systems
- Vacuum pump testing

Low Frequency ICP® Accelerometers
- Bridges & civil structures
- Building vibration
- Floor & foundation monitoring
- Optical instrument studies
- Semiconductor manufacturing
- Site surveys for sensitive equipment
MEMS DC Response Accelerometers

PCB® MEMS DC response accelerometers, available in piezoresistive and capacitive types, measure static or constant acceleration without a low frequency cut-off restriction, as frequency response extends to 0 Hz.

- Aerospace satellite & launch vehicle vibration
- Automotive crash sled testing
- Automotive road & load measurements
- Aviation ground vibration & flight testing
- Centrifuges
- Gravitational force

![Model 3711D1FA3G High Sensitivity DC Response](image)
- 700 mV/g
- 71.4 mV/(m/s²)
- 0 to 100 Hz
- 14.5 g
- Titanium housing
- Welded case, hermetically sealed

![Model 3713D1FD3G Triaxial High Sensitivity DC Response](image)
- 700 mV/g
- 71.4 mV/(m/s²)
- 0 to 100 Hz
- 78.1 g
- Titanium housing
- Welded case, hermetically sealed

![Model 3741D4HB200G High Sensitivity DC Response](image)
- 10 mV/g
- 1.02 mV/(m/s²)
- 0 to 1500 Hz
- 9.92 g
- Anodized aluminum case

MEMS High Amplitude 20,000 g Shock Accelerometers

PCB® MEMS high amplitude shock accelerometers, available in single and triaxial versions, can measure long duration transient motion, and respond to very fast rise times, typical of high-g shock events. Models offer a full active Wheatstone bridge, with 30,000 g internal mechanical stops and ± 60,000 g overshock limit, and are drop-in replacements for competitive models.

- Fuze / Safe & Arm applications
- Weapons data recorders
- Pile drying/Jackhammer testing
- Canon / mortar firings
- Crash / impact / drop testing
- Penetrator tests

Common Specifications
- 0 to ±20,000 g range
- 0.001 mV/V/g
- 5 % damping
- 2-15 VDC Excitation

![Model 3501A2120KG Single Axis](image)
- 0.01 gm
- Flip Chip
- Solder ball mounting

![Model 3911A3020KG Single Axis](image)
- 0.04 gm
- Substrate housing
- Adhesive mounting

![Model 3501A2020KG Triaxial](image)
- 0.15 gm
- Ceramic LCC
- Leadless chip carrier
- SMT mounting

![Model 3991A1020KG Single Axis](image)
- 1.28 gm
- Titanium housing
- Integral Aramid cable (3 ft/0.9 m)
- Through-hole mounting

![Model 3501A1320KG Single Axis](image)
- 3 gm
- Titanium housing
- Integral copper cable (10 ft/3.1m)
- 1/4-28 Thread

![Model 3501A1220KG Single Axis](image)
- 3 gm
- Titanium housing
- Integral copper cable (10 ft/3.1m)
- 1/4-28 Thread

![Model 3601A11 Single Axis](image)
- 2 gm
- Aluminum housing
- Integral copper cable, side exit (23R/7m)
- Through-hole mounting

![Model 3503A12020KG Triaxial](image)
- 2.5 gm
- Titanium housing
- Integral copper cable (10 ft/3.1m)
- Through-hole mounting

![Model 3503A2020KG Triaxial](image)
- 0.10 gm
- Ceramic LCC
- SMT mounting
Flight Test Accelerometers – For Civilian and Military Applications

For 40 years, PCB® has assisted customers in the Aerospace and Defense industries, with the design and manufacture of sensors for flight testing and monitoring of fixed wing, rotary aircraft, missiles and launch vehicles. In addition, when testing and monitoring applications require specialized sensor packaging, testing, or performance, PCB® can provide sensors that are custom engineered to meet demanding or unusual tasks. The sensors below represent a small sample of such units.

Quality Standards:
AS9100:2004 certified; ISO 9001:2000 certified; A2LA accredited to ISO 17025; Manufacturing capabilities to certain MIL & aerospace standards; Some designs have been qualified to RTCA-160E.

Recent Programs:
Airbus A380; Boeing 787; Delta Launch; F-18 Flight Test; GEnx™ Engine; Ground Missile Defense (GMD); National Missile Defense; Titan launch vehicle.

Accelerometers for On-board Diagnostics, Engine Monitoring, ROTABS & Health and Usage Monitoring Systems (HUMS)

- ICP® & charge output types; ceramic & quartz sensing elements
- Molded integral cable; case isolated to reduce ground loop interference/EMI
- Hermetically sealed, stainless steel or Inconel® housing
- Operating temperatures to +900 °F (+482 °C)

Model 337A31
ICP® Accelerometer
- 10 mV/g
- 1.02 mV/(m/s²)
- 1 to 5000 Hz
- Temperature range: -60 to +250 °F (-53 to +121 °C)
- HUMS/Mechanical Diagnostics

Model 357C73
Charge Output Accelerometer
- 100 pC/g
- 10.2 pC/(m/s²)
- Response to 2000 Hz
- Temperature range: -65 to +900 °F (-54 to +482 °C)
- High temperature engine monitoring

Model 337A30
ICP® Accelerometer
- 10 mV/g
- 1.02 mV/(m/s²)
- 1 to 1000 Hz
- Temperature range: -30 to +250 °F (-35 to +121 °C)
- HUMS/Mechanical Diagnostics

Sensors for Flutter, Buffeting & Load Factor Tests

Series 3741
High Sensitivity DC Response Accelerometer
- Offered in ranges from 2 to 200 g
- Differential output
- Low-profile design, for mounting on restricted areas of aircraft wings
- Gas damped, temperature compensated for stable measurement in varying environments
- Isolated anodized aluminum housing
- Triaxial mounting block available
- Flutter measurements, extremely low frequency measurements

Model 355B33
Ring-Style, Quartz ICP® Accelerometer
- 100 mV/g
- 10.2 mV/(m/s²)
- 2 to 5000 Hz
- Ring-style, stable quartz shear sensing element
- Vibration measurements on large fixed wing aircraft

Model 352C43
Low-profile, Miniature ICP® Accelerometer
- 10 mV/g
- 1.02 mV/(m/s²)
- 2 to 8000 Hz
- Ground isolated
- Optional high temperature
- Ground vibration testing; modal & structural vibration analysis; general shock & vibration measurement
Special Purpose Products

PCB® offers customers the option to tailor sensors and instrumentation to satisfy virtually any application requirement. Capabilities range from single-copy, exclusive-use devices, to high volume sensors. An extensive commitment of resources for the design, development, manufacture, and test of sensors and instrumentation allows PCB® to respond to customer’s needs. Models offered in this section are only a minor representation of available special purpose products. For more information, please consult factory.

Model HVM100 Human Vibration Meter

- Collects Hand-Arm & Whole-Body vibration data
- Meets ISO 5346/2631 & EU exposure directives, including 2002/44/EC & HSE (UK) recommended points system
- Connects to single axis, triaxial & ICP® accelerometers
- Offers filtering, integration & data storage
- Available with dedicated sensors & adaptors for hand tool & seat pad studies
- Provides instantaneous tool assessments with HVManager™ software
- Offloads data to PC for further analysis & reporting with Blaze® software.

HVManager™ Software

- Creates a tool-based human vibration level database
- Projects tool users daily cumulative vibration exposure
- Simplifies tool use management, to stay within legal limits
- Presents vibration exposure time history graphs for X, Y, Z sum
- Supports compliance with ISO and EC directives

Model 356B41 Seat Pad Triaxial ICP® Accelerometer

- 100 mV/g
- 10.2 mV/(m/s²)
- 0.5 to 1000 Hz
- Integral cable
- 7.87” W × 0.472” H (200 x 12 mm)
- Operates directly with HVM100 for ride comfort studies

- Meets ISO 10326-1, ISO 2631 & ISO 8041 standards; supports compliance with EU Physical Agents Directives

Model 394C06 Handheld Shaker

- Conducts field check of accelerometer sensitivity
- Offers end-to-end system testing and troubleshooting
- Generates 1 g pk or 1 g rms at 159.2 Hz
- Battery operated, AC adaptable
- Provides 80 to 1600 calibration cycles, depending on accelerometer weight

LaserTach™ ICP® Tachometer

- Simplifies acquisition of rotational speed signals
- Operates via ICP® sensor signal conditioning
- Easy to install – 20 in (0.5 m) range in a standard 5/8-18 UNF threaded package
- BNC output