



EMBEDDABLE & WIRELESS SENSORS FOR CONDITION MONITORING

LOW COST, EMBEDDABLE ACCELEROMETERS



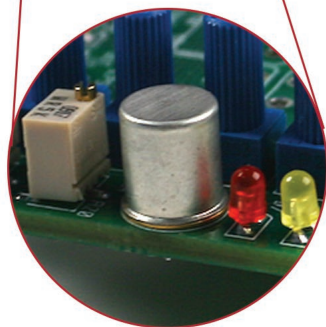
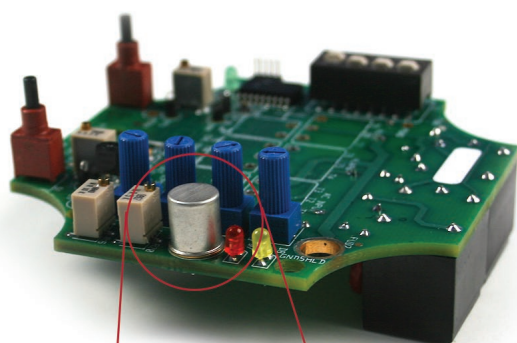
IDEAL FOR CONTINUOUS VIBRATION MONITORING IN HIGH-VOLUME AND COMMERCIAL OEM APPLICATIONS

This catalog documents many of the sensors and signal conditioners offered by PCB Piezotronics to the flight test community. PCB's also manufactures aerospace and defense sensors for other applications such as aerospace vehicle ground testing, environmental testing, Health and Usage Monitoring (HUMS), fuze/safe and arm, and blast testing.

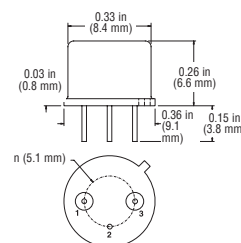
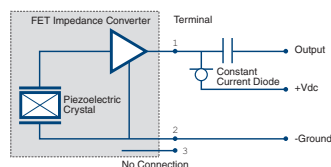
Because of the complexity of the flight test application and breadth of PCB's product line, this catalog offers the most commonly used subset of PCB's flight test sensors and signal conditioners. For a complete exploration of other options, we invite inquiries to PCB's application engineering

team (see contact information on the back of this catalog). The variety of flight test measurement requirements creates a proliferation of sensor/signal conditioning types. For example, this brief catalog contains, among others, the following sensor types, each of which is targeted at specific flight test procedures:

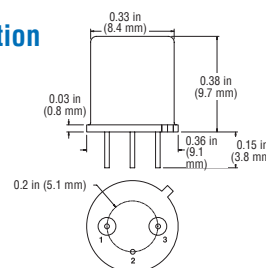
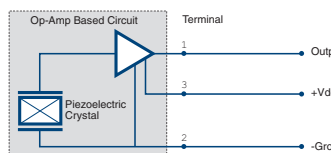
- Choice of charge mode, ICP® and 3-wire low power varieties
- Mountable via adhesive or soldering with choice of integral cable or solder pin connections
- Variety of sensitivities to accommodate a wide variety of applications



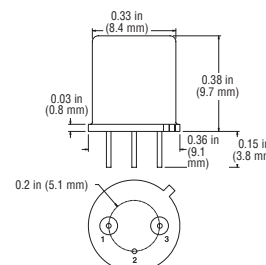
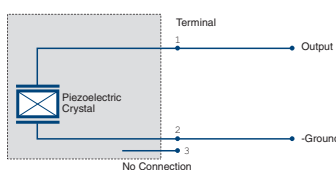
2-Wire ICP® Configuration



3-Wire Low Power Configuration



2-Wire Charge Mode





IO LINK VIBRATION MONITORING

Simple point to point connection, between a sensor and an interface module with an innovative digital data communication. Reduce your cost and shorten commissioning times and increase productivity of your machinery.

SELF DIAGNOSIS TOOL

Consistent and efficient in processing values, where information like parameters or diagnostic can be exchanged, allowing the entire process in the sensor being covered.

No special cable is required: unshielded three wire industrial cable let you choose between standard switching and operating communication world.

Advantages in having a more efficient production via an economical fast plug and play integration in existing factory automation, simple compatibility with most popular Field bus.

Unlock your monitoring system full potential.

HIGHLIGHTS

- IO-Link – Plug'n'Play for Integration
- Standard IEC 61131/9
- Digitising the traditional 4-20 mA signal
- IODD – IO Device Description
- M12-Connectors & Cables

Use
IO-Link
Universal · Smart · Easy



USB DIGITAL ACCELEROMETER



VIBRATION TESTING SIMPLIFIED

The USB Digital Accelerometer puts high-quality, low-hassle vibration measurements in the palm of your hand. Model 633A01 allows users to take professional-grade vibration measurements right from a PC, smartphone or tablet, turning any device into a portable, handheld vibration meter spectrum analyzer. The simplicity of Model 633A01 opens the door to those just starting out in vibration, while still providing the accuracy and range needed by the experts. This unit is compatible with a variety of software applications, allowing users to choose the app that best fits their testing needs. Model 633A01 also uses standard drivers, making it possible to write custom software if necessary.

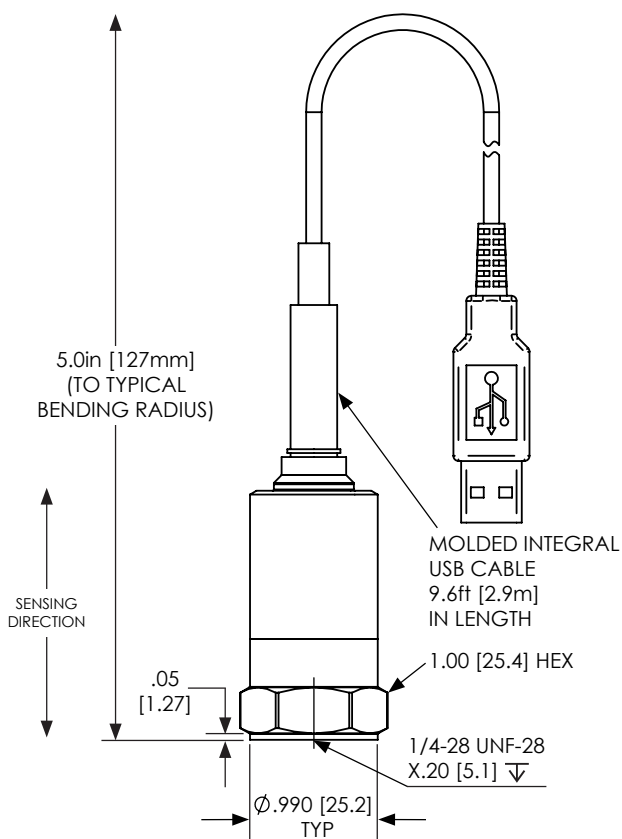
Based on piezoelectric sensing technology, Model 633A01 has a wide frequency range (0.9 to 15,000 Hz at ± 3 dB tolerance). The unit comes in a rugged, stainless steel, hermetically sealed package to survive harsh environments. With a cable length of 9.6 feet, taking measurements is quick and easy, even in the most difficult to reach places. The USB Digital Accelerometer delivers accurate, useful vibration testing in a package you can trust.

HIGHLIGHTS

- USB plug-and-play capability
- Rugged piezoelectric sensing technology
- Broad frequency and dynamic range
- Phone, tablet and PC ready
- Record and send data to offsite specialists
- Embedded calibration

APPLICATIONS

- Vibration Testing & Troubleshooting
- Machinery Health Monitoring
- Route Based Measurements
- Predictive Maintenance & Condition Monitoring



WINDOWS

(AVAILABLE FOR WEB DOWNLOAD)

- **SpectraPLUS-SC** by Pioneer Hill Software LLC
www.spectraplus.com
- **SpectraPLUS-RT** by Pioneer Hill Software LLC
www.spectraplus.com
- **ME'scope** by Vibrant
www.vibetech.com/mescope

ANDROID

(AVAILABLE IN THE PLAY STORE)

- **VibeCheck** by iTnnovate
- **vib.cloud** by iTnnovate

IOS

(AVAILABLE IN THE APP STORE)

- **VibeCheck** by iTnnovate
- **SignalScope Pro 2018** by Faber Acoustical
- **SignalScope X** by Faber Acoustical
- **Vibration** by Diffraction Limited Design LLC
- **iVibraMeter** by Motionics, LLC (iPad only)
- **Vibra Test Pro** by Motionics LLC

macOS

(AVAILABLE FOR WEB DOWNLOAD)

- **SignalScope** by Faber Acoustical
www.faberacoustical.com
- **SignalScope Pro** by Faber Acoustical
www.faberacoustical.com
- **Electroacoustics Toolbox**
by Faber Acoustical
www.faberacoustical.com

ECHO® WIRELESS VIBRATION MONITORING



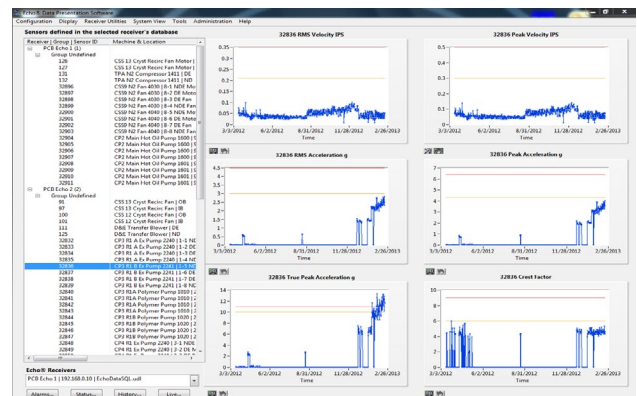
PERFORMANCE

Why use valuable manpower to collect vibration data on healthy machines? Why settle for measurements once a month when you can have them multiple times daily? Why have people venture into unsafe areas to collect routine measurements? Echo® Wireless Vibration Sensors can safely “look” at the machine’s health several times per day and provide immediate notification when warning or critical levels are reached. This frees up technical experts, like certified vibration analysts, for higher value tasks such as fault analysis.

The Echo® Wireless Vibration Sensor and the EchoPlus® Wireless Junction Box make the set of overall vibration measurements, listed below, that provide early warning of most common machine faults. In addition to these measurements, Echo® provides accurate battery status. Using a user-programmable vibration threshold, Echo® can detect if the machine is not running and if not, skip a measurement to conserve battery power.

HIGHLIGHTS

- Easily integrates with legacy vibration and plant monitoring systems via Modbus®
- Transmits long distances, eliminating expensive cable runs
- Runs standalone or with junction box
- Stores data in ODBC format
- Requires no repeaters, gateways, or mesh



SIX PRIMARY MEASUREMENTS

- **RMS Velocity:** RMS Velocity is the average of all velocity values captured within the sampling window and identifies low frequency faults such as unbalance and misalignment.
- **Peak Velocity:** Peak Velocity is RMS Velocity multiplied by 1.414 and identifies low frequency faults such as unbalance and misalignment.
- **RMS Acceleration:** RMS Acceleration is the average of all acceleration values captured within the sampling window and identifies high frequency faults such as broken rotor bars in electric motors.
- **Peak Acceleration:** Peak Acceleration is RMS Acceleration multiplied by 1.414 and identifies high frequency faults such as broken rotor bars in electric motors.
- **True Peak Acceleration:** True Peak Acceleration is the highest acceleration value captured within the sampling window and identifies high-frequency, impulsive faults such as rolling element bearing defects and some gear defects.
- **Crest Factor:** Crest Factor is the ratio of True Peak to RMS Acceleration and is used as an indicator of fault severity with caution.

LOW COST ICP® ACCELEROMETERS

IMI Sensors offers a wide range of ICP® accelerometers with an AC voltage output. These accelerometers are ideal for route-based and permanently-mounted predictive maintenance applications. The AC voltage output can interface with third-party data collectors or other online monitoring systems for analysis.

ICP® accelerometers operate on a simple, two-wire system consists of an 18-30 VDC power source, current-regulating diode, voltmeter and decoupling capacitor.

- **18-30 VDC Power Source:** Supply voltage can be provided by line or battery power. Most line-powered signal conditioners supply 24 VDC power as they are connected to an external 24VDC power source. The power provided by a battery-powered signal conditioner can vary depending on the number and voltage of the batteries.
- **Current-Regulating Diode:** ICP® accelerometers require a fixed constant current between 2 and 20 mA so the power must pass through a current-regulating diode. There is an approximate 1V drop across the diode.
- **Voltmeter:** The power is transmitted to the ICP® accelerometer via two-conductor cable with one conductor acting as the ground and the other conductor transmitting both the power to the sensor and the output signal from the sensor. The portion of the voltage used to power the accelerometer's amplifier is called the bias voltage and is usually in the range of 8-12 VDC. The voltmeter monitors this bias voltage and is useful for checking sensor operation. The output signal is an AC dynamic signal that rides on top of the bias voltage.
- **Decoupling Capacitor:** When the output signal is received at the signal conditioner, the DC bias voltage must be decoupled from the AC signal voltage in order to record accurate data. The 10-30 μ F capacitor shifts the signal level to essentially eliminate the sensor bias voltage, providing a drift-free AC mode operation.



**ACCELEROMETER
WITH MIL CONNECTOR**

MODEL 603C01



**ACCELEROMETER
WITH INTEGRAL CABLE**

MODEL 608A11



**ACCELEROMETER
WITH MIL CONNECTOR**

MODEL 602D01



**ACCELEROMETER WITH MIL
CONNECTOR**

MODEL 605B01



**ACCELEROMETER WITH M12
CONNECTOR**

MODEL (EX)639A91



**AC VOLTAGE TO 4-20 MA
TRANSMITTER**

MODEL 682C03



**INDUSTRIAL CABLE WITH
4-/5-SOCKET M12**

PCB IS...



DIVISIONS OF PCB PIEZOTRONICS, INC.

PCB PIEZOTRONICS AN AMPHENOL COMPANY

PCB manufactures vibration, pressure, force and strain, shock, and acoustic sensors used by design engineers and predictive maintenance professionals worldwide for test, measurement, monitoring, and control requirements. Our sensors support testing in aerospace and defense, automotive, transportation, civil engineering, and general R&D industries. Primary sensing technologies include piezoelectric (ICP®), piezoresistive, and capacitive MEMS. With a worldwide customer support team, 24-hour SensorLine, and a global distribution network, PCB is committed to Total Customer Satisfaction. PCB Piezotronics is a wholly-owned subsidiary of Amphenol Corporation.

IMI SENSORS A PCB DIVISION

IMI Sensors is a global designer and manufacturer of industrial vibration monitoring instrumentation, including accelerometers, vibration transmitters, switches, cables and accessories. Our industrial sensors are used to spot imbalance, bearing faults, and misalignment by measuring machine vibration for early fault diagnosis, reducing downtime and protecting critical machinery. For power generation and energy applications requiring precision measurement, IMI also offers pressure sensors and accelerometers. With a worldwide customer support team, 24-hour SensorLine, and a global distribution network, IMI is committed to Total Customer Satisfaction. IMI Sensors is a division of PCB Piezotronics, Inc.

LARSON DAVIS A PCB DIVISION

Larson Davis offers a full line of noise and vibration measurement instrumentation, including sound level meters, outdoor noise monitoring systems, personal noise dosimeters, and human vibration meters. Instrumentation is used in community and environmental noise monitoring, measurement of building acoustics, managing worker exposure to noise and vibration, and various automotive, aerospace, and industrial applications. With a worldwide customer support team, 24-hour SensorLine, and a global distribution network, Larson Davis is committed to Total Customer Satisfaction. Larson Davis is a division of PCB Piezotronics, Inc.

THE MODAL SHOP AN AMPHENOL COMPANY

The Modal Shop offers structural vibration and acoustic sensing systems and services for various applications in design and test laboratories, as well as manufacturing facilities. We simplify testing with an extensive sound and vibration rental program, precision calibration systems, non-destructive test systems, digital sensors, and both modal and vibration shakers. With a worldwide customer support team, 24-hour SensorLine, and a global distribution network, The Modal Shop is committed to Total Customer Satisfaction. The Modal Shop, Inc. is a wholly-owned subsidiary of PCB Piezotronics, Inc.

ENDEVCO AN AMPHENOL COMPANY

Endevco provides a complete range of dynamic test and measurement sensor solutions, including piezoelectric, piezoresistive, MEMS, and variable capacitance accelerometers, as well as angular rate, shock, and 6 DoF sensors, miniature pressure sensors, signal conditioners, cables and accessories. Our brand is known for highly reliable products with a wide range of testing applications, including automotive design and crash testing, aircraft and space vehicle testing, weapons and munition testing, and general lab testing. With a worldwide customer support team, 24-hour SensorLine, and a global distribution network, Endevco is committed to Total Customer Satisfaction. Endevco is an assumed name of PCB Piezotronics of North Carolina, Inc., which is a wholly-owned subsidiary of PCB Piezotronics, Inc.

ACCUMETRICS AN AMPHENOL COMPANY

Accumetrics is a pioneer and global leader in rotor telemetry technology, offering digital systems that transmit sensor data from rotating structures using wireless techniques. Our systems support a variety of applications from aerospace to power generation, and range from single channel solutions, measuring torque, temperature or voltage, to advanced ground fault detection technology. With a worldwide customer support team, 24-hour SensorLine, and a global distribution network, Accumetrics is committed to Total Customer Satisfaction. Accumetrics, Inc. is a wholly-owned subsidiary of PCB Piezotronics, Inc.

PCB PIEZOTRONICS AN AMPHENOL COMPANY

3425 Walden Avenue, Depew, NY 14043 USA

pcb.com | info@pcb.com | 800 828 8840 | +1 716 684 0001