HIGH TEMPERATURE ACCELEROMETERS

FOR GAS TURBINES, HELICOPTERS & ROCKET MOTORS

Including **ENDEVCO** sensors, electronics, and cables

PCB PIEZOTRONICS
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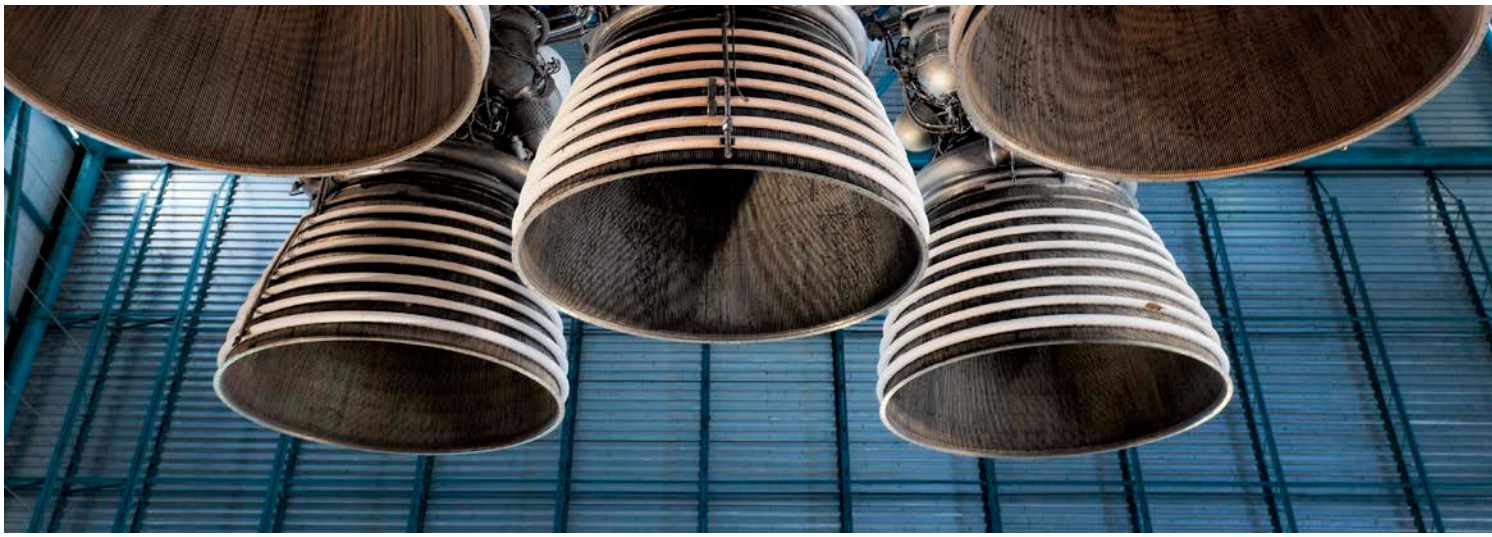


VIBRATION TESTING IN SEVERE THERMAL ENVIRONMENTS

Featuring UHT-12™ Sensors for Extreme Temperatures up to 1400 °F

Vibration testing of aircraft gas turbine engines, industrial turbines, rocket propulsion systems, and exhaust systems requires accelerometers that are designed to withstand very high temperature environments. PCB's accelerometers for testing and monitoring of turbomachinery are manufactured from tough low mass materials such as titanium and Inconel, and are hermetically sealed.

This brochure contains a sample of our stock and standard high temperature instrumentation, including our UHT-12™ sensors, which can operate up to 1400 °F (760 °C). We also offer sensors that are matched precisely to the requirements of engine manufacturers to ensure successful measurement.

VIBRATION TESTING IN SEVERE THERMAL ENVIRONMENTS

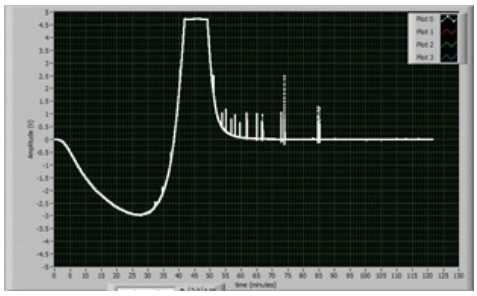
- Temperature Range: -100 to +1400 °F (-73 to +760 °C)
- ICP® & Charge Output
- Case and Ground Isolation
- RTCA/DO-160 & MIL STD-810 Qualification Available

APPLICATIONS

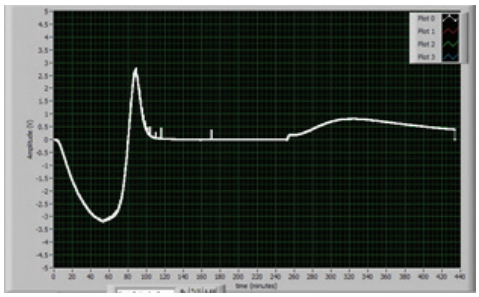
- Test & Monitor Vibration of Gas Turbine Engines
- Turbocharger and Exhaust System Testing
- Engine Balancing

WHY CHOOSE UHT-12™ SENSORS?

UHT-12™ technology reduces the effects of temperature variation. Pyroelectricity phenomenon may occur during large temperature fluctuations, generating “spikes” and disrupting behavior of the accelerometer and the test results. UHT-12™ accelerometers have an improved data quality.



Without UHT-12™ Sensing Element



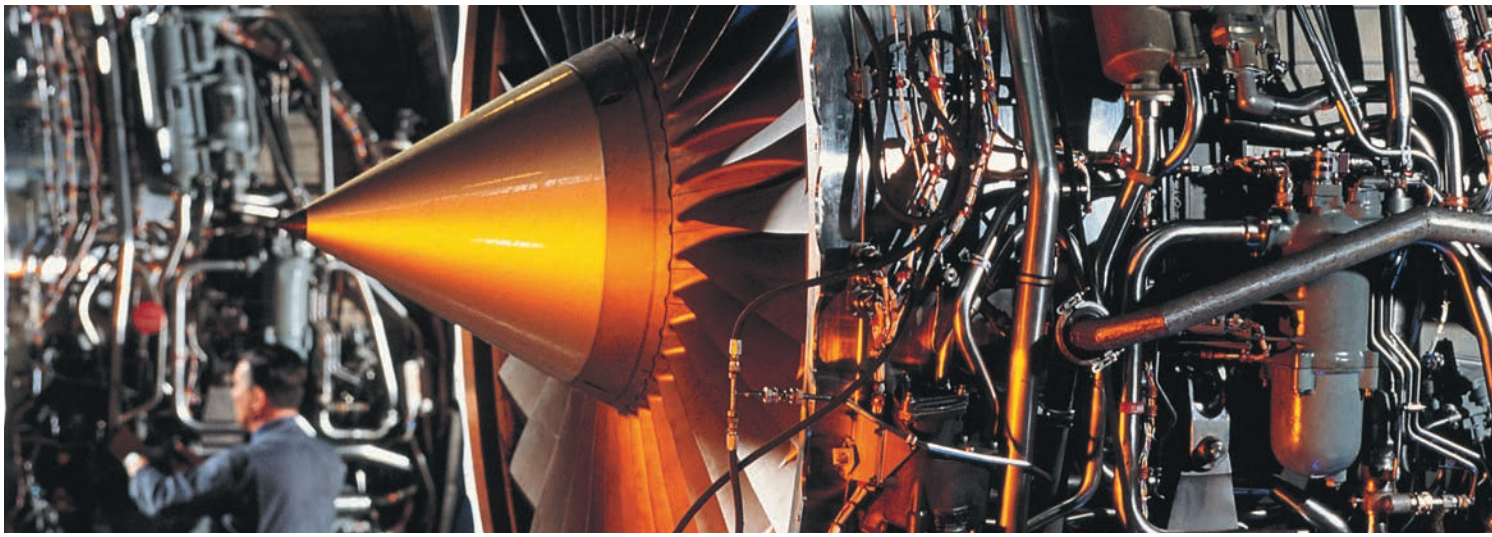
With UHT-12™ Sensing Element

PCB® offers specially designed and tested ICP® accelerometers for conducting vibration and shock measurements under demanding environmental conditions of up to 356 °F (180 °C). These sensors combine proven quartz and ceramic shear sensing technology with specialized, built-in microelectronic signal conditioning circuitry to achieve dependable operation in extreme temperatures and through repetitive temperature cycling.

Charge output accelerometers from PCB® use piezo-ceramic sensing elements that output an electrostatic charge signal proportional to the applied acceleration. These sensors can operate at extremely high temperatures (up to 1400 °F/ 760 °C) because they do not contain the built-in signal conditioning electronics that limit the temperature range of ICP® accelerometers.

HIGHLIGHTS

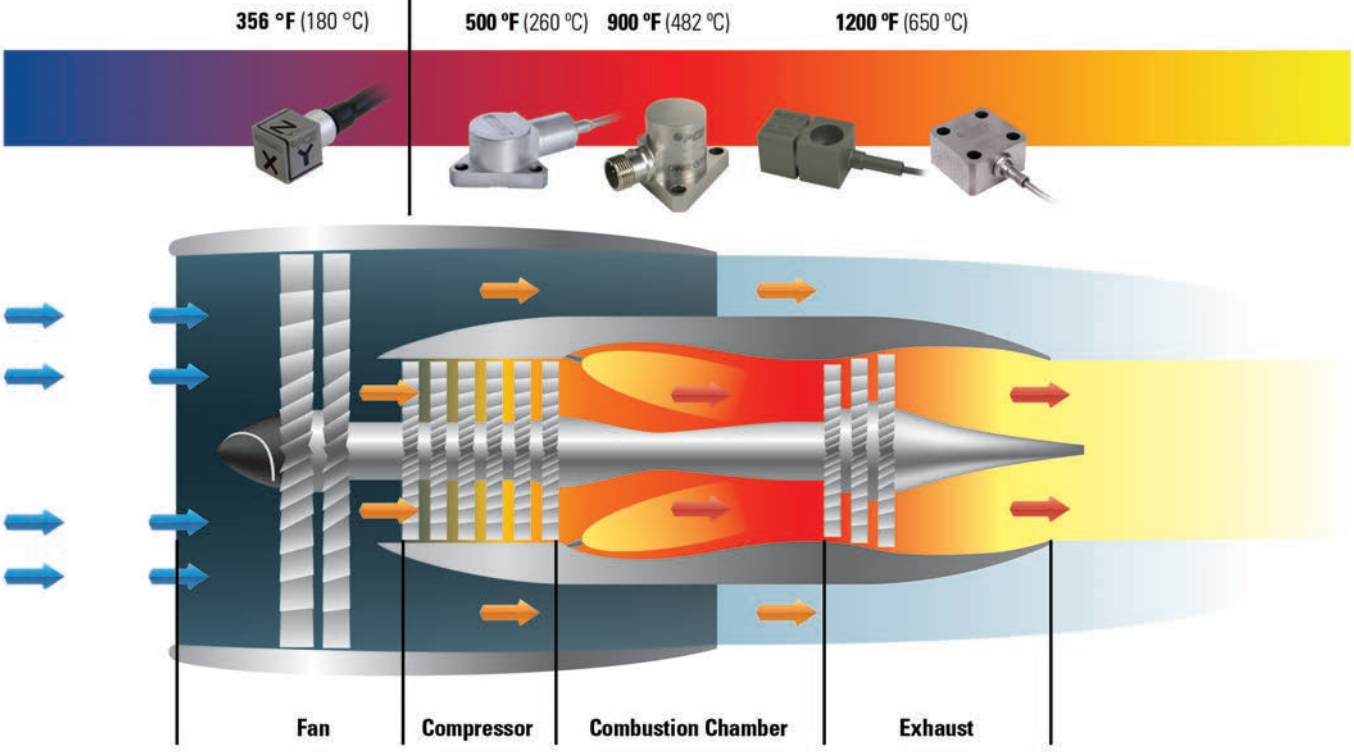
- Absence of pyroelectric noise spikes up to 1400 ºF (760 ºC)
- Sensitivity that remains more consistent over a wide temperature change
- Shear mode crystals isolated from base strain & transverse measurement errors
- Proprietary crystal technology comes sealed in a hermetic package and has proven reliable performance in hundreds of research and monitoring installations



PCB® High Temperature Accelerometers are Available to 1400 ºF (760 ºC)

ICP® Accelerometers available in single and triaxial versions to 356 ºF (180 ºC)

Charge output accelerometers for testing or continuous monitoring cover temperature ranges to 1400 ºF (760 ºC)



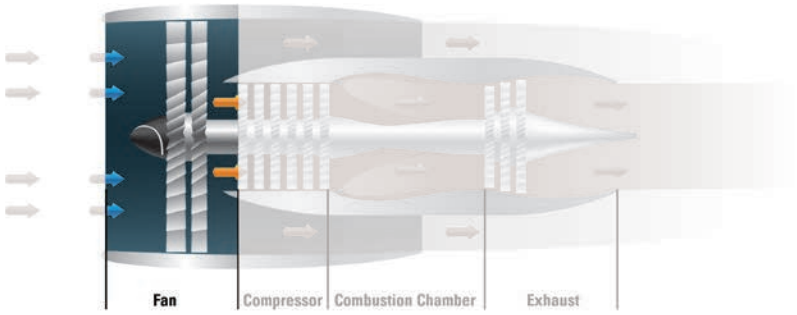
FAN AREA AND COMPONENT TESTING

HIGHLIGHTS

- Robust titanium housings
- Measurement range up to 1000 g
- Frequency from 2 to 10k Hz
- Low weight starting at only 1 gram

ICP® ACCELEROMETERS TO 356 ˚F (180 ˚C)

The fan area of a turbine engine requires test accelerometers capable of withstanding not only high temperatures but also severe vibration. With small size and low mass, ICP® accelerometers below are recommended for ESS and HALT/HASS testing of engine components.



ESS MINI QUARTZ SHEAR ICP® ACCELEROMETER

MODEL 320C15 & 320C18

Temperature: -100 to +325 ºF (-73 to +163 °C)

Sensitivity: 10 mV/g

Measurement Range: ±500 g

TRIAXIAL LIGHTWEIGHT MINIATURE ICP® ACCELEROMETER

MODEL HT356B01 & HTJ356B01

Temperature: -65 to +356 ºF (-54 to +180 °C)

Sensitivity: 5 mV/g

Measurement Range: 1k g pk

HTJ356B01 is ground isolated

UHT-12™ ICP® TRIAXIAL ACCELEROMETER

MODEL 339B32

Temperature: -65 to +325 ºF (-54 to +163 °C)

Sensitivity: 10 mV/g

Measurement Range: ±500 g pk

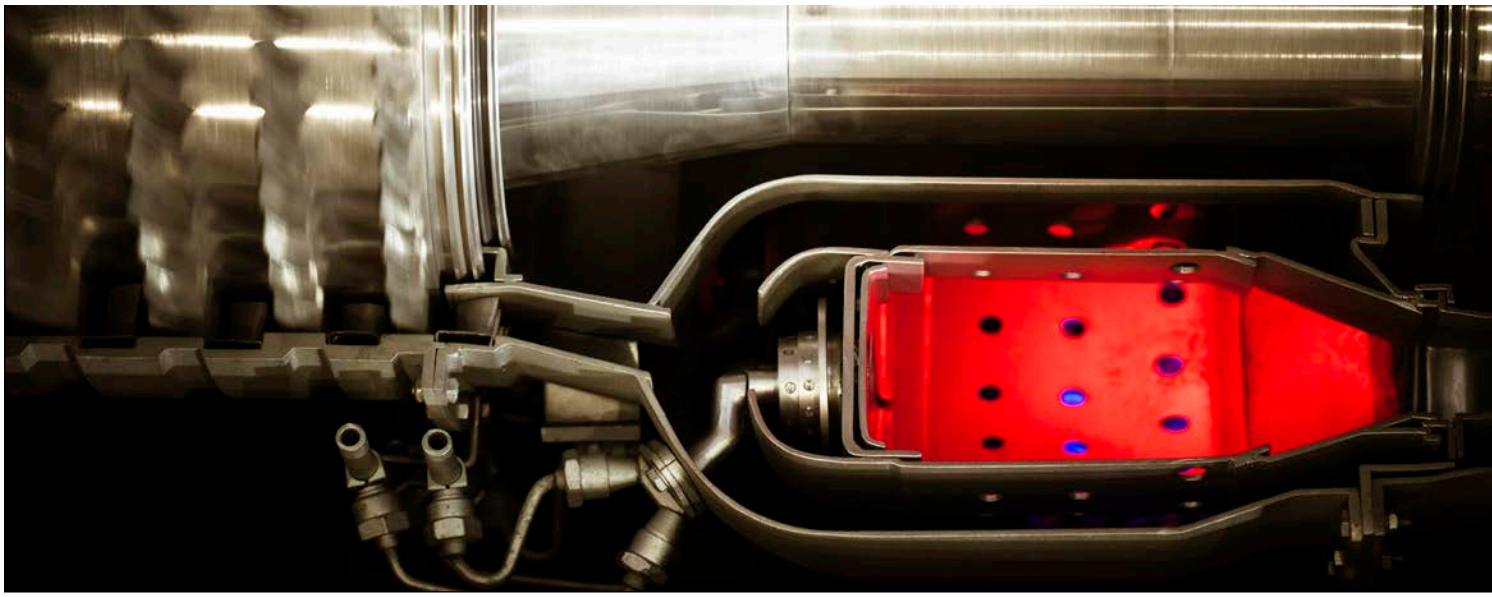
UHT-12™ ICP® TRIAXIAL ACCELEROMETER

MODEL HT339C31

Temperature: -65 to +325 ºF (-54 to +163 °C)

Sensitivity: 10 mV/g

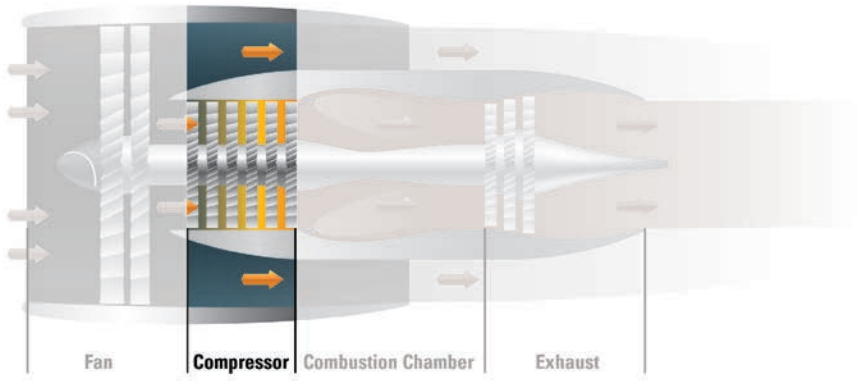
Measurement Range: 500 g pk



COMPRESSOR AREA AND COMPONENT TESTING

CHARGE OUTPUT ACCELEROMETERS TO 900 ˚F (482 ˚C)

The compressor area of a turbine engine requires an accelerometer capable of higher temperatures. The charge accelerometers listed below are ideal for the application and feature hermetically sealed titanium housings, smaller size and high frequency range.



HIGHLIGHTS

- Robust housings, hermetically sealed
- Measurement range to 2300 g
- Frequency to 12k Hz
- Miniature models from 2 grams

MINIATURE TRIAXIAL CHARGE OUTPUT ACCELEROMETER

MODEL 356A70

Temperature: -94 to +490 °F (-70 to +254 °C)

Sensitivity: 2.7

Measurement Range: ±500 g pk

MINIATURE TRIAXIAL CHARGE OUTPUT ACCELEROMETER

MODEL 356A71

Temperature: -94 to +490 °F (-70 to +254 °C)

Sensitivity: 10 pC/g

Measurement Range: ±500 g pk

MINIATURE RING-STYLE CHARGE OUTPUT ACCELEROMETER

MODEL 357B06

Temperature: -65 to +500 °F (-54 to +260 °C)

Sensitivity: 5 pC/g

Measurement Range: ±1k g pk

HIGH TEMPERATURE MINIATURE CHARGE OUTPUT ACCELEROMETER

MODEL 357B11

Temperature: -95 to +500 °F (-71 to +260 °C)

Sensitivity: 3.0 pC/g

Measurement Range: ±2300 g pk

UHT-12™ CHARGE OUTPUT TRIAXIAL ACCELEROMETER

MODEL EX356A73

Temperature: -67 to +900 °F (-55 to +482 °C)

Sensitivity: 3.1 pC/g

Measurement Range: 500 g pk

UHT-12™ HIGH TEMPERATURE CHARGE OUTPUT ACCELEROMETER

MODEL 357A63

Temperature: -65 to +900 °F (-54 to +482 °C)

Sensitivity: 0.53 pC/g

Measurement Range: ±5k g pk

HIGH TEMPERATURE CHARGE OUTPUT ACCELEROMETER

MODEL 357B69

Temperature: -65 to +900 °F (-54 to +482 °C)

Sensitivity: 3.5 pC/g

Measurement Range: ±500 g pk

HIGH TEMPERATURE CHARGE OUTPUT ACCELEROMETER

MODEL 357A67

Temperature: -76 to +392 °F (-60 to +200 °C)

Sensitivity: 3.0 pC/g

Measurement Range: ±1k g pk

MINIATURE CHARGE OUTPUT ACCELEROMETER

ENDEVCO MODEL 7240C

Temperature: -67 to +500 °F
(-55 to +260 °C)

Sensitivity: 3 pC/g

Measurement range: 5k g pk

MINIATURE CHARGE OUTPUT ACCELEROMETER

ENDEVCO MODEL 2220E

Temperature: -67 to +500 °F
(-55 to +260 °C)

Sensitivity: 3 pC/g

Measurement range: 5k g pk

CHARGE OUTPUT ACCELEROMETER

ENDEVCO MODEL 2221F

Temperature: -67 to +500 °F
(-55 to +260 °C)

Sensitivity: 10 pC/g

Measurement range: 2k g pk

TRIAXIAL CHARGE OUTPUT ACCELEROMETER

ENDEVCO MODEL 2230EM1

Temperature: -67 to +500 °F
(-55 to +260 °C)

Sensitivity: 3 pC/g

Measurement range: 2000 g pk

CHARGE OUTPUT ACCELEROMETER

ENDEVCO MODEL 7201-10

Temperature: -67 to +500 °F
(-55 to +260 °C)

Sensitivity: 10 pC/g

Measurement range: 2000 g pk

CHARGE OUTPUT ACCELEROMETER

ENDEVCO MODEL 7221A

Temperature: -67 to +500 °F
(-55 to +260 °C)

Sensitivity: 10 pC/g

Measurement range: 2k g pk

CHARGE OUTPUT ACCELEROMETER

ENDEVCO MODEL 7703A-50

Temperature: -67 to +550 °F
(-55 to +288 °C)

Sensitivity: 300 pC/g

Measurement range: 2k g pk

CHARGE OUTPUT ACCELEROMETER

ENDEVCO MODEL 7704A-50

Temperature: -67 to +550 °F
(-55 to +288 °C)

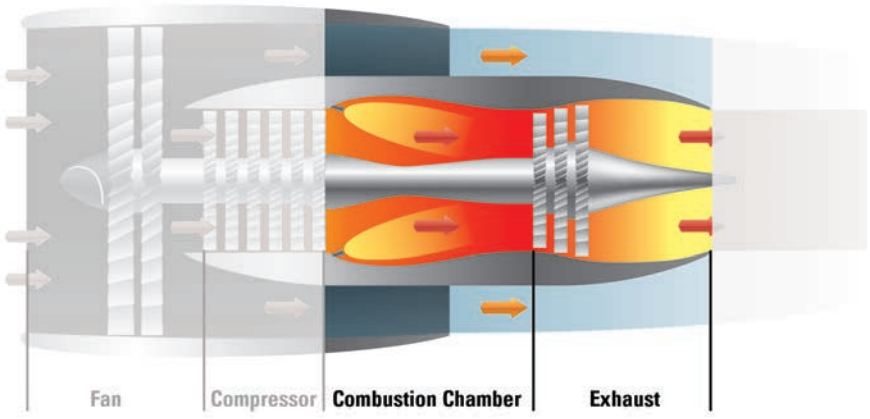
Sensitivity: 50 pC/g

Measurement range: 2k g pk

COMBUSTOR AND EXHAUST TESTING

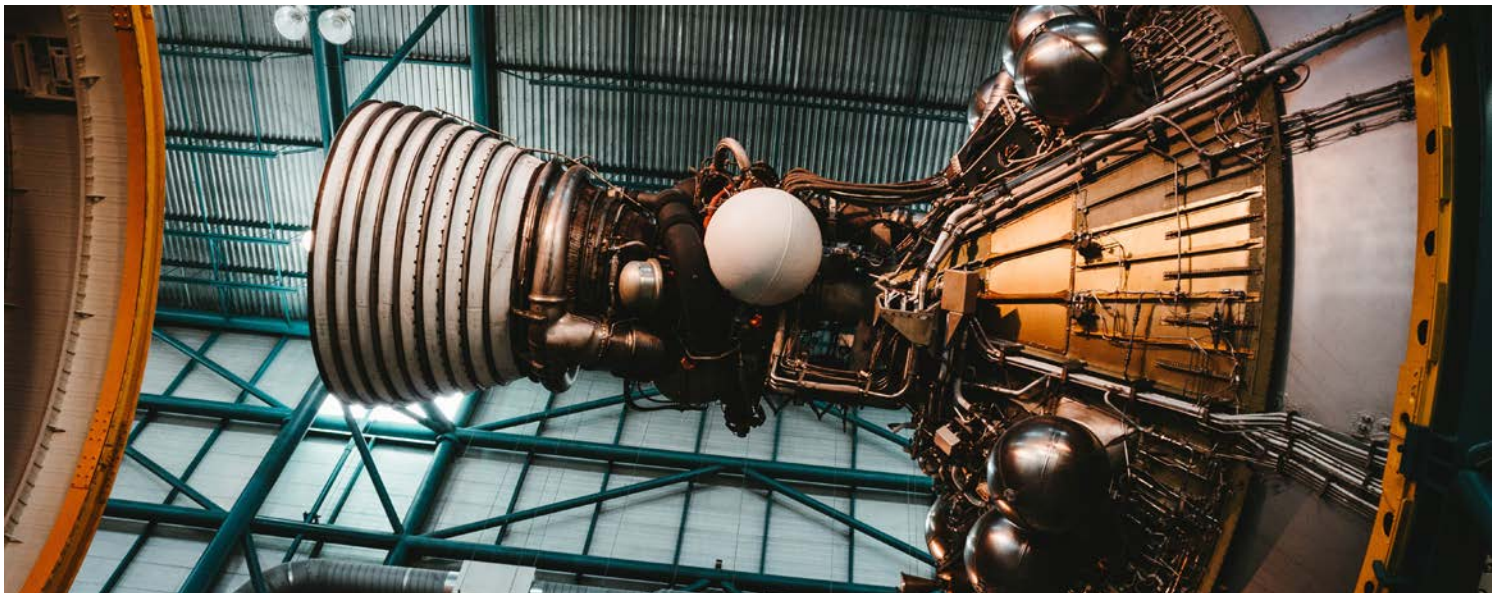
CHARGE OUTPUT ACCELEROMETERS UP TO 1400 ˚F (760 ˚C)

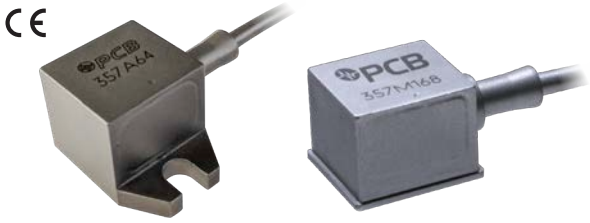
Testing the combustor and exhaust of turbine engines requires an ultra-high temperature sensor. The confined space demands accelerometer compactness. These sensors are designed specifically for the testing and development of turbine combustors and exhaust systems and feature integral hardline cables.

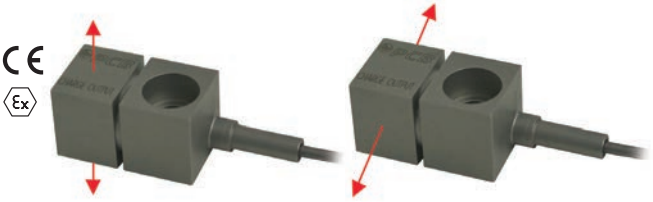


HIGHLIGHTS

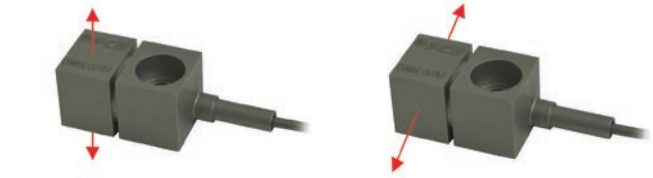
- Compact and electrically isolated
- Temperature range to 1400 ºF (760 ºC)
- Insensitive to extreme variations in temperature with UHT-12™ sensing element







MODEL EX357E90 MODEL EX357E91



MODELS EX357E92 & EX357A94 MODELS EX357E93 & EX357A95

Arrows Depict Sensitive Axis

UHT-12™ CHARGE OUTPUT ACCELEROMETER

MODEL 357A64 & 357M168

Sensitivity: 1.15 pC/g

Measurement Range: ±1k g pk

Signal Type: Single-ended

Connector: 10-32 jack

UHT-12™ CHARGE OUTPUT ACCELEROMETER

SERIES EX357A9X & EX357E9X

EX357E90/91 Sensitivity: 5.0 pC/g

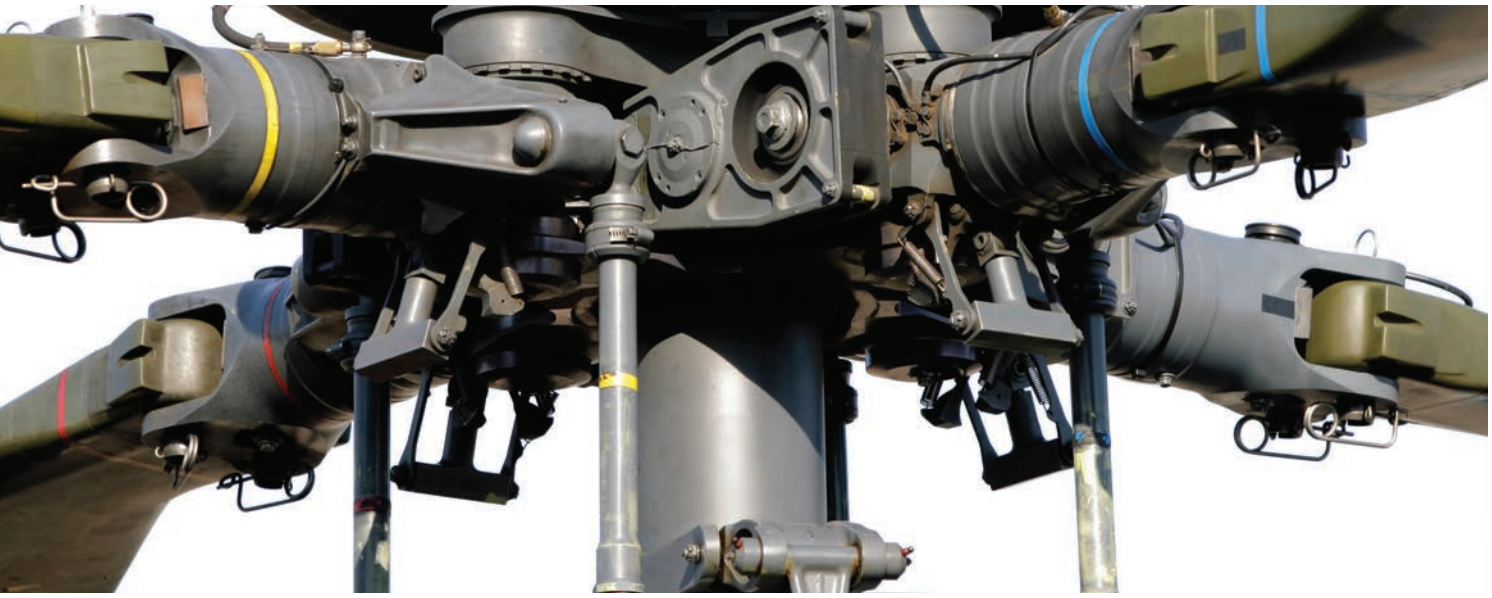
EX357E92/93 Sensitivity: 2.3 pC/g

EX357A94/95 Sensitivity: 3.3 pC/g

Measurement Range: ±1k g pk

Signal Type: Single-ended (EX357E9X), differential (EX357A9X)

Connector: 10-32 jack (EX357E9X), 7/16-27 2-pin (EX357A9X)



LONG TERM VIBRATION MONITORING AND HUMS

DIFFERENTIAL ACCELEROMETERS FOR TURBINE ENGINE MONITORING

Charge mode accelerometers with high temperature differential output are ideal for monitoring of turbines and HUMS applications on helicopters.

UHT-12™ HIGH TEMPERATURE ACCELEROMETER

SERIES EX600B13/14

Temperature: -65 to 900 °F (-54 to 482 °C)

Sensitivity: 100/10 mV/g

Measurement Range: ±50/±500 g

Hazardous location approvals

UHT-12™ HIGH TEMPERATURE CHARGE OUTPUT ACCELEROMETER

MODEL 357A100

Temperature: -65 to 900 °F (-54 to 482 °C)

Sensitivity: 5.0 pC/g

Measurement Range: ±200 g pk

CHARGE OUTPUT ACCELEROMETER

SERIES 357C71/72/73

Temperature: -65 to 900 °F (-54 to 482 °C)

Sensitivity: 10/50/100 pC/g

Measurement Range: ±1000/±500/±300 g pk

DIFFERENTIAL CHARGE OUTPUT ACCELEROMETER

ENDEVCO MODEL 6222S-20/ 6222S-50/6222S-100

Temperature: -65 to 500 °F (-54 to 260 °C)

Sensitivity: 20/50/100 pC/g

Measurement Range: 2k/1k/500 g pk

ACCESSORIES

HIGH TEMPERATURE, SINGLE-ENDED, CHARGE OUTPUT SYSTEM CONFIGURATION

Model FZ or RP
10-32 Plug

Model GA
10-32 Jack

Model 023
(023A10, 023B10)
Hardline Cable

Model EB
10-32 Plug

Model EB
10-32 Plug

Series 003Axx
Low Noise, Solid, Softline Cable

Endevco Series 3090C
Low Noise, Stranded, Softline Cable

Endevco & PCB Series 422
In-Line Charge Converter

RECOMMENDED OUTPUT CABLES

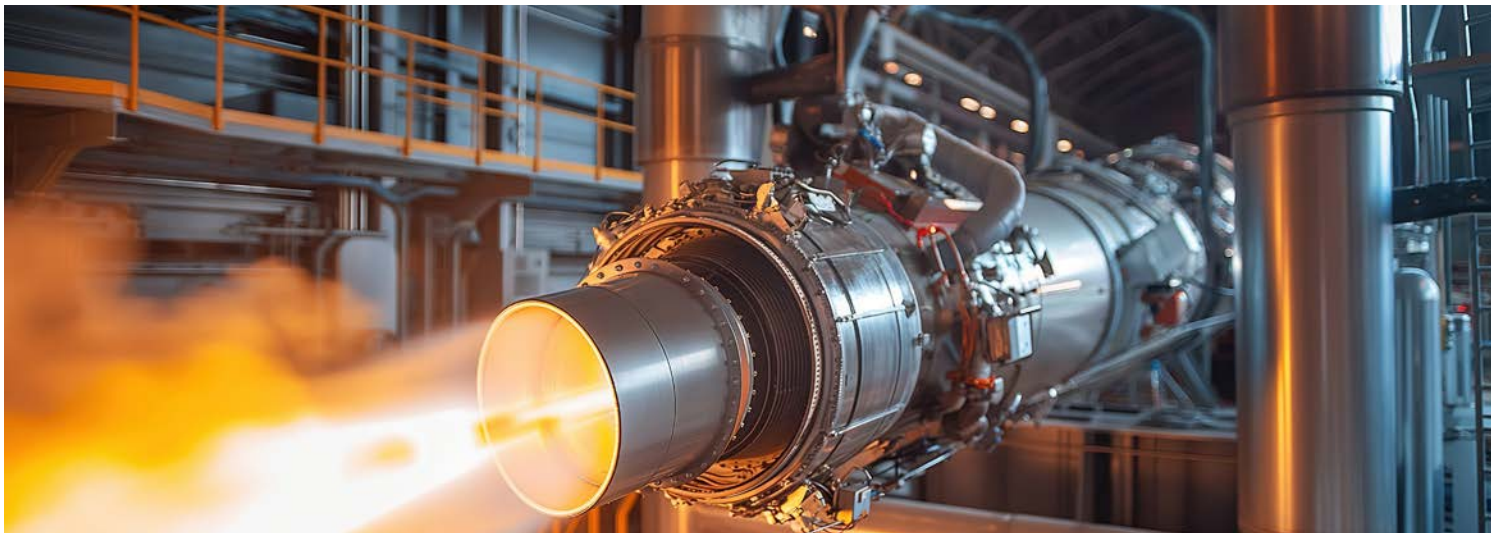
Note: A low noise cable is needed between a charge output sensor and converter to mitigate the triboelectric effect. A low noise cable is not necessary after the converter or for non-shock ICP® sensors.

Series 003Cxx
10-32 Plug to BNC Plug
Low Noise, Solid, Softline Cable

Endevco Series 3090CM12
10-32 Plug to BNC Plug
Low Noise, Stranded, Softline Cable

Series 003Dxx
BNC Plug to BNC Plug
Low Noise, Solid, Softline Cable

Series 002Txx
BNC Plug to BNC Plug
General Purpose, Stranded, Softline Cable



SINGLE-ENDED CHARGE CONVERTERS

In-line ICP® charge converters serve to convert high impedance charge mode piezoelectric sensor signals into low impedance voltage signals for input into readout, recording, and analysis instruments. Powered by ICP® sensor signal conditioners, these converters are placed between the sensor and signal conditioner. They can also connect directly to a DAQ system or readout device if the system includes ICP® power.

REMOTE CHARGE CONVERTER

ENDEVCO MODEL 2771CM2-1

REMOTE CHARGE CONVERTER

SERIES 422EXX

Model	Sensitivity	Input Range	Low Frequency (-5%)
2771CM2-1	1 mV/pC	5000 pC	3 Hz
422E38	0.1 mV/pC	25000 pC	5 Hz
422E35	1 mV/pC	2500 pC	5 Hz
422E36	10 mV/pC	250 pC	5 Hz
422E39	1 mV/pC	2500 pC	5 Hz

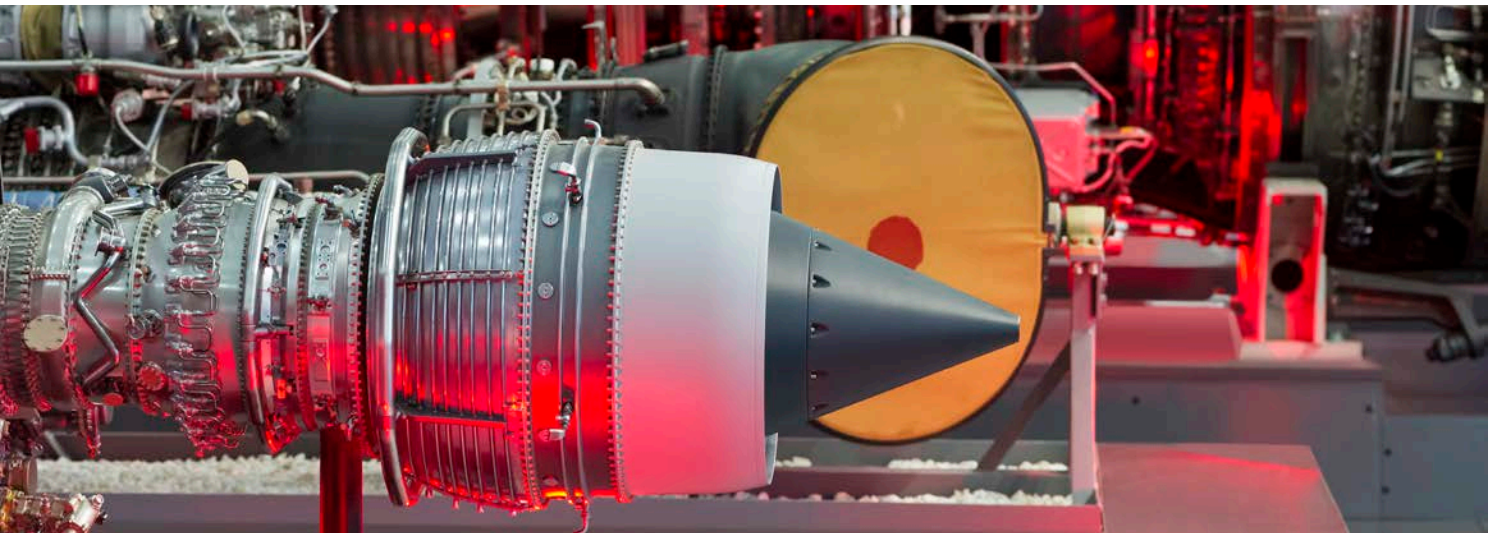
SIGNAL CONDITIONER

ENDEVCO MODEL 2775C

SIGNAL CONDITIONER

ENDEVCO MODEL 6634D

Model	Description	Channels	Power	Sensor Types
2775C	Low noise, high gain piezoelectric/ integrated electronics piezoelectric signal conditioner	1	DC, powered through AC to DC converter (supplied)	Charge output piezoelectric, integrated electronics piezoelectric
6634D	Differential piezoelectric signal conditioner	1	DC, powered through AC to DC converter (supplied)	Differential and singled ended charge output piezoelectric, integrated electronics piezoelectric



DIFFERENTIAL CHARGE OUTPUT SYSTEM COMPONENTS

Model GN
2-socket 7/16-27 UNS-2B Plug
900 °F (482 °C)

Model 013
2-Conductor Hardline Cable
1200 °F (650 °C)

Model GP
2-pin 7/16-27 UNS-2A Jack

Endevco Series 2680B
Airborne Charge Amplifier

Model ET
2-socket, 7/16-27 UNS-2B Plug
400 °F (204 °C)

Model 045
2-Conductor Softline
PFA Cable 500 °F (260 °C)

Model JD
2-pin Plug
Mates to 2777A Series

Endevco Model 2777A
Differential Charge Converter

Endevco Model 6634D
Differential Charge Amplifier

Endevco Series 6917B
Low Noise FEP Cable
2-Socket 7/16-27 UNS-2B Plug to Pigtails

Endevco Series 6917M113
Low Noise FEP Cable
2-Socket 7/16-27 UNS-2B Plug
to BNC Twinax Plug

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