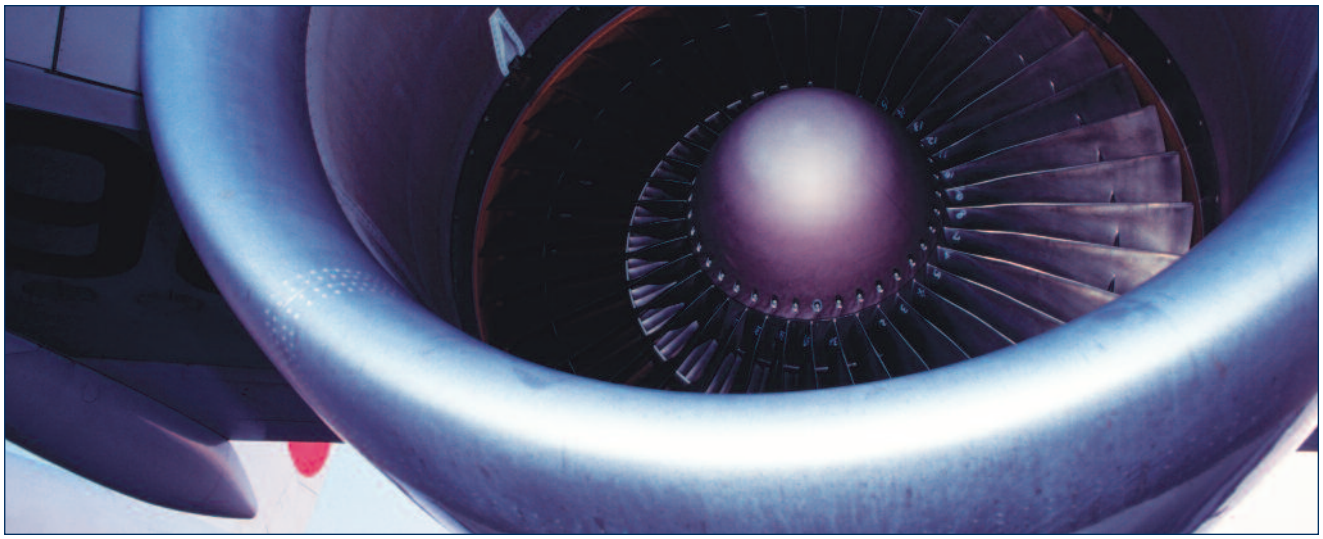
Vibration Testing in Severe Thermal Environments

Featuring UHT-12™ Ultra High Temperature Sensing Element



Highlights

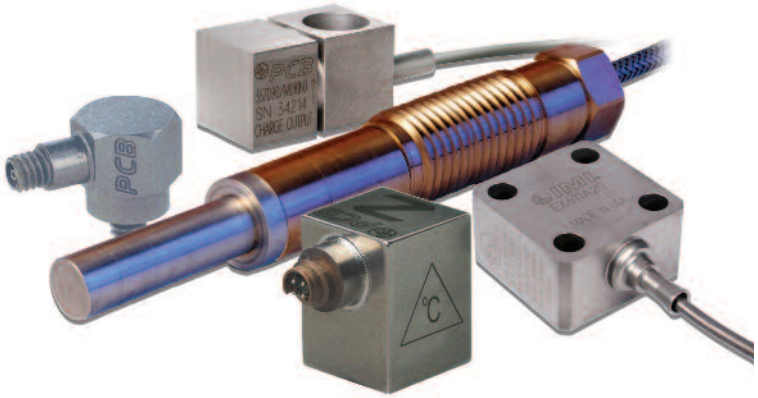
- Temperature Range: -100 to +1300 °F (-73 to +704 °C)
- ICP® & Charge Output
- Case and Ground Isolation
- RTCA/DO-160 & MIL STD-810 Qualification Available
- New UHT-12™ Crystal

Applications

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

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, hermetically sealed and have no moving parts.

This brochure contains a sample of our stock and standard high temperature instrumentation, featuring the new UHT-12™ high temperature crystal for operation up to 1200 °F/650 °C. We also offer sensors that are matched precisely to the requirements of engine manufacturers to ensure successful measurement.



Featuring UHT-12™ Sensing Element

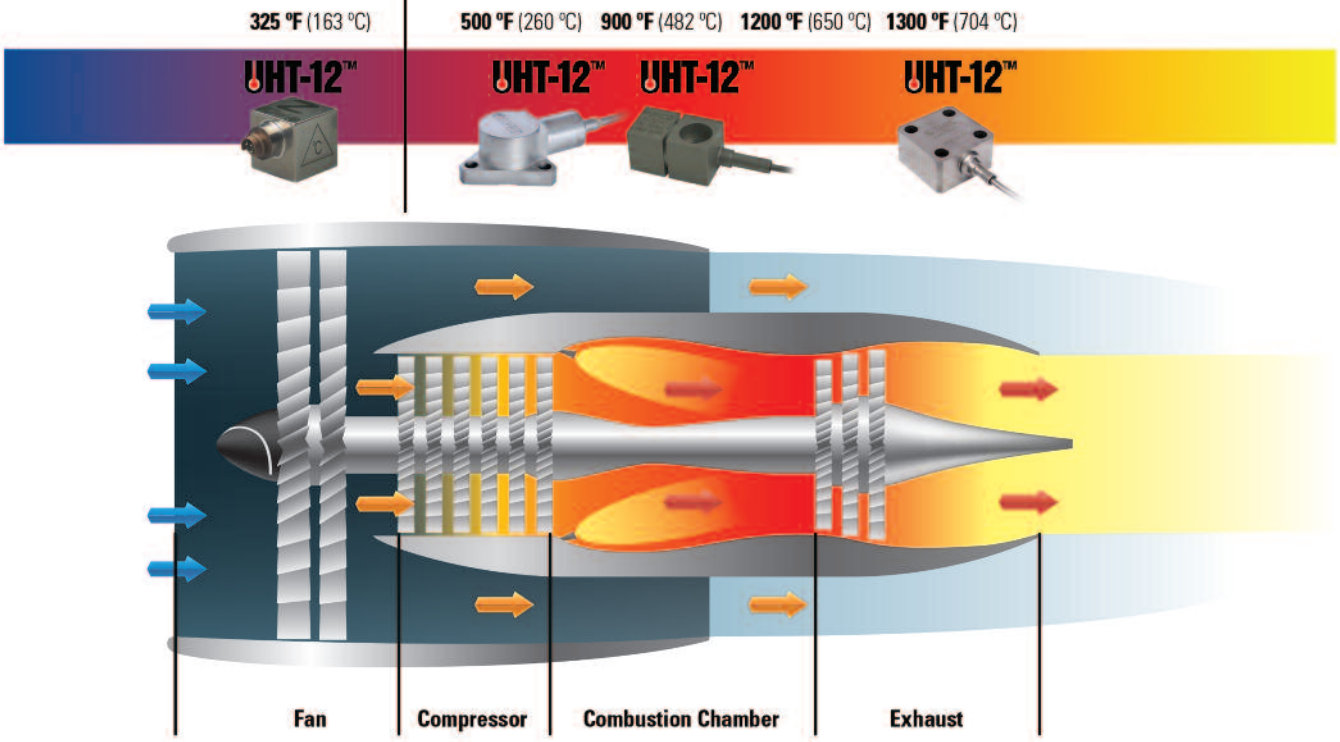
PCB PIEZOTRONICS INC.

Aerospace & Defense Division ☎ Toll-Free in USA 866-816-8892 ☎ 716-684-0001 www.pcb.com

PCB® High Temperature Accelerometers are Available Up to 1300 °F (704 °C)

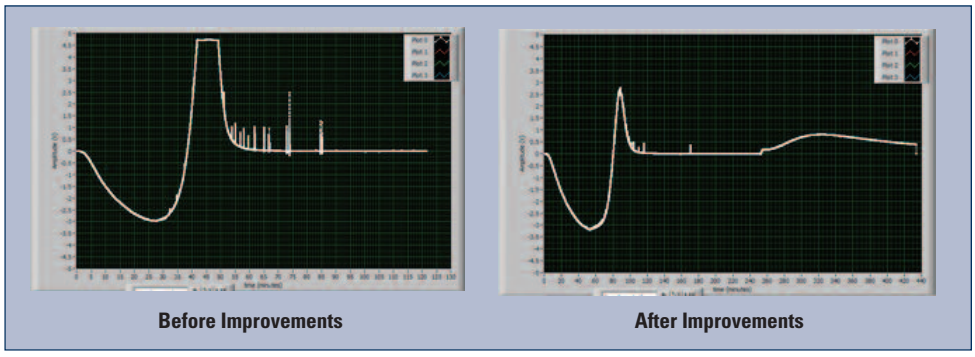
ICP® Accelerometers available in single and triaxial versions up to + 325 °F (+163 °C)

Charge output accelerometers for testing or continous monitoring cover temperature ranges up to 1300 °F (704 °C)



What is UHT-12™?

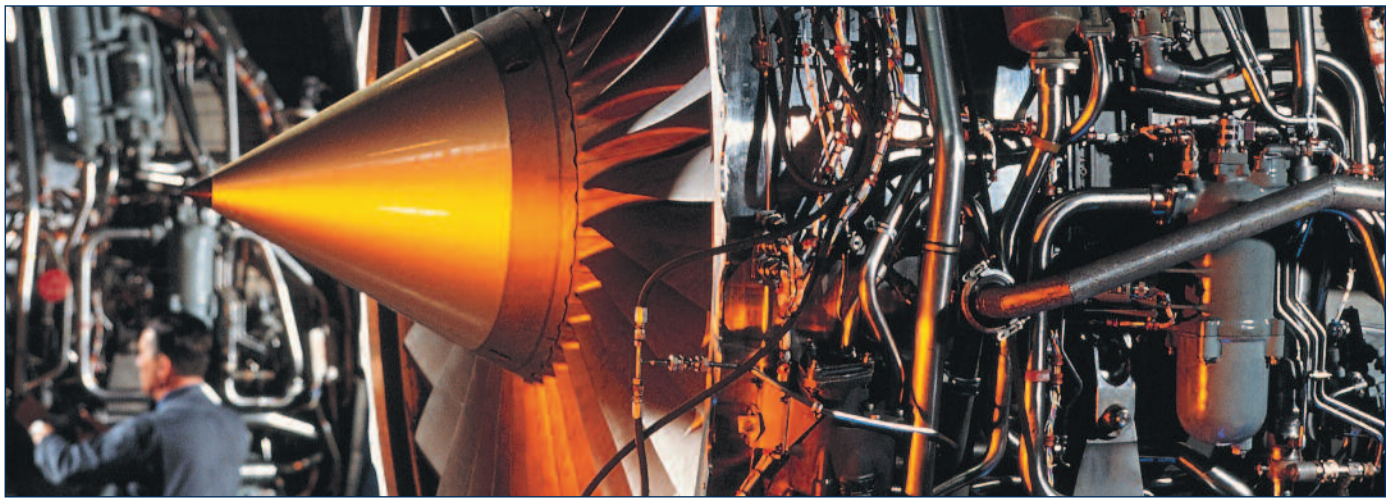
UHT-12™ is a new crystal designed for more accurate, lower noise measurements during large temperature variations. UHT-12™ technology allows accelerometers to be unaffected by temperature variations. Pyroelectricity phenomenon (shown in graphs below) may occur during large temperature fluctuations, generating "spikes" and disrupting behavior of the accelerometer and the test results.



The UHT-12™ family of accelerometers include **Model 320C52, Series 339, 357D9x,** and **EX611**. Other products such as **Series 115** and **176** combustion pressure sensors are also available.

Highlights:

- Absence of pyroelectric noise spikes up to 1200 °F (650 °C)
- Sensitivity remains more consistent over a wide temperature change
- Shear mode crystals isolated from base strain and transverse measurement errors

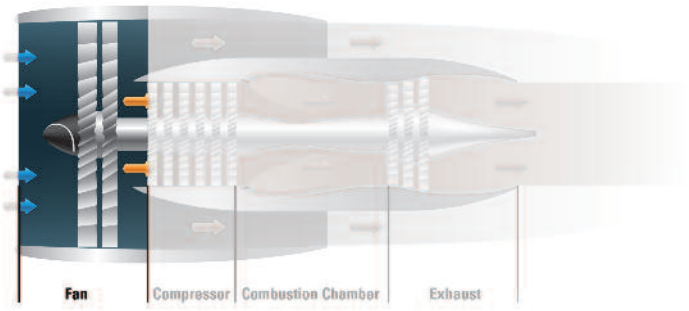


Fan Area and Component Testing

ICP® Accelerometers to +338 ºF (+170 ºC)

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.

- Robust titanium housings
- Measuring range up to 1000g
- Frequency from 2 to 10k Hz
- Low weight from 1 gram



Model HT356B01

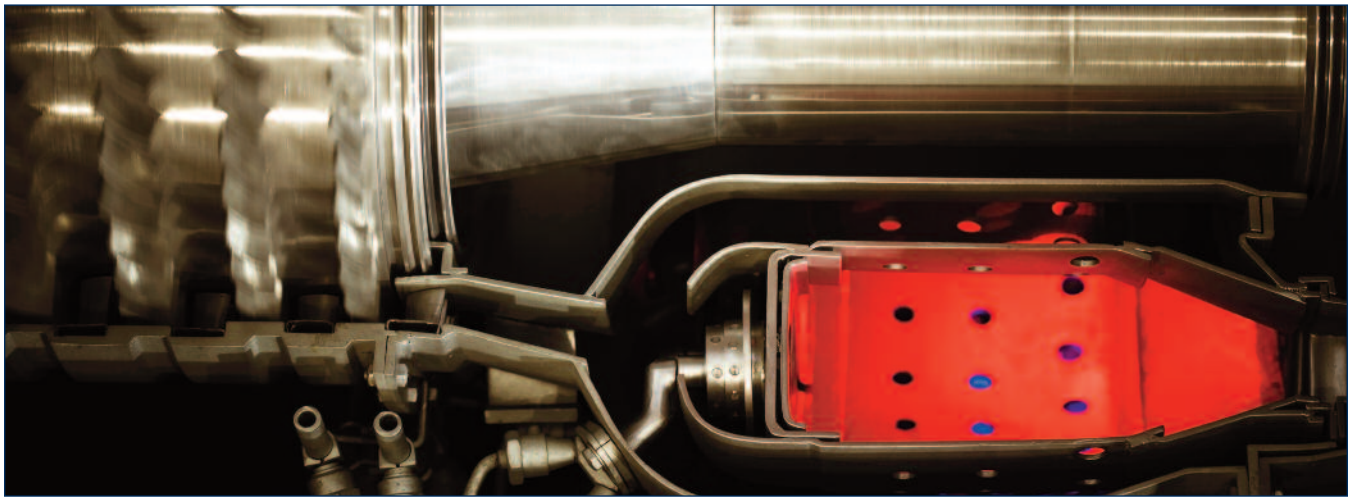
- Temperature: -65 to +338 ºF (-54 to +170 °C)
- Sensitivity: 5 mV/g
- Measuring range: 1000g
- Weight: 1 gram

Models 339A31 & 339A32

- Temperature: -65 to +325 ºF (-54 ° to +163 °C)
- Sensitivity: 10 mV/g
- Measuring range: 500g
- Weight: 3.6 to 5.5 grams

Models 320C15 & 320C18

- Temperature: -100 to +325 ºF (-73 ° to +163 °C)
- Sensitivity: 10 mV/g
- Measuring range: 500g
- Weight: 1.7 to 2 grams

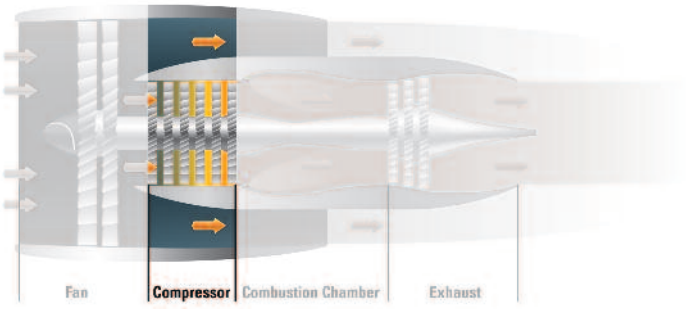


Compressor Area and Component Testing

Charge Output Accelerometers up to 500 ˚F (260 ˚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 with hermetically sealed titanium housings, smaller size and high frequency range.

- Robust titanium housings, hermetically sealed
- Measuring range up to 2300g
- Fequency up to 12kHz
- Miniature models from 2 grams



Models 356A70 & 356A71

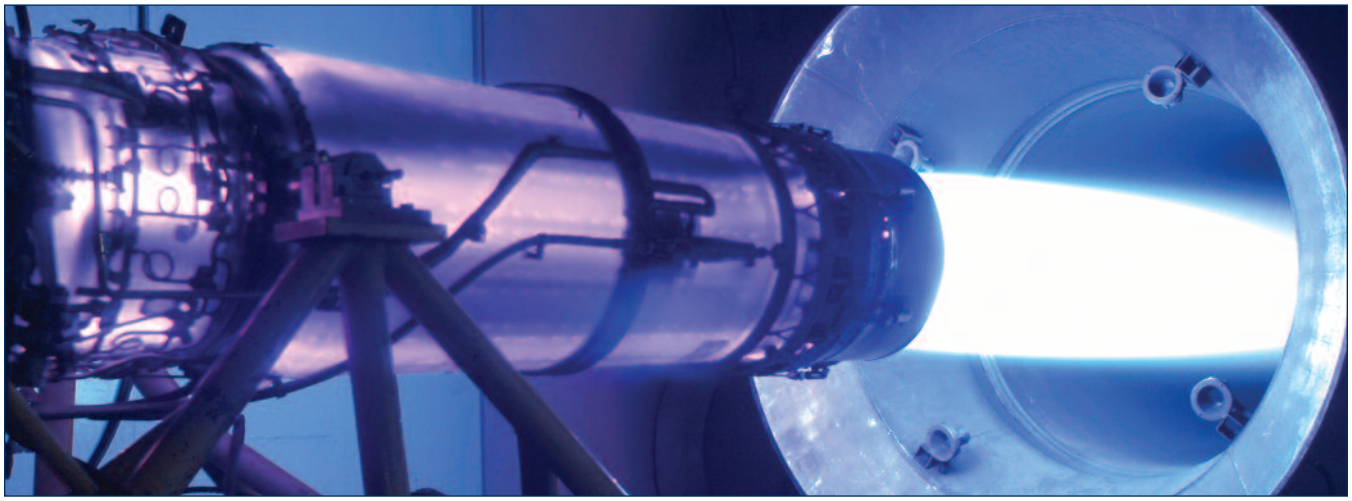
- Temperature: -94 to +490 ºF (-70 ° to + 254 °C)
- Sensitivity: 2.7 to 10 pC/g
- Measuring range: 1500g
- Weight: 8 grams

Model 357B06

- Temperature: -65 to +500 ºF (-54 ° to + 260 °C)
- Sensitivity: 5 pC/g
- Measuring range: 500g
- Weight: 2.3 grams

Model 357B11

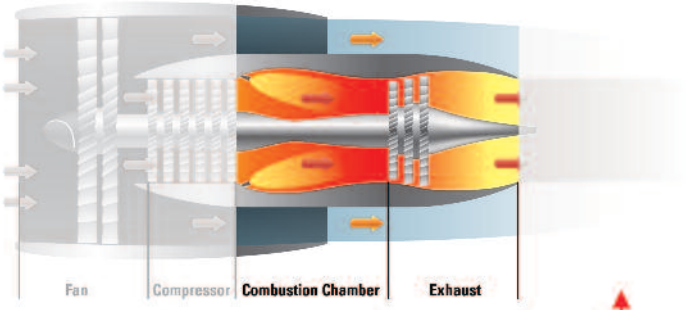
- Temperature: -95 to +500 ºF (-71 ° to + 260 °C)
- Sensitivity: 3 pC/g
- Measuring range: 2,300g
- Weight: 2 grams



Combustor and Exhaust Testing

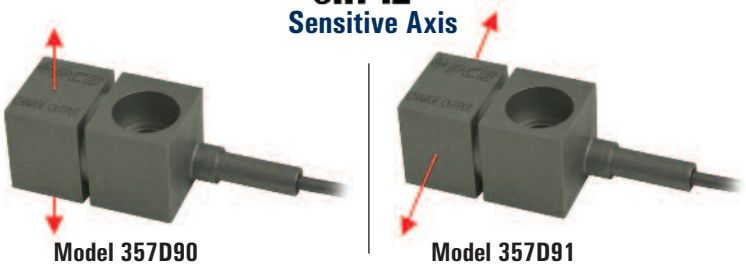
Charge Output Accelerometers up to 1200 ˚F (650 ˚C)

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.



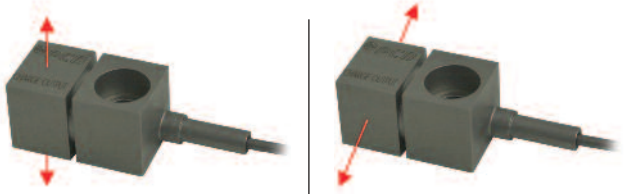
- Compact and electrically isolated, **Series 357D9X**
- Temperature ranges up to +1200 ºF (+650 ºC)
- Insensitive to extreme variations in temperature

UHT-12™
Sensitive Axis



Model 357D90 **Model 357D91**

0.66 x 1.26 x 0.66 in (H x L x W)

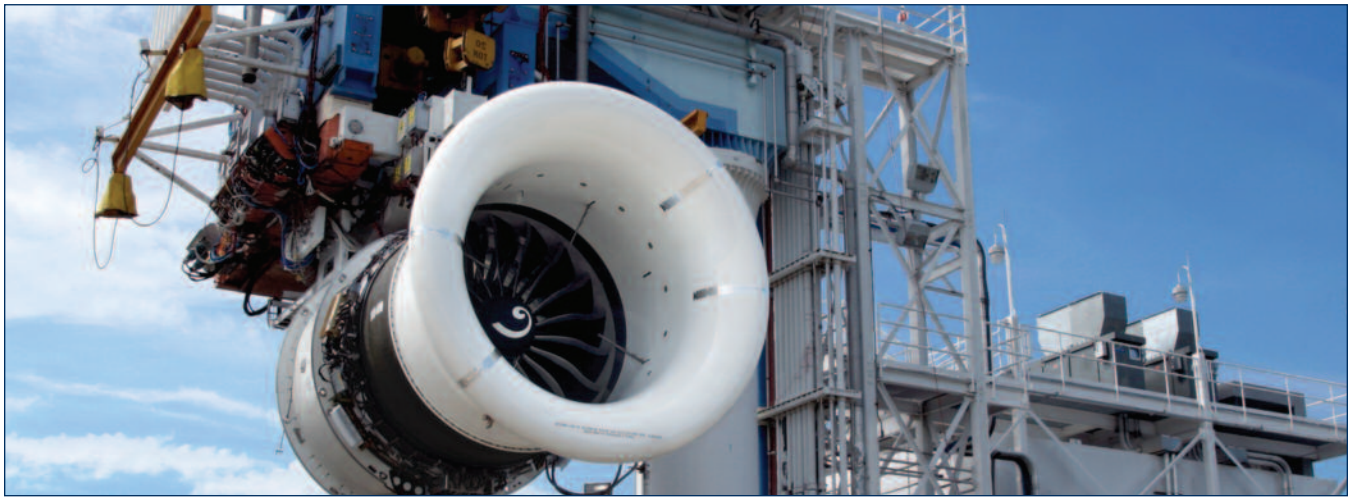


Model 357D92 **Model 357D93**

0.56 x 0.95 x 0.56 in (H x L x W)

Series 357D9X

- Temperature: -67 to 1200 ºF (-55 to 650 ºC)
- Sensitivity: 2.3 & 5 pC/g
- Measurement Range: ±1000 g pk



Long Term Vibration Monitoring

Differential Accelerometers For Turbine Engine Monitoring

Charge mode accelerometers with high temperature differential output are ideal for monitoring of turbines.

Model 357C7X

- Temperature: -65 to 900 °F (-54 to 482 °C)
- Sensitivity: 10 to 100 pC/g
- Measuring range: to 1000g

Model EX611A20

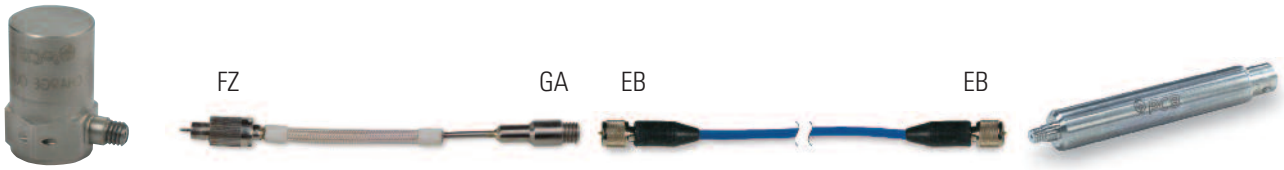
- Temperature: -165 to 1300 °F (-109 to 704 °C)
- Sensitivity: 10 pC/g
- Measurement Range: ±200 g pk
- Featuring shear mode sensing element vs. compression mode
- Hazardous location approvals

Series EX600B1X

- Temperature: -65 to 900 °F (-54 to 482 °C)
- Sensitivity: 10 to 100 mV/g
- Measurement Range: ±50 to 500 g peak
- Hazardous location approvals

Accessories

High Temperature, Single-Ended, Charge Output System Configuration



900 °F (482 °C) Single-ended, Charge-output Accelerometer

Series 023 Hardline Cable

Series 003Axx Low Noise, Softline Cable

Series 422 In-Line Charge Converter

Recommended Output Cables

Series 003Cxx

Series 003Dxx

Single-Ended In-Line Charge Converters

- Condition signals from charge output piezoelectric sensors
- Convert high impedeance charge signals intolow impedance voltage signals
- Operate with ICP® sensor signal conditioners or readout devices with an ICP® sensor input
- Maintain fixed charge conversion regardless of input capacitance

Series Exx and **Series 422Exx/A**

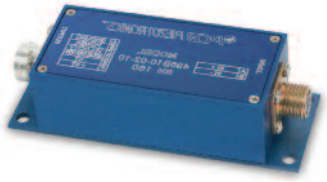
Model	Sensitivity	Input Range	Low Frequency (-5%)
422E38	0.1 mV/pC	25,000 pC	5 Hz
422E35	1 mV/pC	2500 pC	5 Hz
422E36	10 mV/pC	250 pC	5 Hz

Differential Charge Output System Components

Model GN Hardline Accelerometer Mating Socket Connector 900 °F (482 °C)

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

Model GP Hardline 7/16-27 2-pin Connector 900 °F (482 °C)



Model ET Softline Accelerometer Mating Socket Connector 500 °F (260 °C)

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

Model JD 2-pin connector mate to 495B10

Series 495B10 Differential Charge Amplifier

Complete High Temperature Accelerometer Listing

Temp	Model	Gas Trbine Location
< 500 °F	357C10	Fan Area & ESS, HALT/HASS Testing
	357C10/NC	
	320C15	
	320C18	
	357A09	
	P357A09	
	339A31 UHT-12™	
	339A32 UHT-12™	
	HT356B01 UHT-12™	
	356A70	
	356A71	
≥ 500 to < 1200 °F	357B03	Compressor Area & Component Testing
	357B06	
	357B21	
	357B04	
	357B03	
	357B11	
	EX600B1X UHT-12™	
	357C71	
	357C72	
	357C73	
	357B81	
	357A07/NC	
	357B69	
	357B69/NC	
	357B53	
	357B61	
	357B61/NC	
	EX611A20 UHT-12™	
≥ 1200 °F	357D90 UHT-12™	Monitoring
	357D91 UHT-12™	
	357D92 UHT-12™	
	357D93 UHT-12™	

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