

 **PCB** *PIEZOTRONICS* ^{INC.}
VIBRATION DIVISION

PRODUCT CATALOG



SENSORS FOR ACCELERATION, SHOCK, VIBRATION,
AND ACOUSTIC MEASUREMENTS

Seismic ICP[®] Accelerometers

- **Building vibration monitoring**
- **Earthquake detection**
- **Structural testing of bridges**
- **Floor vibration monitoring**
- **Geological formation studies**
- **Foundation vibration monitoring**

Seismic accelerometers are specifically designed to enable the detection of ultra-low-level, low-frequency vibrations associated with very large structures, foundations, and earth tremors. These sensors typically possess exceptional measurement resolution as the result of a comparatively larger size, which furnishes a stronger output signal and a lower noise floor.

Both ceramic and quartz sensing elements are utilized in seismic accelerometer designs. The Model 393C, with quartz sensing element, offers the best low-frequency response. Ceramic element styles with built-in, low-noise, signal conditioning circuitry offer the greatest measurement resolution. For best measurement clarity, seismic accelerometers should be used with a unity gain, battery-powered signal conditioner.

Several versions offer rugged, laser-welded, stainless steel housings with durable military-style connectors. Electrical case isolation, hermetic sealing, RF, EMI, ESD, and overload protection all ensure tolerance against environmental influences and mishandling.



 **PCB PIEZOTRONICS**^{INC.}
VIBRATION DIVISION

Seismic ICP[®] Accelerometers

SEISMIC ICP[®] ACCELEROMETERS

(complete specifications are featured on page 1.76 to 1.77)

Seismic ICP[®] accelerometers are characterized by a low noise floor, high output signal, and low frequency response. They are also larger in size and weight.

- building vibration
- floor and foundation vibration
- large machinery
- heavy equipment
- site surveys

Model 393B04 — Low noise, wide amplitude range

- 1000 mV/g [102 mV/(m/s²)] sensitivity
- 0.05 Hz to 750 Hz frequency range
- 50 gram (1.8 oz) weight
- 3 μ g (30 μ m/s² resolution)

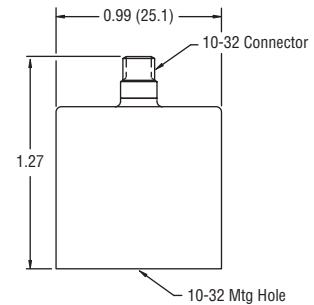
Recommended cables and accessories ②② — see page 4.2

Select an ICP[®] sensor signal conditioner from those featured in section 3

Options: M — see pages xvii to xx for option information



1/2x Actual Size



Model 393B05 — High output signal in a small package size

- 10 V/g [1.02 V/(m/s²)] sensitivity
- 0.5 Hz to 750 Hz frequency range
- 50 gram (1.8 oz) weight
- 4 μ g (40 μ m/s² resolution)

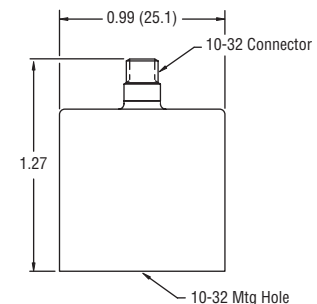
Recommended cables and accessories ②② — see page 4.2

Select an ICP[®] sensor signal conditioner from those featured in section 3

Options: M — see pages xvii to xx for option information



1/2x Actual Size



Model 393A03 — General purpose, rugged

- 1000 mV/g [102 mV/(m/s²)] sensitivity
- 0.3 to 4000 Hz frequency range
- 210 gram (7.4 oz) weight
- 10 μ g (100 μ m/s²) resolution
- 5000 g (49k m/s²) shock survivability
- Electrical case isolation

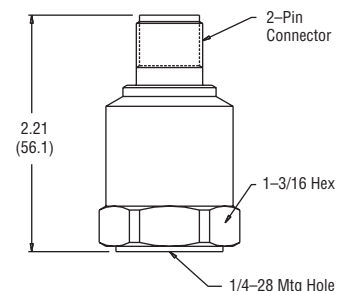
Recommended cables and accessories ⑦ — see page 4.2

Select an ICP[®] sensor signal conditioner from those featured in section 3

Options: M — see pages xvii to xx for option information



1/2x Actual Size



Seismic ICP[®] Accelerometers

SEISMIC ICP[®] ACCELEROMETERS (continued)

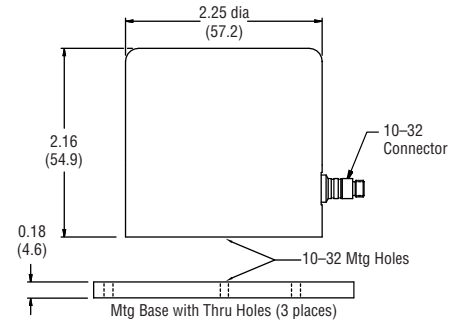
Model 393C — Quartz sensing element provides stable, low-frequency measurement capability

- 1000 mV/g [102 mV/(m/s²)] sensitivity
- 0.01 to 1200 Hz frequency range
- 885 gram (31.2 oz) weight
- 100 µg (1mm/s²) resolution
- Electrical ground isolation

Recommended cables and accessories ②② — see page 4.2

Select an ICP[®] sensor signal conditioner from those featured in section 3

Options: none



1/2x Actual Size

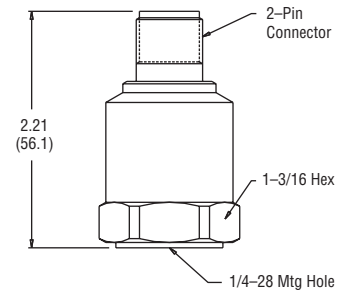
Model 393B12 — High output signal in a relatively small package size

- 10 V/g [1.02 V/(m/s²)] sensitivity
- 0.1 to 2000 Hz frequency range
- 210 gram (7.4 oz) weight
- 8 µg (80 µm/s²) resolution
- 5000 g shock survivability
- Electrical case isolation

Recommended cables and accessories ⑦ — see page 4.2

Select an ICP[®] sensor signal conditioner from those featured in section 3

Options: M — see pages xvii to xx for option information



1/2x Actual Size

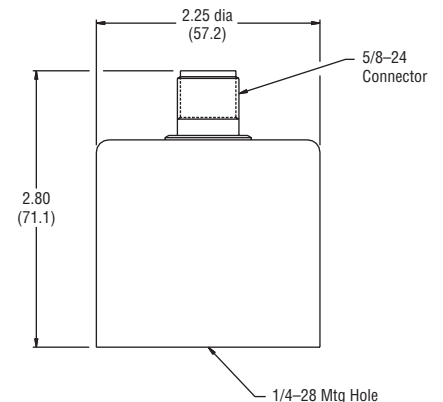
Model 393B31 — Best resolution seismic accelerometer

- 10 V/g [1.02 V/(m/s²)] sensitivity
- 0.07 to 300 Hz frequency range
- 635 gram (22.4 oz) weight
- 1 µg (9 µm/s²) rms resolution
- Electrical case isolation

Recommended cables and accessories ⑦ — see page 4.2


Select an ICP[®] sensor signal conditioner from those featured in section 3

Options: M — see pages xvii to xx for option information




1/2x Actual Size

Seismic ICP[®] Accelerometers

Seismic ICP [®] Accelerometer Specifications						
Model Number ^[1]	393C		393A03 		393B04	
Performance	English	SI	English	SI	English	SI
Sensitivity	1000 mV/g	102 mV/(m/s ²)	1000 mV/g	102 mV/(m/s ²)	1000 mV/g	102 mV/(m/s ²)
Sensitivity Tolerance	± 15%	± 15%	± 5%	± 5%	± 10%	± 10%
Measurement Range	2.5 g pk	24.5 m/s ² pk	± 5 g pk	± 49 m/s ² pk	± 5 g pk	± 49 m/s ² pk
Frequency Range (± 5%)	0.025 to 800 Hz	0.025 to 800 Hz	0.5 to 2000 Hz	0.5 to 2000 Hz	0.06 to 450 Hz	0.06 to 450 Hz
Frequency Range (± 10%)	0.01 to 1200 Hz	0.01 to 1200 Hz	0.3 to 4000 Hz	0.3 to 4000 Hz	0.05 to 750 Hz	0.05 to 750 Hz
Resonant Frequency	≥ 3.5 kHz	≥ 3.5 kHz	≥ 10 kHz	≥ 10 kHz	≥ 2500 Hz	≥ 2500 Hz
Broadband Resolution (1 to 10k Hz)	0.0001 g rms	0.001 m/s ² rms	0.00001 g rms	0.0001 m/s ² rms	0.000003 g rms	0.00003 m/s ² rms
Non-Linearity ^[2]	≤ 1 %	≤ 1 %	≤ 1 %	≤ 1 %	≤ 1 %	≤ 1 %
Transverse Sensitivity	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %	≤ 5 %
Environmental						
Overload Limit (Shock)	± 100 g pk	± 981 m/s ² pk	± 5000 g pk	± 49k m/s ² pk	± 300 g pk	± 2950 m/s ² pk
Temperature Range (Operating)	-65 to +200 °F	-54 to +93 °C	-65 to +250 °F	-54 to +121 °C	0 to +176 °F	-18 to +80 °C
Electrical						
Excitation Voltage	18 to 30 VDC	18 to 30 VDC	18 to 30 VDC	18 to 30 VDC	18 to 30 VDC	18 to 30 VDC
Constant Current Excitation	2 to 20 mA	2 to 20 mA	2 to 20 mA	2 to 20 mA	2 to 10 mA	2 to 10 mA
Output Impedance	<100 ohms	<100 ohms	<250 ohms	<250 ohms	<500 ohms	<500 ohms
Output Bias Voltage	3 to 4.5 VDC	3 to 4.5 VDC	8 to 12 VDC	8 to 12 VDC	7 to 12 VDC	7 to 12 VDC
Discharge Time Constant	≥ 20 sec	≥ 20 sec	1 to 3 sec	1 to 3 sec	5 to 15 sec	5 to 15 sec
Electrical Isolation (Case)	≥ 10 ⁸ ohms ^[7]	≥ 10 ⁸ ohms ^[7]	≥ 10 ⁸ ohms	≥ 10 ⁸ ohms	N/A	N/A
Physical						
Sensing Element	Quartz	Quartz	Ceramic	Ceramic	Ceramic	Ceramic
Sensing Geometry	Compression	Compression	Shear	Shear	Flexural	Flexural
Housing Material	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel	Titanium	Titanium
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Weight	31.2 oz	885 gm	7.4 oz	210 gm	1.8 oz	50 gm
Size (Diameter × Height)	2.25 in × 2.16 in	57.2 mm × 54.9 mm	1 3/16 in × 2.19 in ^[6]	1 3/16 in × 55.6 mm ^[6]	0.99 in × 1.22 in	25 mm × 31 mm
Electrical Connection	10-32 Coaxial Jack	10-32 Coaxial Jack	2-Pin MIL-C-5015	2-Pin MIL-C-5015	10-32 Coaxial Jack	10-32 Coaxial Jack
Electrical Connection Position	Side	Side	Top	Top	Top	Top
Mounting Thread	10-32 Female	10-32 Female	1/4-28 Female	1/4-28 Female	10-32 Female	10-32 Female
Supplied Accessories ^[3]						
Petro Wax	080A109		—		—	
Mounting Base	080A88		—		—	
Mounting Stud	081B05		081B20		081B05	
Metric Mounting Stud	M081B05		M081B20		—	
Protective Thermal Jacket	—		085A31		—	
NIST Calibration ^[4]	ACS-1, ACS-4		ACS-1, ACS-4		ACS-1, ACS-4	
Additional Accessories ^[3]						
Magnetic Mounting Base	080A21		080A54		N/A	
Triaxial Mounting Adaptor	080M16		080A57		N/A	
Mating Cable Connectors	EB, AH, AK, AW		AE, AM, AP		EB, AH, AK, AW	
Recommended Stock Cables	002, 003		N/A		002, 003	
Options ^[5]						
Available Options	N/A		N/A		M	
NOTES: [1] See note regarding accuracy of information on inside front cover. [2] Zero-based, least-squares, straight line method. [3] See section 4 of this catalog for cable and accessory information. [4] See page 1.130 for calibration information. [5] See page xvii to xx for option information. [6] Hex × Height. [7] Base Isolation.						

Seismic ICP[®] Accelerometers

Seismic ICP [®] Accelerometer Specifications						
Model Number ^[1]	393B05 		393B12		393B31	
Performance	English	SI	English	SI	English	SI
Sensitivity	10 V/g	1.02 V/(m/s ²)	10.0 V/g	1.02 V/(m/s ²)	10.0 V/g	1.02 V/(m/s ²)
Sensitivity Tolerance	± 10%	± 10%	± 10%	± 10%	± 5%	± 5%
Measurement Range	0.5 g pk	4.9 m/s ² pk	0.5 g pk	4.9 m/s ² pk	0.5 g pk	4.9 m/s ² pk
Frequency Range (± 5%)	0.6 to 450 Hz	0.6 to 450 Hz	0.15 to 1000 Hz	0.15 to 1000 Hz	0.1 to 200 Hz	0.1 to 200 Hz
Frequency Range (± 10%)	0.5 to 750 Hz	0.5 to 750 Hz	0.10 to 2000 Hz	0.10 to 2000 Hz	0.07 to 300 Hz	0.07 to 300 Hz
Resonant Frequency	≥ 2.5 kHz	≥ 2.5 kHz	≥ 10 kHz	≥ 10 kHz	≥ 700 Hz	≥ 700 Hz
Broadband Resolution (1 to 10k Hz)	0.000004 g rms	0.00004 m/s ² rms	0.000008 g rms	0.00008 m/s ² rms	0.000001 g rms	0.000009 m/s ² rms
Non-Linearity ^[2]	≤ 1 %	≤ 1 %	≤ 1 %	≤ 1 %	≤ 1 %	≤ 1 %
Transverse Sensitivity	≤ 5 %	≤ 5 %	≤ 7 %	≤ 7 %	≤ 5 %	≤ 5 %
Environmental						
Overload Limit (Shock)	± 300 g pk	± 2950 m/s ² pk	± 5000 g pk	± 49k m/s ² pk	± 40 g pk	± 392 m/s ² pk
Temperature Range (Operating)	0 to +176 °F	-18 to +80 °C	-50 to +180 °F	-45 to +82 °C	0 to +150 °F	-18 to +65 °C
Electrical						
Excitation Voltage	18 to 30 VDC	18 to 30 VDC	18 to 30 VDC	18 to 30 VDC	24 to 28 VDC	24 to 28 VDC
Constant Current Excitation	2 to 10 mA	2 to 10 mA	2 to 20 mA	2 to 20 mA	2 to 10 mA	2 to 10 mA
Output Impedance	<500 ohms	<500 ohms	<1000 ohms	<1000 ohms	≤ 500 ohms	≤ 500 ohms
Output Bias Voltage	7 to 12 VDC	7 to 12 VDC	8 to 12 VDC	8 to 12 VDC	8 to 14 VDC	8 to 14 VDC
Discharge Time Constant	0.5 to 2.0 sec	0.5 to 2.0 sec	≥ 3.5 sec	≥ 3.5 sec	≥ 5 sec	≥ 5 sec
Electrical Isolation (Case)	N/A	N/A	≥ 10 ⁸ ohms	≥ 10 ⁸ ohms	≥ 10 ⁸ ohms	≥ 10 ⁸ ohms
Physical						
Sensing Element	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic	Ceramic
Sensing Geometry	Flexural	Flexural	Shear	Shear	Flexural	Flexural
Housing Material	Titanium	Titanium	Stainless Steel	Stainless Steel	Stainless Steel	Stainless Steel
Sealing	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic	Hermetic
Weight	1.8 oz	50 gm	7.4 oz	210 gm	22.4 oz	635 gm
Size (Diameter × Height)	0.99 in × 1.22 in	25 mm × 31 mm	1 3/16 in × 2 3/16 in ^[6]	1 3/16 in × 55.6 mm ^[6]	2 1/4 in × 2.8 in ^[6]	2 1/4 in × 71.1 mm ^[6]
Electrical Connection	10-32 Coaxial Jack	10-32 Coaxial Jack	2-Pin MIL-C-5015	2-Pin MIL-C-5015	2-Pin MIL-C-5015	2-Pin MIL-C-5015
Electrical Connection Position	Top	Top	Top	Top	Top	Top
Mounting Thread	10-32 Female	10-32 Female	1/4-28 Female	1/4-28 Female	1/4-28 Female	1/4-28 Female
Supplied Accessories ^[3]						
Petro Wax	—	—	—	—	—	—
Mounting Base	—	—	—	—	—	—
Mounting Stud	081B05	—	081B20	—	081B20	—
Protective Thermal Jacket	—	—	085A31	—	—	—
NIST Calibration ^[4]	ACS-1	—	ACS-1, ACS-4	—	ACS-4	—
Additional Accessories ^[3]						
Magnetic Mounting Base	N/A	—	080A54	—	N/A	—
Triaxial Mounting Adaptor	N/A	—	080A57	—	080M189	—
Mating Cable Connectors	EB, AH, AK, AW	—	AE, AM, AP	—	AE, AM, AP	—
Recommended Stock Cables	002, 003	—	N/A	—	N/A	—
Options ^[5]						
Available Options	M	—	M	—	M	—

NOTES: [1] See note regarding accuracy of information on inside front cover. [2] Zero-based, least-squares, straight line method.
[3] See section 4 of this catalog for cable and accessory information. [4] See page 1.130 for calibration information.
[5] See page xvii to xx for option information. [6] Hex × Height.

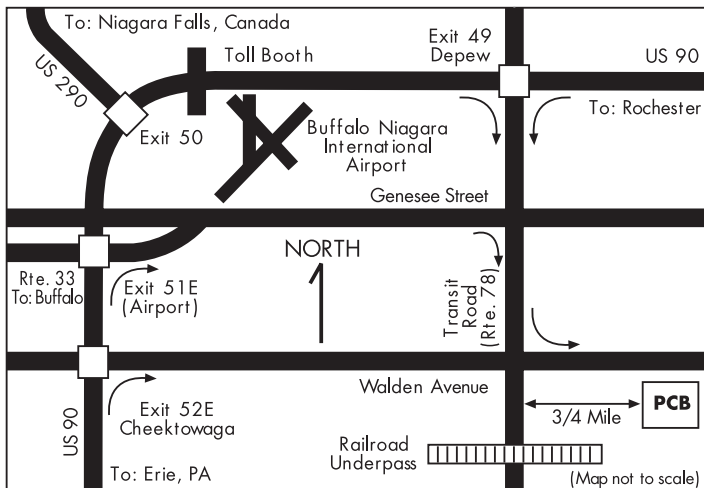


Seismic accelerometers are utilized on large civil structures, such as buildings and bridges, to monitor their motion in response to such effects as wind, traffic, and earthquakes.



Sensor Technology Center

Piezoelectric, capacitive, strain gage, and resistive sensors for acceleration, acoustics, actuation, force, load, pressure, shock, strain, torque and vibration



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