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# Seismic

## Seismic Sensors

Combine a supersensitive piezoelectric accelerometer, an ultra low-noise amplifier, excellent electrical/mechanical isolation, and the result will be unmatched performance in measuring low-level vibration.

The Model 731A Ultra-Quiet Seismic Accelerometer can measure vibration levels down to the sub micro-g range by using an ultra-low noise internal amplifier and a high sensitivity inertial sensing element. It contains no moving parts, is not sensitive to magnetic fields, and has a relatively low mass.

The Model P31 Amplifier enhances the capabilities of the 731A by providing special low noise signal amplification and conditioning by providing 2.4mA constant current needed to power the accelerometer's internal amplifier.

Some common applications include: earthquake detection, geophysics, geothermal development, structural analysis and mine safety.

Wilcoxon considers seismic sensors to be accelerometers characterized by good low frequency response, high output sensitivity and having a low noise floor. They are primarily designed to measure low amplitude low frequency signals in applications such as structural monitoring and vibration isolation verification. Accelerometers used for earth seismic monitoring should have a very low noise floor. Wilcoxon's 731A has a noise floor very near the New High Noise Model (NHNM) developed by the U.S. Department of Interior.

Seismic accelerometers have internal amplifiers similar to the industrial accelerometers. They are powered using the same method that is, using a constant-current diode to provide power to the accelerometer. The seismic accelerometer amplifier output has a characteristic Bias Output Voltage (BOV) and the vibration signal is superimposed upon this DC voltage level. The accelerometer circuit is isolated from the case making installation and mounting simple, while the two-wire powering and signal method simplifies the wiring.

### Wilcoxon Seismic Sensors:

Model	Style	Sensitivity	Low Freq	High Freq	Accel Range
731A	flexure	10 V/g	.05 Hz	500 Hz	0.5 g peak
731A/P31	flexure	selectable	.05 Hz	100 Hz	0.5 g peak
731-207	flexure	10 V/g	0.2 Hz	1,300 Hz	0.5 g peak

Note: Frequency @  $\pm 3dB$ .

## Model 731A

### Ultra-Quiet, Ultra Low Frequency, Seismic Accelerometer



**FEATURES:**

- Ultra high sensitivity
- Ultra low-noise electronics for clear signals at sub micro-g levels
- Low frequency capable
- Low pass filtered to eliminate high frequencies
- Miswiring protection

**DYNAMIC**

Sensitivity, $\pm 10\%$ , 25°C .....	10 V/g
Acceleration Range .....	0.5 g peak
Amplitude Nonlinearity .....	1%
Frequency Response:	
$\pm 10\%$ .....	0.10 - 300 Hz
$\pm 3$ dB .....	0.05 - 500 Hz
Resonance Frequency .....	815 Hz
Transverse Sensitivity, max. ....	1% of axial
Temperature Response .....	-10°C      -12%
	+65°C      +5%

**ELECTRICAL**

Power Requirement:	voltage source .....	18 - 30 VDC
	current regulating diode .....	2 - 10 mA
Electrical Noise, equiv. g:		
Broadband	2.5 Hz to 25 kHz .....	0.2 $\mu$ g
Spectral	2 Hz .....	0.03 $\mu$ g/ $\sqrt$ Hz
	10 Hz .....	0.01 $\mu$ g/ $\sqrt$ Hz
	100 Hz .....	0.004 $\mu$ g/ $\sqrt$ Hz
Output Impedance, max. ....		100 $\Omega$
Bias Output Voltage .....		9 VDC
Grounding .....		case isolated

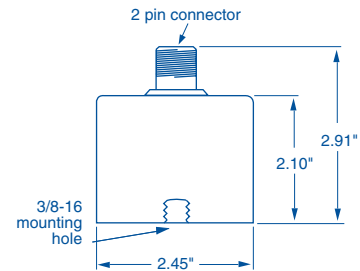
**ENVIRONMENTAL**

Temperature Range .....	-10 to 65°C
Vibration Limit .....	10 g peak
Shock Limit .....	fragile
Electromagnetic Sensitivity @ 60 Hz .....	20 $\mu$ g/gauss
Sealing .....	Hermetic
Base Strain Sensitivity .....	0.0001 g/ $\mu$ strain

**PHYSICAL**

Sensing Element Design .....	PZT ceramic / flexure
Weight .....	670 grams
Case Material .....	316L stainless steel
Mounting .....	3/8 - 16 tapped hole
Output Connector .....	2 pin, MIL-C-5015 style
Mating Connector .....	R6 type
Recommended Cabling .....	J9 / J9T2A

CONNECTOR PIN	FUNCTION
SHELL	ground
A	power/ signal
B	common



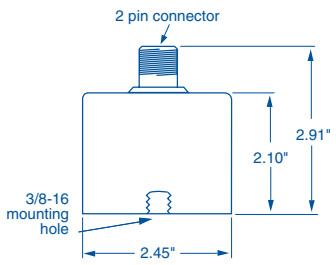
**ACCESSORIES SUPPLIED:** SF7 mounting stud; Calibration data (level 3).  
**OPTIONS:** Power unit/Amplifier P31.  
**NOTE:** Special handling required due to sensitivity.



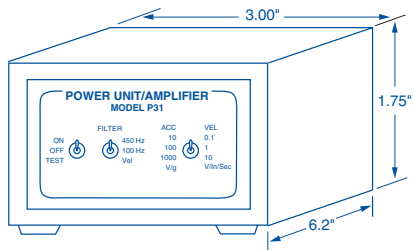


**FEATURES:**

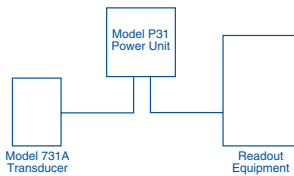
- Ultra high sensitivity
- Ultra low-noise electronics for clear signals at sub micro-g levels
- Low frequency capable
- Low pass filtered to eliminate high frequencies
- ESD protection
- Miswiring protection



**Model 731A**



**Model P31**



**POWERING WITH P31 POWER UNIT**

## Model 731A / P31

### Seismic Accelerometer and Power Amplifier System

**DYNAMIC**

Acceleration Sensitivity, selectable .....	10, 100, 1000 V/g
Velocity Sensitivity, selectable .....	0.1, 1, 10 V/in/sec
Vibration Range, max. ....	0.5 g peak
Amplitude Nonlinearity .....	1%
Frequency Response:	
<b>Filter</b> <b>100 Hz</b> <b>450 Hz</b> <b>Velocity</b>	
-10%          0.08 - 70 Hz                      0.08 - 300 Hz                      ---	
-3dB          0.05 - 100 Hz                      0.05 - 450 Hz                      0.8 - 150 Hz	
Transverse Sensitivity, max. ....	1% of axial

**ELECTRICAL**

Output Impedance .....	2500 Ω
Recommended Load Impedance .....	> 250 KΩ
Maximum Output Voltage .....	5 V peak
Noise:	
Spectral          2 Hz .....	0.03 µg/√Hz
10 Hz .....	0.01 µg/√Hz
100 Hz .....	0.004 µg/√Hz
Grounding .....	Case isolated
Output Connector:	
Model 731A .....	2 pin, MIL-C-5015 style
Model P31 .....	BNC
Input Connector (P31) .....	Twin Axial BNC

**POWER REQUIREMENTS (P31)**

Internal Batteries .....	Two 9 Volt Alkaline
Battery Life .....	> 75 hours

**ENVIRONMENTAL**

Temperature Range .....	-10 to 65°C
Vibration Limit .....	10 g peak
Shock Limit .....	Fragile
Base Strain Sensivity .....	0.0001 g/µstrain

**PHYSICAL**

Sensing Element Design .....	PZT ceramic / flexure
Weight:	
Model 731A Seismic Accelerometer .....	670 grams
Model P31 Power Unit/Amplifier .....	600 grams
Interconnect Cable, Model 731A to Model P31 .....	R6-2T-J9-10

OUTPUT	CONNECTOR	FUNCTION	CABLE
731A	SHELL	case	Shield
	A	power / signal	White
	B	common	Black
P31	SHELL	common	Shield
	PIN	signal	Center Conductor
INPUT	CONNECTOR	FUNCTION	CABLE
P31	SHELL	ground	Shield
	PIN	power/signal	White
	SOCKET	common	Black

**ACCESSORIES SUPPLIED:**

**NOTE:**

SF7 mounting stud; Calibration data (level 3).  
Special handling required due to sensitivity.



## Model 731-207

### Ultra Low Frequency, Seismic Accelerometer



#### DYNAMIC

Sensitivity, $\pm 10\%$ , 25°C .....	10 V/g
Acceleration Range .....	0.5 g peak
Amplitude Nonlinearity .....	1%
Frequency Response, nominal:	
$\pm 5\%$ .....	0.6 - 650 Hz
$\pm 10\%$ .....	0.5 - 850 Hz
$\pm 3$ dB .....	0.2 - 1,300 Hz
Resonance Frequency, mounted, nominal .....	2.4 kHz
Transverse Sensitivity, max. ....	1% of axial
Temperature Response .....	-0°C -18%
	+80°C +8%

#### ELECTRICAL

Power Requirement:	
voltage source .....	18 - 30 VDC
current regulating diode .....	2 - 10 mA
Electrical Noise, equiv. g, nominal:	
Broadband 2.5 Hz to 25 kHz .....	2 $\mu$ g
Spectral 2 Hz .....	0.28 $\mu$ g/ $\sqrt{\text{Hz}}$
10 Hz .....	0.09 $\mu$ g/ $\sqrt{\text{Hz}}$
100 Hz .....	0.03 $\mu$ g/ $\sqrt{\text{Hz}}$
Output Impedance, max. ....	500 $\Omega$
Bias Output Voltage, nominal .....	10 VDC
Grounding .....	case grounded

#### ENVIRONMENTAL

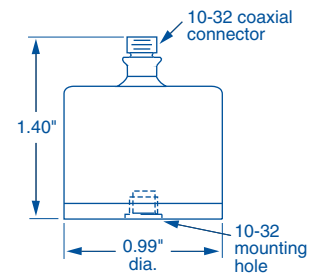
Temperature Range .....	0 to 80°C
Vibration Limit .....	50 g peak
Shock Limit .....	250 g peak
Electromagnetic Sensitivity @ 60 Hz .....	20 $\mu$ g/gauss
Base Strain Sensitivity .....	0.0005 g/ $\mu$ strain
Sealing .....	hermetic design

#### PHYSICAL

Weight .....	50 grams
Case Material .....	316L stainless steel
Mounting .....	10-32 UNF
Output Connector .....	10-32 coaxial

#### FEATURES:

- Compact construction to fit in tight spaces
- Ultra-high sensitivity
- Ultra low-noise electronics for clear signals at very low vibration levels
- Miswiring protection



**NOTE:** Radiation Hardened option available.

**ACCESSORIES SUPPLIED:** Calibration data; SF1 mounting stud

**ACCESSORIES AVAILABLE:** R1-2-J93-10 cable assembly, magnetic mounting bases, SF5 cementing studs, SF4 isolation mounting base, signal conditioners.



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