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# Underwater

## Underwater Accelerometers

Wilcoxon Research, Inc. underwater accelerometers are designed to be used virtually anywhere under continuous submersion. They are resistant to galvanic corrosion and built to withstand the high pressures of deep submergence. Titanium cases are useful when it is desired to have the accelerometer be highly resistant to galvanic corrosion or mounted on titanium structures. Stainless steel can be used for applications where the accelerometer will be mounted on cast iron or mild steel structures since they are near one another on the galvanic series list.

The ability to retain a hermetic seal while submerged is paramount for underwater accelerometers. All Wilcoxon underwater accelerometers are designed for continuous exposure to 650 PSI of water pressure. Helium leak testing is used to verify the hermeticity of the welding for accelerometers.

### Pressure vs. Depth

1 atmosphere  $\approx$  14.7 psi  
 33.9 feet of water  $\approx$  1 atmosphere  
 1,500 feet  $\approx$  650 psi

## Galvanic Corrosion

Galvanic corrosion is an electrochemical action of two dissimilar metals in the presence of an electrolyte and an electron conductive path. It occurs when dissimilar metals are in contact. It is recognizable by the presence of a buildup of corrosion at the joint between the dissimilar metals. For example, when aluminum alloys or magnesium alloys are in contact with steel (carbon steel or stainless steel), galvanic corrosion can occur and accelerate the corrosion of the aluminum or magnesium. Platinum is the most resistant and magnesium is the least resistant to galvanic corrosion.

The natural differences in metal potentials produce galvanic differences, such as the galvanic series in sea water. If electrical contact is made between any two of these materials in the presence of an electrolyte, current must flow between them. The farther apart the metals are in the galvanic series, the greater the galvanic corrosion effect or rate will be. Metals or alloys at the upper end are noble while those at the lower end are active. The more active metal is the anode or the one that will corrode. Control of galvanic corrosion is achieved by using metals closer to each other in the galvanic series or by electrically isolating metals from each other.

### Abbreviated Galvanic Series Table

#### Noble (least active)

- Platinum
- Gold
- Graphite
- Silver
- Titanium
- :
- :
- 18-8-3 Stainless steel, type 316
- 18-8 Stainless steel, type 304
- Cast iron
- Mild steel
- :
- :
- Aluminum
- Galvanized steel
- Zinc
- Magnesium
- Anodic (most active)

## Wilcoxon Underwater Accelerometers:

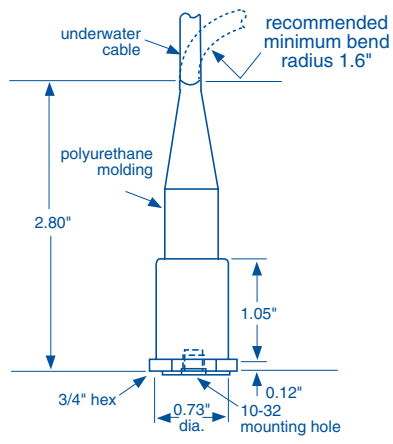
Model	Style	Sensitivity	Low Freq	High Freq	Accel Range
746	compression	100 mV/g	1.0 Hz	15 kHz	50 g peak
754	shear	10 mV/g	2.0 Hz	25 kHz	250 g peak
757	shear	100 mV/g	2.0 Hz*	2 kHz*	50 g peak

Note: Frequency @  $\pm$ 3dB except \*Frequency @  $\pm$ 10%.



**FEATURES:**

- High Sensitivity
- Wide frequency range
- High pressure rating
- Ground isolated-eliminates ground loops
- Miswiring protected
- Titanium case to minimize galvanic corrosion activity



# Model 746

## Underwater Accelerometer

**DYNAMIC**

Sensitivity, $\pm 5\%$ , $25^\circ\text{C}$ .....	100 mV/g
Acceleration Range .....	50 g peak
Amplitude Nonlinearity .....	1%
Frequency Response:	
$\pm 1$ dB .....	2 - 8,000 Hz
$\pm 3$ dB .....	1 - 15,000 Hz
Resonance Frequency, mounted, nominal .....	30 kHz
Transverse Sensitivity, max. ....	5% of axial
Temperature Response .....	$-50^\circ\text{C}$ $-10\%$
	$+80^\circ\text{C}$ $+4\%$

**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 .....	50 $\mu\text{g}$
Spectral            10 Hz .....	10 $\mu\text{g}/\sqrt{\text{Hz}}$
100 Hz .....	0.8 $\mu\text{g}/\sqrt{\text{Hz}}$
1000 Hz .....	0.2 $\mu\text{g}/\sqrt{\text{Hz}}$
Output Impedance, max. ....	100 $\Omega$
Bias Output Voltage .....	10, $\pm 2$ VDC
Grounding .....	case isolated

**ENVIRONMENTAL**

Hydrostatic Pressure .....	650 psi
Temperature Range .....	$-50$ to $80^\circ\text{C}$
Vibration Limit .....	500 g peak
Shock Limit .....	5,000 g peak
Base Strain Sensitivity .....	0.005 g/ $\mu\text{strain}$

**PHYSICAL**

Dynamic Weight .....	45 grams
Case Material .....	titanium
Mounting .....	10 - 32 tapped hole
Integral Cabling .....	J6, 10 ft., coaxial, water blocked, polyurethane jacket, 30 pF/ft

CABLE CONNECTION	FUNCTION
Center	power/ signal
Shield	common

**OPTIONS:** Customer specified cable length, connectors, sensitivity, filtering.  
**ACCESSORIES SUPPLIED:** SF1 mounting stud; calibration data  
**ACCESSORIES AVAILABLE:** Magnetic mounting bases, cementing studs, power supplies, amplifiers, signal conditioners



## Model 754 Miniature Underwater Accelerometer



### DYNAMIC

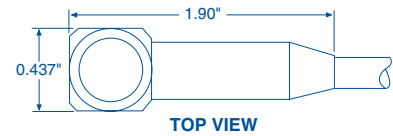
Sensitivity, $\pm 1.5$ dB, 25°C .....	10 mV/g
Acceleration Range .....	250 g peak
Amplitude Nonlinearity .....	1%
Frequency Response:	
$\pm 1$ dB .....	10 - 15,000 Hz
$\pm 3$ dB .....	2 - 25,000 Hz
Resonance Frequency, mounted, nominal .....	60 kHz
Transverse Sensitivity, max. ....	10% of axial
Temperature Response .....	-50°C -10%
	+80°C +8%

### FEATURES:

- High Sensitivity
- Wide frequency range
- High pressure rating
- Ground isolated-eliminates ground loops
- Miswiring protected
- Titanium case to minimize galvanic corrosion activity

### ELECTRICAL

Power Requirement:	
voltage source .....	18-30 VDC
current regulating diode .....	2-5 mA
Electrical Noise, equiv. g, nominal:	
Broadband           2.5 Hz to 25 kHz .....	300 $\mu$ g
Spectral	
10 Hz .....	50 $\mu$ g/ $\sqrt{\text{Hz}}$
100 Hz .....	4.0 $\mu$ g/ $\sqrt{\text{Hz}}$
1,000 Hz .....	1.5 $\mu$ g/ $\sqrt{\text{Hz}}$
10,000 Hz .....	1.0 $\mu$ g/ $\sqrt{\text{Hz}}$
Output Impedance, max. ....	200 $\Omega$
Bias Output Voltage, nom. ....	8 $\pm$ 1.5 VDC
Grounding .....	case isolated, internally shielded



### ENVIRONMENTAL

Hydrostatic Pressure, max. ....	650 psi
Temperature Range .....	-20 to 90°C
Vibration Limit .....	500 g peak
Shock Limit .....	5000 g peak
Base Strain Sensitivity .....	0.01 $\mu$ /strain

Dynamic Weight .....	4 grams
Case Material .....	titanium
Mounting .....	adhesive
Integral Cabling .....	J6, 10 ft, coaxial polyurethane jacket, 30 pF/ft

#### CABLE CONNECTION

Center  
Shield

#### FUNCTION

power/ signal  
common

- NOTES:**
- 1 To minimize the possibility of signal distortion when driving long cables with high vibration signals, 24 to 30 VDC powering is recommended. The higher level constant current source should be used when driving long cables (please consult Wilcoxon Customer Service).



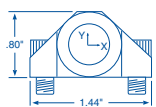
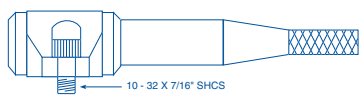
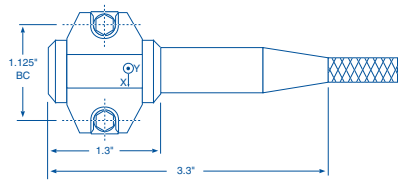


## Model 757

### Bi-axial, Low Profile, Underwater Accelerometer

**FEATURES:**

- Rugged
- General purpose underwater accelerometer
- Industrial
- Easy to mount
- Bi-axial measurements



**DYNAMIC**

Sensitivity, $\pm 10\%$ , 25°C .....	100 mV/g
Acceleration Range .....	50 g peak
Amplitude Nonlinearity .....	1%
Frequency Response:	
Both Channels, $\pm 10\%$ .....	2 - 2,000 Hz
Transverse Sensitivity, max. ....	5% of axial
Temperature Response .....	-20°C    -5%
	+80°C    +5%

**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 .....	100 $\mu\text{g}$
Spectral	
10 Hz .....	10 $\mu\text{g}/\sqrt{\text{Hz}}$
100 Hz .....	1 $\mu\text{g}/\sqrt{\text{Hz}}$
1000 Hz .....	0.5 $\mu\text{g}/\sqrt{\text{Hz}}$
Output Impedance, max. ....	100 $\Omega$
Bias Output Voltage, nominal .....	12 VDC
Grounding .....	case isolated, internally shielded

**ENVIRONMENTAL**

Temperature Range .....	-50 to 80°C
Hydrostatic Pressure, max. ....	650 psi
Vibration Limit .....	500 g peak
Shock Limit .....	5000 g peak
Electromagnetic Sensitivity, equiv. g. ....	100 $\mu\text{g}/\text{gauss}$
Base Strain Sensitivity .....	0.002 g/ $\mu\text{strain}$

**PHYSICAL**

Weight .....	110 grams
Case Material .....	316L stainless steel
Mounting .....	Two 10-32 x 7/16 SHCS on 1.125 bolt circle
Recommended Cable .....	J81S, 10 ft., 2 conductor shielded, polyurethane jacket, stainless steel braid
Cable Connection:	
White .....	X signal / power
Black .....	Y signal / power
Shield .....	common

**ACCESSORIES SUPPLIED:** Two 10-32 x 7/16 hex mounting screws; calibration data  
**ACCESSORIES AVAILABLE:** Power supplies, amplifiers, signal conditioners.



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