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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 ≈ 14.7 psi
33.9 feet of water ≈ 1 atmosphere
1,500 feet ≈ 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

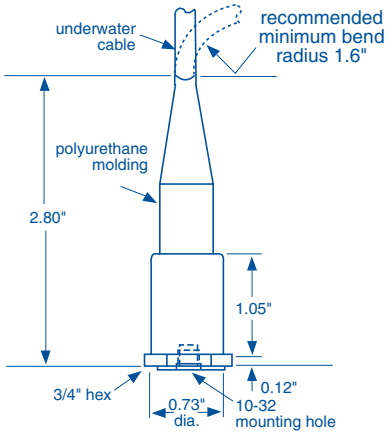
*Note: Frequency @ ±3dB except *Frequency @ ±10%.*

Model 746

Underwater Accelerometer

FEATURES:

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



DYNAMIC		
Sensitivity, ±5%, 25°C		100 mV/g
Acceleration Range		50 g peak
Amplitude Nonlinearity		1%
Frequency Response:		
±1 dB		2 - 8,000 Hz
±3 dB		1 - 15,000 Hz
Resonance Frequency, mounted, nominal		30 kHz
Transverse Sensitivity, max.		5% of axial
Temperature Response		–50°C –10% +80°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 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	0.8 µg/√Hz
	1000 Hz	0.2 µg/√Hz
Output Impedance, max.		100 Ω
Bias Output Voltage		10, ±2 VDC
Grounding		case isolated

ENVIRONMENTAL	
Hydrostatic Pressure	650 psi
Temperature Range	—50 to 80°C
Vibration Limit	500 g peak
Shock Limit	5,000 g peak
Base Strain Sensitivity	0.005 g/µstrain

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

CE

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Model 754

Miniature Underwater Accelerometer

DYNAMIC

Sensitivity, ±1.5 dB, 25°C	10 mV/g
Acceleration Range	250 g peak
Amplitude Nonlinearity	1%
Frequency Response:	
±1 dB	10 - 15,000 Hz
±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%

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 µg
Spectral	10 Hz	50 µg/√Hz
	100 Hz	4.0 µg/√Hz
	1,000 Hz	1.5 µg/√Hz
	10,000 Hz	1.0 µg/√Hz
Output Impedance, max.		200 Ω
Bias Output Voltage, nom.		8 ±1.5 VDC
Grounding		case isolated, internally shielded

ENVIRONMENTAL

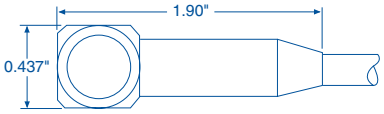
Hydrostatic Pressure, max.	650 psi
Temperature Range	–20 to 90°C
Vibration Limit	500 g peak
Shock Limit	5000 g peak
Base Strain Sensitivity	0.01 g/µstrain

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

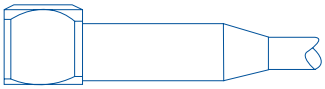
CABLE CONNECTION	FUNCTION
Center	power/ signal
Shield	common

FEATURES:

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



TOP VIEW



SIDE VIEW

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).

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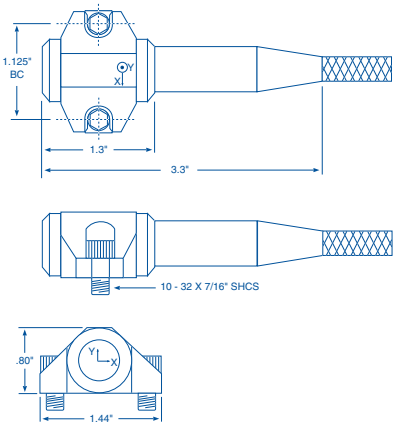
Model 757

Bi-axial, Low Profile, Underwater Accelerometer

FEATURES:

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



DYNAMIC

Sensitivity, ±10%, 25°C		100 mV/g
Acceleration Range		50 g peak
Amplitude Nonlinearity		1%
Frequency Response:		
Both Channels, ±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 µg
Spectral	10 Hz	10 µg/√Hz
	100 Hz	1 µg/√Hz
	1000 Hz	0.5 µg/√Hz
Output Impedance, max.		100 Ω
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 µg/gauss
Base Strain Sensitivity	0.002 g/µstrain

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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