



# SENSORS FOR UNDERWATER VIBRATION AND PRESSURE MEASUREMENT





Photo By: John F. Williams

## RAPIDLY FLUCTUATING PRESSURE, FLOW, SCREW CAVITATION, & WAVE SLAP

Piezoelectric pressure sensors are suited for dynamic pressure measurements including turbulence and cavitation. These measurements require a fast response or rise time, ruggedness, and high stiffness in order to obtain a high frequency response.

- Strict quality control inspection and standards
- Smaller footprint allows for mounting on models, or within limited size testing environments



### High Resolution ICP® Pressure Probe

Model S112A22

- 100 mV/psi, 50 psi
- Stainless steel



### High Frequency CVLD Pressure Sensor

Model 113M231

- 50 psi, 100 uA/psi
- Emralon coated
- Integral waterproof cable
- Acceleration compensated
- Ground isolated

## VIBRATION

Shear mode accelerometers isolate the sensing crystals from the base and housing, lowering thermal transients and signal noise resulting from base bending effects. This is a very important feature when attaching them to relatively thin walled vessel hull models during wave slap applications.



### ICP® Underwater Accelerometer

Model 352M221

- 10 mV/g,  $\pm 500$  g
- 2nd order LP filter
- Frequency response from 1 Hz to 10 kHz
- Integral waterproof cable



### ICP® Quartz Force Rings

Series 200M

- $\pm 100$  or 2500 lbs. (0.4 or 11 kN)
- Measures dynamic excitation or reaction forces
- Integral waterproof cable



### Miniature Ring-style, Ceramic Shear CVLD Accelerometer

Model 355M87A

- 100  $\mu$ A/g,  $\pm 50$  g
- Frequency response from 7 Hz to 9 kHz
- Integral waterproof cable
- Case isolated



### Miniature Ring-style, Ceramic Shear ICP® Accelerometer

Model 355M73

- 100 mV/g,  $\pm 50$  g range
- Frequency response 7 Hz to 10 kHz
- Integral waterproof cable
- Case isolated



### Teardrop ICP® Accelerometer With Flexible, Integral Cable

Model 352A74

- 100 mV/g,  $\pm 50$  g range
- Frequency response 1 Hz to 8 kHz
- Hermetic housing



### Ring-Style Seismic Shear CVLD Accelerometer

Model 631M21

- 1000  $\mu$ A/g,  $\pm 2.5$  g range
- Frequency response from 1 Hz to 4 kHz
- Integral waterproof cable
- Case isolated



### Precision Quartz Industrial ICP® Accelerometer

Model 624B11

- 100 mV/g,  $\pm 50$  g range
- Frequency response 0.8 Hz to 10 kHz
- Integral waterproof cable
- Case isolated



### The Swiveler® Low Cost Industrial ICP® Accelerometer

Model 607A11

- 100 mV/g,  $\pm 50$  g range
- Frequency response from 0.5 Hz to 10 kHz
- Integral waterproof cable
- Patented 360° cable orientation
- Case isolated



## UNDERWATER BLAST

Piezoelectric pressure sensors measure shock waves and bubble energy associated with underwater explosion testing. Sensors structured with volumetrically sensitive, omnidirectional tourmaline crystal and ICP® microelectronics provide a high frequency, low impedance output in underwater test environments. Waterproof cables of customer requested lengths are factory installed.



### Tourmaline ICP® Underwater Blast Sensor

Series 138A

- ICP® underwater blast pressure probes
- Ranges from 1000 to 50 kpsi (6894 to 344,740 kPa)
- Rise time 1.5  $\mu$  sec
- Resonant frequency  $\geq$  1 MHz



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