



# SENSORS FOR UNDERWATER MEASUREMENT

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 **PCB PIEZOTRONICS**  
AN AMPHENOL COMPANY

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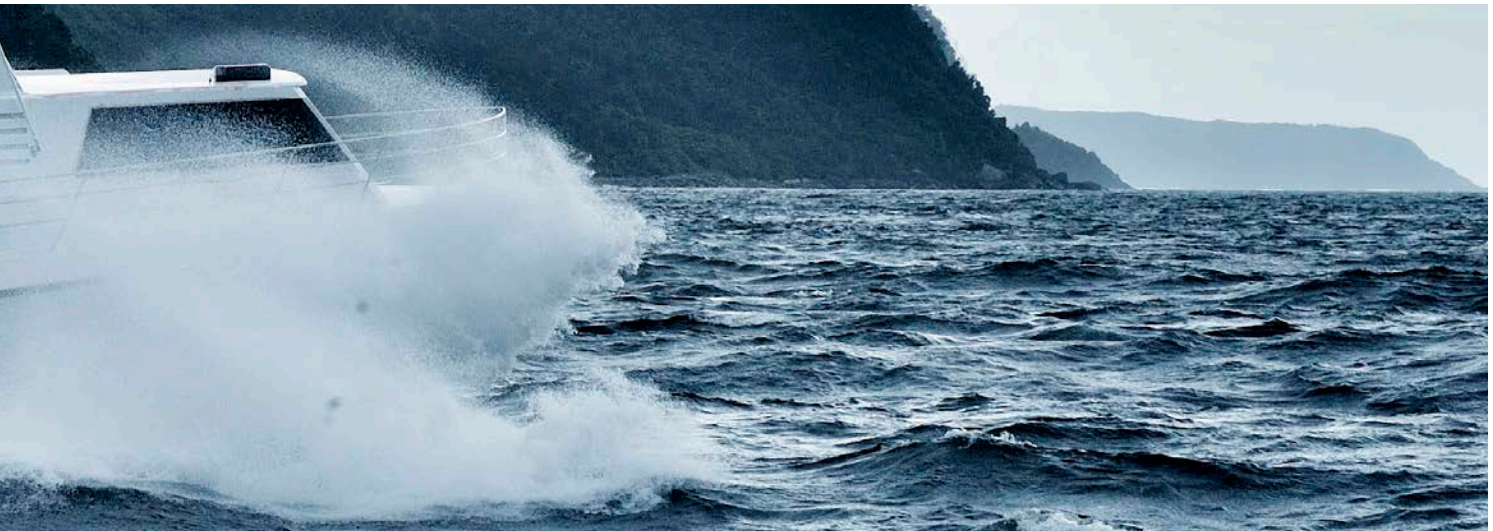


## RAPIDLY FLUCTUATING PRESSURE, FLOW, SCREW CAVITATION, & WAVE SLAP



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  
Small footprint allows for mounting on models,  
or within limited size testing environments



### HIGH FREQUENCY CVLD PRESSURE SENSOR

MODEL 113M231

50 psi, 100 uA/psi

Integral waterproof cable,  
hydrotested to 600 psi

Acceleration compensated

Ground isolated



### HIGH RESOLUTION ICP® PRESSURE PROBE

MODEL S112A22

100 mV/psi, 50 psi

Stainless steel, hermetic  
wetted diaphragm



### ACOUSTIC ICP® PRESSURE SENSOR

MODEL 103M49/003AW

200 psi, 250 mV/psi

Integral twisted pair cable

SS hermetic, wetted diaphragm

RTV coated diaphragm for thermal  
stability



### SUBMINIATURE ICP® PRESSURE SENSOR

MODEL 105C

100 psi, 50 mV/psi

Integral twisted pair cable

SS hermetic wetted diaphragm

Solid end cap diaphragm well  
suited for cavitation measurement



## FORCE

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### ICP® QUARTZ FORCE RINGS

MODEL 202M44/FCS-6

100 lb, 50 mV/lb

Measures dynamic excitation or reaction forces

Integral waterproof cable, hydrottested to 600 psi



### MODALLY TUNED® IMPULSE HAMMER

MODEL 086M99

500 lbf, 10 mV/lbf

Hammer mass 0.34 lbs.

Integral waterproof cable, hydrottested to 100 psi



## 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 344740 kPa)

Rise time 1.5  $\mu$  sec

Resonant frequency  $\geq$  1 MHz

Approximate max depth 1000 ft.



## 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.



### 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, short term low pressure immersion



### 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, hydrotested to 500 psi



### 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, hydrotested to 600 psi

Case isolated



**MINIATURE RING-STYLE,  
CERAMIC SHEAR ICP®  
ACCELEROMETER**

MODEL 355M73

- 100 mV/g, ±50 g range
- Frequency response  
7 Hz to 10 kHz
- Stainless steel hermetic housing
- Integral waterproof cable,  
hydrotested to 600 psi
- Case isolated



**4-CONDUCTOR, SHIELDED,  
POLYURETHANE CABLE**

MODEL 078WXX

- Used with triaxial ICP®  
accelerometers
- 4-conductor, shielded, flexible  
polyurethane jacket
- IP68 Rated 1/4-28, 4-socket plug  
to 3 BNC plugs



**RING-STYLE SEISMIC SHEAR  
CVLD ACCELEROMETER**

MODEL 631M21

- 1000 µA/g, ±2.5 g range
- Frequency response from 1 Hz  
to 4 kHz
- Integral waterproof cable,  
hydrotested to 600 psi
- Case isolated



**4-CONDUCTOR, SHIELDED,  
LOW NOISE, FEP CABLE**

MODEL 034W10

- IP68 rated 1/4-28, 4-socket plug  
to (3) BNC plugs
- Used with triaxial ICP®  
accelerometers
- 4-conductor, twisted, shielded, low  
noise, lightweight FEP jacket



**TRIAxIAL ICP®  
ACCELEROMETER**

MODEL TLD339A37/NC

- 100 mV/g, ±50 g
- (±5 %) 0.3 to 4000 Hz, LP filtered
- Titanium housing,  
hermetically sealed
- Low thermal coefficient with  
operating temperature  
-65 to +356 °F (-54 to +180 °C)



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