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MEASUREMENT SPECIALTIES

Piezo Film Sensors

Technical Manual

Internet Version

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SONAR

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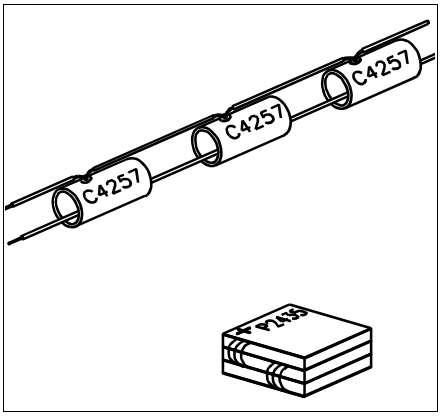
Figure 65. Hydrophone



Piezo ceramic materials have been used in hydrophones for SONAR since the 1940's. Ceramics have many desirable features as hydrophones including high hydrostatic sensitivity, high capacitance, ability to fabricate into shapes, and availability in thick cross-section (sensitivity is proportional to piezo element thickness). However, the weight of ceramic is much greater than water, so buoyancy must often be added to structures as compensation.

The current trend in SONAR is toward higher numbers of hydrophone sensors per vehicle. Longer towed arrays and larger and more numerous hull mounted hydrophone panels are being considered for the fleet. This trend requires the advancement of much lower weight hydrophones making piezo film an excellent choice for these applications.

New piezo polymer hydrophones of thick film (1200μm) have been made into sheet and cylinder form (Figure 65). The cylinders, about 2-3 cm in length and <1 cm in diameter, are strung together into a continuous hydrophone line array. The hydrophones are very light weight (0.60 g/cm^3), yet have excellent hydrostatic sensitivity.

Piezo polymer hull mounted hydrophones in panels, of about one square meter in area and greater than 1000μm in piezo polymer thickness, are used by the British and French Navies for submarines. Called "Flank Arrays", these units work in combination with towed arrays in advanced SONAR systems. Piezo film sheets are not fragile, conform to the radius of curvature of the hull, and are low cost. Typical sensitivities for the piezo film thick sheet hydrophones are similar to ceramic types (-192 to -195 dB re 1 V/μ Pa). The lower capacitance of the piezo film hydrophones is compensated by the large area and number of parallel hydrophones used.

New hydrophone technologies, including underwater ultrasound imaging for divers and related applications are also in development.