Piezoelectric Components for UUVs

Applications for Unmanned Underwater Vehicles

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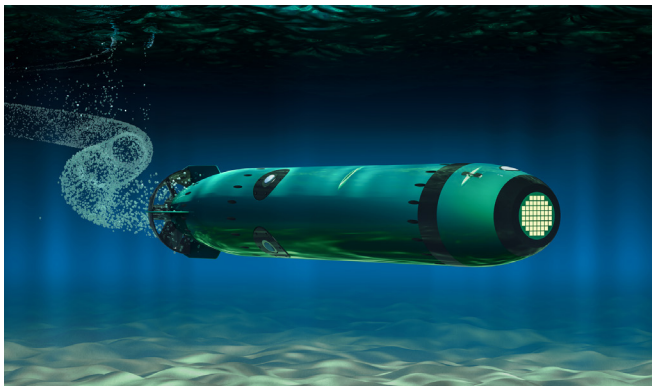
Unmanned Underwater Vehicles (UUV) are submersible vehicles that can be operated remotely (ROUV or ROV) or autonomously (AUV). UUVs are used for both civilian and military applications and can be adapted for a variety of needs.



ROVs, sometimes called underwater robots, are designed to performed tasks that would be difficult, dangerous, or entirely impossible for humans to complete. Such tasks include exploration, surveying, recovery, inspection, and maintenance of subsea structures.

AUVs, otherwise known as underwater drones, are effective and economical alternatives for performing simple tasks without human supervision. Some AUVs perform the same tasks as ROVs, but with the advantage of covering a larger area. Common applications are surveys of the seafloor, mapping, pipe and structure inspection, recovery, and research. For military and defense purposes, they can be used for activities such as mine countermeasures, anti-submarine warfare, or payload delivery.

PIEZOELECTRIC COMPONENTS AND APPLICATIONS IN ROVS

Piezoelectric components in ROVs enable a number of functions and vary by design. Our expert team partners with customers to create products optimized for specific applications, and muli-layer, bulk ceramic, and single crystal options are available. No matter the application, CTS piezo products are known for reliability, performance, and durability in even the toughest environments.

Forward-looking and side-scan sonar. Visibility underwater is often limited. A sonar device emits a pulse of sound and measures the time that it takes for the pulse to return after being reflected by an obstacle. By using a linear or 2D array of receivers, it is possible to obtain a 2D or 3D image of the surroundings. An array of small plates made of Navy type II material (3195HD, NCE51) provides high sensitivity and robustness.

Collision avoidance. For operation in confined spaces such as off-shore structures, or under limited visibility, single beam sonar waves are used to measure the distance between the vehicle and an obstacle. A typical design for this function is a disc of Navy type I ceramic (K1300, NCE40).

Depth sonar. A single sonar beam pointing downwards provides reliable depth measurement in ROVs for a variety of applications. A common design for this function is a disk of Navy type III material (K1000, NCE81).

PIEZOELECTRIC COMPONENTS AND APPLICATIONS IN AUVS

Because they are not physically tethered to a ship and in order to operate without human supervision, AUVs employ additional piezoelectric components.

Communication (acoustic modem). Radio waves have a limited penetration in water, which is why acoustic waves are commonly used to transfer information. A piezoelectric component generates pulses of sound to transmit information and senses receive signals. A typical design for an acoustic modem is a tube of Navy type III material (K1000, NCE81), providing high power at low frequency (10-50kHz).

Location and navigation. Location signals such as GPS cannot be used underwater. Acoustic waves generated by piezoelectric components enable several alternatives. Using several piezo receivers, it is possible to determine the range (distance) and bearing (direction) relative to a transmitting surface ship (short baseline, SBL or ultra-short baseline, USBL navigation) or a net of fixed transponders (long baseline, LBL navigation) with fixed or known position. Some location systems utilize hemispheres of Navy type III material (K1000, NCE81), which is able to transmit high power in all directions.

Inertial navigation. AUVs often embark inertial navigation systems in order to navigate without any reference. Piezoelectric components are widely used in precision accelerometers and vibrating gyrometers. Another help for navigation is Doppler Velocity Log (DVL), where the Doppler Effect provides a measurement of speed relative to the seafloor.

Proximity or impact sensor. In military devices such as autonomous torpedoes, piezoelectric components are used in fuze systems, the part of the device that initiates the detonation. A typical design for this function is a disc of Navy type I ceramic (K1300, NCE40).

CTS CUSTOM CAPABILITIES

Each company that CTS partners with has unique needs that require custom solutions. Our internal team of engineers and subject matter experts work directly with customers, designing solutions that meet demanding specifications.

All of our piezo components for UUVs are designed specifically for one particular customer and application. CTS has the ability to manufacture these products from our locations in America, Europe, and Asia to provide local production for global customers, comply with a variety of stringent regulations, and have the possibility of purchasing different components from a single supplier to streamline processes and ensure quality at every stage of our partnership.

PIEZOELECTRIC EXPERTISE

A leading developer and manufacturer of high-performance piezoelectric materials and components, CTS' piezo products come in a variety of compositions, geometries, and dimensions with high quality standards to meet demanding requirements. Our portfolio encompasses bulk and multilayer ceramics, single crystal, as well as sub-assemblies, composites, and transducers based on these products.

ABOUT CTS

CTS is a leading designer and manufacturer of products that Sense, Connect, and Move. We manufacture sensors, actuators, and electronic components in North America, Europe, and Asia, and provide solutions to OEMs in the aerospace & defense, medical, industrial, communications, information technology, and transportation industries.

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