

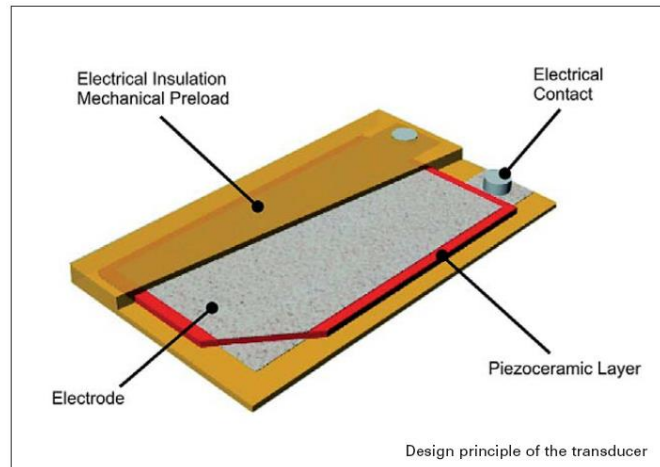
Category: Sensors & Measurement Techniques

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Piezoelectric Patch Transducers for Industry and Research

The development of self-correcting, adaptive systems is receiving more and more attention in modern industrial research. Structures using "smart materials" which integrate sensor and actor functions are taking on growing importance in this field. These systems are designed to detect and react to changes in their operating environment, like impact, pressure or bending forces.

With along history as adaptive materials, piezo actuators have been especially popular for the monitoring and active damping of high-frequency vibration. The novel DuraAct™ patch transducers now offer a compact solution in this area.



Applied directly to a substrate, or used as part of the structure itself, DuraAct™ patch transducers can detect and produce vibrations or contour deformations at the source, inside the structure. The magnitude of usable deflection depends strongly on the substrate properties, and extends into the millimeter range.

The standard transducer design features a piezoceramic foil with metalized surfaces for electrical contact. The thickness of standard foils used is typically 100 to 500 µm, with even thinner layers possible. Without further processing, these piezoceramic elements are brittle and difficult to handle. Embedding them in a polymer structure provides electrical insulation and mechanical stability. The result is a module that is ductile and extremely robust.

An alternative design features multiple layer piezoceramics, enhancing force generation for the same operating voltage. DuraAct™ patch transducers are solid state actuators and therefore have no moving parts. Wear and failure rates are low. Electrical contact is realized by soldering, clamping or gluing leads to two pads. Connecting multiple layers separately allows separation of the sensor and actuator functionality, meaning that the transducer can be used as sensor and actuator simultaneously.

Innovative Aspects:

- „Features and Advantages
- high damage immunity
- choice of materials and geometries
- well-defined mechanical and electric properties
- short lead-time availability
- compact
- long lifetime
- high bandwidth
- customized solutions
- can be applied to curved surfaces
- cost-effective

- constant & proven quality
- easy to use
- operation as actuator, sensor or power source
- multilayer module, e.g. for actuator-sensor combination
- highly flexible ceramic elements.

Application Areas:

Sensor Mode

- Vibration damping applications:
good results can be achieved by combining a piezoelectric sensor with a servo-controller and having the sensor signal control an (external) damping mechanism.
- Structural Health Monitoring (SHM) / Damage Diagnosis:
DuraAct™ patch transducers can be used to monitor the functional and structural integrity; the patch transducers are either part of the structure itself, or embedded within it.
- Fast switching:
DuraAct™ patch transducers provide fast response and long lifetime and are ideal actuators for these applications.

Actuator Mode

DuraAct™ patch transducers feature a very high bandwidth. In combination with suitable electronics they can be used as high-dynamics positioners with sub-micron precision

Adaptive Systems use both sensors and actuators

- Active vibration damping:
A DuraAct™ patch transducers is used as high-precision sensor and high-performance actuator, simultaneously detecting and damping or eliminating undesirable vibrations in, for example, rotating components. The DuraAct™ sensor signal may be used as power supply for the same module, where it is fed back in with a phase shift.
- Profile or shape control:
The sensor functionality is used to detect a deformation, and the actuator function to counteract it. The resulting shape control is highly precise, down to the submicron range.

Energy Harvesting

DuraAct™ patch transducers can provide power for low-power electronics like sensors, making the development of autonomous systems possible. A special branch of Structural Health Monitoring (SHM) is Wireless Health Monitoring. Here, a DuraAct™ patch transducer can serve simultaneously as shape-control sensor and supply energy to a radio transmitter for remote data transfer. DuraAct™ patch transducers may replace other power supply solutions in existing applications.

The transducers have the following main application areas:

- Noise reduction
- Vibration control
- Contour control and stabilisation
- Energy harvesting
- High dynamic and precise actuators
- Health Monitoring.

Cooperation:

The company is interested in for selling the patch transducers incl. measurement electronic. Furthermore, interest exist in all kind of co-operations to develop and adapt systems for different applications.