

# The unique advantages of multilayer piezoelectric actuators

---

C. Goueffon<sup>1</sup> and B. Andersen<sup>1</sup>

<sup>1</sup>Noliac A/S, Hejreskovvej 18, Kvistgaard, 3470, Denmark. Tel. +45 4912 5030, cg@noliac.com

Preferred kind of presentation: oral

## Abstract

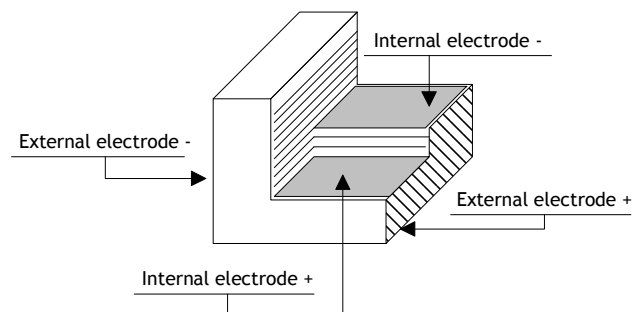
Multilayer piezoelectric components have in recent years become a very effective solution for engineers looking for a high degree of precision and control in their micro-positioning applications.

These engineers, once limited to standard, off-the-shelf components, now have at their disposal a large range of actuating components that can be designed and produced to meet the exact performance parameters of their state-of-the-art applications.

Multilayer piezoelectric ceramic actuators are electromechanical devices for generating movements in the micrometer range. The conversion of electrical energy into mechanical motion takes place without the generation of any magnetic field or the need for moving electrical contacts. Piezoelectric devices are capable of response times in the microsecond range and can develop blocking forces up to several KN, and their stroke varies approximately linearly with applied voltage.

Piezoelectric actuators possess unique and interesting properties. Dimensional changes proportional to the applied voltage can be adjusted with infinite resolution. They can be operated over billions of cycles without wear or deterioration. Speed of response is very high, limited only by the inertia of the object being moved and the output capability of the electronic driver. Virtually no power is consumed or heat generated to maintain a piezoelectric actuator in an energized state.

Multilayer piezoelectric actuators are produced by tape casting very thin layers of PZT material on which are deposited thin layers of electrode material. Several layers are laminated together to form a monolithic ceramic component with internal electrodes. The multilayer approach enables designs with multiple functions e.g. integration of sensors in actuators.



Advances in multilayer piezoelectric technology enable much better performance and greater design flexibility than any other solution available in the market today.

Noliac will present the advances in the piezo multilayer technology together with four unique actuator developments and their applications

1. A 2x2x2 mm multilayer piezo actuator with 25% higher free stroke than competitive products. Displacement is 2.8  $\mu\text{m}$  and it is available for stacking granting you up to 21  $\mu\text{m}$  free displacement at operating voltage down to 60V. Typical applications are micro/nano-positioning stages, tunable lasers, ...
  2. A tiny piezo multilayer actuator of 1mm x 1.2mm x 0.2mm made of 20 layers each being 10um thick. Typical application is in a hard disk drive.
  3. A large piezo multilayer actuator of 76mm x 20.5mm x 3mm. Typical application is in a transducer.
- A huge piezo multilayer stack actuator of 16.9mm x 16.2mm x 125mm. Typical application is in valves and active vibration damping.