

# Dielectric Elastomer Actuators

## General features

Dielectric elastomer actuators (DEA) consist of a highly stretchable elastomer film coated on both sides with also stretchable electrodes. When an electric voltage is applied between the electrodes, the elastomer film compresses in thickness and expands in area.

## Applications

- Actuation of flaps and other mechanical components
- Control of mirrors and other optical elements
- Valves and pumps for the transport of liquids and gases
- Haptic human-machine interfaces
- Loudspeakers

## Properties

- Manufacturing of actuator films up to 150 mm x 40 mm
- Elastomer film thickness 200  $\mu\text{m}$
- Preferred elastomer material: silicone rubber
- The stiffness (Young's modulus 0.1 – 0.5 MPa) of the elastomer determines the actuation strain.
- Actuation strain of single film DEA up to 10 %

## Characterization methods

- Young's modulus of elastomer film through stress-strain experiments
- Viscoelastic properties (storage and loss modulus, loss factor)
- Electric breakdown field strength of elastomer
- Dielectric permittivity (frequency dependent)
- Electrode conductivity, also under stretch
- Actuation strain