

NED – Nanoscopic Electrostatic Drive

NED-based ultrasonic transducer (NEDMUT) glued on printed circuit board with wirebonds & bondlands

NED is a MEMS transducer principle. A beam-shaped actuator consists of at least two electrodes, which are electrically separated from each other by gaps of 2.5 μm down to a few 10 nm. By applying a control voltage, an electrostatic field is generated between these electrodes, resulting in large attractive forces between the electrodes. Suitable geometries of the electrodes in turn transform these forces into lateral forces thus bending the actuators.

The benefits of the NED actuators comprise: #1 Low power consumption \Rightarrow low capacitance, small reactive currents and low control voltages enable the use of energy-efficient driver circuits and thus result in low power consumption of the overall system. #2 CMOS compatibility \Rightarrow integration of actuators with CMOS circuits, RoHS compatibility. #3 High number of degrees of freedom \Rightarrow beam shape or plate, either deflection direction or combination, translation or tilting movement, cascading serially and/or parallel to increase deflection and/or forces or both.

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Bending actuators configurations

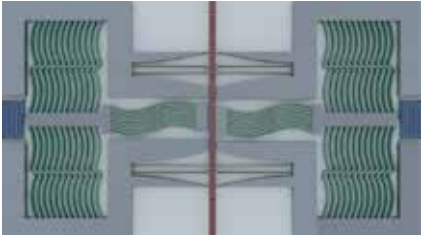
Single entity examples

Direction/type	Unit	Out-of-plane (vertical)	In-plane (lateral)
Travel	μm	1	100
Dimension	μm	60 x 4000 x 30	6 x 2000 x 10
Force	μN	1.6	1.6
Voltage	V	90	60

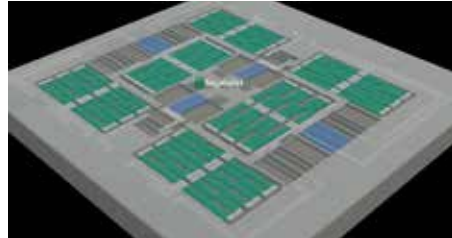
System examples

Direction/type	Unit	Out-of-plane (vertical)	In-plane (lateral)
Travel	μm	> 200	> 500
Dimension	μm	7023 x 3605 x 25	2500 x 1600
Force	μN	> 100	> 3500
Voltage	V	1 ... 250	2.5...300

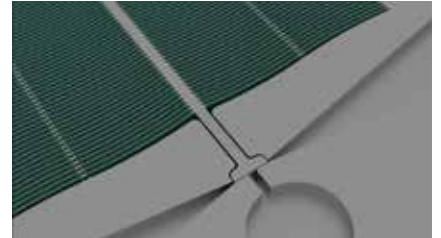
Applications



NED based Step Drive



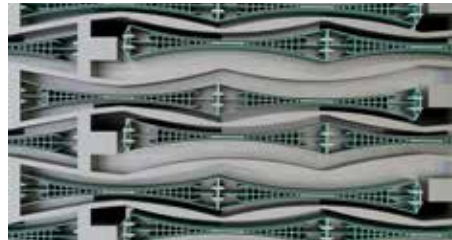
NED 2D micromotors



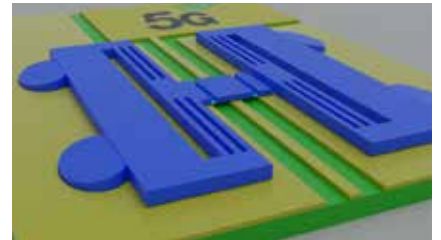
NED microfluidic valves



NEDMUT Ultrasonic Transducer

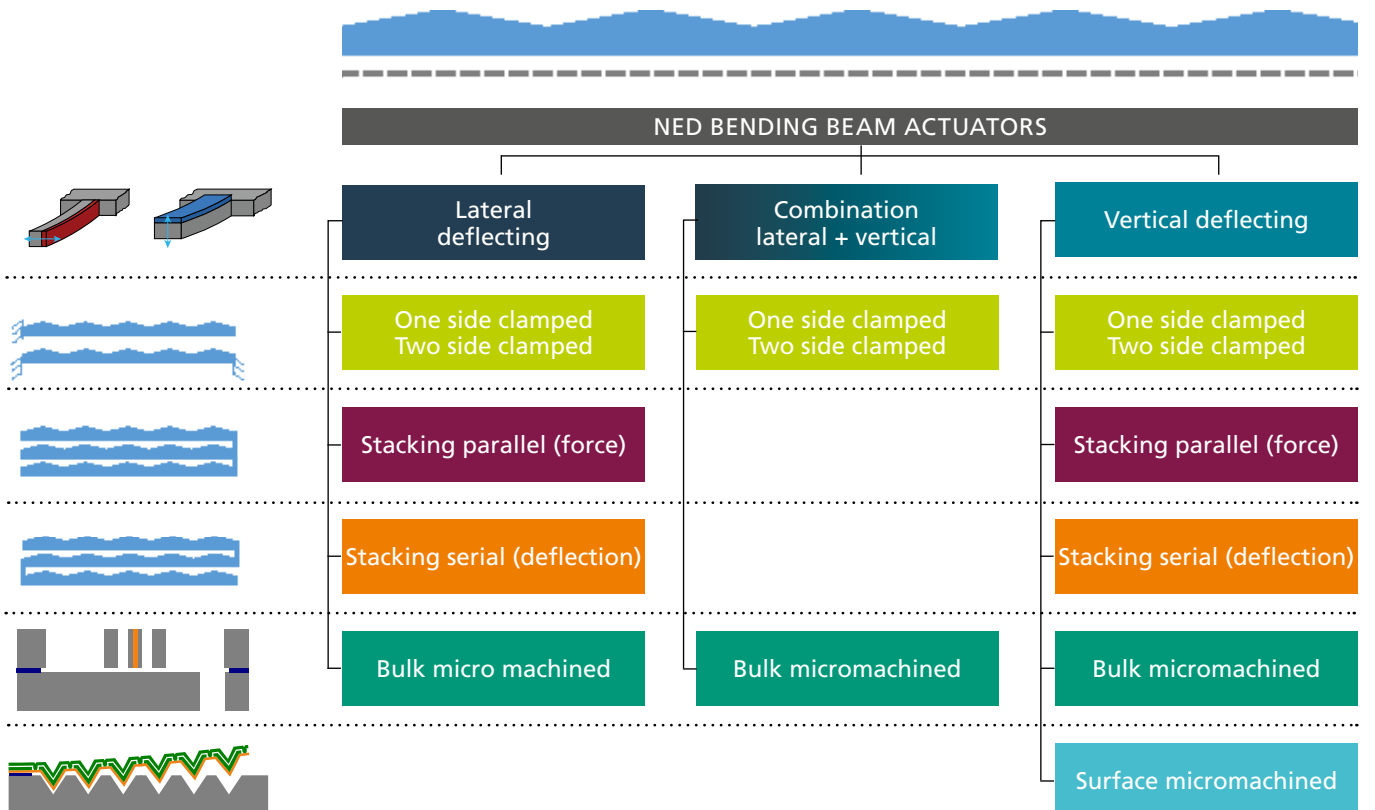


NED speaker



NED RF MEMS Varactor

Classification



Versatility

Specific adaption for various applications possible. Limited examples available from premanufacturing. User specific fabrication upon request.