

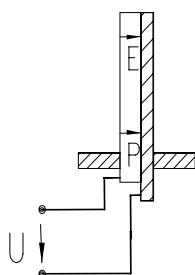
Bending Actuator

We have manufactured piezoceramic bending actuators for more than ten years and we are leading world market suppliers in several branches of industry, in particular in the field of actuators. Generally bending elements are differentiated into actuators and sensors.

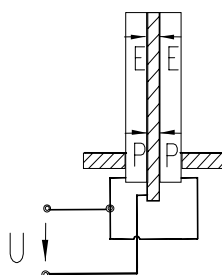
Bending actuators are predestined to replace magnets in the form of control elements. Special actuator design, but also the use of highly effective ceramics make it possible to meet requirements relating to regulating deflection and controlling force. The advantages here include low energy requirement, a higher regulating speed, almost no heat evolution, silent operation and smaller space requirements. Since our bending actuators are only operated in the direction of polarisation, these actuators experience a refreshment during each bending process so that the regulating deflection and the controlling force are maintained for the total working life. This kind of actuation consequently guarantees a very long working life and represents the main advantage of our actuators.

For ranges of application in special climatic conditions our bending units are additionally provided with a sealant consisting of a specially developed protective coating.

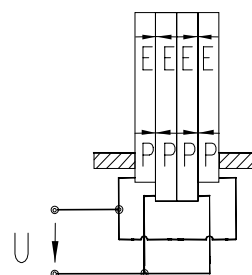
The standard bending actuator is a compound of two piezoceramics with or without an intermediate layer, the so-called Bimorph or Trimorph. For certain applications monomorph bending actuators in which one of the two ceramics is not included and multimorphic bending actuators which include numerous active layers are also used. (see Fig. 1a, 1b, 1c)



Monomorph
Fig. 1a)



Trimorph
Fig. 1b)

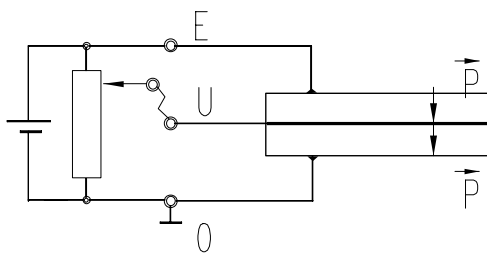


Multimorph
Fig. 1c)

One-sided clamping is normally chosen to make use of the deflection and controlling force at the other end of the bending actuator. The ceramic layers are actuated electrically. The inverse piezoelectric effect gives rise to mechanical stress which results in a bending of the compound.

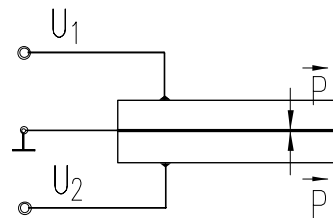
Bending Actuator

Bending actuators may be connected in parallel or anti-parallel. The following example illustrates the factual situation with a Trimorph. (see Fig. 2a, 2b)



Parallel - Trimorph

Fig. 2a)

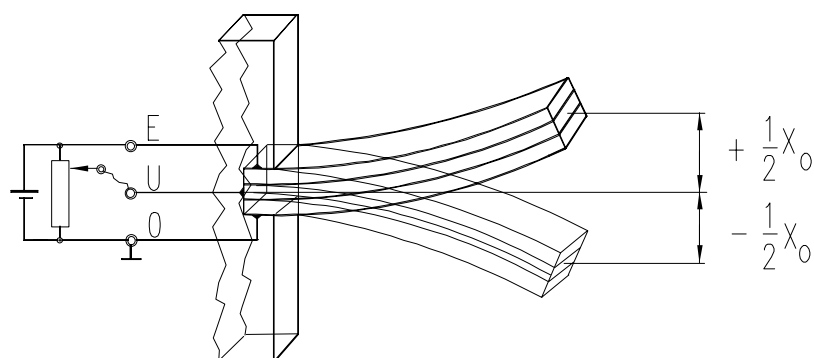


Series - Trimorph

Fig. 2b)

In the case of a) the direction of the remanent polarisation is the same in both strips. The insert is connected to a variable voltage level. The bending actuator deflects by $\pm \Omega x_0$ compared to when it is switched off so that the total deflection difference at commutation is x_0 .

In the case of b) two separate voltage sources are necessary which are driven by counter-rotating. The advantage is that the insert can be connected to a reference voltage level (earth connection) [from 1].



Reference:

[1] Piezokeramik, Karl Ruschmeyer, expert Verlag, pp. 154 - 155