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Piezo motors - a suitable drive for artificial limbs?

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A multitude of novel motor principles based on the inverse piezoelectric effect has been published in the past [1]. Most of them have not gone beyond the laboratory stage, but especially in the last two decades several motors have been established as products on the market. Compared to electromagnetic drives (electro motors) especially small piezo motors have a higher efficiency (see Fig. 1). And even with respect to their rather disadvantageous properties such as a comparatively high operating voltage or voluminous control electronics in relation to the motor dimensions, piezo motors have achieved clear improvement in recent years (see Fig. 2). Therefore, the question arises whether modern piezo motors could also be used as drives for artificial limbs. The presentation is not intended to give definitive answers to this question. Instead, showing the operating principles of motors in use today and corresponding products should aid potential users when making decisions about the most appropriate drive for their application. The inherent sensory abilities of piezo materials (self-sensing effect) [2] will also be touched upon.

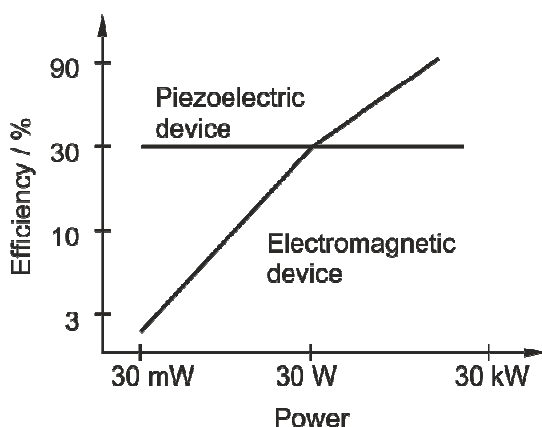


Figure 1 - Efficiency versus power relation for electromagnetic and piezoelectric motors.
(Source: K. Uchino)

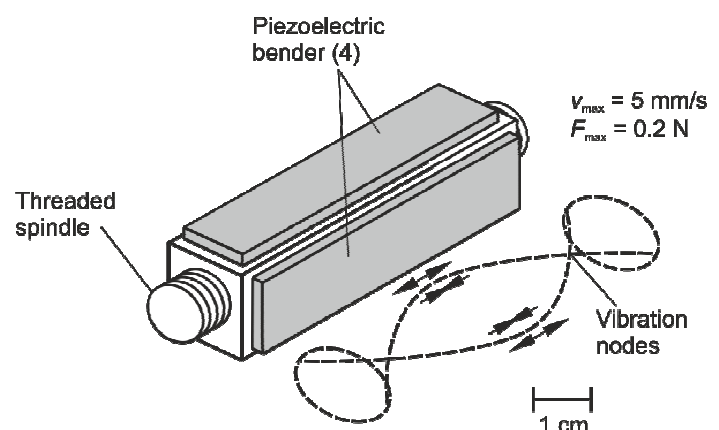


Figure 2 - Principle construction and function of the Squiggle® motor
(Source: New Scale Technologies)

- [1] Spanner, K.; Koc, B.: An Overview of Piezoelectric Motors. 12th Int'l Conf. New Actuators, Bremen 2010, pp. 167 - 176
- [2] Janocha, H.: Unkonventionelle Aktoren - Eine Einführung. München: Oldenbourg Verlag 2010