

## Spherical piezoelectric drive

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**P**iezoelectric magnetic drive is a device which uses two piezoelectric actuators for precise 3 degrees of freedom (DOF) rotation of sphere-shaped rotor. Mechanical part of this drive described further: sphere-shaped rotor inserted between two piezoelectric actuators. These ring-shaped piezoelectric actuators have polarization in axial direction and one of the electrodes is divided into three equal sectors. Each segmented electrode is excited by separate harmonic signal. All three electrodes can be excited independently i.e. three channels generator is used to drive actuator. Amplitude and duration of the applied signal depends on rotation velocity and motion trajectory of the sphere. The out-of-plane bending and radial vibrations of the piezoelectric rings are excited to obtain elliptical motion of the contacting points and to rotate magnetic sphere in desired direction. In addition, it must be mentioned that actuator can be driven by burst type signal in order to achieve positioning of the sphere with very high resolution. Described system could be used for applications, where precise 3 DOF rotational control of the sphere-shaped rotor is needed. Few examples of such applications: space and attitude control of the satellites, laser beam control, precise mirror deflectors and etc.



Fig. 1. 1 - sphere-shaped rotor, 2 - piezoelectric actuators, 3 - contact points, 4 - elastic supports, 5 - Gears

### Recent Publications

1. Bansevicius, Ramutis Petras, Mažeika Dalius, Jūrėnas Vytautas, Kulvietis Genadijus and Bakanauskas Vytautas (2016) Development of traveling wave actuators using waveguides of different geometrical forms. Shock and Vibration. New York: Hindawi publishing corporation. 2016 (4101062):1-9.
2. Grybas Ignas, Bansevicius Ramutis Petras, Jūrėnas Vytautas, Bubulis Algimantas, Janutėnaitė Jūratė and Kulvietis Genadijus (2016) Ultrasonic standing waves-driven high resolution rotary table. Precision engineering. New York, NY: Elsevier. 45:396-402.
3. Sakalys Rokas, Janusas Giedrius, Palevicius Arvydas, Cekas Elingas, Jurenas Vytautas and Sodah Amer (2016) Microstructures replication using high frequency excitation. Microsystem technologies. Berlin: Springer. 22(7):1831-1843.
4. Ostasevicius Vytautas, Markevicius Vytautas, Jūrėnas Vytautas, Žilys Mindaugas, Čepėnas Mindaugas and Kižauskienė Laura Gylienė Virginija (2015) Cutting tool vibration energy harvesting for wireless sensors applications. Sensors and actuators A: Physical. Lausanne: Elsevier. 233:310-318.

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### **Biography**

Grazvydas Kazokaitis has experience in design and R&D fields developing small and precise mechanisms for ultra-fast laser beam control and machining apparatus. This experience allows provide solid foundation and knowledge creating possible solutions for laser beam orientation mechanisms between small units in space, attitude control and other control tasks.

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