The invention relates to micro-power generators using a piezoelectric effect. It is a piezoelectric vibration energy harvester, having an increased harvesting efficiency and stability under low frequency (<10 Hz) oscillations. The generator comprises a housing (1), a cantilever-type piezoelectric transducer (2) with a magnetic mass (3), and a special system of accelerated magnets. The accelerating magnets (13), under external vibrations and inertial forces, move in special beds (12) of the housing (1), and via magnetic interaction accelerate the driving magnets (9) in a non-contact manner. The array (9) comprises at least 2 magnets (10) separated by nonferromagnetic gaskets (11). Due to the accelerating magnets, the array (9) slides at nearly constant speed, interacts with the magnetic mass (3), deforms the transducer (2) thereby initiating its free high-frequency oscillations. The generator is applicable and efficient under low-frequency excitations such as biomechanical oscillations, e.g. generated by limbs of an actively moving person.