

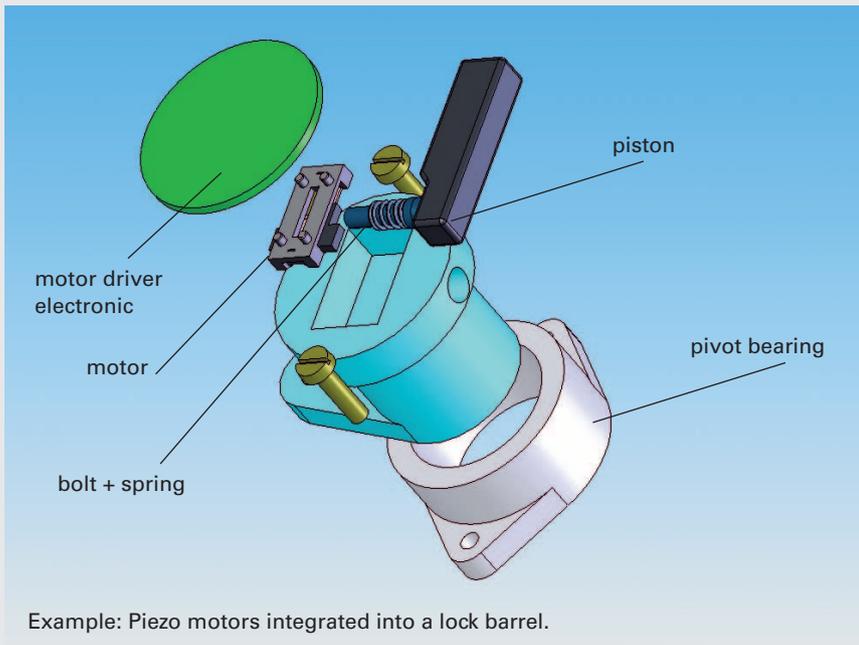
Piezo Motors & Actuators in Security Technology



Drive Solutions for Lock Systems and Cameras

Smaller - Faster - More Reliable

Demands on Safety Technology



considerably due to their high speed – 0.1 m/s and more – and their response times of a few milliseconds. And this is not only the case when moving pin tumblers. Surveillance cameras must also be able to move quickly: To follow moving targets, for example, or to move lenses in focusing or zooming mechanisms.

High Reliability

Piezo ultrasonic motors have a simple construction nonetheless: A rapidly oscillating piezo-ceramic element is pressed against a movable slider and pushes it forwards and backwards. This results in a linear motion if the movable slider is guided linearly. If the drive acts tangentially on a turntable, a rotary motion is generated. No additional mechanical wearing parts, such as gears, leadscrews or shafts, are required to transfer the motion. A small electronic circuit induces the oscillation of the piezo ceramic. The control requires only a small DC voltage, which needs to be maintained until the motion is completed.

Smaller & Faster with Piezo Motors

An important branch of mechatronics is the miniaturization of functional systems. Compact piezo drives occupy very little space. This opens up new possibilities for lock systems because it means electromechanical components can be accommodated in the door system. Piezo ultrasonic motors can be built to be very small with a basically unlimited travel range. Mechanical components, such as gears, leadscrews or spindles, are not necessary. Piezo ultrasonic motors operate on the following principle: A guided slider is pressed against the piezo-ceramic actuator which executes high frequency oscillations depending upon the direction of motion and thus drives the slider. Piezo motors speed up processes



Piezo Actuators & Motors

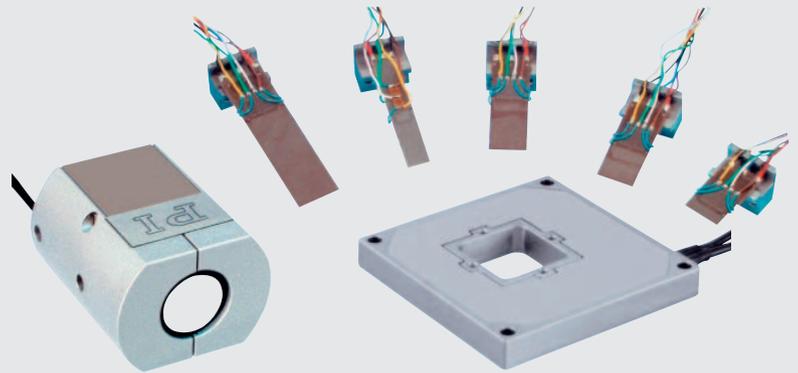
Novel Drive Technology Put to Good Use

Small Drive – Low Cost

Piezo ultrasonic drives replace classic motor/spindle solutions. A smaller number of mechanical components and a motor consisting of one piece of ceramic only keep the purchasing costs low.



Example: A PI mini-motor is integrated into an auto-focusing lens for cameras in mobile phones.



Improved resolution for cameras and scanners. Piezo drives are the driving force behind pixel sub-stepping: Piezo tip/tilt mirrors, low cost bender type actuators and XY scanners (from left to right).

The advantages of piezo ultrasonic motors at a glance!

- **Smaller:** The core of the drive comprises one piece of ceramic, against which a movable slider is pressed, and driver electronics. The smallest model provides 2.5 mm stroke with a total length of 10 mm.
- **Faster:** The drive operates directly without a gear. Velocities of more than 0.1 m/s can be achieved, the travel distance is covered in 10 – 50 milliseconds.
- **More reliable (I):** The drive is durable because it has no wearing parts such as small cogs in the drive train.
- **More reliable (II):** The power consumption is low and amounts to a current of approx. 100 mA for 10 ms. The motion cycle is short due to the high acceleration.
- **More reliable (III):** The drive cannot be manipulated from the outside. Piezo ceramics are unaffected by magnetic fields and are operated by high AC voltages.
- **More reliable (IV):** The drive is clamped when switched off. So no additional mechanical brakes or holding currents are required.



Ultrasonic linear actuators replace complete motor/spindle systems



PI – Leader in Piezo-Ceramic Drives

Secure Your Competitive Edge with the Market Leader

PI Head Office in Karlsruhe/Germany



Competitive Advantages with New Drive Technologies

Nothing is as safe as the use of tried-and-tested technology. If a manufacturing company knows which improvements to a product are necessary to satisfy the market requirements, however, then innovative thinking secures the competitive edge. Fewer, smaller mechanical components and reduced power consumption – the facts speak for piezo ultrasonic motors as the alternative drive.

Secure Your Competitive Edge with the Market Leader

Physik Instrumente (PI) is market leader for piezo-ceramic drive technology, which is used mainly for high-precision positioning tasks, for example in quality assurance or the semiconductor industry. The latter, in particular, places extremely high demands on reliability: The stoppage of a production unit can cost the chip manufacturer hundreds of thousands of dollars and cannot be tolerated.

PI: Competence in the Piezo Business

Physik Instrumente was founded in 1969 and specialized in high-precision positioning systems with piezo-ceramic drives at a very early stage. In 1992, the subsidiary company PICeramic was founded as the development and production facility for piezo drives. PI is therefore the only manufacturer of positioning systems in the world to develop and produce its own ceramics. This secures a great technological and production depth for PI, enabling it to react flexibly to customer requirements and to develop new drive systems for existing markets.

Integration Capacities

PI not only manufactures the drives but also integrates them into mechanical motion systems. Moreover, PI also develops the controller and, if applicable, the regulation system to suit the requirements of the complete system.



Physik Instrumente (PI) GmbH & Co. KG

Auf der Römerstrasse 1
D-76228 Karlsruhe
Tel. +49 721 4846-0
Fax +49 721 4846-100
info@pi.ws
www.pi.ws

PI Ceramic GmbH

Lindenstrasse
D-07589 Lederhose
Tel. +49 36604 882-0
Fax +49 36604 882-25
info@piceramic.de
www.piceramic.de