

# Small Diameter Stepper Motors for Compact E-Locks



Automatic door locks are becoming more popular as public hygiene and safety remain in the forefront of our daily lives. These locks require complex motion control in a compact solution. Miniature precision stepper motors are the ideal solution for compact, precision design requirements.

Automatic door locks have been around for some time – getting their start in the commercial space initially within hotels and offices. Increased numbers of smartphone users and broader adoption of smart home technology have led to a more recent growth in residential automatic door lock applications. Touchless solutions for both public and private door locks assist in preventing the spread of viruses and bacteria, which is of particular interest during the current global COVID-19 pandemic.

While there are technology differences between commercial and residential users – battery vs hard wire, RFID vs Bluetooth – one of the mutual requirements is a compact, efficient design that meets essential performance targets.

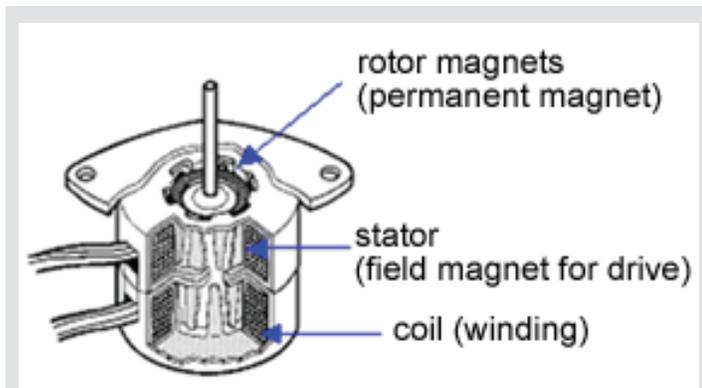
Traditional deadbolts require a key be inserted into the locking cylinder and manually turned in order to lock/unlock an access point. This method has advantage of being fairly secure and protected from power failures, however, people can misplace physical keys and the process of replacing locks/keys requires tools and expertise. Electronic locks are more flexible in the sense that access control can typically be modified simply through software updates. Many of the newer e-locks provide options for both manual and electronic locking control in order to provide a more robust solution.



# Micro Stepper Motors for Compact Designs

Size constraints and precise positioning requirements present an ideal scenario in which to employ miniature stepper motors. As a world leading stepper motor manufacturer, MinebeaMitsumi has established advanced technology and processes to enable high volume production – several hundred million per year – while maintaining maximum performance and quality. We are able to leverage our motor engineering expertise and proprietary magnetization technology to develop PM stepper motors with the smallest diameters (3.4mm OD) currently available. By utilizing advanced magnetic and structural analysis techniques, we can optimize the design and materials for a confined space. These miniature stepper motors are typically used in applications such as camera lenses, Blu-ray disc drives and mobile devices.

In addition to the compact form factor, stepper motors are typically easier to control – especially for applications such as automatic locks, which demand accurate positioning and low-speed torque. To achieve the same functionality, other motor technologies would require the addition of Hall Effect sensors or complex position feedback control mechanisms. Typical stepper motors can be driven with simple microcontrollers which may alleviate a design engineer's concern with overly sophisticated solutions.



Internal Structure of PM Stepping Motor



Product Photo (Left:  $\Phi$ 3mm, Right:  $\Phi$ 6mm)

The smart home market will continue to grow with new technology advances and greater consumer adoption leading to a variety of smart, electronic lock options. With consumers interested in low-profile and unobtrusive products, there is a need for smaller components to fit this shrinking form factor. MinebeaMitsumi miniature stepper motor solutions and local engineering support offer an ideal solution for small e-lock applications.