

# MIGA Motor Company™

Comparison chart of competing small electrical devices.

<b>Device</b>	<b>Theory of Operation</b>	<b>Advantages</b>	<b>Disadvantages</b>	<b>Principle Uses</b>
<b>DC Motor</b>	Permanent magnets and alternating polarity of rotor	Reliable, hundreds of vendors, inexpensive, non-proprietary design, start-up / shut-down control	Many parts, many failure modes, suited only for rotary motion unless additional hardware is added (gear-trains), noisy	Toys, computers, consumer electronics, appliances, automotive: seats, mirrors
<b>Solenoid</b>	Oppositely charged electromagnet plunger repelled by permanent magnet	Reliable, thousands of vendors, non-proprietary design, few moving parts, works well in hostile environment	Force decreases dramatically with stroke (Max. at start, drops at end), large & heavy due to permanent magnets, can't control output design not scaleable	Washing machines, automatic outdoor sprinklers, industrial machines, car trunk openers
<b>Linear Motor</b>	Same as DC motor, but rolled linear	Linear output or motion	Same as DC Motor	Assembly lines, manufacturing
<b>Piezo-Electric (PZT)</b>	Material changes shape in electric field	Large force in small package	Expensive, small displacements only	Specialized movements in scientific instruments
<b>Wax Actuator</b>	Wax expands when heated to produce force	Large forces possible, few moving parts	Expensive, slow response for wax to heat, operation dependent on thermal environment, threatening failure modes	Satellite mechanisms
<b>Pyrotechnic</b>	Ignition of powder	High Force	Use once	Ejection seats, emergency systems
<b>MIGA Motor Company SMA Actuators</b>	Heating of SMA wire leads to change in state of material and release of force	Reliable, long lasting, reusable, fast acting, silent operation, few simple parts, scalable movement, very small & light weight, constant force throughout linear stroke, customizable	New device*	All of the above

\*Displacement Multiplied™ SMA actuators have been tested to over 3,000,000 cycles.