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Shape Memory Alloy Actuators

Shape Memory Alloy Actuators are devices that use Nitinol alloy wire made of high strength corrosion resistant Nickel Titanium material that contracts 4% or more when heated. In most applications the heat is conveniently and precisely generated by an electrical current. SMA Actuators using Nitinol wire are used reliably in a wide variety of applications including medical, computer, consumer, automotive and industrial products.

Contact Kevin Nash at 858.678.3103 or [Kevin](#) for more information about Shape Memory Alloy Actuators.

[– Benefits of Shape Memory Alloy \(SMA\) Actuators](#)

In many applications Shape Memory Alloy (Nitinol) Wire provides actuation solutions that permit the elimination of solenoids and motors. SMA Actuators offer energy efficiency, lighter weight, space savings, cost savings and quiet operation while meeting the life cycling requirements of a wide variety of products.



Shape Memory Alloy Wire Motion Principle

[– Nitinol Alloy Wire Performance Characteristics](#)

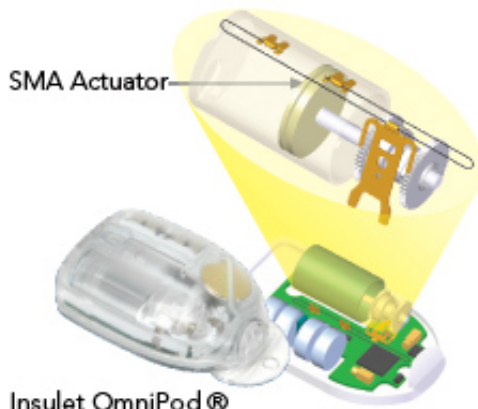
The chart below shows typical Nitinol Alloy Wire performance characteristics based on set parameters. (Nitinol Wire Contracts .040 inches per inch) However, there are ways to improve response time, actuation range (movement), power requirements, etc.

Nitinol Alloy Wire Performance Characteristics

Wire Size (Inches)	Resistance (Ohms/Inch)	Maximum Pull Force (grams)	Applied Current at Room Temp (mA)	Contraction Time (sec)	Off Time 70°C Wire (sec)	Off Time 90° Wire (sec)
0.0010	45.0	7	20	1	0.10	0.06
0.0015	21.0	17	30	1	0.25	0.09
0.002	12.0	35	50	1	0.3	0.1
0.003	5.0	80	100	1	0.5	0.2
0.004	3.0	150	180	1	0.8	0.4
0.005	1.8	230	250	1	1.6	0.9
0.006	1.3	330	400	1	2.0	1.2
0.008	0.8	590	610	1	3.5	2.2
0.010	0.5	930	1000	1	5.5	3.5
0.012	.033	1250	1750	1	8.0	6.0
0.015	0.2	2000	2750	1	13.0	10.0
0.020	0.16	3562	4000	1	17.0	14.0

[– Shape Memory Alloy Actuator Motor](#)

The OmniPod Insulin Pump portable delivery system provides a "freedom of lifestyle" change for diabetics requiring Insulin use. The unique product was made possible with the use of a Shape Memory Alloy wire actuator jointly developed with insulet and manufactured by Autosplice! Standard motors are too costly, too heavy, generate too much heat, and require far too much power to provide a portable solution. The SMA actuator makes this assembly possible from both a technical and cost effective standpoint. The SMA wire actuator drives the gear by alternately energizing one side of the wire assembly and then the other. This in turn drives the arms into the gear mechanism, which results in the turning of the shaft. The gear mechanism provides the motion for the operation of the pump.



Insulet OmniPod®
Shape Memory Alloy Actuator
Insulin Pump Motor

[+ Energy Efficient Latching Shape Memory Actuator](#)

Shape Memory Alloy Actuator provides a latched condition for alternate positions of a shaft with significant energy conservation making it especially ideal for battery driven devices. Testing shows potential of 1/10th power consumption vs. traditional latching solenoids. Interface can be designed to fit a wide variety of applications, especially for water valves.

- Power consumption reduced to .035 Watt-seconds from .36 Watt-seconds.
- Battery life extended for product life.



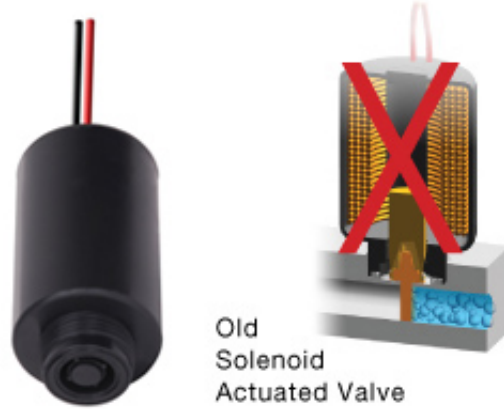
Latching Shape Memory Alloy Actuator

VOLTAGE INPUT	FORCE	STROKE
1.5/3 VDC	100 g	0.118 (3mm)

[+ Irrigation/Water Valve Shape Memory Alloy Actuator](#)

Ideal for solenoid replacement. Can be used as a drop in or be modified to fit specific design requirements.

Flexible design allows use with AC or DC power input, offers quiet operation, is low cost and is energy efficient.

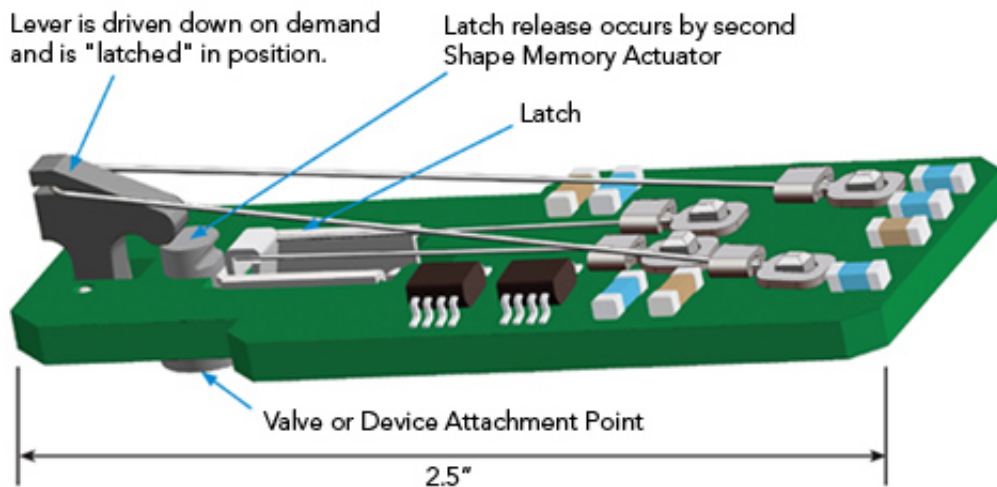


VOLTAGE INPUT	FORCE	STROKE
DC 1.5 - 3 VDC	100g	0.35 (0.89mm)
AC - VARIABLE	100g	0.35 (0.89mm)

+ Custom SMA Actuator designs-latching/unlatching

Autosplice has developed a variety of custom SMA Actuator latch solutions for devices that require overall control of operation and/or accessibility.

The device below provides control and operation lockout by integrating two Shape Memory Actuators with electronic control of all functions. One SMA Actuator is integrated with a lever system to actuate the actual device, while the second SMA Alloy wire provides "latch" control and lockout until electronically released. This device also provides "burst control" in the actual application as well.



Custom SMA Actuator for latching/unlatching, releasing and device control

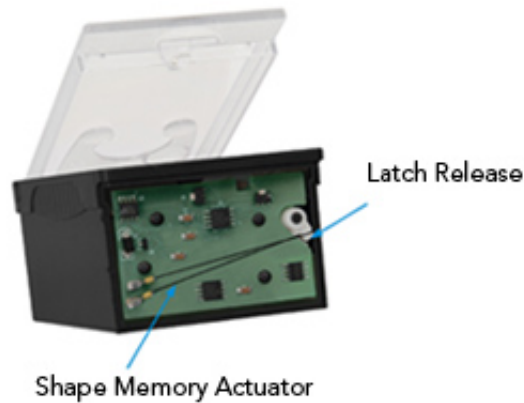
For this dispensing unit it was essential to develop a low profile release system. SMA Alloy wire eliminated the need for solenoids and increased the number of containers available in a given area, with flexible configuration

management.

The Shape Memory Actuator opens the lid on programmable demand when access is required.

In addition to offering custom control that is difficult to match via traditional devices, Shape Memory Actuators also offer low cost, low power, generate less heat, are extremely lightweight and offer Quiet operation!

Discuss your latch release/latching applications with an Autosplice representative and take advantage of a Shape Memory Actuator solution for your device!

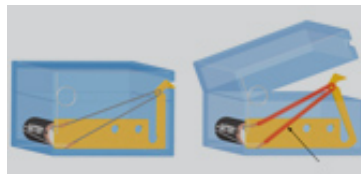


SMA Actuator dispensing unit

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