

Mission Success

Ensign-Bickford Aerospace & Defense Company (EBAD) is dedicated to supporting our customers in the aerospace and defense industry through on-time delivery of innovative products that exceed expectations and assure mission success.

## TiNi™ Pin Puller

EBAD's TiNi™ Pin Pullers are utilized in satellite applications to provide a simple and effective non-pyro separation system between two components where a pull force is required. Ranging in size from a 5lbF to 1000lbF pull force, the pin pullers offer a versatile solution from small satellite solar array deployments, launch locks for optical payloads and antenna releases.

Easy to use, resetting the device is straightforward with our custom reset tools and requiring no parts to replace.

## Principle of Operation

The pin puller is a reliable fast operating device that utilizes a shape memory alloy “SMA” wire to release a latch to allow for the internal compression springs to retract the pin.

In the fully reset mode, the internal circuit is closed. When sufficient power is applied, the current raises the temperature of the SMA wire and subsequently contracts at its transition temperature. This allows internal ball locks to release and internal drive springs to retract the pin into the body of the device. Once retracted, the circuit is open allowing no power to continue to heat the SMA wire and provides the user with positive feedback that the device has actuated.

The device is reset with a custom tool that either pulls the pin out from the front or pushes it out from the rear.

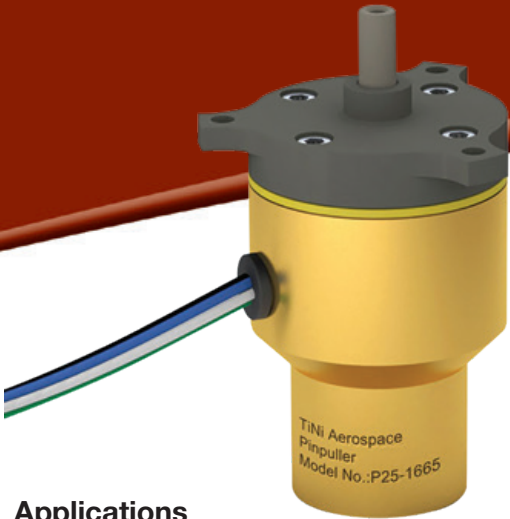
## Construction

Utilizing a shape memory alloy “SMA” wire, the wire is threaded through a latch and attached to the electrical contacts. The latch retains an internal ball bearings that keeps the compressed drive springs in place before actuation. Another smaller internal reset spring is installed to assist in the reset process.

The pin puller is fully vented and typically the enclosure is made with aluminum alloy with a titanium flange. The output pin is made with stainless steel with a tiolon finish.

Alternative voltages utilize an internal resistor to protect the SMA wire from overheating.

# TiNi™ Pin Puller



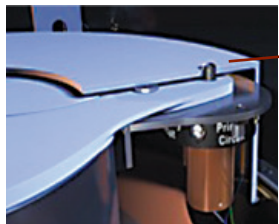
## Applications

Since 1996 Mars Global Surveyor mission, EBAD's TiNi™ Pin Pullers have extensive heritage in space applications. Such applications include solar array and instrument deployment, instrument launch locks, optic cover releases and other space applications where a pull force is needed. In addition, the pin pullers have high non-actuated side load capability that can withstand rigorous launch vehicle environmental levels.

## Key Features

- Nonpyrotechnic
- Easy to field reset and simple to use
- Minimum 50 cycles
- Redundant firing circuit
- Maximum reliability thru design simplicity
- Flight pedigree and testability

Alternative applications include missile fin locks and underwater acutations with our subsea versions.



TiNi™ Pin Puller Launch lock example (before actuation)



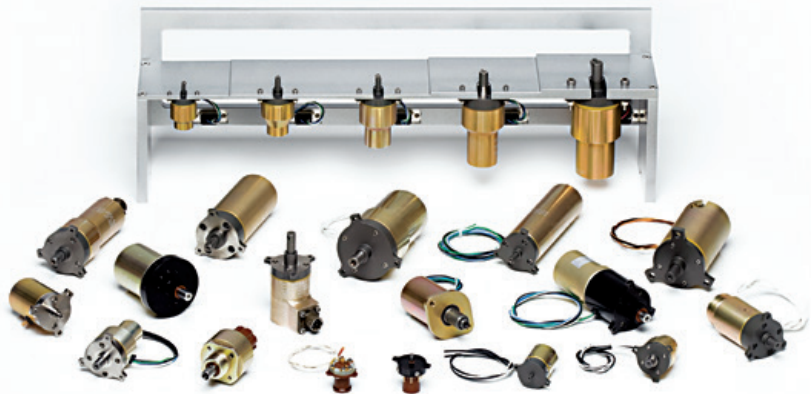
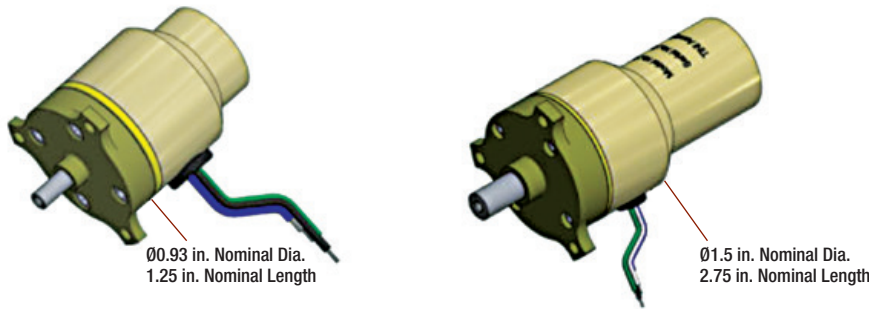
TiNi™ Pin Puller Launch lock example (after actuation)

## TiNi™ Pin Puller Family Technical Specifications

Pin Puller Family	P5		P10	P25	P50	P100	P1000
Pull Force	5lbF (22.2N)		10lbF (44N)	25lbF (111N)	50lbF (222N)	100lbF (445N)	1000lbF (4450N)
Side Load (actuation)	7lbF (31.1N)	10lbF (44.5N)	20lbF (89N)	50lbF (222N)	100lbF (445N)	200lbF (890N)	1500lbF (6675N)
Side Load (non-actuation)	20lbF (88.9N)	100lbF (444.8N)	330lbF (1468N)	400lbF (1823N)	490lbF (2180N)	600lbF (2670N)	Contact EBAD
Mass	.73 oz (18g)	1.06 oz (30g)	1.7 oz (48g)	2.6 oz (75g)	5.3 oz (150g)	12.7 oz (360g)	17 oz (482g)
Operating Current	.5 to 2A	.4 to 1.5A	.6 to 2A	1.25A to 4.5A	2.25A to 6.5A	2.25A to 6.5A	2.75A to 8.75A
Resistance	5.2±.5 Ω	7.7±.5 Ω	5.8±.5 Ω	3.1±.3 Ω	2.7±.3 Ω	3.1±.3 Ω	2.2±.3 Ω
Function Time @ 23°C	130ms max @ .5A		100ms max @ 1A	130ms max @ 2A	100ms max @ 4A	100ms max @ 4A	75ms max @ 4A
Cycle Life (min)	100				100	100	50
Operating Temp	-65°C + 70°C				-65°C + 70°C	-65°C + 70°C	-60°C + 70°C
Height (before pin retraction)	1.25"	1.625"	1.72"	2.54"	3.50"	4.255"	4.605"
Height (after pin retraction)	1.00"	1.375"	2"	2.16"	3.00"	3.635"	3.88"
Max diameter (with flange)	1.25" diam	1.25" diam	1.6" diam	1.8" diam	2.00" diam	2.55" diam	2.44" x 2.44"
Front/Rear Resettable	Yes	Yes	Yes	Front Std; Rear Optional with growth in device			Contact EBAD

Contact EBAD about alternative voltages/resistance and pin type

## TiNi™ Pin Puller Mechanical Interface Drawing



TiNi™ Pin Puller Family of products