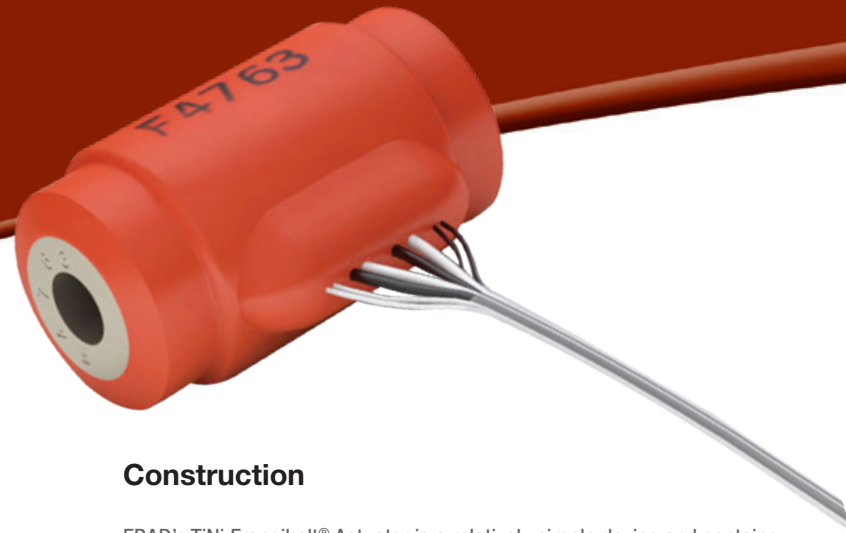


Mission Success

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.



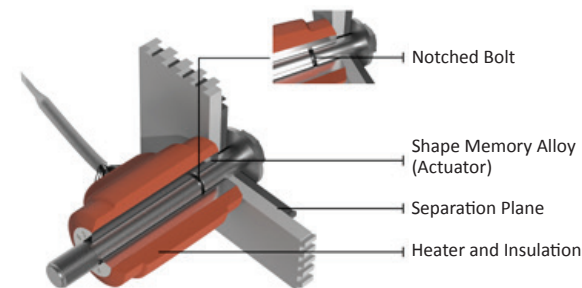
TiNi™ Frangibolt® Actuator

EBAD's Frangibolt® Actuators are utilized in satellite applications to provide a simple and effective non-pyrotechnic separation system between two components or structures. With the ability to customize the Titanium (Ti) fastener to meet the applications joint design, the frangibolt offers design flexibility in a compact package.

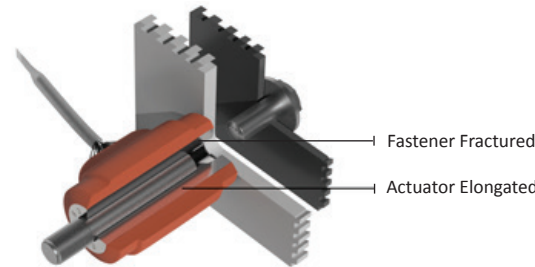
Easy to use, resetting the device is straightforward with our compression reset fixture and replacement of the notched Titanium (Ti) fastener.

Principle of Operation

The EBAD Frangibolt® Actuator is a simple and effective way to support and release loads up to 20,000 lbf. The principle of operation is simple - actuation occurs when power is applied to a Shape Memory Alloy (SMA) cylinder until it reaches its transition temperature. As the SMA cylinder heats up, it expands to its elongated length to produce strain on the bolt or stud thereby achieving separation of two or more components or structures and fracturing occurs at the predetermined notch. Standard Fastener sizes range from #8 to 3/4" bolts.



Frangibolt before actuation



Frangibolt after actuation

Construction

EBAD's TiNi Frangibolt® Actuator is a relatively simple device and contains few components that increase its reliability. The device is comprised of a machined SMA cylinder, encapsulated with redundant resistive heaters and embedded RTD's. The whole assembly is then wrapped in a silicone rubber compound to provide both thermal and electrical isolation.

Applications

Since 1994, the frangibolt has extensive heritage in space applications. Such applications include solar array and instrument deployment, instrument launch locks, optic covers and other space applications where a small form factor is needed between two interfaces. In addition, EBAD manufactures subsea versions and the #4 mini-frangibolt actuator for smaller applications.

Key Features

- Nonpyrotechnic
- Easy to reset and simple to use
- Redundant Firing Circuit
- Maximum reliability thru design simplicity
- Flight Pedigree and Testability

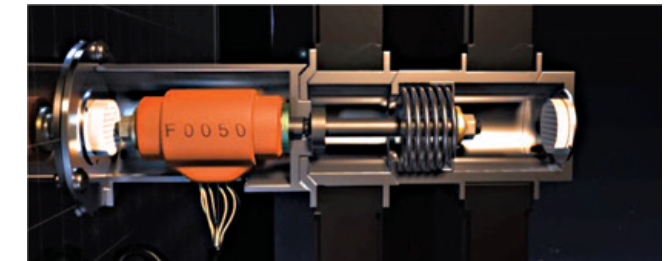
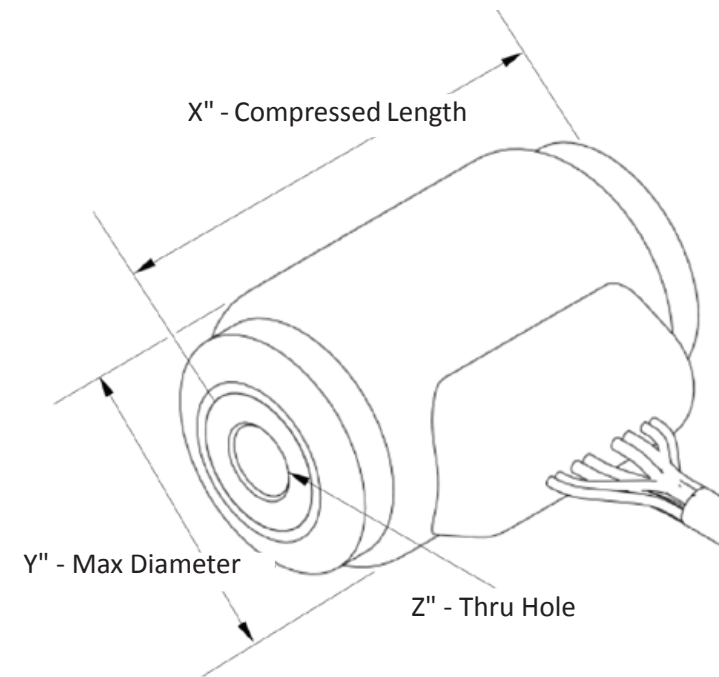
EBAD's TiNi Frangibolt® Actuators must be ordered with custom to Titanium (Ti) notched fasteners that are manufactured per strict tolerances. Accessory hardware such as washer, lock nuts, enclosures are available. In addition, switch washers, when wired in series can be used as an automatic shut-off switch to the frangibolt actuator once tension is released and the to Titanium (Ti) fastener is fractured.

TiNi™ Frangibolt® Actuator Technical Specifications

Actuator Family	FC2	FC3	FC4		FC6	FC8	FB12
Ti Fastener Size	#8	#10	1/4"		3/8"	1/2"	1"
Mass	25g	40g	55g		110g	175g	350g
Power	25W @ 28V	49W @ 28V	80W @ 28V	111W @ 100V	112W @ 28V	143W @ 100V	145W @ 29V
Operational Voltage*	22-36V	22-36V	22-36V	95V-105V	22-36V	95-105V	28-41V
Current Draw	.9A @ 28V	1.75A @ 28V	2.9A @ 28V	1.1A @ 100V	4A @ 28V	1.4A @ 100V	4.8A @ 36V
Resistance	31±3 Ω	16±1.6 Ω	9.7±1.5 Ω	90±9 Ω	7±1 Ω	70±7 Ω	7.5±1 Ω
Max Load Support	850lbf (3781N)	1400lbf (6227N)	3400lbf (15,123N)		6000lbf (26,689N)	9600lbf (42,702N)	26,200lbf (116,543N)
Function Time	30s @ 28V (23°C)	35s @ 28V (23°C)	35s @ 28V (23°C)	25s @ 28V (23°C)	60s @ 28V (23°C)	40s @ 100V (23°C)	80s @ 28V (23°C)
Life	60 cycles min						32 cycles min
Operating Temperature	-65°C + 80°C						CONTACT EBAD
Compressed Length (X")	.960"	1.210"	1.450"		1.940"	2.120"	2.460"
Diameter (Y")	.625"	.760"	.950"		1.225"	1.400"	1.975"
Thruhole (Z")	.169"	.194"	.257"		.381"	.520"	.762"

*Inquire with EBAD on alternative voltage ranges/options

TiNi™ Frangibolt® Actuator Mechanical Interface Drawing



Frangibolt before actuation



Frangibolt after actuation