This paper proposes a new standard for testing Frangibolt actuators, which are a type of hold down and release mechanism (HDRM) produced by Ensign-Bickford Aerospace & Defense Company (EBAD). The aerospace industry has moved away from using explosive HDRMs and have been increasingly using actuators which do not induce as much vibration and are resettable, such as Frangibolts. Frangibolts are considered a linear actuator and should typically be tested for available force and stroke margin. This paper proposes a standard method for measuring the force and stroke margin available in a Frangibolt to qualify a unit for flight. Mechanical ground support equipment (MGSE) was specifically designed to support the testing of an FD04 Frangibolt unit in an Instron machine. The novelty of this test procedure is that the MGSE and methodology are designed to initially apply a pre-load to the Frangibolt which simulates the load a torqued bolt in a flight assembly would apply. Once the Frangibolt is actuated, the load it experiences linearly increases to the desired test load. Multiples of the Frangibolt bolt-breaking load were used as test loads and applied by the Instron to the Frangibolt unit to measure its available force margin. The stroke of the Frangibolt was measured at each test load using an extensometer, and the stroke margin was calculated from the bolt-breaking stroke. Two Frangibolt units were successfully tested following this procedure while demonstrating ample force margin up to 100% and an average stroke margin of 28%. Although the MGSE was designed for FD04 Frangibolts, this easily repeatable, reliable, and scalable test procedure can be modified to support the testing of other Frangibolts units of different specifications and sizes. This test procedure can be used as a standard testing method to verify the force and stroke margin of Frangibolts, which are increasingly being used in flight assemblies.

Additional info that I removed from the abstract as it was a bit too specific:

~~The MGSE was designed in such a way that when the Instron platen moves down onto the MGSE, only the required pre-load (~150 lbf) is initially applied to the Frangibolt. Even as the Instron ramps up to the test load, only the pre-load is applied to the Frangibolt while the rest of the force is disturbed in the MGSE. Once the Instron reaches the test load, the Frangibolt is actuated which causes it to expand and push back up against the Instron platen. As the Frangibolt expands, the load on the Frangibolt is linearly increasing to the test load applied by the Instron. Eventually, the Frangibolt carries the entire test load of the Instron while it is expanding.~~