

Market Analysis: Biaxial Tensile Tester

1. Competing Products

1) 574 Series Planar Biaxial Test Machine

Summary: This biaxial tensile tester can perform tensile tests, compression tests, and fatigue tests on flat samples. A four channel closed loop servo motor controller controls four actuators, which move the specimen in opposing directions on two perpendicular axes. Each actuator operates independently, which allows users to perform tests with unequal states of stress on the specimen.

Price: Based on other market prices, anywhere between \$4000 and \$6000.

Pros and Cons:

Pros:

Team Tensile Tester's Machine	574 Series Planar Biaxial Test Machine
Can apply smaller forces (0.1N to 100N)	Wide range of forces (22N to 30kN)
Designed specifically for tensile tests (easier user interface)	Multiple test types (tension, compression, fatigue tests)
Inexpensive (\$1000-\$1500)	0.1 micron resolution for actuator displacement

Cons:

Team Tensile Tester's Machine	574 Series Planar Biaxial Test Machine
Cannot apply larger forces (100N maximum)	Cannot apply smaller forces (22N minimum)
Only one test type (tension)	More challenging user interface
Lower resolution for displacement (0.1mm)	Expensive (\$4000-\$6000)

2) BioTester 3000

Summary: The BioTester 3000 system was designed to make biaxial testing user friendly so that customers can focus on results rather than testing. The modular system that can be easily customized to meet unique testing needs for customers preferences. [2] The BioTester has four key features that include: four high performance actuators with inline load cells, several attachment options for personal customization, high resolution cameras that record data and a controlled fluid bath.

Price: Based on other market prices, anywhere between \$3000 and \$4000..

Pros and Cons:

Pros:

Team Tensile Tester's Machine	BioTester 3000
Can apply larger forces (0.1N to 100N)	Temperature-Controlled Bath
Shall record displacement and force	BioRake magnet design for pulling biomaterials
Max velocity is 50 mm/s	1.5 X 1.5 X .5 ft dimensions of device (portability)

Cons:

Team Tensile Tester's Machine	BioTester 3000
Does not have a Temperature-Controlled Bath	Can only apply 10-23 N
2 X 2 X 1 ft dimensions of device (portability)	Only records displacement (additional cost for force)
Inexpensive (\$1000-\$1500)	Max velocity is 20 mm/s

2. Related Patents

1) **Biaxial Tensile Testing Machine** (US Patent 8671771) --Published 03/18/2014-- [3]

Abstract: A biaxial tensile testing machine performing a tensile test of a test piece by stretching the test piece in four directions along two axes perpendicular to each other includes: first and second turntables which are disposed so as to be parallel to each other and relatively rotatable about a rotary axis along the planer direction thereof; first to fourth link mechanisms which are provided at 90° intervals in the circumferential direction about the rotary axis so that one ends of

respective members of a pair of members are rotatably connected to each other, and the other ends of respective members of the pair of members are attached across the first and second turntables; and first to fourth test piece holding units which are respectively attached to the first to fourth link mechanisms and hold the test piece.

Do these patents show that you have the freedom to operate in this space?

- This patent is still in effect, but should not hinder the design of our product. For this particular patent, the owners have designed the tensile tester to use clamps as the method to stretch the specimen. Another claim of the patent is the use of a turntable design. The method and design used to stretch the specimen will be different from ours, so we have some freedom to operate in our design process as long as it is not similar in these aspects.

2) **Cruciform planar specimen for biaxial materials testing** (US Patent 5144844A)
--Published 09/08/1992--expired [4]

Abstract: A flat cross-shaped test piece is made of sheet metal for biaxially testing of its material. This test piece includes a central region that defines an area of measurement. Four arms for applying loads to the central region extend from the central region along orthogonal axes. Each arm has one end integral with the central region and an opposite end with an end part for connection to a test device for the application of a test load. Tensile stresses can thus be applied to the central region along the first and second orthogonal coordinate axes of the central measurement region. Slots in the load applying arms extend along the arms parallel to the first and second coordinate axes from the end part as far as and up to the area of measurement. The slots in the load applying arms prevent the escape of stress trajectories along the arms, thus making it possible to obtain a homogenous stressed state in the central measurement region.

Do these patents show that you have the freedom to operate in this space?

- This patent is expired, so we will not have to worry about getting copyrighted. We can also use ideas from this design within our own.

3. Citations:

- [1] L. Lachica, “574 Series Planar Biaxial Test Machine,” *TestResources*. [Online]. Available: <https://www.testresources.net/test-machines/planar-biaxial-test-machines/574-series-planar-biaxial-test-machine/>. [Accessed: 25-Sep-2021].
- [2] A. P. M. Rausch, P. A. Kamenskiy, and P. A. Azadani, “Biotester – Biaxial Tester,” CellScale. [Online]. Available: https://www.cellscale.com/products/biotester/?_vsrefdom=adwords&gclid=Cj0KCQjwkbu
- [3] Y. Hanabusa, “Biaxial tensile testing machine - Mitsubishi MATERIALS CORPORATION,” *Biaxial tensile testing machine - Mitsubishi Materials Corporation*, 18-Mar-2014. [Online]. Available: <https://www.freepatentsonline.com/8671771.html>. [Accessed: 25-Sep-2021].
- [4] Y. Feng, “Mechanical property tester and testing method of biological soft tissue - soochow university,” *Mechanical property tester and testing method of biological soft tissue - Soochow University*, 12-Jun-2018. [Online]. Available: <https://www.freepatentsonline.com/9995727.html>. [Accessed: 25-Sep-2021].