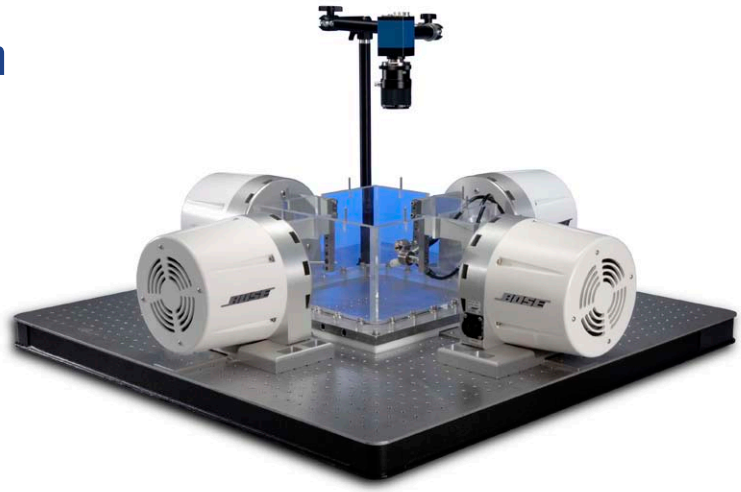
# ElectroForce® Planar Biaxial TestBench Test Instrument

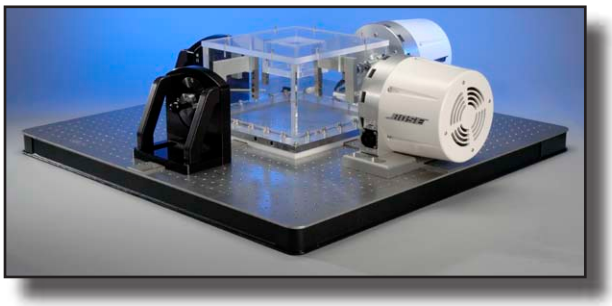
## Advancing Tissue and Biomaterials Research

Biomedical researchers are constantly looking to characterize and develop constitutive models to predict the mechanical behavior of new materials and compare them to biological soft tissues. This comparison and characterization is important to the development of essential tissue replacements such as tissue-engineered heart valves. Biological and tissue-derived soft biomaterials are used for many physiological, surgical, and medical device applications where rigorous constitutive models are required.



**Four Motor Planar Biaxial TestBench Instrument with Saline Bath and Digital Video Extensometer**

Examples include natural and prosthetic skin, myocardium, heart valves, and blood vessels. The challenge in constitutive modeling these materials is that they often exhibit mechanical anisotropy in addition to highly non-linear stress-strain relationships, large deformations, and viscoelasticity. Soft biological materials defy simple material models and require more intensive study. Bose has developed the ElectroForce® planar biaxial TestBench instrument for the characterization of such tissues and biomaterials. The instrument consists of four Bose® linear motors mounted on a horizontal baseplate and two load cells, one for each axis of loading. A heated saline bath can be added to the baseplate to provide a physiological environment, and a digital video extensometer is available for strain measurements. A simplified version of the instrument consists of two Bose linear motors and two reaction brackets as shown below.



**Two Motor Planar Biaxial TestBench Instrument with Saline Bath and Submersible Load Cells**

The ElectroForce planar biaxial TestBench test instrument incorporates Bose motor technologies and WinTest® controls. The friction-free motor design offers exceptional reliability and durability resulting in practically maintenance-free operation. WinTest controls include advanced WinTest software and PCI control electronics to provide data acquisition, waveform generation and instrument control in one comprehensive package. WinTest software features a fully integrated display and user windows that simplify test operations while providing advanced capabilities such as recreation of real-life waveform profiles and multi-channel synchronization.

## Features and Benefits:

- The ability to characterize mechanical properties of natural and artificial tissues in a 37°C saline bath.
- Both uniaxial and biaxial tests can be performed to aid in the research and development of constitutive models.
- Proprietary ElectroForce linear motors operate without friction, an important feature for high resolution, low-force testing.
- Two-dimensional strain is measured without contacting or damaging the soft tissue specimen while it floats in the heated saline bath.
- Load cells are provided on the X and Y axis.

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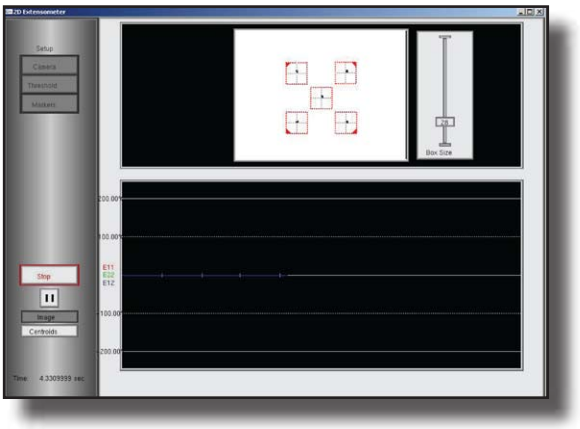
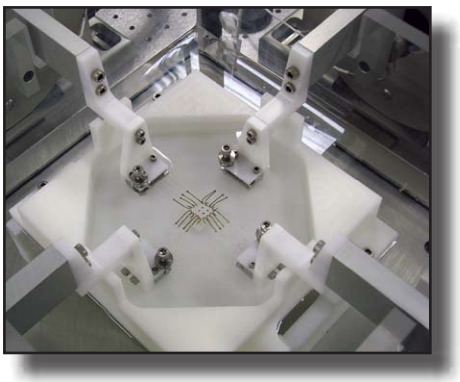
The Bose® digital video extensometer uses digital video techniques along with an integrated software application to optically monitor the two-dimensional (planar) displacement relationships between five markers made on a soft specimen. Using these five markers, the extensometer software acquires the Green-Lagrange primary strain, secondary strain, and shear strain values as the specimen is subjected to a waveform via WinTest® software. The software also calculates the two principal strain values at the same time. Strain values are obtained real-time and can be recorded along with other data using WinTest's data acquisition feature.



**Bose 2D Digital Video Extensometer Software**



**Specimen Mounting with Hook Grips**

A major challenge in planar biaxial testing of soft tissues and biomaterials is specimen gripping. Depending on specimen size, clamp-style or hook grips are available to mount samples as small as 10x10 mm. Customer-supplied grips and fixtures can also be integrated for specialized applications.

The combination of specimen gripping, mechanical loading and properties characterization capabilities are specifically tailored to planar biaxial testing of soft tissues and biomaterials. These capabilities coupled with the Bose linear motors that provide excellent dynamic performance and years of reliable operation make the ElectroForce® planar biaxial TestBench instrument the system of choice for a variety of test applications.

## Product Guide and Specifications*

| | Four Motor Configuration | Two Motor Configuration |
|---|---|---|
| **Motors** | Four (4) independently controlled ElectroForce linear motors | Two (2) independently controlled ElectroForce linear motors with two (2) reaction brackets |
| **Peak Force** | ±200 N | ±200 N |
| **Static (RMS) Force** | ±140 N | ±140 N |
| **Displacement** | 25 mm | 12.5 mm |
| **Displacement Transducers** | Four (4) | Two (2) |
| **Load Cells** | Two (2) 225 N<br>*Lower force and/or submersible load cells are also available.** | |
| **Tensile Grips** | Minimum sample length and width: 25 mm<br>Maximum sample thickness: 5 mm | |
| **Hook Grips** | Minimum sample length and width: 40-50 mm<br>Maximum sample thickness: 2.5 mm<br>Maximum force: 20 N<br>*Hook grips suitable for smaller samples are also available.** | |
| **Non-contact Strain Measurements** | Digital video extensometer to measure primary, secondary, shear strain and principal strains<br>• ±200% strain measurement range<br>• 200 Hz update rate<br>• 5 Hz maximum recommended test frequency<br>• 0.5% strain noise band | |
| **Environment** | Heated saline bath with temperature sensor and controller<br>• Room temperature to 45°C temperature range<br>• 10 L volume<br>*Low volume saline bath is also available.** | |
| **Dimensions** | 914 mm x 914 mm x 50 mm (36 in x 36 in x 2 in) base plate | |

*Specifications are subject to change*

*Note: Consult Bose about your test application.

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