



## Bionix® Orthopaedic Subsystems

Test fixtures for testing orthopaedic specimens on Bionix servohydraulic load frames

Orthopaedic researchers and product developers around the world leverage MTS' leading capabilities in precision control and multiaxial test and simulation to meet their toughest testing challenges. In order to accurately perform kinematics research or evaluation of implantable devices, proper systems for gripping the specimen and creating the desired test environment are required.

MTS offers a variety of modular and scalable Bionix Orthopaedic Subsystems that are designed to facilitate a wide variety of orthopaedic kinematics studies, including spine, knee, hip or other areas of the musculoskeletal system. In combination with MTS' Bionix Tabletop Servohydraulic Test Systems, FlexTest® Controllers and MTS software, these subsystems comprise complete, out-of-the-box solutions for all your biomechanical research needs.

be certain.

### Knee Wear Subsystem

The Bionix Knee Wear Subsystem is designed for use with the axial/torsional Bionix load frame and FlexTest controller. It performs active flexion testing with six degrees of freedom. The six degrees are:

- » Axial loading to 5 kN
- » Torsion (tibial rotation >20°)
- » Flexion/extension up to 120°
- » Shear (anterior-posterior shearing to 20 mm)
- » Varus/valgus alignment (free-floating)
- » Medial/lateral (free-floating)

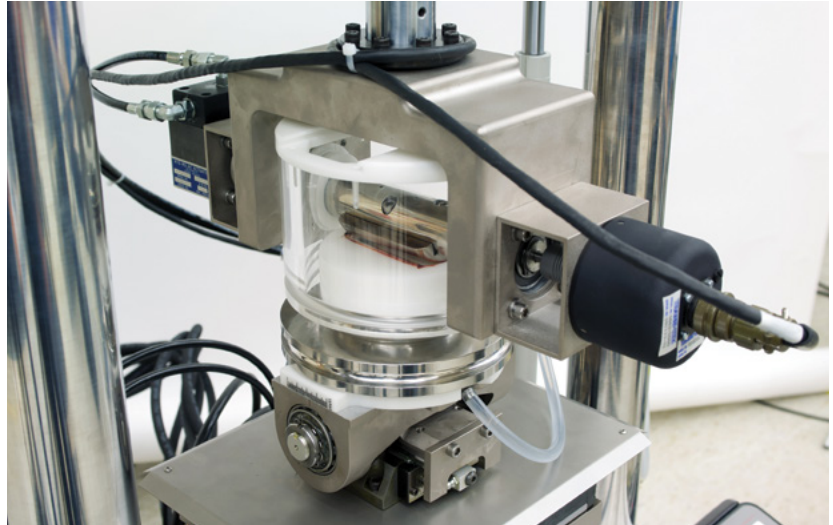
The following activities can be programmed in combination:

- » Level walking
- » Stair descending/ascending
- » Sitting down/rising from a chair

A chamber and catch basin are included so that in-vivo conditions can be simulated with optional 37°C temperature control.

When paired with the Bionix load frame and a FlexTest controller configured for four-channel operation, the system provides biomechanically related displacements and loads for various physical duty cycles.

Using the FlexTest controller, the operator can design the required loading and displacement profiles to evaluate the wear characteristics of designs and materials.



Bionix Knee Wear Subsystem

### Femoral Fatigue Subsystem

The Bionix Femoral Fatigue Subsystem was designed to meet current ASTM and ISO test criteria for femoral stem components of hip replacements. The specific test references are: ASTM 1440 – “Cycle Fatigue Testing of Metallic Stemmed Hip Arthroplasty Femoral Stem Components” and ISO 7206-4 – “Determination of endurance properties of stemmed femoral components.”

With this economically priced fixture, this axial-only test can be performed on any Bionix system. The fixture includes the load cell adapter, potting cup base, chamber and seals, chamber holder and thrust bearing and lower housing assembly.



Bionix Femoral Fatigue Subsystem

### Single-Station (Biaxial Rocking Hip) Simulator Subsystem

Built for use with an MTS Bionix axial-rotation system, the Bionix Single-Station Simulator Subsystem provides biaxial rocking motion that simulates exaggerated walking kinematics. While axially loaded, the fixture design simulates the motions, load and environment that the implanted hip will experience during the walking process. It provides a realistic and practical compromise between general wear-screening devices and the intensive research done with full-scale simulation and modeling using multichannel Bionix test systems.

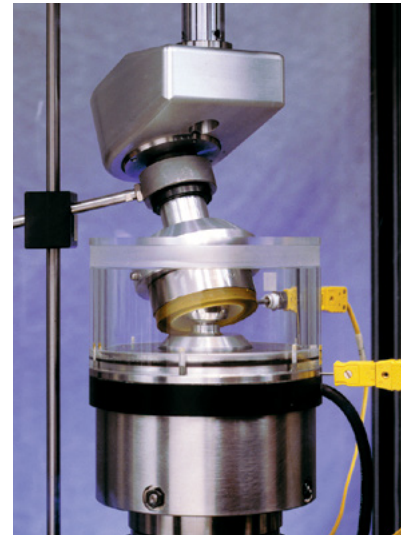
It is designed for nominal operation at the approximate walking speed cycle of 1 Hz. Rotation of the fixture provides the simulation motion (biaxial rocking). It uses continuous rotation of an inclined

block to achieve a mechanically induced extension/flexion, adduction/abduction and internal/external rotation for the hip arthroplasty components.

The fixture includes a pin bearing assembly, chamber and base, alignment fixture, anti-rotate device, and a universal mounting pattern for cup and ball hip implant. The system is designed to accommodate loads up to 5000 N.

Special corrosion-resistant fluid chambers house the acetabulum cup or femoral head. These are designed to be filled with bovine serum maintained at a temperature of 37°C.

A special alignment fixture assures proper positioning of the femoral ball and acetabulum cup during setup and throughout the test.



Bionix Single-Station (Biaxial Rocking Hip) Simulator Subsystem

### Single-Station, Multi-Degree-of-Freedom Hip Wear Subsystem

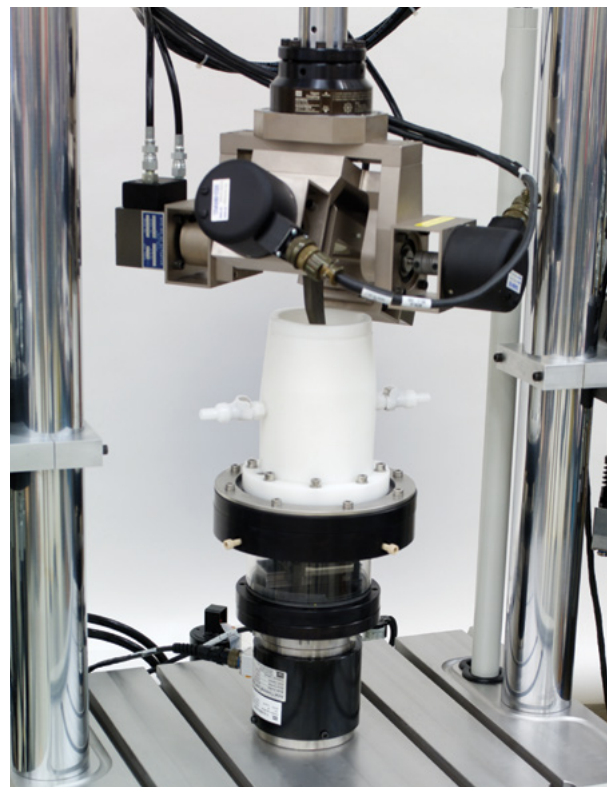
The four degree-of-freedom Bionix Hip Wear Subsystem was designed to provide researchers with a tool for long-term tests of hip replacement wear and fatigue. Its unique design, coupled with a Bionix axial-torsion test system, achieves the following motions:

- » Flexion/extension (120°)
- » Abduction/adduction (60° – medial/lateral motion)
- » Internal/external rotation (greater than 20°)

These motions are achieved by the fixture's special double-yoke design which provides independently controlled, synchronized motion. The following activities can be programmed in combination:

- » Level walking
- » Descending/ascending stairs
- » Sitting down and rising from a chair

The fixture requires a FlexTest four-channel software configuration to achieve the necessary test control and data acquisition.



Bionix Single-Station, Multi-Degree-of-Freedom Hip Wear Subsystem

## The Rest of the Solution

### VERSATILE MODEL 370.02 BASE

#### LOAD FRAME SYSTEM

These modular orthopaedic subsystems are integrated into a versatile Bionix servohydraulic test system, which makes the latest MTS servohydraulic technology available in a compact tabletop design. The axial/torsional configuration is well suited for testing the durability and wear properties of components such as knee, hip and spine implants, and conducting simple to very complex kinematics studies of skeletal tissue and other orthopaedic constructs. The axial configuration is designed to perform accurate and repeatable fatigue life studies, and tension, bending and compression tests of biomaterials and components.

#### FLEXTEST DIGITAL CONTROLS

The FlexTest family of digital controllers provides the flexibility required to address a full spectrum of testing needs and adapt to evolving standards and requirements. Scalable and easy to use, FlexTest controllers provide the high-speed closed-loop control, data acquisition function generation and transducer conditioning needed for reliable, multichannel, multistation testing.



#### INTUITIVE TEST SOFTWARE

Bionix orthopaedic subsystems operate on MTS multipurpose testing software, which provides a powerful, versatile and user-friendly environment for managing every aspect of your test. Easily orchestrate such processes as function generation, image capture, data acquisition, data correlation, and events and triggers – all with drag-and-drop simplicity, and all from within a single user environment.

#### QUIET AND COMPACT HPUS

MTS SilentFlo™ hydraulic power units (HPUs) are recognized for their superior performance, small footprint and extremely low noise. They are so compact and quiet that they can easily be installed almost anywhere in your laboratory. A “wall-hugging” design also conserves floor space.

#### Unparalleled Global Support

MTS fields the largest, most experienced worldwide service, support and consulting staff of any testing solution provider. This global team offers lifecycle management services, test consulting, systems integration/installation expertise and classroom or on-site training.

#### For More Information

To discuss your specific testing needs, e-mail [info@mts.com](mailto:info@mts.com) or contact your MTS sales representative.



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