



## Bionix® Knee Wear Simulator

Accurately replicate a full range of knee forces and motions

Bionix Knee Wear Simulators are used by orthopaedic researchers worldwide to conduct long-term wear, fatigue and durability tests of implantable knee devices and related materials. Precise and durable, they accurately replicate the full range of real-world knee forces and motions required to generate the high-quality wear data necessary for gaining device approval, validating production processes and pursuing continued development.

Multistation Bionix Knee Wear Simulators come equipped with six test stations to facilitate statistically significant sampling and minimize testing time. They employ a compact, modular design that combines the latest in MTS servohydraulic load frame technology, versatile FlexTest® controls and proven MTS application software. This combination affords the configurability and ease-of-use needed to fulfill the most stringent research requirements and adapt readily to diverse and evolving standards.

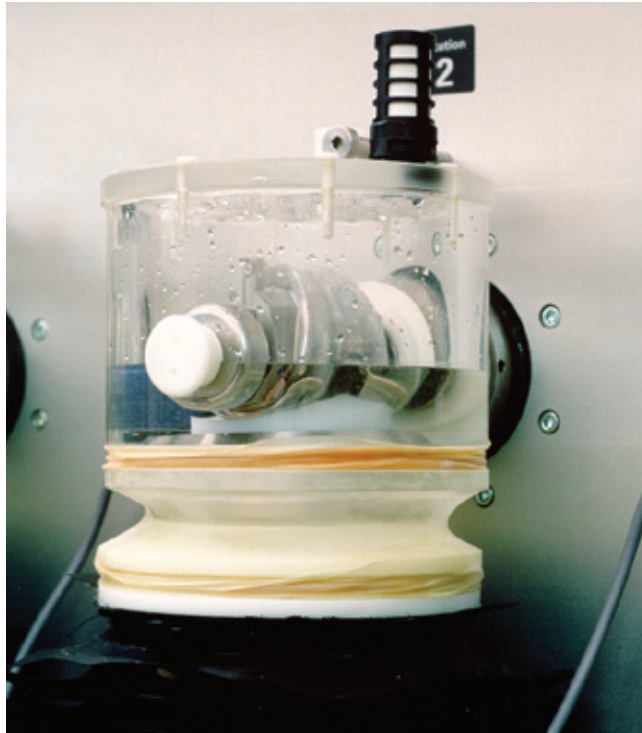
### Precise, Reliable Servohydraulic Power Module

MTS understands your critical need for constant uptime and absolute system reliability. That's why you'll find only superior materials and components built into every detail of the Bionix Knee Wear Simulator. The simulator employs an advanced hydraulic actuation scheme that delivers precise, closed-loop control of four independent degrees of freedom, while exhibiting levels of dynamic performance and stiffness not possible with other actuation approaches. User-defined flexion/extension (My), axial force (Fz), anterior/posterior (Fx) and tibial rotation (Mz) motions are generated by durable, low-friction MTS linear actuators and state-of-the-art servovalve technology. Additionally, the simulator is capable of achieving operating speeds of up to 2 cycles per second to accommodate accelerated test protocols. The six-station configuration matches the statistical sample size required by current testing standards.

### A Complete Selection of Optional Accessories

With the available selection of optional MTS test accessories, Bionix Knee Wear Simulators can be easily configured to address a full spectrum of knee wear simulation needs.

- » **LOAD SOAK:** Load–soak partner system works independently to subject control specimens to axial forces (Fz) only. It features separate closed loop control channels to ensure synchronization with active wear simulator load channels and stands alone to maximize laboratory layout flexibility.
- » **FORCE SENSING:** The simulator can accommodate a variety of force measurement devices, including delta pressure transducers, high accuracy single degree-of-freedom cells and six degree-of-freedom cells.
- » **FLUID SENSING:** The optional fluid-level sensing module reduces the need for manual monitoring by automatically alerting operators when fluids drop below predetermined levels in any specimen containment module.
- » **TEST FIXTURING:** MTS test fixtures are engineered to maintain high-quality system-to-specimen interfaces. The optional ISO 14243 Knee Wear Fixturing Module allows for free floating varus (+)/valgus (-) and medial/lateral (Fy) motions. The optional High Displacement Knee Wear Module allows for adjustable, locking varus (+)/valgus (-) and medial/lateral (Fy) motions—see product specifications.
- » **TEMPERATURE CONTROL:** The optional temperature control module circulates tempered fluid through a closed–heat exchange system to maintain tight control of testing temperatures. Circulating fluid is kept completely segregated from the specimen and test fluid at all times, ensuring that any debris generated by the wear simulation remains within the specimen–containment module.



Optional High Displacement Fixturing

### User-Friendly Specimen Containment Modules

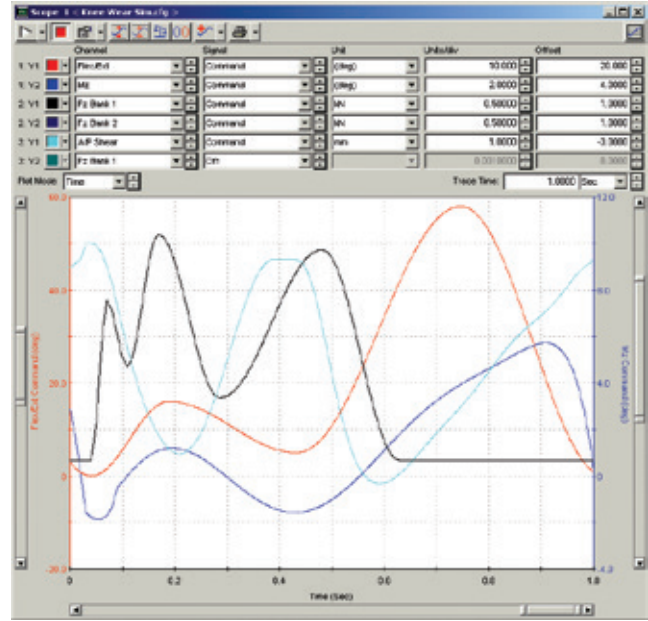
The Bionix Knee Wear Simulator can accommodate a variety of specimen fixturing and containment approaches. Specimen containment modules\* for ISO 14242 fixtures, for example, are designed to facilitate easy removal and transport of specimens to and from clean environments for inspection and debris analysis. An innovative pin-and-slot mounting scheme enhances test repeatability by ensuring that tibial and femoral components of the specimen can be returned to their exact test locations after removal and inspection intervals.

### Sophisticated Digital Controls and Software

The Bionix Knee Wear Simulator employs sophisticated FlexTest digital controls and user-friendly Multipurpose TestWare® (MPT™) application software. MPT software features an easy-to-use “drag-and-drop” environment for building both standard and nonstandard tests and allows you to use your favorite spreadsheet or analysis program to analyze, plot and report data. MPT software also includes methods for running complex profiles based on ASTM and ISO standards. You can generate far greater loads and displacement than currently required, equipping you to meet future test requirements. You can also input other profiles of interest such as duty-cycle loading\* with varying end levels, complex wave shapes and phasing, and simulations of periodic extreme conditions to replicate stair climbing and twisting.

### Unmatched Service and Support

The Bionix Knee Wear Simulator is supported by the largest, most experienced worldwide service and consulting staff of any biomedical testing solutions provider. This global team offers a wide range of onsite services to help maximize your test laboratory’s productivity, such as preventive maintenance, system lifecycle management, problem solving, technology transfer, consulting engineering and process optimization.



### Be Certain with MTS

The Bionix Knee Wear Simulator is a critical component in any structured knee implant development program. Whether you seek implant approval, production verification or continued research, this system delivers the accuracy, repeatability and detailed time histories you need to generate high-quality wear data.

### Product Specifications

#### BIONIX KNEE WEAR SIMULATOR

	6 Station Base Power Module		Optional - ISO 14243 Knee Wear Fixturing Module		Optional - High Displacement Knee Wear	
	Load Frame Range of Motion	Load Frame Range of Forces (per specimen)	Fixture Range of Motion	Fixture Range of Forces (per specimen)	Fixture Range of Motion	Fixture Range of Forces (per specimen)
<b>Flexion/Extension (My)</b>	180 deg -20 deg	74 N-m -74 N-m	67 deg -5 deg	74 N-m -74 N-m	180 deg -20 deg	74 N-m -74 N-m
<b>Varus (+) / Valgus (-) (Mx)</b>	(see fixturing)		5 deg -5 deg	-0 N-m -0 N-m	5 deg -5 deg	**
<b>Tibial Rotation (Mz)</b>	12.3 deg -12.3 deg	74 N-m -74 N-m	7.0 deg -5.9 deg	74 N-m -74 N-m	12 deg -12 deg	74 N-m -74 N-m
<b>Axial Force (Fz)</b>	50 deg -50 deg	10,000 N 0 N	50 mm -50 mm	5000 N 0 N	50 mm -50 mm	10,000 N 0 N
<b>Anterior/Posterior (Fx)</b>	25.4 mm -25.4 mm	1667 N -1667 N	7.5 mm -7.5 mm	1667 N -1667 N	25 mm -25 mm	1667 N -1667 N
<b>Medial/Lateral (Fy) Translation</b>	(see fixturing)		7.5 mm -7.5 mm	~ 0.N* ~ 0.N*	3.7 mm 3.7 mm	**

BLUE text indicates controlled DOF

\* Free-floating axis

\*\* Adjustable position, locked during operation

### Simulator Dimensions

Length	Depth	Height (cover closed)	Height (cover open)	Weight
1320 mm (52 in)	1145 mm (45 in)	1725 mm (68 in)	2235 mm (88 in)	1590 kg (3506 lb)



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**\*Patents Pending**

MTS is pursuing numerous U.S. and foreign patent applications covering various aspects of the Bionix Knee Wear Simulator. Contact MTS for more information on these patent applications.

Specifications subject to change without notice.

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