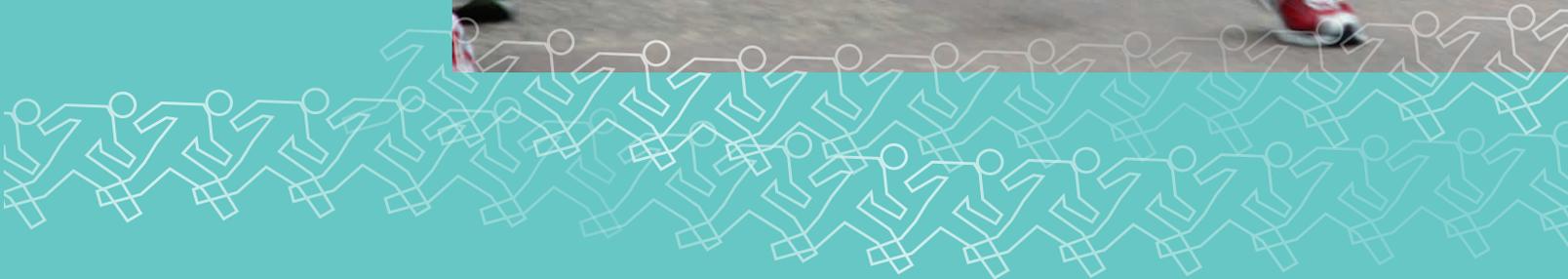




## Biomedical Testing Solutions

be certain.

PRECISE MECHANICAL TESTING DELIVERS THE DATA MEDICAL DEVICE  
MANUFACTURERS AND RESEARCHERS NEED TO PROPERLY CHARACTERIZE  
MATERIALS, VALIDATE DESIGNS, MEET REGULATORY STANDARDS AND  
ENSURE RELIABLE PERFORMANCE. LOOK TO MTS FOR THE UNMATCHED  
TEST EXPERTISE AND FULLY INTEGRATED TESTING SOLUTIONS YOU NEED TO  
**SPEED DEVELOPMENT, ENHANCE QUALITY CONTROL AND BRING NEW  
PRODUCTS TO MARKET WITH CONFIDENCE AND COST-EFFICIENCY.**



## Driving the pace of innovation

Every day, biomedical research transforms the lives of patients worldwide, enabling faster healing, restored mobility, greater longevity and higher quality of life. At the core of these innovations are advanced biomaterials and biomechanical products, all of which must be rigorously tested to comply with industry standards and deliver the performance that physicians and patients expect.

Building on more than 40 years of experience in biomedical testing, MTS offers what others cannot: a powerful combination of deep domain expertise and an extensive portfolio of testing solutions to meet virtually any need. Whether your primary concern is biomaterials, orthopaedic constructs, medical devices or medical packaging and consumables, MTS understands exactly how to integrate a testing solution that generates the accurate, repeatable and meaningful test data your team needs to maintain momentum.

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### Expertise

For more than four decades, MTS has successfully collaborated with leading researchers and manufacturers to develop and refine test protocols for an incredibly diverse range of materials, devices and other biomedical products. Through these partnerships, MTS developed the pioneering technologies in force and motion generation required to precisely simulate the complex dynamics of the body, from axial to multiple degree-of-freedom (DOF) movement.

### Flexibility

The complete MTS offering covers a wide variety of applications in biomaterials and biomechanics. On the biomaterials side, MTS Bionix® test systems characterize materials themselves as well as test the wear rate of materials used in orthopaedic devices, medical and dental components, surgical tools, pharmaceutical packaging and veterinary products. For biomechanical applications, MTS Bionix solutions facilitate advanced motion studies for prosthetic limbs and implants used in the spine, knee and hip. We also excel in developing custom solutions for new and unique test applications.

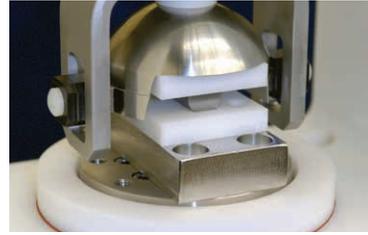
### Reliability

To maintain a competitive advantage and launch new products as quickly as possible, manufacturers rely on very tight timelines. Known industry-wide for outstanding reliability, MTS solutions for biomedical testing ensure high uptime, smooth operation and dependable performance in the lab, from day to day and test to test. Adding MTS solutions to the lab can help your team generate accurate data on schedule. Of course, we also provide responsive service and support to make sure every potential issue is resolved before it affects your productivity.

## Pursue new designs and devices with confidence

Trust MTS biomedical testing solutions to conduct complex tests quickly and precisely, allowing your test team to allocate resources efficiently during every stage of the development cycle.





#### ENABLE REGULATORY AND STANDARDS COMPLIANCE

Achieving full compliance with regulatory and other standards is absolutely vital, since products can't be launched without prior approval. Maintaining compliance after introduction requires additional investments in testing and evaluation. MTS has decades of experience helping biomedical organizations complete tests according to hundreds of standards and specifications, including:

- » ISO and ASTM standards
- » FDA guidance documents
- » Country-specific standards

For a complete list of all applicable standards and specifications, please contact your MTS representative.

#### Research

To properly characterize materials, devices and constructs during the initial stages of regulatory approval, biomedical researchers must accurately simulate the highly complex biological environments found in the human musculoskeletal system. Researchers subject devices to forces, moments and service conditions they experience during clinical use, conducting strength, fatigue and wear tests to predict performance. This not only enables research teams to gain new insight earlier in the process, but it generates results that are often submitted during approval. MTS is a valuable partner for integrating the entire test setup, as well as devising appropriate methods.

#### Product development

Designing and conducting mechanical tests accurately and reproducibly is essential not only for maintaining proper speed to market, but for improving the performance of products over time. Like researchers, product developers are concerned with accurate simulation of complex physical motions, such as walking, running and climbing stairs. Developers must also simultaneously optimize performance, durability, functionality and cost — all while conforming to rigorous, device-specific standards. Because MTS solutions are designed to work together, developers can use them to execute many kinds of tests with equal accuracy and repeatability.

#### Contract testing

Contact test laboratories offer essential capabilities for manufacturers who need additional test capacity. For these labs, MTS offers an extensive array of systems for dynamic and universal testing, as well as wear simulation and kinematics studies. With the right mix of test systems, contract labs can generate precise, on-time results for many kinds of customers. Our systems also help accelerate setup and execution, so your lab runs at optimal productivity.

#### Quality assurance and control

In manufacturing and production environments, quality assurance (QA) and quality control (QC) teams must perform critical checks quickly and accurately. In these applications, MTS offers user-friendly test systems engineered for the highly reliable, repeatable monotonic tests required to achieve control over product quality and establish scalable, standards-compliant test procedures.



#### **PROSTHETIC DEVICE TESTING**

Under intense pressure to introduce prostheses that optimize durability, true-to-life feel and overall functionality, manufacturers must precisely simulate the real-world static and dynamic forces these devices experience in the field. MTS offers complete solutions for lower limb prosthetics manufacturers. With our Bionix test systems, you can recreate rocking motions as well as static load tests for the toe and heel, gaining deeper insight into performance earlier in development and getting to market faster with designs that maximize durability and mobility.

## Testing solutions for orthopaedic implants and devices

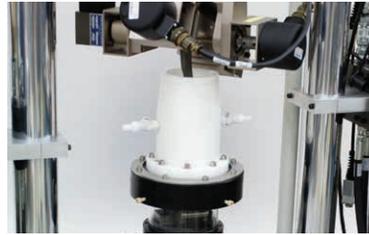
Around the world, orthopaedic researchers and product developers depend on MTS to provide test solutions that offer precision control for multiaxial test and simulation. In terms of our solution portfolio and the collective expertise of our specialists in biomechanical testing, MTS remains unrivaled. We can deliver an ideal solution for virtually any application, from complex kinematics research and trauma studies to detailed evaluations of implantable devices for the spine, knee, hip or other areas of the musculoskeletal system. When you choose MTS, you gain a partner who understands how to optimize test design and shrink time-to-market.

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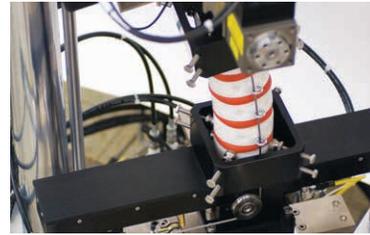
### Knee

MTS solutions enable you to conduct long-term wear, fatigue and durability studies of implantable knee devices. Replicate the full range of real-world knee forces and motions with a single-station subsystem or a multi-station wear simulator designed to deliver statistically significant sampling in a fraction of conventional test time. MTS also offers a knee kinematics system to help evaluate materials, prostheses and surgical techniques.



### Hip

Depend on MTS solutions to perform motion studies as well as wear and fatigue testing of implantable hip prostheses. Use biaxial rocking motion to simulate exaggerated walking kinematics with a single-station subsystem or a multi-station wear simulator. Or use multiple degree-of-freedom testing for long-term tests of hip replacement wear and fatigue. MTS also offers a specialized hip stem fatigue fixture for testing femoral stem components.



### Spine

Develop effective treatments for spinal injuries and disease with MTS solutions for kinematics studies and wear simulation. The Bionix® Spine Kinematics Subsystem enables you to gain extensive knowledge of the complexities of spine kinematics by applying real-world forces and motions to cadaveric spine specimens. MTS also offers both single- and multi-station spine wear simulators for highly accurate, long-term wear, fatigue and durability simulations.



Spine Wear Simulator



Hip Wear Simulator



Knee Wear Simulator

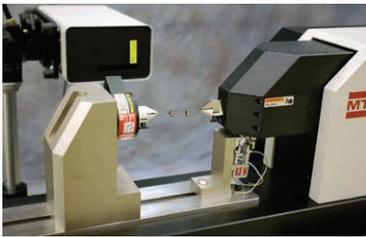
Modular and scalable Bionix Orthopaedic Subsystems integrate with Bionix Tabletop Servohydraulic Test Systems, FlexTest® Controllers and MTS application software to create complete solutions for demanding applications in biomechanical research.



## Testing solutions for biomaterials and related components

Designed to operate within the body or facilitate critical medical procedures, biomaterials and components made from these materials must be properly characterized to ensure strength and reliably comply with regulatory standards. MTS solutions enable you to perform dynamic and universal tests on bone, soft tissue, dental elements, plastics, stainless steel, titanium, ceramics, shape-memory alloy, wire and other specimens. Test specimens may also include medical device components, surgical tools and fasteners, medical packaging and consumables.

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Designed to test small specimens under low loads, the Tytron™ 250 Microforce Testing System enables precise characterization of electronics, medical devices, polymers and other materials.



The Bionix EM Torsion test system integrates an electromechanical load frame, advanced digital controls and powerful application software to test components and tools subject to torque loading.

### Biomaterials and implantable device components

MTS solutions help you generate reliable test data for product developers and regulatory organizations with speed and confidence. Designed to test small specimens under low loads, MTS microforce test systems are ideal for soft tissue and other tissue-engineering applications. Our servohydraulic test systems determine dynamic properties of materials and components through fatigue life and fracture growth studies as well as tension, bending and compression testing.



MTS Criterion® Universal Test Systems leverage decades of MTS mechanical testing expertise, technology leadership and unmatched global support to address the monotonic testing demands of a diverse spectrum of users, ranging from the pioneering researcher to the high-volume manufacturer.

The compact Bionix Tabletop Test Systems are ideally suited for a wide range of biomaterial and biomechanical test applications. These systems, coupled with Bionix subsystems and accessories, enable researchers to characterize biomaterials and medical components through performance, durability, and fatigue testing.

MTS Acumen® Electrodynamic Test Systems deliver the capabilities medical device developers and manufacturers need to perform high-fidelity dynamic and static tests that are vital to improving the efficiency, reliability and performance of biomaterials, devices and components.

### Quality assurance and control

Acquire meaningful, high-quality test data about a wide variety of tools, hardware and consumables with MTS solutions for quality assurance and control. Bionix electromechanical testing systems enable universal testing for cosmetic implant materials, joint replacement compounds, soft tissue materials, medical tubing, tape and sutures. Our electromechanical torsion test systems are ideal for orthopaedic bone screws, constructs and tools, as well as tubing, catheters, torsion springs and lead wires. MTS also offers specialized systems for testing hypodermic and surgical needles, and hip replacement hammers.

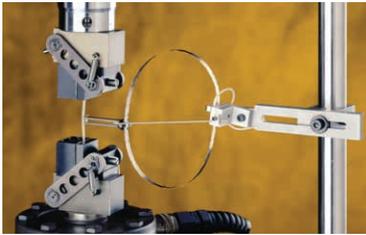


## Complete solutions for biomedical testing

Biomedical researchers and developers have rapidly evolving needs. To make sure our biomedical test systems serve as viable long-term platforms in your laboratory, MTS provides everything you need to extend the capabilities of your current system, adapt to new test requirements and protect your investment.



Bionix accessories includes affordable grips, fixtures, platens and baths for a diverse range of biomedical specimens.



The MTS Model 632.32 Biomedical Extensometer enables highly accurate measurements of strain on soft tissue specimens with minimal contact force effects.

### Extensive accessories

Accessories specifically designed for biomedical testing make it convenient to configure the best system for any test application.

- » Grips, fixtures and compression platens. These accessories are engineered from the highest-quality materials to deliver years of accurate and efficient monotonic testing and help labs engage a greater variety of specimens and better meet the requirements of specific tests.
- » Extensometers. MTS extensometers offer unmatched quality and accuracy. We also offer specialized extensometers for soft tissue specimens, immersible extensometers for fluid baths, and high-resolution video and laser extensometers for non-contact applications.
- » Fluid baths. The Bionix EnviroBath facilitates efficient, accurate mechanical testing of biomedical specimens in fluids heated to body temperatures. It is available in three volume configurations for testing in temperature-controlled saline or protein-based fluids.

### Proven application software

Versatile, easy-to-use MTS application software ensures operators can design and execute tests, as well as report results with speed and accuracy. Compatible with all MTS load frames, these applications can be configured to perform tests that meet ASTM, ISO and other specifications.

- » MTS TestSuite™ TW software delivers powerful test design and execution capabilities plus advanced features for data analysis and reporting.
- » MTS TestSuite Multipurpose Testing Software includes packages with all-inclusive modules for low-cycle, high-cycle and advanced low-cycle fatigue testing.

### Service and support

The MTS global team of service, support and consulting professionals is the largest and most experienced of its kind. We offer complete lifecycle management services for all your biomedical testing systems, enabling you to achieve maximum productivity and uptime, as well as develop and deploy new test programs rapidly. Our complete service offering includes:

- » Professional services and consulting
- » Maintenance services and spare parts
- » Accessories and upgrades
- » Lifetime system protection

## Transform your lab

Contact MTS today to learn how our deep application expertise and extensive portfolio of biomedical testing solutions can help your lab increase productivity, deliver high-quality results and meet aggressive schedules for research and product development.



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