



MTS Bionix® Tabletop Test Systems

Flexible, easy-to-use servohydraulic test systems feature Model 370.02 load frames in axial and axial/torsional configurations for characterizing biomaterials and medical components

be certain.

Versatile Performance, Compact Design

Complete solutions designed for biomedical testing

Biomedical researchers and manufacturers rely on innovative biomaterials and components to help patients around the world achieve greater mobility and a higher quality of life. Before they are even used in clinical situations, these materials and components require rigorous testing to validate both performance and durability. Mechanical testing is also essential for ensuring compliance with industry and regulatory standards.

MTS Bionix® tabletop test systems are engineered to meet this need. These compact servohydraulic systems are particularly suited to evaluating the dynamic properties of an extensive range of biomedical materials and components. Highly versatile and easy to operate, Bionix tabletop test systems offer everything required to perform a full array of mechanical tests for biomedical applications, including highly stiff load frames, precise digital controls, proven software and a wide selection of grips, fixtures and extensometers.

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Common Applications

BIOMATERIAL CHARACTERIZATION

- » Yield and ultimate strength
- » Creep and viscoelastic characteristics
- » Fatigue characteristics
- » Fracture toughness and fracture mechanics
- » Modulus of elasticity
- » Poisson's ratio
- » Wear characteristics
- » Coefficient of thermal expansion
- » Response characteristics

BIOMECHANICAL COMPONENT TESTING

- » Fatigue certification studies
- » Bone, joint and soft tissue studies
- » Implantable orthopaedic device studies
- » External prostheses studies
- » In vitro biomaterials studies

SIMULATION OF BIOLOGICAL FORCES

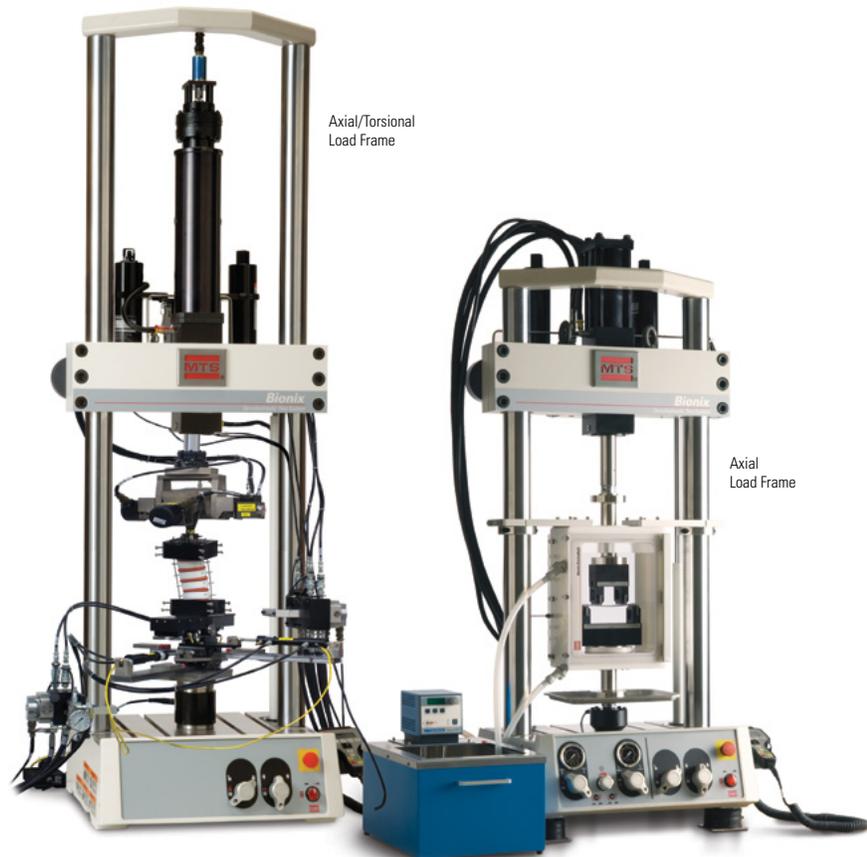
- » Kinematic studies of the knee joint
- » Wear studies of hip and knee implant materials
- » Biaxial spine studies
- » Upper body joint studies
- » Dental wear simulation
- » Biaxial fatigue of orthopaedic implants

Axial/Torsional

The axial/torsional configuration of the Bionix tabletop system enables biaxial testing, controlling torsional moments up to $\pm 250 \text{ N}\cdot\text{m}$ ($\pm 2200 \text{ lbf}\cdot\text{in}$) and total rotations of 270° . It is excellent for testing the durability and wear properties of components such as knee, hip and spine implants. When paired with specialized subsystems and accessories, it is capable of performing both simple and complex kinematics studies of skeletal tissue and orthopaedic constructs.

Axial

The axial configuration of the Bionix tabletop test system can be used to perform accurate and repeatable fatigue life and fracture growth studies, as well as tension, bending and compression tests of biomaterials. It runs tests up to $\pm 25 \text{ kN}$ (5.5 kip) with standard displacements of $\pm 50 \text{ mm}$ ($\pm 2 \text{ in.}$), and can easily be configured for monotonic or fatigue testing.



Engineered for Performance

Advanced features ensure efficiency, safety and convenience

Bionix tabletop test systems deliver the high-performance features and functions that researchers and device manufacturers need to ensure accurate results as well as efficient, safe operation.

Highly stiff load frames

Bionix tabletop systems integrate Model 370.02 load frames. Combining stiff and precision-machined columns in a cylinder-centric design, these load frames provide superior rigidity, tight alignment and exceptional ease of maintenance. Fatigue-rated MTS actuators incorporated directly into the cross-beam ensure unsurpassed reliability for years of accurate testing.

Piloted end caps

Precision-machined connections between the actuator cylinder and end-caps guarantee precise, consistent alignment over the life of the system, improving the reliability of the actuator and eliminating the need for realignment after periodic maintenance.

Innovative ergonomics

Bionix tabletop systems provide a user-friendly testing environment that emphasizes operational safety and simplifies test setup. This ergonomic approach enables operators to perform more tests safely and reliably with fewer damaged or misaligned specimens. On-frame controls keep operators focused on the test space during setup. Conveniently located to eliminate awkward bending and reaching, these controls also feature easy-to-turn handles and intuitive labeling.

Exceptional safety

Bionix tabletop systems deliver a level of safety that exceeds the guidelines of CE and other organizations. Powered crosshead positioning provides tight control of lifting and lowering for precise and easy test space configuration. These systems also restrict the actuator's speed

as it moves into test position, preventing unexpected motion that could cause damage to the specimen, the test system or the operator. In addition, MTS grips provide positive specimen gripping ensuring specimens are attached securely and will not slip during tests.

Highly efficient workspace

To ensure workspace accessibility and convenience, Bionix tabletop test systems incorporate a load frame stand with an integrated T-slot table and channels to contain spilled fluids. A compact system handset clearly displays test status, and precision controls allow fine actuator positioning.



Integrated Solutions

Configurable for a wide range of biomedical applications

MTS offers the components and accessories biomedical researchers and manufacturers need to conduct biomedical testing accurately and efficiently in accordance with worldwide standards.

Hydraulic power units

MTS SilentFlo™ hydraulic power units (HPUs) power Bionix tabletop test systems with superior flexibility and cost-efficiency. They are engineered to handle continuous-duty servohydraulic applications, and perform reliably, year after year. With their quiet, clean and compact design, MTS SilentFlo HPUs can be placed directly on the test lab floor, eliminating the expenses associated with managing a separate pump room and transporting hydraulic fluid across the test facility.

Powerful software

MTS TestSuite™ Multipurpose Testing Software provides a flexible and productive environment for testing biomaterials and biomedical components. Within this environment, you can efficiently create, run, report and conduct analysis across the test lab. Available applications, modules and options are designed to adapt to your lab's evolving needs, giving test professionals the power to boost both efficiency and productivity. You can easily test to industry standards – or pursue your own interpretation of a standard – using customizable, plug-and-play modules.

The software also captures setup data and test results, so you can quickly repeat tests. Data can also be exported to stand-alone MTS TestSuite analysis packages or a Reporter Add-in for Microsoft Excel.

Controls

Versatile MTS FlexTest® digital controllers deliver the flexibility to address a wide range of biomedical testing applications. They provide the high-speed closed-loop control, data acquisition, function generation and transducer conditioning required for reliable multi-channel, multi-station testing. FlexTest controllers also offer superior scalability, so you can use a single controller to manage multiple load frames in the lab.

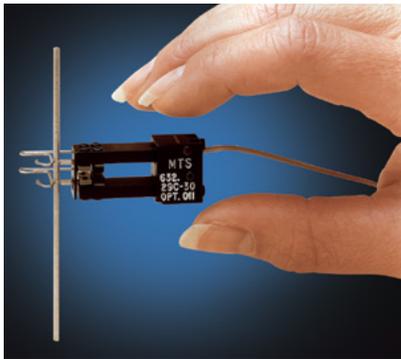
Load cells

Additional load cells for Bionix tabletop test systems are available with force ratings down to 5 N (1 lbf). Load cells with a lower force rating can typically be attached directly to the standard load cell.



Grips and fixtures

MTS augments Bionix tabletop test systems with an extensive family of durable accessories, including grips and fixtures specifically designed to perform mechanical testing on biomaterials, medical device components, medical packaging and consumables. Made from high-quality stainless steel, titanium and aluminum, these grips and fixtures ensure precise, efficient and accurate testing.



Extensometers

MTS offers an extensive and comprehensive line of extensometers, including models that operate precisely for strain measurement, soft tissue strain measurement and high elongation studies. Like all MTS extensometers, extensometers designed for biomedical applications provide superior performance in linearity, repeatability, hysteresis, low activation force and ease of use. For extremely delicate or submerged specimens, MTS also offers highly accurate noncontacting video



extensometers that use traditional edge-to-edge or more flexible point-to-point technology. To learn how extensometers can optimize your lab's testing program please contact your MTS Sales Representative.

Lab carts and table

Optional lab carts and table offer rigid support and stability of the load frame and controller, increasing the test system's overall portability.

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

Environmental simulation baths

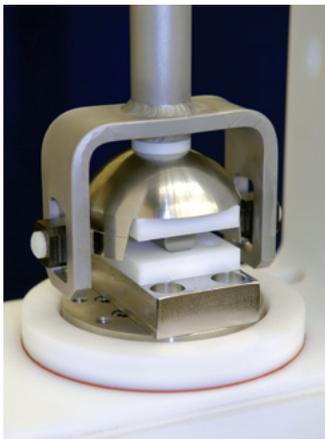
Testing biomaterials and constructs in realistic conditions is crucial to delivering statistically significant wear and performance data. Bionix accessories include the Bionix EnviroBath for testing in environments heated to body temperature. These accessories also include optimized fixtures and extensometers which can be safely deployed in saline solutions providing biomedical researchers years of reliable and accurate testing.

- » Saline bath or bovine serum (37° C/98.6° F)
- » Immersible strain measurement
- » Axial/torsional testing
- » Axial testing
- » Thin film/flat specimen testing
- » Catheter testing



Extensive Applications

Bionix® tabletop test systems can be configured to perform a diverse range of static and dynamic testing for biomedical materials and components, enabling device manufacturers and researchers to generate and analyze data for many applications using a single, powerful system.



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Biomaterials testing

Biomedical manufacturers depend on the latest biomaterials and composites to improve performance and longevity of their products. When fitted with accessories, the Bionix Tabletop test systems can perform a variety of testing ranging from tensile to fatigue tests enabling test engineers and researchers to more precisely characterize biomaterials.

- » Axial-torsional testing
- » Fine wire testing

Orthopaedic mechanics

Validating product design and proving orthopaedic devices involves complex kinematics research, trauma studies and detailed evaluations of implantable devices for spine, knee, hip and other areas of the musculoskeletal system. MTS offers advanced subsystems to perform wear simulation and fatigue testing for such research.

- » Femoral fatigue testing
- » Wear simulation
- » Kinematics testing

Tissue/bone mechanics

Bionix tabletop test systems incorporate precision extensometry and accurate strain measurement to deliver high-fidelity low-force testing of tissue and biomaterials for a wide range of test applications.

- » Strain measurement
- » Soft tissue strain
- » High-elongation studies

For more information on these applications and more, please contact your MTS Sales Representative.

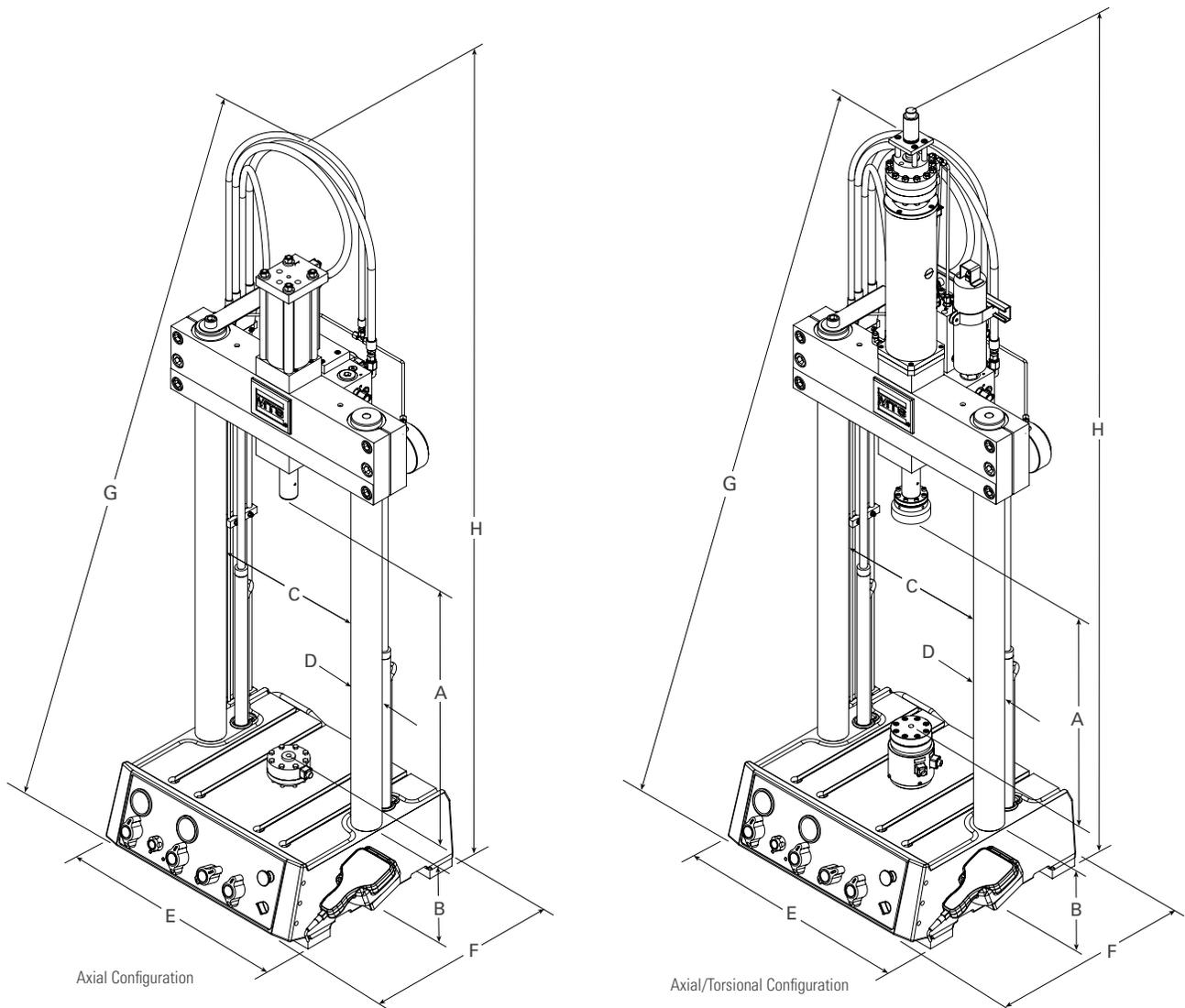
Expert Service and Support

Comprehensive assistance ensures smooth, efficient operation

MTS fields one of the largest, most experienced service, support and consulting staff of any testing solution provider, to ensure your lab is quickly maximizing the utility of your system.

Trained technicians perform installation and operational checkout at your site and conduct informal, one-one-one training on operation and basic maintenance procedures. A software technical support and maintenance contract for your controller software is available with each system. A system warranty is included; with extended warranty contracts also available.

Depending on the plan you select, field service may include calibration, routine maintenance, extended system warranty service and priority technical support. MTS also provides extensive, regularly scheduled training programs conducted at MTS or your facility to ensure operators are familiar with all the capabilities of the hardware and software. To meet unique testing objectives, MTS testing expertise can help you develop custom test templates. In addition, our global service team also offers complete life cycle management to maximize the return on your technology investment and help you address new test requirements as cost-effectively as possible.



Load Frame Specifications

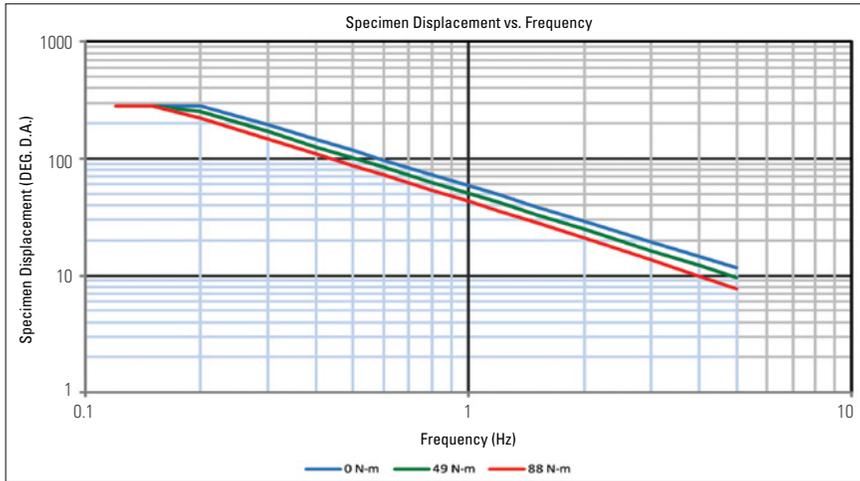
Bionix tabletop test systems incorporate Model 370.02 load frames that are available in standard or extended heights.

Load Frame Specifications	Diagram Detail	Units	MODEL	
			370.02 Axial	370.02 Axial / Torsional
Force capacity (rated dynamic force)		kN (kip)	25 (5.5)	25 kN / 250 N-m (5.5 kip / 2200 lbf-in)
Available actuator ratings ₁		kN (kip)	15, 25 (3.3, 5.5)	15 kN / 150 N-m 25 kN / 250 N-m (3.3 kip / 1300 lbf-in) (5.5 kip / 2200 lbf-in)
Actuator dynamic stroke ₁		mm (in)	100, 150 (4, 6)	100 mm / 270° 150 mm / 270° (4, 6)
Minimum vertical test space – standard height ₂	A	mm (in)	144 (5.7)	30 (1.2)
Maximum vertical test space – standard height ₃	A	mm (in)	827 (32.6)	714 (28.1)
Minimum vertical test space – extended height ₂	A	mm (in)	398 (15.7)	284 (11.2)
Maximum vertical test space – extended height ₃	A	mm (in)	1335 (52.6)	1222 (48.1)
Working height ₄	B	mm (in)	230 ₈ (9.1)	230 ₈ (9.1)
Column spacing (test space width)	C	mm (in)	460 (18.1)	460 (18.1)
Column diameter	D	mm (in)	76.2 (3)	76.2 (3)
Base width	E	mm (in)	622 (24.5)	622 (24.5)
Base depth	F	mm (in)	577 (22.7)	577 (22.7)
Diagonal clearance – standard height ₅	G	mm (in)	1750 ₈ (68.9)	1750 ₈ (68.9)
Diagonal clearance – extended height ₅	G	mm (in)	2250 ₈ (88.6)	2250 ₈ (88.6)
Overall height – standard height ₆	H	mm (in)	1989 ₈ (78.3)	2185 _{8,9} (86)
Overall height – extended height ₆	H	mm (in)	2624 ₈ (103.3)	2693 _{8,9} (106)
Stiffness ₇		N/m (lbf/in)	345 x 10 ⁶ (1.95 x 10 ⁶)	345 x 10 ⁶ (1.95 x 10 ⁶)
Weight		kg (lb)	248 (547)	322 (710)

1. All load frame specifications listed in this chart are based upon the actuator ratings and dynamic stroke values indicated by bold text.
2. Minimum Vertical Test Space: Span between load cell and piston rod face when fully retracted at beginning of the dynamic stroke; crosshead down, no alignment fixture.
3. Maximum Vertical Test Space: Span between load cell and piston rod face when fully retracted at beginning of the dynamic stroke; crosshead up, no alignment fixture.
4. Working Height: Tabletop to top of T-slot table; includes standard FabCell isolation.
5. Diagonal Clearance: Hose height to tip of foot with FabCell; crosshead down.
6. Overall Height: From tabletop surface, including standard FabCell isolation, to top of the hoses or highest point on actuator; crosshead fully raised.
7. Measured at crosshead height of 600 mm (23.6 in).
8. For load frames with optional pneumatic/ elastomeric vibration isolation mounts, add 37 mm (1.44 in) to dimensions B, G, and H.
9. For axial/torsional frames, add 152 mm (6 in) to dimension H, for 1.50 mm (6 in) stroke actuator.

Tabletop System Performance Curves*

The graphs on the following pages illustrate the dynamic performance characteristics of a sampling of configurations available for MTS Bionix tabletop systems (370.02). Actual performance will depend upon the specimen under test and the particular grips, fixtures and components employed by your system. MTS can assist you in configuring a system to meet your specific test requirements.



ROTARY ACTUATOR:

Stroke: +/- 135 degrees

Torque rating: +/- 100 N-m (885 in-lbf)

HYDRAULIC POWER UNIT:

Pressure: 14 MPa (2000 psi)**

Flow: 15 l/min (4 gpm)

LOAD FRAME MODEL: 370.02

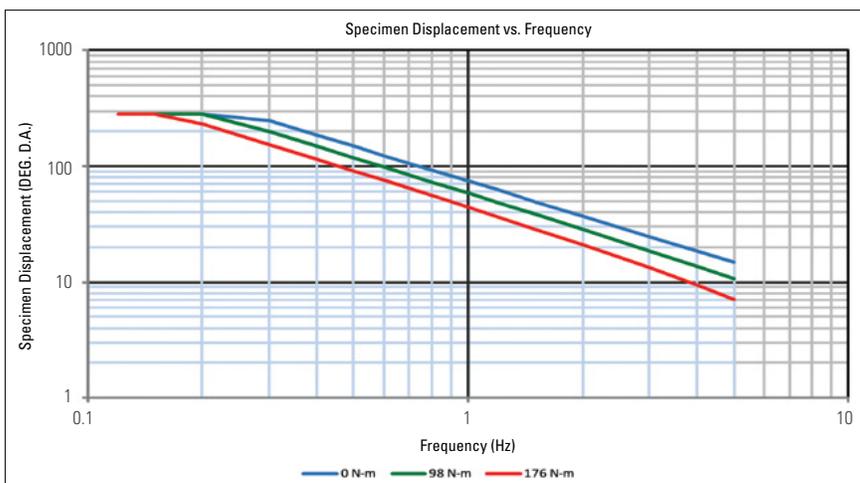
SERVOVALVE(S) FLOW RATING: 4 l/min (1 gpm)

MAXIMUM OPEN LOOP VELOCITY: (150 deg/sec)

TIME TO REACH MAXIMUM VELOCITY: <.01 sec

ANGLE TO REACH MAXIMUM ROTATIONAL SPEED: <2 deg

**Hydraulic pressure to the rotary actuator is limited to approximately 5.7 MPa (825 psi)



ROTARY ACTUATOR:

Stroke: +/- 135 degrees

Torque rating: +/- 200 N-m (1770 in-lbf)

HYDRAULIC POWER UNIT:

Pressure: 14 MPa (2000 psi)**

Flow: 15 l/min (4 gpm)

LOAD FRAME MODEL: 370.02

SERVOVALVE(S) FLOW RATING: 4 l/min (1 gpm)

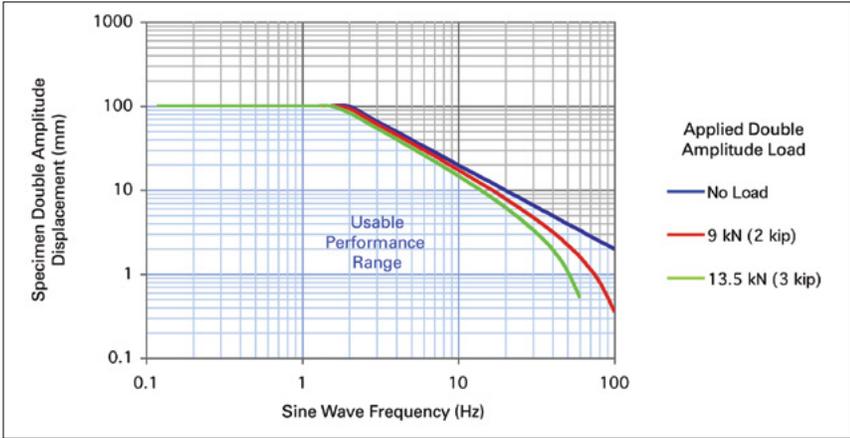
MAXIMUM OPEN LOOP VELOCITY: (210 deg/sec)

TIME TO REACH MAXIMUM VELOCITY: <.01 sec

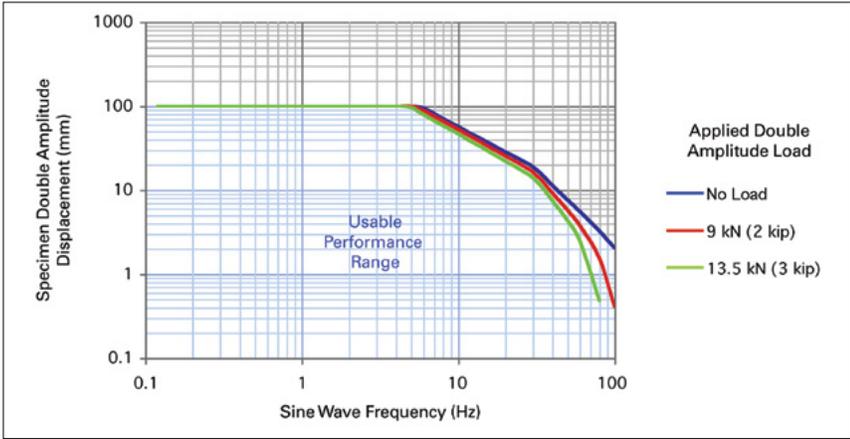
ANGLE TO REACH MAXIMUM ROTATIONAL SPEED: <2 deg

**Hydraulic pressure to the rotary actuator is limited to approximately 11.4 MPa (1650 psi)

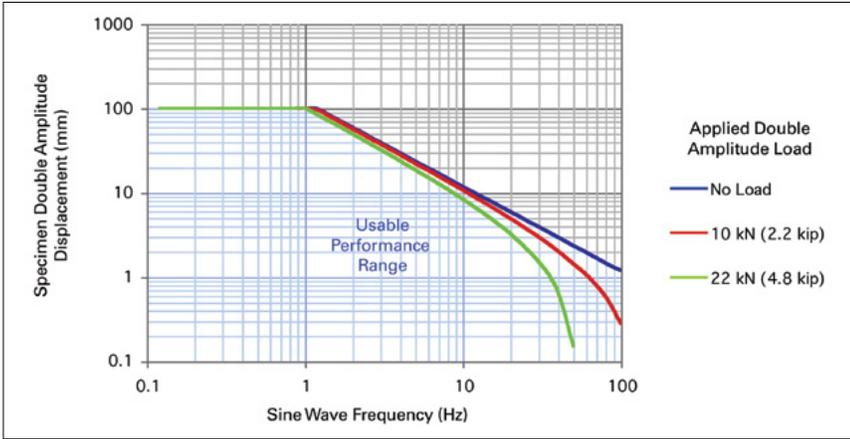
* Systems profiled feature accumulation, pressure and return hoses selected to match the load frame system configurations. Hydraulic power supplies support 21 MPa (3000 psi) pressure and have been selected to not limit performance provided by other components. The performance curves depicted represent a mathematical prediction of system performance using appropriately-sized hydraulic wedge grips holding a linear spring specimen. Your MTS sales representative can discuss these and other available performance options.



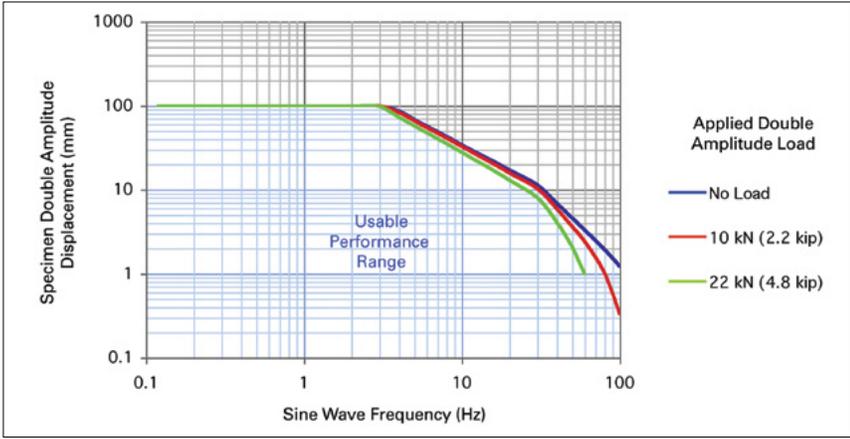
ACTUATOR STATIC FORCE: 15 kN (3.3 kip)
 ACTUATOR DYNAMIC STROKE: 100 mm (4 in)
 LOAD FRAME MODEL: 370.02
 SERVOVALVE(S) FLOW RATING: 19 lpm (5 gpm)



ACTUATOR STATIC FORCE: 15 kN (3.3 kip)
 ACTUATOR DYNAMIC STROKE: 100 mm (4 in)
 LOAD FRAME MODEL: 370.02
 SERVOVALVE(S) FLOW RATING: 57 lpm (15 gpm)



ACTUATOR STATIC FORCE: 25 kN (5.5 kip)
 ACTUATOR DYNAMIC STROKE: 100 mm (4 in)
 LOAD FRAME MODEL: 370.02
 SERVOVALVE(S) FLOW RATING: 19 lpm (5 gpm)



ACTUATOR STATIC FORCE: 25 kN (5.5 kip)
 ACTUATOR DYNAMIC STROKE: 100 mm (4 in)
 LOAD FRAME MODEL: 370.02
 SERVOVALVE(S) FLOW RATING: 57 lpm (15 gpm)

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