

MTS 810 & 858 Material Testing Systems



Versatile, multipurpose
servohydraulic testing systems
for static and dynamic tests



MTS 810 & 858 Test Systems

Meeting the Full Spectrum of Testing Needs

Superior Testing and Global Support for all Environments

Test engineers worldwide rely on MTS Material Testing Systems and unrivaled global support to achieve outstanding results for both static and dynamic material and component testing. Renowned for their unmatched accuracy, flexibility, high performance, and innovative standard features, these systems provide for years of superior testing for all types of test and lab environments. With a large selection of fully fatigue-rated MTS load units, control technology and accessories to choose from, tightly integrated systems can be easily configured to meet an extremely wide array of test requirements.

Unmatched Accuracy

- ▶ An integral actuator design, stiff, low-mass crossheads, and special force transducers deliver superior axial and lateral stiffness.
- ▶ Precision-machined columns and actuator rods, and laser-guided factory alignment ensure unprecedented alignment accuracy.
- ▶ Highly accurate MTS load cells exhibit low hysteresis and long-term stability.
- ▶ Linear Variable Differential Transducers mounted co-axially with actuators deliver precise actuator position measurement.

Flexibility

- ▶ MTS load units perform both highly accurate monotonic tests and dynamic test applications.
- ▶ Flexible test spaces, hydraulic lifts and locks, and conveniently placed controls facilitate easy crosshead positioning.
- ▶ MTS servovalves are available in a wide variety of force and flow capacities.
- ▶ 810 systems can accommodate up to two servovalves - port shut-offs allow operation of one or both valves.
- ▶ MTS load units require no special mounting or foundation.

High Performance

- ▶ Lightweight crossheads and stiff components reduce load frame deflections and increase performance envelopes.
- ▶ Extremely low friction actuators and high response servovalves ensure superior test control.
- ▶ Close-coupled accumulators enable high frequency servovalve response, resulting in low distortion and reduced line noise.
- ▶ Hydraulic service manifolds provide smooth ramping of system pressure to ensure precise control during system start-up.

Innovative Features

- ▶ Five-port servovalves ensure that pressure changes – low-to-high, high-to-low, and rapid shutoff - are made under system control to guarantee smooth transitions.
- ▶ Local hydraulic station control integral with actuator-mounted manifold provides unmatched convenience and First-on/Last-off management of hydraulic power.
- ▶ Off-Low-Slow-High pressure control provides true bumpless start and protects specimens.
- ▶ Force-limited stroke control for specimen insertion protects both operators and specimens.

MTS Proven Control Solutions

FlexTest SE & GT Digital servo-controllers from MTS make up a powerful array of reliable, flexible and easy-to-use controllers designed to address the full spectrum of material and component testing needs. These systems employ robust VME-based MTS hardware and provide the pricing flexibility to accommodate a broad range of budgets.

An array of MTS material testing software perform test definition, test execution, and report generation for virtually all types of material tests, including tension, bending, and compression testing, fatigue life studies, and fracture growth studies. MTS software programs include:

- ▶ MTS's MultiPurpose TestWare® for flexibility to meet the demands of quickly changing test requirements in your standard and non-standard testing applications.
- ▶ MTS TestWorks® to perform all of your tensile, flex, compression and peel/tear tests, we well as complicated non-standard tests.
- ▶ MTS Fatigue and Fracture Testing Software for general-purpose and material-specific testing applications.

Material Testing Continuum

Force Range	5 kN (1 kip)	25 kN (5.5 kip)	100 kN (22 kip)	250 kN (55 kip)	500 kN (110 kip)
Range of Available Performance	Moderate		High	Very High	
Material Strength	Plastics	Elastomers	Aluminum	Composites	Steel Super Alloys
Specimen Size	Subsized		Standard	Medium	Large
Test Type	Tension • Bend • Durability • High Cycle Fatigue • Low Cycle Fatigue Compression • Creep • Fatigue Crack Growth • Fracture Toughness				

858

810

Versatile, Configurable 810

The 810 Material Testing System delivers a broad array of testing capabilities for both low and high force static and dynamic testing. By selecting from a variety of force capacities, servovalve flow ratings, pump capacities, software, and accessories, the floor-standing 810 system can easily be configured to meet your specific material or component testing needs. The versatile 810 system features:

- ▶ Force ranges from 25 kN (5.5 kip) to 500 kN (110 kip)
- ▶ A wide performance range - see Performance Curves on pages 20-23
- ▶ The ability to test materials ranging in strength from plastics to aluminum, composites and steel
- ▶ A large test space to accommodate standard, medium and large size specimens, grips, fixtures and environmental subsystem
- ▶ The capability to perform a wide variety of test types from tensile to high cycle fatigue, fracture mechanics, and durability of components



Full Featured, Compact 858

The 858 Material Testing System is a cost-effective choice for low force static and dynamic testing applications. Designed to preserve valuable floor space, the 858 load unit can fit conveniently on an existing laboratory bench, or sit on its own portable, custom cart. While extremely compact, the 858 system provides a broad range of test enhancing features, including:

- ▶ Force ranges from 5 kN (1.1 kip) to 25 kN (5.5 kip)
- ▶ A moderate performance range - see Performance Curves on pages 24-27
- ▶ The ability to test lower strength materials ranging from plastics to aluminum
- ▶ Accommodation of subsized to standard specimens
- ▶ The capability to perform tension, compression, bend and fatigue tests; specialized tests for biomedical and biomechanical testing; and durability testing on small components
- ▶ Wide column spacing to accommodate larger fixtures, environmental chambers and furnaces



The Flexibility to Perform

A Full Spectrum of Material or Component Tests

Fatigue Testing

MTS FlexTest material testing systems provide high stiffness, precision-aligned load frames with integral actuators. When the FlexTest system is coupled with MTS patented grips for consistent loading, and alignment fixtures for minimizing specimen bending strain, the system is ideally suited for fatigue testing.

Test Examples

Constant Amplitude, Variable Amplitude, Block Loading, Low Cycle Fatigue, and High Cycle Fatigue

Standards

ASTM E606, ASTM E466, ISO 1099, ISO 12106

Typical Configuration

- ▶ FlexTest 810 Material Test System
- ▶ 646 or 647 Multi-Purpose Axial Wedge Grips
- ▶ 634.11/31 Axial Extensometer
- ▶ Basic or MultiPurpose TestWare® testing software
- ▶ Cyclic Fatigue TestWare® testing software



Environmental Testing

Integrated solutions with MTS designed grips, fixtures, chambers and extensometers fulfill your testing requirements over a wide range of temperatures. This integrated solution gives assurance that you can put your focus on successful results.

Test Examples

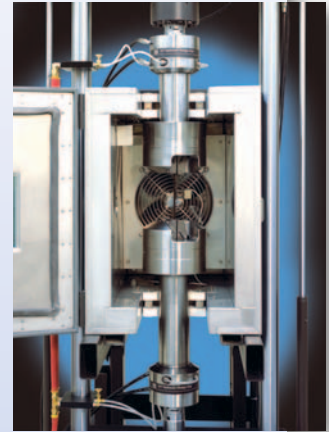
Fatigue Testing of Composite materials

Standards

ASTM D3479, D6115

Typical Configuration

- ▶ FlexTest 810 Material Testing System
- ▶ MTS Model 651 Chamber
- ▶ MTS Model 647 All Temp Grips
- ▶ MultiPurpose Testware or Cyclic Fatigue TestWare
- ▶ Adaptive Compensation



Monotonic Testing

Your monotonic testing needs can be performed with precision and ease on a FlexTest material testing system equipped with the industry leading TestWorks Application Software. TestWorks provides powerful capabilities with simplified operation and complete reporting of your test results.

Test Examples

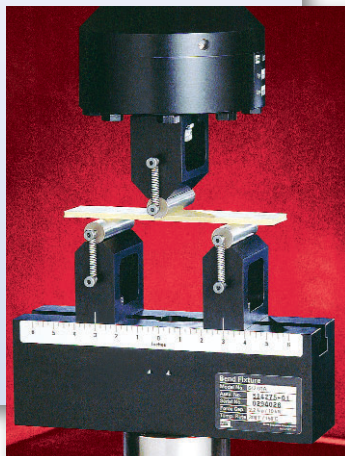
Tensile, Compression, Bend, Stress Relaxation

Standards

ASTM E8, E9, E21, ISO 6892

Typical Configuration

- ▶ FlexTest 810 or 858 Material Testing System
- ▶ TestWorks Application Software or MultiPurpose Testware
- ▶ Variety of Mechanically and Hydraulically Actuated Grips
- ▶ Fixtures
- ▶ Extensometers



Fracture Testing

MTS provides the most complete Linear Elastic and Elastic-Plastic Fracture Toughness solutions. In addition to K_{Ic} , J-Integral, and CTOD fracture criteria software, MTS provides Fatigue Crack Propagation solutions. MTS Fracture Mechanics Application software improves the accuracy of your testing while still being easy and flexible to use. Predefined test templates provide the capability of testing to various ASTM, ISO and British test standards. Run-time graphical displays allow for monitoring the tests in progress and in order to react to events as they occur.

Test Examples

Fracture Toughness, Fatigue Crack Growth, Crack Propagation, K_{Ic} , J_{Ic}

Standards

ASTM E399, E647, B645, E1820, ISO 12737, 12108, 12135

Typical Configuration

- ▶ FlexTest 810 or 858 Material Test System
- ▶ 640 grips or 642 Bend Fixture
- ▶ 632.02 and 632.03 Clip-On Displacement Gages
- ▶ Fracture Toughness or Fatigue Crack Growth Test Application Software
- ▶ Crack Length Monitor Application Software
- ▶ MultiPurpose TestWare



Component Testing

MTS material testing systems have flexible test space and a wide range of performance packed in a durable frame powered by a controller with a suite of advanced control algorithms suitable for a variety of component tests. FlexTest testing systems are software driven with MTS MultiPurpose TestWare, providing a powerful and simple process to easily run complex component tests.

Test Examples

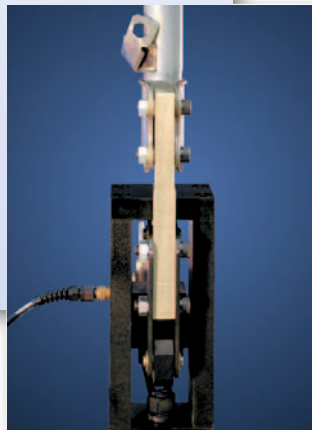
Durability, Strength and Physical Properties of Components and Assemblies

Standards

Various Industry and Corporate Standards; ASTM, ISO, FDA and DIN Standards

Typical Configuration

- ▶ FlexTest 810 or 858 Material Testing System
- ▶ MultiPurpose TestWare
- ▶ TestWorks Application Software
- ▶ Adaptive Compensation and Calculations Software
- ▶ Specialized Fixtures



Biomedical Testing

MTS 858 material testing systems are designed with many features to provide high performance at the low forces needed for biomedical testing, including very low friction actuators. These clean and powerful systems are available with a wide range of specialized grips, fixtures and environments to test biomedical materials and products.

Test Examples

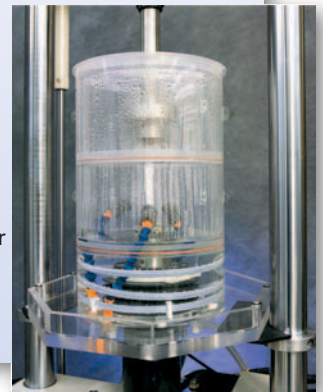
Hip Stem Fatigue, Dental Implant Wear, Bone Screw Fatigue

Standards

ASTM F1440, F2118

Typical Configuration

- ▶ 858 Material Testing System
- ▶ MTS Model 658 Bio-Environmental Chamber
- ▶ Corrosion Resistant Pull Rods and Fixtures
- ▶ MultiPurpose TestWare



High Temperature Testing

Super alloys, ceramics, and advanced materials need advanced testing equipment. MTS has industry proven grips, furnaces, and extensometers to elevate the capability of your FlexTest material testing system to meet the demands of high temperature testing.

Test Examples

Elevated Temperature Fatigue, Tensile

Standards

ASTM E8, E606, ISO 783

Typical Configuration

- ▶ FlexTest 810 Material Testing System
- ▶ MTS Model 653
- ▶ MTS Model 647.10 Grips with water-cooled wedges
- ▶ MTS Model 632.53 Extensometer
- ▶ Cyclic Fatigue Application Software



Thermal Mechanical Fatigue Testing

Thermal Mechanical Fatigue (TMF) Toolkit Test Application Software, an original toolkit created by MTS, simplifies the set up and running of TMF tests without sacrificing flexibility. With real-time plots you can monitor both thermal mechanical wave shapes and advanced properties such as strain hardening or softening as a function of cycles. The MTS Toolkit includes automated post-test analysis to assist you in creating test summaries and reports.

Standards

ASTM E606, E2368, ISO T6164

Typical Configuration

- ▶ FlexTest 810 Material Testing System
- ▶ MTS Model 646 Grips
- ▶ MTS Model 632.53 Extensometer
- ▶ Induction Heater
- ▶ Air Cooling System
- ▶ MultiPurpose TestWare with TMF Toolkit Test Application Software



Additional MTS Testing Capabilities

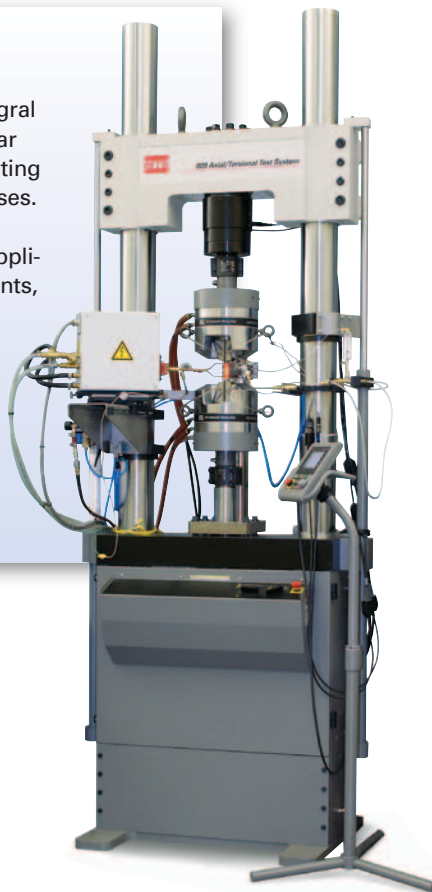
Axial Torsion Testing

MTS 809 Axial Torsion Materials Testing Systems provide extremely stiff, high natural frequency load frames with integral axial and torsional actuators. Axial Torsion loading of tubular specimens has proven to be a valuable method for investigating material response to both static and fatigue multi-axial stresses.

The MTS 858 A/T offers similar capabilities for lower force applications. These systems are ideally suited for small components, Biomedical applications, and lower strength materials.

Typical Configuration

- ▶ FlexTest 858 or 809 Axial-Torsional Material Test System
- ▶ MTS Model 646 or 647 Axial-Torsional Wedge Grips
- ▶ Two-Channel Controller
- ▶ MTS Model 632.68 or 632.80 Extensometer
- ▶ MultiPurpose TestWare

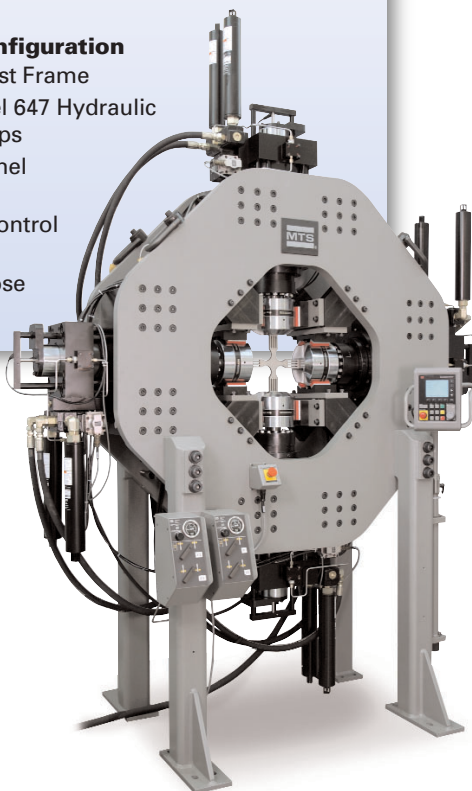


Planar Biaxial Testing

MTS capabilities include Planar Biaxial Testing Systems. These systems are utilized when it is desired to investigate true in-plane stress states of materials, or biaxial loading of design elements. System features include high load axis stiffness for low stored energy and integral actuators with high lateral stiffness to minimize buckling. Powerful features in the FlexTest control software make centroid control easy to implement.

Typical Configuration

- ▶ Bi-Axial Test Frame
- ▶ MTS Model 647 Hydraulic Wedge Grips
- ▶ Four-Channel Controller
- ▶ Centroid Control Algorithm
- ▶ MultiPurpose TestWare

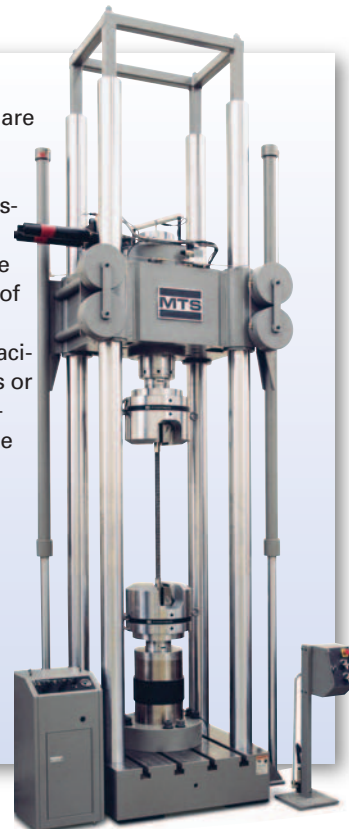


High Force Testing

MTS high force testing systems are rigid, 4-column testing units designed especially for precise application of high-force/high-displacement loads and fatigue cycles. Load frames are available to accommodate a wide variety of specimens, components or full scale test articles, and force capacities range from 100 to 3,000 tons or higher. Grips, fixtures, and transducers are available for large size specimens to complete the test system.

Typical Configuration

- ▶ MTS Model 311 High Force Load Frame (up to 3000 tons)
- ▶ MTS Model 647 Grips (up to 1200 kN)
- ▶ MultiPurpose TestWare or TestWorks



High Frequency Testing

MTS 1000 Hz high-cycle fatigue test systems provide accurate and reliable accelerated fatigue testing. The systems maintain a high waveform fidelity while running at high frequency, as well as highly accurate control made possible with an MTS high response voice coil servovalve and AdapTrac control software.

Typical Configuration

- ▶ 1000 Hz High-Cycle Fatigue Test System
- ▶ MTS Model 318.50S Load Frame
- ▶ High Performance Actuator with 25 kN, +/- 25.4 mm
- ▶ Low-mass grips and fixtures
- ▶ High-flow voice coil servovalve
- ▶ MultiPurpose TestWare with AdapTrac Software



Elastomer Testing

Elastomer test systems meet the high frequency, high precision testing requirements of automotive and material industries. The standard configuration features a frequency range of 0.01 to 1000 Hz, with +/-10 kN force and displacements of +/-20 mm. Designed for measuring dynamic properties such as K^* , phase, E^* , tan delta, energy, and damping coefficients over its wide frequency range.

Typical Configuration

- ▶ 1000 Hz High Frequency Elastomer Test System
- ▶ Specially designed Model 831.50 Load Frame (up to 10 kN)
- ▶ FlexTest GT Controller (48 kHz acquisition rate)
- ▶ MTS Model 505.07 SilentFlo Hydraulic Power Unit
- ▶ MTS Model 793.3x Elastomer Application Software



High Rate Testing

High rate systems provide robust load frames with high performance servohydraulic controls; high-speed data acquisition; and TestWorks® software to provide operator interface, test analysis and reporting. These systems provide reliable results for automotive crash worthiness testing, forging simulation and other high strain rate, or high penetration rate testing needs.

Typical Configuration

- ▶ MTS Model 819.1x Load Frame (up to 100 kN)
- ▶ High-flow voice coil servovalve
- ▶ Low Mass Grips



Components of the 810 System

Load Unit Assembly

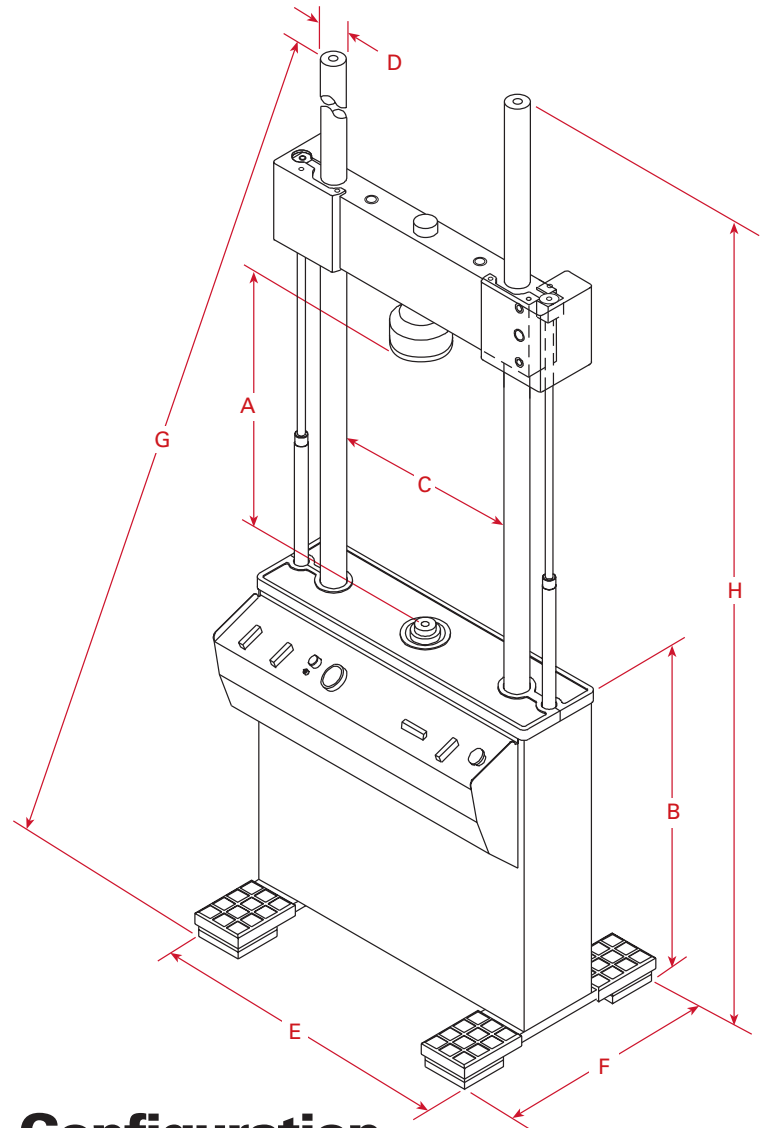
A complete load frame assembly requires the selection of the frame, actuator size, actuator rod/load cell thread, and hydraulic service manifold. The servovalve(s) and other options are selected separately.

The 810 system employs MTS Model 318 load unit assemblies that are force rated up to 500 kN. This floor mounted frame has high axial and lateral stiffness that improves test accuracy and system performance. This load frame is available in a variety of sizes and can be easily configured for many different applications. Please see Performance Curves on page 20 for more details.

Crosshead mounted load cell provides an accurate force reading for measurement and control. The displacement transducer is integral to the actuator for position measurement and control.

Other options such as crosshead mounted actuators, actuator antirotate, hydrostatic bearing actuators, and air isolator pads are available with the 318. Integral actuator design shortens the force train providing higher lateral stiffness. Low friction actuator ensures the best possible test control and resolution.

There are two hydraulic service manifold options for the 318 Load Units. The 298.11 provides OFF/ON pressure control while the 298.12 has OFF/LOW/HIGH pressure control with a controlled pressure transition to and from high pressure.



Specifications by Frame Configuration

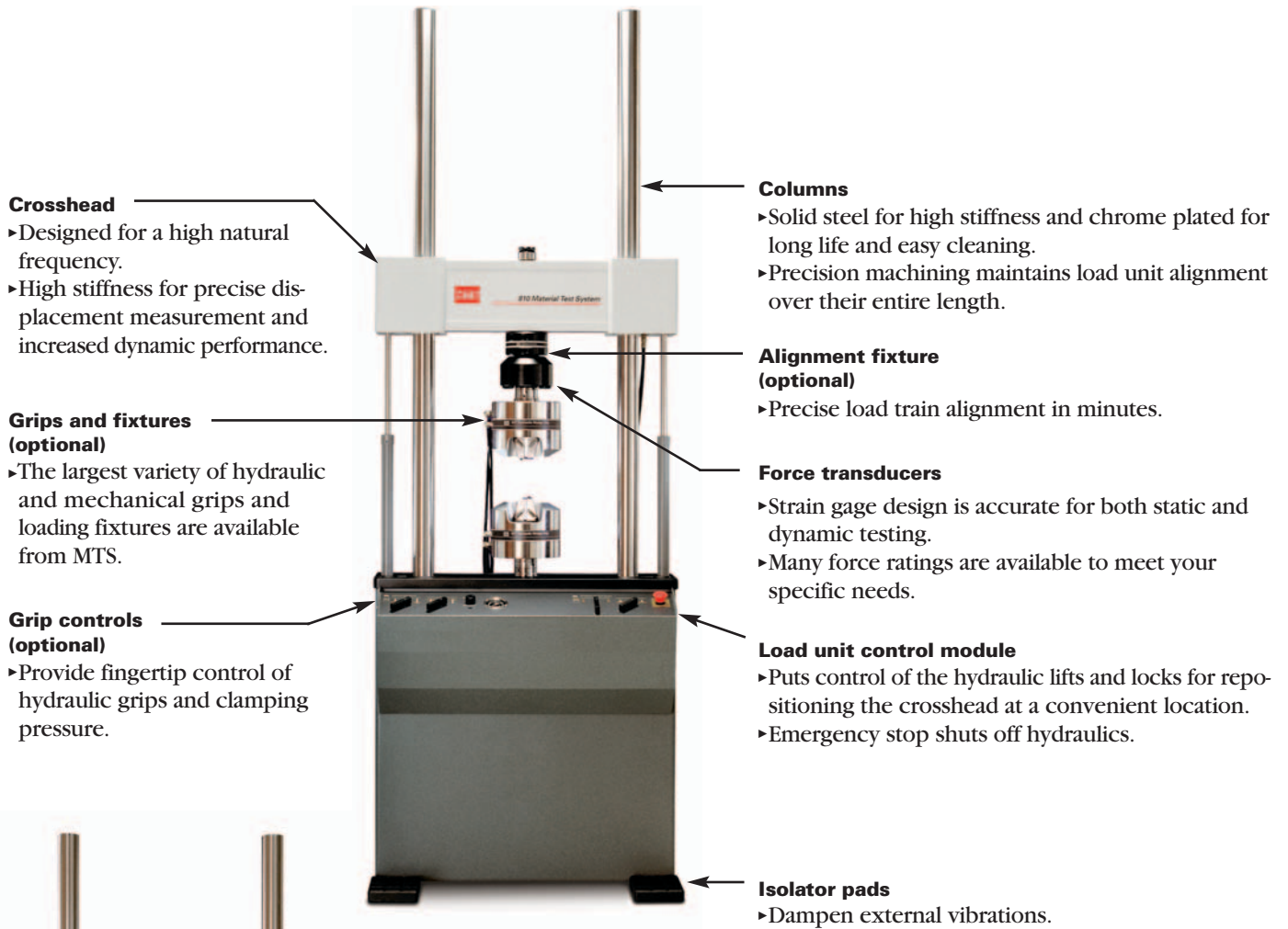
Load unit specifications

Model	318.10	318.25	318.50
Force capacity (maximum)	100 kN (22 kip)	250 kN (55 kip)	500 kN (110 kip)
Available actuator ratings	15, 25, 50, 100 kN (3.3, 5.5, 11, 22 kip)	100, 250 kN (22, 55 kip)	250, 500 kN (55, 100 kip)
Vertical test space* (A)	1308 mm (51.5 in)	1625 mm (64 in)	2108 mm (83 in)
Working height (B)	889 mm (35 in)	889 mm (35 in)	889 mm (35 in)
Column spacing (C)	533 mm (21 in)	635 mm (25 in)	762 mm (30 in)
Column diameter (D)	64 mm (2.5 in)	76 mm (3 in)	102 mm (4 in)
Base width (E)	864 mm (34 in)	1003 mm (39.5 in)	1245 mm (49 in)
Base depth (F)	610 mm (24 in)	762 mm (30 in)	914 mm (36 in)
Diagonal Clearance (G)	2718 mm (107 in)	3251 mm (128 in)	3835 mm (151 in)
Overall Height (H)	2540 mm (100 in)	3023 mm (119 in)	3581 mm (141 in)
Stiffness†	2.6 x 10 ⁸ N/m (1.5 x 10 ⁶ lb/in)	4.3 x 10 ⁸ N/m (2.4 x 10 ⁶ lb/in)	7.5 x 10 ⁸ N/m (4.3 x 10 ⁶ lb/in)
Weight	500 kg (1100 lb)	910 kg (2000 lb)	1770 kg (3900 lb)

*Test space is the maximum distance between the load cell and the actuator with the actuator fully retracted.

Optional extended height versions available, add 300 mm (12 inches) to pertinent dimensions.

†Determined at each load unit's full fatigue rating with its crosshead raised 1270 mm (50 in.) above the base plate.



Hydraulic lifts and locks

- ▶ Allow easy repositioning of the crosshead and fast crosshead locking/unlocking.

Hydraulic actuator

- ▶ Integrally mounted in the base plate to shorten the force train for increased stiffness, better side load capability, and more accurate test results.
- ▶ Available in a variety of force ratings and stroke lengths.
- ▶ Includes a co-axially mounted displacement transducer for precision displacement control and measurement.

Actuator manifold

- ▶ Provides mounting for up to two servovalves of equal or different sizes.
- ▶ Mounted on the actuator for the highest possible response and most accurate test control.
- ▶ Available with close coupled accumulators that help minimize hydraulic pressure fluctuations for improved test control and data accuracy.

Options for MTS 318 Load Unit Assemblies

- ▶ Air bag vibration isolators
- ▶ Alignment adjustment fixtures
- ▶ Extended length columns
- ▶ Actuator stroke lengths
- ▶ Test area guard
- ▶ Crosshead actuator mounting
- ▶ Hydrostatic actuator bearings
- ▶ Actuator anti-rotate
- ▶ Low force load transducers
- ▶ Low force actuator/high stiffness load unit combinations
- ▶ Actuator rod bellows

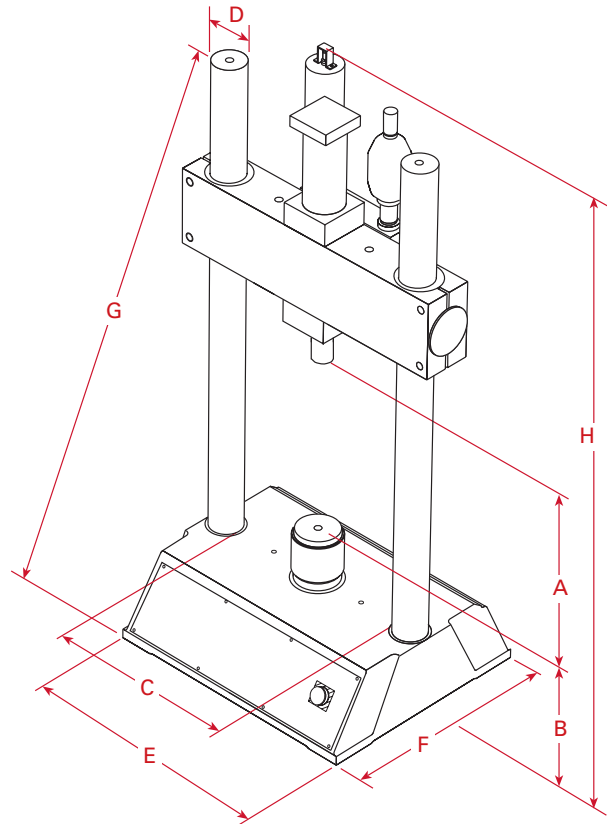
Components of the 858 System

The 858 employs a MTS Model 359 load unit that is fatigue-rated at 25 kN (5.5 kip). This freestanding load unit can be operated at frequencies up to 30 Hz without having to secure it to the lab bench or the optional cart that is available from MTS.

The 359 load unit features a generous horizontal test space between the columns, which enables easy specimen mounting. Load units with extended columns can be ordered to gain additional vertical free space.

The basic load unit configurations each use an integral crosshead-mounted linear actuator with an attached manifold. This provides close-coupled servovalves and accumulators for improved performance and reduced pressure fluctuations.

A selection of linear actuators are available to achieve a wide range of scale force data from 5 kN to 25 kN. The full-scale force is dependent on the output pressure of the particular MTS hydraulic power unit selected. Optional hydraulic lifts can be provided to facilitate repositioning of the crosshead. See Performance Curves on page 24.



Specifications By Frame Configuration

Load unit specifications

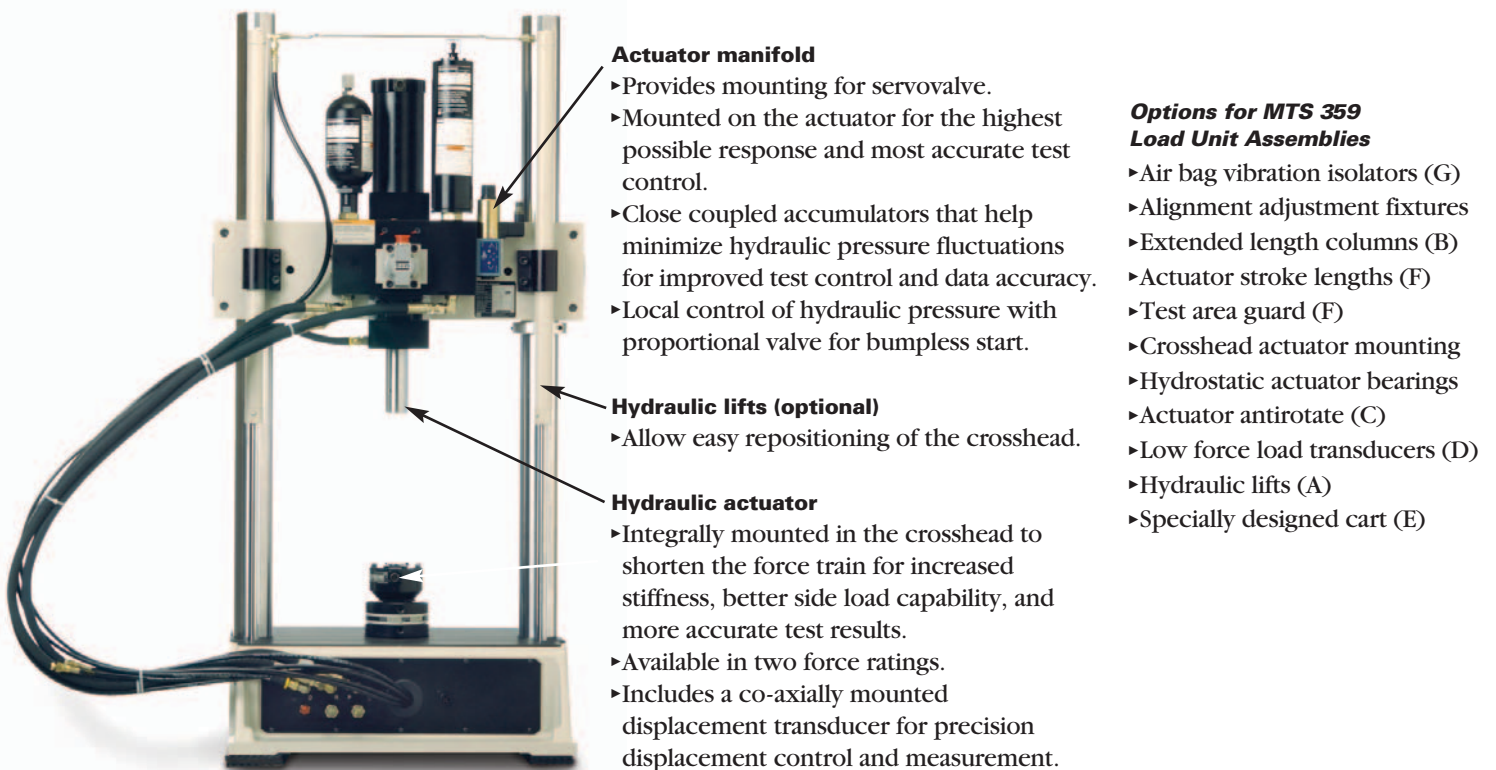
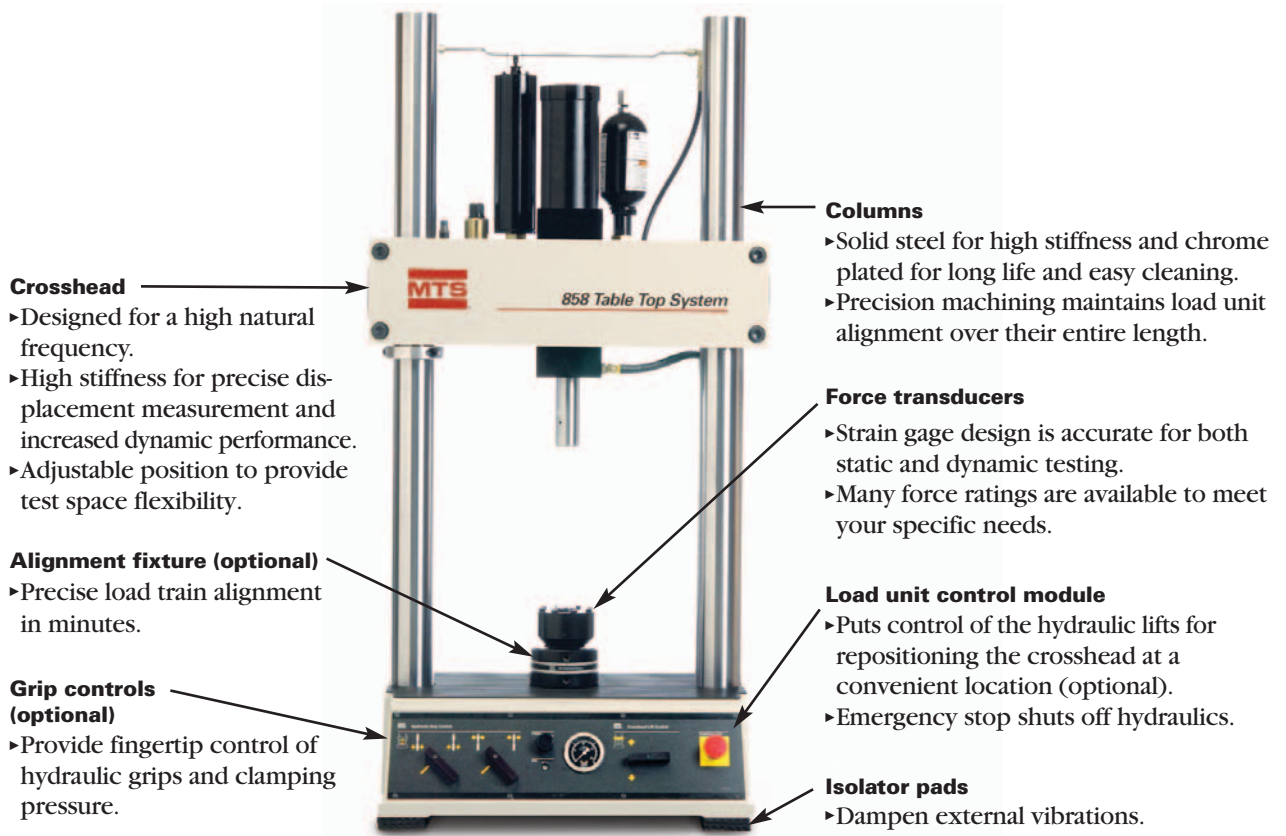
Model	359.15 Standard	359.15 Extended	359.25 Standard	359.25 Extended
Force capacity [§]	15 kN (3.3 kip)	15 kN (3.3 kip)	25 kN (5.5 kip)	25 kN (5.5 kip)
Vertical test space* (A)	789 mm (31.0 in)	1289 mm (50.7 in)	789 mm (31.0 in)	1289 mm (50.7 in)
Working height (B)	278 mm (10.9 in)	278 mm (10.9 in)	278 mm (10.9 in)	278 mm (10.9 in)
Column spacing (C)	460 mm (18.1 in)	460 mm (18.1 in)	460 mm (18.1 in)	460 mm (18.1 in)
Column diameter (D)	76 mm (3.0 in)	76 mm (3.0 in)	76 mm (3.0 in)	76 mm (3.0 in)
Base width (E)	625 mm (24.6 in)	625 mm (24.6 in)	625 mm (24.6 in)	625 mm (24.6 in)
Base depth (F)	527 mm (20.8 in)	527 mm (20.8 in)	527 mm (20.8 in)	527 mm (20.8 in)
Diagonal Clearance (G)	1378 mm (54.25 in)	1879 mm (74.0 in)	1378 mm (54.25 in)	1879 mm (74.0 in)
Overall Height (H)	1687 mm (66.4 in)	2187 mm (86.1 in)	1687 mm (66.4 in)	2187 mm (86.1 in)
Stiffness [†]	275x10 ⁶ N/m (1.57x10 ⁶ lb/in) (measured)	275x10 ⁶ N/m (1.57x10 ⁶ lb/in) (measured)	275x10 ⁶ N/m (1.57x10 ⁶ lb/in) (measured)	275x10 ⁶ N/m (1.57x10 ⁶ lb/in) (measured)
Weight	192 kg (425 lb)	231 kg (508 lb)	192 kg (425 lb)	231 kg (508 lb)

* Test space is the maximum distance between the load cell and the actuator with the actuator fully retracted.

† Determined at each load unit's full fatigue rating with its crosshead raised 800 mm (31.5 in.) above the base plate.

§ Rated actuator force at 21 MPa (3000 psi).

Specifications are subject to change without notice. Contact MTS to verify critical specifications.



FlexTest SE & GT Control Options

MTS 810 systems include your choice of FlexTest SE or GT digital servocontrollers. FlexTest controllers are reliable, and easy-to-use, and are designed to address the full spectrum of material and component testing needs. With a common set of proven and reliable hardware and software, and capabilities ranging from one to eight channels and one to four stations, this family of digital controllers provides the pricing flexibility to accommodate a broad range of budgets, as well as a comprehensive set of features for performing the material testing application specific to your particular testing needs.

Both FlexTest GT and PC driven FlexTest SE controllers employ proven MTS Model 793 Software - used daily on thousands of MTS controllers worldwide. This powerful control package features a Windows multi-tasking operating system that allows you to define new tests, acquire data, and analyze results of prior and current tests while other tests are still in progress. Model 793 Software makes it easy to integrate your FlexTest control system into your organization's computer networks and to share data with other networked equipment. It also allows you to take advantage of the full array of proven MTS test application software.

FlexTest SE Plus

A high capacity control solution for more demanding single-channel, single-station material and component testing

The PC driven FlexTest SE Plus digital controller delivers real-time closed-loop control of demanding single-channel, single-station tests. FlexTest SE Plus hardware includes a high-power VME processor capable of yielding a 6kHz update rate, a single 2- or 3-stage valve driver, up to 5 digital universal conditioners (DUCs), an encoder interface board, and a set of 6 auxiliary input channels. The Plus model is also capable of supporting a temperature control system via serial communications.

Additional capabilities include:

- ▶ Bumpless start
- ▶ Hydraulics-on mode-switching
- ▶ Auto-zeroing
- ▶ Auto-tuning

Typical FlexTest SE Plus Configuration

- ▶ One valve driver (2-stage or 3-stage)
- ▶ Two digital universal conditioners (DUCs)
- ▶ One analog input - for data signal or external program
- ▶ Three analog outputs
- ▶ Digital inputs and outputs for interlock and user-defined use

Popular Options

- ▶ Basic TestWare, MultiPurpose TestWare, TestWorks, and Fatigue and Fracture Software
- ▶ Up to three additional DUCs
- ▶ Set of six additional A/D inputs
- ▶ On-line scope
- ▶ Adjustable arm or stand

- ▶ Saving and restoring PID settings
- ▶ On-line scope to observe signals
- ▶ Digital display of measurements
- ▶ Full-range calibrations
- ▶ Integrates with third party data acquisition and program generation

Integral Front Panel Controls

The FlexTest SE model features front panel system controls that supplement the PC interface to facilitate convenient test monitoring and specimen handling, eliminating the need for an additional Remote Station Control pendant.

This intuitive front panel combines a sharp, multi-color display with easy-to-read graphics and an array of controls including dedicated menu keys, a keypad, HPS, HSM, program run-stop-hold, E-stop, and a rotary adjustment knob.



Portability and Convenience

Lightweight FlexTest SE controllers are designed for portability, featuring a multiposition handle to facilitate easy transport to other test locations. Additionally, there are a variety of ways to position a FlexTest SE controller either on or near a load frame: it can be secured to an adjustable arm attached to the load frame itself; mounted on a portable, adjustable stand near the load frame; or it can simply be placed on a table or cart.

FlexTest GT

A proven control solution for complex multichannel, multistation material and component testing

The FlexTest GT digital controller features the power and flexibility to deliver high speed, real-time closed-loop control, data acquisition, function generation, and transducer conditioning for multichannel, multistation applications, allowing several test systems to be driven from one controller. It accommodates up to 32 modules that can be distributed among 8 channels and 4 stations as required, with the option to add 16 user programmable digital inputs and digital outputs.

Hardware Driven Flexibility

The flexible design of the FlexTest GT lets you reconfigure the system easily as your needs change. By adding hardware modules you can expand your system's capabilities and customize it for a wide range of tests. This includes the ability to use externally conditioned signals as control modes. In addition, you can use D/A signals as low-rate control channels for signals like pressure or temperature.

Portable Remote Station Control

The optional Remote Station Control (RSC) provides a convenient, portable control interface for carrying out simple operations, such as specimen handling and test setup. The FlexTest GT requires an RSC to comply with CE safety standards for material testing applications. The RSC simplifies many operations, including operating the hydraulic controls, moving the actuator to mount specimens, and starting and stopping tests. In addition



to hydraulic controls and an interlock indicator, it provides run, stop, and hold controls; a display screen and function keys; and an actuator positioning control for specimen loading. Once a specimen is loaded, transducers can be auto-zeroed from the computer, or from the RSC. For multichannel systems the actuator command toggles between axes. Multistation configurations require a dedicated RSC per station. The lightweight RSC can be located on the PC table or cart if this is near the load frame, or it can be mounted on a stand by the load frame if the PC is not located nearby.

Remote Station Control Option



Typical FlexTest GT Configurations

- ▶ One valve driver (2-stage or 3-stage) per control channel
- ▶ Two digital universal conditioners (DUCs) per control channel
- ▶ Digital inputs and outputs for HSM and HPU interlock

Popular Options

- ▶ Basic TestWare, MultiPurpose TestWare, TestWorks, and Fatigue and Fracture Software
- ▶ Additional DUCs
- ▶ Auxiliary A/D inputs
- ▶ Set of 16 digital inputs and 16 digital outputs for user-defined operation

FlexTest Digital Servocontrollers

Addressing the full spectrum of material and component testing needs

FlexTest SE Basic

The FlexTest SE Basic is a cost-effective control solution for simple single-channel, single-station strength or fatigue tests on materials or components for which a simple command and a single result are all that is required. Examples include:

- ▶ Tensile test, reporting peak load and maximum elongation
- ▶ High Cycle Fatigue test, reporting number of cycles to failure
- ▶ Durability, reporting material degradation after block-cyclic loading
- ▶ Integrates with third party data acquisition and program generation



FlexTest SE Plus

Coupled with a PC running MTS 793 software, the FlexTest SE Plus is a higher capacity control solution for more demanding single-channel, single-station materials tests. It supports more hardware and software options than the Basic model. The FlexTest SE Plus allows you to:

- ▶ Take advantage of a wide array of proven MTS test application software to run a wide variety of tests
- ▶ Customize and automate test procedures
- ▶ Acquire and store test data
- ▶ Generate test reports
- ▶ Network to other PCs
- ▶ Monitor test status from remote PCs



FlexTest GT

The FlexTest GT is a proven control solution for performing complex materials and component testing. Capable of supporting up to 8 channels and multiple stations, the FlexTest GT enhances productivity by allowing you to manage several stations from one PC screen. Or, if you prefer, the PC-per-Station option enables you to employ additional PCs so different opera-

tors can run their respective test stations without having to share a PC. This option also makes it possible to support test stations in different locations. The FlexTest GT runs with MTS 793 software and a multitasking Windows™ operating system, allowing you to take advantage of the full array of proven MTS test application software.



Comparison of FlexTest SE and FlexTest GT Controllers

	FlexTest SE				FlexTest GT
	BASIC with 2kHz processor	BASIC with 6kHz processor	PLUS	2-Channel	
PC Automation	Opt ^A	Opt ^{A,B}	Yes	Yes	Yes
Max update rate	2kHz	6kHz	6kHz	6kHz	6kHz
Built-in A/D inputs	1	1	1	1	0
Built-in D/A outputs	3	3	3	3	0
Valve Drivers	1	1	1	2	up to 8
Conditioners	up to 3 ^C	up to 3 ^C	up to 5	up to 6 ^C	up to 24 ^C
DIO	4 pair ^D	4 pair ^D	4 pair ^D	4 pair ^D	Opt ^E
Basic TestWare	Opt ^F	Opt ^F	Yes	Yes	Yes
MultiPurpose TestWare	Opt ^F	Opt ^F	Opt	Opt	Opt
Testworks 4	No	Opt ^F	Opt	Opt	Opt
Fatigue & Fracture	No	Opt ^F	Opt	Opt	Opt
Remote Station Control	No	No	No	No	Opt
Remote Setpoint Adjust	Opt ^{F,G}	Opt ^{F,G}	Opt ^G	Opt ^G	Opt ^G
Temp Control^H	No	Opt ^F	Yes	Yes	Yes

A Can upgrade with PC Automation in the field.

B If PC automation is included use PLUS or 2-Channel model column information.

C Pending other hardware options selected.

D One pair dedicated to hydraulic interlock, three pair definable by user.

E Set of 16/16 Digital Inputs/Outputs are available as an option.

F Requires PC automation.

G Requires available IO Carrier slot and encoder interface board.

H Via serial communications to appropriate temperature control system, for non-TMF applications.

If a customer wants a stand-alone controller to run tests without requiring a PC and expects to need FlexTest SE Plus model capabilities in the future then the 6kHz processor upgrade should be ordered with the FlexTest SE Basic model controller.

Specifications (descriptions in gray shading apply to both FlexTest SE and FlexTest GT models)

Parameter	FlexTest SE	FlexTest GT
Station configurations		
Number of station	1 station	up to 4 stations
Servo Control		
Control channels	1 (FlexTest SE Basic and Plus models) 2 (FlexTest SE 2-Channel model)	up to 8 channels
Control modes	Any connected transducer (typically load, strain or displacement), calculation (option for automated applications), and load-limited displacement for specimen loading.	
DDC loop update rate	6kHz (2kHz for Basic model unless optional upgrade processor provided)	6kHz
Data Acquisition		
Resolution	16 bit	
Sample rate	Up to 6kHz sampling rate	
Number of channels	1 per internal conditioner, 6 per Analog input board. All channels simultaneous sample and hold.	
Signal Conditioners		
Resolution	19 bit	
Data sample rate	100kHz	
Signal Processing	32 bit, double precision computation	
Program Generation		
Frequency range	0.001 Hz to 600 Hz	
Waveforms	Sine, square, triangle, ramp, and any user-defined waveform	
Maximum ramp time	>1000 years	

(Specifications continued)

Parameter	FlexTest SE	FlexTest GT
Valve Drive - 2 Stage (493.14)	Dual balance differential current source	
Maximum output	25 or 50 mA (selectable), +/- 20V across 1Kohm load	
Dither	Adjustable, 0 to 5 V p-p, frequency adjustable 1 to 4915 Hz	
Valve Drive - 3 Stage (493.15)	50mA at +/- 20V	
Maximum drive current	Adjustable, 0 to 5 V p-p, frequency adjustable 1 to 4915 Hz	
Dither	Adjustable, 0 to 5 V p-p, frequency adjustable 1 to 4915 Hz	
Excitation	Balanced AC-coupled output 100mA max +/-20V frequency set to 9.8kHz	
Input	Differential AC-coupled with adjustable gain and zero	
Feedback	Proportional and differential	
Digital Universal Conditioner	For resistive or reactive type transducers	
Excitation	Balanced constant voltage or constant current 0-20 VDC, supports 4- or 8-wire connections	
Transducer ID cable	Supports shunt calibration value. Bridge-balancing and completion for quarter- and half-arm bridges.	
Interlocks	Excitation failure in hardware, conditioner saturation in software	
Analog Inputs	16-bit resolution	
Input channels	1 built-in, plus 6 per optional 493.45 board	6 per each optional 493.45 board
Input voltage	22 V p-p maximum	
Analog Outputs	3 built-in, plus 6 per optional 493.46 board	
Output channels	6 per each optional 493.46 board	
Output voltage	+/-10V	
Max load	2000 ohm, 1000 pf	
Digital I/O	4 in/4 out (1 pair dedicated to hydraulic interlock)	16 in / 16 out (493.72 option)
Input	ON voltage = 2.7-26VDC @ 0.5mA min. Input Resistance = 2K ohm	
Output	Open Collector Open Emitter; 30VDC max; VCE max = 1V @ 6mA; IC max = 20mA	
Hydraulics	1 A @ 24 V	
Hydraulic service manifold contact outputs	20 to 800mA; 2 or 4 sec ramp on; 0, 2, or 4 sec ramp off (selectable)	
HSM proportional output	1A @ 30 VDC (must use one of above Digital I/O)	
Run/stop contact outputs		2A @ 30 VDC
Digital Controller Dimensions	13 cm (5.2 in)	
Height	61 cm (24 in)	
Width	43 cm (17 in)	
Depth	43 cm (17 in)	
Weight	8.6 kg (19 lb)	
Environmental	5°C to 40°C	
Temperature	10% to 85% non-condensing	
Relative humidity		
Power Input	100-240 VAC, 47-63 Hz	
Input voltage *	<50A max for 1/2 cycle	
Input surge	<50A max for 1/2 cycle	<100A max for 1/2 cycle
Static current	~4A @ 115VAC, ~2A @ 230VAC	~12A @ 115VAC, ~6A @ 230VAC
Circuit protection	Short circuit protection by duty cycle current foldback with automatic recovery	
Standards	EN 5008-2 (1995) Electromagnetic compatibility, Generic immunity standard, Part 2: Industrial environment	
EMC	EN 55011 (1991) Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical (ISM) Equipment	
Safety	EN 61010-1 (1993) Safety requirements for electrical equipment for measurement, control, and laboratory use	
Communication to PC	Dedicated 100 Mbit Ethernet connection with 10 Mbyte/sec data transfer rate	
Online Documentation	FlexTest SE User manual	System Software manual
	System Software manual	MultiPurpose Testware manual
	MultiPurpose Testware manual	

* The specifications shown conform to CE compliance. The specification allows for +/-10% of the values stated. The actual voltage that the FlexTest controllers can operate within is 90-264 VAC.

HPU Solutions

Hydraulic Power Unit

MTS has a hydraulic power unit (HPU) that fits your needs. We offer units with flow ratings from 3.8 to 114 Lpm (1.5 to 30 gpm) or even higher if you need it.

The HPU most commonly used with the 810 test system is the SilentFlo™ model 505.07. This super-quiet pump operates at an amazingly low 58 dB(A). That's as quiet as your typical office photocopier—no pump room required!

The SilentFlo 505.07 HPU provides continuous pressure of 21 MPa (3000 psi) and a flow rating of 26.5 Lpm (7 gpm) when operating @ 60 Hz. The SilentFlo HPU is a fully integrated machine including both the hydraulic system components and the fuses, electrical disconnect, motor starters, and control logic. Simply connect electric power and water to the unit and it's ready to run.

SilentFlow HPUs feature advanced technology and integrated controls that make them easy to use. They utilize variable displacement pump units for maximum electrical efficiency, automatic interlocks that protect against low oil level and high temperature conditions, and 3-micron return line filtration designed specifically for servohydraulic testing system use.



The SilentFlo 505.07 hydraulic power unit

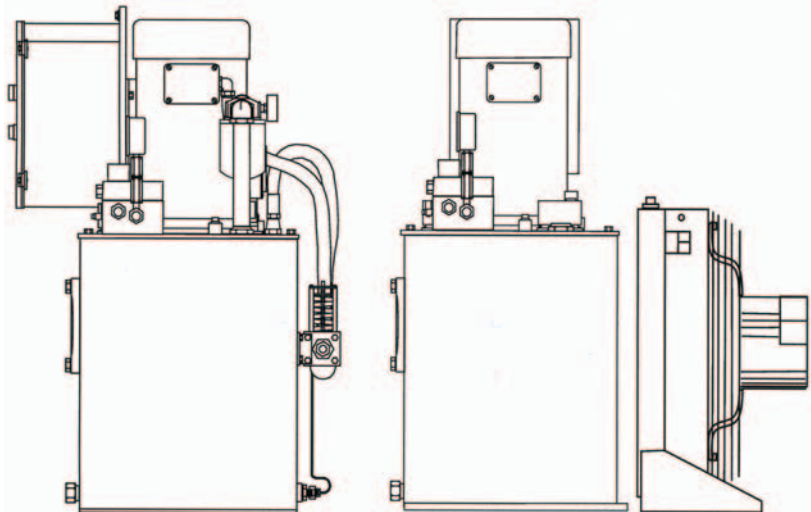
Hydraulic power supply specifications

Model	505.07		505.11		505.20		505.30	
	lpm	gpm	lpm	gpm	lpm	gpm	lpm	gpm
At 50 Hz	22.7	6	41.6	11	62.5	16.5	100.7	26.6
At 60 Hz	26.5	7	41.6	11	75	20	113	30

An additional economical MTS Hydraulic Power Units is available for testing with lower flow requirements. These high-efficient, low-noise pumps are used to produce smooth hydraulic fluid output, low in entrained air and free of pressure spikes that can produce erratic test results. Highly effective filtration systems protect against silting that degrades system performance, distorts data, and damages machinery.

Specifications

Model	512.14	
Flow rate	lpm	gpm
At 50 Hz	12.5	3.3
At 60 Hz	15.1	4.0



Water Cooled

Air Cooled

System Lifecycle Management



Extend Your System Life – Improve Your ROI

Let MTS help you efficiently and cost-effectively maintain and enhance your lab resources with our Lifecycle Management approach. As a result you will improve the return on your investment by:

- ▶ Extending your systems useful life
- ▶ Expanding your systems testing capabilities
- ▶ Enhancing your systems testing throughput



World Class Field Service

One of the keystones of our Lifecycle Management program is the 250+ highly trained and skilled professional Field Service Engineers stationed in more than 60 cities around the world. A wide variety of Support Service offerings are available to maintain peak effectiveness.

Contact your MTS FSE at:
<http://www.mts.com/world-wide/continents.asp>

Trusted and Experienced Testing Partners

MTS is more than a leading physical test equipment supplier. The MTS staff of materials scientists, engineers and technicians are known around the world for their expertise, experience and insight into virtually all types of material and finished product testing.

Ongoing Software Assurance

The most economic and automatic way to make way to make sure you are always running the latest and greatest software on your MTS controllers is to enroll in the MTS Software Assurance Program and guarantee the maintenance, enhancement and support of your system's performance.

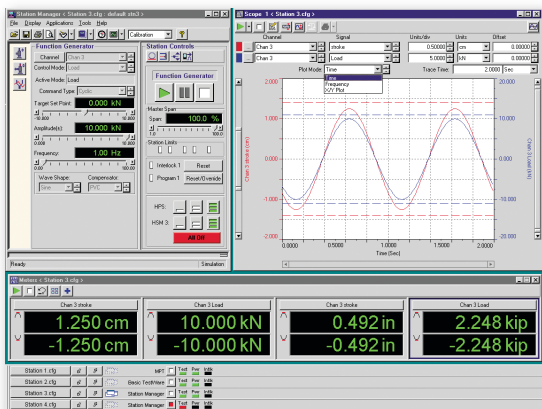
Productivity-Enhancing Training

Maximize the productivity and lifetime of your test system investment with our hands-on learning courses. Our courses cover systems and software operation and maintenance, testing principles, methodologies, and applications. Learn more at:
<http://www.mts.com/training/training.asp?Market=All>

Proven MTS Software

Both FlexTest GT and PC-driven FlexTest SE controllers employ proven MTS Model 793 Software - used daily on thousands of MTS controllers worldwide. This powerful control package features a Windows multi-tasking operating system that allows you to define new tests, acquire and share data, and analyze results of prior and current tests while other tests are still in progress. Take advantage of the full array of proven MTS test application software:

- ▶ Basic TestWare Software enables you set up and run simple monotonic and cyclic tests by defining the rate, frequency, amplitude, and mean for sine, triangle, square, and ramp command signals. Capture data while a test is



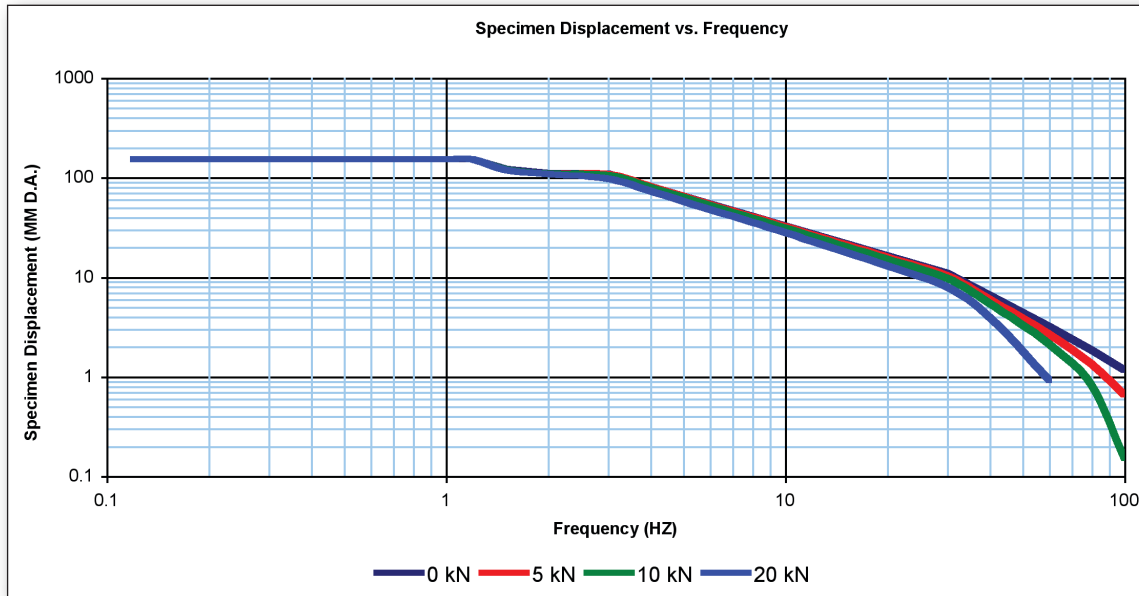
running and store it in standard formats for easy importation into your favorite analysis, plotting, and word processing programs.

- ▶ MultiPurpose TestWare (MPT) - easy-to-use “drag and drop” environment for building standard and nonstandard tests. Link basic processes, including function generation, data acquisition, events, and triggers, to quickly and easily build complex tests. Use your favorite spreadsheet program or analysis package to analyze, plot, and report data.
- ▶ TestWorks Software enables you to easily define and run test methods for tensile, compression, flexure, and other simple monotonic tests. Acquire and manipulate data from displacement, time, load, and up to six strain channels, as well as store test setup data along with test results, so you can easily determine how a test was run and repeat it as desired.
- ▶ High-Cycle, Low-Cycle, and Advanced Low-Cycle Fatigue Testing Software is designed for the definition, execution, and analysis of constant amplitude, high-cycle and low-cycle fatigue tests.
- ▶ K_{IC} and J_{IC} Fracture Toughness Testing Software performs plane-strain and plane-stress fracture toughness tests on compact tension, C(T), and bend, SE(B), test specimens.
- ▶ Programming Libraries include drivers for LabVIEW, Visual Basic, and C++ programming environments to assist you in developing customized test applications

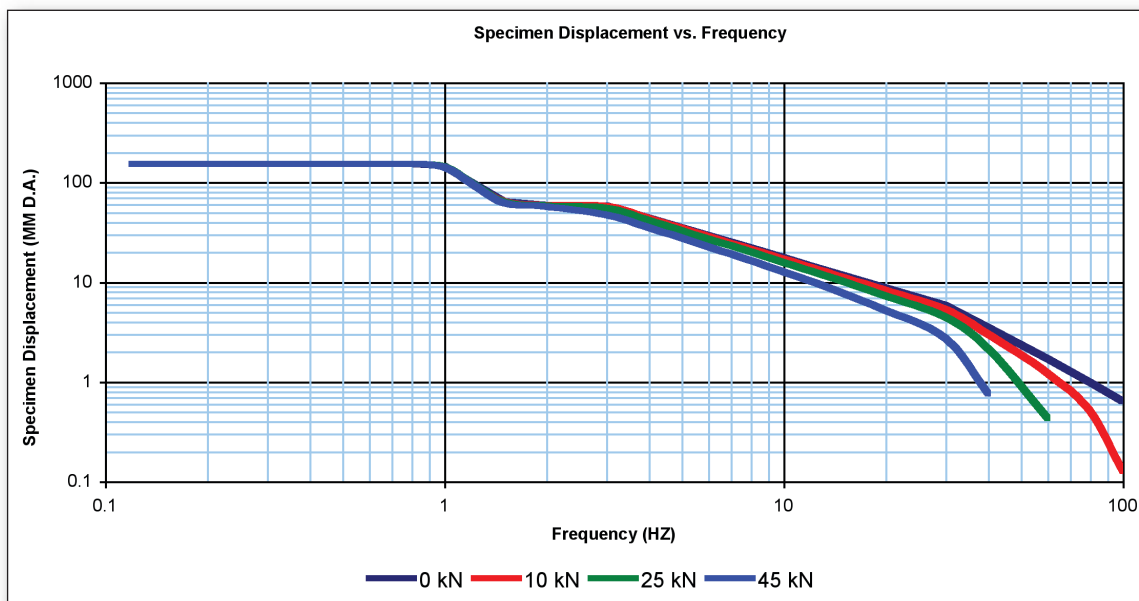
810 Performance Curves

The graphs on the following pages illustrate the dynamic performance characteristics of a sampling of configurations available for the 810 and 858 systems. Actual performance will depend upon the

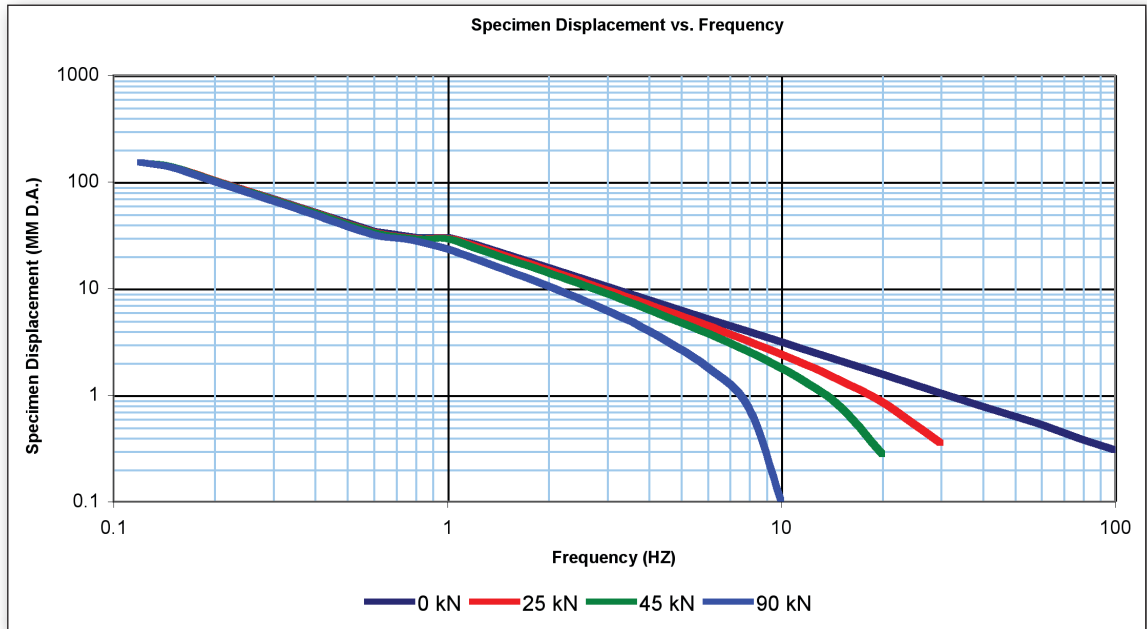
specimen under test, grips and fixtures employed, and the components selected in your system. MTS can assist you in configuring a system to meet your test requirements.



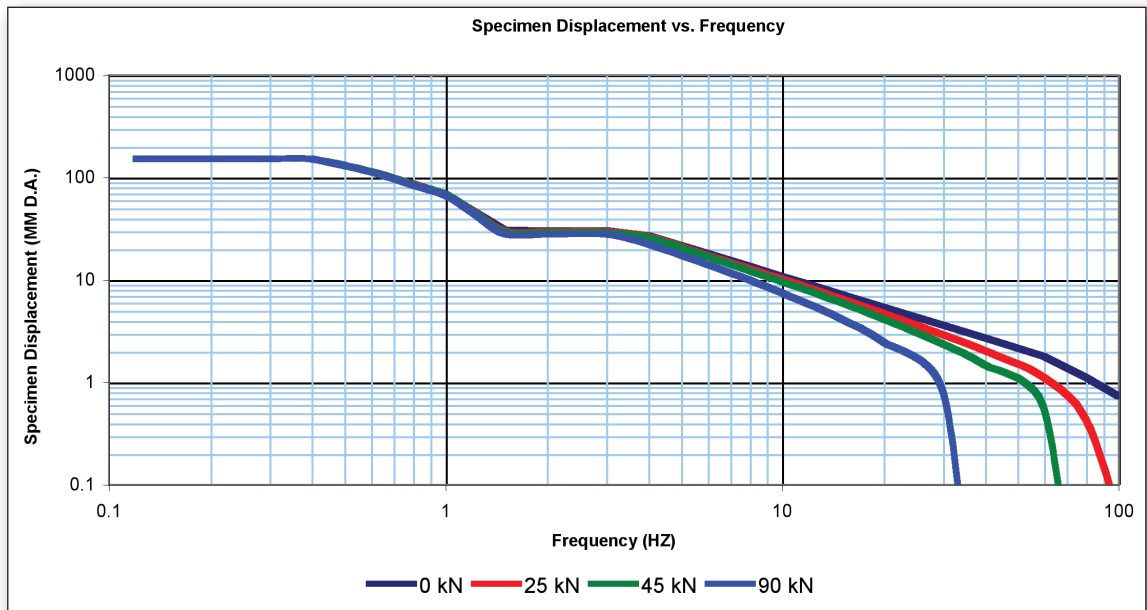
Load Frame Model: 318.10	100 kN (22 kip)	ServoValve(s): 252.25G x (1)	57 lpm (15 gpm)
Actuator Static Force:	25 kN (5.5 kip)	Grip: 647.02	6.8 kg (15.0 lbs.)
Actuator Nominal Stroke:	150 mm (6 inches)	HPU: 505.20 60 Hz	76 lpm (20 gpm)
System Oil Pressure:	210 bar (3000 psi)		



Load Frame Model: 318.10	100 kN (22 kip)	ServoValve(s): 252.25G x (1)	57 lpm (15 gpm)
Actuator Static Force:	50 kN (11 kip)	Grip: 647.10	30.4 kg (66.9 lbs.)
Actuator Nominal Stroke:	150 mm (6 inches)	HPU: 505.20 60 Hz	76 lpm (20 gpm)
System Oil Pressure:	210 bar (3000 psi)		

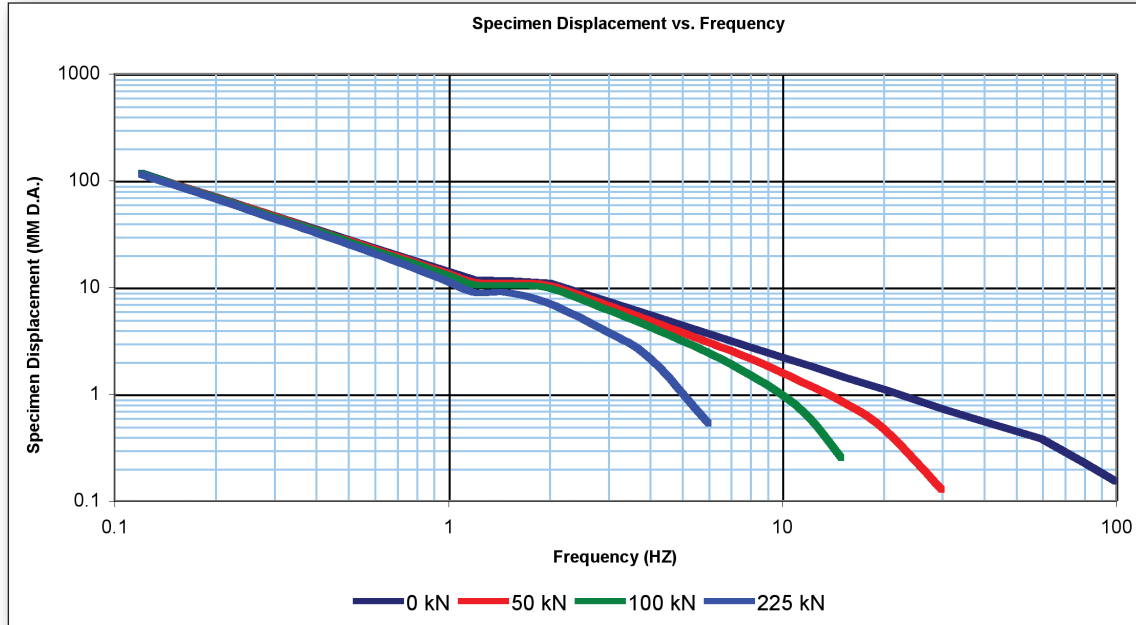


Load Frame Model: 318.10	100 kN (22 kip)	ServoValve(s): 252.23G x (1)	19 lpm (5 gpm)
Actuator Static Force:	100 kN (22 kip)	Grip: 647.10	30.4 kg (66.9 lbs.)
Actuator Nominal Stroke:	150 mm (6 inches)	HPU: 505.20 60 Hz	76 lpm (20 gpm)
System Oil Pressure:	210 bar (3000 psi)		

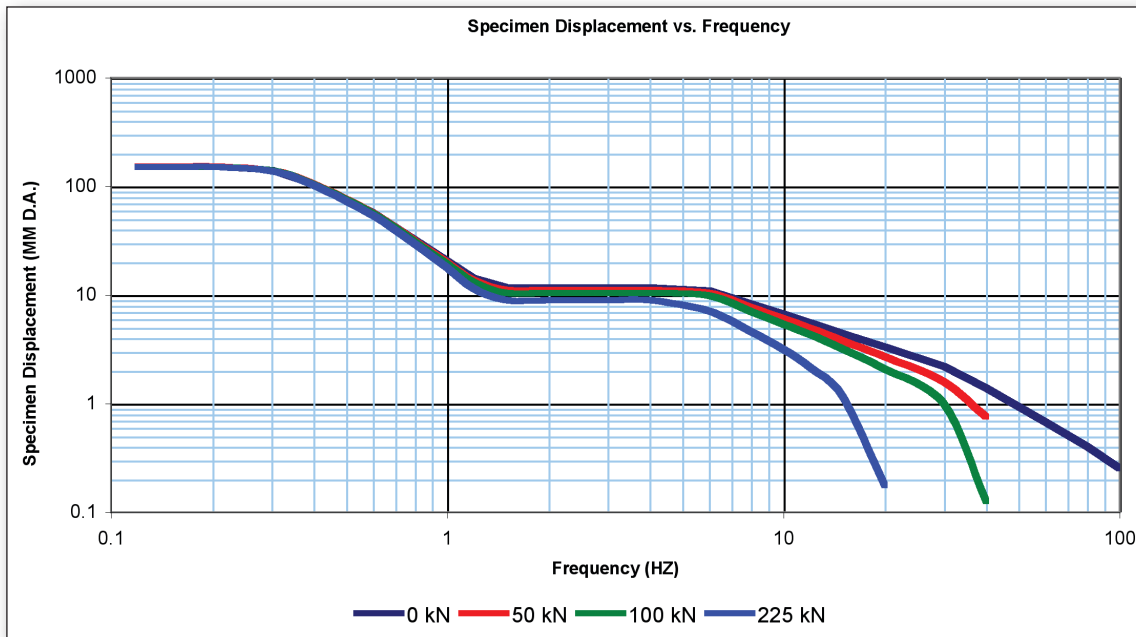


Load Frame Model: 318.10	100 kN (22 kip)	ServoValve(s): 252.24G x (2)	76 lpm (20 gpm)
Actuator Static Force:	100 kN (22 kip)	Grip: 647.10	30.4 kg (66.9 lbs.)
Actuator Nominal Stroke:	150 mm (6 inches)	HPU: 505.07 60 Hz	26.5 lpm (7 gpm)
System Oil Pressure:	210 bar (3000 psi)		

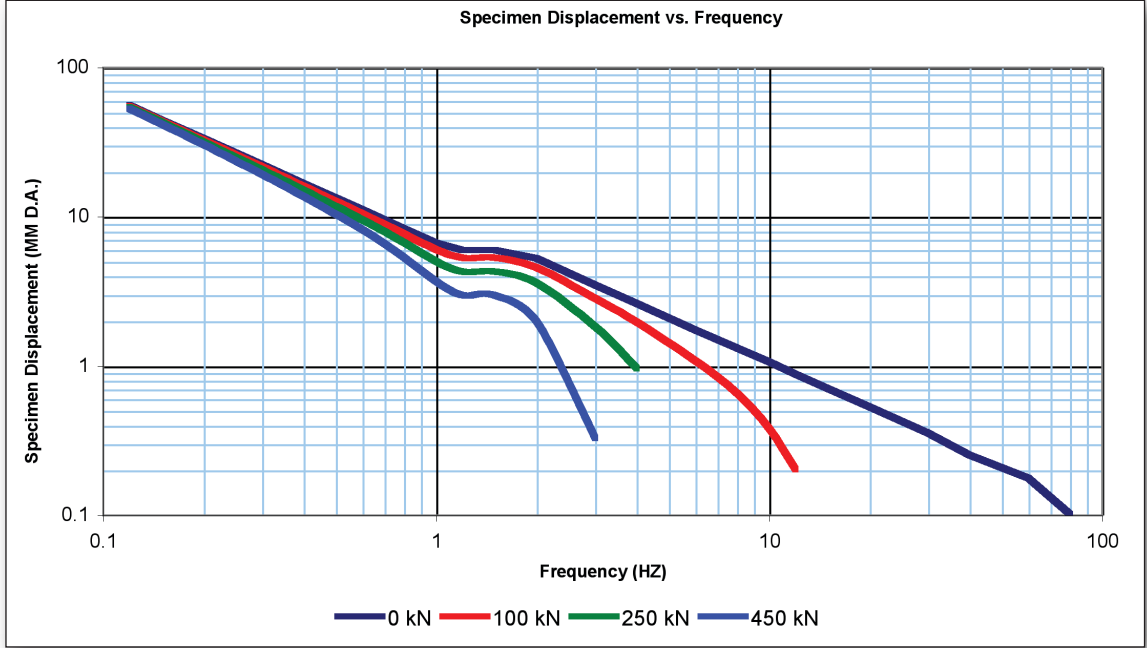
810 Performance Curves (continued)



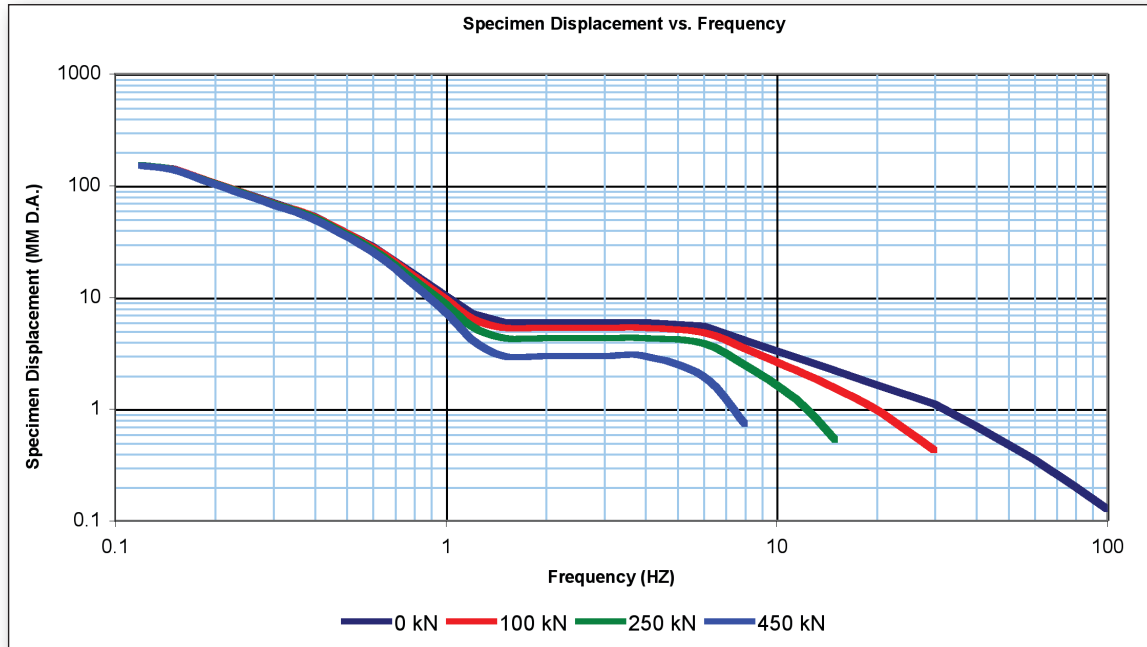
Load Frame Model: 318.25	250 kN (55 kip)	ServoValve(s): 252.24G x (1)	38 lpm (10 gpm)
Actuator Static Force:	250 kN (55 kip)	Grip: 647.25	77 kg (169 lbs.)
Actuator Nominal Stroke:	150 mm (6 inches)	HPU: 505.11 60 Hz	41.6 lpm (11 gpm)
System Oil Pressure:	210 bar (3000 psi)		



Load Frame Model: 318.25	250 kN (55 kip)	ServoValve(s): 252.25G x (2)	114 lpm (30 gpm)
Actuator Static Force:	250 kN (55 kip)	Grip: 647.25	77 kg (169 lbs.)
Actuator Nominal Stroke:	150 mm (6 inches)	HPU: 505.30 60 Hz	113.5 lpm (30 gpm)
System Oil Pressure:	210 bar (3000 psi)		



Load Frame Model: 318.50	500 kN (110 kip)	ServoValve(s): 252.24G x (1)	38 lpm (10 gpm)
Actuator Static Force:	500 kN (110 kip)	Grip: 647.50	148 kg (326 lbs.)
Actuator Nominal Stroke:	150 mm (6 inches)	HPU: 505.11 60 Hz	41.6 lpm (11 gpm)
System Oil Pressure:	210 bar (3000 psi)		



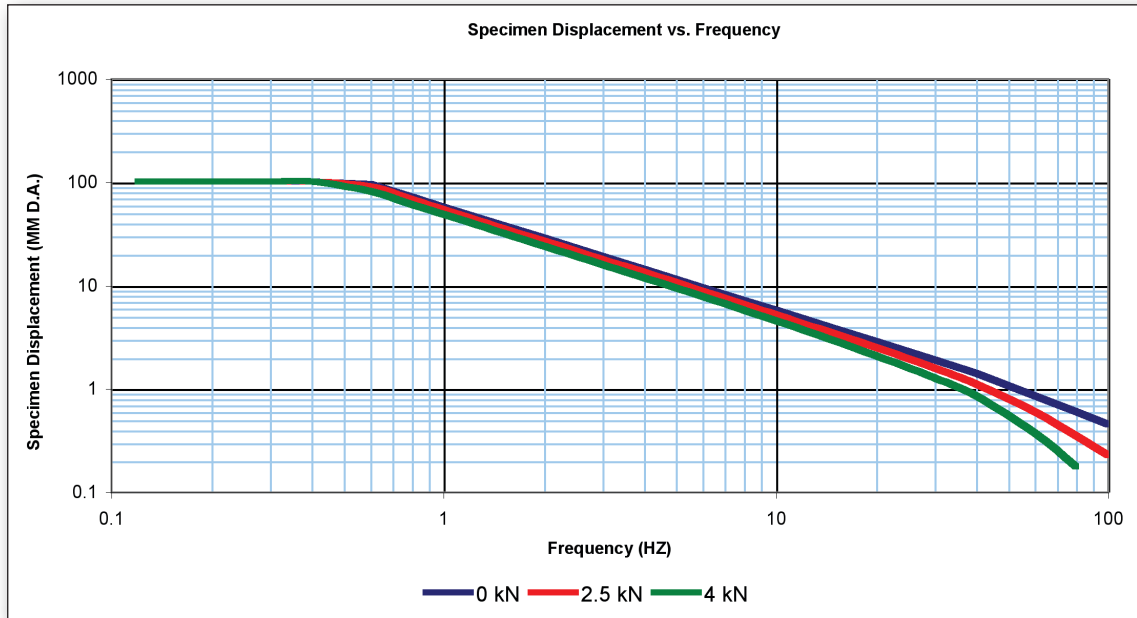
Load Frame Model: 318.50	500 kN (110 kip)	ServoValve(s): 252.25G x (2)	114 lpm (30 gpm)
Actuator Static Force:	500 kN (110 kip)	Grip: 647.50	148 kg (326 lbs.)
Actuator Nominal Stroke:	150 mm (6 inches)	HPU: 505.30 60 Hz	113.5 lpm (30 gpm)
System Oil Pressure:	210 bar (3000 psi)		

* Systems illustrated include accumulation, pressure and return hoses selected to match the other component ratings listed. Hydraulic power supplies have been selected to not limit performance provided by other components. Performances illustrated represent a mathematical prediction of system performance acting against a spring specimen. Your MTS Sales representative can discuss these and other performance options available.

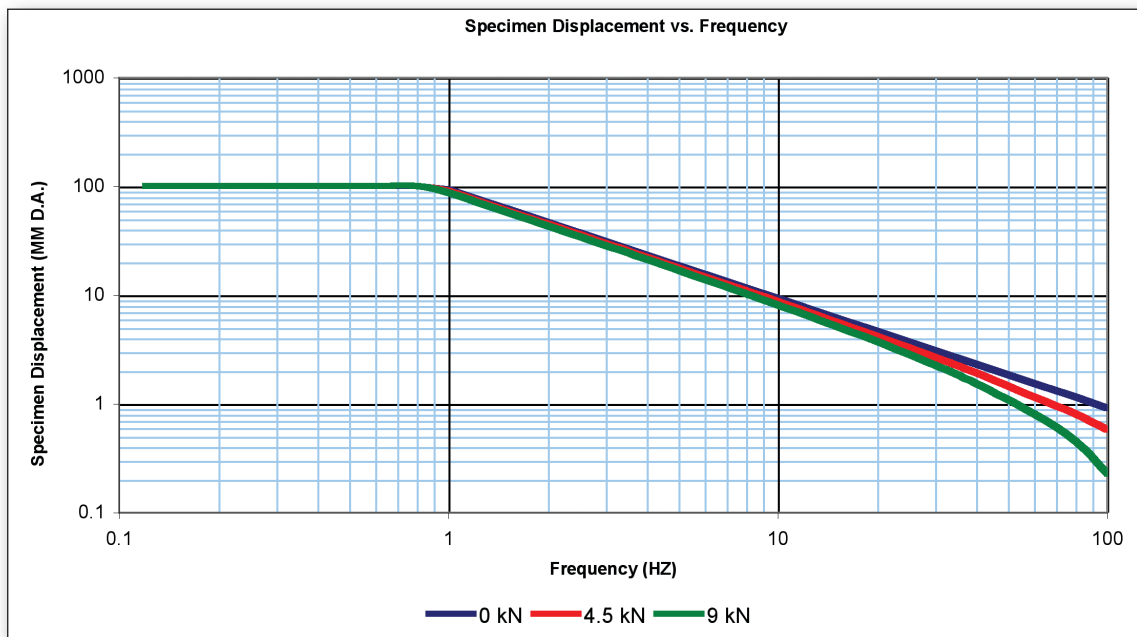
858 Performance Curves

The graphs on the following pages illustrate the dynamic performance characteristics of a sampling of configurations available for the 810 and 858 systems. Actual performance will depend upon the

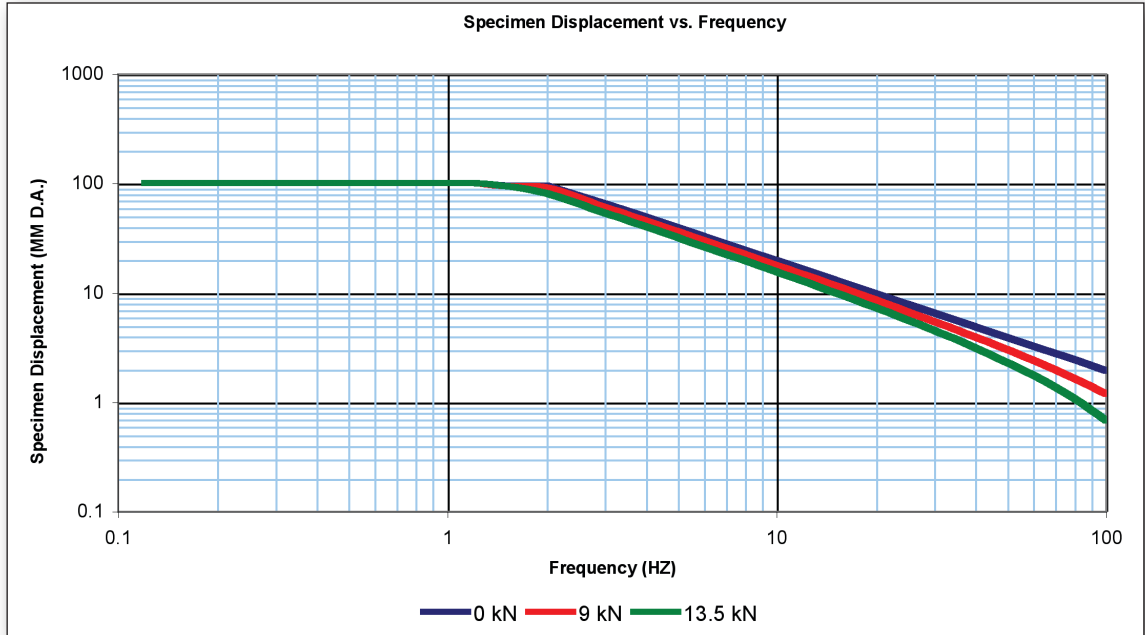
specimen under test, grips and fixtures employed, and the components selected in your system. MTS can assist you in configuring a system to meet your test requirements.



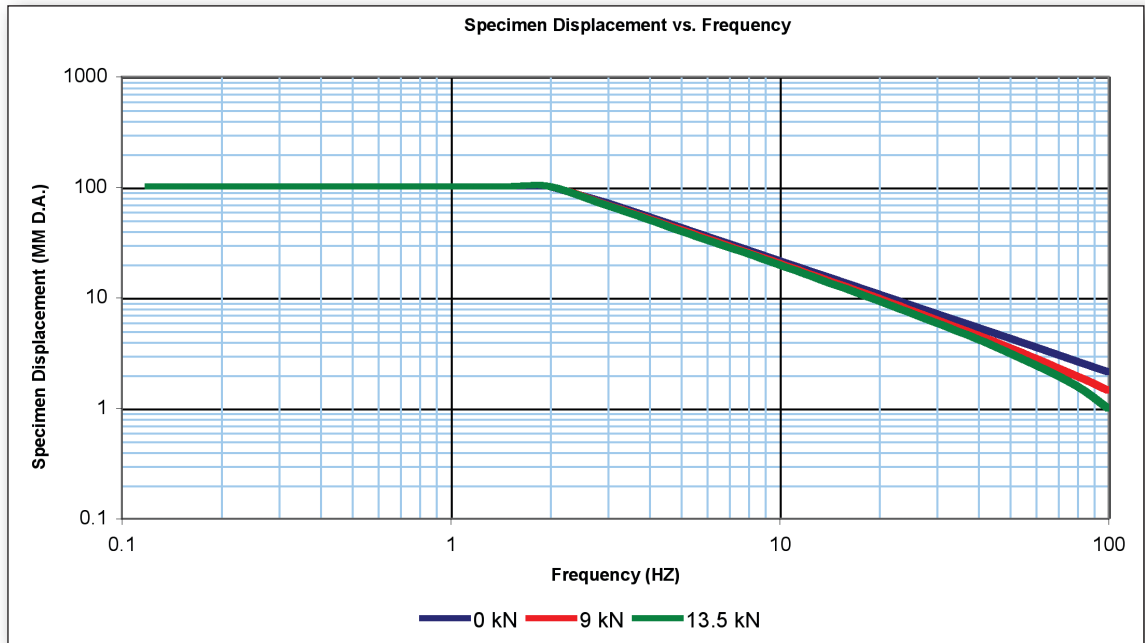
Load Frame Model: 359	25 kN (5.5 kip)	ServoValve(s): 252.22G x (1)	9.5 lpm (2.5 gpm)
Actuator Static Force:	15 kN (3.3 kip)	Grip: 647.01	4.1 kg (9.0 lbs.)
Actuator Nominal Stroke:	100 mm (4 inches)	HPU: 512.14 60 Hz	15.1 lpm (4 gpm)
System Oil Pressure:	70 bar (1000 psi)		



Load Frame Model: 359	25 kN (5.5 kip)	ServoValve(s): 252.23G x (1)	19 lpm (5 gpm)
Actuator Static Force:	15 kN (3.3 kip)	Grip: 647.01	4.1 kg (9.0 lbs.)
Actuator Nominal Stroke:	100 mm (4 inches)	HPU: 512.14 60 Hz	15.1 lpm (4 gpm)
System Oil Pressure:	140 bar (2000 psi)		

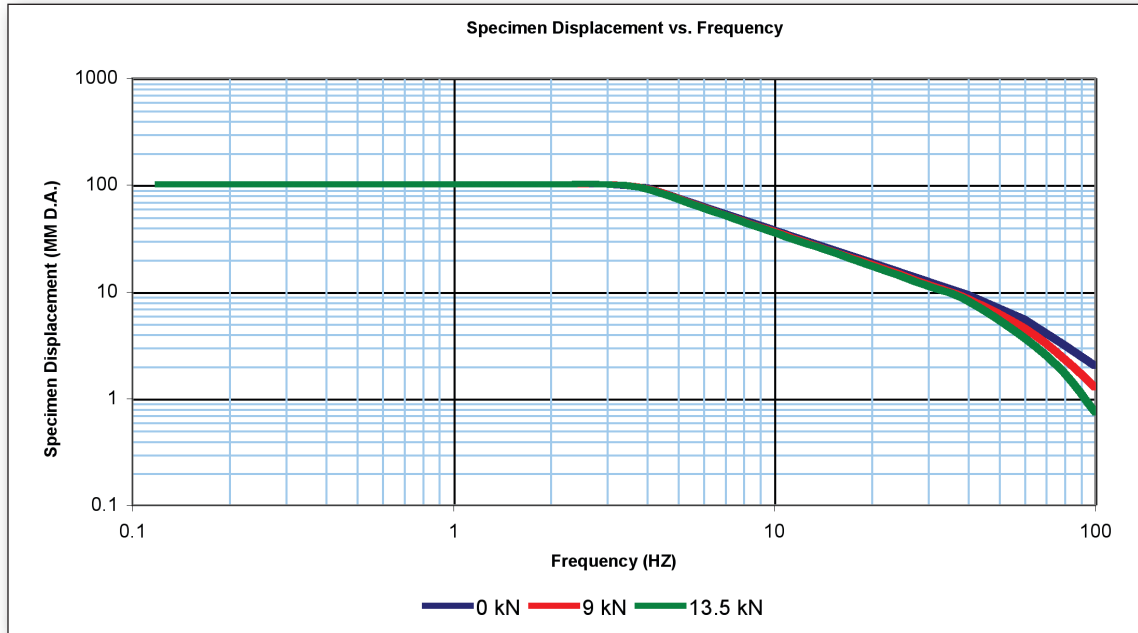


Load Frame Model: 359	25 kN (5.5 kip)	ServoValve(s): 252.23G x (1)	19 lpm (5 gpm)
Actuator Static Force:	15 kN (3.3 kip)	Grip: 647.01	4.1 kg (9.0 lbs.)
Actuator Nominal Stroke:	100 mm (4 inches)	HPU: 505.07 60 Hz	26.5 lpm (7 gpm)
System Oil Pressure:	210 bar (3000 psi)		

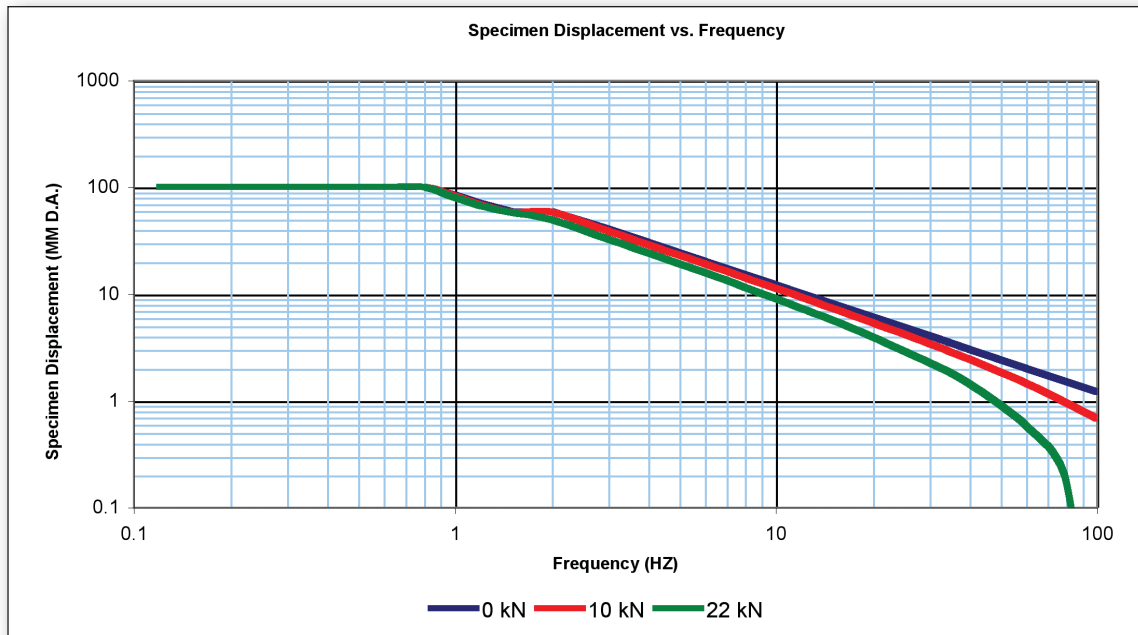


Load Frame Model: 359	25 kN (5.5 kip)	ServoValve(s): 252.24G x (1)	38 lpm (10 gpm)
Actuator Static Force:	15 kN (3.3 kip)	Grip: 647.01	4.1 kg (9.0 lbs.)
Actuator Nominal Stroke:	100 mm (4 inches)	HPU: 505.07 60 Hz	26.5 lpm (7 gpm)
System Oil Pressure:	210 bar (3000 psi)		

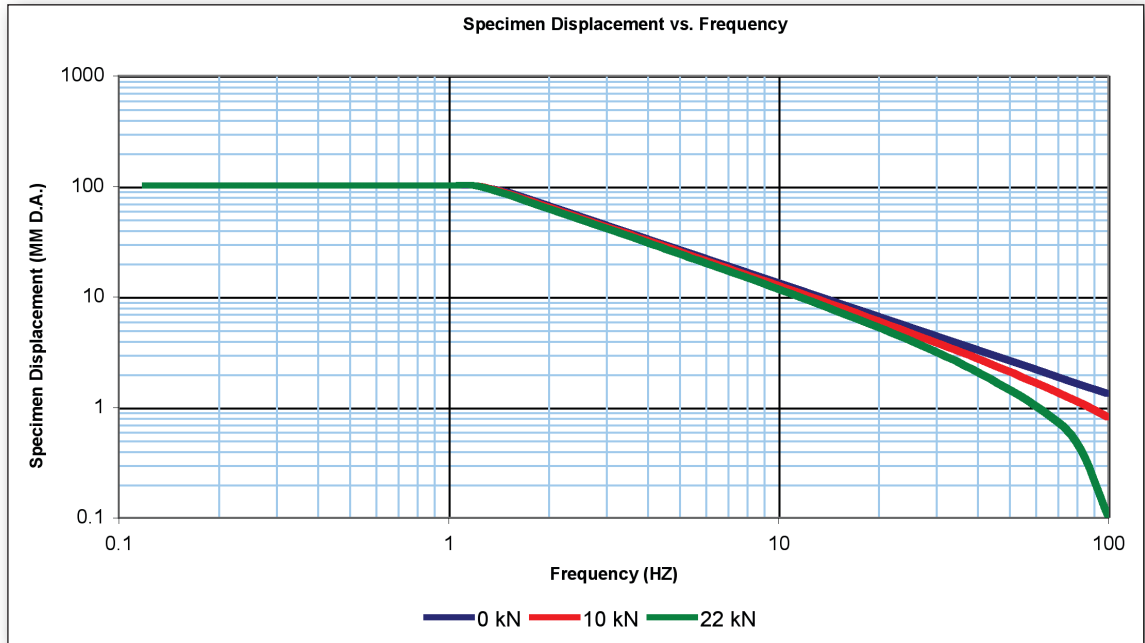
858 Performance Curves (continued)



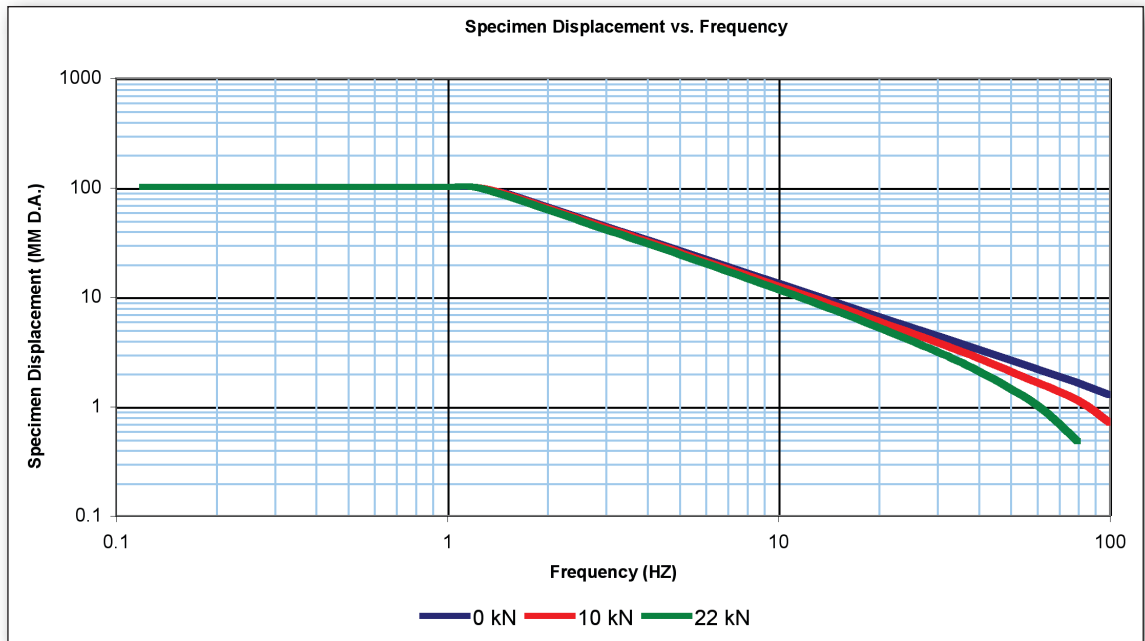
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Actuator Static Force:	15 kN (3.3 kip)	Grip: 647.01	4.1 kg (9.0 lbs.)
Actuator Nominal Stroke:	100 mm (4 inches)	HPU: 505.11 60 Hz	41.6 lpm (11 gpm)
System Oil Pressure:	210 bar (3000 psi)		



Load Frame Model: 359	25 kN (5.5 kip)	ServoValve(s): 252.23G x (1)	19 lpm (5 gpm)
Actuator Static Force:	25 kN (5.5 kip)	Grip: 647.02	6.8 kg (15.0 lbs.)
Actuator Nominal Stroke:	100 mm (4 inches)	HPU: 505.07 60 Hz	26.5 lpm (7 gpm)
System Oil Pressure:	210 bar (3000 psi)		



Load Frame Model: 359	25 kN (5.5 kip)	ServoValve(s): 252.24G x (1)	38 lpm (10 gpm)
Actuator Static Force:	25 kN (5.5 kip)	Grip: 647.02	6.8 kg (15.0 lbs.)
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Load Frame Model: 359	25 kN (5.5 kip)	ServoValve(s): 252.25G x (1)	57 lpm (15 gpm)
Actuator Static Force:	25 kN (5.5 kip)	Grip: 647.02	6.8 kg (15.0 lbs.)
Actuator Nominal Stroke:	100 mm (4 inches)	HPU: 505.07 60 Hz	26.5 lpm (7 gpm)
System Oil Pressure:	210 bar (3000 psi)		

* Systems illustrated include accumulation, pressure and return hoses selected to match the other component ratings listed. Hydraulic power supplies have been selected to not limit performance provided by other components. Performances illustrated represent a mathematical prediction of system performance acting against a spring specimen. Your MTS Sales representative can discuss these and other performance options available.



REGIONAL BUSINESS CENTERS

THE AMERICAS

MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290
USA
Telephone: 1-952-937-4000
Toll Free: 1-800-944-1687
Fax: 1-952-937-4515
E-mail: info@mts.com
Internet: www.mts.com

**MTS Systems Corporation
Nano Instruments Innovation
Center**
1001 Larson Drive
Oak Ridge, TN 37830-8014
USA
Telephone: 1-865-481-8451
Fax: 1-865-481-8455
E-mail: nano@mts.com

EUROPE

MTS Systems
58, rue Auguste Perret
Europarc
94000 Créteil
France
Telephone: 33 (1) 58 43 90 00
Fax: 33 (1) 58 43 90 01
E-mail: contact.france@mts.com

MTS Systems GmbH
Hohentwielsteig 3
14163 Berlin
Germany
Telephone: 49-30-81002-0
Fax: 49-30-81002-100
E-mail: euroinfo@mts.com

MTS Systems S.R.L.
Corso Cincinnato, 228/b
I-10151 Torino TO
Italy
Telephone: 0039-011-4517511
Fax: 0039-011-4517501
E-mail: mtstorino@mts.com

MTS Systems Norden AB
Södra Långebergsgatan 16
SE-421 32 Västra Frölunda
Sweden
Telephone: 46 31 68 6999
Fax: 46 31 68 6980
E-mail: norden@mts.com

MTS Systems Ltd. UK
Brook House
Sommerford Court
Sommerford Road
Cirencester GL7 1TW
Glos. -UK
Telephone: 44-1285-648800
Fax: 44-1285-658052
E-mail: mike.reeves@mts.com

ASIA/PACIFIC

MTS Japan—Tokyo
2-12-3 Midori Sumida-ku
Tokyo 130-0021
Japan
Telephone: 81-3-5624-6101
Fax: 81-3-5624-6106
E-mail: mtsj-info@mts.com

MTS Systems (Korea) Inc.
5th Floor, Core Building
8-1 Sunae-Dong, Bundang-Gu
Seongnam City,
Gyeonggi-Do 463-825,
Korea
Telephone: 82-31-714-7151
Fax: 82-31-714-7198
E-mail: yangseok.yoo@mts.com

MTS Systems (China) Inc.
Unit 23-02 Landmark Bldg.
No.8 North Dong San Huan Road
Chaoyang District
Beijing 100004, P.R.China
Telephone: 86-10-65900931
Fax: 86-10-65900942
E-mail: mtsbje@163bj.com

MTS Systems (Hong Kong) Inc.
Rm 602, Golden Gate
Commercial Building
136-8 Austin Road
Tsim Sha Tsui,
Kowloon
Hong Kong
Telephone: 852-2301-2200
Fax: 852-2722-7240
E-mail: anthony@mtshk.com.hk

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MTS Systems Corporation
14000 Technology Drive
Eden Prairie, MN 55344-2290 USA

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