MAST™ (Multi-axial Simulation Table) Systems

Turnkey solutions for replicating real-world vibration phenomena in controlled laboratory settings

be certain.

AUTOMOTIVE, AEROSPACE AND CIVIL ENGINEERS WORLDWIDE EMPLOY

MTS MAST (MULTI-AXIAL SIMULATION TABLE) SYSTEMS

TO REPLICATE THE VIBRATION PHENOMENA OF REAL-WORLD SERVICE

ENVIRONMENTS IN CONTROLLED LABORATORY SETTINGS.

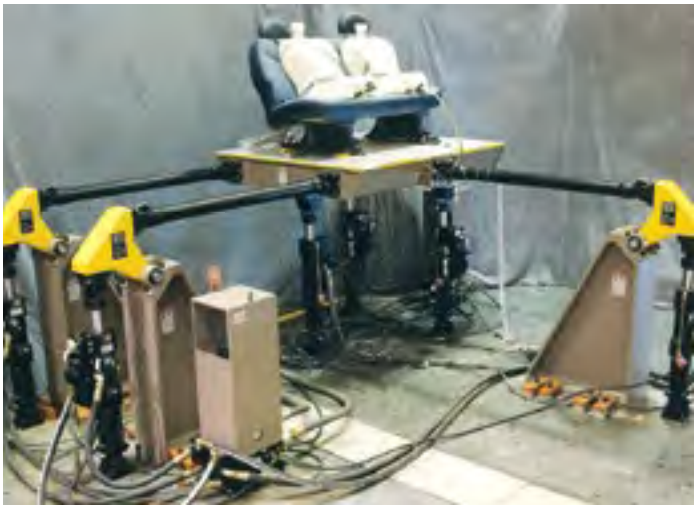
Turnkey MTS MAST systems are designed for quick integration into the test lab and easy operation

High-fidelity Vibration Simulation

Accurate and repeatable vibration testing delivers the data that automotive, aerospace, civil and other engineers need to create safer, more reliable and more comfortable vehicles and structures. Multi-axial vibration testing entails realistic simulation of challenging and often unpredictable real-world operational environments, which requires precise control, sophisticated test design and comprehensive data analysis.

With more than 30 years of experience, MTS is the industry leader in the design and supply of multi-axial simulation tables for squeak and rattle, modal and durability testing of components and subassemblies for ground vehicles and other structures. We have developed and delivered hundreds of 100 systems for numerous organizations worldwide, including standard and custom designs. No other provider can match our range of innovative simulation technology, proven expertise and responsive service.

Model 353 Hexapod MAST System



Model 323 Orthogonal MAST System

Model 354 Hexapod MAST System

Speed

MTS MAST systems empower you to generate meaningful information about component and subsystem performance and durability at the earliest stages of development. Designed for quick integration into the test lab and easy operation, these turnkey solutions deliver a proven way to compress test schedules, accelerate time to market and minimize long-term costs.

Flexibility

The MAST portfolio spans a very broad range of payloads, performance and test applications. This extensive selection ensures you can find the right capabilities at the right price. To ensure a complete solution, MTS provides versatile digital controls and state-of-the-art software for a wide variety of product development and validation applications. Plus, we can custom-tailor a table size, payload or other performance capability to meet your unique functional requirements.

Reliability

MTS MAST systems deliver outstanding reliability and high levels of uptime. They incorporate low-maintenance, zero-backlash bearings throughout their designs to optimize both performance and dependability. When scheduled maintenance is required, you can expect fast, knowledgeable assistance wherever you do business. Our unmatched field service network includes hundreds of skilled technicians stationed in countries throughout the world.

MTS MAST systems are well-suited for applications beyond ground vehicle vibration testing, such as simulating earthquake motions to certify the seismic worthiness of non-structural hospital equipment.

Photo courtesy of Dynamic Certification Laboratory (DCL)

Extensive Testing Application Range

MTS MAST solutions are engineered to employ a variety of excitation methods to achieve the high-fidelity replication of vibration phenomena across a very wide range or real-world service environments.

High-quality vibration simulation for a full range of vehicle components

- Body assemblies
- Instrument panels, dashboard assemblies
- Fuel tanks
- Radiators
- Engine mounts
- Exhaust systems
- Headlamp assemblies
- Batteries, battery carriages
- Powertrain mounts
- HVAC systems
- Seats
- Electrical systems
- Roof racks, bicycle racks
- Spare-wheel carriers
- Wiring harnesses
- Sunroofs

Photo courtesy of Jaguar Land Rover

Photo courtesy of IMA Dresden

Photo courtesy of CED Caligny

Photo courtesy of CED Caligny

Durability

Simulate the multi-axial loading of real-world service environments to assess the durability of components and subsystems such as cooling systems, engine mounts, seats, instrument panels and interior trim. Random loading can be employed to accelerate durability testing for components that do not require preservation of multi-axial phasing. Cycle or block cycle loading can be employed to accelerate durability tests of very simple components such as brackets.

Noise & Vibration

Perform detailed studies of nonlinear phenomena (squeaks and rattles) with exceptional accuracy and repeatability. MTS MAST systems are ideal for accurate squeak-and-rattle testing of door panels, instrument panels, seats, sunroofs and other subassemblies.

Ride Comfort

Obtain true, accelerated simulation of the proving ground or service environment in a controlled and repeatable test laboratory, using patented MTS mechanical designs and proprietary software.

Modal Evaluation

Excite structures with multiple simulation force inputs for empirical modal evaluation. Force inputs can be swept sine or random excitations. MTS software can be used for data acquisition, frequency content analysis and modal deformation plots.

Modeling

Using the MTS Virtual MAST system, integrate state-of-the-art analytical modeling techniques to predict performance with confirmatory physical testing. This accelerates design optimization and minimizes the number of required prototypes.

Special Applications

MTS MAST systems also have broad utility beyond the ground vehicle industry. For example, they have been used to conduct seismic readiness tests on nonstructural equipment such as generators and HVAC systems to meet a growing array of mandated certification requirements for public buildings and healthcare facilities.

A Diverse Family of Turnkey Solutions

The MTS MAST family comprises a diverse selection of both hexapod and orthogonal designs to address a full spectrum of simulation requirements across a wide range of test article types and geometries.

Advanced, High-frequency Hexapod Systems

Model 353.10, 353.20 and 354.20 hexapod MAST systems deliver superior service environment replication and model correlation at frequencies up to 500, 150 and 100 Hz, respectively. The unique hexapod design enables intuitively controlled excitation at high frequencies through the repeatable and simultaneous application of force and motion in all six degrees of freedom (DOF). This results in accurate simulations of difficult-to-characterize service environments through the inclusion of key high-frequency content and the excitation of critical nonlinear response effects.

Meticulously engineered to be very stiff, MTS hexapod systems deliver stable, coherent response at high frequencies, offering outstanding potential for durability and noise, vibration and harshness (NVH) testing of ground vehicle and aerospace components and subassemblies. Low noise levels and reduced sound energy radiation are also ideal for squeak and rattle applications. Typical test items include seats, radiators, instrument panels and HVAC subsystems as well as large automotive components.

MTS MAST hexapod platforms are driven by six servohydraulic actuators. An inverted, seal-less actuator design and hydrostatic bearings provide an ultra-stiff, low-friction configuration that enhances control and extends system life. Actuators are joined to the table by patented high-frequency swivel and strut assemblies. Platform position is determined by advanced digital servo-controls, using feedback from displacement and acceleration sensors. Close-coupled accumulation maximizes frequency response.

Versatile, Cost-effective Orthogonal Systems

Model 323 orthogonal MAST systems are specifically designed for multi-axial simulation testing of components and subassemblies used in automotive and aerospace vehicles. Engineered to deliver the rigidity, durability and performance required for severe test applications, they also feature a lightweight design with stiff, resonance-free tables and exceptionally precise control. These cost-effective systems are ideal for simulations that require the application of larger angular displacements and higher linear velocities at frequencies up to 50 Hz.

Model 323 systems include a stiff, resonance-free vibration table that supports the test specimen, plus longitudinal, lateral and vertical actuators. The standard configuration provides either four degree-of-freedom (4DOF) or six degree-of-freedom (6DOF) motion for the table and test specimen, depending on your specific application needs. To accomplish this, the system uses three vertical actuators that provide vertical (heave), pitch, and roll motions, plus three horizontal actuators that provide lateral, yaw, and longitudinal motions.

MTS often applies its advanced multi-axial simulation technology and expertise to meet unique mechanical testing challenges with one-of-a kind custom solutions.

Driving Simulation

Sophisticated MTS Driving Simulators are used to replicate the forces and motions of a maneuvering vehicle to study vehicle safety systems, road and highway designs, and driver behavior. The simulator features a turntable version of a 6DOF hexapod MAST driven by a custom motion control system. Large enough to accommodate a full-vehicle specimen, the turntable is encased in a large dome measuring 4.5 by 7.15 meters. The dome itself is placed on an X-Y track that allows it to move 35 meters forward or backward, and 20 meters side to side. The dome has a maximum tilt angle of 25°, while the turntable has a turning radius of 330° to reproduce the forces experienced during driving maneuvers.

Photo courtesy of Toyota Motor Corporation

Exhaust System Durability Testing

Engineered to reproduce the operating environment of a vehicle exhaust system, MTS' exhaust test solution simulates all six degrees of chassis motion at frequencies up to 50 Hz, with an additional actuator that drives torque wind-up to the engine. An engine motion simulator can also be integrated to add six degrees of engine motion input to the exhaust system for cases where an actual engine is not available.

Ride Comfort Assessment

In response to industry demands for more advanced ride comfort analysis capabilities, MTS produced a custom human-rated MAST system for gaining subjective feedback to replicated automobile ride dynamics. Featuring a 6DOF hexapod MAST capable of 100 Hz operation, this system integrates Human-in-the-Loop measurement and control capabilities, as well as the tools necessary to measure and make objective development decisions.

Rolling Road Aerodynamics Testing Systems with Model Motion

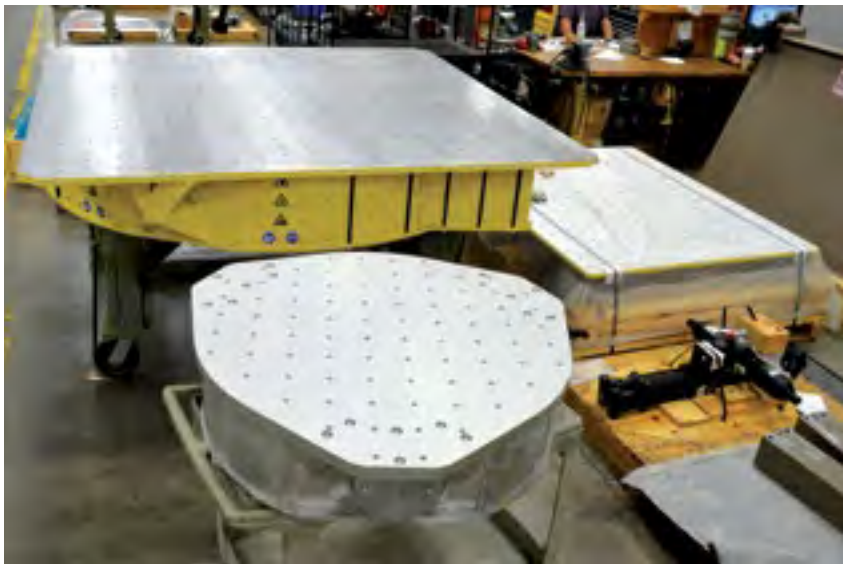
MTS Rolling Road Systems are used to enhance the quality of data collected from wind tunnel testing programs by accurately simulating ground effect conditions under the test vehicles and around rotating wheels. To achieve true dynamic realism with these systems, MTS developed an advanced Model Motion System capable of applying force and motion in multiple degrees-of-freedom to the vehicle models during aerodynamic simulations. This motion system features a tightly integrated hexapod motion platform, wheel motion system, internal model balance and sophisticated digital controls.

Based on durable designs that have been fine-tuned continually for more than three decades, MTS MAST systems offer the ideal balance between performance and total investment. Unlike tables intended for driving and flight simulation, these systems are engineered to withstand the higher payloads, forces and accelerations of even the most demanding durability testing.

MTS designs, develops and integrates all elements of its MAST systems in-house, including: tables, actuators and swivels; hydraulic power and distribution systems; and controls and software. This level of control ensures optimal system quality, reliability and performance; higher-fidelity simulations; and more meaningful results. All MTS MAST systems incorporate minimal-mass actuators and zero-backlash bearings, essential for accurate replication of real-world forces and modal response recreation.

Tables

MTS MAST systems feature lightweight tables with hollow cores and webbed construction that exhibit high stiffness-to-mass ratios; this maximizes payload capacity while ensuring that any table resonance falls outside of the test frequency range. MTS manufactures these tables in a variety of geometries and sizes.



Round and square MAST tables in various steps of production

Actuators

MTS MAST systems employ double-ended hydraulic actuators, specially engineered to minimize moving mass and maximize performance under the most demanding simulation conditions. A linear variable differential transformer (LVDT) inside each actuator generates an electrical feedback signal proportional to the actuator's position. For some applications, accelerometers are mounted near actuator/table attachment points (or the differential hydraulic pressure across the actuator is measured) to send stabilization feedback to the control system when testing large payloads. Additionally, actuator piston rods are oversized to increase lateral stiffness, avoid bending resonances and provide ample overload protection.

High-performance, double-ended actuators

Durable, maintenance-free swivels feature low-friction zero-backlash bearings

Swivels

MTS swivels are designed with a high tilt angle to accommodate large roll and pitch angles frequently required for MAST testing. High stiffness and minimized mass enable higher performance and an extended frequency operating range. MTS Swivels are oversized to provide additional overload protection, and special bearings provide for long life with minimal friction and zero backlash. They are designed to function across a wide range of temperatures and are virtually maintenance free.

Integrated ISM (Model 353.20 only)

Isolation Service Manifolds (ISMs)

Safe and trouble-free operation is a key MAST system requirement. Additionally, isolation service manifolds are required to meet regional European Norm (EN) machinery safety standards, including EN 13121, EN 13849-1, and EN ISO 4413. To fully meet these needs, MTS offers specially designed standalone and integrated (Model 353.20) ISMs to work with its MAST test solutions. These manifolds enable precise control of the hydraulic fluid flow through a MAST system during power on, power off and in the event of a system problem or E-stop, to help ensure the safety of test lab personnel and equipment.

Standalone ISM

Quiet, high-efficiency hydraulics

Reliable SilentFlo™ hydraulic power units (HPUs) provide clean and quiet operation and can be placed directly adjacent to test systems. Integrated water or air cooling systems offer even more location flexibility. MTS hydraulic service manifolds (HSM) filter and distribute fluid to actuators. The HSM provides on/off and low/high hydraulic pressure control and emergency pressure "dump" control. Hydraulic accumulators on the pressure and return lines minimize fluctuations in hydraulic fluid pressure. To protect the test specimen and test system, cross port relief valves on the HSM prevent hydraulic over-pressure during high inertial acceleration or deceleration events.

SilentFlo Hydraulic Power Unit

Model 293 Hydraulic Service Manifold

FlexTest controllers simplify MAST system setup and operation by allowing easy switching between function generation, time history control and system tuning.

Above: Hybrid vehicle battery pack vibration test.

Advanced FlexTest® Controls

MTS FlexTest controllers ensure reliable, user-friendly testing control, allowing test professionals to reproduce table signals or specimen responses in real time with exceptional accuracy and repeatability. FlexTest controllers employ advanced digital technology to drive adaptive control schemes that compensate for amplitude and phase distortion that may arise from actuator roll-off, resonances or cross-coupling between actuator channels. They also simplify setup and operation, easily switching between function generation and time history control and optimizing system tuning.

FlexTest controller software includes numerous adaptive features required to optimize MAST test system control and produce superior results; these include:

Three Variable Control (TVC) – provides a flat acceleration frequency response over a wider frequency band, enabling better high frequency control stability with less compensation

Degree-of-Freedom Control – enables control of table motion along and about each axis independently, and location of center of motion anywhere in space; especially useful for performing resonance identification with sine wave input or modal studies, or for running triaxial tests with multiple samples.

Amplitude Phase Control (APC) – facilitates adaptive compensation of fixed and swept frequency sinusoidal waveforms to maintain desired amplitude and phase relationships

Adaptive Harmonic Cancellation (AHC) – introduces input harmonics into the controller command waveform to reduce or cancel spurious feedback harmonics

Adaptive Inverse Control (AIC) – provides continuous compensation of random or time history commands for linear systems without significant cross coupling

The FlexTest controller platform can accommodate multiple command sources to satisfy a wide range of testing requirements, including:

Cyclic/Sweep Function Generator – provides frequency and amplitude adjustable sine, triangle, and square wave commands, plus sine-sweep, dwell, jog increment and target frequency functions for squeak and rattle testing

Random Function Generator – creates a band- and RMS-adjustable signal that can be frequency weighted for specimen characterization and evaluation of specimen frequency response

Time History Playback – allows RPC drive and road-surface files to be downloaded and played out for durability testing, unique road surface squeak and rattle testing, and ride comfort testing

cRPC Pro software features a streamlined design and flexible bundling that enables labs to start with a select set of capabilities that can be added to as requirements change.

Leading-edge Application Software

MTS complements its MAST system offering with a broad selection of application software, featuring the capabilities and functionality necessary for addressing a full spectrum of simulation requirements – from standard to unique.

Full-featured RPC® Pro software

RPC Pro software is the world's leading package for data validation, analysis, laboratory simulation and test monitoring. RPC Pro uses Remote Parameter Control™ techniques to quickly and accurately duplicate the service environment of full vehicles by recording parameters – strains, accelerations and displacements – on the proving ground and reproducing that environment on an MTS test fixture. RPC Pro software is design optimize to maximize the capabilities of MTS MAST test systems. It is configured to control the uncoupled motion of the table on each axis, and has command optimization methods specifically designed for MAST testing. It complements existing test system installations, providing:

- Advanced methods
- Intelligent simulation tools
- Customizable, process-driven user interfaces
- Customization and automation capabilities to meet specific needs
- Unsurpassed control techniques and analysis functionality
- Powerful diagnostics

RPC Pro Ride-Comfort Analysis Add-on

This optional software module is used to measure ride-comfort levels and evaluate discomfort using an objective, accurate and repeatable methodology, and to benchmark ride-comfort performance of competitive products.

Modular Component RPC Pro (cRPC Pro) Software

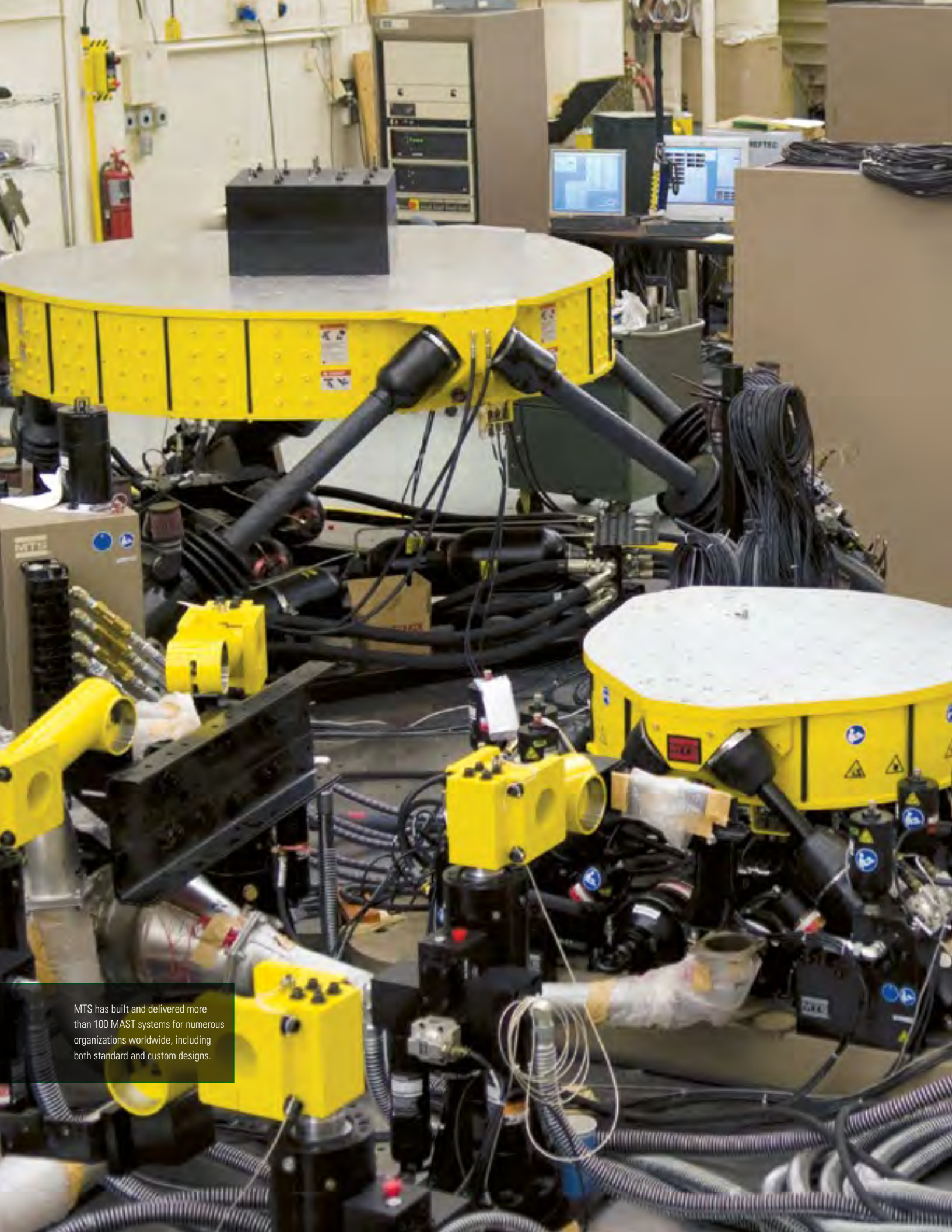
cRPC Pro software provides an affordable subset of RPC Pro capabilities specially configured for automotive component and subsystem simulation testing. Because cRPC Pro software is specifically designed for lower channel-count component testing applications, it does not include some of the more costly features required for complex full-vehicle testing. Additionally, its modular architecture and flexible bundling allows labs to purchase only what they need and add capabilities as requirements change. cRPC Pro software is easy to employ correctly – for experienced or novice users alike. A variety of helpful features guide the user through the testing process, these include:

- Preconfigured templates
- Interactive wizards
- Informative graphical displays
- Integrated data management
- Process-sensitive operations guide/ knowledge database

Versatile MTS TestSuite™ MP Elite Software

MTS TestSuite MP Elite software provides a rich set of process tools for designing customized block-cyclic test sequences that comprise commands, data acquisition, events and external activities. This diverse tool set allows engineers to quickly and efficiently create test procedures by simply adding and linking processes together in an intuitive graphic flow diagram, according to their specific test requirements. Processes of particular value for MAST system users include:

- Trend Monitoring
- Time history playback and recording



MTS has built and delivered more than 100 MAST systems for numerous organizations worldwide, including both standard and custom designs.

Unmatched Service, Support & Consulting

MTS maintains one of the industry's largest global networks of engineers, consultants and field service representatives. This team offers unmatched skill and experience, delivering responsive local service, comprehensive technical support and cost-effective preventive maintenance wherever our customers operate around the world. They are available to consult with you up front to help configure the MAST system most appropriate for your specific testing needs, as well as assist with facilities planning. MTS also offers a broad curriculum of training to optimize the effectiveness and efficiency of test lab personnel.

Extensive Optional Capabilities

If your application requires some unique features or capabilities, but not a completely customized design, a variety of options for both hexapod and orthogonal MAST systems make it simple and cost-effective to create the ideal simulation system for virtually any need.

Model 353 MAST system with integrated environmental chamber at PLDS Automotive Test Laboratory in Wetzlar Germany (Photo courtesy of PLDS Germany GmbH)

SOUND DEADENING

Sound reduction techniques help make MAST systems more suitable for noise and vibration tests.

CLOSE-COUPLED ACCUMULATORS

Close-coupled accumulators installed near the actuators minimize fluctuations in the hydraulic line. They help maintain adequate flow during short-duration, high-velocity events and ensure constant pressure at the servovalve regardless of demand.

ENVIRONMENTAL CHAMBERS

Replicate real-world service environments by applying extreme temperatures and introducing corrosive elements such as humidity and salt spray.

APPLIED TORQUE

MTS offers two types of hydraulic Torque Inputs Fixture (TIF) units to simulate engine torque for tests of engine mount systems. Orthoganal TIF units supply torque through a floating diamond crank linkage assembly mounted to the floor adjacent to a MAST system, affording maximum table performance. Rotary TIF units, while mounted to the table, represent a far simpler configuration. Both units can be employed to apply torque through two drive shafts for front wheel drive vehicles, or through a single shaft for conventional rear wheel drive vehicles.

Model 353 & 354 (6DOF Hexapod) Specifications[1, 2, 3, 4]

	Units	353.10 Round Table	353.20 Round Table	353.20 HP Round Table	353.20 Square Table	353.20 HP Square Table	353.50 Square Table	354.20 Square Table
Table Size	mm	1.0 dia.	2.0 dia.	2.0 dia.	2.2 x 2.2	2.2 x 2.2	2.5 x 2.5	2.2 x 2.2
	ft	3.3 dia.	6.8 dia.	6.8 dia.	7.2 x 7.2	7.2 x 7.2	8.2 x 8.2	7.2 x 7.2
Simulation Frequency (bare table)	Hz	0.8-500	0.8-150	0.8-150	0.8-150	0.8-150	0.8-100	0.8-100
Simulation Frequency (max payload)	Hz	0.8-250	0.8-100	0.8-100	0.8-100	0.8-100	0.8-100	0.8-100
Maximum Payload	kg	500	680	1000	680	1000	3000	2000
	lbs	1102	1499	2205	1499	2205	6600	4409
Table Mounting Pattern[6]	mm	100 x 100	100 x 100	100 x 100	100 x 100	100 x 100	200 x 200	100 x 100
	in	3.94 x 3.94	3.94 x 3.94	3.94 x 3.94	3.94 x 3.94	3.94 x 3.94	7.9 x 7.9	3.94 x 3.94
Actuator Peak Force (172 bar - 353.10; 210 bar - 353.20 & 354.20)	kN	22.2	70.6	70.6	70.6	70.6	250	67
	kip	5.0	15.9	15.9	15.9	15.9	56.2	15.1
Linear Displacement								
Vertical (Z)	± mm	36	145	140	145	140	164	140
	± in	1.42	5.71	5.51	5.71	5.51	6.46	5.51
Lateral (Y)	± mm	31	115	110	115	110	170	110
	± in	1.22	4.53	4.33	4.53	4.33	6.69	4.33
Longitudinal (X)	± mm	35	130	125	130	125	200	125
	± in	1.38	5.12	4.92	5.12	4.92	7.87	4.92
Angular Displacement								
Roll	± deg	4.6	8.5	8	8.5	8	10	9
Pitch	± deg	4.1	7.5	7	7.5	7	10	8
Yaw	± deg	3.5	6	5.5	6	5.5	8.4	6
Linear Velocity								
Vertical (Z)	mm/s	950	1200	1200	1200	1200	2180	1700
	in/s	37.40	47.24	47.24	47.24	47.24	85.83	66.93
Lateral (Y)	mm/s	850	900	900	900	900	1800	1300
	in/s	33.47	35.43	35.43	35.43	35.43	70.87	51.18
Longitudinal (X)	mm/s	850	1000	1000	1000	1000	1740	1350
	in/s	33.47	39.37	39.37	39.37	39.37	68.50	53.15
Angular Velocity								
Roll	deg/s	140	78	78	78	78	110	78
Pitch	deg/s	130	70	70	70	70	110	70
Yaw	deg/s	105	50	50	50	50	90	50
Linear Acceleration (bare table)								
Vertical (Z)	g	27.0	18.1	18.1	16.0	16.0	16.0	15.9
Lateral (Y)	g	19.5	14.1	14.1	12.5	12.5	8.5	11.6
Longitudinal (X)	g	21.0	16.7	16.7	14.8	14.8	7.5	12.8
Linear Acceleration (max payload)								
Vertical (Z)	g	10.0	11.1	9.4	10.3	8.8	9.5	6.0
Lateral (Y)	g	7.0	8.6	7.3	8.0	6.8	5.5	4.2
Longitudinal (X)	g	7.8	10.2	8.7	9.5	8.1	6.0	4.8

353.20

354.20

Model 323 (6DOF Orthogonal) Specifications[1, 2, 3, 4]

	Units	323.10 Square Table	323.20 Square Table	323.30 S Square Table	323.40 Square Table
Table Size[5]	m	1.5 x 2.2	1.5 x 2.2	1.5 x 2.2	1.5 x 2.2
	ft	5 x 7	5 x 7	5 x 7	5 x 7
Simulation Frequency (bare table)	Hz	50	50	50	50
Simulation Frequency (max payload)	Hz	50	50	50	50
Maximum Payload	kg	500	680	680	680
	lbs	1102	1499	1499	1499
Table Mounting Pattern[6]	mm	100 x 100	100 x 100	100 x 100	100 x 100
	in	3.94 x 3.94	3.94 x 3.94	3.94 x 3.94	3.94 x 3.94
Actuator Peak Force (172 bar)					
Vertical (Z)	kN	± 35.6	± 35.6	± 67	± 67
	kip	± 8	± 8	± 15	± 15
Lateral (Y) & Longitudinal (X)	kN	± 25	± 25	± 50	± 50
	kip	± 6	± 6	± 11	± 11
Linear Displacement[7]					
Vertical (Z)	± mm	75	125	75	125
	± in	2.95	4.92	2.95	4.92
Lateral (Y)	± mm	75	75	75	75
	± in	2.95	2.95	2.95	2.95
Longitudinal (X)	± mm	75	75	75	75
	± in	2.95	2.95	2.95	2.95
Angular Displacement					
Roll	± deg	6.8	14	6.8	14
Pitch	± deg	8.5	11.3	8.5	11.3
Yaw	± deg	8.5	5.4	8.5	5.4
Linear Velocity[7]					
Vertical (Z)	mm/s	700	700	1950	1950
	in/s	27.56	27.56	76.77	76.77
Lateral (Y)	mm/s	1000	1000	1570	1570
	in/s	39.37	39.37	61.81	61.81
Longitudinal (X)	mm/s	750	750	1200	1200
	in/s	29.53	29.53	47.24	47.24
Linear Acceleration[7] (max payload)					
Vertical (Z)	g	5.0	5.0	10	10
Lateral (Y)	g	3.3	3.3	6.5	6.5
Longitudinal (X)	g	2.4	2.4	4.3	4.3

1. *All linear and angular translation, velocity and acceleration values are based on single degree of freedom table movement about, or from the table-top center.*
2. *All velocity and acceleration values are peak levels. Indicated levels of performance are not achievable throughout the simulation frequency range.*
3. *Maximum performance is only achievable when payload is mounted wholly within 1m radius (in X-Y plane) of the table center. Stated performance cannot be realized with all specimens as it is dependent on specimen modes and attachment to the table.*
4. *Assumes solid steel test payload rigidly mounted above the table-top center*
5. *323 systems also available with 5 x 6 ft table*
6. *Table Mounting Hole Sizes:*
   - *» 353.10 = M10 x 1.5*
   - *» 353.20 = M12 x 1.75*
   - *» 354.20 = M12 x 1.75*
   - *» 323.X = M12 x 1.75 or ½-13*
7. *Translational, not simultaneous*

Note: The MAST system performance capabilities on page 18 and 19 are estimates that are subject to change at any time by MTS Systems Corporation. Possession of this information is not a guarantee that a system will perform as predicted. MTS will not be liable for any incidental or consequential damages or losses arising from use of this information. Interpretation of the data and its use are the sole responsibility of the user.

323.20

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