

Multi Axis Systems

High Performance
Test Systems



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eMpulse
test systems

Servoelectric Multi Axis Systems

Accurately replicate complex dynamic motion, real-world vibrations, stress, and strain with 3 (3-DOF) and 6 degrees of freedom (6-DOF) tables, our systems provide precise multi-axial control, accommodating hexapod, orthogonal, and custom configurations to meet diverse testing requirements.

Utilizing servoelectric technology, eMpulse MAST systems deliver higher fidelity, reduced maintenance, and up to 80% energy savings over hydraulic alternatives. Integrated with advanced control algorithms, they achieve high-frequency response, precise motion replication, and enhanced durability.

eMpulse systems are designed for precise multi-axis testing, allowing simultaneous linear and rotational motion control for realistic simulation of real-world loading conditions. Configured for motion in vertical, lateral, and longitudinal axes, 3-DOF systems accurately reproduce complex loading for NVH, structural, and durability testing. All MAST solutions comply with SAE, ISO, and industry standards for automotive, aerospace, and industrial applications.

- Durability
- Noise, Vibration, and Harshness (NVH)
- Ride Comfort
- Modal Correlation
- SAE and ISO Test Specifications



Configurations

The seaMAST has been designed and can be configured to meet the needs of diverse industries, products, and applications.

Hexapod systems offer versatility by providing motion and force in all 6 degrees-of-freedom, which makes them well-suited for applications that require complex motion. Hexapod systems can also offer high accuracy, repeatability, and frequencies in excess of 200 Hz.

Orthogonal systems typically consist of three vertical actuators, with a combination of at least one actuator in a horizontal axis opposed by 2 actuators in the other horizontal axis to fully provide true 6 degrees-of-freedom in X, Y, Z, Roll (rotation about the X axis), Pitch (rotation about the Y axis), and Yaw (rotation about the Z axis). By optimizing the system to specific combinations of stroke, velocity, and acceleration performance, orthogonal systems are easily adapted to meet customer-specific needs.

Custom configurations are often designed for project and application specific requirements.



Advantages of Servoelectric Multi Axis Systems

Extended Stroke and Velocity

Servoelectric linear or rotary motors provide the actuation to drive multi axis simulation tables in a variety of different geometric configurations. Common system arrangements include both orthogonal or hexapod 6-DOF, which provide X, Y, Z linear and Roll, Pitch, and Yaw rotational motions. Also available in other configurations, including linear only 3-DOF, for X,Y,Z motion profiles.

High Fidelity Feedback and Control

High precision 32-bit closed-loop control ensures smooth, accurate motion across all test speeds, without switching valve types or control strategies.

High-Frequency Capability

Motor coherence up to 400 Hz enables test profiles that demand high dynamic response, exceeding the capabilities of servo-hydraulic actuators.

Solid Welded Construction

Precision CNC machined and ground surfaces to 0.0001" tolerances to ensure perfect alignment for system longevity. Nickel plating surfaces resist long-term corrosion better than zinc, powder-coating, or paint.

Force Range and Modular Design

Modular motor configurations deliver a wide range of table sizes and payload capabilities up to 1000kg.

Efficient, Clean Operation

Up to 80% more efficient than hydraulics, with no fluid handling, reduced maintenance, and a cleaner test environment.

Thermal Management

Increased efficiency in converting electrical to mechanical energy, results in significantly lower heat generation. This improved efficiency reduces the size of the active cooling infrastructure, minimizes thermal loading on components, and contributes to lower overall operational costs.

Application-Specific Software

Integrated with eMpulse controls that feature application-specific software, seaPLUS MAST systems are ideal for field data reproduction, sine sweep, or Power Spectral Density (PSD) profile replication.

Integrated Safety Features

These features are built into the control architecture to ensure operator safety and specimen integrity during every test cycle.

Included comprehensive safety monitoring:

- Safe Limited Speed (SLS)
- Safe Limited Acceleration (SLA)
- Absolute encoder fault detection
- Safe Torque Off (STO)
- Internal motor/drive temperature monitoring
- Customizable specimen-specific protection limits

Nanometer-Level Accuracy

Integrated displacement feedback systems offer <10 nm resolution, supporting high-precision test requirements.

Sideload Capacity

Outboard bearings significantly improve sideload tolerance, outperforming comparable servohydraulic systems in lateral stability and reliability.

Reliable and Flexible Design

Liquid cooled rotary motors with link arms combined with stingers achieve the right balance between available travel and peak acceleration.

Pneumatic Support

Pneumatic Static Load Support supports the specimens and table weight, which allows the motors to provide the full dynamic force capacity independent of static weight.

MAST Specifications

SPECIFICATIONS		15-1S	15-1S-HP	35-2S	69-2.2S
	units				
Table Size	m in	1.2 x 1.2 48.0" x 48.0"	1.2 x 1.2 48.0" x 48.0"	2.0 x 2.0 78.7" x 78.7"	2.2 x 2.2 86.6" x 86.6"
Minimum Simulation Frequency Range	Hz	>0-200	>0-400	>0-200	>0-200
Rated Payload	Kg	500	400	500	1000
	Lb	1102	880	1102	2205
Actuator Peak Force (standard moment arm)	KN	15.4	15.4	34.5	69
	Kip	3.5	3.5	7.8	15.5
Linear Displacement (total Pk-Pk)					
Longitudinal (X)	mm in	94 3.7	94 3.7	220 8.66	220 8.66
Lateral (Y)	mm in	82.8 3.26	82.8 3.26	250 9.84	250 9.84
Vertical (Z)	mm in	80.8 3.18	80.8 3.18	345 13.6	345 13.6
Angular Displacement (total Pk-Pk)					
Roll	deg	13.8	13.8	18.8	18.8
Pitch	deg	12.6	12.6	20.9	20.9
Yaw	deg	11.4	11.4	12.4	12.4
Linear Acceleration (bare table)					
Longitudinal (X)	+/- g	19.4	13.0	11.0	10.2
Lateral (Y)	+/- g	16.3	14.0	11.0	13.6
Vertical (Z)	+/- g	14.3	15.0	13.5	13.5
Linear Acceleration (at Rated Payload)					
Longitudinal (X)	+/- g	4.2	6.3	7.2	7.2
Lateral (Y)	+/- g	5.8	6.4	7.2	7.6
Vertical (Z)	+/- g	6.3	9.7	9.5	10.8

A photograph of an industrial testing facility. In the foreground, a large yellow platform is mounted on a blue and white base. The background shows a complex network of pipes, cables, and structural elements. A green diagonal overlay covers the left side of the image.

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