

eMpulse Test Systems

High Performance
Test Systems



eMpulse
test systems



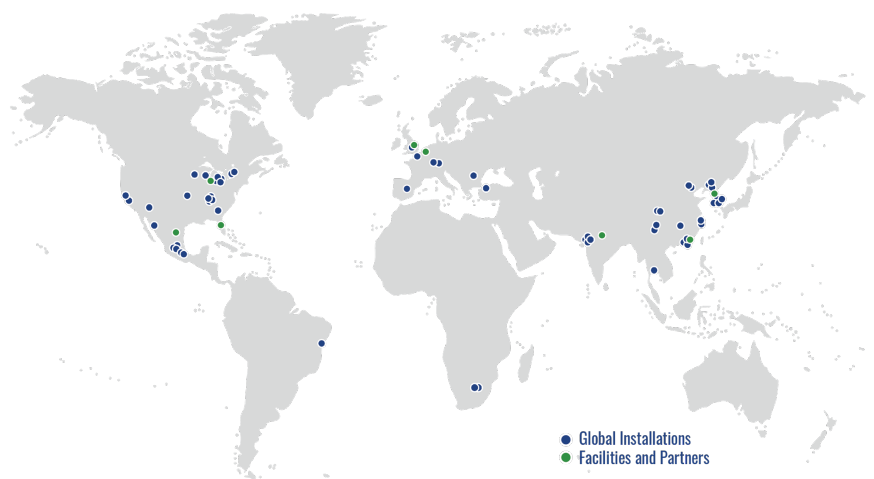


Global Expert in Servoelectric Test Systems

eMpulse servoelectric test systems are designed to deliver high force output, high fidelity, and extended stroke capabilities—while maintaining lower energy consumption than servo-hydraulic systems. By integrating liquid-cooled motor and our proprietary custom control architectures developed around the Siemens motion control platform, our systems support faster thermal recovery and sustained high-duty-cycle operation.

This combination of precision and efficiency enables continuous cyclic testing over long durations, making eMpulse systems ideally suited for demanding NVH, structural, and durability testing. The scalable design and adaptability of our actuation technology also allow for custom configurations tailored to specific testing requirements.

With over 200 systems deployed globally, eMpulse has demonstrated the ability to meet complex testing needs with reliability, repeatability, and measurable performance advantages across industries.



Advantages of Working with eMpulse Servoelectric Systems

Increased Performance and Accuracy

High-Resolution Optical Encoder Feedback: Motors equipped with high-resolution optical encoders capable of achieving an impressive resolution of 10nm (0.00001mm). This level of precision ensures accurate measurement and control, enabling detailed analysis of the design under test (DUT) performance under various conditions, and unmatched repeatability.

Fully Digital Signal Processing: Signals are processed digitally, eliminating noise and signal drift that often plague analog systems. Digital processing enhances reliability, particularly in high-demand testing environments.

Proven Software Integration: Ensures seamless integration into existing workflows, reducing setup time and improving operational efficiency.

Real-Time Digital Communication: Components within the system are interconnected via real-time digital communication protocols. This architecture minimizes latency, enabling rapid adjustments and maintaining synchronization across the system.

High Fidelity and Low Noise: High fidelity 32-bit closed-loop control ensures smooth, accurate motion across all test speeds, without switching valve types or control strategies. The system's design prioritizes signal integrity. Low noise levels enhance the accuracy of test results, particularly in scenarios requiring fine resolution.

High Frequency Response: The eMpulse systems support high-frequency response, critical for replicating dynamic conditions in real-world scenarios.

Greater Efficiency

Direct-drive electric motion is more efficient than hydraulics - resulting in only 1/5 of the energy consumption, no fluid handling, reduced maintenance, and a cleaner test environment.

High-Frequency Capability

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

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.

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.

Improved Reliability

A less complicated actuator assembly resulting in fewer parts yields an increase in reliability and lower maintenance costs.

Integrated Safety Features

Our actuators are compact, easy to install, and require minimal maintenance, resulting in lower overall system costs. These features are built into the control architecture to ensure operator safety and specimen integrity during every test cycle. Every system includes 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

Reduced Maintenance

Servolectric actuators are compact, easy to install, and require minimal maintenance, resulting in lower overall system costs.

Improved Troubleshooting

Smart diagnostics capability within the controls can direct operators to the specific hardware causing a fault condition. Remote log-in capability allows eMpulse engineers to aid in troubleshooting anywhere in the world.

Customizable and Configurable

The adaptability of our servoelectric actuation technology allows us to easily develop custom solutions for unique testing scenarios, ensuring that even the most specialized testing needs are met with precision and efficiency. This innovation allows for continuous cyclic testing that can run uninterrupted for days or even weeks, facilitating accelerated lifecycle analysis and precise failure mode determination across a wide range of industries and applications.

Robust Design

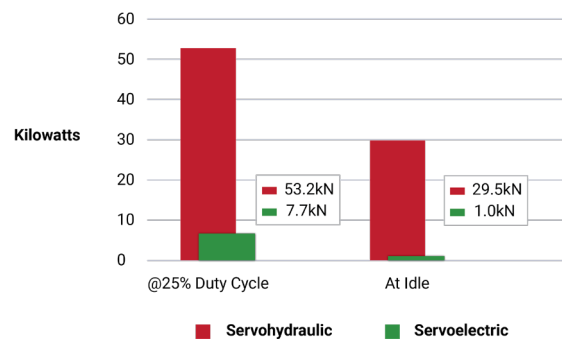
Built to operate reliably in harsh environments with exposure to shock, vibration, extreme temperatures and environments.

Sustainability

Our systems operate without hydraulic fluid, eliminating the need for fluid handling, filtration, spill containment, or waste disposal. They generate less heat and noise, and produce lower idle power consumption. High-efficiency motors and regenerative energy recovery reduce overall electrical usage, and the absence of pumps and valves decreases maintenance requirements and consumable waste.

These factors contribute to cleaner operation, reduced resource consumption, and lower environmental impact throughout the system's service life.

POWER USAGE FOR 41kN 4-POSTER



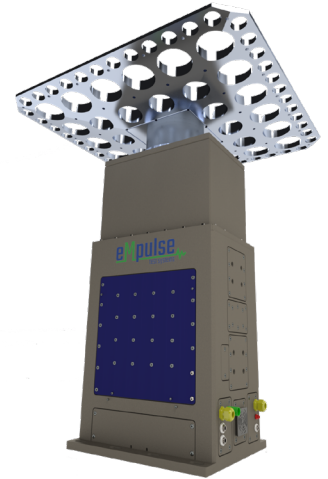
Comparison of servoelectric actuation systems versus servohydraulic actuation systems at idle and at typical operation cycle with a 25% duty cycle

Systems

Single Axis Test Systems

Engineered for NVH and durability testing, this system delivers superior performance with minimal maintenance requirements, making it an eco-friendly and cost-effective alternative to traditional hydraulic systems for various applications.

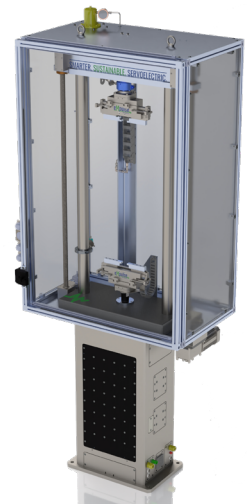
Durability | Noise, Vibration, and Harshness (NVH)
 Research and Development | End-of-Line Production
 Accelerated Life | Packaging



Load Frame Test Systems

Developed for precise force and displacement control for single-axis durability, fatigue, and structural testing. Engineered for high dynamic performance and superior reliability, these systems support a range of testing applications, including damper characterization, elastomer testing, and structural component evaluation.

Research and Development | End-of-Line Production
 Accelerated Life | Durability



Road Simulator Test Systems

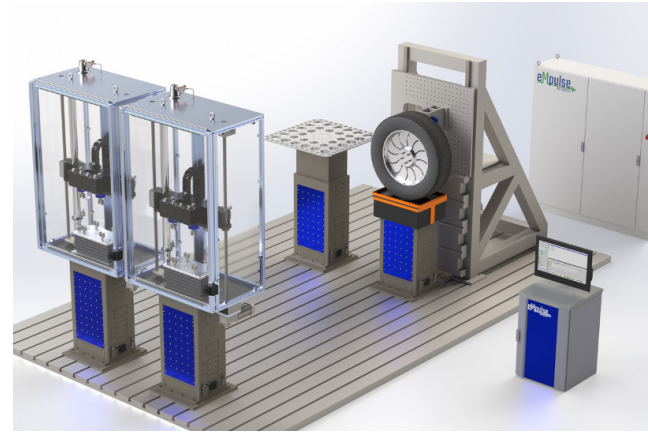
Reproduce real-world dynamic conditions across various surfaces and environments. Available in 4-Poster, body-coupled, and aero loading configurations, they support durability, structural, and vibration testing across a broad range of applications.

Durability | Noise, Vibration, and Harshness (NVH)
 Research and Development | End-of-Line Production
 Accelerated Life | Buzz, Squeak, and Rattle (BSR)



eMtest - Modular Configurations

Configurable test platform utilizing four servoelectric actuators arranged in either vertical or horizontal orientation - operating independently or in coordinated motion. Designed for flexible test setup, it supports synchronized multi-axis control, independent channel operation, and load sharing configurations.



Multi Axis Test Systems

The Multi Axis Test System accurately replicates complex dynamic motion, simulating real-world vibrations, stress, and strain experienced by products across industries. With 3 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.

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



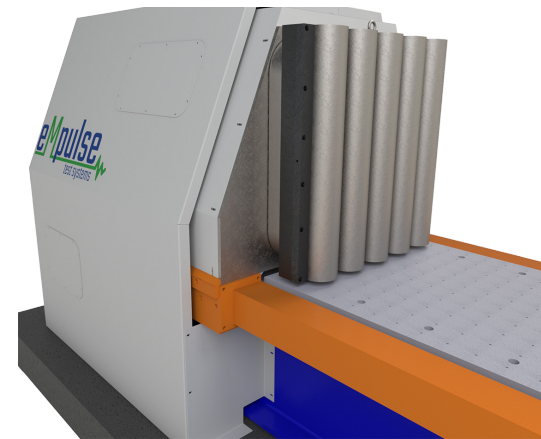
Servo Controller

The eMcontrol real-time servo controller is compatible with both eMpulse servoelectric systems and existing servohydraulic test systems. By supporting both, eMcontrol provides a cost-effective upgrade path, enabling phased replacement of hydraulic components without requiring a full overhaul of the servo control system.



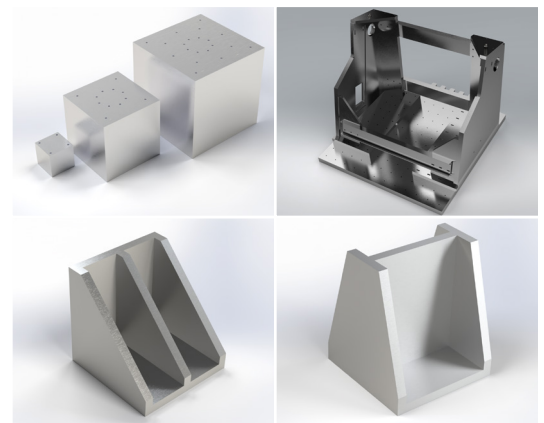
Battery Crusher

Engineered to meet the rigorous SAE J2464 standards. These systems are essential for ensuring the highest levels of safety and performance in Automotive EV batteries, providing comprehensive and reliable testing solutions for the evolving electric vehicle industry.



Vibration Fixtures

Engineered to eliminate unintended vibrations, ensuring clean, repeatable results across all test conditions.



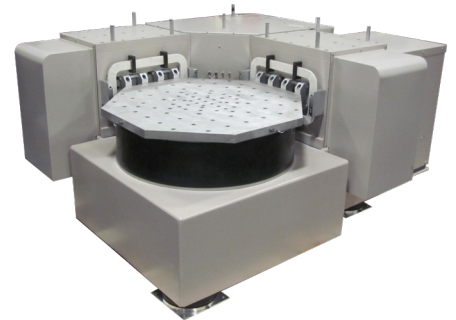
General Purpose Electric Linear Actuators

For general purpose linear motion testing applications, these cost effective electric linear rod actuators are an ideal alternative to traditional pneumatic and hydraulic cylinders. The electric linear actuators feature roller screw linear motion driven by either integrated or belt coupled servo motors.



Dual Axis Electrodynamic Shaker Systems

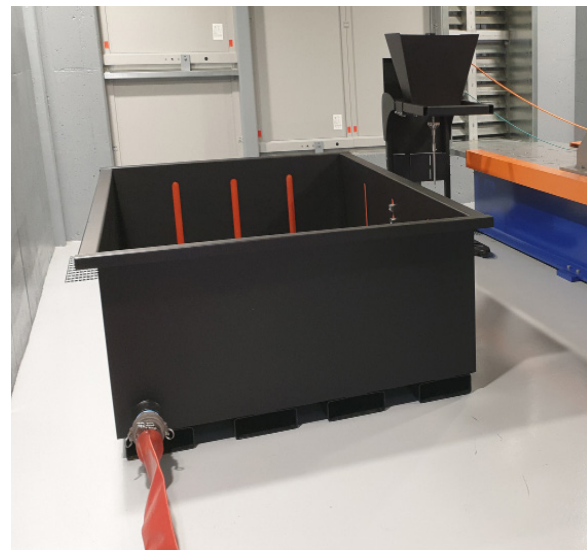
Delivers fast, precise, and efficient vibration testing. By applying vibration in two perpendicular axes simultaneously, it reduces test cycle time, minimizes handling, and provides more realistic simulations of real-world conditions. This system is ideal for both product qualification and high-volume production screening.



Durability | Noise, Vibration, and Harshness (NVH)
Research and Development | Buzz, Squeak, and Rattle (BSR)
End-of-Line Production | Accelerated Life

Nail Penetration - Battery

Provides long, robust actuator life due to inverted roller screw technology. Compact, power-dense integrated motor actuator improves motion control compared to fluid actuation systems



Heat Exchanger Test Systems

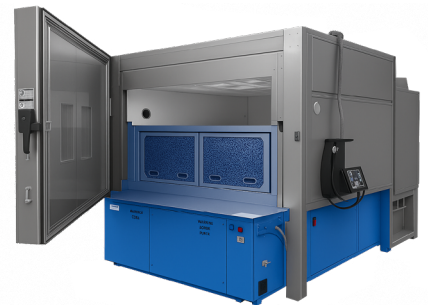
With over four decades of experience in supplying advanced test equipment, we bring specialized expertise in the design and implementation of fluid durability test systems, addressing complex and niche testing requirements with precision and reliability.

Radiators | Pumps | Air Induction System | Oil Coolers
Refrigerant Heat Exchangers | Hoses and Connectors
Intake Manifolds | Charge Air Coolers/Intercoolers



Thermal Shock Modules

Upgrade existing AGREE chamber into a two-zone thermal shock system. Delivers faster qualification testing, improved control, and seamless integration.



Custom Solutions

Active Damper Feedback

Isolated Suspension Durability Test System

Hardware in the Loop/Human in the Loop

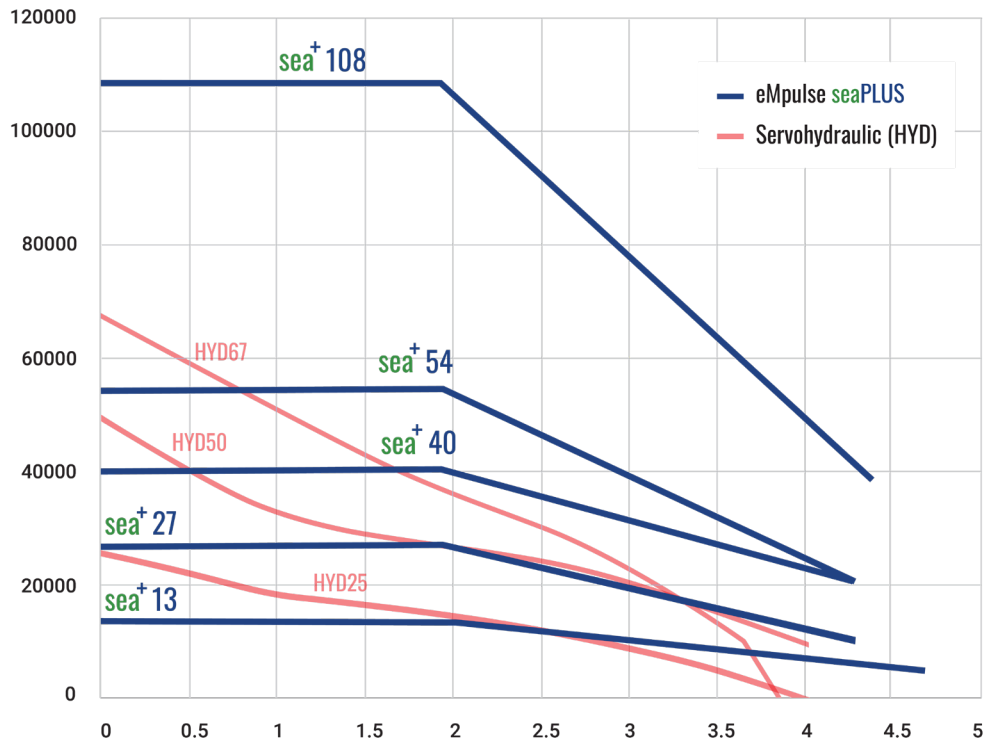
Quarter Car Test System

Technological Comparison

Versatile systems for numerous testing environments and applications.

Technology	Stroke	Frequency
Servo-Hydraulic	Longer stroke, 300mm+ _{p-p}	Lower Frequencies, 0-50hz
Servoelectric - eMpulse	Longer stroke, 300mm+ _{p-p}	Lower Frequencies, 0-500hz
Electro-Dynamic	Short stroke, 25mm-100mm _{p-p}	High Frequencies, 10-2000hz

Force Available vs Velocity
Based on Published Research



Specifications Example

Single Axis Test System Specifications

SPECIFICATIONS ¹	SYMBOL	UNITS	sea* 13		sea* 27		sea* 40		sea* 54		sea* 108	
Stroke² Working Stroke, peak - peak	s	mm (in)	160 (6,3)	260 (10,2)	160 (6,3)	260 (10,2)	160 (6,3)	260 (10,2)	160 (6,3)	260 (10,2)	160 (6,3)	260 (10,2)
Motor Dynamic Peak Force Motor Peak Force	Fpk, mot	N (lbF)	13.486 (3.032)		26.910 (6.049)		40.326 (9.065)		53.820 (12.100)		107.640 (24.200)	
Motor Continuous Dynamic Force³ Motor Continuous or RMS Force	Fn, mot	N (lbF)	5.018 (1.128)		10.530 (2.367)		21.060 (4.734)		21.060 (4.734)		42.120 (9.469)	
Static Load Support Max Air Spring Capacity at Prated	Fpk, air	N (lbF)	7.117 (1.600)		14.235 (3.200)		14.235 (3.200)		14.235 (3.200)		28.470 (6.400)	
Total Peak Force Fpk mot + Fpk air	Fpk, total	N (lbF)	20.603 (4.632)		41.145 (9.249)		54.561 (12.265)		68.055 (15.299)		136.110 (30.598)	
Total Continuous Force Fn,mot + Fpk,air	Fcont, tot	N (lbF)	12.135 (2.728)		24.765 (5.567)		35.295 (7.934)		35.295 (7.934)		70.590 (15.869)	
Velocity max at Fn,mot	Vmax, fn	m/s (in/s)	4,6 (181)		4,2 (165)		4,2 (165)		4,2 (165)		4,2 (165)	
Velocity max at Fpk,mot	Vmax, fpk	m/s (in/s)	2,0 (78,7)		1,9 (74,8)		1,9 (74,8)		1,9 (74,8)		1,9 (74,8)	
Acceleration max (unloaded)	gmax	G	45	36	44	31	42	40	55	49	50	45
Absolute Digital Encoder Resolution	Δs	nm (in)	<10, or 0.01um (<3,94E-07)									
Noise Level – Typical (NVH Mode)	SPL(A)	dbA	<55									
Safety Rating, DIN EN 61508***	SIL		2									
Safety Rating, DN EN ISO 13849-1	Cat		3									
Performance, DIN EN ISO 13849-1	PL		D									
Bearing Materials			Qty 4 - Prelubricated, preloaded t-rail caged roller bearings. Replacement interval: 15 years under designed usage.									
Facility Requirements		V A	380-480Vac, 3φ, 50-60 Hz Current Rating based on motor sizing and system performance requirements.									
Air Supply, Rated	Prated	Psi (bar)	100 Higher Static Load Support possible at higher supply pressures. (6,9)									
Recommend Liquid Cooling Flow, approximately 20deg delta C	Q	Lpm (gpm)	20 (5,3)		22 (5,8)		26 (6,9)		26 (6,9)		52 (13,7)	
Max Motor Heat Removal @100% duty cycle, full durability rating	Qp	kW Btu/hr ton	15,5 52.832 4,4	29,4 100.205 8,4	29,4 100.205 8,4	53,8 183.713 15,3	53,8 183.713 15,3	53,8 183.713 15,3	107,7 367.426 30,6	107,7 367.426 30,6		



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