

seaPLUS SINGLE AXIS SHAKER

SMARTER.
SUSTAINABLE.
SERVOELECTRIC.



Rev: 2.0 MAR2025

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The seaPLUS Single-Axis Shaker by eMpulse Test Systems combines precision, efficiency, and reliability in a cutting-edge servoelectric design. 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. Ideal for a range of industries, the seaPLUS Single-Axis Shaker ensures consistent, repeatable results while offering unparalleled control and adaptability to meet your testing needs.

seaPLUS SINGLE AXIS SHAKERS

The seaPLUS series by eMpulse Test Systems offers superior efficiency and extended performance. With a 46% higher performance over previous systems, the seaPLUS series widens the performance gap between our servoelectric technology and comparable hydraulic systems. seaPLUS further enhances durability and expands testing capabilities across a wider range of applications and industries.

The key benefits of seaPLUS single axis testing technology include:

Higher Accuracy and Increased Performance: SEA systems are not affected by many physical constraints that reduce system accuracy and repeatability, such as oil viscosity changes with temperature, accumulator pressure, servo valve wear, flow restrictions, seal friction, hydraulic resonances, and oil contamination. Additionally, the seaPLUS systems deliver increased performance by achieving higher velocities at higher forces, with 3X higher frequency response, resulting in significantly lower RMS errors compared to hydraulic systems.

- **High-Resolution Optical Encoder Feedback:** At the core of the eMpulse systems are 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 damper performance under various conditions.
- **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:** The system's design prioritizes signal integrity, ensuring high fidelity in measurements. 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.

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

Greater Efficiency: In comparable use cases, SEA systems use less than 20% of the electrical energy compared to hydraulic systems.

Safer Operation: The seaPLUS eliminates the potential for high pressure oil leaks and related environmental pollution. The seaPLUS also utilizes safety integrated functions that allow for safety limited acceleration, velocity and force (current) to be configured for specific applications or testing.

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.

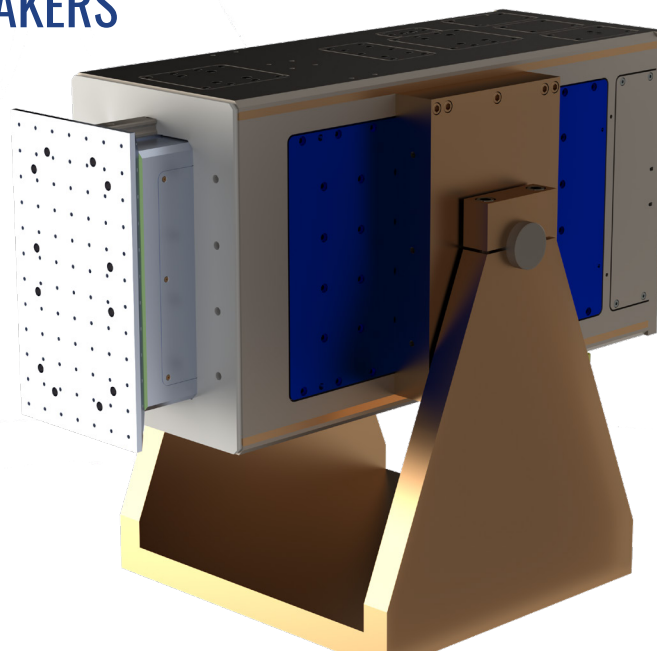
Reduced Maintenance: Servoelectric actuators are compact, easy to install, and require minimal maintenance, resulting in lower overall system costs.

Cleaner Environment: Hydraulic fluids can be hazardous to the environment, and the process of disposing of used fluids can be costly and complex. Servoelectric systems do not require any fluids, making them a cleaner and safer alternative.

APPLICATIONS FOR seaPLUS SINGLE AXIS SHAKERS

We offer standard (vertical and horizontal) and custom configurations for various applications, such as:

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



seaPLUS SINGLE AXIS SHAKERS 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	ms/ (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 0.01μm (<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 (6.9) Higher Static Load Support possible at higher supply pressures.									
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)	

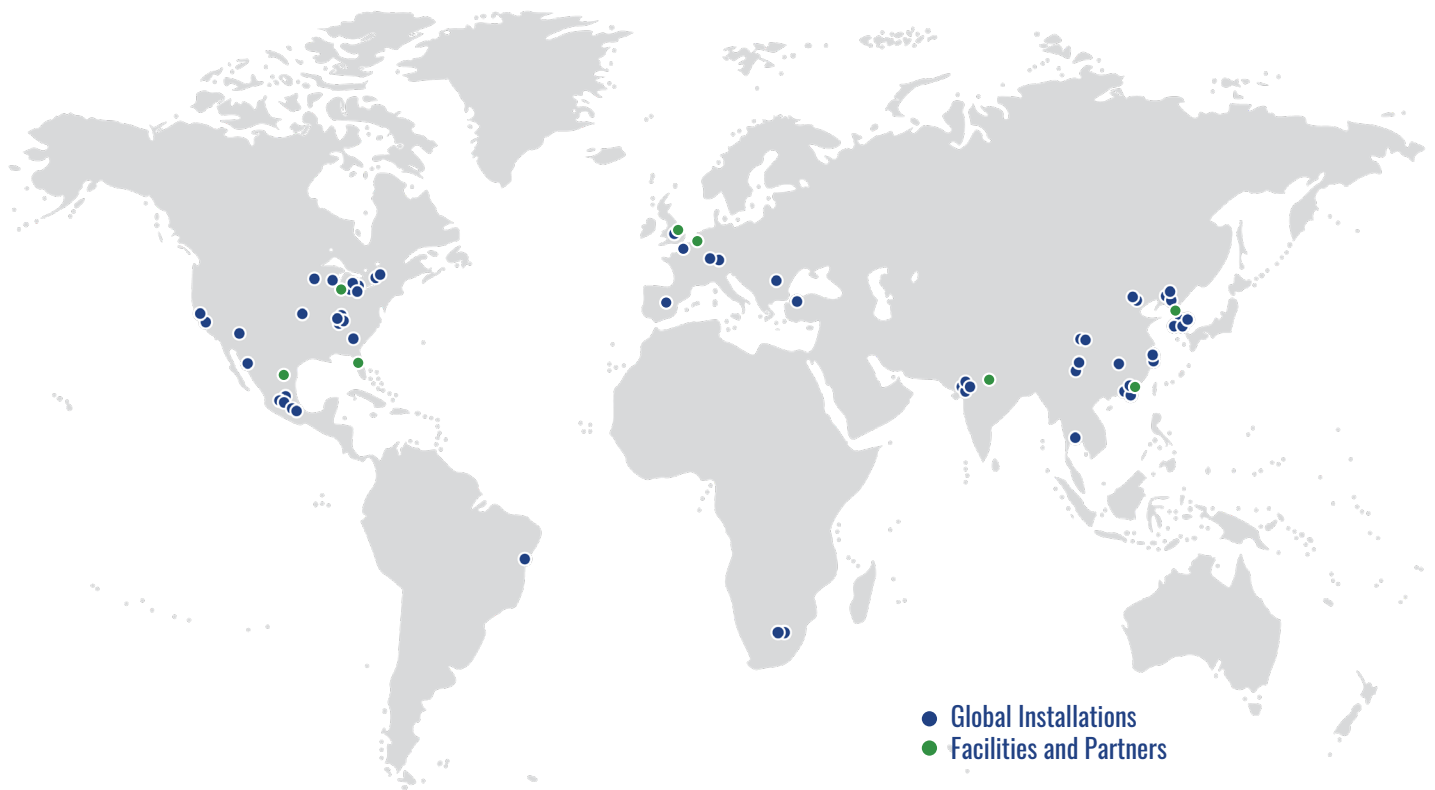
Notes:

1. All performance parameters are estimates based on design considerations and are subject to change at any time.
As such, eMpulse cannot be held liable for any incidental or consequential damages or losses arising from the use of this information.
2. Custom Strokes are available upon request.
3. Continuous or RMS Dynamic Force, independent of Air Support for inertial or compressed spring loads, is achievable with liquid cooling option rated for Max Motor Heat Removal at 100% duty cycle Qp.

Interpretation and use of the data are the sole responsibility of the user. Please consult eMpulse Test Systems for further clarification.



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