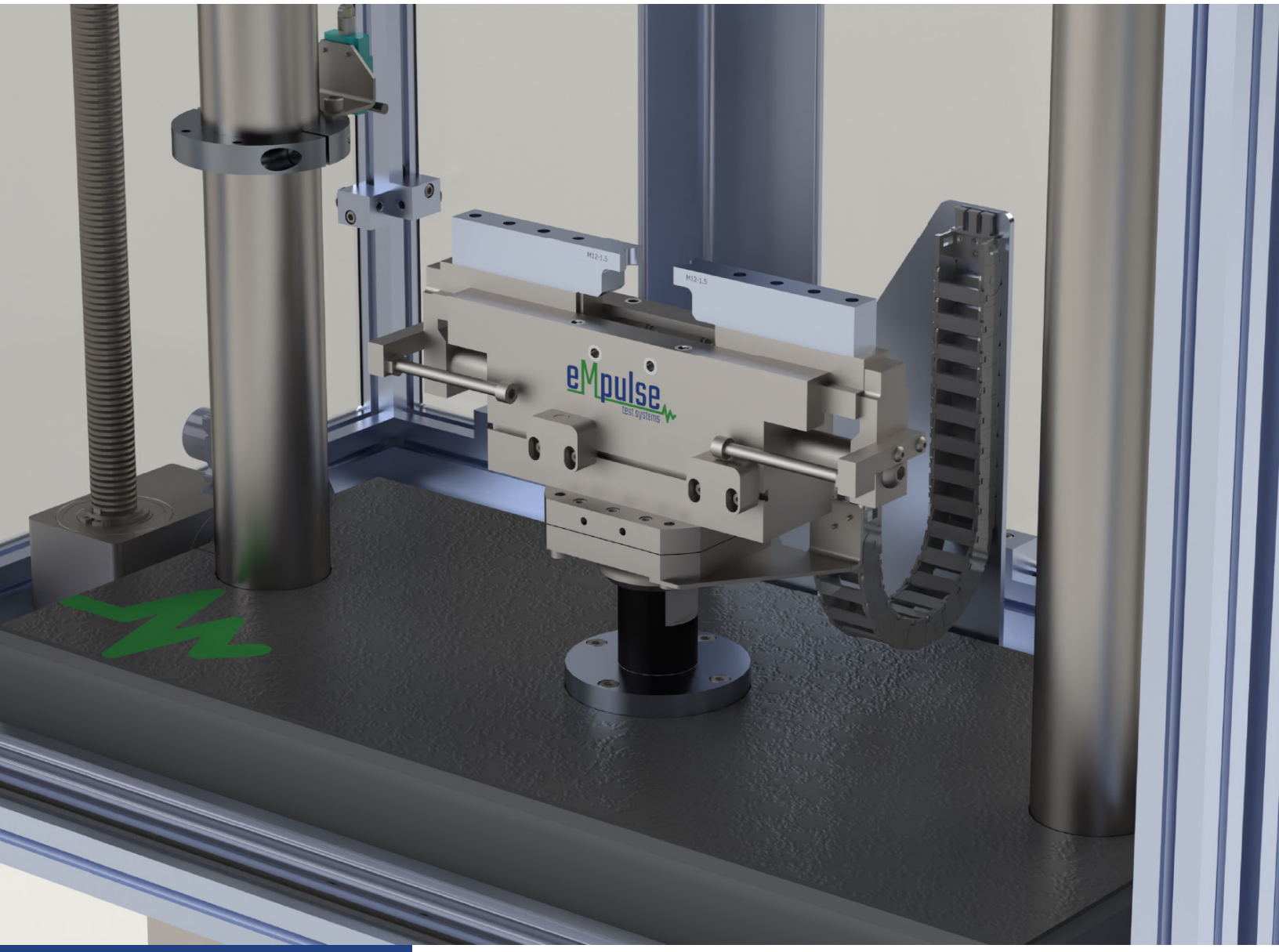
eMpulse
test systems



seaPLUS LOAD FRAMES

SMARTER.
SUSTAINABLE.
SERVOELECTRIC.

Rev: 3.0 MAR2025

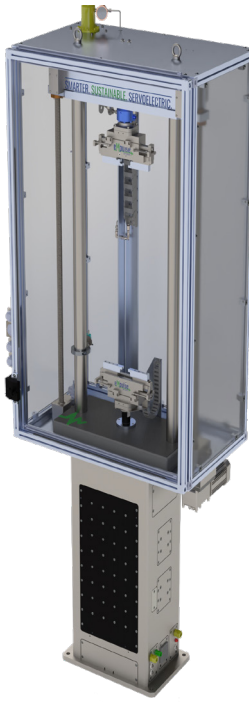
SMARTER. SUSTAINABLE. SERVOELECTRIC.

Servoelectric load frames are a valuable tool to test the performance, durability, material characteristics, and service life of essential assemblies or individual components, including dampers, springs, struts, engine mounts, bushings, and more.

seaPLUS LOAD FRAMES

Designed to replace servo hydraulics and exceed the performance of other electric options, the seaPLUS series of Load Frame test systems provide a clean, efficient, and dynamically responsive solution for both performance and durability component testing.

The seaPLUS series Load Frame test systems are comprised of five standard models with peak dynamic forces of 13kN, 27N, 40kN, 54kN, and 108kN. Coupled with our integrated Static Load Support, the full dynamic force range is available in addition to a static load offset, further increasing the total force capacity of the test stands. With a 46% higher performance over previous systems, the seaPLUS series widens the performance gap between our servoelectric technology and comparable hydraulic systems. The seaPLUS Load Frames can achieve significantly higher continuous loads than other linear motor technologies which makes them an excellent choice for extended duration durability testing and expands testing capabilities across a wider range of applications and industries.



Utilizing the proven technology of our Four Post test systems, in continuous operation globally, the SEA actuator assembly forms the base structure of the Load Frame. This modular structure lends itself well to customizing the upper columns, crosshead, and adjustment system without impacting the SEA actuator design.

eMpulse's seaPLUS Load Frames feature three dedicated software configurations, each optimized for user interface and test setups for specific applications:

- BL1 General Purpose
  optional M10 Fatigue Test
  optional M3 MIMIC Iterative Transfer Function Compensation
- M18A Damper Testing
  optional M33 Automation Interface
- M83 Elastomer Testing
  optional M33 Automation Interface

www.empulsetestsystems.com

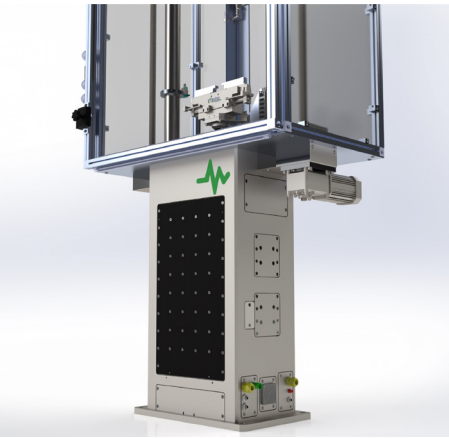
seaPLUS LOAD FRAMES

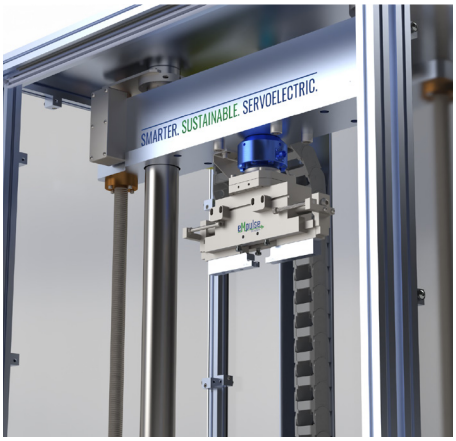
For each configuration, a number of hardware options are available to provide additional functionality, including:

- Pneumatic Static Air Assist
- Integrated Safety Cage or Light Curtain
- Automated Crosshead Lifts and Locks
- Pneumatic Sideload
- Acoustic or Environmental Specimen Chambers
- Automation Interface for use in Production

KEY BENEFITS OF seaPLUS LOAD FRAME TESTING

- Energy Efficient
- Quiet Operation
- Full Digital Control with Built-In Diagnostics
- High Bandwidth
- Safety Integrated Functions including:
  - Safe Torque Off (STO)
  - Safe Limited Speed (SLS)
  - Safe Limited Acceleration (SLA)
  - Low Force Mode Integrated into Operator Safety Options
- High Continuous Dynamic Force Capacity
- Precise Control – 28 bit Command and Displacement feedback resolution
- Liquid or Air Cooled Motors for Continuous Duty Testing
- More Accurate and Repeatable Control compared to servohydraulic systems

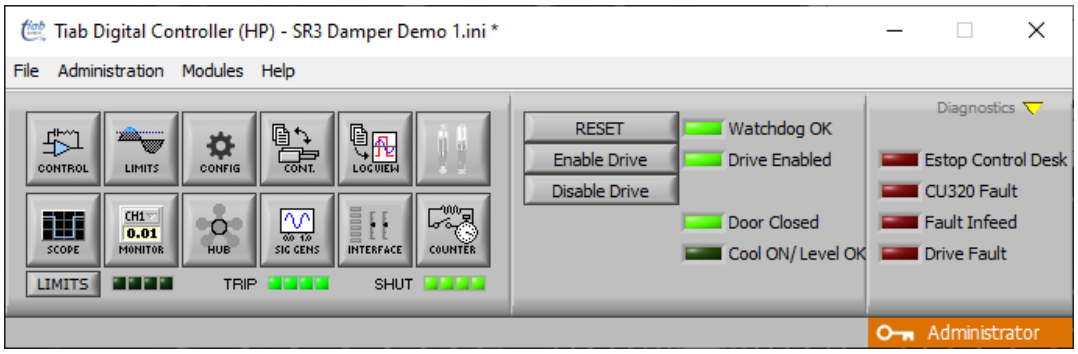




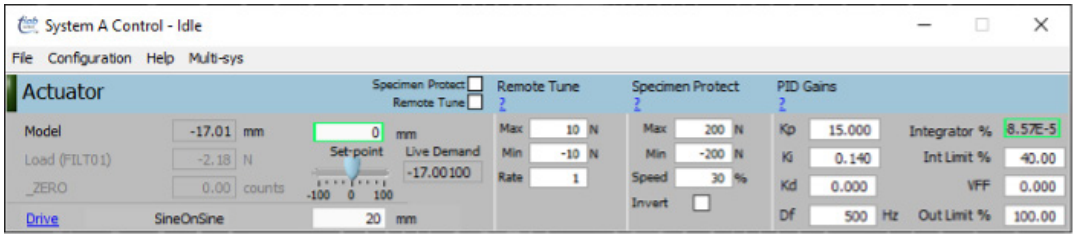
seaPLUS BL1 GENERAL PURPOSE LOAD FRAME TESTING

For general purpose applications, most test steps required to run a test can be done manually through a suite of modules in BL1 General Purpose Test Software. These include:

- Waveform amplitude and mean control
- Periodic Waveforms include Sine, Triangle, Square, and more, with cycle counters
- Replay from time history files
- Limit monitoring with custom response
- Force limited position control for loading /unloading test specimens
- Amplitude Control from a second transducer (also called Remote Tune)
- 4 Channel Oscilloscope with active cursors
- Reduced Force mode when safety circuits are triggered
- Customizable Digital Monitors for viewing any internal variable
- Built in Data Logger with Viewer
- Compatible with advanced MIMIC system transfer function compensation with Iterative Control



When used in conjunction with M10 Fatigue Test Software, BL1 Generic Purpose software can provide a convenient method to Install, Tune, Configure, Setup Upper and Lower Peak Limits, Run, Monitor, and Collect Data on many endurance or Durability test configurations.

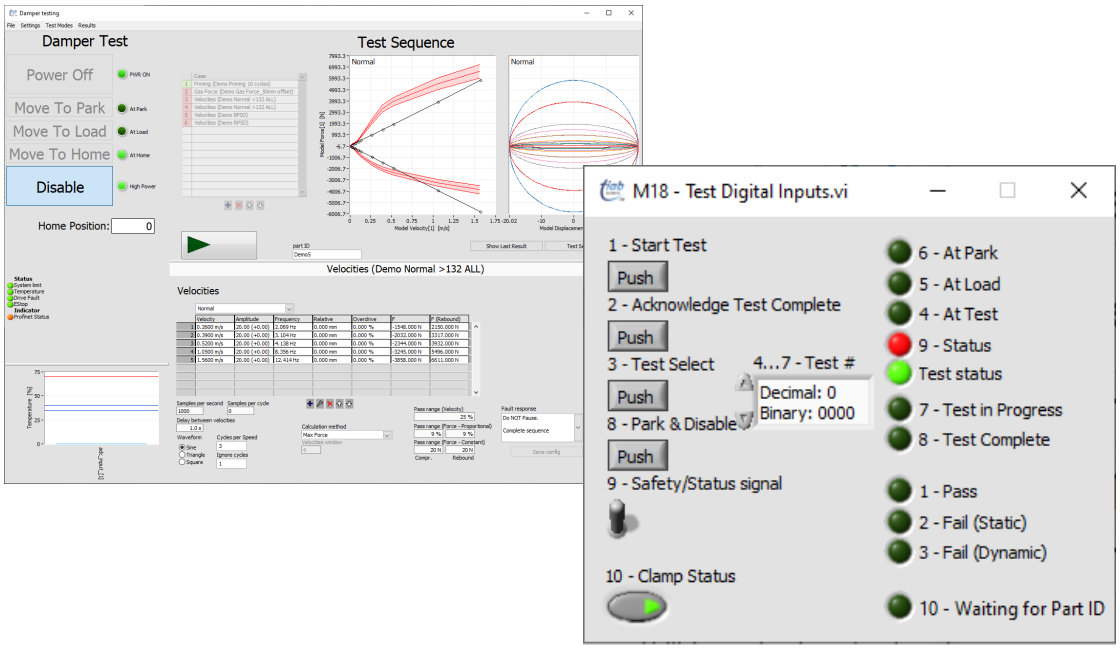


seaPLUS M18A DAMPER TESTING

The M18A Damper Testing Software suite provides an intuitive interface to setup and run common tasks associated with testing Dampers, including:

- Precycles based on number of cycles or temperature
- Gas Force Test
- Friction Force Test
- Combined Gas and Friction Force Test
- Multi-Speed (PVP) Test Cases with variable offset test position
- Ability to group results based on customer-defined parameters, such as test position, temperature, etc.
- Customizable Data Collection available for post analysis and comparison using M38 TDAP TIAB Data Analysis Package
- Select Sine or Triangle waveforms
- Pass/Fail criteria based on Absolute Values or % plus offset values
- Accelerometer-based Test Cases
- Multiple Force Evaluation methods
- Variable number of cycles, with ability to ignore and average multiple cycles
- Batch Testing, with Part Identification entered manually or via Scanner, along with Statistics

The M18A Damper Test Software can be combined with M33 Automation Interface to integrate the seaPLUS Load Frame into your existing Production Automation system. Additionally, eMpulse can provide a complete PLC integrated solution with pneumatic grippers and lighted touch button controls for manual load/unload and test operation.



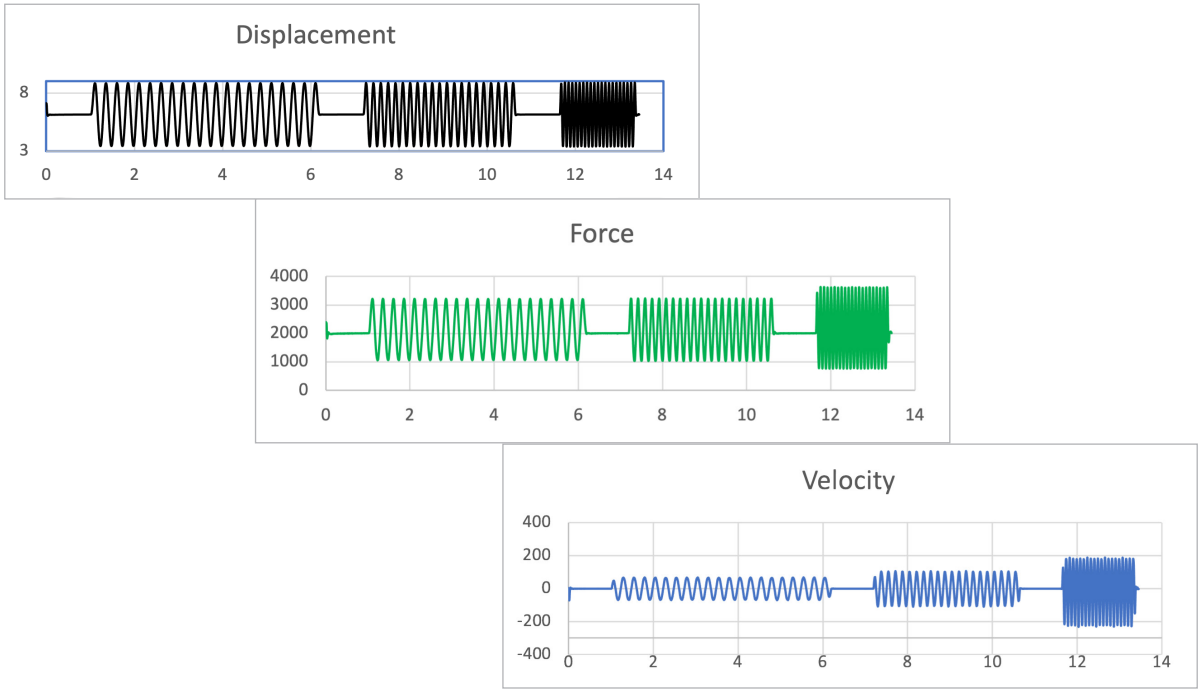
seaPLUS M83 ELASTOMER TESTING

M83 Elastomer Testing Software operates in a similar fashion to M18A Damper Testing software, with a specific focus on calculating the material properties of elastomeric materials. These calculations include:

K* Dynamic Spring Rate
C* Dynamic Damping coefficient
Θ Phase Angle
K′ Elastic Stiffness
K″ Viscous or loss Stiffness
tan(Θ) tan Delta

DE_t Damping Energy Extension
DE_c Damping Energy Compression
H_t Hysteresis Extension
H_c Hysteresis Compression
Additional parameters can be added on request

Elastomer Test Stands are available with frequency response exceeding 200 Hz.



seaPLUS LOAD FRAME SPECIFICATIONS

SPECIFICATIONS	UNITS	sea+ 13	sea+ 27	sea+ 40	sea+ 54	sea+ 108
Peak Dynamic Force Motor Peak Force (not including Air Support	N (lbF)	13468 (3028)	26910 (6050)	40326 (9066)	53820 (12100)	107640 (242000)
Continuous Dynamic Force** Moto Continuous Force (not including Air Support)	N (lbF)	5018 (1128)	10530 (2367)	21060 (4735)	21060 (4735)	42120 (9469)
Maximum Static Air Support Air support maximum force @100 psi (6.9 bar)	N (lbF)	8900 (2000)	17800 (4000)	17800 (4000)	17800 (4000)	35600 (8000)
Continuous Force Motor Continuous Force + Maximum Air support	N (lbF)	13918 (3129)	28330 (6369)	38860 (8737)	38660 (8737)	77720 (143240)
Combined Peak Force Motor Peak Force + Maximum Air Support	N (lbF)	22368 (5029)	44710 (10052)	58126 (13068)	71620 (16102)	143240 (32203)
Peak Velocity at Continuous Dynamic Force	m/sec in/sec	4.6 181	4.2 165	4.2 165	4.2 165	4.2 165
Peak Velocity at Peak Dynamic Force	m/sec in/sec	2.0 79	1.9 75	1.9 75	1.9 75	1.9 75
Frequency Response -3dB Velocity Roll-Off	Hz	149	149	149	149	149
Temperature Monitoring	Specimen	Monitored Non-contacting IR				
	Motor	Embedded PTC thermocouple with redundant safety KTY sensor				
Digital Encoder Accuracy	nm	10.0				
Noise Level – Typical	dbA	<55				
Waveforms Supported	Type	Sine, Triangle, Square, Frequency Sweep & Custom				
Facility Requirements	V	380-480Vac, 3φ, 50-60 Hz				
	A	Current Rating based on motor sizing and system performance requirements.				
Air Supply, Rated	psi (bar)	100 (6.9), higher Static Load Support possible at higher supply pressures.				
	CFM	<5				
Recommend Liquid Cooling Flow, approximately 20deg delta C	Lpm gpm	5 1.3	5.5 1.5	6.5 1.7	6.5 1.7	13 3.4
Max Heat Removal @100% duty cycle, full durability rating	kW Btu/hr ton	3.9 13208 1.1	7.3 2505 2.1	13.5 45928 3.8	13.5 45928 3.8	26.9 91856 7.7

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. Interpretation and use of the data are the sole responsibility of the user.

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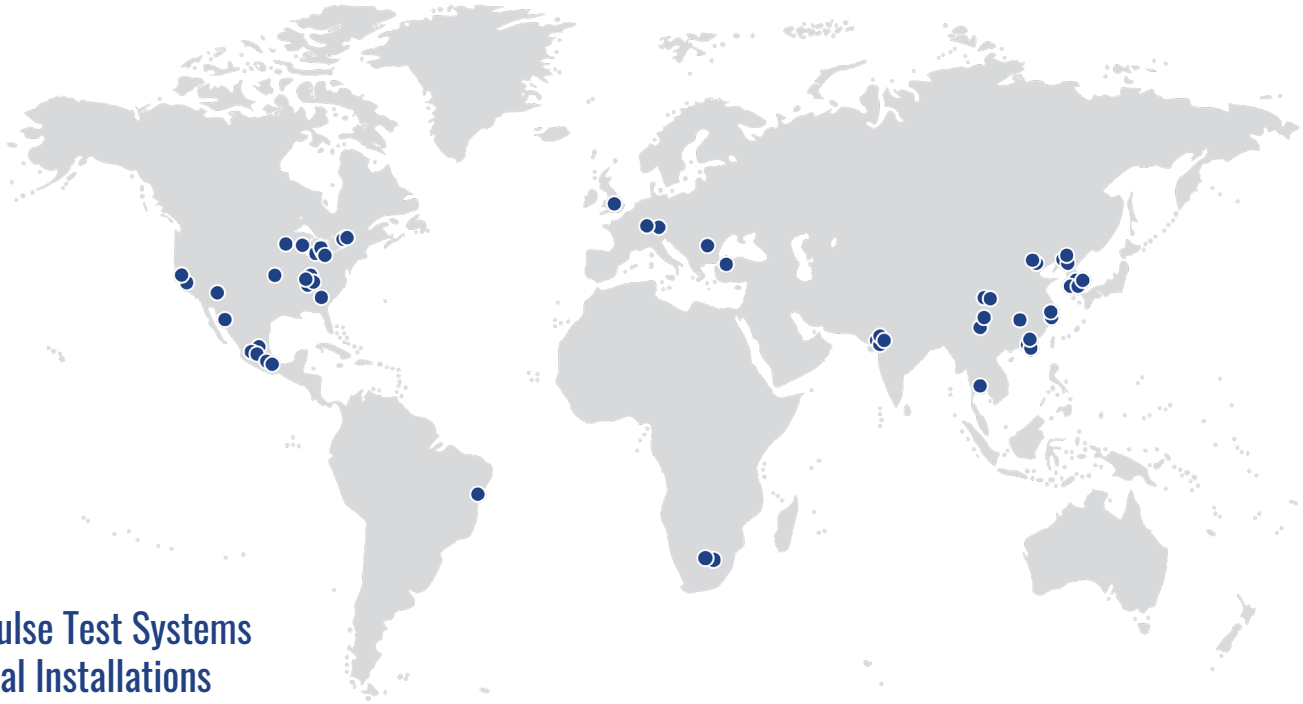

eMpulse Test Systems
Global Installations

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