



# APS Dynamics

Systems for Generating Controlled Vibration

**Products & Services**

# Table of Contents

---

## Overview Vibration Exciters

- Air Bearing APS Shakers
- Linear Bearing APS Shakers

## Vibration Exciters

- APS 113
- APS 113-AB
- APS 113-AB-LA
- APS 129
- APS 300
- APS 400
- APS 420
- APS 500
- APS 600

## Power Amplifiers

- APS 125
- APS 145

## Accessories

- APS 0109
- Connecting Cables Shaker to Amplifier

## Vibration Control System

- VCS 201
- VCS 400
- VCS 401

## Selected References

# APS Long Stroke Shaker ELECTRO-SEIS®

## with Air Bearing Load Mounting Table

Overview 1/2



APS 129



APS 500

### Applications

- Seismic simulation for components
- Calibration and test for seismic instruments
- Sensor characterization

### Range of Use

- Departments for the supervision of measuring instruments in research, industry, automotive, aviation, space, military
- Test and calibration laboratories

### Features

- Long stroke shaker for sine wave, swept sine wave, random or impulse force waveforms
- Mounting table for high payloads
- Low noise vibration by means of air bearing guidance and support

### Specifications

	APS 129	APS 129-HF Increased Force	APS 500
Force (Sine Peak)	133 N (30 lbf)	186 N (42 lbf)	95 N (21 lbf)
Stroke (Peak - Peak)	158 mm (6.25 inch)		152 mm (6.0 inch)
Frequency Range	DC ... 200 Hz		
Operation	horizontal or vertical		
Armature Weight	8.5 kg (18.7 lb)		1.5 kg (3.3 lb)
Max. Payload	Horizontal	23.0 kg (50.7 lb)	
	Vertical	11.0 kg (24.3 lb)	
Impedance	4.4 or 1.1 Ω	1.4 Ω	1.2 Ω
Air Pressure Required	4 bar ... 5 bar (60 psig ... 70 psig)		
Air Flow Required	650 l/h (0.4 cfm)		
Total Shaker Weight	79.0 kg (174.2 lb)		64.0 kg (141.1 lb)
Overall Dimension L x W x H	889 x 219 x 216 mm (35 x 8.6 x 8.5 inch)		813 x 219 x 210 mm (32 x 8.6 x 8.3 inch)
Load Table Size L x W	254 x 254 mm (10 x 10 inch)		79.5 x 79.5 mm (3.1 x 3.1 inch)

### Accessories (optional)

	APS 129	APS 129-HF	APS 500
Power Amplifier	APS 125		
System Cables for Connection Shaker to Amplifier	APS 0082-6E		
Zero Position Controller for Vibration Exciters	APS 0109		
Vertical Mounting Kit / Vertical Operation Kit	APS 1291		APS 5002

Additional accessories available

# APS Long Stroke Shaker ELECTRO-SEIS®

with Air Bearing Load Mounting Table

Overview 2/2



APS 113-AB



APS 113 AB-LA

## Applications

- Seismic simulation for components
- Calibration and test for seismic instruments
- Sensor characterization

## Range of Use

- Departments for the supervision of measuring instruments in research, industry, automotive, aviation, space, military
- Test and calibration laboratories

## Features

- Long stroke shaker for sine wave, swept sine wave, random or impulse force waveforms
- Low noise vibration by means of air bearing guidance and support

## Specifications

	APS 113-AB	APS 113-AB-HF Increased Force	APS 113-AB-LA Lightweight Armature
Force (Sine Peak)	133 N (30 lbf)	186 N (42 lbf)	95 N (21 lbf)
Stroke (Peak - Peak)	158 mm (6.25 inch)		
Frequency Range	DC ... 200 Hz		DC ... 400 Hz
Operation	horizontal or vertical		
Armature Weight	2.7 kg (5.8 lb)		0.95 kg (2.1 lb)
Max. Overhung Load at Armature Attachment Point	1.5 kg (3.3 lb)		1.0 kg (2.2 lb)
Impedance	4.4 or 1.1 Ω	1.4 Ω	1.2 Ω
Air Pressure Required	4 bar ... 5 bar (60 psig ... 70 psig)		
Air Flow Required	500 l/h (0.3 cfm)		
Air Quality	ISO 8573.1 Class 3		
Total Shaker Weight	36.0 kg (80 lb)		34.0 kg (75 lb)
Overall Dimension L x W x H	526 x 213 x 168 mm (20.7 x 8.4 x 6.6 inch)		

## Accessories (optional)

	APS 113-AB	APS 113-AB-HF	APS 113-AB-LA
Power Amplifier	APS 125		
System Cables for Connection Shaker to Amplifier	APS 0082-6E		
Zero Position Controller for Vibration Exciters	APS 0109		
Vertical Mounting Kit / Vertical Operation Kit	APS 0162		

Additional accessories available

All data are subject to change without notice

January 2014

# APS Long Stroke Shaker ELECTRO-SEIS®

## with Linear Ball Bearings

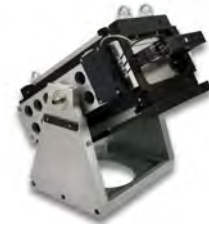
Overview 1/2



**APS 113 horizontal**



**APS 400 vertical**  
with APS 0412 Reaction Mass



**APS 420 horizontal**  
with APS 4222 Trunnion Base

### Applications

- Modal analysis of dynamic loaded structures
- Seismic simulation for components
- Calibration and test for seismic instruments
- Geoservice, Geoscience, Geophysics, Geoseismic

### Range of Use

- Departments for the supervision of measuring instruments in research, industry, automotive, aviation, space, military and civil engineering
- Test and calibration laboratories

### Features

- Long stroke shaker for sine wave, swept sine wave, random or impulse force waveforms
- Optimized to deliver power to resonant load with minimum shaker weight and drive power
- Rugged linear guidance system

### Specifications

	APS 113 / APS 113-HF	APS 400	APS 420
Force (Sine Peak)	133 N / 186 N (30/42 lbf)	445 N (100 lbf)	900 N (200 lbf)
Velocity (Sine Peak)	1,000 mm/s (39 inch/s)		
Stroke (Peak - Peak)	158 mm (6.25 inch)		150 mm (5.9 inch)
Frequency Range	DC ... 200 Hz		
Operation	horizontal or vertical		
Armature Weight	2.3 kg (5.1 lb)	2.8 kg (6.2 lb)	3.6 kg (8.0 lb)
Max. Overhung Load at Armature Attachment Point	9.0 kg (20 lb)		
DC Coil Resistance	4.4 or 1.1 Ω / 1.4 Ω	1.6 Ω	1.1 Ω
Total Shaker Weight	36.0 kg (80 lb)	73.0 kg (161 lb)	140.0 kg (310 lb)
Dimension L x W x H	526 x 213 x 168 mm (20.7 x 8.4 x 6.6 inch)	526 x 314 x 178 mm (20.7 x 12.4 x 7.0 inch)	591 x 360 x 280 mm (23.3 x 14.2 x 11.0 inch)



# APS Long Stroke Shaker ELECTRO-SEIS®

with Linear Ball Bearings

Overview 2/2

## Accessories (optional)

	<b>APS 113</b>	<b>APS 400</b>	<b>APS 420</b>
Power Amplifier	APS 125	APS 145	
System Cables for Connecting Shaker to Amplifier	APS 0082-6E	APS 0082-6E	
Auxiliary Table Kit – Horizontal	APS 0052	APS 0452	
Auxiliary Table Kit – Vertical	APS 0077	APS 0477	
Auxiliary Table Kit – Horizontal and Vertical	APS 0078	APS 0478	
Reaction Mass Assembly	APS 0112	APS 0412	APS 4212
Lifting Handles (Set of 4)	APS 0414	APS 0414	APS 4221
Carrying Handles and Tie-down Bars	APS 0108	APS 0421	
Trunnion Base		APS 4222	
Over Travel Switch		APS 8543	
Modal Stinger Kit		APS 8610	
Steel Cable Kit	APS 8611	APS 8612	

Additional accessories available

All data are subject to change without notice

March 2014

# APS 113 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings



The **APS 113 ELECTRO-SEIS®** shaker is a long stroke, electrodynamic force generator specifically designed to be used alone or in arrays for studying dynamic response characteristics of various structures. It finds use in modal excitation of complex structures, particularly when low frequencies are required. Furthermore it can be used for low frequency vibration testing of components and assemblies.

### Applications

- Determination of natural mode frequencies, shapes, damping ratios, and stress distributions
- Excitation of manufactured equipment in the factory or installed in the field to demonstrate compliance with seismic specification criteria
- Seismic simulation for components
- Test and calibration for seismic instruments
- Geological Services, Science, Physics and Seismic

### Features

- Can be used to generate sine wave, swept sine wave, random or impulse force waveforms, fully adjustable at source
- Test set-up flexibility - operates fixed body, free body, free armature
- Optimized to deliver power to resonant load with minimum shaker weight and drive power
- Adjustable armature re-centering for horizontal and vertical operation or other external pre-loads
- Rugged standard armature and linear guidance system carries full weight of body
- One-Man Portability - 36 kg (80 lb) total weight

# APS 113 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings

### Description and Characteristics

The APS 113 ELECTRO-SEIS® shaker has been optimized for driving structures at their natural resonance frequencies. It is an electrodynamic force generator, the output of which is directly proportional to the instantaneous value of the current applied to it, independent of frequency and load response. It can deliver random or transient as well as sinusoidal waveforms of force to the load. The armature has been designed for minimum mass loading of the drive point. The ample armature stroke allows driving antinodes of large structures at low frequencies and permits rated force at low frequencies when operating in a free body mode.

The unit employs permanent magnets and is configured such that the armature coil remains in a uniform magnetic field over the entire stroke range - assuring force linearity. The enclosed, self-cooled construction provides safety and minimum maintenance. Attachment of the armature to the drive point is accomplished by a simple thrust rod like the APS 8610 - Modal Stinger.

An amplifier, such as the APS 125 - Power Amplifier, is required to provide armature drive power.

The drive coil is wound in a manner which allows series or parallel connection, offering the user the choice of standard or low impedance. This option is required if the shaker is to be used with the APS 125 - Power Amplifier for extended frequency range or random noise excitation.

### Modes of Operation

#### Free Armature Mode

In this mode, the armature provides the reaction mass for force delivered to the test structure via the shaker body. Auxiliary reaction mass may be added to the armature to decrease the low frequency limit for rated force operation.

The APS 113 shaker and APS 0112 - Reaction Mass may be used in a vertical or horizontal free armature mode with rated force down to 2 Hz. Feet and carrying handles are provided for ease in placement of the shaker on horizontal test surfaces.



APS 113 with APS 0112 - Reaction Mass Assembly and APS 0414 - Lifting Handles



APS 113 with APS 0112 Reaction Mass Assembly

#### Fixed Body Mode

By providing a rigid attachment between the body and ground, the full relative velocity and stroke capability is available for load motion. Maximum rated force can be delivered down to 0.01 Hz and 70% maximum to 0 Hz.



# APS 113 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings



APS 113 with APS 0108 - Carrying Handles and Tie-down Bars and APS 8610 - Modal Stinger prepared for Fixed Body Mode operation

surfaces include floors, roofs, platforms, cabinets, bridges and tanks.

### Shaker Table Mode

Auxiliary tables are available which attach directly to the armature and enable the basic shaker to provide long stroke, low frequency excitation to components or model structures mounted on the tables. APS 0052 - Auxiliary Table provides a 10 in x 10 in horizontal load mounting surface for horizontal motion rated for 23 kg (50 lb) test loads. The APS 0077 - Auxiliary Table provides the same load mounting surface for vertical motion. The APS 0078 provides for both vertical and horizontal applications.



APS 113 with APS 0052 - Auxiliary Table Kit - Horizontal

### Free Body Mode

In this mode, the body provides the reaction mass. Load and body motion are accommodated within the total relative velocity and stroke. Because of the high cross-axis stiffness provided by the armature linear guidance system, the shaker may be supported above ground level by means of suspension lines (APS 8611 - Steel Cable Kit) attached to the body. This provides a convenient mounting for introducing force parallel to a horizontal mounting surface. Examples of such



APS 113 with APS 8610 - Modal Stinger and APS 8611 - Steel Cable Kit prepared for Free Body Mode operation



APS 113 with APS 0077 - Auxiliary Table Kit - Vertical

### Performance

One application of the APS 113 ELECTRO-SEIS® shaker is to determine the dynamic characteristics of mechanical structures. At resonance, a large amount of energy is contained in the structure, and the shaker must accommodate the resulting motion. However, it need only supply the real mechanical power dissipated by damping mechanisms within the structure.

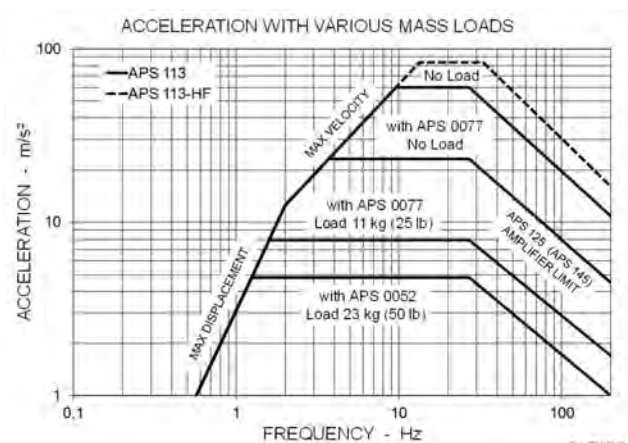
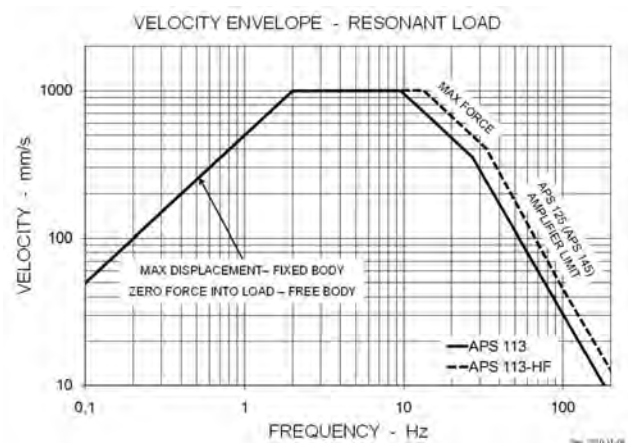
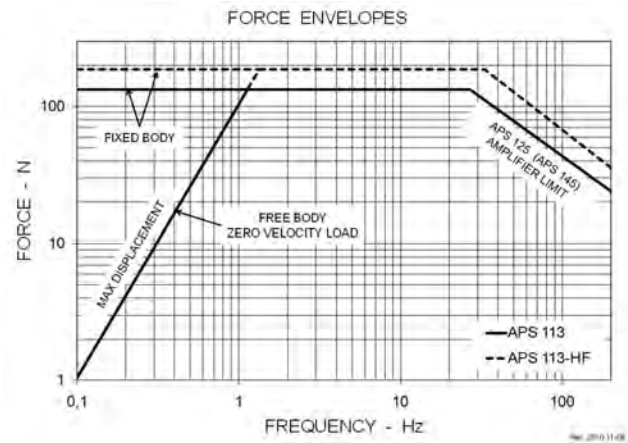
If a drive point on a structure in resonance is vibrating with a velocity of 1,000 mm/s (39 in/s) peak and a force of 133 N (30 lbf) peak is required to sustain the vibration level, then the shaker will be delivering approximately 65 W RMS to the structure. Such a load on the shaker is termed a matched resonant load, and it is purely resistive since the force is in a phase with the velocity.

If the resonant load input is other than 133 N x 1,000 mm/s, the full 65 W of mechanical power cannot be delivered to the structure, the system being either force or velocity limited. If the resulting maximum response level is not great enough, the user may have the option of moving the shaker to a drive point having an impedance closer to the matched value, or adding more shakers to the array driving the structure.

Within the limitations of maximum force and velocity, the actual power delivered to a structure is a function of the input mechanical impedance at the drive point. In typical modal testing, this input impedance varies widely in magnitude and phase angle. At different frequencies, the input impedance of the drive point may appear predominately spring-like, mass-like, or resistive. Since the object of the tests is to establish resonant modes, at which the input mechanical impedance of all drive points are resistive, the shaker's maximum performance capability is most meaningful stated in terms of the force and velocity that can be obtained when driving a matched resistive load.

Therefore performance is given in the form of graphs which present the envelopes of maximum force and velocity delivered to a resonant structure as functions of the resonance frequency of the structure.

Another application is the excitation for sensor calibration. Acceleration performance of the APS 113 ELECTRO-SEIS® shaker with various mass loads is shown in the lower graph.



### Optional Configurations

#### APS 113-HF

All features of the basic APS 113 shaker are retained. The drive coil is made for 40 % increase in force with a 50 % duty cycle (30 min cycle).

# APS 113 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings

### Specifications

Shaker	APS 113	APS 113-HF High Force
Force (Sine Peak)	133 N (30 lbf)	186 N (42 lbf)
Velocity (Sine Peak)	1,000 mm/s (39 inch/s)	
Stroke (Peak - Peak)	158 mm (6.25 inch)	
Frequency Range	DC ... 200 Hz	
Operation	horizontal or vertical	
Armature Weight	2.3 kg (5.1 lb)	
Max. Overhung Load at Armature Attachment Point	9.0 kg (20 lb)	
DC Coil Resistance	4.4 or 1.1 Ω	1.4 Ω
Total Shaker Weight	36.0 kg (80 lb)	
Shipping Weight	41.0 kg (90 lb)	
Overall Dimension L x W x H	526 x 213 x 168 mm (20.7 x 8.4 x 6.6 inch)	
Operating Temperature	5 ... 40 degrees C	
Storage Temperature	-25 ... 55 degrees C	

### Accessories (optional)

Shaker	APS 113	APS 113-HF High Force
Power Amplifier	APS 125	
System Cable for Connecting Shaker to Amplifier	APS 0082-6E	
Auxiliary Table Kit – Horizontal	APS 0052	
Auxiliary Table Kit – Vertical	APS 0077	
Auxiliary Table Kit – Horizontal and Vertical	APS 0078	
Carrying Handles and Tie-down Bars	APS 0108	
Zero Position Controller for Vibration Exciter	APS 0109	
Reaction Mass Assembly	APS 0112	
Lifting Handles (Set of 4)	APS 0414	
Overtravel Switch	APS 8543	
Modal Stinger Kit	APS 8610	
Steel Cable Kit	APS 8611	

Additional accessories available

# APS 113-AB ELECTRO-SEIS®

## Long Stroke Shaker with Linear Air Bearings



The **APS 113-AB ELECTRO-SEIS®** Air Bearing shaker is a long stroke, electrodynamic force generator specifically designed to be used for calibration and evaluation of accelerometers and other motion transducers. It provides excellent properties for low frequency excitation of such devices. Furthermore it is optimized for measuring decay rates in very lightly damped structures.

### Applications

- Calibration and test for seismic instruments
- Seismic simulation for components
- Determination of natural mode frequencies, shapes, damping ratios, and stress distributions

### Features

- Designed for calibration and evaluation of accelerometers
- Can be used to generate sine wave, swept sine wave, random or impulse force waveforms, fully adjustable at source
- Optimized to deliver power to very lightly damped structures with minimum shaker weight and drive power
- Adjustable armature re-centering for horizontal and vertical operation or other external pre-loads
- Rugged standard armature and air bearing guidance system
- One-Man Portability - 36 kg (80 lb) total weight

# APS 113-AB ELECTRO-SEIS®

## Long Stroke Shaker with Linear Air Bearings

### Description and Characteristics

The APS 113-AB ELECTRO-SEIS® shaker, the Air Bearing version of the APS 113 ELECTRO-SEIS® shaker, is a long stroke, electrodynamic force generator, designed for calibration and evaluation of accelerometers and other motion transducers.

Air lubricated bushings replace the linear ball bearings used in the basic ELECTRO-SEIS® armature guidance system. In addition an air distribution system, tie down and leveling base are provided.

The near zero friction of the air bushings is an essential feature for measuring resonance decay rates in very lightly damped structures.

The unit employs a permanent magnet and is configured such that the armature coil remains in a uniform magnetic field over the entire stroke range. This feature, along with the air bearings, assures a high degree of force linearity and absence of armature guidance induced noise and distortion. Drive power for the shaker is obtained from a low frequency power amplifier, such as the APS 125 - Power Amplifier.

Modes of operation requiring high bearing loads (table mode and APS 0112 - Reaction Mass mode), permissible with the standard linear ball bushing

version, are not permitted with the APS 113-AB shaker. Since the suspension system need not support the armature and test load weight when used in the horizontal mode, a soft suspension may be used, minimizing non-linearity effects. The maximum overhung load that may be used is 1.5 kg (3.3 lb) concentrated at the mounting point.

The shaker may be used with various optional accessory items to extend the areas of application:

APS 0108 - CARRYING HANDLES AND TIE-DOWN BARS - improve the portability feature of the shaker.

APS 0109 - ZERO POSITION CONTROLLER - automatically controls the zero position of a vibration exciter irrespective of its load.

APS 0162 - VERTICAL MOUNTING KIT - permits vertical orientation of the shaker, either free-standing or rigid bench attachment.

### Optional Configurations

#### APS 113-AB-HF

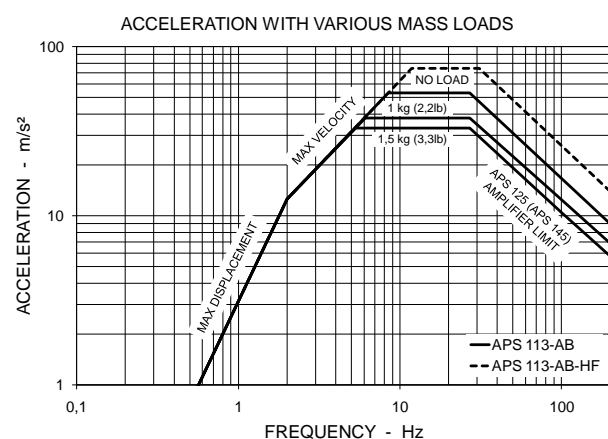
All features of the basic APS 113-AB shaker are retained. The drive coil is made for 40 % increase in force with a 50 % duty cycle (30 min cycle).

### Performance

Acceleration performance of the APS 113-AB shaker with various mass loads is shown in the lower graph.



APS 113-AB with APS 0162  
Vertical Mounting Kit



Rev. 2010-11-06

# APS 113-AB ELECTRO-SEIS®

## Long Stroke Shaker with Linear Air Bearings

### Specifications

Shaker	APS 113-AB	APS 113-AB-HF
Force (Sine Peak)	133 N (30 lbf)	186 N (42 lbf)
Stroke (Peak - Peak)	158 mm (6.25 inch)	
Frequency Range	DC ... 200 Hz	
Operation	horizontal or vertical	
Armature Weight	2.7 kg (5.8 lb)	
Max. Overhung Load at Armature Attachment Point	1.5 kg (3.3 lb)	
DC Coil Resistance	4.4 or 1.1 $\Omega$	1.4 $\Omega$
Air Pressure Required	4 bar ... 5 bar (60 psig ... 70 psig)	
Air Flow Required	500 l/h (0.3 cfm)	
Air Quality	ISO 8573.1 Class 3	
Total Shaker Weight	36.0 kg (80 lb)	
Shipping Weight	41.0 kg (90 lb)	
Overall Dimension L x W x H	526 x 213 x 168 mm	
Operating Temperature	5 ... 40 degrees C	
Storage Temperature	-25 ... 55 degrees C	

### Accessories (optional)

Shaker	APS 113-AB	APS 113-AB-HF High Force
Power Amplifier	APS 125	
System Cable for Connection Shaker to Amplifier	APS 0082-6E	
Carrying Handles	APS 0108	
Zero Position Controller for Vibration Exciters	APS 0109	
Vertical Mounting Kit	APS 0162	
Overtravel Switch	APS 8543	

Additional accessories available

# APS 113-AB-LA ELECTRO-SEIS®

## Long Stroke Shaker with Linear Air Bearings



The **APS 113-AB-LA ELECTRO-SEIS®** Air Bearing shaker is a long stroke, electrodynamic force generator with a Lightweight Armature specifically designed for calibration and evaluation of accelerometers and other motion transducers with higher acceleration levels. Furthermore the Lightweight Armature is a desirable feature when using the shaker for exciting structures having low modal mass.

### Applications

- Calibration and test for seismic instruments
- Seismic simulation for components
- Determination of natural mode frequencies, shapes, damping ratios, and stress distributions

### Features

- Designed for calibration and evaluation of accelerometers with higher acceleration levels
- Can be used to generate sine wave, swept sine wave, random or impulse force waveforms, fully adjustable at source
- Optimized to deliver power to very lightly damped structures having low modal mass with minimum shaker weight and drive power
- Maximum force output is extended to 120 Hz
- Adjustable armature re-centering for horizontal and vertical operation or other external pre-loads
- Light weight armature and air bearing guidance system
- One-Man Portability - 36 kg (80 lb) total weight

# APS 113-AB-LA ELECTRO-SEIS®

## Long Stroke Shaker with Linear Air Bearings

### Description and Characteristics

The APS 113-AB-LA ELECTRO-SEIS® shaker, the Air Bearing Lightweight Armature version of the APS 113 ELECTRO-SEIS® shaker, is a long stroke, electrodynamic force generator, designed for calibration and evaluation of accelerometers and other motion transducers.

Air lubricated bushings replace the linear ball bushings used in the basic ELECTRO-SEIS® armature guidance system. In addition an air distribution system, tie down and leveling base are provided.

The near zero friction of the air bushings is an essential feature for measuring resonance decay rates in very lightly damped structures.

The body of the ELECTRO-SEIS® Shaker is retained but the armature and guidance system are replaced with elements offering substantial weight reduction. The drive coil is lightened - with corresponding reduction in maximum force - and the armature guidance system elements are reduced in size and weight. This results in a corresponding reduction in cross axis stiffness and load carrying ability. The long stroke capability is retained and the frequency range for maximum force output is extended to 120 Hz.

The Lightweight Armature is a desirable feature when using the shaker for exciting structures having low modal mass.



APS 113-AB-LA reverse side

The unit employs a permanent magnet and is configured such that the armature coil remains in a uniform magnetic field over the entire stroke range. This feature, along with the air bearings, assures a

high degree of force linearity and absence of armature guidance induced noise and distortion. Drive power for the shaker is obtained from a low frequency power amplifier, such as the APS 125 Power Amplifier.

Modes of operation requiring high bearing loads (table mode and APS 0112 - Reaction Mass mode), permissible with the standard linear ball bushing version, are not permitted with the APS 113-AB-LA shaker. Since the suspension system need not support the armature and test load weight when used in the horizontal mode, a soft suspension may be used, minimizing non-linearity effects. The maximum overhung load that may be used is 1.0 kg (2.2 lb) concentrated at the mounting point.

The shaker may be used with various optional accessory items to extend the areas of application:

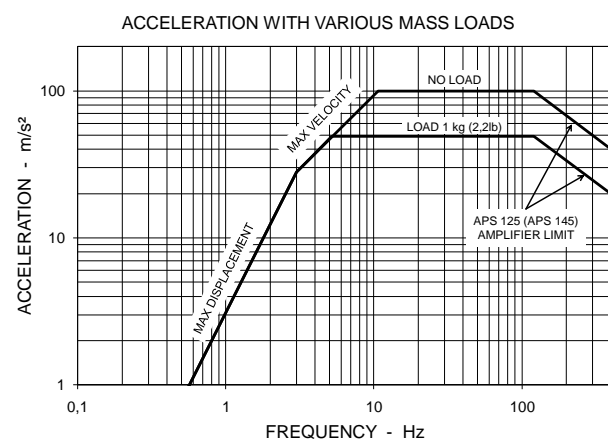
APS 0108 - CARRYING HANDLES AND TIE-DOWN BARS - improve the portability feature of the shaker.

APS 0109 - ZERO POSITION CONTROLLER - automatically controls the zero position of a vibration exciter irrespective of its load.

APS 0162 - VERTICAL MOUNTING KIT - permits vertical orientation of the shaker, either free-standing or rigid bench attachment.

### Performance

Acceleration performance of the APS 113-AB-LA shaker with various mass loads is shown in the lower graph.



Rev. 2010-11-05



# APS 113-AB-LA ELECTRO-SEIS®

## Long Stroke Shaker with Linear Air Bearings

### Specifications

Shaker	APS 113-AB-LA
Force (Sine Peak)	95 N (21 lbf)
Stroke (Peak - Peak)	158 mm (6.25 inch)
Frequency Range	DC ... 400 Hz
Operation	horizontal or vertical
Armature Weight	0.95 kg (2.1 lb)
Max. Overhung Load at Armature Attachment Point	1.0 kg (2.2 lb)
DC Coil Resistance	1.2 Ω
Air Pressure Required	4 bar ... 5 bar (60 psig ... 70 psig)
Air Flow Required	500 l/h (0.3 cfm)
Air Quality	ISO 8573.1 Class 3
Total Shaker Weight	34.0 kg (75 lb)
Shipping Weight	39.0 kg (86 lb)
Overall Dimension L x W x H	526 x 213 x 168 mm (20.7 x 8.4 x 6.6 inch)
Operating Temperature	5 ... 40 degrees C
Storage Temperature	-25 ... 55 degrees C

### Accessories (optional)

Shaker	APS 113-AB-LA
Power Amplifier	APS 125
System Cable for Connection Shaker to Amplifier	APS 0082-6E
Carrying Handles and Tie-down Bars	APS 0108
Zero Position Controller for Vibration Exciters	APS 0109
Vertical Mounting Kit	APS 0162

Additional accessories available

# APS 129 ELECTRO-SEIS®

## Long Stroke Shaker with Air Bearing Load Mounting Table



The **APS 129 ELECTRO-SEIS®** Air Bearing shaker is a long stroke, electrodynamic force generator specifically designed to be used for calibration and evaluation of accelerometers and other motion transducers. It provides excellent properties for low frequency excitation of such devices. The model consists of an air bearing driver attached to an air bearing load mounting table that allows high payloads up to 23 kg (50 lb) e.g. for the calibration of geophones and heavy seismic sensors.

### Applications

- Calibration and test for seismic instruments like geophones and heavy seismic sensors
- Seismic simulation for components

### Features

- 133 N (30 lbf) or 186 N (42 lbf) force (sine peak)
- 254 x 254 mm (10 x 10-in) load mounting table
- Air bearing guidance and support system carries up to 23 kg (50 lb) test load with very low cross-axis motion
- Efficient electrodynamic driver produces sine, random or transient waveforms
- Excellent waveform purity

# APS 129 ELECTRO-SEIS®

## Long Stroke Shaker with Air Bearing Load Mounting Table

### Description

The APS 1290 ELECTRO-SEIS® shaker consists of a load mounting table and air bearing assembly driven by an APS 113-AB ELECTRO-SEIS® long stroke air bearing shaker. The shaker imparts transverse base excitation to items mounted on the table.

Static and dynamic loads normal to the table surface are transferred through a large area precision air bearing to a rigid guide bar of rectangular cross section. The driver unit and guide bar assembly are mounted on a common rigid base, ensuring correct alignment of all moving parts.

The standard hole pattern consists of 25 threaded holes in a 5 x 5 array. Optional metric threads and spacing are available.

The APS 113-AB driver unit employs permanent magnets and is configured such that the armature coil remains in a uniform magnetic field over the entire stroke range ensuring a high degree of linearity. The self-cooled armature coil requires power from a matching electronic power amplifier.

Clean, water and oil free air for bearing operation is carried to the moving bearing housing by flexible PVC tubing, constrained to move with a rolling action.

The shaker may be used with optional accessory items to extend the areas of application:

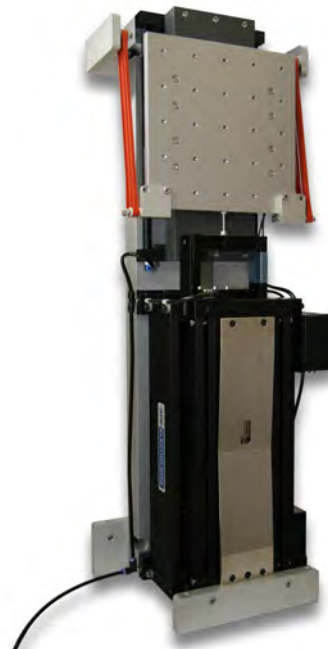
APS 0109 - ZERO POSITION CONTROLLER - automatically controls the zero position of a vibration exciter irrespective of its load.

APS 1291 - VERTICAL MOUNTING KIT - permits vertical orientation of the shaker with a rigid bench attachment.

### Optional Configurations

#### APS 129-HF

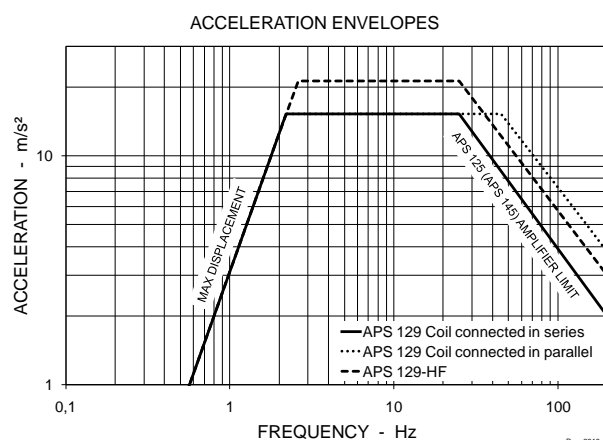
All features of the basic APS 129 ELECTRO-SEIS® shaker are retained. The drive coil is made for 40 % increase in force with a 50 % duty cycle (30 min cycle).



APS 129 with APS 1291 - Vertical Mounting Kit

### Performance

Test loads of up to 23 kg (50 lb) can be driven to acceleration levels typical of those found in seismic specifications. Performance envelopes of the APS 129 shaker with the APS 125 Power Amplifier are given in the graph. These envelopes represent the maximum acceleration with no test load that can be achieved on the table.



Rev. 2010-11-05

# APS 129 ELECTRO-SEIS®

## Long Stroke Shaker with Air Bearing Load Mounting Table

### Specifications

Shaker	APS 129	APS 129-HF
Force (Sine Peak)	133 N (30 lbf)	186 N (42 lbf)
Stroke (Peak - Peak)	158 mm (6.25 inch)	
Frequency Range	DC ... 200 Hz	
Operation	horizontal or vertical	
Armature Weight	8.5 kg (18.7 lb)	
Max. Payload	Horizontal Vertical	23.0 kg (50.7 lb) 11.0 kg (24.3 lb)
DC Coil Resistance	4.4 or 1.1 Ω	1.4 Ω
Air Pressure Required	4 bar ... 5 bar (60 psig ... 70 psig)	
Air Flow Required	650 l/h (0.4 cfm)	
Air Quality	ISO 8573.1 Class 3	
Total Shaker Weight	79.0 kg (174.2 lb)	
Overall Dimension L x W x H	889 x 219 x 216 mm (35 x 8.6 x 8.5 inch)	
Load Table Size L x W	254 x 254 mm	
Operating Temperature	5 ... 40 degrees C	
Storage Temperature	-25 ... 55 degrees C	

### Accessories (optional)

Shaker	APS 129	APS 129-HF High Force
Power Amplifier	APS 125	
System Cable for Connection Shaker to Amplifier	APS 0082-6E	
Zero Position Controller for Vibration Exciters	APS 0109	
Vertical Operation Kit	APS 1291	
Overtravel Switch	APS 8543	

Additional accessories available

# APS 300

## Portable Shaker-Amplifier



The **APS 300** - Portable Shaker-Amplifier is a self-contained, permanent magnet, electrodynamic shaker and a linear power amplifier in an aluminum carrying case. For operation, the unit separates into two sections - the Amplifier section and the Shaker section. Options for the Shaker include a very soft armature suspension for modal test application (APS 300-M) and a very stiff suspension for sensor calibration and component test (APS 300-C).

### Applications

- Modal test excitation of structures
- Field calibration of accelerometer and velocity pick-up systems
- Component testing

### Features

- Portability - 8 inch cube for Shaker and Amplifier
- Capable of carrying relatively heavy loads - Vertical and Horizontal
- Rugged, self-cooled design

# APS 300

## Portable Shaker-Amplifier

### Description

The APS 300 Portable Shaker is a self-contained shaker and amplifier in an aluminum carrying case. For operation, the unit separates into two sections - the Amplifier Section and the Shaker Section.

The shaker section consists of a permanent magnet electrodynamic shaker designed to operate at rated output for extended periods.

Applications for the APS 300 include Modal Test and Calibration. The Shaker includes provision for mounting an internal reference accelerometer.

Options for the Shaker include a very soft armature suspension for Modal applications (APS 300-M) and a very stiff suspension for carrying heavy transducers for calibration (APS 300-C).

### Performance

Acceleration performance charts of the APS 300 Portable Shaker will be provided on request.

### Specifications

<b>Model</b>	<b>APS 300</b>
<b>Shaker</b>	
Frequency Range	0 Hz ... 10 kHz
Force (Sine Peak)	22 N (5 lbf)
Stroke (Peak – Peak)	soft suspension: 0.2 in, 5 mm, p-p stiff suspension: 0.1 in, 2.5 mm, p-p
Armature Weight	240 gram (0.52 lb)
Load Weight Rating with Stiff Flexures Horizontal and Vertical	1.8 kg (4 lb)
Soft Flexures, vertical only	0.4 kg (0.9 lb)
Test Load Attachment	10-32 or 1/4-28 threaded insert optional metric thread sizes available
<b>Amplifier</b>	
Max. Current Output	1.75 A RMS
Max. Input Signal	2 V peak
Frequency Range	0 Hz ... 10 KHz
AC Power	50 VA
Line Voltage	120 V or 240 V 100 V Optional
<b>Total Unit</b>	
Weight	14.5 kg (32 lb)
Operating Temperature	5 ... 40 degrees C
Storage Temperature	-25 ... 55 degrees C

### Accessories (optional)

Installed sine-wave generator with selectable	APS 3001
Suspension/Tie-down Kit (APS 300-C, APS 300-M)	APS 3002
Installed Accelerometer (Internal) with cable (APS 300-C, APS 300-M)	APS 3003
Reaction Mass Kit including Tie-down (APS 300-C)	APS 3005
Re-usable Shipping Container (APS 300-C, APS 300-M)	APS 3006

Additional accessories available

All data are subject to change without notice

# APS 400 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings



The **APS 400 ELECTRO-SEIS®** shaker is a longstroke, electrodynamic force generator specifically designed to be used alone or in arrays for studying dynamic response characteristics of various structures. It finds use in modal excitation of complex structures, particularly when low frequencies are required. Furthermore it can be used for low frequency vibration testing of components and assemblies.

### Applications

- Determination of natural mode frequencies, shapes, damping ratios, and stress distributions
- Excitation of manufactured equipment in the factory or installed in the field to demonstrate compliance with seismic specification criteria
- Seismic simulation for components
- Test and calibration for seismic instruments
- Geological Services, Science, Physics and Seismic

### Features

- Can be used to generate sine wave, swept sine wave, random or impulse force waveforms, fully adjustable at source
- Test set-up flexibility - operates fixed body, free body, free armature
- Optimized to deliver power to resonant load with minimum shaker weight and drive power
- Adjustable armature re-centering for horizontal and vertical operation or other external pre-loads
- Two-Man Portability - 73 kg (160 lb) total weight

# APS 400 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings

### Description and Characteristics

The APS 400 ELECTRO-SEIS® shaker has been optimized for driving structures at their natural resonance frequencies. It is an electrodynamic force generator, the output of which is directly proportional to the instantaneous value of the current applied to it, independent of frequency and load response. It can deliver random or transient as well as sinusoidal waveforms of force to the load. The armature has been designed for minimum mass loading of the drive point. The ample armature stroke allows driving antinodes of large structures at low frequencies and permits rated force at low frequencies when operating in a free body mode.

The unit employs permanent magnets and is configured such that the armature coil remains in a uniform magnetic field over the entire stroke range - assuring force linearity. The enclosed, self-cooled construction provides safety and minimum maintenance. Attachment of the armature to the drive point is accomplished by a simple thrust rod like the APS 8610 - Modal Stinger.

An amplifier, such as the APS 145 - Power Amplifier, is required to provide armature drive power.

### Modes of Operation

#### Free Armature Mode

In this mode, the armature provides the reaction mass for force delivered to the test structure via the shaker body. Auxiliary reaction mass may be added to the armature to decrease the low frequency limit for rated force operation.

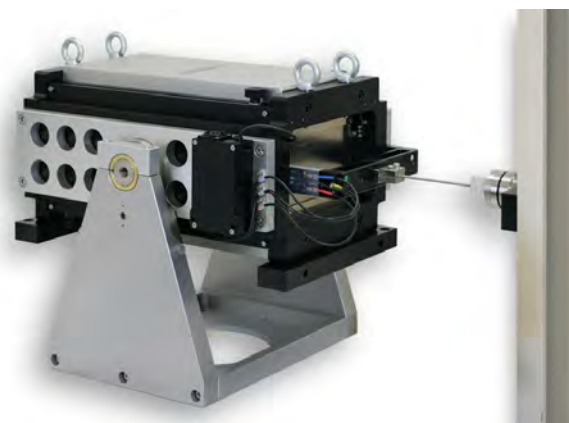
The APS 400 shaker and APS 0412 - Reaction Mass may be used in a vertical or horizontal free armature mode with rated force down to less than 3 Hz. Feet and carrying handles are provided for ease in placement of the shaker on horizontal test surfaces.

#### Fixed Body Mode

By providing a rigid attachment between the body and ground, the full relative velocity and stroke capability is available for load motion. Maximum rated force can be delivered down to 0.01 Hz and 70 % maximum to 0 Hz.



APS 400 with APS 0412  
Reaction Mass Assembly



APS 420 with APS 4222 - Trunnion  
and APS 8610 Modal Stinger



# APS 400 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings

### Free Body Mode

In this mode, the body provides the reaction mass. Load and body motion are accommodated within the total relative velocity and stroke. Because of the high cross-axis stiffness provided by the armature linear guidance system, the shaker may be supported above ground level by means of suspension lines (APS 8612 - Steel Cable Kit) attached to the body. This provides a convenient mounting for introducing force parallel to a horizontal mounting surface. Examples of such surfaces include floors, roofs, platforms, cabinets, bridges and tanks.



APS 400 with APS 0452 - Auxiliary Table Kit – Horizontal



APS 420 with APS 8610 - Modal Stinger and  
APS 8612 - Steel Cable Kit prepared for  
Free Body Mode operation

### Shaker Table Mode

Auxiliary Table Kits are available which, when installed on the basic shaker, enable the shaker to provide long stroke excitation to components or model structures mounted on the table.

The APS 0452 Auxiliary Table Kit provides horizontal motion, the APS 0477 Auxiliary Table Kit provides vertical motion and the APS 0478 Auxiliary Table Kit provides either the vertical or horizontal motion configuration.



APS 400 with APS 0477 - Auxiliary Table Kit –  
Vertical

### Performance

The primary purpose of the APS 400 ELECTRO-SEIS® shaker is to determine the dynamic characteristics of mechanical structures. At resonance, a large amount of energy is contained in the structure, and the shaker must accommodate the resulting motion. However, it need only supply the real mechanical power dissipated by damping mechanisms within the structure.

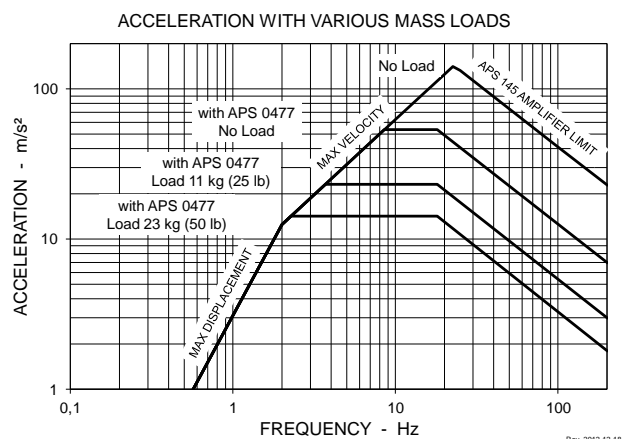
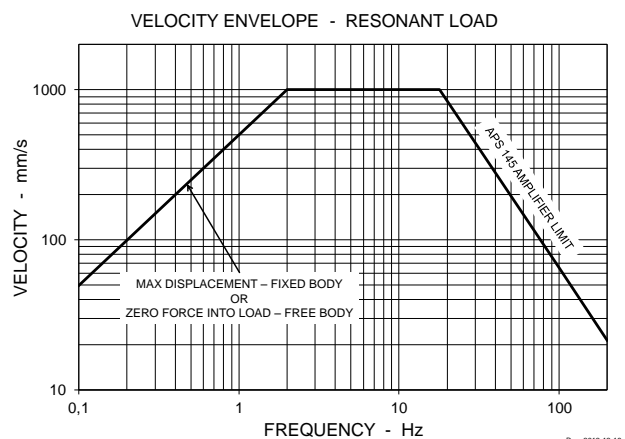
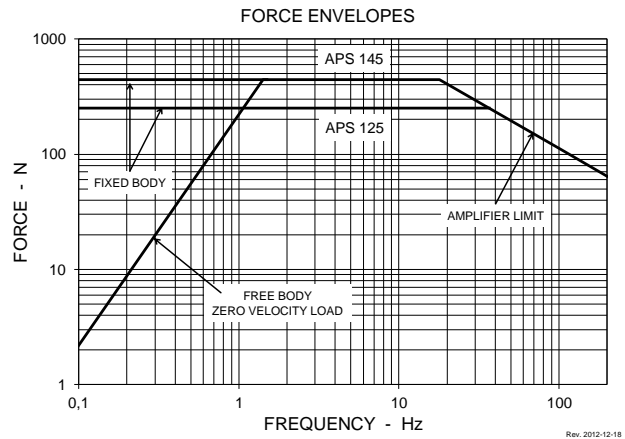
If a drive point on a structure in resonance is vibrating with a velocity of 1,000 mm/s (39 in/s) peak and a force of 445 N (100 lbf) peak is required to sustain the vibration level, then the shaker will be delivering approximately 220 W RMS to the structure. Such a load on the shaker is termed a matched resonant load, and it is purely resistive since the force is in a phase with the velocity.

If the resonant load input is other than 445 N x 1,000 mm/s, the full 220 watts of mechanical power cannot be delivered to the structure, the system being either force or velocity limited. If the resulting maximum response level is not great enough, the user may have the option of moving the shaker to a drive point having an impedance closer to the matched value, or adding more shakers to the array driving the structure.

Within the limitations of maximum force and velocity, the actual power delivered to a structure is a function of the input mechanical impedance at the drive point. In typical modal testing, this input impedance varies widely in magnitude and phase angle. At different frequencies, the input impedance of the drive point may appear predominately spring-like, mass-like, or resistive. Since the object of the tests is to establish resonant modes, at which the input mechanical impedance of all drive points are resistive, the shaker's maximum performance capability is most meaningful stated in terms of the force and velocity that can be obtained when driving a matched resistive load.

Therefore, performance is given in the form of graphs which present the envelopes of maximum force and velocity delivered to a resonant structure as functions of the resonance frequency of the structure.

Another application is the excitation for sensor calibration. Acceleration envelopes of the APS 400 ELECTRO-SEIS® shaker with various mass loads is shown in the lower graph for the 445 N rating.



# APS 400 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings

### Specifications

Shaker	APS 400
Force (Sine Peak)	445 N (100 lbf)
Velocity (Sine Peak)	1,000 mm/s (39 inch/s)
Stroke (Peak - Peak)	158 mm (6.25 inch)
Frequency Range	DC ... 200 Hz
Operation	horizontal or vertical
Armature Weight	2.8 kg (6.2 lb)
Max. Overhung Load at Armature Attachment Point	9.0 kg (20 lb)
DC Coil Resistance	1.6 Ω
Total Shaker Weight	73.0 kg (161 lb)
Shipping Weight	86.0 kg (190 lb)
Overall Dimension L x W x H	526 x 314 x 178 mm (20.7 x 12.4 x 7.0 inch)
Operating Temperature	5 ... 40 degrees C
Storage Temperature	-25 ... 55 degrees C

### Accessories (optional)

Shaker	APS 400
Power Amplifier	APS 145
System Cable for Connecting Shaker to Amplifier	APS 0082-6E
Zero Position Controller for Vibration Exciters	APS 0109
Reaction Mass Assembly	APS 0412
Lifting Handles (Set of 4)	APS 0414
Carrying Handles and Tie-down Bars	APS 0421
Auxiliary Table Kit – Horizontal	APS 0452
Auxiliary Table Kit – Vertical	APS 0477
Auxiliary Table Kit – Horizontal and Vertical	APS 0478
Horizontal Reaction Mass System	APS 4001
Overtravel Switch	APS 8543
Modal Stinger Kit	APS 8610
Steel Cable Kit	APS 8612

Additional accessories available

# APS 420 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings



The **APS 420 ELECTRO-SEIS®** shaker is a long stroke, electrodynamic force generator specifically designed to be used alone or in arrays for studying dynamic response characteristics of various structures. It finds use in modal excitation of complex structures, particularly when low frequencies are required. Furthermore it can be used for low frequency vibration testing of components and assemblies.

### Applications

- Determination of natural mode frequencies, shapes, damping ratios, and stress distributions
- Excitation of manufactured equipment in the factory or installed in the field to demonstrate compliance with seismic specification criteria
- Seismic simulation for components
- Test and calibration for seismic instruments
- Geological Services, Science, Physics and Seismic

### Features

- Can be used to generate sine wave, swept sine wave, random or impulse force waveforms, fully adjustable at source
- Test set-up flexibility - operates fixed body, free body, free armature
- Optimized to deliver power to resonant load with minimum shaker weight and drive power
- Adjustable armature re-centering for horizontal and vertical operation or other external pre-loads

# APS 420 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings

### Description and Characteristics

The APS 420 ELECTRO-SEIS® shaker has been optimized for driving structures at their natural resonance frequencies. It is an electrodynamic force generator, the output of which is directly proportional to the instantaneous value of the current applied to it, independent of frequency and load response. It can deliver random or transient as well as sinusoidal waveforms of force to the load. The armature has been designed for minimum mass loading of the drive point. The ample armature stroke allows driving antinodes of large structures at low frequencies and permits rated force at low frequencies when operating in a free body mode.

The unit employs permanent magnets and is configured such that the armature coil remains in a uniform magnetic field over the entire stroke range - assuring force linearity. The enclosed, self-cooled construction provides safety and minimum maintenance. Attachment of the armature to the drive point is accomplished by a simple thrust rod like the APS 8610 - Modal Stinger.

An amplifier, such as the APS 145 - Power Amplifier, is required to provide armature drive power.

### Modes of Operation

#### Free Armature Mode

In this mode, the armature provides the reaction mass for force delivered to the test structure via the shaker body. Auxiliary reaction mass may be added to the armature to decrease the low frequency limit for rated force operation.

The APS 420 and APS 4212 - Reaction Mass may be used in a vertical or horizontal free armature mode with rated force down to less than 4 Hz. Feet and carrying handles are provided for ease in placement of the shaker on horizontal test surfaces.

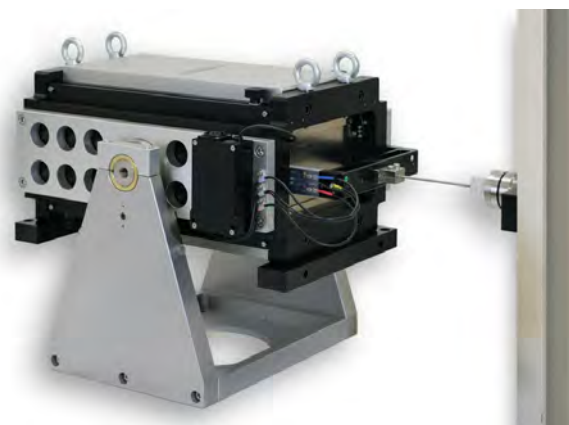
#### Fixed Body Mode

By providing a rigid attachment between the body and ground, the full relative velocity and stroke capability is available for load motion. Maximum rated force can be delivered down to 0.01 Hz and 70 % maximum to 0 Hz.

When choosing the best shaker location for tests, the APS 4222 - Trunnion Base allows the shaker to be set up in any axis from vertical to horizontal.



APS 420 with APS 4212 Reaction Mass Assembly



APS 420 with APS 4222 - Trunnion Base and APS 8610 Modal Stinger

# APS 420 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings

### Free Body Mode

In this mode, the body provides the reaction mass. Load and body motion are accommodated within the total relative velocity and stroke. Because of the high cross-axis stiffness provided by the armature linear guidance system, the shaker may be supported above ground level by means of suspension lines (APS 8612 - Steel Cable Kit) attached to the body. This provides a convenient mounting for introducing force parallel to a horizontal mounting surface. Examples of such surfaces include floors, roofs, platforms, cabinets, bridges and tanks.



APS 420 with APS 4252 - Auxiliary Table Kit – Horizontal



APS 420 with APS 8610 - Modal Stinger and  
APS 8612 - Steel Cable Kit prepared for  
Free Body Mode operation

### Shaker Table Mode

Auxiliary Table Kits are available which, when installed on the basic shaker, enable the shaker to provide long stroke excitation to components or model structures mounted on the table.

The APS 4252 Auxiliary Table Kit provides horizontal motion, the APS 4277 Auxiliary Table Kit provides vertical motion and the APS 4278 Auxiliary Table Kit provides either the vertical or horizontal motion configuration.



APS 420 with  
APS 4277 - Auxiliary Table Kit - Vertical

# APS 420 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings

### Performance

The primary purpose of the APS 420 ELECTRO-SEIS® shaker is to determine the dynamic characteristics of mechanical structures. At resonance, a large amount of energy is contained in the structure, and the shaker must accommodate the resulting motion. However, it needs only supply the real mechanical power dissipated by damping mechanisms within the structure.

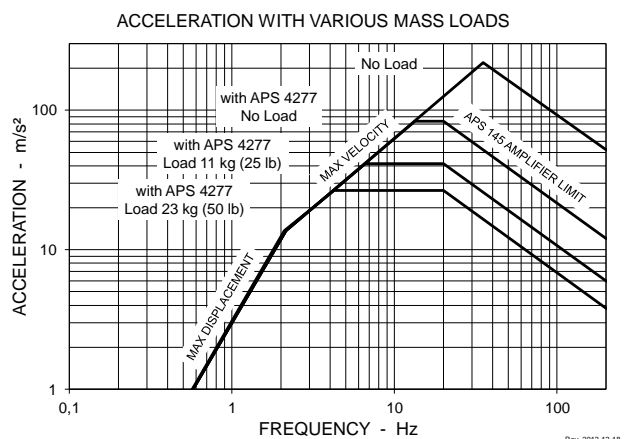
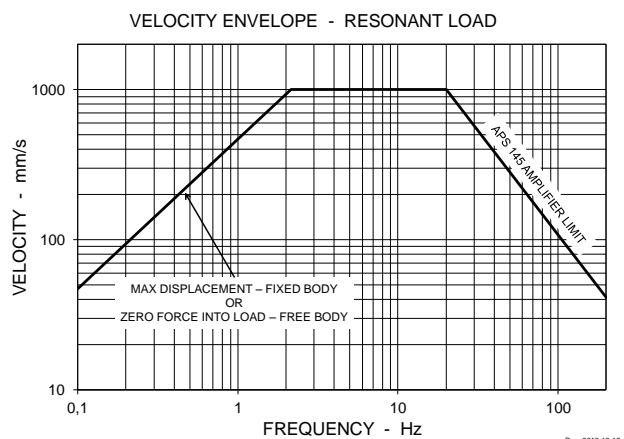
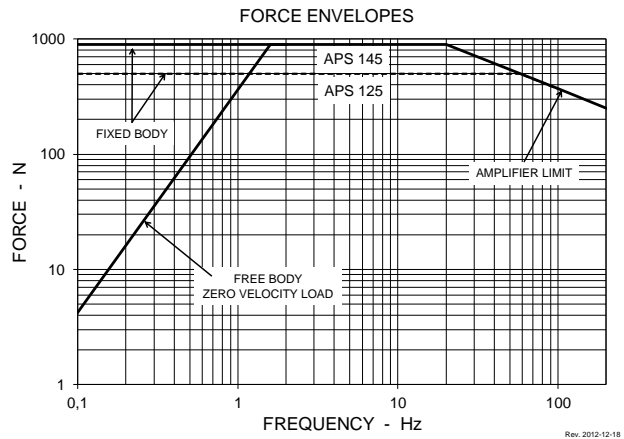
If a drive point on a structure in resonance is vibrating with a velocity of 1,000 mm/s (39 in/s) peak and a force of 900 N (200 lbf) peak is required to sustain the vibration level, then the shaker will be delivering approximately 450 W RMS to the structure. Such a load on the shaker is termed a matched resonant load, and it is purely resistive since the force is in a phase with the velocity.

If the resonant load input is other than 900 N x 1,000 mm/s, the full 450 watts of mechanical power cannot be delivered to the structure, the system being either force or velocity limited. If the resulting maximum response level is not great enough, the user may have the option of moving the shaker to a drive point having an impedance closer to the matched value, or adding more shakers to the array driving the structure.

Within the limitations of maximum force and velocity, the actual power delivered to a structure is a function of the input mechanical impedance at the drive point. In typical modal testing, this input impedance varies widely in magnitude and phase angle. At different frequencies, the input impedance of the drive point may appear predominately spring-like, mass-like, or resistive. Since the object of the tests is to establish resonant modes, at which the input mechanical impedance of all drive points are resistive, the shaker's maximum performance capability is most meaningful stated in terms of the force and velocity that can be obtained when driving a matched resistive load.

Therefore, performance is given in the form of graphs which present the envelopes of maximum force and velocity delivered to a resonant structure as functions of the resonance frequency of the structure.

Another application is the excitation for sensor calibration. Acceleration envelopes of the APS 420 ELECTRO-SEIS® shaker with various mass loads is shown in the lower graph for the 900 N rating.



# APS 420 ELECTRO-SEIS®

## Long Stroke Shaker with Linear Ball Bearings

### Specifications

Shaker	APS 420
Force (Sine Peak)	900 N (200 lbf)
Velocity (Sine Peak)	1,000 mm/s (39 inch/s)
Stroke (Peak - Peak)	150 mm (5.9 inch)
Frequency Range	DC ... 200 Hz
Operation	horizontal or vertical
Armature Weight	3.6 kg (8.0 lb)
Max. Overhung Load at Armature Attachment Point	9.0 kg (20 lb)
DC Coil Resistance	1.1 Ω
Total Shaker Weight	140 kg (310 lb)
Shipping Weight	165 kg (365 lb)
Overall Dimension L x W x H	591 x 360 x 280 mm (23.3 x 14.2 x 11.0 inch)
Operating Temperature	5 ... 40 degrees C
Storage Temperature	-25 ... 55 degrees C

### Accessories (optional)

Shaker	APS 420
Power Amplifier	APS 145
System Cable for Connecting Shaker to Amplifier	APS 0082-6E
Zero Position Controller for Vibration Exciters	APS 0109
Reaction Mass Assembly	APS 4212
Handles	APS 4221
Trunnion Base	APS 4222
Auxiliary Table Kit – Horizontal	APS 4252
Auxiliary Table Kit – Vertical	APS 4277
Auxiliary Table Kit – Horizontal and Vertical	APS 4278
Over Travel Switch	APS 8543
Over Temperature Switch	APS 8544
Modal Stinger Kit	APS 8610
Steel Cable Kit	APS 8612

Additional accessories available



# APS 500 ELECTRO-SEIS®

## Long Stroke Shaker with Air Bearing Load Mounting Table



The **APS 500 ELECTRO-SEIS®** Air Bearing shaker is a long stroke, electrodynamic force generator specifically designed to be used for calibration and evaluation of accelerometers and other motion transducers. It provides excellent properties for low frequency excitation of such devices. The model consists of an air bearing driver attached to an air bearing load mounting table that allows payloads up to 3.0 kg (6.6 lb).

### Applications

- Calibration and test for seismic instruments like geophones and heavy seismic sensors
- Seismic simulation for components

### Features

- Designed for calibration and evaluation of seismic instruments with higher acceleration levels
- 21 lb, 95 N vector force
- 3.13 x 3.13-in, 79.5 x 79.5 mm load mounting table
- Air bearing guidance and support system carries up to 3.0 kg (6.6 lb) test load with very low cross-axis motion
- Efficient electrodynamic driver produces sine, random or transient waveforms
- Excellent waveform purity

# APS 500 ELECTRO-SEIS®

## Long Stroke Shaker with Air Bearing Load Mounting Table

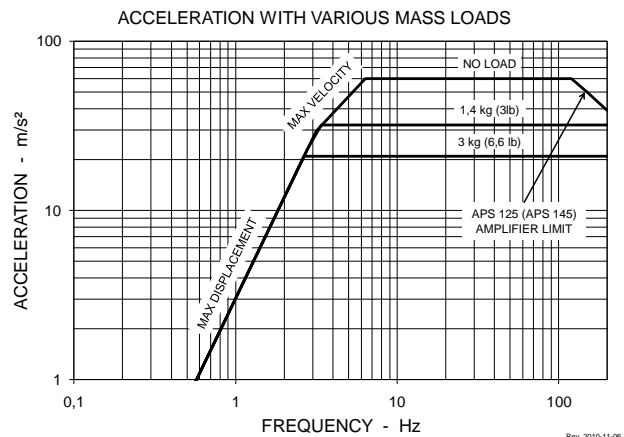
### Description and Characteristics

The APS 500 ELECTRO-SEIS® shaker consists of a load mounting table and air bearing assembly driven by an APS 113-AB-LA ELECTRO-SEIS® long stroke air bearing shaker. The shaker imparts transverse base excitation to items mounted on the table.

Static and dynamic transverse loads are transferred through a large area precision air bearing to a rigid guide bar of square cross section. The driver unit and guide bar are mounted on a common rigid base, ensuring correct alignment of all moving parts. The standard hole pattern consists of 25 threaded holes in a 5 x 5 array. Optional metric threads and spacing are available.

The APS 113-AB-LA driver unit uses permanent

magnets and is configured such that the armature coil remains in a uniform magnetic field over the entire stroke range ensuring a high degree of linearity. The self-cooled armature coil requires power from a matching electronic power amplifier.



### Specifications

Shaker	APS 500
Force (Sine Peak)	95 N (21 lbf)
Stroke (Peak - Peak)	152 mm (6.0 inch)
Frequency Range	DC ... 200 Hz
Operation	horizontal or vertical
Armature Weight	1.5 kg (3.3 lb)
Max. Payload	Horizontal Vertical
	3.0 kg (6.6 lb) 1.3 kg (2.9 lb)
DC Coil Resistance	1.2 Ω
Air Pressure Required	4 bar ... 5 bar (60 psig ... 70 psig)
Air Flow Required	650 l/h (0.4 cfm)
Air Quality	ISO 8573.1 Class 3
Total Shaker Weight	64.0 kg (141.1 lb)
Overall Dimension L x W x H	813 x 219 x 210 mm
Load Table Size L x W	79.5 x 79.5 mm
Operating Temperature	5 ... 40 degrees C
Storage Temperature	-25 ... 55 degrees C

### Accessories (optional)

Shaker	APS 500
Power Amplifier	APS 125
System Cable for Connection Shaker to Amplifier	APS 0082-6E
Zero Position Controller for Vibration Exciters	APS 0109
Vertical Operation Kit	APS 5002

Additional accessories available

All data are subject to change without notice

# APS 600 ELECTRO-SEIS®

## Very Long Stroke Shaker with Air Bearing Load Mounting Table



The **APS 600 ELECTRO-SEIS®** Air Bearing shaker is a very long strong force generator specifically designed to be used for calibration and evaluation of accelerometers and other motion transducers. It provides excellent properties for very low frequency excitation of such devices. This model consists of an air bearing table that allows high payloads up to 25 kg (55 lb) e.g. for the calibration of geophones and heavy seismic sensors.

### Applications

- Calibration and test for seismic instruments like geophones and heavy seismic sensors
- Seismic simulation for components

### Features

- 215 N (48 lbf) force (sine peak)
- 450 mm stroke (peak - peak)
- 254 x 254 mm (10 x 10-in) load mounting table
- Air bearing guidance and support system carries up to 25 kg (55 lb) test load with very low cross-axis motion
- Efficient electrodynamic driver produces sine, random or transient waveforms
- Excellent waveform purity
- Horizontal and vertical operation

# APS 600 ELECTRO-SEIS®

## Very Long Stroke Shaker with Air Bearing Load Mounting Table

### Description

The APS 600 ELECTRO-SEIS® shaker consists of a driver attached to a load mounting table and air bearing assembly. The shaker imparts transverse base excitation to items mounted on the table.

Static and dynamic loads normal to the table surface are transferred through a large area precision air bearing to a rigid guide bar of rectangular cross section. The driver unit and guide bar assembly are mounted on a common rigid base.

The standard hole pattern consists of 25 threaded holes in a 5 x 5 array. Optional metric threads and spacing are available.

The driver unit employs permanent magnets and is configured such that the armature coil remains in a uniform magnetic field over the entire stroke range ensuring a high degree of linearity. The self-cooled armature coil requires power from a matching electronic power amplifier.



APS 600 - Vertical Operation  
with APS 0109 - Zero Position Controller

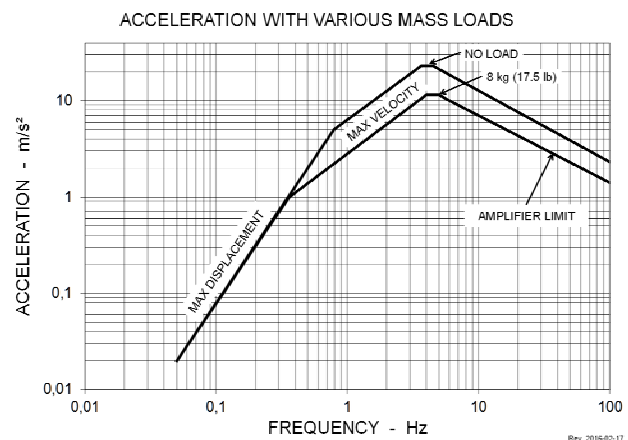
Clean, water and oil free air for bearing operation is carried to the moving bearing housing by flexible PVC tubing, constrained to move with a rolling action.

The shaker may be used with optional accessory items to extend the areas of application:

APS 0109 - ZERO POSITION CONTROLLER - automatically controls the zero position of a vibration exciter irrespective of its load.

### Performance

Test loads of up to 25 kg (55 lb) can be driven to acceleration levels typical of those found in seismic specifications. Performance envelopes of the APS 600 shaker with the APS 125 Power Amplifier are given in the graph. These envelopes represent the maximum acceleration for various test loads that can be achieved on the table.



# APS 600 ELECTRO-SEIS®

## Very Long Stroke Shaker with Air Bearing Load Mounting Table

### Specifications

Shaker	APS 600	
Force (Sine Peak) <sup>1)2)</sup>	215 N (48 lbf)	
Stroke (Peak - Peak) <sup>3)</sup>	400 mm (15.7 inch)	
Frequency Range	DC ... 100 Hz	
Operation	horizontal or vertical	
Armature Weight	9,3 kg (20.5 lb)	
Max. Payload	Horizontal Vertical	25 kg (55 lb) 8 kg (18 lb)
DC Coil Resistance	1.7 Ω	
Air Pressure Required	2 bar ... 3 bar (30 psig ... 45 psig)	
Air Flow Required	650 l/h (0.4 cfm)	
Air Quality	ISO 8573.1 Class 3	
Total Shaker Weight	230 kg (505 lb)	
Overall Dimension L x W x H	905 x 440 x 360 mm (35.6 x 17.4 x 14.2 inch)	
Load Table Size L x W	254 x 254 mm (10 x 10 inch)	
Operating Temperature	23 degrees C (± 2 K)	
Storage Temperature	-25 ... 55 degrees C	

### Accessories (optional)

Shaker	APS 600
Power Amplifier	APS 125
System Cable for Connection Shaker to Amplifier	APS 0082-6E
Zero Position Controller for Vibration Exciters	APS 0109

<sup>1)</sup> Peak sine

<sup>2)</sup> Intervall mode of operation

<sup>3)</sup> Recommended operation range peak-peak; mechanical stops at 450 mm (17.5 inch)

Additional accessories available

# APS 125

## Power Amplifier



### Applications

- Power amplifier for modal testing shaker
- Power amplifier for environmental testing systems

### Range of Use

- Research and development departments in industry
- Environment testing laboratories
- Universities and research institutes

### Features

- Voltage or current amplifier mode
- Frequency range DC ... 150 kHz
- Current and voltage monitor output
- Gain control
- Current limit control
- Multifunction display
- Switch for phase inversion (0° or 180°)
- Control inputs for remote emergency shut down
- Control mute input
- Amplifier state outputs for integration in testing systems
- Overload protection
- Forced air cooling for continuous operation
- High reliability operation

# APS 125

## Power Amplifier

### Description

The Power Amplifier Type APS 125 has been designed to drive any vibration or modal exciter requiring a 500 VA power amplifier.

The rated AC output is 500 VA into a 4 Ohm exciter or resistive load. Harmonic content of the output is very small as heavy negative feedback is used.

The instrument can tolerate temperature and supply line variations while maintaining excellent stability.

The APS 125 can be used as a voltage generator with low output impedance and a flat voltage frequency response, or as a current generator with high output impedance and a flat current frequency response.

The RMS output-current limit is adjustable.

### Specifications

General	
Power Output, Max.	500 VA into a 4 Ohm exciter or resistive load, at 25°C, at 1 kHz and nominal mains voltage.
Voltage Output, Max.	45 V RMS, DC ... 15 kHz
Current Output, Max.	5 A DC 5 A RMS, 0.1Hz..... 1 Hz 9 A RMS, 1 Hz.... 20 Hz 11 A RMS, 20 Hz.... 15 kHz
Frequency Range	20 Hz ... 15 kHz full power DC ... 150 kHz small signal voltage (-20 dB)
Input Impedance	> 10 kOhm
Input Voltage, Max.	10 V RMS
Monitor Output	Voltage monitor: 0.1 V/V $\pm$ 3 %, 0.1 Hz ... 15 kHz Current monitor: 0.1 V/A $\pm$ 3 %, 0.1 Hz ... 15 kHz
Power Requirements	Single phase 100 V / 120 V / 230 V RMS, $\pm$ 10 %, 50 Hz ... 60 Hz. Approx. 1,000 VA at full load
Dimensions	Height: 2 U equivalent of 88 mm (3.5 in.) Width: 482.6 mm (19 in.) with flanges for standard 19" rack mounting Depth: 450 mm (17.7 in.)
Weight	21 kg (46 lb.)
Voltage Mode	
Frequency Response	DC Input: DC ... 15 kHz $\pm$ 0.5 dB DC ... 150 kHz $\pm$ 3.0 dB small signal voltage (-20 dB) AC Input: 5 Hz ... 15 kHz $\pm$ 0.5 dB 2 Hz ... 150 kHz $\pm$ 3.0 dB small signal voltage (-20 dB) (2 separate BNC sockets at back panel)
Total Harmonic Distortion + Noise	< 0.1 % (40 Hz ... 5 kHz) < 0.2 % ( 5 kHz ... 15 kHz)
Gain	18 V/V ( $\pm$ 2 dB) at 1 kHz
Current Mode	
Frequency Response	DC Input:: DC ... 15 kHz $\pm$ 0.5 dB DC ... 60 kHz $\pm$ 3.0 dB small signal voltage (-20 dB) AC Input:: 5 Hz ... 15 kHz $\pm$ 0.5 dB 2 Hz ... 60 kHz $\pm$ 3.0 dB small signal voltage (-20 dB)
Total Harmonic Distortion + Noise	< 0.2 % (40 Hz ... 2 kHz) < 0.8 % ( 2 kHz ... 15 kHz)
Gain	5.5 A/V ( $\pm$ 2 dB) at 1 kHz

# APS 145

## Power Amplifier



### Applications

- Power amplifier for modal testing shaker
- Power amplifier for environmental testing systems

### Range of Use

- Research and development departments in industry
- Environment testing laboratories
- Universities and research institutes

### Features

- Voltage or current amplifier mode
- Frequency range DC ... 50 kHz
- Current and voltage monitor output
- Gain control
- Current limit control
- Multifunction display
- Switch for phase inversion (0° or 180°)
- Control inputs for remote emergency shut down
- Control mute input
- Amplifier state outputs for integration in testing systems
- Overload protection
- Forced air cooling for continuous operation
- High reliability operation



# APS 145

## Power Amplifier

### Description

The Power Amplifier Type APS 145 has been designed to drive any vibration or modal exciter requiring a 810 VA power amplifier.

The rated AC output is 810 VA into a 2.5 Ohm exciter or resistive load. Harmonic content of the output is very small as heavy negative feedback is used.

The instrument can tolerate temperature and supply line variations while maintaining excellent stability.

The APS 145 can be used as a voltage generator with low output impedance and a flat voltage frequency response, or as a current generator with high output impedance and a flat current frequency response.

The RMS output-current limit is adjustable.

### Specifications

General	
Power Output, Max.	810 VA into a 2.5 Ohm exciter or resistive load, at 25°C, at 1 kHz and nominal mains voltage.
Voltage Output, Max.	45 V RMS, DC ... 15 kHz
Current Output, Max.	4 A DC 15 A RMS > 0.1 Hz, Z = 1.5 Ohm 18 A RMS > 0.1 Hz, Z = 2.5 Ohm – optimal impedance
Frequency Range	0.1 Hz ... 10 kHz full power DC ... 50 kHz small signal voltage (-20 dB)
Input Impedance	> 10 kOhm
Input Voltage, Max.	10 V RMS
Monitor Output	Voltage monitor: 0.1 V/V ± 3 %, 5 Hz ... 15 kHz Current monitor: 0.1 V/A ± 3 %, 5 Hz ... 15 kHz
Power Requirements	Single phase 100 V / 120 V / 230 V RMS, ± 10 %, 50 Hz ... 60 Hz (factory presetting) approx. 1,500 VA at full load
Dimensions	Height: 3 U equivalent of 132 mm (5.2 in.) Width: 482.6 mm (19 in.) with flanges for standard 19-inch rack mounting Depth: 451 mm (17.8 in.)
Weight	22 kg (48.5 lb.)
Voltage Mode	
Frequency Response	DC Input: DC ... 10 kHz ± 0.5 dB DC ... 50 kHz ± 3.0 dB small signal voltage (-20 dB) AC Input: 5 Hz ... 10 kHz ± 0.5 dB 2 Hz ... 50 kHz ± 3.0 dB small signal voltage (-20 dB) (2 separate BNC sockets at back panel)
Total Harmonic Distortion + Noise	< 0.2 % (0.1 Hz ... 5 kHz) < 0.3 % (5 kHz ... 10 kHz)
Gain	18 V/V ± 2 dB
Current Mode	
Frequency Response	DC Input: 0.1 Hz ... 10 kHz ± 0.5 dB DC ... 50 kHz ± 3.0 dB small signal voltage (-20 dB) AC Input: 5 Hz ... 10 kHz ± 0.5 dB 2 Hz ... 50 kHz ± 3.0 dB small signal voltage (-20 dB) (2 separate BNC sockets at back panel)
Total Harmonic Distortion + Noise	< 0.3 % (0.1 Hz ... 2 kHz) < 0.8 % (2 kHz ... 10 kHz)
Gain	7.5 A/V ± 2 dB

All data are subject to change without notice

# APS 0109

## Zero Position Controller for Vibration Exciters



The APS 0109 Zero Position Controller automatically controls the zero position of a vibration exciter irrespective of its load. It is essential to employ a position controller of type APS 0109 especially when working with an air-bearing vibration shaker without any integrated automatic load-compensation. The control characteristics of the APS 0109 can be adjusted, so the Zero Position Controller APS 0109 can easily be adapted to different types of shakers in vertical or horizontal operation directions. The Zero Position Controller contains a number of monitoring and control functions that efficiently prevent any overload or damage of the connected system. The APS 0109 is intended for the automatic control of vibration systems with integrated power amplifiers that supply an offset-free DC voltage.

### Applications

- Zero position control of vibration exciters used in vibration testing and in calibration systems

### Range of Use

- Calibration laboratories for vibration measuring equipment
- Environmental test laboratories using vibration test equipment

### Features

- For use on vibration exciters operating in horizontal and vertical directions
- Monitoring of vibration displacement for exceedance of maximum displacement
- Indicator of zero position
- Set up of certain load independent zero positions
- Monitoring of air pressure in air bearing vibration exciters
- Monitoring of Amplifier
- Modular structure allows system configuration to customer's demands

# APS 0109

## Zero Position Controller for Vibration Exciters

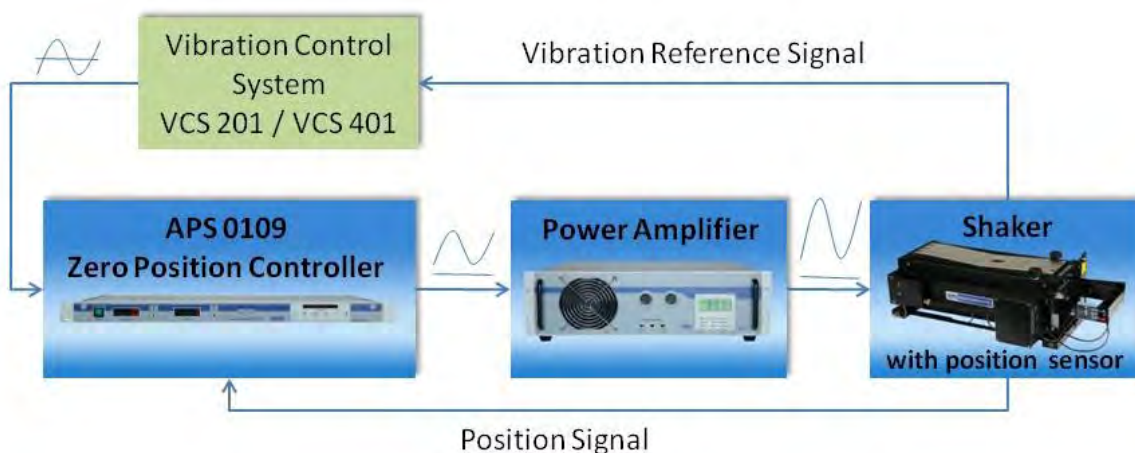
**The following functions are available:**

- Switching on and off regime controlled by microcontroller (soft start-up and shut-down)
- Signal inputs will be connected through only after zero position has been reached
- In case of error: system is shut down in a well-defined and soft manner
- Monitoring of maximum vibration displacement
- Monitoring of air pressure in air-bearing shakers
- Monitoring of amplifier
- Adjustable zero position
- LED for indication of operating condition and protective function

The customer can opt between three types of optical position measuring systems. In this way, any interference by magnetic fields (for example that of the shaker) is avoided. Because of its modular design, the APS 0109 can be configured cost-effectively in line with the requirements of the entire system.

<b>Internal Gain</b>	0 dB = 1
<b>Bandwidth</b>	0.1 Hz ... 25 kHz
<b>Max. Input Voltage</b>	10 V peak
<b>Zero Setting Range</b>	30 % of maximum displacement
<b>Power Supply</b>	100 V ... 240 V, 50 Hz or 60 Hz
<b>Dimensions of the Rack</b>	1 U, 19"
<b>Operation</b>	controls on front panel
<b>Interface</b>	RS232 Interface for linkage to SPS (24 VDC, indirect-coupled) (optional extra)
<b>Optional Extras:</b>	
<b>Remote Control</b>	via RS232 / USB
<b>Position Measuring System</b>	Optical wedge (APS 0109-G) Laser (APS 0109-L) Triangulation sensor (APS 0109-T)
<b>PC Software</b>	for editing and saving the configuration files, FW-Update
<b>External Configuration Memory</b>	To swap configuration files between several APS 0109 (without a PC)

### Example Application



# Connecting Cables

## Vibration Exciter to Amplifier

Connecting cables between the power amplifiers APS 125 and APS 145 with Speakon® output and vibration exciters manufactured 2010 and later

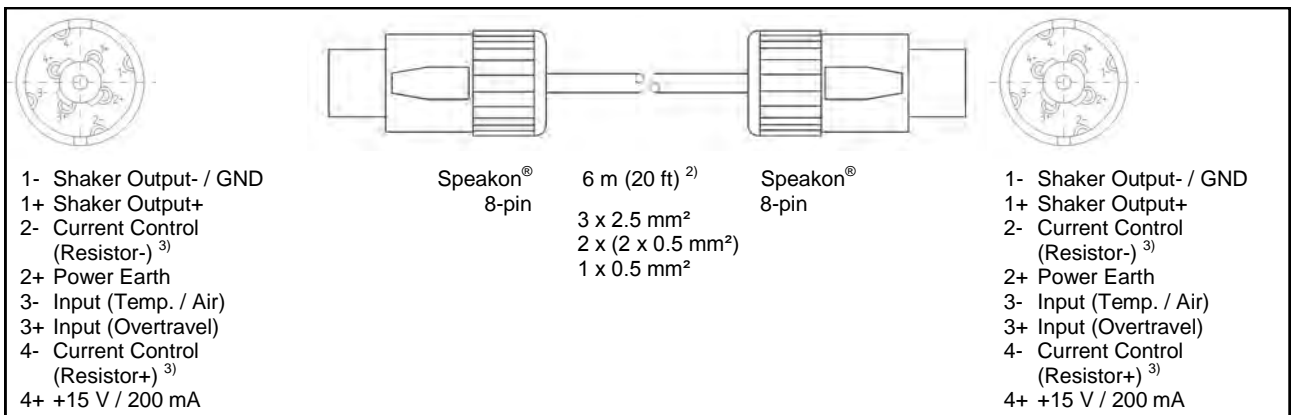
### Model 0082-6E

#### Power Amplifier

APS 125  
 APS 145  
 APS 125 with APS 0109  
 APS 145 with APS 0109

#### Vibration Exciter

All APS Shaker



<sup>2)</sup> Further cable lengths on request

<sup>3)</sup> Table 1: Resistors for Over Current Protection (Resistors are encoded in the shaker-connection-box)

R <sub>OCP</sub>	I max.	Vibration Exciter
∞	3 A RMS	
27.4 kOhm	4 A RMS	APS 113, APS 113-AB, APS 129
5.62 kOhm	8 A RMS	APS 113-LZ, APS 129-LZ
4.87 kOhm	9 A RMS	APS 113-HF, APS 113-AB-HF, APS 113-AB-LA, APS 129-HF, APS 500
0 Ohm	11.3 A RMS (APS 125)	APS 400, APS 420
2.26 kOhm	16.2 A RMS (APS 145)	APS 400, APS 420



# Connecting Cables

## Vibration Exciter to Amplifier

Connecting cables between the power amplifiers APS 125 and APS 145 with Speakon® output and vibration exciters manufactured before 2009

### Model 0082-1F

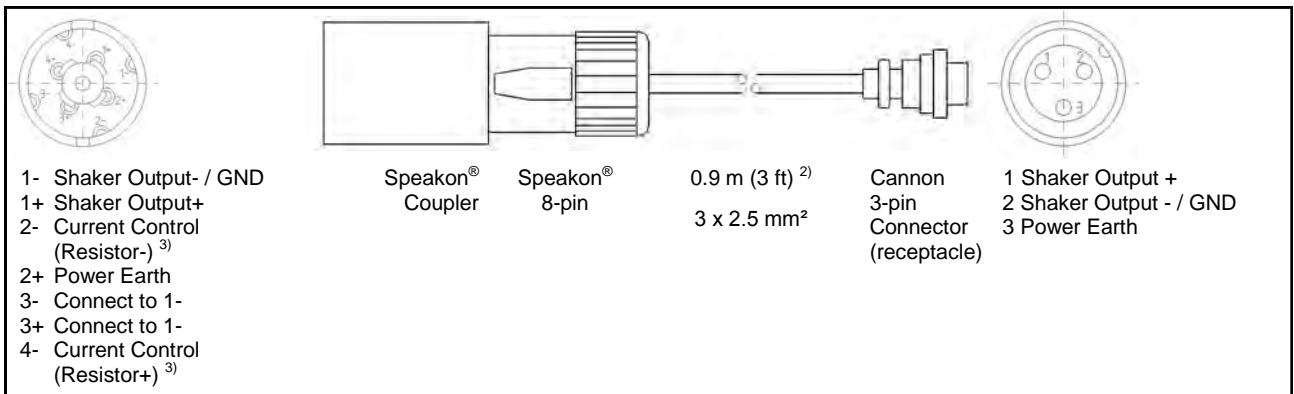
#### Power Amplifier

(APS 125)

only in combination with

#### Vibration Exciter

APS 113-AB-LA <sup>1)</sup>  
 APS 129 <sup>1)</sup>  
 APS 129 HF <sup>1)</sup>



Connecting cables between the power amplifiers APS 114, APS 125 and APS 145 with Cannon output and vibration exciters manufactured before 2009

### Model 0082-20A/2C

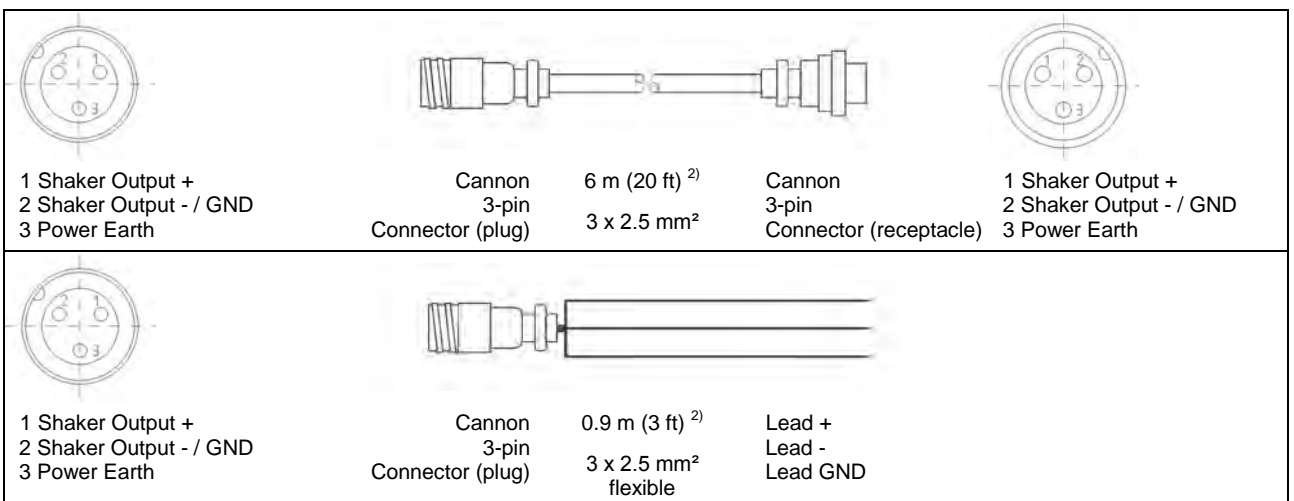
(replaces 0081-20A/2C)

#### Power Amplifier

APS 114  
 APS 124  
 APS 144

#### Vibration Exciter

APS 113  
 APS 113-HF  
 APS 113-AB  
 APS 113-AB-HF  
 APS 400



<sup>1)</sup> With Cannon connector

<sup>3)</sup> See Table 1 on page 3

# Connecting Cables

## Vibration Exciter to Amplifier

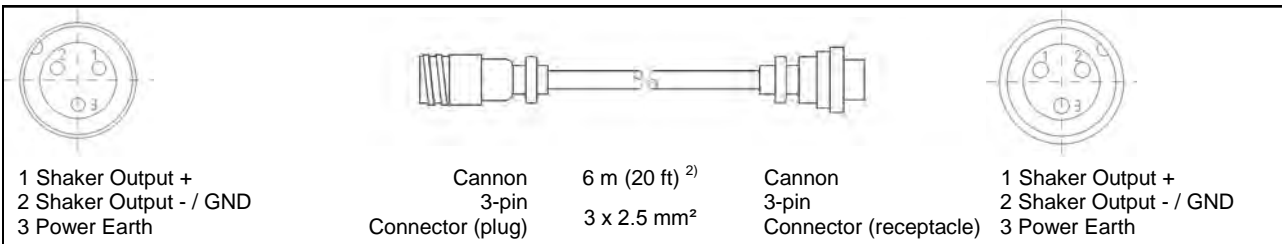
### Model 0082-20A

#### Power Amplifier

APS 114  
 APS 124  
 APS 144

#### Vibration Exciter

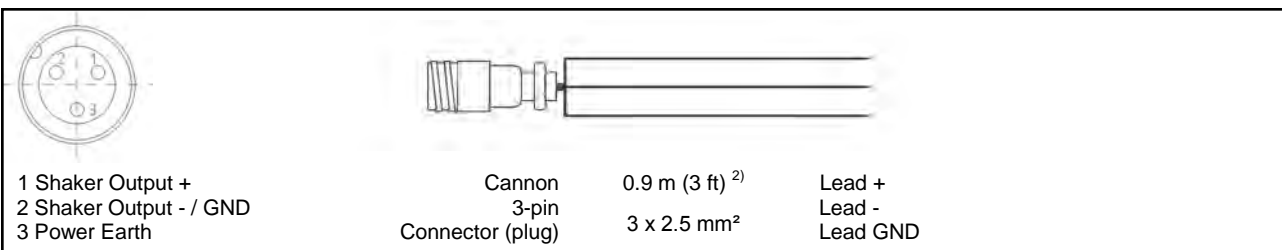
APS 113-AB-LA <sup>1)</sup>  
 APS 129 <sup>1)</sup>  
 APS 129-HF <sup>1)</sup>  
 APS 500 <sup>1)</sup>



### Model 0082-2C

(replaces 0081-2C)

by default part of  
 0082-20A/2C



<sup>1)</sup> With Cannon connector

<sup>2)</sup> Further cable lengths on request

# VCS 201

## Vibration Control System

### Fields of Application

The VCS 201 Vibration Control System is a digital measuring and control system to be used in vibration engineering. Thus it is employed as standard control module in vibration test systems by SPEKTRA. It is used to set up and control the test equipment and visualize the test criteria for the simulation of environments of objects under test according to DIN EN 60068-2, military or manufacturer's standards.

The VCS 201 is suitable as control module for any kind of equipment mentioned above. I.e. the VCS 201 can also be used without any trouble for updating existing systems.

A special application of the VCS 201 Vibration Control System is used as SRS-35 in the CS18 Calibration System by SPEKTRA for the calibration of accelerometers.

### Applications

Typical applications of the VCS 201 Vibration Control System in combination with a vibration exciter are systems for:

- the simulation of environments in the lab,
- vibration exposure testing in the production of susceptible modules (e.g. CD drives)
- balancing systems for vibration sensors (e.g. airbag sensors)

### Features

Selectable modes:

- Sine - fixed frequencies
- Swept sine
- Noise (optional extra)
- Shock (optional extra)

The frequency range of the control action is identical for all modes:

- 5 Hz ... 5 kHz (optional extras: other ranges, up to 0.4 Hz up to 50 kHz)

Other features (subset)

- Remote control option by DCOM or DLL
- Observation channels (notch)
- Laservibrometer as velocity sensor
- Sensor curve correction

**Option:** Plug-in module I/O13 for generating +24 V switching signals.

This plug-in module is needed when the VCS 201 is part of an automatic test stand and control signals have to be supplied or processed.

### Example of Applications



*Vibration testing of sensors up to 400 g<sub>r</sub> using the VCS 201 on a vibration exciter SE-R101*

### Design and Configuration

The Vibration Control System VCS 201 is a Vibration Control Unit VCU13 (front-end hardware in 19" modular design) in conjunction with the PC software VCS 201 for WINDOWS.

In its basic version, the VCS 201 includes the following plug-in units: (1 TE = 5.08 mm)

- Dual-channel measuring amplifier ANA13.5 (10 TE)
- Signal generator CPU13.5 (10 TE)
- Signal processor/controller (SHARC) DSP13 (4 TE)
- Power supply unit PS13.5 (14 TE).

Depending on the application, the plug-in units are housed either in a laboratory case or in a 19" module frame to be used as a plug-in for rack mount.

In its basic version, channel 1 of the measuring amplifier carries the reference signal used for control and channel 2 is used as a supplementary measuring channel. Each channel has three inputs which can be selected electronically and to which the following sources can be directly connected:

- Charge transducers, CHAx
- Transducers with integrated amplifiers, ICPx
- Voltage signal, DIR

There is a RS-232, USB or ethernet interface for communication with the control PC.

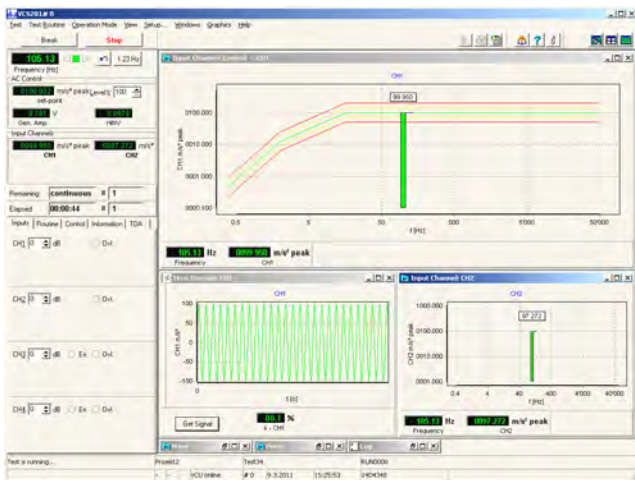
The VCS 201 can be upgraded by adding two more measuring channels (1 plug-in unit ANA13.5).

The VCS 201 software is optionally also available for all CS18 calibration systems.

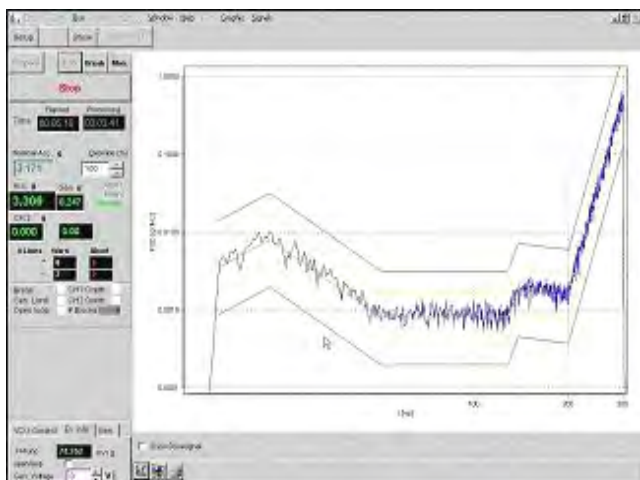


# VCS 201

## Vibration Control System



Sine sweep 0.4 Hz ... 50 kHz with interfaces a, v, d



Noise in a frequency range with stress profile

### Specification

- Signal generation:** 5 Hz ... 5 kHz (option:  
0.4 Hz ... 50 kHz with 0.01 Hz  
resolution, to be set in discrete steps)
- Swept-sine  
excitation:** Linear or logarithmic frequency  
sweep
- Noise excitation:** controlled noise up to 2,000 lines  
**2 Hz ... 5 (32) kHz**
- Shock excitation:** half sine, trapezoid, saw tooth  
0.25 ms ... 40 ms
- Signal inputs:**
  - DIR input for AC signals, e.g.  
from a measuring amplifier
  - CHA input for directly  
connecting charge sensors
  - ICP® input for directly connecting  
ICP® sensors, incl. 4 mA supply
- Gain:** to be programmed for each channel  
in 6 dB steps between
  - 12 dB and 78 dB for combined  
inputs DIR / ICP®
- Interfaces:** RS 232 / USB / Ethernet
- AD conversion:** 16 Bit resolution: 128 / 64 / 32 /  
16 / 8 kHz sampling frequency
- AC signal output:** 10 V (0 V<sub>RMS</sub> ... 7,071 V<sub>RMS</sub>) to  
external power amplifier
- COLA output:** Constant level output
- AC output:** OUT X analog input for checking  
the waveform for each channel
- Power supply:** 230 V / 50 Hz // 115 V / 60 Hz
- Dimensions  
(W x H x D):** Width depending on configuration  
19" x 3 U x 320 mm



Vibration Control System VCS 201  
with power amplifier PA14-500

# VCS 400

Vibration Control System – powerful, modular, flexible



## Applications

- Vibration tests
- Modal excitation
- Quality assurance
- Environmental tests

## Fields of use

- Subsystem for automatic tests in production lines
- Mobile use in field
- Laboratory applications
- Updating of existing vibration test systems
- Customized solutions
- Tailored controller configurations for APS-shakers

## Features

- Scalable, flexible vibration control system with variable number of measurement/control channels
- Hardware base:  
**National Instruments PXI**  
reasonable price, worldwide available
- Compact hardware, suitable for industrial applications
- Controller for vibration test modes:  
sine, random, shock
- Control of acceleration, velocity, displacement, voltage, also with laser vibrometers
- Stand-alone usage without PC possible
- Remote controllable by Ethernet interface, DLL
- Measurement database
- Rich display and export options

# VCS 400

## Vibration Control System – powerful, modular, flexible

### Operation modes

- Sine
- Random
- Shock optional

### Application

- Providing well controlled vibration with one exciter in low frequency range
- Orientation measurement for environmental tests
- Easy and medium complex test scenarios

### Technical data

Sine	0.1 Hz ... 5 kHz (Extensions on request)
Random	1 Hz ... 5 kHz, 5,000 Lines

### Output Channels

- 2 output channels 16 bit, 10 V:
- 1 control channel for 1 shaker
- 1 Monitoring channel (COLA, Freq. Monitor,...)

### Input Channels

- 2 input channels 16 bit (0.2, 1, 5, 10 V) DC
- IEPE/ICP optional
- One of the two input channels is usually connected with a reference sensor at exciter thru a supply box

### Configuration

- NI PXI Real time system in flexible composition
- Connection to PC via Ethernet
- Powerful PC User Interface (National Instruments LabVIEW), extensible by customer if necessary
- Digital I/O for status, start, stop
- optional signal conditioning for charge sensors, PR sensors, capacitive sensors

### Remote control

- simple flexible remote control by DLL, Ethernet, VI or COM/DCOM

### Options

- flexible data analysis
- Complex test schedules by easy scripts inside user interface program

### Standards

- DIN EN 60068-2 Part 6, 27, 29, 64, 80

# VCS 401

Vibration Control System – powerful, modular, flexible



## Applications

- Vibration tests
- Modal excitation
- Quality assurance
- Environmental tests
- Micro-structural investigation

## Fields of use

- Subsystem for automatic tests in production lines
- Mobile use in field
- Laboratory applications
- Updating of existing vibration test systems
- Customized solutions
- Tailored controller configurations for SPEKTRA HF-shaker SE-09 and APS-shakers
- Laser measurement station for micro-mechanic components

## Features

- Scaleable, flexible vibration control system with variable number of measurement/control channels
- Hardware base:  
**National Instruments PXI**  
reasonable price, worldwide available
- Compact hardware, suitable for industrial applications
- Controller for vibration test modes:  
sine, random, shock, time signal replication
- Control of acceleration, velocity, displacement, voltage, also with laser vibrometers
- Stand-alone usage without PC possible
- Remote controllable by Ethernet interface, DLL
- Measurement database
- Rich display and export options
- Real time data acquisition, transmission, recording
- Complex test schedules by easy scripts inside user interface program

# VCS 401

## Vibration Control System – powerful, modular, flexible

### Operation modes

- Sine
- Random
- Shock
- Sine over Random
- Resonance (search & dwell)
- Time signal replication
- others on request

### Technical data

Sine	0.01 Hz ... 50 (95) kHz (Extensions on request)
Random	1 Hz ... 50 (95) kHz, 5,000 (10000) Lines
Shock	Halfsine, Trapezoid, Sawtooth, Custom; 0.25 ms ... 40 ms

### Multi channel operation

- 1 to 8 control channels for up to 8 shakers
- Synchronous excitation, with adjustable phase shift if required
- Individual excitation of some or all channels
- 1 channel control with up to 34 inputs, average, min., max.
- Monitoring channels

### Configuration

- NI PXI Real time system in flexible composition
- Connection to PC via Ethernet
- Powerful PC User Interface (National Instruments LabVIEW), extensible by customer if necessary
- 2 to 34 Analogue Inputs 24 Bit, 10 V, with or without IEPE, switchable
- 2 to 8 Analogue Outputs 24 Bit, 10 V
- optional data acquisition channels e.g. 16 \* 16 Bit
- optional Digital I/O for status, start, stop
- optional signal conditioning for charge sensors, PR sensors, capacitive sensors

### Remote control

- simple flexible remote control by DLL, Ethernet, VI or COM/DCOM

### Data acquisition

- Real time data acquisition, transmission, recording
- flexible data analysis

### Special solutions

- Low cost standard system, 1 output / 2 input channel(s), 0.1 Hz ... 5 kHz
- 4 Channel Controller for 4 long stroke shakers APS 400 with seismic masses for modal analysis
- HF-Controller with HF Shaker SE-09, 1 Hz ... 95 kHz
- Customized solutions, production test systems, digital acc. sensor data acquisition, 3D excitation

### Standards

- DIN EN 60068-2 Part 6, 27, 29, 64, 80

All data are subject to change without notice

September 2014

# List of References \*

## APS Vibration Exciters

### National Laboratories

**INMETRO, Rio de Janeiro (Brasil)**  
**LNE, National Institute of Metrology (France)**  
**National Measurement Institute, Lindfield (Australia)**  
**National Institute of Metrology, Beijing (China)**  
**National Metrology Institute, Pretoria (South Africa)**  
**National Institute of Standards and Technology - NIST (USA)**  
**Physikalisch-Technische Bundesanstalt - PTB (Germany)**

### Universities

**University of Auckland, Auckland (New Zealand)**  
**University of Canterbury, Christchurch (UK)**  
**University of Michigan (USA)**  
**University of Puerto Rico, Río Piedras (Puerto Rico)**  
**University of Seoul, Seoul (South Korea)**  
**University of Sheffield (UK)**  
**University of Swinburn (Australia)**

### Automotive Industry Customers

**Ashok Leyland, Chennai (India)**  
**Audi, Ingolstadt (Germany)**  
**BMW (Germany)**  
**ChangAn Auto (China)**  
**Continental Automotive (Germany)**  
**Ford, Detroit (USA)**  
**Toyota, Arizona (USA)**

## **Aerospace and Defense**

**Airbus, Toulouse (France)**

**Boeing, Seattle (USA)**

**Defense Science and Technology Organisation (Australia)**

**Eurocopter (Germany)**

**Lockhead Martin, Texas (USA)**

**NASA, Washington D.C (USA)**

**Shenyang Aircraft (China)**

## **Other Industrial Customers**

**Amsted Rail Company (USA)**

**Central Building Research Ins. (India)**

**CSIR - Structural Engineering Research Centre (India)**

**Hewlett Packard (USA)**

**High Speed Railway Construction (China)**

**Industrial Technology Research Institute (Taiwan)**

**ION Geophysical Corp. (USA)**

**Kistler (China, Switzerland)**

**Meggitt (USA)**

**Missouri Tooling & Automation (USA)**

**Mining and Technology School (China)**

**Sismik Heating, Cooling and Security, Istanbul (Turkey)**

**Syscom Instruments (Switzerland)**

**Westinghouse Electric (Sweden)**

\* extract from the APS customer data base