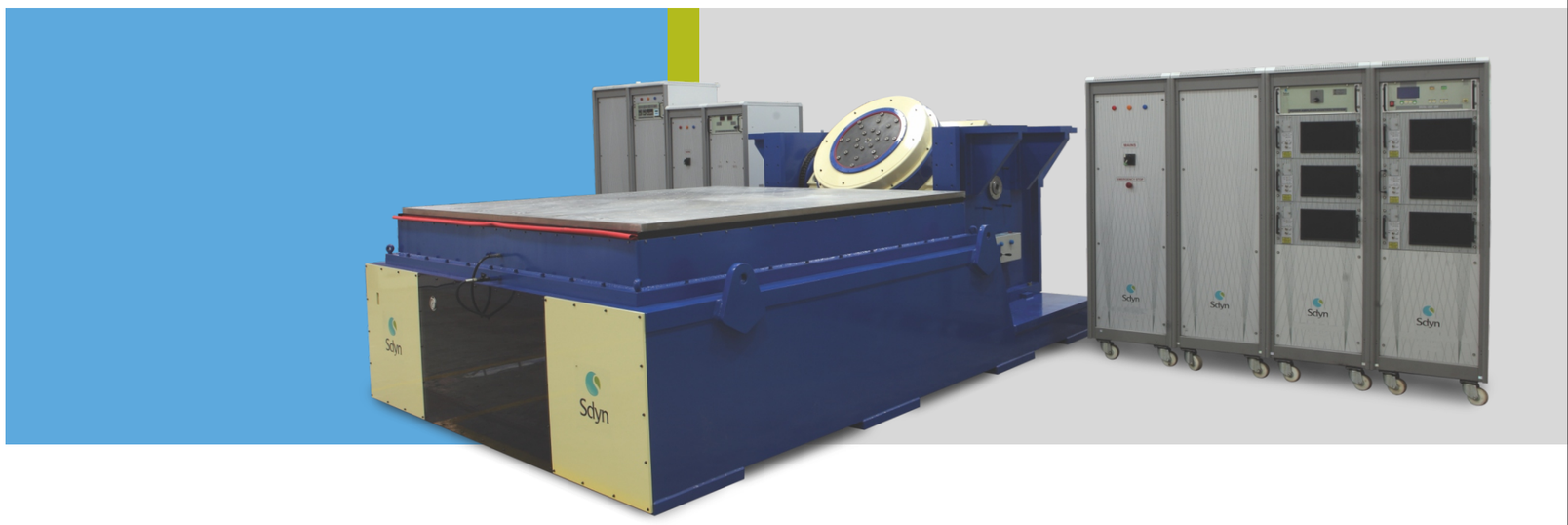
Sdyn

Product Catalogue



Sdyn

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Sdyn

This catalogue will acquaint you with our range of products and provide you with requisite information about our company, a pioneer in the field of Environmental Testing

CONTENTS









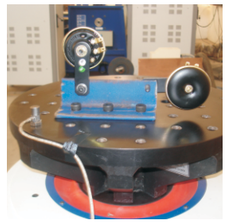

Introduction

Sdyn offers a holistic range of solutions and support aimed towards the advancement of Environmental Testing. In order to achieve the desired outcome, these systems are manufactured as per your requirements, and are installed at your chosen location, anywhere in the world.

Sdyn commenced its journey as an engineering company in early 1980s. With increasing sophistication in product quality and better understanding of our customers over the years, we took on the challenge of developing and manufacturing Electrodynamic Vibration Systems and Environmental Chambers for emerging needs in the Asian subcontinent.

Once this journey gathered momentum, we inducted multi-disciplinary engineering talent and utilised state-of-the-art technologies and materials to offer higher performance systems that carry a mark of reliability. We have strengthened our reputation by emerging as an organisation with a highly inclusive and receptive customer support team, a knack for timely delivery, un-matched aftersales support, and high quality products that offer value for money for our global customer base.

At Sdyn, we believe that the foundation of any modern civilisation is built upon the reliability of new and developing technologies. As a forerunner in the field of Environmental Testing, Sdyn facilitates the quality assurance of your product by helping you simulate environmental conditions to test and validate their reliability. Our systems ensure that idea and inventions being built today are impervious and exhibit endurance against the arduous test of time and nature.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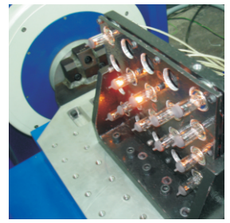
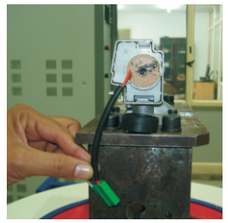
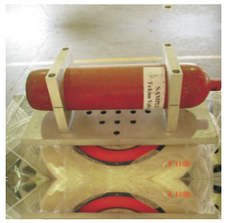

Bulb

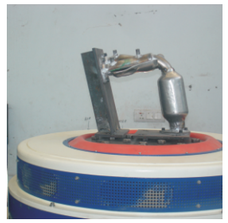

Genset Lock

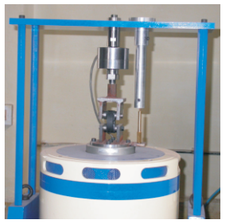

Cylinder

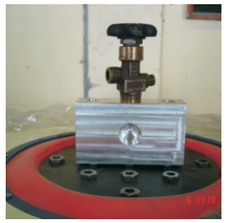

Radiator


Vehicle Lock


Steering Column


Cat Converter


Rubber testing


Valve

Application

	Automotive, Agriculture & Railways	Aeronautics, Astronautics & Defence	Consumer Electronics	Instrumentations	Electrical Equipment	Transportation	General Usage
Low Thrust Series	ECU, Window Regulator, Engine Sensor, Car Audio System, Navigation System, Horns, Lamps, Flashers, Lighting Assemblies, Mirrors, Solenoid, Pumps, ABS, Seat Belt, Latch, Ignition Switch, Door Handle, Gear Shifters, Car Radiators, Rear View Mirror, Steering Column Wheel, Engine Mounts (Rubber), Sensors, Switches, Air Conditioning Vent	In Flight Sensors, OBC, Display Systems, Resin Products, Sealing Agents, Engine Blades, Airborne Instruments, Rocket Launch Equipment, Research Profiles	Electronic Games (Video), Laptops, Tablets, Optical Disc Players, Scanners, Wireless Keyboards, Set Top Box, Electronic Clocks, LED/LCD TV, Digital Cameras, Video Recorders, Watches, Computer Mouse	Electronic Toll Collector, Fare Meters, Modem Routers, Telephone Answering Machine, Mobile Phone, Chargers, Medical Instruments, CCTV, Dish Antennas, Modem, Connectors	Overhead Transmission Line Dampers, Energy Meters, HVDC Equipment, Isolators, Light Masts, Electronic Ballast, LED Luminaries, Contactors, Domestic Inverters, UPS, Voltage, Current Coils, Connection Leads	Rolling Stock Equipment, Road Shipping Goods, Rail Coach Lights	Earthquake Simulation of Scaled Structures, University Curriculum, Engineering Colleges, Institutions
Medium Thrust Series	Vehicle Battery, Braking System, Seating Cabin, HVAC, Generator Radiators, HCV Radiators, Tractor Fenders, Starter Alternators, ECU Related Parts, Instrument Cluster Dashboard, Hybrid Related Systems, EV Parts, Electric Pump, Muffler, Catalyst, Fuel Battery, ABS Coil, Seat Belt, Bogie and Coach Braking System	Display Systems, Optical Navigation Systems, Radars, In Flight Communication System, Seating, Airborne Equipment, Space Launch Vehicle Systems, On Board Computers, Atomic and Defence Equipment, Microwave Tubes	Plasma TV, Microwave Owen, Printers, Plotters, VDU, General Purpose Motor, In Rack Equipment, PC, Printed Circuit Board, Audio Amplifiers, Automatic Data Processing Machines	Photocopy Machines, Optical Equipment, Industrial Robots, Communication Antennas	Voltage and Current Transformers, Fuel Battery, Industrial Power Generators, Industrial Inverters, Large Lithium Battery, Solar Lights	Rail Vehicle Equipment, Naval Shipping Container, Railway Braking System	Solar Panels, Instrument Panels, Atomic Energy Reactor Models
High Thrust Series	Compressor, Heavy Mounting Brackets, Catalytic Convertors, CNG Units, Hydraulic Sensors Starter, Alternator, Muffler, Hybrid Motor, Dynamo Power Unit	Launch Vehicle, Ground Systems, Satellite Sections, Rocket Mounted Computers, Cryogenic Equipment, Helicopter Assemblies, Propeller, Defence Associated Equipment, Missile Associated Component, Propeller, Flight Structures	Servo Stabiliser, Refrigerator, Industrial Washer, Industrial Electronics	Large Parabolic Antenna, Antenna Associated Equipment, Electronic Control Module, Launch Vehicle	Power Generation System, Power Distribution System, Heavy Transformers	Packing Cases, Heavy Vehicle Radiator, Railway Refrigeration System	Defence and Aerospace Research Projects

Electrodynamic Vibration Systems

An Electrodynamic Vibration System and an audio system are somewhat similar in the basic principle. In an Electrodynamic Vibration System the Electrodynamic Shaker work like the speakers of an audio system. The Vibration Controller generates the signal that is feed to a Power Amplifier much like an MP3 Player of an audio system. The Power Amplifier increases the gain to match with the speaker in an audio system and Electrodynamic Shaker in an Electrodynamic Vibration System. The main purpose of speaker in an audio system is to drives the diaphragm to create sound whereas the main purpose of Electrodynamic Shaker in an Electrodynamic Vibration System is to create the vibration itself.

The one big difference between the two is that in an Electrodynamic Vibration System, a sensor is placed on the armature of the Electrodynamic Shaker to sense the acceleration and provide a negative feedback to the Vibration Controller so that it may control the vibrations to meet the required test parameters.

The basic formula behind any Electrodynamic Vibration System is Force = Mass × Acceleration.

- The unit of Force is 'Newton' (N) as per SI and 'kgf' as per Gravitational Units
- The unit of Acceleration is 'm/s2'as per SI and 'g' as per Gravitational Units
- The unit of Mass is 'kg' as per SI and Gravitational Units

An acceleration of 9.8 m/s^2 is 1 g. To make the math easy this value of 9.8 m/s^2 is sometimes referred as 10 m/s^2. If we have a mass of 10 kg and acceleration is 10 m/s^2 or 1 g, then we get a force of 100 N if we consider acceleration in m/s^2 and 10 kgf if we consider acceleration in g. Hence, we say that 10 N = 1 kgf.

In the real world, vibration is a noise with infinite degree of freedom, but in a laboratory, this noise has to be made meaningful. We therefore break down vibration to Acceleration (m/s^2), Velocity (m/s) and Displacement (mpp) at a single or multiple Frequency (Hz). From these values we recreate the vibration in a controlled manner while monitoring the response of the Unit under Test (UUT).

- For given Frequency and Acceleration, Velocity is derived by $v = \frac{g \times 9810}{2 \times \pi \times f}$
- For given Frequency and Acceleration, Displacement is derived by $d = \frac{g \times 9810}{2 \times \pi^2 \times f^2}$
- For given Frequency and Velocity, Acceleration is derived by $g = \frac{2 \times \pi \times f \times v}{9810}$
- For given Frequency and Velocity, Displacement is derived by $d = \frac{v}{\pi \times f}$
- For given Frequency and Displacement, Acceleration is derived by $g = \frac{2 \times \pi^2 \times f^2 \times d}{9810}$
- For given Frequency and Displacement, Velocity is derived by $v = \pi \times f \times d$

Major Sub Systems of an Electrodynamic Vibration System are:

Electrodynamic Shaker
An Electrodynamic Shaker converts electrical energy from the Power Amplifier to mechanical vibrations using the principles of electromagnetism as described by Fleming's Left Hand Rule.

Power Amplifier
A Power Amplifier multiplies the output of the Vibration Controller by a fixed gain with great efficiency and feeds it to the Electrodynamic Shaker.

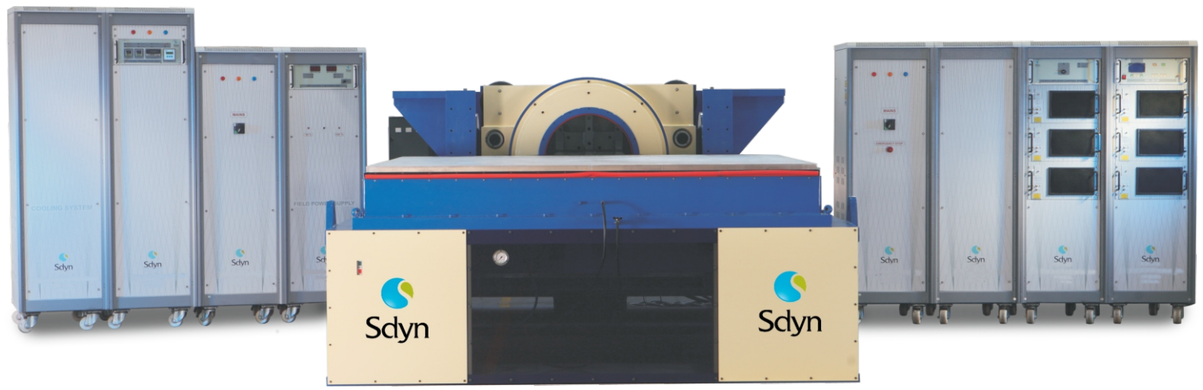
Vibration Controller
A Vibration Controller allows a user to create a test profile on a PC and generates a signal in real time to match the test profile. A sensor on the Electrodynamic Shaker provides negative feedback to keep the system in closed loop control.

Horizontal Slip Table
A Horizontal Slip Table is a frictionless platform used for vibration testing in X and Y axis.

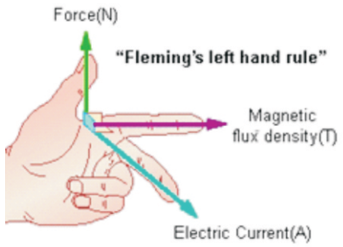
Head Expander
A Head Expander is bolted to the Armature head for increasing the platform size in Z axis only.

Vertical Load Support
A Vertical Load Support is bolted to the Armature head and supported by the shaker body for increasing the platform size in Z axis only.

Fixture
A Fixture is used to firmly hold the Unit Under Test (UUT) and provide proper mounting to the Armature or Attachment being used.



Electrodynamic Shaker



Sdyn's SEV and SEW series of Electrodynamic Shaker produces vibration based on the principle of magnetism. The SEV series is air cooled and SEW series is water cooled, respectively. The product portfolio covers all ranges of shaker, from 10 kgf up to 32000 kgf and beyond.

An Electrodynamic Shaker has two separate coils, one is stationary and the other is dynamic. A stationary magnetic field is produced from the stationary or field coil inside the shaker body and a dynamic magnetic field is produced from the dynamic or armature coil winded on the armature. Interaction of these two magnetic fields causes the freely suspended armature to move. This principle of magnetism is based on Fleming's Left Hand Rule.

Major Sub Systems of the Electrodynamic Shaker are:

Armature Structure

Constructed from magnesium alloy, an armature is the heart of any Electrodynamic Vibration System. Our armature features a web structure to minimise weight, while maintaining structural integrity. The pattern can only be casted, therefore, in order to achieve the best quality, we import these castings from one of the world's most renowned sources. Complete tooling, milling, drilling, and tapping of these castings is performed in our in-house CNC centre located in Noida, India.

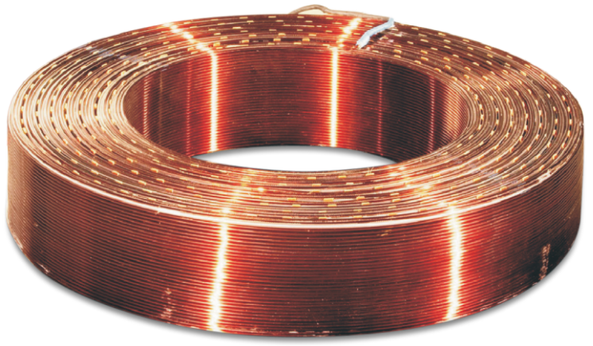
The winding process is carried out at our headquarters in Roorkee, India. Industrial grade epoxy is used to ensure that the coils adhere to each other as well as the magnesium structure. Air cooled systems use a solid copper conductor for superior conductivity and water cooled systems use hollow aluminium conductor for weight reduction.

For an air cooled system, power is transferred to the armature coil using highly flexible copper ropes. For a water cooled system, power and water are transferred on the same line using highly flexible copper ropes and hose pipes, respectively. Only oxygen free copper is used to ensure long life of the

Air Cooled Armature

Water Cooled Armature

Field Structure



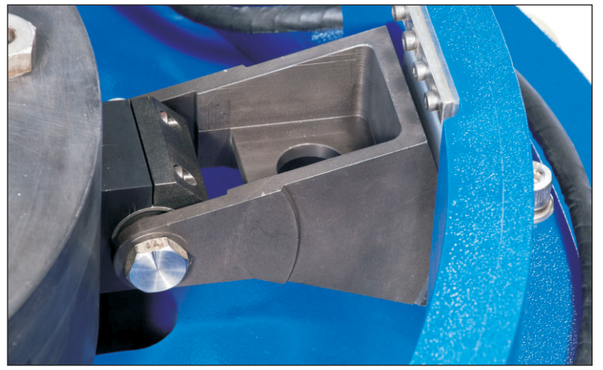
Housed inside the shaker's body, field coils are always stationary and produce a constant magnetic field. Sdyn's proprietary design uses two field coils with two copper rings between them. Location of the copper rings falls directly in the front and at the back of the armature coil with minimal space between the rings and the armature for smooth operation. As the field is powered with DC supply and the armature with AC supply, interaction of flux of these coils causes the movement of the armature. The copper rings are used to reduce the effect of induction caused by the AC supply to the armature coil.

The field coil is the primary source of heating inside the shaker as it is powered with a constant DC supply regardless of the test profile. The coils itself are made of copper for every system to reduce conductor losses. In an air cooled system, these coils are cooled by forced air which flows through the air gaps between each winding of both the coils. In a water cooled system, these coils are cooled by water flowing through each winding of both the coils. To ensure proper cooling of the field coils in a water cooled system, both the field coils are built by stacking multiple disks of thin coils. These discs are connected in parallel for cooling and in series for transfer of electricity.

Suspension System

As the movement of the armature is based on magnetism, no physical contact is established with the shaker body. The armature is freely suspended in the air and without any suspension or auto centring system, it will sit at the bottom of the shaker. To achieve full displacement of the shaker, its armature should be centred. At Sdyn, we have multiple designs to centre the armature based on customer specifications and test requirements.

Our low displacement system (less than or equal to 2 inch / 51 mm) features a rolling strut design which offers mechanical stiffness to keep the armature centred. Our high displacement system (more than 2 inch / 51 mm) feature a rocker design which offers no mechanical stiffness and the armature is centred via DC from the amplifier. Both the designs use an air bellow at the bottom of the shaker to assist in the centring process.



Electrodynamic Shaker

Isolation System

Our shakers are capable of producing vibrations over a wide range of frequencies at high g levels. These vibrations are produced on the armature head from where they are transmitted to various attachments and fixtures depending on the test. However undesirable it may be, a certain part of these vibrations are also transferred into the body of the shaker. It is necessary to isolate the vibration in the body of the shaker from its base. This is achieved with a complex array of air bellows and spring, placed between the shaker and its base.

As an option for a customer requiring further isolation, air bellows can be attached to the bottom of the base or the combo base in case of a system with a Horizontal Slip Table.

Cooling System

It is not possible to run a shaker reliably without proper cooling because the extensive heat produced inside the shaker can damage the armature coil. Small shakers (50kgf and below) generally feature a permanent magnet instead of a field coil, therefore, they can operate without any cooling at light loads. A similar feature can also be offered with bigger systems to meet certain test requirements like Squeak and Rattle test being performed on an air cooled shaker.

A shaker can either be air cooled or water cooled. Each method has its own key features, advantages, and disadvantages. Selecting a cooling method that meets customer's test requirement is crucial. Both these methods are discussed below:

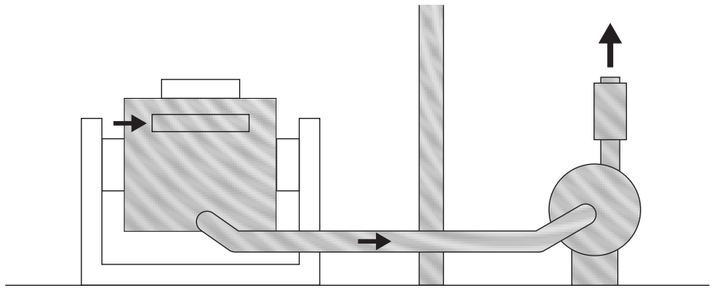
Air Cooling

An air cooled shaker features a centrifugal blower for forced air cooling. A hose pipe connects the bottom of the shaker to the blower which sucks air from a perforated sheet at the top of the shaker. It is very important to ensure that the blower is not located in close vicinity of the shaker because this might cause the exhaust air from the blower to be sucked back by the shaker. In this scenario, the shaker's temperature will keep increasing as it is being cooled by the same air in a loop, causing thermal runaway and even burning of the armature coil. To ensure safety and proper operation of the cooling system, various sensors are installed in the shaker that are mentioned below:

- Air Pressure Sensor - To ensure sufficient air pressure for proper suction
- Air Temperature Sensor - To stop the system if the air temperature is too high to ensure proper cooling

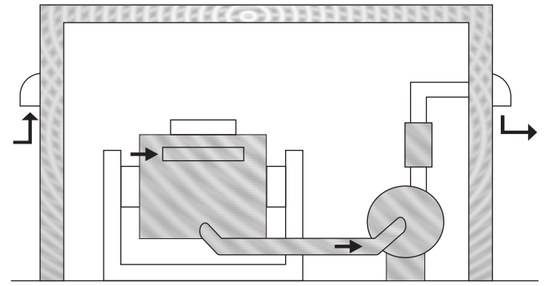
Due to suction, audible noise is always present near the shaker and the blower. It is suggested to take measures during installation to prevent this audible noise from creating an un-conducive working environment for the test/ lab personnel.

To effectively reduce it, the most effective way is to install the blower system outside the lab and route a flexible hose from the shaker. This can be done by puncturing a hole in the separation wall of the lab to the blower installed outside. A typical sketch is shown in the figure.



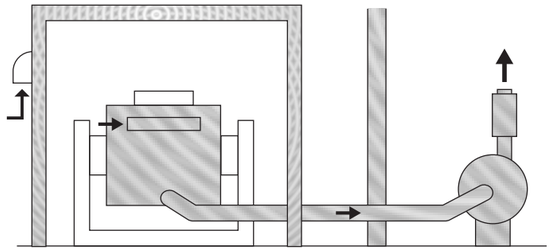
Installing the blower outside

If the placement of blower outside fails in some path way where the acoustic noise would still disturb the surroundings then a soundproof booth can be made for the blower as shown in the figure.



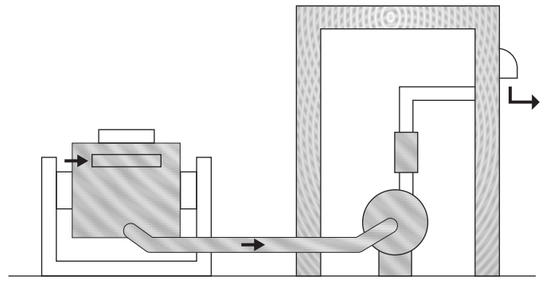
Sound Booth: For both Vibration system and blower

Excitation noise of the shaker becomes dominant when testing at higher frequencies, sometimes exceeding 100db at higher acceleration levels. Encapsulating the shaker and the blower both in a sound booth is an effective remedy if higher frequency testing are regular and the work place is small as shown in the figure.



Sound Booth: Only for Vibration system

If there is place available to keep the blower outside but excitation noise is dominant (high frequency testing), then a sound booth can be erected just around the blower for effective reduction of noise as shown in the figure.



Sound Booth: Only for blower

Water Cooling

A water cooled shaker features a dedicated cooling system for storing, circulating, and cooling distilled water that is used for cooling. The system is assembled in two 19-inch racks of 42 unit height. Pressure pump is installed in the cooling rack to circulate distilled water at high pressure through the shaker's field and armature coils. Heat exchanger is installed in the cooling rack to cool this distilled water with another supply of water from a cooling tower or chiller at the customer's site. To ensure safety and proper operation of the cooling system, various sensors are installed in the cooling racks that are mentioned below:

- Liquid Pressure Sensor - To measure the water pressure in the pipes in order to detect any obstruction in the pipeline
- Liquid Flow Sensor - To measure the water flow in the pipes in order to detect any leakages in the pipeline
- Liquid Temperature Sensor - To measure the temperature of the incoming and outgoing water in order to detect overheating

Power Amplifier

Sdyn's Power Amplifiers use compact and extremely efficient power modules. These help to amplify the small electrical signal from the Vibration Controller to a proportionally high voltage and high current output, that is ideal to drive the shaker. The design of the Power Amplifier ensures energy and space. DSA series Power Amplifier use solid-state power devices in a Class-D Full Bridge configuration. They are digitally modulated with a high frequency pulse width modulated signal with efficiency of over 92%. Their modular construction makes them easy to handle and arrange for maximum output power with direct coupling to any resistive or inductive load. Integral air cooled design ensures continuous duty cycle without sacrificing performance at peak temperature and humidity.

These Power Amplifiers are compatible with any make of Electrodynamic Shakers and are designed to provide continuous rated voltage and current at high ambient temperature and humidity. A low knee filter provides smooth output, while removing switching noise and electromagnetic interference. A zobel network is dedicated for impedance matching over a wide range of frequencies for inductive loads. Adjustable current limit is also provided for controlling maximum output power so that accidents can be avoided.

Assembled in industry standard modular racks, all modules of our Power Amplifier are rack mountable. Removing and installing modules is made easy via guide rails on which every module is designed to slide. Designed to meet international design and safety standards, every module of our Power Amplifier is feature rich and contains its own power entry, power filtering, error indication and EMI conforming systems. Continuous upgrade of technology to better meet the international standards and reduce the carbon footprint of our system is a never-ending process at Sdyn. Through our various training, services and maintenance programs, we keep our customers updated with the latest product offerings and upgrades.

Major Sub Systems of the Power Amplifier are:

Digital Logic Unit

The microcontroller based Digital Logic Unit (DLU) controls and monitors the system features and safety interlocks of the DSA series Power Amplifier. The logic unit acts as a user friendly interface between the user and the equipment and can be operated both in manual and auto modes.

System parameters and trip interlocks are displayed on the alphanumeric display of the feather touch membrane keyboard front panel. Soft start and controlled shut down is offered with an online key on the front panel.

Shaker and amplifier safety interlocks are monitored and indicated on the front panel through a microcontroller chip. Interlock signals are routed through isolators and buffer network for proper latching and to prevent false triggering.

The signals are latched on to the fault analysis section of the microcontroller. Only after all faults are resolved, the system is allowed to go Online and increase the gain. Major system interlocks associated with DSA series of amplifier are over current, field fail, displacement limit, cooling shaker, over temperature, etc.

Major Sub Systems of the Digital Logic Unit are:

Internal Oscillator

The internal oscillator is a feature provided in the DLU for manual mode of operations wherein the g level is not controlled. The output of the internal oscillator is a pure sine wave. Its gain is controlled via the feather touch membrane keyboard front panel. Output voltage, current and frequency are displayed on the alphanumeric display.

The oscillator is capable of producing sine wave from 1Hz to 10kHz.

Signal Source Selection

As the DLU can generate its own sine signal in addition to the external signal from a Vibration Controller, it features a signal source selection that allows users to seamlessly switch between internal and external signal source using the feather touch membrane keyboard front panel. The selectable signal path offers negligible resistance and ensures signal integrity.

Gain Control

The highly integrated gain control block of the DLU is designed using a digital potentiometer. All changes in gain are made gradually, one step at a time, to prevent any spike or sudden movement of the armature. Clamp and release operation is done automatically by the microcontroller inside the DLU based upon various inputs from the user and the interlocks.

Auto Centring

All shakers from Sdyn have dynamic auto centring. Models SEV 125 to SEV 180 feature mechanical auto centring. Models SEV 240 to SEV 760 feature a combination of mechanical and electronic auto centring. The mechanical auto centring is based on rubber bushes and cam bolt assemblies, which exhibit mechanical stiffness when the armature is at its centre. The electronic auto centring is based on optical sensors that centre the armature by filling or releasing air from a cup below the armature structure.

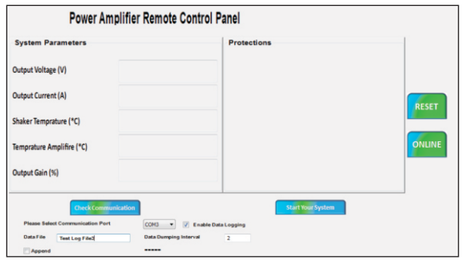
For long stroke systems which require displacement of more than 51mm or 2 inch, a highly sophisticated laser based auto centring is provided. The suspension system of a long stroke system is different and offers no stiffness whatsoever. Therefore, this auto centring system controls pneumatics and DC output from the amplifier, in order to ensure the system achieves its centre with varied test loads.

Power Amplifier Remote

Power Amplifier Remote is provided as a separate module for applications that require remote control of the Power Amplifier and monitoring of all parameters and interlocks on a PC. This feature completely replicates the functionality of the LCD screen and the feather touch membrane keyboard on the Power Amplifier on the PC. It provides customers with the capability to control and monitor the following:

System Controls
- Shaker Field
- Shaker Cooling
- Reset
- Online
- Amplifier Gain

System Parameters
- Output Voltage
- Output Current
- Amplifier Temperature
- Shaker Temperature
- Gain



The remote application interfaces with the DLU via the following options:
- RS232 for low end application with distances up to 25 meters
- RS485 for high end application with distances up to 1 kilometre

The system is designed on robust and versatile HEX command based protocol stack. It takes account of the start-up and shut-down sequence and does not allow user to input conflicting data. Associated cables and accessories are provided along with the application.

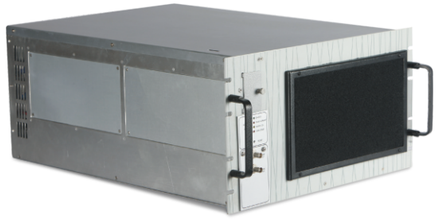
Power Amplifier

Power Module

The high power density and efficiency of the Power Modules of DSA series Power Amplifier is the heart of the system. These modules can use MOSFETs or IGBTs as their primary switching devices and can be coupled with numerous types of loads varying from resistive to inductive. As they are designed in a Class-D Full Bridge configuration, their operation is very similar to that of a buck converter. At output voltages lower than the input voltage, output current can be higher than the input current, as long as the input power is equal to the sum of output power and losses.

Every power module is rack mounted and features a wire free design implemented using copper bus bars instead of wires. This ensures that our power module never faces any issues pertaining to loose or damaged connection.

Each power module of the DSA series has a built-in PWM generation and management. These modules are stacked in master slave configuration for their parallel operation in the amplifier. PWM in paralleled modules is synchronised through master clock and a current feedback network is also implemented for precise current sharing amongst modules. Three-sigma design ensures peak current capability for continuous random operation, without affecting the life of the power device.



Major Sub Systems of the Power Module are:

Driver Section

Driver section of the Power Module provides the necessary gate pulse to switch the conduction state of power devices from on to off and vice versa. A galvanic isolation-based gate driver circuit provides gate signals with negligible propagation and time delays. The final stage of the driver has a totem pole circuit in push-pull configuration for fast charging and discharging of the gate capacitances of the power devices at high frequencies.

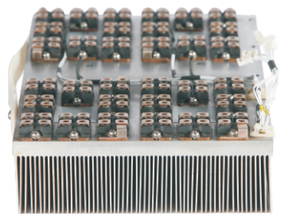
In a multiple module system, one module is master and the rest are slaves. The driver section of the master module generates the clock that is followed by every module in that system. This syncs all the PWM signals and reduces the final output ripple. The driver section also has two feedback networks. First is a voltage feedback to ensure output waveform is proportional to input waveform. Second is a current feedback to ensure equal current is drawn from every module in a system.

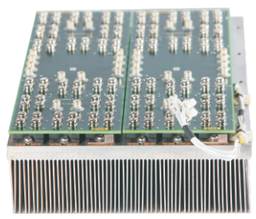
Power Section

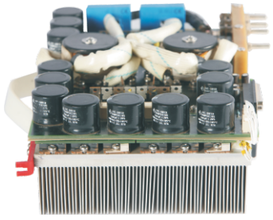
Power section is a high frequency pulse width modulated power converter. The MOSFETs or IGBTs are connected in full bridge configuration and mounted on a common heat sink. The integral cooling fans ensure safe thermal operation.

Each half of the bridge switches at modulated frequency such that the duty cycle varies at input signal rate. Each side is driven out of phase so that an amplified PWM signal appears across the bridge output.

An array of heat sensors and two dedicated current sensors ensure the safety of this section. They are factory set to respond to the absolute maximum limits of the devices to ensure their safety in the event of a malfunction.







Feedback Section

Voltage feedback from the output terminal of the power section (within the output filter) to the PWM controller makes a flat response Power Amplifier. The loop incorporates DC and high frequency derivative feedback. An integrator in the loop provides linear gain and low harmonic distortion. Overall current of the power module is sensed by a non-contacting sensor which is used for the purpose of tripping and current sharing.

Filter Section

Sufficient attenuation to high frequency is done by LC filters to get a pure amplified output. The major part is a combination of inductor and low ESR high frequency capacitors. The final stage of the filter section contains capacitor network for minimising any noise and electromagnetic interferences along with the zobel network for impedance matching.

HVDC Section

The Power Amplifiers run on a widely acceptable range of 3-phase mains input and does not require any special operating environment or support equipment. Step-down 3-phase AC output of highly efficient vacuum impregnated transformer is rectified using three phase bridge rectifiers. Bridge rectifiers of single body construction are used for space saving and good heat sinking characteristics, alongside high voltage capacitors to suppress transients and minimise mains ripple. Different protection circuits are coupled at various stages for synchronisation. Single Phase Preventer is used at the 3-phase input, which senses any phase loss and any imbalance in 3-phase line voltage through phase synchronisation relay. It also displays the phase status on the Digital Logic Unit.

LOW THRUST SERIES

Vibration Systems

Sdyn's Low Thrust Series of Electrodynamic Vibration Systems comprises of our air cooled shakers and air cooled amplifiers. These are designed for low payload capacity and for tests that require high resonance and frequency response.

A customer chooses this range for its low price, small form factor, and high reliability. These systems are generally very specific to the customer's testing requirements and offer very little scope for future up-gradation.

Standard features of Low Thrust Series are:

- Electromagnetic Armature and Field Coils
- Magnesium Alloy Casting based Armature Structure
- Dual Field Coil based Magnetic Circuit
- Class D Full Bridge (H Bridge) Power Amplifier

Advanced features of Low Thrust Series are:

- Explosion Proof Design
- Remote Operation from PC
- Modified Shaker and Controller for Damper Testing using Force and Acceleration Sensing
- Modified Shaker and Controller for Rubber and Elastomer Testing using LVDT and Load Cell

Some common applications of Low Thrust Series are:

- Testing to meet BIS Test Specifications
- Electronics and Electrical Component Testing
- LED and Bulb Testing
- Sensor and Transducer Testing
- Transmission Line Damper Testing
- Rubber and Elastomer Testing

Ranges covered under Low Thrust Series are:

- SEV 125 (100 to 150 kgf)
- SEV 140 (200 to 300 kgf)
- SEV 180 (400 to 600 kgf)

SEV 125 Series

System Description

The SEV 125 Series of shakers are matched with the DSA1K and DSA1.5K Series of Power Amplifiers. Its armature and field supplies are assembled in one 19-inch rack mountable bench/ table top cabinet.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position

Optional Features

- Air mounts between the base and ground for isolation
- PC based Power Amplifier Remote

Technical Specifications

SEV 125 Series Shaker, DSA Series Amplifier	SEV 125 – DSA 1K	SEV 125 – DSA 1.5K
System Performance		
Armature Diameter	125 mm	125 mm
Sine Force (peak)	100 kgf (220 lbf, 1 kN)	150 kgf (330 lbf, 1.5 kN)
Random Force (rms)	70 kgf (154 lbf, 0.7 kN)	105 kgf (230 lbf, 1 kN)
Acceleration (sine)	50 g	75 g
Velocity (sine peak)	1.2 m/sec	1.2 m/sec
Displacement (pk-pk)	20 mm (0.8 in)	20 mm (0.8 in)
Axial Resonance (±5%)	4200 Hz	4200 Hz
Useful Frequency Range	DC to 4500 Hz	DC to 4500 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer	
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA	
Shaker Characteristics		
Moving Element Mass	2 kg	2 kg
Internal Load Capability	12 kg	12 kg
Suspension Axial Stiffness	1.6 kg/mm	1.6 kg/mm
Suspension Cross-Axial Stiffness	230 kg/mm	230 kg/mm
Stray Magnetic Field*	< 3.0 mT (30 gauss)	< 3.0 mT (30 gauss)
Cooling Air Flow	300 cfm	300 cfm
Compressed Air**	Not Required	Not Required
Shaker Body Mass	400 kg	400 kg
Dimensions (L x W x H)	540 x 375 x 495 (mm)	540 x 375 x 495 (mm)
Amplifier Characteristics		
Power Output	1 kVA	1.5 kVA
Total Harmonic Distortion***	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%

Armature Insert Pattern	SEV 125 Shaker		
Pattern	PCD	PCD	PCD
Position of Insert	Centre	64 mm	90 mm
No. of Inserts (Total – 9)	1	4	4

Notes:
1. *150 mm above armature head
2. **Compressed air to be provided by customer at installation site
3. ***Measured on pure resistive load
4. Customised specifications are also tailored on request
5. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
6. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice

SEV 140 Series

System Description

The SEV 140 Series of Shakers are matched with the DSA 2K and DSA 3K Series of Power Amplifiers. Its armature and field supplies are assembled in one 19-inch network rack of 30 unit height.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Self-lubricating central guidance bearing
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position

Optional Features

- Air isolation mounts between base and ground
- PC based Power Amplifier Remote
- Attachment to Horizontal Slip Table, Head Expander and Vertical Load Support
- Customisation for operation in Damper Testing Application
- Customisation for operation in Rubber Testing Application

Technical Specifications

SEV 140 Series Shaker, DSA Series Amplifier	SEV 140 – DSA 2K	SEV 140 – DSA 3K
System Performance		
Armature Diameter	140 mm	140 mm
Sine Force (peak)	200 kgf (440 lbf, 2 kN)	300 kgf (660 lbf, 3 kN)
Random Force (rms)	140 kgf (310 lbf, 1.4 kN)	210 kgf (462 lbf, 2 kN)
Acceleration (sine)	60 g	85 g
Velocity (sine peak)	1.4 m/sec	1.4 m/sec
Displacement (pk-pk)	25 mm (1.0 in)	25 mm (1.0 in)
Axial Resonance (±5%)	3600 Hz	3600 Hz
Useful Frequency Range	DC to 4000 Hz	DC to 4000 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer	
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA	
Shaker Characteristics		
Moving Element Mass	3.5 kg	3.5 kg
Internal Load Capability	20 kg	20 kg
Suspension Axial Stiffness	1.6 kg/mm	1.6 kg/mm
Suspension Cross-Axial Stiffness	230 kg/mm	230 kg/mm
Stray Magnetic Field*	< 3.0 mT (30 gauss)	< 3.0 mT (30 gauss)
Cooling Air Flow	400 cfm	400 cfm
Compressed Air**	Not Required	Not Required
Shaker Body Mass	600 kg	600 kg
Dimensions (L x W x H)	585 x 415 x 535 (mm)	585 x 415 x 535 (mm)
Amplifier Characteristics		
Power Output	2 kVA	3 kVA
Total Harmonic Distortion***	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%

Armature Insert Pattern	SEV 140 Shaker		
Pattern	PCD	PCD	PCD
Position of Insert	Centre	70 mm	100 mm
No. of Inserts (Total – 9)	1	4	4

Notes:
1. *150 mm above armature head
2. **Compressed air to be provided by customer at installation site
3. ***Measured on pure resistive load
4. Customised specifications are also tailored on request
5. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
6. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice

SEV 180 Series

System Description

The SEV 180 Series of Shakers are matched with the DSA 4K and DSA 6K Series of Power Amplifiers. Its armature and field supplies are assembled in one 19-inch network rack of 36 unit height.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Self-lubricating central guidance bearing
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position

Optional Features

- Air isolation mounts between base and ground
- PC based Power Amplifier Remote
- Attachment to Horizontal Slip Table, Head Expander and Vertical Load Support
- Integration with Environmental Chamber
- Customisation for operation in Damper Testing Application
- Customisation for operation in Rubber Testing Application
- Customisation for operation in Rubber Testing Application

Technical Specifications

SEV 180 Series Shaker, DSA Series Amplifier	SEV 180 – DSA 4K	SEV 180 – DSA 6K
System Performance		
Armature Diameter	180 mm	180 mm
Sine Force (peak)	400 kgf (880 lbf, 4 kN)	600 kgf (1320 lbf, 6 kN)
Random Force (rms)	280 kgf (650 lbf, 2.8 kN)	420 kgf (925 lbf, 4.2 kN)
Shock Force (rms)	800 kgf (1760 lbf, 8 kN)	1200 kgf (2640 lbf, 12 kN)
Acceleration (sine)	50 g	75 g
Velocity (sine peak)	1.6 m/sec	1.6 m/sec
Displacement (pk-pk)	38 mm (1.5 in)	38 mm (1.5 in)
Axial Resonance (±5%)	3200 Hz	3200 Hz
Useful Frequency Range	DC to 3500 Hz	DC to 3500 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer	
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA	
Shaker Characteristics		
Moving Element Mass	8 kg	8 kg
Internal Load Capability	150 kg	150 kg
Suspension Axial Stiffness	3.2 kg/mm	3.2 kg/mm
Suspension Cross-Axial Stiffness	250 kg/mm	250 kg/mm
Stray Magnetic Field*	< 2.0 mT (20 gauss)	< 2.0 mT (20 gauss)
Cooling Air Flow	700 cfm	700 cfm
Compressed Air**	4 bar (58 psi)	4 bar (58 psi)
Shaker Body Mass	850 kg	850 kg
Dimensions (L x W x H)	725 x 500 x 795 (mm)	725 x 500 x 795 (mm)
Amplifier Characteristics		
Power Output	4 kVA	6 kVA
Total Harmonic Distortion***	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%

Armature Insert Pattern	SEV 180 Shaker		
Pattern	PCD	PCD	PCD
Position of Insert	Centre	100 mm	141.4 mm
No. of Inserts (Total – 9)	1	4	4

Notes:
1. *150 mm above armature head
2. **Compressed air to be provided by customer at installation site
3. ***Measured on pure resistive load
4. Customised specifications are also tailored on request
5. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
6. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice

SEV 240 Series

System Description

The SEV 240 Series of Shakers are matched with the DSA 10K and DSA 15K Series of Power Amplifiers. Its armature and field supplies are assembled in one 19-inch network rack of 36 unit height.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Imported magnesium alloy armature structure
- Imported hose pipe of extended temperature range
- Self-lubricating central guidance bearing
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position
- Pneumatic based auto-centring of armature head
- Body isolation using air bellows to isolate vibrations from the shaker

Optional Features

- Air isolation mounts between base and ground
- PC based Power Amplifier Remote
- Attachment to Horizontal Slip Table, Head Expander and Vertical Load Support
- Integration with Environmental Chamber
- Lowering of gauss level at the armature head

Technical Specifications

SEV 240 Series Shaker, DSA Series Amplifier	SEV 240 – DSA 10K	SEV 240 – DSA 15K
System Performance		
Armature Diameter	240 mm	240 mm
Sine Force (peak)	1000 kgf (2200 lbf, 10 kN)	1500 kgf (3300 lbf, 15 kN)
Random Force (rms)	1000 kgf (2200 lbf, 10 kN)	1500 kgf (3300 lbf, 15 kN)
Shock Force (rms)	2000 kgf (4400 lbf, 20 kN)	3000 kgf (6600 lbf, 30 kN)
Acceleration (sine)	75 g	90 g
Velocity (sine peak)	1.7 m/sec	1.7 m/sec
Displacement (pk-pk)	38 mm/51 mm* (1.5 in/2 in*)	38 mm/51 mm* (1.5 in/2 in*)
Axial Resonance (±5%)	2800 Hz	2800 Hz
Useful Frequency Range	DC to 3200 Hz	DC to 3200 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer	
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA	
Shaker Characteristics		
Moving Element Mass	13 kg	17 kg
Internal Load Capability	240 kg	260 kg
Suspension Axial Stiffness	5 kg/mm	5 kg/mm
Suspension Cross-Axial Stiffness	300 kg/mm	300 kg/mm
Stray Magnetic Field**	< 1.5 mT (15 gauss)	< 1.5 mT (15 gauss)
Cooling Air Flow	1200 cfm	1200 cfm
Compressed Air****	6 bar (87 psi)	6 bar (87 psi)
Shaker Body Mass	1500 kg	1500 kg
Dimensions (L x W x H)	1000 x 660 x 880 (mm)	1000 x 660 x 880 (mm)
Amplifier Characteristics		
Power Output	10 kVA	15 kVA
Total Harmonic Distortion****	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%

Armature Insert Pattern	SEV 240 Shaker			
Pattern	PCD	PCD	PCD	PCD
Position of Insert	Centre	100 mm	141.4 mm	200 mm
No. of Inserts (Total – 13)	1	4	4	4

Notes:
1. *For transient shock operation
2. **150 mm above armature head
3. ***Compressed air to be provided by customer at installation site
4. ****Measured on pure resistive load
5. Customised specifications are also tailored on request
6. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
7. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice

MEDIUM THRUST SERIES

Vibration Systems

Sdyn's Medium Thrust Series of Electrodynamic Vibration Systems comprises of our air cooled shakers and air cooled amplifiers. These are designed to address a wide range of test objects and attachments which represent generalised testing requirements.

A customer chooses this range for its "value for money", high scalability and high reliability. Being the most commonly opted range, these systems are used where a variety of tests are conducted on a single system. With features like body isolation and trunnion being standard, this series is the first pick of every national and international testing laboratory.

Standard features of Medium Thrust Series are:

- Electromagnetic Armature and Field Coils
- Magnesium Alloy Casting based Armature Structure
- Dual Field Coil based Magnetic Circuit
- Class D Full Bridge (H Bridge) Power Amplifier

Advanced features of Medium Thrust Series are:

- Long stroke design with displacement up to 76 mm (3 inch)
- Explosion Proof Design
- Remote Operation from PC

Some common applications of Medium Thrust Series are:

- Automotive parts and assemblies
- Locomotive parts and assemblies
- Aeronautic parts and assemblies
- Industrial parts and assemblies

Ranges covered under Medium Thrust Series are:

- SEV 300 (2000 to 2500 kgf)
- SEV 360 (3000 to 3500 kgf)
- SEV 440 (4000 to 6000 kgf)

SEV 300 Series

System Description

The SEV 300 Series of Shakers are matched with the DSA 24K and DSA 32K Series of Power Amplifiers. Its armature and field supplies are assembled in one 19-inch network rack of 36 unit height.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Imported magnesium alloy armature structure
- Imported hose pipe of extended temperature range
- Self-lubricating central guidance bearing
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position
- Pneumatic based auto-centring of armature head
- Body isolation using air bellows to isolate vibrations from the shaker

Optional Features

- Air isolation mounts between base and ground
- PC based Power Amplifier Remote
- Attachment to Horizontal Slip Table, Head Expander and Vertical Load Support
- Integration with Environmental Chamber
- Lowering of gauss level at the armature head

Technical Specifications

SEV 300 Series Shaker, DSA Series Amplifier	SEV 300 – DSA 24K	SEV300 – DSA 32K
System Performance		
Armature Diameter	300 mm	300 mm
Sine Force (peak)	2000 kgf (4400 lbf, 20 kN)	2500 kgf (5500 lbf, 25 kN)
Random Force (rms)	2000 kgf (4400 lbf, 20 kN)	2500 kgf (5500 lbf, 25 kN)
Shock Force (rms)	4000 kgf (8800 lbf, 40 kN)	5000 kgf (11000 lbf, 50 kN)
Acceleration (sine)	80 g	100 g
Velocity (sine peak)	1.8 m/sec	1.8 m/sec
Displacement (pk-pk)	51 mm/63 mm* (2 in/2.5 in*)	51 mm/63 mm (2 in/2.5 in*)
Axial Resonance (±5%)	2700 Hz	2700 Hz
Useful Frequency Range	DC to 3000 Hz	DC to 3000 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer	
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA	
Shaker Characteristics		
Moving Element Mass	25 kg	25 kg
Internal Load Capability	350 kg	350 kg
Suspension Axial Stiffness	8 kg/mm	8 kg/mm
Suspension Cross-Axial Stiffness	400 kg/mm	400 kg/mm
Stray Magnetic Field**	< 1 mT (10 gauss)	< 1 mT (10 gauss)
Cooling Air Flow	1500 cfm	1500 cfm
Compressed Air***	6 bar (87 psi)	6 bar (87 psi)
Shaker Body Mass	3250 kg	3250 kg
Dimensions (L x W x H)	1360 x 825 x 1100 (mm)	1360 x 825 x 1100 (mm)
Amplifier Characteristics		
Power Output	24 kVA	32 kVA
Total Harmonic Distortion****	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%

Armature Insert Pattern	SEV 300 Shaker			
Pattern	PCD	PCD	PCD	PCD
Position of Insert	Centre	141.4 mm	200 mm	250 mm
No. of Inserts (Total – 13)	1	4	4	4

Notes:
1. *For transient shock operation
2. **150 mm above armature head
3. ***Compressed air to be provided by customer at installation site
4. ****Measured on pure resistive load
5. Customised specifications are also tailored on request
6. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
7. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice

SEV 360 Series

System Description

The SEV 360 Series of Shakers are matched with the DSA 36K and DSA 45K Series of Power Amplifiers. Its armature and field supplies are assembled in one 19-inch network rack of 36 unit height.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Imported magnesium alloy armature structure
- Imported hose pipe of extended temperature range
- Self-lubricating central guidance bearing
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position
- Pneumatic based auto-centring of armature head
- Body isolation using air bellows to isolate vibrations from the shaker

Optional Features

- Air isolation mounts between base and ground
- PC based Power Amplifier Remote
- Attachment to Horizontal Slip Table, Head Expander and Vertical Load Support
- Integration with Environmental Chamber
- Lowering of gauss level at the armature head
- Long stroke with displacement up to 76 mm (3 inch)

Technical Specifications

SEV 360 Series Shaker, DSA Series Amplifier	SEV 360 – DSA 36K	SEV 360 – DSA 45K
System Performance		
Armature Diameter	360 mm	360 mm
Sine Force (peak)	3000 kgf (6600 lbf, 30 kN)	3500 kgf (7700 lbf, 35 kN)
Random Force (rms)	3000 kgf (6600 lbf, 30 kN)	3500 kgf (7700 lbf, 35 kN)
Shock Force (rms)	6000 kgf (13200 lbf, 60 kN)	7000 kgf (15400 lbf, 70 kN)
Acceleration (sine)	85 g	100 g
Velocity (sine peak)	1.8 m/sec	1.8 m/sec
Displacement (pk-pk)	51 mm/63 mm* (2 in/2.5 in*)	51 mm/63 mm* (2 in/2.5 in*)
Axial Resonance (±5%)	2600 Hz	2600 Hz
Useful Frequency Range	DC to 2800 Hz	DC to 2800 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer	
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA	
Shaker Characteristics		
Moving Element Mass	35 kg	35 kg
Internal Load Capability	350 kg	350 kg
Suspension Axial Stiffness	8 kg/mm	8 kg/mm
Suspension Cross-Axial Stiffness	400 kg/mm	400 kg/mm
Stray Magnetic Field**	< 1 mT (10 gauss)	< 1 mT (10 gauss)
Cooling Air Flow	1800 cfm	1800 cfm
Compressed Air***	6 bar (87 psi)	6 bar (87 psi)
Shaker Body Mass	3500 kg	3500 kg
Dimensions (L x W x H)	1420 x 885 x 1165 (mm)	1420 x 885 x 1165 (mm)
Amplifier Characteristics		
Power Output	36 kVA	45 kVA
Total Harmonic Distortion****	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%

Armature Insert Pattern	SEV 300 Shaker			
Pattern	PCD	PCD	PCD	PCD
Position of Insert	Centre	141.4 mm	200 mm	300 mm
No. of Inserts (Total – 17)	1	4	4	8

Notes:
1. *For transient shock operation
2. **150 mm above armature head
3. ***Compressed air to be provided by customer at installation site
4. ****Measured on pure resistive load
5. Customised specifications are also tailored on request
6. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
7. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice

SEV 440 Series

System Description

The SEV 440 Series of Shakers are matched with the DSA 48K, DSA 56K, DSA 60K, and DSA 80K Series of Power Amplifiers. Its armature and field supplies are assembled in two 19-inch network racks of 36 unit height.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Imported magnesium alloy armature structure
- Imported hose pipe of extended temperature range
- Self-lubricating central guidance bearing
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position
- Pneumatic based auto-centring of armature head
- Body isolation using air bellows to isolate vibrations from the shaker

Optional Features

- Air isolation mounts between base and ground
- PC based Power Amplifier Remote
- Attachment to Horizontal Slip Table, Head Expander and Vertical Load Support
- Integration with Environmental Chamber
- Lowering of gauss level at the armature head
- Long stroke with displacement up to 76 mm (3 inch)

Technical Specifications

SEV 440 Series Shaker, DSA Series Amplifier	SEV 440 — DSA 48K	SEV 440 — DSA 56K	SEV 440 — DSA 60K	SEV 440 — DSA 80K
System Performance				
Armature Diameter	440 mm	440 mm	440 mm	440 mm
Sine Force (peak)	4000 kgf (8800 lbf, 40 kN)	4900 kgf (10800 lbf, 49 kN)	5000 kgf (11000 lbf, 50 kN)	6000 kgf (13200 lbf, 60 kN)
Random Force (rms)	4000 kgf (8840 lbf, 40 kN)	4900 kgf (10800 lbf, 49 kN)	5000 kgf (11000 lbf, 50 kN)	6000 kgf (13200 lbf, 60 kN)
Shock Force (rms)	8000 kgf (17600 lbf, 80 kN)	9800 kgf (21600 lbf, 98 kN)	10000 kgf (22000 lbf, 100 kN)	12000 kgf (26400 lbf, 120 kN)
Acceleration (sine)	80 g	95 g	100 g	100 g
Velocity (sine peak)	1.8 m/sec	1.8 m/sec	1.8 m/sec	1.8 m/sec
Displacement (pk-pk)	51 mm/63 mm* (2 in/2.5 in*)	51 mm/63 mm* (2 in/2.5 in*)	51 mm/63 mm* (2 in/2.5 in*)	51 mm/63 mm* (2 in/2.5 in*)
Axial Resonance (±5%)	2100 Hz	2100 Hz	2100 Hz	2000 Hz
Useful Frequency Range	DC to 2400 Hz	DC to 2300 Hz	DC to 2300 Hz	DC to 2000 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer			
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA			
Shaker Characteristics				
Moving Element Mass	50 kg	50 kg	50 kg	60 kg
Internal Load Capability	550 kg	550 kg	550 kg	550 kg
Suspension Axial Stiffness	15 kg/mm	15 kg/mm	15 kg/mm	15 kg/mm
Suspension Cross-Axial Stiffness	500 kg/mm	500 kg/mm	500 kg/mm	500 kg/mm
Stray Magnetic Field**	< 1 mT (10 gauss)	< 1 mT (10 gauss)	< 1 mT (10 gauss)	< 1 mT (10 gauss)
Cooling Air Flow	2000 cfm	2000 cfm	2000 cfm	3000 cfm
Compressed Air***	6 bar (87 psi)	6 bar (87 psi)	6 bar (87 psi)	6 bar (87 psi)
Shaker Body Mass	5000 kg	5100 kg	5000 kg	6000 kg
Dimensions (L x W x H)	1605 x 985 x 1245 (mm)	1605 x 985 x 1245 (mm)	1605 x 985 x 1245 (mm)	1700 x 1080 x 1345 (mm)
Amplifier Characteristics				
Power Output	48 kVA	56 kVA	60 kVA	80 kVA
Total Harmonic Distortion****	Typically 0.5%	Typically 0.5%	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%	> 90%	> 90%

Armature Insert Pattern	SEV 440 Shaker		
Pattern	PCD	PCD	PCD
Position of Insert	Centre	200 mm	400 mm
No. of Inserts (Total – 17)	1	4	4

Notes:
1. *For transient shock operation
2. **150 mm above armature head
3. ***Compressed air to be provided by customer at installation site
4. ****Measured on pure resistive load
5. Customised specifications are also tailored on request
6. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
7. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice

HIGH THRUST SERIES

Vibration Systems

Sdyn's High Thrust Series of Electrodynamic Vibration Systems comprises of our water cooled shakers and air cooled amplifiers. These are designed for large and heavy specimens of irregular shapes and sizes.

A customer chooses this range for its sheer power, very high payload capacity, and high reliability. Being a part of big projects, everything about these systems is as per the customer's requirement.

Standard features of High Thrust Series are:

- Electromagnetic Armature and Field Coils
- Magnesium Alloy Casting based Armature Structure
- Dual Field Coil based Magnetic Circuit
- Class D Full Bridge (H Bridge) Power Amplifier

Advanced features of High Thrust Series are:

- Explosion Proof Design
- Remote Operation from PC

Some common applications of High Thrust Series are:

- Aeronautics and Astronautics
- Arms and Ammunitions

Ranges covered under High Thrust Series are:

- SEW 500 (7000 to 10000 kgf)
- SEW 590 (13000 to 16000 kgf)
- SEW 760 (29000 to 32000 kgf)

SEW 500 Series

System Description

The SEW 500 Series of Shakers are matched with the DSA 120K and DSA 160K Series of Power Amplifiers. Its armature and field supplies are assembled in three 19-inch network racks of 36 unit height. The water cooling system is assembled in two 19-inch network racks of 42 unit height.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Imported magnesium alloy armature structure
- Hydrostatic central guidance bearing
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position
- Pneumatic based auto-centring of armature head
- Body isolation using air bellows to isolate vibrations from the shaker
- Hermetically sealed construction

Optional Features

- Air isolation mounts between base and ground
- PC based Power Amplifier Remote
- Attachment to Horizontal Slip Table, Head Expander and Vertical Load Support
- Integration with Environmental Chamber
- Lowering of gauss level at the armature head

Technical Specifications

SEW 500 Series Shaker, DSA Series Amplifier	SEW 500 – DSA 120K	SEV 500 – DSA 160K
System Performance		
Armature Diameter	500 mm	500 mm
Sine Force (peak)	7000 kgf (15400 lbf, 70 kN)	10000 kgf (22000 lbf, 100 kN)
Random Force (rms)	7000 kgf (15400 lbf, 70 kN)	10000 kgf (22000 lbf, 100 kN)
Shock Force (rms)	14000 kgf (30800 lbf, 140 kN)	20000 kgf (44000 lbf, 200 kN)
Acceleration (sine)	85 g	100 g
Velocity (sine peak)	1.8 m/sec	2.0 m/sec
Displacement (pk-pk)	38 mm/51 mm* (1.5 in/2 in*)	38 mm/51 mm* (1.5 in/2 in*)
Axial Resonance (±5%)	2000 Hz	2000 Hz
Useful Frequency Range	DC to 2000 Hz	DC to 2000 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer	
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA	
Shaker Characteristics		
Moving Element Mass	82 kg	100 kg
Internal Load Capability	800 kg	1000 kg
Suspension Axial Stiffness	8 kg/mm	8 kg/mm
Suspension Cross-Axial Stiffness	2000 kg/mm	2200 kg/mm
Stray Magnetic Field**	< 1.0 mT (10 gauss)	< 1.0 mT (10 gauss)
Compressed Air***	6 bar (87 psi)	6 bar (87 psi)
Cooling	A dedicated cooling system for storing, circulating and cooling distilled water used for cooling	
Amplifier Characteristics		
Power Output	120 kVA	160 kVA
Total Harmonic Distortion****	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%

Armature Insert Pattern	SEW 500 Shaker		
Pattern	PCD	PCD	PCD
Position of Insert	Centre	200 mm	400 mm
No. of Inserts (Total – 17)	1	8	8

Notes:
1. *For transient shock operation
2. **150 mm above armature head
3. ***Compressed air to be provided by customer at installation site
4. ****Measured on pure resistive load
5. Customised specifications are also tailored on request
6. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
7. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice

SEW 590 Series

System Description

The SEW 590 Series of Shakers are matched with the DSA 200K and DSA 240K Series of Power Amplifiers. Its armature and field supplies are assembled in six 19-inch network racks of 36 unit height. The water cooling system is assembled in two 19-inch network racks of 42 unit height.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Imported magnesium alloy armature structure
- Hydrostatic central guidance bearing
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position
- Pneumatic based auto-centring of armature head
- Body isolation using air bellows to isolate vibrations from the shaker
- Hermetically sealed construction

Optional Features

- Air isolation mounts between base and ground
- PC based Power Amplifier Remote
- Attachment to Horizontal Slip Table, Head Expander and Vertical Load Support
- Integration with Environmental Chamber
- Lowering of gauss level at the armature head

Technical Specifications

SEW 590 Series Shaker, DSA Series Amplifier	SEW 590 – DSA 200K	SEW 590 – DSA 240K
System Performance		
Armature Diameter	590 mm	590 mm
Sine Force (peak)	13000 kgf (28600 lbf, 130 kN)	16000 kgf (35200 lbf, 160 kN)
Random Force (rms)	13000 kgf (28600 lbf, 130 kN)	16000 kgf (35200 lbf, 160 kN)
Shock Force (rms)	26000 kgf (57200 lbf, 260 kN)	32000 kgf (70400 lbf, 320 kN)
Acceleration (sine)	85 g	100 g
Velocity (sine peak)	2.0 m/sec	2.0 m/sec
Displacement (pk-pk)	38 mm/51 mm* (1.5 in/2 in*)	38 mm/51 mm* (1.5 in/2 in*)
Axial Resonance (±5%)	1700 Hz	1700 Hz
Useful Frequency Range	DC to 2000 Hz	DC to 2000 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer	
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA	
Shaker Characteristics		
Moving Element Mass	160 kg	160 kg
Internal Load Capability	2000 kg	2000 kg
Suspension Axial Stiffness	10 kg/mm	10 kg/mm
Suspension Cross-Axial Stiffness	3200 kg/mm	3200 kg/mm
Stray Magnetic Field**	< 1 mT (10 gauss)	< 1 mT (10 gauss)
Compressed Air***	7 bar (100 psi)	7 bar (100 psi)
Cooling	A dedicated cooling system for storing, circulating and cooling distilled water used for cooling	
Amplifier Characteristics		
Power Output	200 kVA	240 kVA
Total Harmonic Distortion****	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%

Armature Insert Pattern	SEW 590 Shaker			
Pattern	PCD	PCD	PCD	PCD
Position of Insert	Centre	200 mm	400 mm	550 mm
No. of Inserts (Total – 25)	1	8	8	8

Notes:
1. *For transient shock operation
2. **150 mm above armature head
3. ***Compressed air to be provided by customer at installation site
4. ****Measured on pure resistive load
5. Customised specifications are also tailored on request
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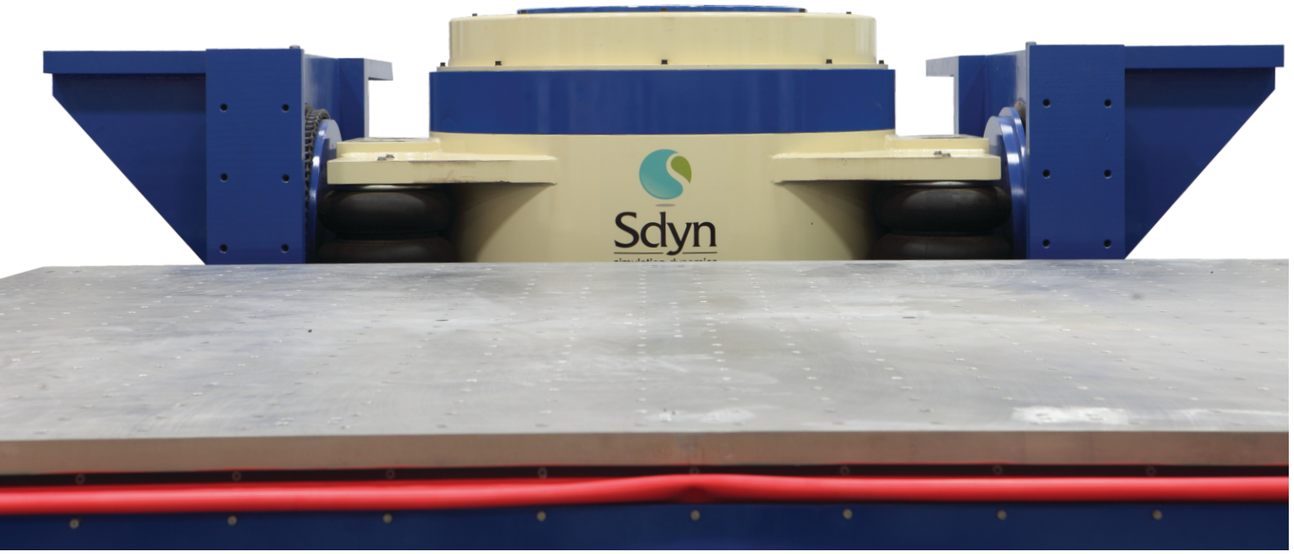
SEW 760 Series



System Description

The SEW 760 Series of Shakers are matched with the DSA 280K and DSA 320K Series of Power Amplifiers. Its armature and field supplies are assembled in eight 19-inch network racks of 36 unit height. The water cooling system is assembled in two 19-inch network racks of 42 unit height.

Standard Features

- Complies with EMC, Low Voltage and Machinery Directives under CE
- Imported magnesium alloy armature structure
- Hydrostatic central guidance bearing
- Compatible with all standard Vibration Controllers
- Trunnion mounted shaker for operation in vertical and horizontal position
- Pneumatic based auto-centring of armature head
- Body isolation using air bellows to isolate vibrations from the shaker
- Hermetically sealed construction

Optional Features

- Air isolation mounts between base and ground
- PC based Power Amplifier Remote
- Attachment to Horizontal Slip Table, Head Expander and Vertical Load Support
- Integration with Environmental Chamber
- Lowering of gauss level at the armature head

Technical Specifications

SEW 760 Series Shaker, DSA Series Amplifier	SEW 760 – DSA 280K	SEW 760 – DSA 320K
System Performance		
Armature Diameter	760 mm	760 mm
Sine Force (peak)	29000 kgf (63800 lbf, 290 kN)	32000 kgf (70400 lbf, 320 kN)
Random Force (rms)	29000 kgf (63800 lbf, 290 kN)	32000 kgf (70400 lbf, 320 kN)
Shock Force (rms)	58000 kgf (127600 lbf, 580 kN)	64000 kgf (140800 lbf, 640 kN)
Acceleration (sine)	100 g	100 g
Velocity (sine peak)	2.0 m/sec	2.0 m/sec
Displacement (pk-pk)	38 mm/51 mm* (1.5 in/2 in*)	38 mm/51 mm* (1.5 in/2 in*)
Axial Resonance (±5%)	1300 Hz	1300 Hz
Useful Frequency Range	DC to 1700 Hz	DC to 1700 Hz
Protection Interlocks	Mains Input Over & Under Voltage, Over Current, Loss of Input Phase, Over Temperature Amplifier & Shaker, Field Fail, Cooling, User Safety Interlock if specifically required by the customer	
Safety Compliance	System complies and marks to the international safety requirements w.r.t. CE and CSA	
Shaker Characteristics		
Moving Element Mass	260 kg	280 kg
Internal Load Capability	3000 kg	3000 kg
Suspension Axial Stiffness	15 kg/mm	15 kg/mm
Suspension Cross-Axial Stiffness	3800 kg/mm	3800 kg/mm
Stray Magnetic Field**	< 1 mT (10 gauss)	< 1 mT (10 gauss)
Compressed Air***	7 bar (100 psi)	7 bar (100 psi)
Cooling	A dedicated cooling system for storing, circulating and cooling distilled water used for cooling	
Amplifier Characteristics		
Power Output	280 kVA	320 kVA
Total Harmonic Distortion****	Typically 0.5%	Typically 0.5%
Input Impedance	> 10 kΩ	> 10 kΩ
Input Sensitivity	4 Vrms, Compatible with all standard controllers	4 Vrms, Compatible with all standard controllers
Signal-to-Noise Ratio	> 70 dB	> 70 dB
Power Efficiency	> 90%	> 90%

Armature Insert Pattern	SEW 760 Shaker				
Pattern	PCD	PCD	PCD	PCD	PCD
Position of Insert	Centre	200 mm	400 mm	550 mm	700 mm
No. of Inserts (Total – 33)	1	8	8	8	8

Notes:
1. *For transient shock operation
2. **150 mm above armature head
3. ***Compressed air to be provided by customer at installation site
4. ****Measured on pure resistive load
5. Customised specifications are also tailored on request
6. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
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Vibration Controller

Sdyn's Vibration Controllers are tailored in 4/8/16 channel configuration to bring users the most advanced and complete range of vibration testing solutions. Our Vibration Controllers are compatible with any make of amplifier and shaker combination available worldwide.

These controllers are perfectly suitable to perform vibration testing in all segments of the industry including defence, space, automobile, seismic, field equipment and consumer electronics. Coupled with analysis and documentation tools, our Vibration Controller makes the complete vibration system user friendly and an ideal means for checking the performance and reliability of your product against hazardous vibration environment to which your product would be exposed during usage. Our Vibration Controller can drive the complete range of electro-dynamic and servo-hydraulic shakers for single axis and multi-axis control applications in single and multi-shaker configurations.

Sdyn's Vibration Controllers employ high speed Digital Signal Processing (DSP) technology, low noise hardware design, optimised vibration control algorithms and high speed data transfer protocols. The software and firmware are based on multi-tasking topology with close-loop control operation between DSP and PC. This ensures true efficiency of real-time control with timely correction in input excitation to counter sudden change in response of the test system. We provide powerful features, high performance, greater than 110 dB of dynamic range and control frequency range up to 20 kHz, besides providing test engineers easy-to-use application software packages.

These Vibration Controllers are available with 4 to 16 input channels and are consistently modified/ upgraded to meet the demand of the latest vibration testing needs. Bundles of application software and embedded functions are specifically designed to work together so as to offer the best loop time and stable control during vibration testing. Our Vibration Controllers have the capability for making independent measurements of transfer functions and spectra of all the channels in use during vibration testing. These measurements may be independently scheduled at any time during the test and can be specifically set for analysis. Test data can be exported or imported into our software in all popular formats. Sdyn's Vibration Controllers can be interfaced with any desktop or laptop running on Windows through USB or Ethernet interface.

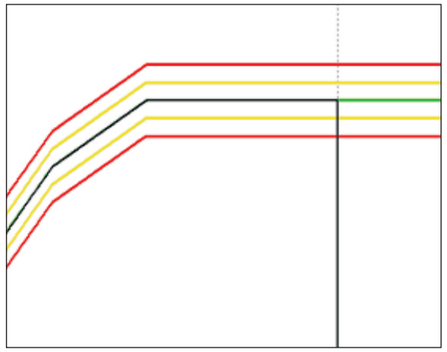
Major Control Applications of the Vibration Controller are:

Sine Control Application

Sine Control Application provides all excitation energy at a single frequency. It generates analog signal with the help of programmable sweep parameters. Sine control application is most applicable to measure the dynamic response of any Unit Under Test (UUT).

Uses:

1. Fatigue and Durability test at a single frequency or swept across a frequency band
2. Characterisation of the structural dynamics of the UUT

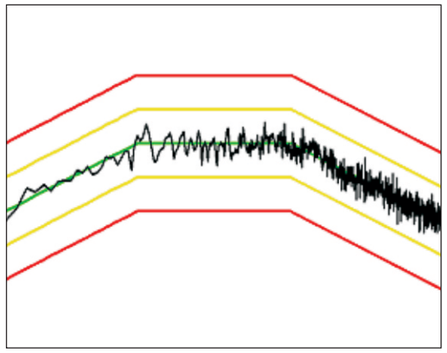


Random Control Application

Random vibration generates real word vibration environment which excites a combination of frequencies at any given instance. Due to the simultaneous generation of all frequencies within the specified frequency band, it is also called accelerated testing. Data to be recreated in represented in 'g2/Hz' vs. 'Frequency' format.

Uses:

1. Production test, stress screening, prototype testing and qualification of products
2. Field measurement replication

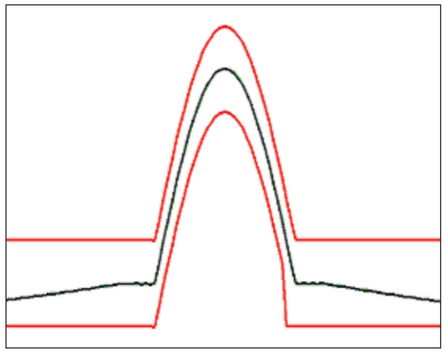


Classical Shock Control Application

Drop test methods do not provide accuracy and repeatability like Classical Shock testing. This tests determines if the UUT can withstand transient vibrations encountered during its life in real environmental conditions.

Uses:

1. Computation of shock response spectrum
2. Bump/ Impact test replacement by shaker

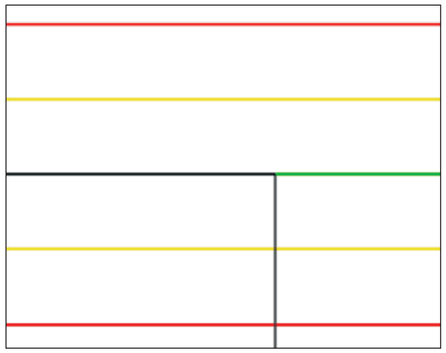


Resonance Search, Track, and Dwell (RSTD) Control Application

RSTD performs a swept sine test to locate the resonant frequency of the UUT, tracks this resonance and dwells on it. This is an invaluable tool for automation of fatigue testing. During dwelling, a special tracking filter is used for computing phase angle information to adjust the drive frequency to track the resonance as its changes during dwelling.

Uses:

1. Fatigue and Durability test at resonance frequency
2. Characterisation of the structural dynamics of the UUT

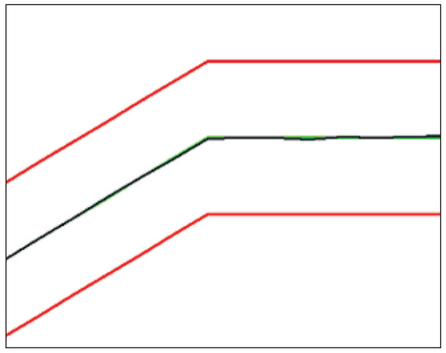


Shock Response Spectrum (SRS) Control Application

Shock Response Spectrum testing provides the ability to synthesize a complex waveform that can be applied to a shaker in a controlled manner. It varies from Classical Shock as it provides maximum achievable response in a single degree of freedom to a given transient signal. The severity of Shock test is maximised using SRS techniques.

Uses:

1. Qualification of equipment sensitive to seismic activity like Nuclear Reactor
2. A military aircraft taking off or landing on a ship - a high level and complex shock is induced in all the equipment while the engine is working

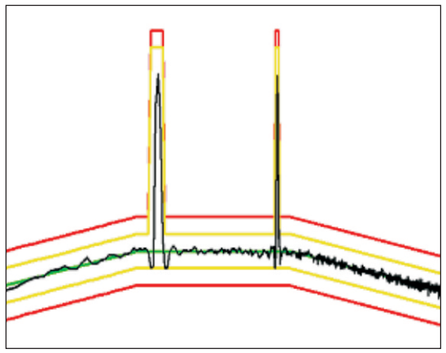


Sine on Random (SoR) Control Application

SoR is a combination of broadband random and sine tone. Sine tone can be shifted over a band of frequencies with a speed which can be linear or logarithmic.

Uses:

1. Periodic bursts of gunfire form flying helicopters
2. Propeller driven aircraft
3. Automobile vibration in engine, drive train and transmission during speed changes



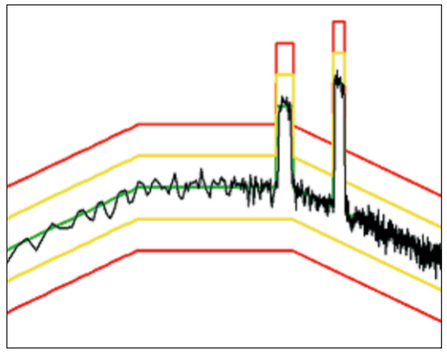
Vibration Controller

Random on Random (RoR) Control Application

RoR merges overall power spectral density where one source of random vibration is consistent and the other varies.

Uses:

1. An accelerating or decelerating vehicle on a rough road
2. Propeller driven aircraft

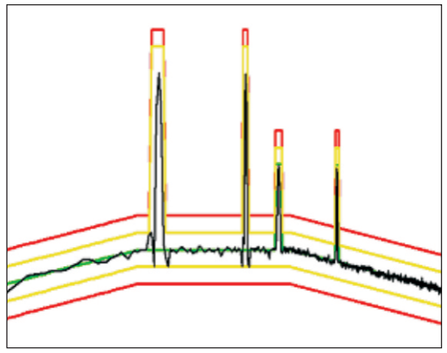


Sine on Random on Random (SoRoR) Control Application

SoRoR control application can create profile with narrowband random and sine tone signal superimposed on broadband random signal, which can be moving or stationery. User can activate or deactivate SoR or RoR profile individually to simulate acceleration, deceleration or periodic force acting on the UUT.

Uses:

1. Testing of launch vehicles
2. Gun fire form helicopter or propeller driven aircraft

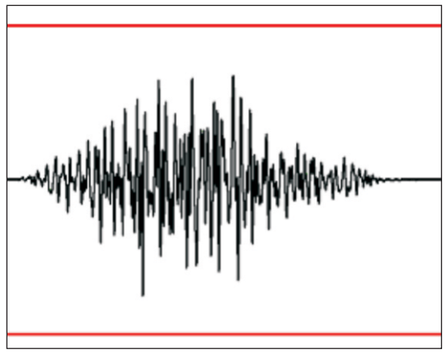


Transient Time History (TTH) Control Application

TTH control application provides a library which can be used to create a waveform like sine, chirp, beats and white noise signal. TTH can also play a short recorded data form field to simulate a transient or a pulse.

Uses:

1. Reproduction of recorded data from field on the laboratory shaker system
2. Door slam testing can be conducted with TTH control application

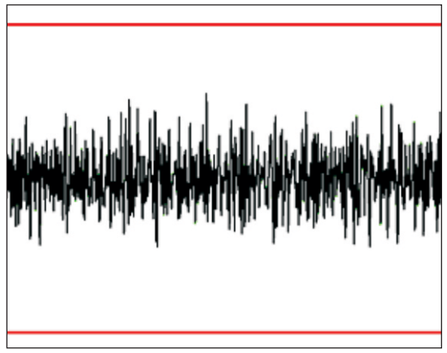


Long Time History (LTH) Control Application

LTH control application recreates field recorded data on the shaker. Unlike TTH, LTH can reproduce vibration on the shaker same as road vibration. Recorded data can be an earthquake or bumps on a road.

Uses:

1. Reproduction of recorded data from field on the laboratory shaker system
2. Door slam testing can be conducted with LTH control application



Technical Specifications

	Spark Vibration Controller	Spandon Vibration Controller
Input		
Channels	4	4, 8, 16
Resolution	16-bit ADC	24-bit ADC
Voltage Range	±1 or ±0.1 V	±10, ±1 or ±0.1 V
Filtering	Analog + 80 dB/octave Digital Filter	Analog + 160 dB/octave Digital Filter
Coupling	Charge & IEPE	Charge, IEPE & TEDS
Bandwidth	1 to 5 kHz	0.1 to 36 kHz
Maximum Input	±36 V Peak without damage	±36 V Peak
Dynamic Range	90 dB	110 dB
Output		
Channels	Drive & COLA	Drive & COLA
Resolution	16-bit DAC	24-bit DAC
Voltage Range	±10 V	±10 V
Filtering	Analog + 80 dB/octave Digital Filter	Analog + 160 dB/octave Digital Filter
Bandwidth	1 to 5 kHz	0.1 to 36 kHz
Maximum Output	±12 V Peak	±12 V Peak
Dynamic Range	90 dB	110 dB
Electrical		
AC Power	220 V, 50 Hz	
Consumption	45W	
Connectivity		
Operating System	Windows XP/ Vista/ 7/ 8/ 10	
Protocol	USB 2.0	
Environmental		
Temperature	5°-45° C	
Humidity	10%-95% RH non-condensing	
Regulatory Compliance		
Compliance	CE Marking	
Safety	EN 61326-1:1997, EN 61010-1:2001	

Notes:
1. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
2. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice

Spark Vibration Controller

Spark Front

Spark Back

Spandon Vibration Controller

Spandon Front

Spandon Back

Horizontal Slip Table

The axis of a shaker's operation is Z axis. In order to achieve vibrations in X and Y axis, a Horizontal Slip Table (HST) is used. A Horizontal Slip Table is compactly constructed using a precisely machined magnesium alloy tool-plate, which rests on top of the flat granite block. Hydraulic bearings are placed at different locations based on the design of the HST to constrain its motion in the same axis as that of the shaker. A consistent oil film is generated on the granite block and in the bearing in order to remove friction, provide dynamic support, control crosstalk and restrain overturning moments. The hydraulic bearings can be low or high pressure type depending on the table specification. High pressure bearings have a lower clearance and require higher pressure to operate as compared to low pressure bearings. Driven by our bull nose design based drive bar, the Horizontal Slip Tables provide excellent performance for heavy, tall or eccentric loads. The test object can be rotated by 90° on the table to switch between X and Y axis. A system integrated with HST is capable of testing objects in all three axis, one at a time.

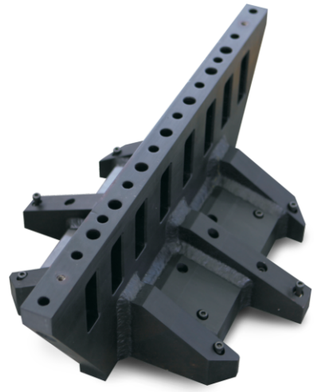
Major Sub Systems of the Horizontal Slip Table are:

Trunnion Assembly

An optimised gear based pivoting system to turn the shaker from its ideal vertical position to a horizontal position using mechanical or electrical means. Locking bolts are provided on either sides to lock the trunnion assembly at the point where the shaker is precisely aligned vertically for operating on the Armature or horizontally for operating on the Horizontal Slip Table.

Shaker to HST Coupling

Our high quality, welded, magnesium alloy tool-plate based drive adaptors attach to the shaker's Armature using every insert of the Armature to bring maximum transmissibility between the shaker and the HST. Interfacing to the HST is accomplished by aligning and bolting the drive bar of the coupling to the HST. Orientation is such that the centre of the Armature, coupling and HST fall in a perfectly straight line to provide dynamic performance. No special or high cost parts are required in our tension bolt design.



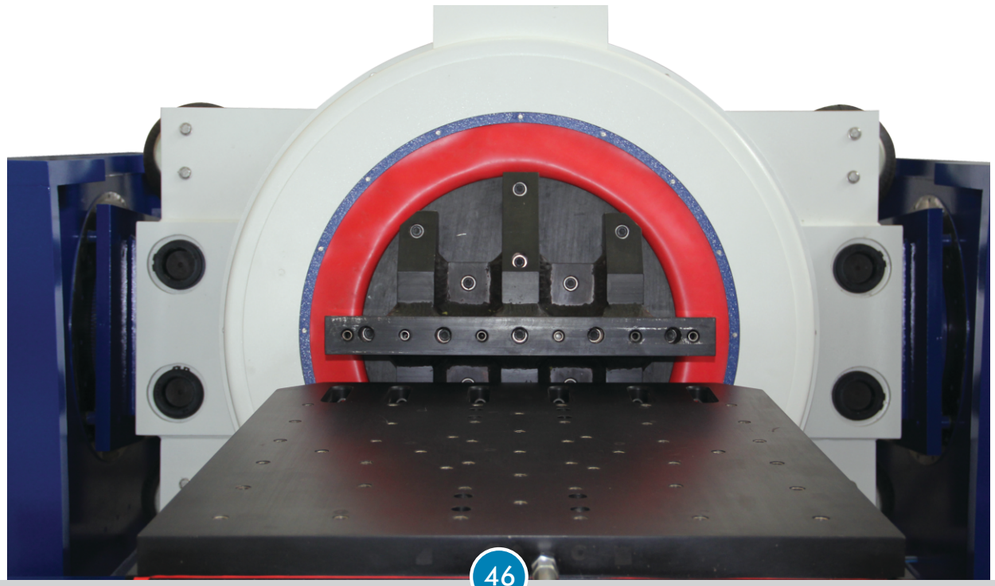
Combo Base

As the usage of the shaker and the HST is dependent on the test parameters, it is required to use the shaker with and without the HST. Therefore, both shaker and HST are bolted on a single platform that ensures that every time you turn the shaker and couple it with our HST, the alignment will be perfect.

Technical Specifications

Horizontal Slip Table								
Shaker Model	Table Size (LxBxH) (mm)	Hole Pattern (mm)	Frequency Range (Hz)	Table Mass (kg)	Drive Bar Mass (kg)	Payload Capacity (kg)	No. of Bearings	Bearing Mass (kg)
Low Pressure Series								
SEV 125	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
SEV 140	400x400x37	50×50	5-2000	12	2.1	200	2	0.500
SEV 180	400x400x37 600x600x37	50×50 100×100	5-2000 5-2000	12 24.5	3.5 3.5	200 350	2 2	0.500 0.630
SEV 240	400x400x37 600x600x37 800x800x50	50×50 100×100 100×100	5-2000 5-2000 5-2000	12 25.5 65	6 6 6	200 350 500	2 2 4	0.500 0.630 0.630
SEV 300	600x600x37 800x800x50 1000x1000x50	100×100 100×100 100×100	5-2000 5-2000 5-2000	29 65 97	12 12 12	350 500 800	2 4 4	0.630 0.630 0.630
SEV 360	600x600x37 800x800x50 1000x1000x50	100×100 100×100 100×100	5-2000 5-2000 5-2000	29 65 97	12 12 12	350 500 800	2 4 4	0.630 0.630 0.630
SEV 440	800x800x50 1000x1000x50 1200x1200x50	100×100 100×100 100×100	5-2000 5-2000 5-2000	65 97 135	20 20 20	500 800 1000	4 4 4	0.630 0.630 0.630
High Pressure Series								
SEW 500	1000x1000x50 1200x1200x50	100×100 100×100	5-2000 5-2000	120 180	50 50	1200 1500	4 5	5.5 5.5
SEW 590	1200x1200x50 1500x1500x50	100×100 100×100	5-2000 5-2000	180 280	60 60	1500 2000	5 5	5.5 5.5
SEW 760	1200x1200x50 1500x1500x50	100×100 100×100	5-2000 5-2000	180 280	80 80	1500 2000	5 5	5.5 5.5

Notes:
1. Customised specifications are also tailored on request
2. Please contact Sdyn for advice on the optimum specifications to meet your testing requirements
3. Specifications are correct at the time of publication and are subject to improvement or amendment without prior notice



Head Expander

The diameter of the shaker's armature is limited by the rating and design of the shaker. Many times, the dimensions of the test object exceeds the working area offered by an armature. In order to increase the working area of an armature, a head expander is used. We offer a varied range of head expanders to meet various testing requirement like accommodating large test articles or multiple test objects at one time. They are manufactured by welding magnesium alloy tool plates which are also used in making the coupling for Shaker to HST. They are available for any size armature with customised hole pattern as per customer requirement.

Sdyn manufactures the following types of Head Expanders:

Circular Head Expander

The top of the expander is circular. Any hole pattern can be provided as per customer requirement. Response is better than Square Head Expander as there are no sharp corners but the usable working area is less.

Technical Specifications

Shaker Model	Circular Head Expander					
	CHE 030 (300 mm)	CHE 040 (400 mm)	CHE 060 (600 mm)	CHE 080 (800 mm)	CHE 100 (1000 mm)	CHE 120 (1200 mm)
SEV 125	X	X	X	X	X	X
SEV 140	10 kg	12 kg	X	X	X	X
SEV 180	12 kg	14 kg	X	X	X	X
SEV 240	X	15 kg	30 kg	X	X	X
SEV 300	X	X	32 kg	58 kg	X	X
SEV 360	X	X	33 kg	62 kg	X	X
SEV 440	X	X	35 kg	64 kg	105 kg	X
SEW 500	X	X	X	X	114 kg	195 kg
SEW 590	X	X	X	X	120 kg	204 kg

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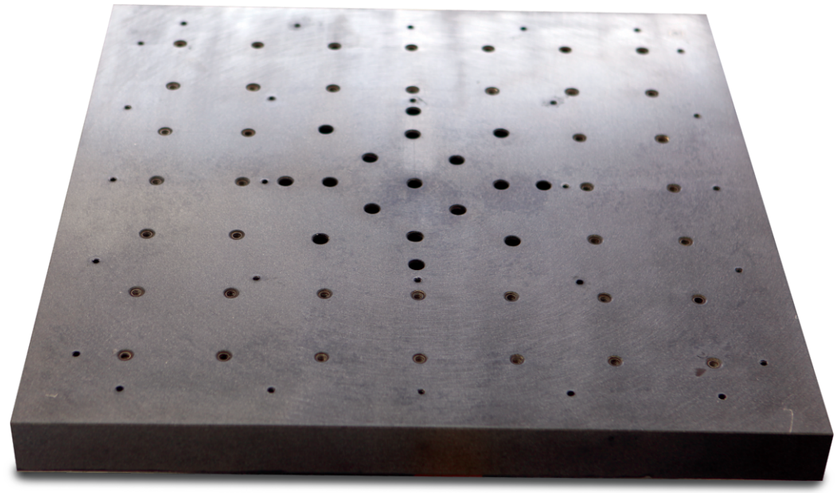
Square Head Expander

The top of the expander is square. Any hole pattern can be provided as per customer requirement. Due to the four sharp corners of the square shape, the response is not as good as in the case of a Circular Head Expander but the usable working area is more. Square Head Expanders are manufactured on order basis as per customer requirement.



Technical Specifications

Shaker Model	Square Head Expander					
	SHE 0303 (300 mm)	SHE 0404 (400 mm)	SHE 0606 (600 mm)	SHE 0808 (800 mm)	SHE 1010 (1000 mm)	SHE 1212 (1200 mm)
SEV 125	X	X	X	X	X	X
SEV 140	12 kg	14 kg	X	X	X	X
SEV 180	14 kg	16 kg	X	X	X	X
SEV 240	X	18 kg	36 kg	X	X	X
SEV 300	X	X	38 kg	68 kg	X	X
SEV 360	X	X	40 kg	74 kg	X	X
SEV 440	X	X	42 kg	76 kg	140 kg	X
SEW 500	X	X	X	X	150 kg	240 kg
SEW 590	X	X	X	X	158 kg	255 kg

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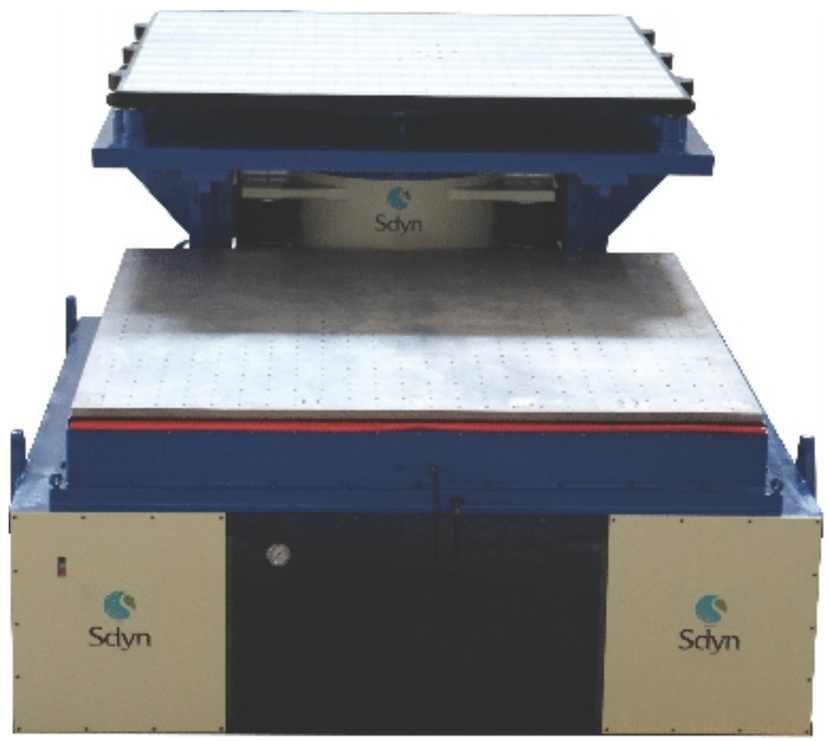
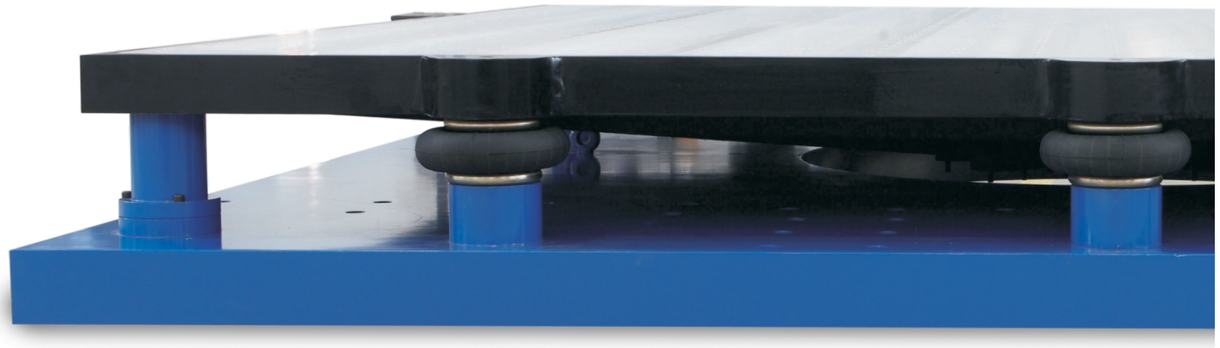
Vertical Load Support

Some test objects are not uniform and require eccentric or overhanging loading. In X and Y axis, the Horizontal Slip Table constraints the Armature of the shaker in one direction using bearings, but in Z axis, the same is not true for the Head Expander. A Head Expander is not supported by the shaker and there is a limit to how much working area you can increase using it for a given Armature size. For these non-uniform test objects, a Vertical Load Support (VLS) is provided which is a guided Head Expander. This attachment is supported by linear or hydrostatic bearings attached to the body of the shaker. The bearings constrain the motion of the VLS to Z axis only. Air bellows are provided for further support, if required. A Vertical Load Support can be designed in a square or rectangular shape based on the customer requirement.





Fixtures

A Fixture is a device that typically interfaces the shaker with the UUT. As the pioneer of Electrodynamic Vibration Systems in India, we also developed in-house capability of designing and manufacturing Fixtures using magnesium tool plates. Our magnesium welding facility is capable of manufacturing Fixtures using a variety of welding techniques to give the best possible frequency response.

Sdyn manufactures the following types of Fixtures:

L Fixture

This Fixture is L shaped, wherein the horizontal member is designed in a manner to enable attachment with the vibration system. The vertical member, on the other hand, is designed for mounting the UUT. This Fixture provides a mounting surface perpendicular to the surface of the vibration system. The UUT is mounted on the shaker for vibration testing in Z axis and on the L Fixture for testing in X and Y axis. The Fixture is rotated by 90° to switch from X to Y axis and vice versa. Objects can only be mounted on one side of this Fixture.

T Fixture

The T Fixture is in the shape of two L Fixtures put together back to back or in the shape of an inverted T. The horizontal member is designed to be attached with the vibration system and the vertical member is designed for mounting the UUT. This Fixture provides a mounting surface perpendicular to the surface of the vibration system. The UUT is mounted on the shaker for vibration testing in Z axis and on the L Fixture for testing in X and Y axis. The Fixture is rotated by 90° to switch from X to Y axis and vice versa. Objects can be mounted on either side this Fixture.

Cube Fixture

This Fixture is in the shape of a cube, wherein the base is designed to be attached with the vibration system and four of the remaining five faces of the cube are designed for mounting the UUT. The top face is not provided so that it may facilitate easy mounting. This Fixture provides an affordable option for multi-axis vibration testing needs.

Environmental Chamber

An Environmental Chamber simulates environmental conditions such as temperature and humidity inside a closed space. These chambers facilitate in identifying flaws that occur due to variation in temperature and humidity in a product, which remain unidentified in the process of design, manufacture and shipment.

Sdyn's Environmental Chambers are recognised globally for the highest quality raw material used in its manufacturing. Our highly versatile refrigeration system performs well under high temperature and high humidity environment. Finished in anti-corrosive and satin-finish stainless steel, Sdyn's complete range of Environmental Chambers offers economy and performance to the customer.

Every chamber manufactured by Sdyn is feature rich and boasts an array of protections as default. These protections are interlocked to immediately shutdown the system in case of any failure. This includes, but is not limited to:

- Compressor Overload
- Compressor High Pressure
- Compressor Low Pressure
- Fan Motor Overload
- Input Phase Error
- Door Switch

In addition to this, an independent safety sensor and controller are also provided to sense over and under temperature inside the working volume and then shutdown the system in case the limits are exceeded. This safety controller is powered separately in order to meet International Standards.

Sdyn manufactures the following types of Environmental Chambers:

Standalone Chamber
A Standalone Chamber simulates temperature and humidity in a single working volume.

Integrated Chamber
An Integrated Chamber simulates temperature, humidity and vibration from an Electrodynamic Vibration System in a single working volume.

Thermal Shock Chamber
A Thermal Shock Chamber simulates hot and cold temperature in two different zones. The working volumes can change its zone in a matter of seconds to simulate thermal shock.

Standalone Chamber

A Standalone Chamber can be designed to simulate temperature and humidity conditions, individually or simultaneously in the same working volume. The working volume is kept at an adequate height to allow easy loading and unloading. A uniform airflow is maintained and its speed is set according to chamber specifications to ensure uniform temperature. Separate sensors are used to measure temperature and humidity, along with separate heaters and cooling coils.

The Standalone Chamber can be air cooled or water cooled as per the customer's requirements.

Standard Features

- Independent safety sensor and controller to trip the system in case of any malfunction
- Front opening door with double wall insulation, observation window, heavy duty hinges and lockable clamps
- Multi-pane glass of 300mm by 300mm for observation
- Non-flammable Rockwool of 125mm thickness
- Two pluggable holes of 75mm and 125mm for connection to unit inside the chamber
- Inconel sheathed heaters, evenly spaced outside the usable zone
- On-board display of all Interlocks and Protections
- On-board or PC Software based profile generation and parameter monitoring
- RS-232 Interface with PC for communication

Optional Features

- Sliding shelves for testing multiple units

Technical Specifications

Standalone Chamber						
Model	Working Volume	Working Volume (mm)	Temperature Range (ºC)	Rate Of Change	Humidity Range	Refrigeration System
216/40/2/SA	216 Litre	600x600x600	-40 to +180	2ºC	10-95%	Air Cooled
216/70/2/SA			-70 to +180	2ºC	10-95%	Air Cooled
216/40/5/SA			-40 to +180	5ºC	10-95%	Water Cooled
216/70/5/SA			-70 to +180	5ºC	10-95%	Water Cooled
512/40/2/SA	512 Litre	800x800x800	-40 to +180	2ºC	10-95%	Air Cooled
512/70/2/SA			-70 to +180	2ºC	10-95%	Air Cooled
512/40/5/SA			-40 to +180	5ºC	10-95%	Water Cooled
512/70/5/SA			-70 to +180	5ºC	10-95%	Water Cooled
1000/40/2/SA	1000 Litre	1000x1000x1000	-40 to +180	2ºC	10-95%	Air Cooled
1000/70/2/SA			-70 to +180	2ºC	10-95%	Air Cooled
1000/40/5/SA			-40 to +180	5ºC	10-95%	Water Cooled
1000/70/5/SA			-70 to +180	5ºC	10-95%	Water Cooled
1512/40/2/SA	1512 Litre	1200x1200x1050	-40 to +180	2ºC	10-95%	Air Cooled
1512/70/2/SA			-70 to +180	2ºC	10-95%	Air Cooled
1512/40/5/SA			-40 to +180	5ºC	10-95%	Water Cooled
1512/70/5/SA			-70 to +180	5ºC	10-95%	Water Cooled

Notes:
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Integrated Chamber

An Integrated Chamber can be integrated with a Vibration System for Environmental Stress Screening (ESS). It has all the performance characteristics and features of the Standalone Chamber along with a detachable base. The base can be solid for standalone operation, has a round hole for shaker (Z axis) integrated operation, or has a square hole for HST (X & Y axis) integrated operation. For 3 axis integration, the refrigeration circuit uses flexible pipe in order to allow vertical movement of the working volume. The working volume itself is mounted on guide rails and screw jack to allow smooth movement.

If the Vibration System is air cooled, then the Integrated Chamber can only be water cooled in order to avoid thermal runaway. If the shaker is water cooled, then the Integrated Chamber can be air or water cooled as per the customer's requirements.

Standard Features

- Independent safety sensor and controller to trip the system in case of any malfunction
- Front opening door with double wall insulation, observation window, heavy duty hinges and lockable clamps
- Multi-pane glass of 300mm by 300mm for observation
- Non-flammable Rockwool of 125mm thickness
- Two pluggable holes of 75mm and 125mm for connection to unit inside the chamber
- Inconel sheathed heaters, evenly spaced outside the usable zone
- On-board display of all Interlocks and Protections
- On-board or PC Software based profile generation and parameter monitoring
- RS-232 Interface with PC for communication

Optional Features

- Vertical movement for 3 axis integration
- Guide rails to move the chamber for Z axis,

Technical Specifications

Integrated Chamber						
Model	Working Volume	Working Volume (mm)	Temperature Range (ºC)	Rate Of Change	Humidity Range	Refrigeration System
600/40/3/IN	600 Litre	800x950x800	-40 to +180	3ºC	10-95%	Water Cooled
600/70/3/IN			-70 to +180	3ºC	10-95%	Water Cooled
600/40/5/IN			-40 to +180	5ºC	10-95%	Water Cooled
600/70/5/IN			-70 to +180	5ºC	10-95%	Water Cooled
1100/40/3/IN	1100 Litre	1000x1250x900	-40 to +180	3ºC	10-95%	Water Cooled
1100/70/3/IN			-70 to +180	3ºC	10-95%	Water Cooled
1100/40/5/IN			-40 to +180	5ºC	10-95%	Water Cooled
1100/70/5/IN			-70 to +180	5ºC	10-95%	Water Cooled
2250/40/3/IN	2250 Litre	1500x1500x1000	-40 to +180	3ºC	10-95%	Water Cooled
2250/70/3/IN			-70 to +180	3ºC	10-95%	Water Cooled
2250/40/5/IN			-40 to +180	5ºC	10-95%	Water Cooled
2250/70/5/IN			-70 to +180	5ºC	10-95%	Water Cooled

Notes:
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Thermal Shock Chamber

A Thermal Shock Chamber consists of two independently controlled hot and cold zones. The Unit Under Test is transferred between these two zones to simulate rapid changes in temperature. The movement is facilitated by pneumatics, which uses standard compressed air to operate. Sdyn's Thermal Shock Chamber has vertical movements with dual door arrangement. Hot zone is at the top and cold zone is at the bottom.

The Thermal Shock Chamber can be air cooled or water cooled as per the customer's requirements.

Standard Features

- Two independent safety sensors and controllers to trip the system in case of any malfunction
- Two front opening doors with double wall insulation, observation window, heavy duty hinges and lockable clamps
- Multi-pane glass of 300mm by 300mm for observation on both the doors
- Non-flammable Rockwool of 125mm thickness
- Movement of basket from Hot to Cold and Cold to Hot using pneumatics
- One travelling pluggable hole of 125mm for connection to unit inside the chamber
- Inconel sheathed heaters, evenly spaced outside the usable hot zone
- On-board display of all Interlocks and Protections
- On-board or PC Software based profile generation and parameter monitoring
- RS-232 Interface with PC for communication

Technical Specifications

Thermal Shock Chamber						
Model	Basket Volume	Basket Size (mm)	Hot Zone (ºC)	Cold Zone (ºC)	Load Capacity	Refrigeration System
27/40/TS	27 Litre	300x300x300	Amb to +180	-40 to Amb -70 to Amb	20 kg	Air Cooled Water Cooled
125/40/TS	125 Litre	500x500x500	Amb to +180	-40 to Amb -70 to Amb	30 kg	Air Cooled Water Cooled

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Product Safety & Compliance

Our products are CE certified, which means they comply with international regulations related to health, safety and environment.

The normal applicable directives are:

- **Low Voltage Directive** (73/23/EEC, modified as 93/68/EEC)
- **EMC Directive** (89/336/EEC)
- **Machinery Directive** (98/37/EEC)

The following ISO and IEC standards are covered by the company:

- **IEC 61010-1**: Safety requirements for electrical equipment for measurement, control, and laboratory use
- **IEC 61326-1**: Electrical equipment for measurement, control and laboratory use EMC requirements
- **IEC 62061**: Safety of machinery Functional safety of safety-related electrical, electronic and programmable electronic control systems
- **ISO 12100-1**: **2003** - Safety of machinery Basic concepts, general principles for design Part 1: Basic terminology, methodology
- **ISO 12100-2**: **2003** - Safety of machinery Basic concepts, general principles for design Part 2: Technical principles

Low Voltage Directive
Each product at Sdyn is designed and manufactured to ensure protection against hazards arising from electrical equipment; which means the user is adequately protected against danger of physical injury or harm.

EMC Directive
As per the EMC directive, our products have an adequate level of electromagnetic immunity in the specified electromagnetic compatibility environment.

Machinery Directive
Sdyn's products are designed with safety in mind to ensure protection against hazards resulting from the product itself as well as hazards to the product arising from external influences.

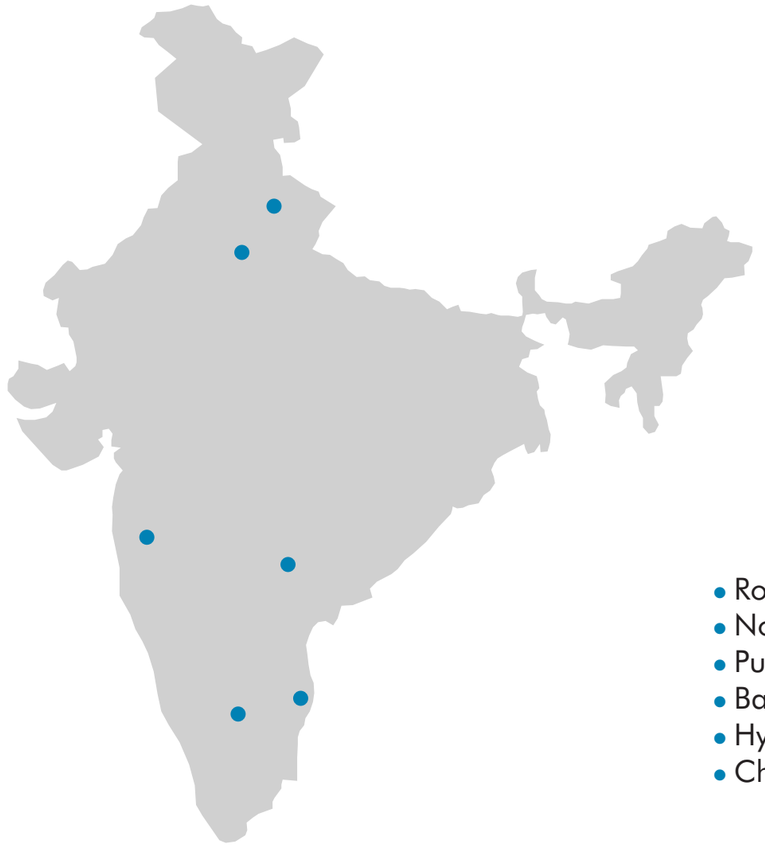
System Technical File
The Technical File on product comprises:
- General description of the product
- Design and manufacturing drawings of items such as components, sub-assemblies and circuits
- Test results of conformity of the product with health and safety norms
- Description of methods adopted to eliminate hazards presented by the product

Norm Affixing
- The CE mark is affixed on the product as a symbol of compliance to health and safety requirements.
- Sdyn has gone one step further from self-certification by getting certified by an external agency.
- European and American norms are affixed on products as a mark of compliance for global use.
- The ISO 9001:2008 certification ensures quality in all fields.

References

DENSO, TVS, Halonix, Philips, Yuyao Pharma, LG, Tyco Electronics, Visteon, Spark Minda, Stoneridge, Mahle, Knorr Bremse, HCL, Exide, IFB, Sanden, Escorts, Hyundai, Flem, Johnson Controls, Delphi, Barco, Bosch, Motometer, Nexter Systems, ARAI, Bharat Forge, ISRO, Telcon, Ushin, Kalyani, GE, Samtel, Honeywell, Siemens VDO, Trelleborg, Valeo, Maruti Suzuki, Tata Motors, Mahindra, HAL, TAFE, FIAMM Technologies, Cummins, Ashok Leyland, Malbit, Sameer, OFB, STQC, Subros, UCAL Fuel Systems, Hero, IBER-OLEFF

Support Network



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