

1.0 Proposal Overview

This proposal provides the following main components:

- One (1) LDS V826 Shaker System
 - 1 Inch Stroke Capability
 - 6,000 lbf Sine and 6,000 lbf RMS Random
 - Totally air-cooled
- One (1) Stand-Alone 36" Oil Film Slip Table Assembly

2.0 Shaker Systems Provided by Spectral Dynamics

Spectral Dynamics (SD) offers a full line of high performance electrodynamic shaker systems. All SD shaker systems have state-of-the-art design, versatile in capability, extremely reliable, and supported by SD worldwide. The SD shaker systems consist of the selected model shaker, a matched power amplifier, cooling system complete with interconnecting cables and hoses.

Optional items including head expanders, accelerometers and a vibration controller can be added upon request.

2.1 New Shaker Systems



Capability

The **Spectral Dynamics** shaker systems have a wide range of capability from 11 to 50000 pound force in size. Completely air-cooled systems to 17,600 lbf. Optional slip tables can be stand alone or integral unibase design with oil film or hydrostatic bearing slip plate systems. Head Expanders are also available for any shaker system. Load support and guidance can be added to most head expanders.

State-of-the-Art Design

SD systems utilize the latest mechanical design with armatures optimized for rigidity and force transmissibility. 100% air-cooled Power Amplifiers have plug-in modular construction to achieve the required output power. The amplifier uses a logic module, power modules, rectifier module and power control module. The modular design and compact structure help save power, space and cost.

Safety and Reliability

IGBT switching amplifiers are 100% air-cooled with redundant safety systems. 20 Automatic Amplifier Protection Interlocks are necessary for operation and faulty diagnosis. The “emergency stop” shuts down the complete vibration system safely in case of emergency. All SD shaker systems comply with ISO regulations and European tests standards.

2.2 Spectral Dynamics Amplifiers



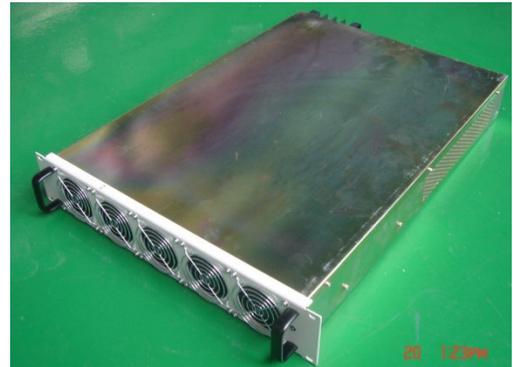
Spectral Dynamics leads the industry with advanced design high performance “SPA/DPA Series” switching power amplifiers. All amplifiers are reliable and have state-of-the-art design. The power amplifiers provide power for the armature, field supply, cooling blower, associated equipment and superb interlock protection. All power models adopt IGBT design with the most advanced technology. Each power module is rated at 15kVA (125Vrms@120Arms) output capability. Power modules can be easily added to increase AC power to the armature of vibration system.

Output Power Range

The SPA/DPA Series amplifiers offer a wide range of output power from 1 kVA to 480 kVA.

Modular Design

These systems utilize plug-in modular construction to achieve the required output power. Since all systems use the same basic modules, a ready source of spares is assured. The amplifier uses a logic module, power modules, rectifier module and power control module. The logic module houses the system modulator, current limits, interlock circuitry and system protections. Power modules can be connected in parallel for higher current to match the system drive power. The Rectifier module can supply DC for power modules, field coil and degauss coil. The modular design and compact structure help save power, space and cost.



Conversion Efficiency & Signal-to-Noise Ratio

Based on IGBT technology, Sine Pulse-Width Modulation (SPWM) technique and 2 two-order LC filters, the “SPA/DPA Series” amplifiers have high efficiency (greater than 95%), high Signal-to-Noise ratio (better than 65 dB), and low harmonic distortion (typically better than 1.0% from DC to 1000Hz and 1.5 % from 1000 Hz to 2000 Hz).

Parallel Current Share Error

Current auto-balanced technique assures current share error is no more than 3%.

Interlock Protection

Each of the 20 Automatic Amplifier Protection Interlocks are identified. These interlock protections are shown below. They are necessary for operation and faulty diagnosis. The “emergency stop” shuts down the complete vibration system safely in case of emergency.

Full and Partial Field Power Supply (Optional)

This option for the Long Stroke (3 and 4 in) model shakers provides the ability of 100g@11ms shock testing. The amplifier is configured with Full / Partial field power supply and an additional Power Module. When shock testing is performed, the amplifier uses Partial field power supply to get the required velocity. At the same time, the additional Power Module will supply more drive current to the armature for the necessary force. This is a factory-supplied feature.

Touch-Screen Control Panel and Remote Control Panel (Optional)

Optional Touch-screen control and remote control panel utilizing a PLC module to display running status and operate the shaker remotely are available.

100% Air Cooled

All the “SPA/DPA Series” amplifiers are forced air-cooled for efficiency, reliability and easy maintenance.

EMC & EMI

The Soft Switching technology, input and output EMC filter have made significant improvement in the EMC level and the reduction of radiated and transmitted emissions.

2.3 Spectral Dynamics Water Cooled Shaker Systems

The Spectral Dynamics water cooled shakers are a versatile wide band electrodynamic vibration test system developed for the aerospace, armament, automotive and construction industry. This shaker system adopts double cycle water circulation to increase the cooling efficiency, and low pressure but large flow cooling technology to ensure reliability. The unique winding of the drive and field coils provide longer working duty. The leading edge armature guiding system technology provides high anti-overturning moment suitable for high Center of Gravity and large Test Articles.

- **Water Cooling System**

The water cooling system utilizes two separate loops that interface in a heat exchanger. This method allows for high quality distilled water to circulate through a closed loop in the shaker body insuring long life and safety of the shaker armature components. The external loop is cooled with facility water or water that passes through an outside water cooling tower.

- **Water Cooling Tower**

The water cooling tower is a self-contained unit that interfaces with the heat exchanger via hoses to cool down the water supply. The tower (pictured) resides outside of the facility and is designed to withstand the elements. We work with a USA supplier and perform all installation as well as parts replacement for a turnkey solution.



2.4 Spectral Dynamics Refurbished Shaker Systems

Spectral Dynamics acquires older shaker systems during the capital procurement system of some companies. Most electrodynamic shakers can be refurbished to “almost” new capability with proper maintenance and replacement of defective or worn parts.

An older shaker is completely dismantled, armature checked and repaired/rewound if necessary, flexures replaced, bearings checked and replaced if required, cooling systems verified to be operational and delivering proper capacities, cables and hoses checked and replaced as necessary.

Most often old amplifiers are not used with refurbished shakers in the SD inventory. Occasionally, a solid state amplifier is available when the customer upgrade requires larger amplifiers. These can be checked with appropriate shakers to then become part of a complete shaker system to be offered for sale.