

# Digital Switching Power Amplifier

ETS Solutions power amplifier series are modular designed to drive Low Force, Medium Force and High Force series shakers. Amplifier outputs range from 1 kVA to 300 kVA. The system specifications are configurable to adapt to existing or new air-cooled or water cooled electro-dynamic shakers.

- High conversion efficiency (greater than 90%)
- High modulation switching frequency
- Intelligence CPU logic control and monitoring system
- Extensive safety protection system incorporated
- 12 kVA power modules configured with two independent sub 6 kVA modules
- Totally air cooled amplifier designed for continuous long period operation
- High signal to noise ratio
- Low total harmonic distortion
- 3 sigma peak current rating
- International compliance to safety and EMC standards
- Equipped with servo control console for dynamic armature centering
- Optional remote control panel with full functional features

The MPA Series family delivers output performance from 1 kVA to 84 kVA. Three different amplifier sizes configured for the 'L' Series and 'M' Series shakers to deliver optimized cabinet weight and size. The design saves essential equipment space as well as reducing installation costs.

The High Performance MPA3000 Series offer modular cabinet design with controlled equivalent current sharing. Each cabinet is designed to deliver up to 60kVA of power. The modular design allows an amplifier design up to 300 kVA with a low floor space requirement. The master logic unit synchronizes drive output electronically among the power cabinets to deliver the sum current output. The master logic unit monitors the entire system operating environment and isolates any failed sub-units from affecting other sub-units. The MPA3000 Series is designed with utmost safety protection offering enhanced reliability, high performance and a high power robust system.



A LCD panel displays 'System Status' parameters with instantaneous output voltage and current indication. The shaker operating status and the error messages are shown for interactive diagnostics. Managed by a high-speed microprocessor logic unit, the intelligence logic control system assures high output power with maximum safety protection.



High switching frequency delivers low distortion with full power output over a broad frequency band.



Designed with the latest high-advanced MOSFET power transistors, the 12 kVA power unit consists of two self-regulating sub 6 kVA units. Designed to continue operation with de-rated 6 kVA power when one sub-unit fails.



# Head Expander & Customized Fixtures

ETS Solutions offers Head Expanders for applications where larger vertical test mounting surfaces are required. Head Expanders are manufactured from light-weight magnesium alloys, providing high strength-to-weight ratio. A choice of less expensive aluminum alloys is also available for smaller fixtures without much addition to the total mass. The Head Expander allows multiple items to be tested at the same time, decreasing total test cycle time. Head Expanders with load support guidance allow payloads with large foot prints to be safely mounted and tested on the shaker, reducing the risk of damage to the shaker suspension system. The Guided Head Expanders are designed for testing of large, heavy packages to handle tough transportation and other demanding test profiles while providing additional restraints and load support.

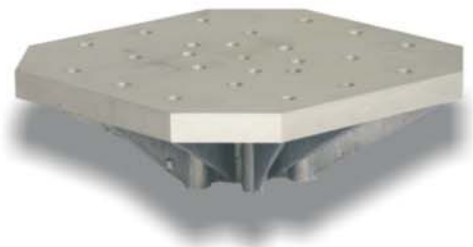
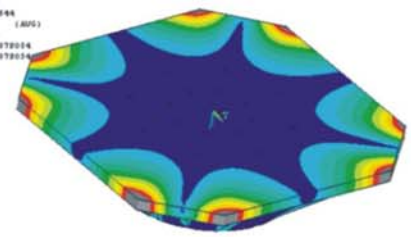
Customized fixtures can also be designed and fully manufactured based on the customer's specimen mounting requirement. Cube, L type and T type fixtures for testing of multiple small sized components are available. The customized cube, L or T types are preferred by customers for three axis testing without investing in an additional slip table.

Latest software for FEM calculation is incorporated into the fixture designs to produce the best results for the designed fixtures with an overall dynamic performance.

## Features

- ⊙ Uniform surface obtained by precision machining
- ⊙ Magnesium composition fixtures for lower total operating mass
- ⊙ FEM designed fixtures for predictable results
- ⊙ Round, square, and octagon shape Head Expanders are available
- ⊙ Useful frequency up to 2,000 Hz
- ⊙ Integrated easily for use with thermal chambers and with optional thermal barrier
- ⊙ Cost effective to increases production testing yield
- ⊙ High resonant frequencies available, depending on size
- ⊙ Choice of insert mounting hole patterns available
- ⊙ Designed to couple with your current shaker system

MODAL SOLUTION  
STEP=1  
DIS=0  
FREQ=1444  
USING 1MODE  
RATIO=0  
SOL=0.079004  
DMS=0.079004





### Innovative Manufacturer

With many years of experience in the vibration and shock testing field, ETS Solutions uses its strong design team to innovate and to develop vibration testing equipments exceeding other vibration testing equipment manufacturers. ETS Solutions has become a major force in the industry by offering a wide range of dynamic testing equipment to our customers. With constantly changing and demanding testing requirements from various industries, continual investments in R & D are necessary and allow ETS Solutions to offer the most advanced products in the industry.

5  
DIGITAL SIGNAL  
STEP#1  
JOB #10  
FREQ#1470  
GTON (AM)  
RATED#  
DRI #7.00  
DRI #7.00  
DRI #7.00



### Affordability

High performance testing equipment with a high standard of quality that is affordable. This is what ETS Solutions offers. Reasonably priced systems, delivering high performance and long term reliability.

### Other Available Products:

- ⊙ **Vibration Controllers**
- ⊙ **Combined Vibration Systems with Chambers**
- ⊙ **Shock Testing Machines**
- ⊙ **Drop Testing Machines**
- ⊙ **Inclined Impact Test Machines**

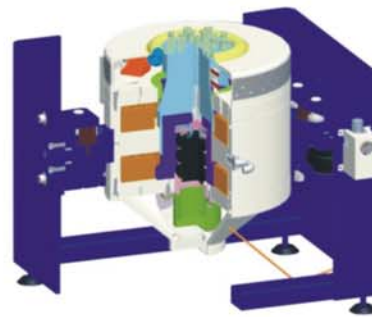


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### Service

To provide the best services to our worldwide base of customers, ETS Solutions has worldwide partners with many years of experience across Europe, Asia and the United States to answer all requests. Major and minor spare parts are strategically stocked in the various continents to support customers with efficient servicing lead time. Customers in different continents do not have to worry about long shipping lead times for spares. The ETS Solutions team is able to offer a complete turnkey solution in facilities planning, installation, equipment maintenance, and training. All of ETS Solutions systems can be customized to suit specific customer requirements.



### Reliability

All ETS Solutions vibration systems, from air-cooled to water-cooled units are built for long hours of operation. Extensive parts replacement warranty period are covered for each delivered system. This includes major parts including armatures and field coils. This product quality assurance ETS Solutions has pledged and provided to all global customers.



# Slip Table for Multi Axis Testing

ETS Solutions slip tables are designed to provide the optimum test platform for horizontal testing with any shaker combination. Our unibase concept provides a structural steel body to align the shaker and table on a rigid platform. All the slip tables are designed with precise grinded natural granite slab with a selection of guidance bearings to meet different applications and budgets. The stiffened and welded body provides good reaction mass and damping. The built-in isolation system reduces vibration transmission to the floor and prevents any interference between lab equipments.



- Magnesium slip plate
- Low profile reaction mass with total system isolation (standard 2.5 Hz)
- Stiffened and welded steel body design with high mass to force ratios
- Designed for combined environment applications
- Stand alone slip table available to interface to any shaker (existing or new)

Rotation of shaker body to couple the slip tables can be performed quickly and easily by one person using geared rotation system. Slip plate alignment with shaker is always ensured with mechanical stops installed. Slip plates can be provided in almost any size from 300 mm square (for small shakers) to 2 m square for large sized specimen test. Different types of restraining bearings are available to meet different application requirements and operating budgets.

## 'GT' Series

GT Series, guided oil film tables are designed with less expensive guided V-groove bearings, combined with magnesium slip plate. Oil is supplied through the granite slab port holes and is dispersed throughout the underside of the slip plate. The oil film provides a low friction slip surface and a damping medium for restraint of resonances, pitch and roll moments.

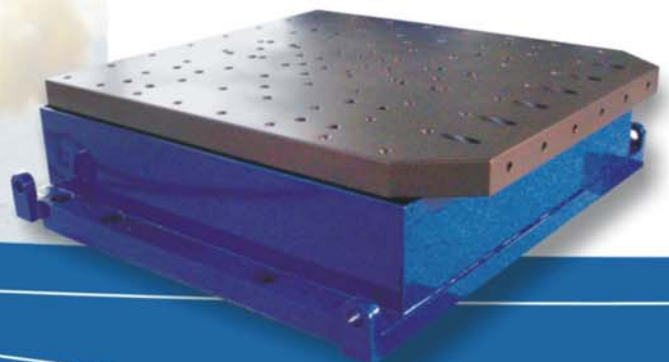
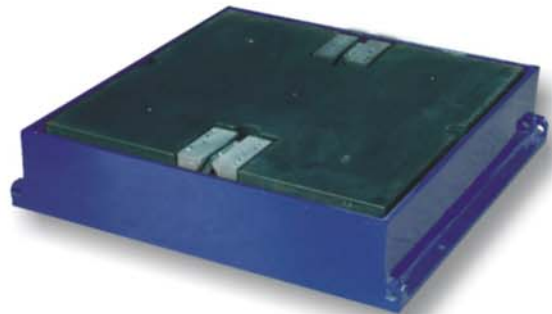
- Low pressure hydraulic pump
- Self contained oil reservoir with oil filter
- Yaw restraint by v-groove guide bearings combining with the armature guidance system
- Inexpensive technique to perform horizontal testing

## 'BT' Series

The BT Series design provides a high over-turning moment and cross-axial restraint. This concept combines a standard slip table assembly with 3000 PSI hydrostatic bearings to provide high dynamic moment restraint while preserving the damping characteristics of guide oil film.

- Heavy products testing with high centers with restraint moments by hydrostatic bearings
- Cross-axis motion is constrained and is typically less than 10% of input at frequencies up to 2,000 Hz\*
- 3,000 PSI Hydraulic Power Supply
- Hydrostatic journal bearings to restrain high yaw, roll and pitch moments
- Pressure interlocks
- Reservoir oil filter
- T-film bearing (optional)

\*Except at resonance.



# VIBRATION TESTING EQUIPMENT PRODUCT GUIDE

- © Classical Shock
- © Random Test
- © Sine-on-Random
- © Swept Sine
- © Sine and Random on Random
- © Step Sine
- © Sine Resonance Phase Track & Dwell
- © Random-on-Random
- © Shock Response Spectra
- © Road Simulation



- © Shaker Systems
- © Power Amplifier
- © Vertical Guidance System
- © Guided Oil Film Slip Tables
- © Hydrostatic Bearing Slip Tables
- © Load Bearing Platform
- © Head Expanders
- © Customized Fixtures
- © Combined Vibration - Climatic System
- © Vibration Control System

# Vibration Testing Equipment

ETS Solutions manufactures a wide range of vibration testing systems with output force from 200 kgf(440 lbf) to 18,000 kgf (39,600 lbf). All systems are designed to meet the requirements of endurance testing, a test environment typical in the automotive industry. All systems comply with international standards including MIL, ASTM, IEC, ISO, BS etc.

## 'L' Series

Vibration systems from 200kgf (440lbf) to 600kgf (1,320 lbf).

- Most cost effective solutions for screening of small components.
- Specimen payloads up to 300 kg (660 lbs).
- Armature diameters range from 150 mm to 230 mm (5.9 inch to 9.1 inch).
- Roller-truss flexure suspension system with high cross axial stiffness.
- Up to 51 mm (2 inch) continuous displacement.
- Test frequency up to 4,500 Hz.
- Rugged trunnion design with air bags or elastomer bearing guidance.



## 'M' Series

Vibration system from 1,000 kgf (2,200 lbf) to 7,000 kgf (15,400 lbf).

- Meets the typical electronic and automotive sub-assembly testing requirements.
- Specimen payload up to 800 kg (1,760 lbs).
- Armature diameters range from 240 mm to 480 mm (8 inch to 18.9 inch).
- Roller-truss flexure suspension system with high cross axial stiffness.
- Servo controlled for long stroke 51 mm (2 inch) continuous displacement.
- Rugged trunnion design with air isolation bearing guidance.
- Test frequency up to 3,000 Hz.



## 'H' Series

Vibration system from 10,000 kgf (22,000 lbf) to 18,000 kgf (39,600 lbf).

- Water-cooled Series designed for exceptionally large test specimens. Used in aerospace, defense, avionics and automotive projects.
- Light weight composite armature coil for high acceleration performance.
- Specimen payloads up to 2,000 kg (4,400 lbs).
- Armature diameters range from 480 mm to 590 mm (18.9 inch to 23.2 inch).
- Flexure suspension system with high cross axial stiffness.
- Servo controlled operation for large payload long stroke 51 mm (2 inch) continuous displacement.
- Standard auto centering load support system.
- Test frequency up to 2,500 Hz.

## 'LS' Series

100 mm Long Stroke Series, from 1,500kgf (3,300lbf) to 4,000kgf (8,800lbf).

- Designed for long stroke displacement test requirements usually performed by hydraulic shakers.
- Specimen payload up to 800 kg (1,760 lbs).
- Armature diameters of 320 mm and 370 mm (12.6 inch and 14.6 inch).
- Roller bearings with rugged suspension system and high cross axial stiffness.
- Servo controlled operation for long stroke 90 mm (3.5 inch) continuous displacement.
- Standard auto centering load support system.
- Rugged trunnion design with bearing guidance built-in with air bag isolator.
- Test frequency up to 3,000 Hz.
- Time and cost savings for customer's with a variety of special test requirements.
- Suitable for test applications including package testing and vehicle testing.

