

A Benchmark Advanced Technology Platform accurate, dependable pneumatically-powered product impact testers

Three models of shock test machines

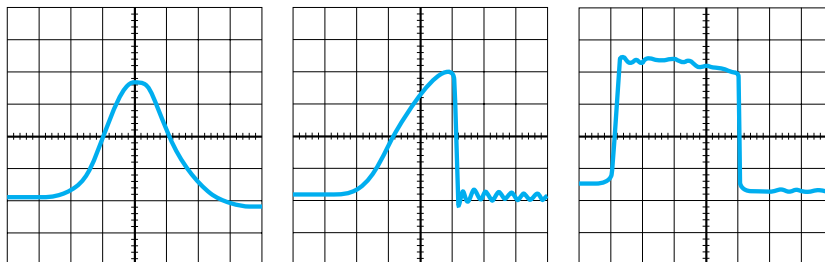
Range of Sizes and Capabilities

AVEX® Shock Machines™ are used in the design and destructive testing of components, circuits, hybrids, and complete assemblies. To better meet your needs, Benchmark offers three models of the Shock Machine Test System:

- **SM-105** Smallest model for testing specimens up to 50 pounds
- **SM-110** Mid-range model tests specimens up to 200 pounds
- **SM-220** Largest model capable of testing up to 1000 pounds

Shock Machine Specifications Overview

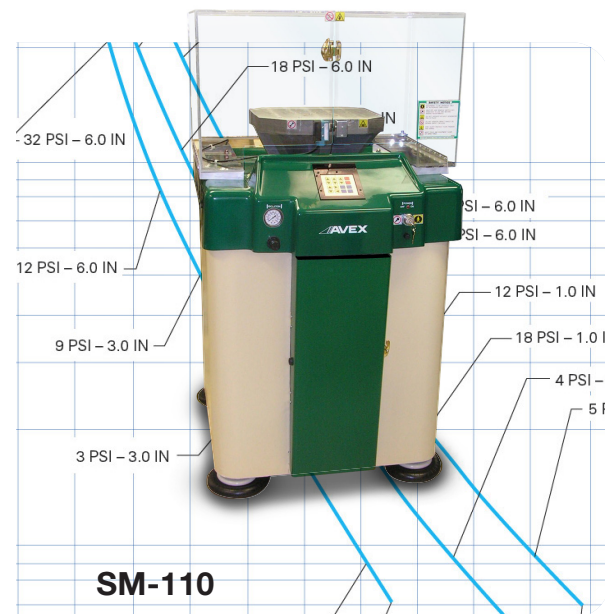
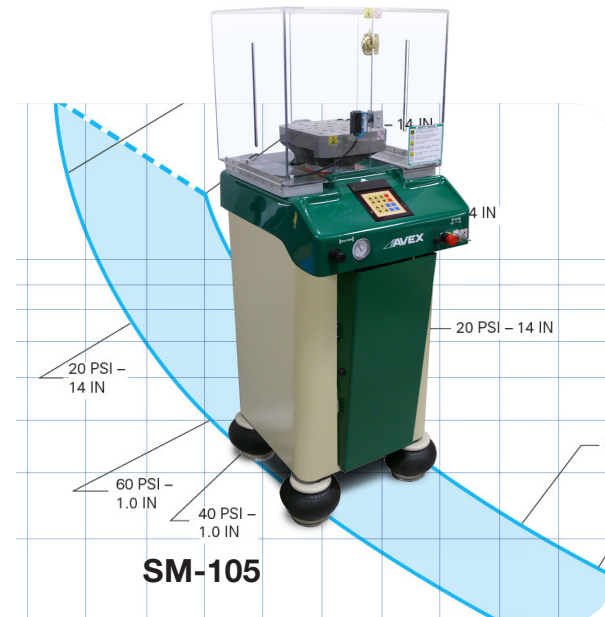
- Keypad Entry of Test Parameters (with 12 character alphanumeric display)
- Shock Testing from 3g's to 30,000g's
- Test Specimen Weights Up to 1,000 Pounds (453.59 kg)
- Shock Durations from 0.012ms to 100ms
- Single or multiple drop cycles at a rate of up to 8 cycles per minute
- Compliance with MIL-STD-202, MIL-STD-750, MIL-STD-810 and MIL-STD-883
- 3 Shock Pulse Generators: Half Sine, Sawtooth, and Square Wave



Three classic waveforms

The Leader in the Industry for over 40 Years

AVEX is the undisputed leader in pneumatic shock testing. Because AVEX machines provide accurate, repeatable test results, they are used globally for both commercial and military applications, testing a wide variety of products from disk drives to wristwatches, spark plugs to automotive sensors.



Note: The **SM-220** looks like the SM-110, but is larger.

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Shock Test Machine Features

All three AVEX Shock Machines are firmware-controlled, pneumatically-powered shock testers for accurate, repeatable laboratory and production impact testing of specimens up to 1000 pounds, depending on the model. A Shock Machine will produce half sine, sawtooth, and square wave pulse shapes that meet exacting military and industrial specifications, or individual test requirements with appropriate pulse generators. Generated waveforms comply with typical military specifications, including MIL-STD-202, MIL-STD-750, MIL-STD-810, and MIL-STD-883.

Installation Requirements

All Shock Machines are entirely portable and require no special floor preparation or bolting. The only site requirements are availability of compressed air, 115 VAC power, and a floor that is reasonably level. The floor must support the weight of the machine plus the test specimen and provide a nominal safety factor to accommodate minimal shock loads. The machine may be moved with a forklift truck.

Operation

The Shock Machine is powered by compressed air with pressure ranging from 100 to 125 psi. The following describes a typical drop cycle: Compressed air is introduced to the lower side of the piston, raising the carriage (specimen attachment plate) to a preselected height. Once this is reached, the holding brake is applied. The lift air is dumped, and compressed air is introduced to the upper side of the piston to the desired charge pressure. When this pressure is reached, the holding brake is released. The carriage is then driven downward by the charge pressure, impacting on a pulse generator mounted on the anvil. Upon impact, the brake is actuated, holding the carriage in a rebound position and preventing secondary impact. Simultaneously a data capture system may be triggered for recording the shock pulse.

Base

The base assembly functions as an inertial mass and reacts with the falling carriage to generate a shock pulse. The assembly is made of high-strength reinforced

concrete, encased in a steel jacket, and is supported on four air mounts. It supports a carriage and guide rod, and contains a pneumatic cylinder assembly, an electronic-pneumatic control system, and a control panel. The machine is shipped completely assembled.

Air Mount Supports

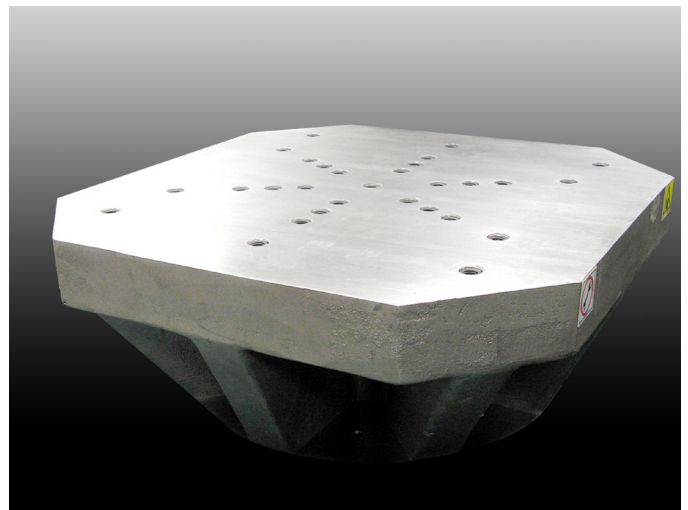
The pneumatic air mount supports, built into the machine's base are inflated by the machine's compressed air supply and effectively isolate impact forces, reducing their transmission to the floor. Air pressure and inflation are controlled by a regulator and pressure gauge and adjusted to suit specific load and test conditions.

Carriage

The carriage is a conical-shaped aluminum casting providing an optimal strength-to-damping ratio (the SM-220 carriage is magnesium). Mounting surfaces are machined to close tolerances with steel inserts to allow the attachment of specimens or fixtures to the carriage.

Shock Pulse Generators

A variety of elastomeric pads, lead pellets, and pneumatic pistons generate half sine, sawtooth, and square wave pulse shapes, respectively. The elastomeric pads are easily changed to meet a wide range of pulse requirements and have proven to be the



Carriage test specimen attachment plate

most economical and versatile generators for half sine waveforms. Molds are available for casting lead pellets to generate terminal peak sawtooth pulse shapes.

Controls

The machine's pneumatic components are controlled by firmware. A keypad and display are used to easily program charge pressure, drop height, braking, cycle count, and any instrumentation triggers for data capture. The SM-220 keypad is on a remote control connected by a 20-foot cable, allowing the machine to be operated from a less noisy location. A key lock switch provides electrical power. Depending on the number of cycles programmed, the machine can initiate one or multiple drop cycles at a rate of up to 8 cycles per minute.

Maintenance

AVEX pneumatic machines are designed and constructed for long service life and minimum maintenance. The valve plate assembly, pneumatics, electronics, and electrical connections are arranged for easy access by maintenance personnel or technicians.

Brief Company History

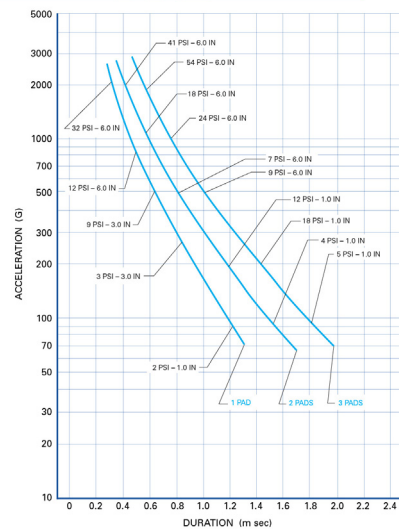
AVEX is the developer of the modern pneumatic shock test machine. The company, called initially AVCO, began in the 1950's building free-fall style shock test machines. These machines were effective, but capabilities were limited by the required size of the testing rooms. To provide a better solution, the pneumatic shock test machine was developed and perfected. These machines have improved testing capabilities and do not require specially designed rooms for their use. Though design

improvements have continued with different models over the years, the basic concept has remained. In 1985, AVCO became AVEX; in 1999, AVEX was acquired by Benchmark Electronics.



Control panel of the SM-110

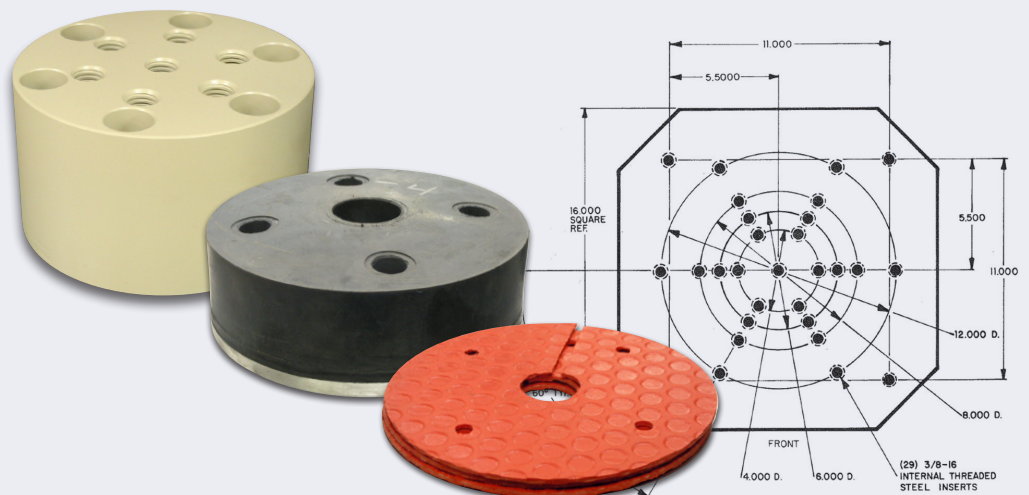
AVEX SM110 **shock machine**
Acceleration vs. Duration
Impact Pad No. 900947-5 / 25 lb. load / Half Sine Waveforms
Graph No. 2



Specific shock generator data available

Standard AVEX Shock Pulse Generators

Standard shock pulse generators are available for meeting the dynamic requirements of the three classical waveforms: Half Sine, Sawtooth and Square Wave. Specific shock generator performance data is available.



Model Specifications Comparison Chart

SM-105

Dimensions

Floor area required: 24 in. x 24 in.
Carriage Surface: 9.25 in. x 9.25 in.

Height (Air Mounts Inflated)

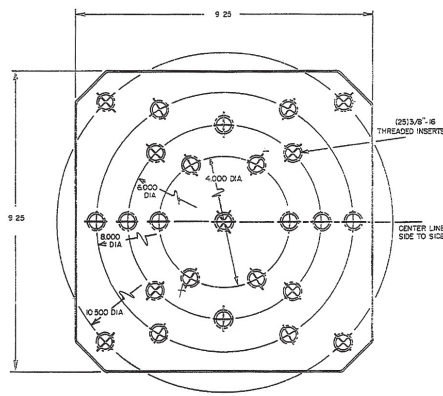
Floor to top of control panel: 43 in.
Floor to carriage down position: 49 in.
Floor to top of safety shield: 62 in.

Weight

Installed Weight: (632 kg.) 1395 lb.
Shipping Weight: (751 kg.) 1655 lb.

Specimen

Weight: 50 lb. maximum
Height: Not limited by machine
Size: Not limited by machine
Center of gravity of specimen must be within 1 inch of center of carriage.
Carriage Mounting Hole Pattern:



Performance

Stroke: 17 in. maximum
Terminal Velocity:
330 in. per sec. (no load)
260 in. per sec. (30 lb. specimen)
Cycling Rate up to 8 cycles per minute
Air Requirements: 4 SCFM maximum

SM-110

Dimensions

Floor area required: 32 in. x 32 in.
Carriage Surface: 16 in. x 16 in.

Height (Air Mounts Inflated)

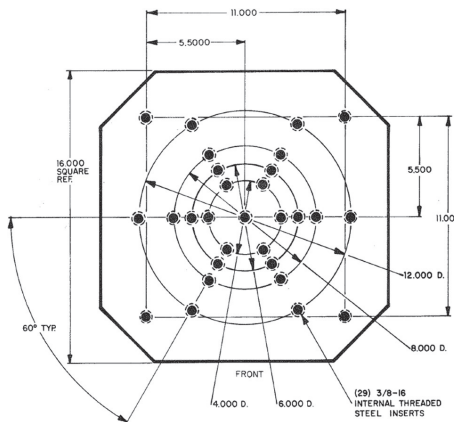
Floor to top of control panel: 43 in.
Floor to carriage down position: 50 in.
Floor to top of safety shield: 63 in.

Weight

Installed Weight: (1406 kg.) 3100 lb.
Shipping Weight: (1547 kg.) 3410 lb.

Specimen

Weight: 200 lb. maximum
Height: Not limited by machine
Size: Not limited by machine
Center of gravity of specimen must be within 1.5 inches of center of carriage.
Carriage Mounting Hole Pattern:



Performance

Stroke: 17 in. maximum
Terminal Velocity:
400 in. per sec. (no load)
285 in. per sec. (150 lb. specimen)
Cycling Rate up to 8 cycles per minute
Air Requirements: 15 SCFM maximum

SM-220

Dimensions

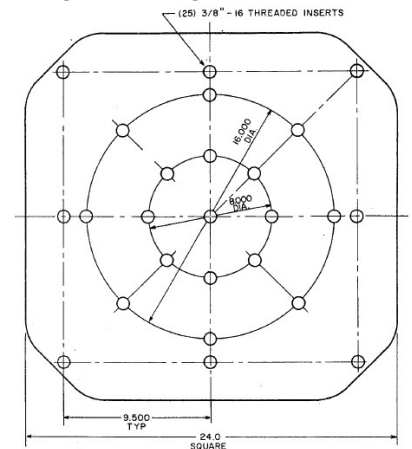
Floor area required: 44 in. x 50 in.
Carriage Surface: 24 in. x 24 in.
Height (Air Mounts Inflated)
Floor to top of control panel: 54 in.
Floor to carriage down position: 67 in.
Floor to top of safety shield: 80 in.

Weight

Installed Weight: (3402 kg.) 7500 lb.
Shipping Weight: (3810 kg.) 8400 lb.

Specimen

Weight: 1000 lb. maximum
Height: Not limited by machine
Size: Not limited by machine
Center of gravity of specimen must be within 2 inches of center of carriage.
Carriage Mounting Hole Pattern:



Performance

Stroke: 21 in. maximum
Terminal Velocity:
330 in. per sec. (no load)
250 in. per sec. (50 lb. specimen)
215 in. per sec. (200 lb. specimen)
185 in. per sec. (400 lb. specimen)
Cycling Rate up to 8 cycles per minute

Maximum Gs Recommended

2500 with 100 lb. specimen
600 with 400 lb. specimen
50 with 1000 lb. specimen
Air Requirements: 32 SCFM maximum
Keypad located on Remote Control:
Remote Control has 20 ft. cable

Specifications Common to All Three Models

Operates Using Standard Pulse Generators

Elastic Pads: Half Sine

Lead Pellets: Terminal Peak Sawtooth

Special Generators: Square Wave

Programming Capability: Program 1 to 10 tests

Conditions can be programmed with repetition of up to 100 Drop Cycles.

Utilities: Power: 115 VAC, 60 cycle, single phase. Air Pressure: 100-125 psi filtered

Benchmark Electronics

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