SM-220-MP

AVEX

SHOCK TEST MACHINE

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Description

The SM-220-MP is a microprocessor controlled, pneumatically powered shock machine for accurate, repeatable laboratory and production impact testing of specimens up to 1000 pounds. With appropriate pulse generators, it will produce half sine, sawtooth, and square wave pulse shapes to meet exacting military and industrial specifications or individual test requirements. Generated waveforms will comply with typical military specifications, such as MIL-STD-202, MIL-STD-810, and MIL-STD-750. The SM-220-MP is completely portable and requires no special floor preparation or bolting. The only locational requirements are availability of compressed air, 115 V. 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 fork lift truck.

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 supports, built into the base of the machine, 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 may be adjusted to suit specific load and test conditions.

Carriage

The carriage is a conical shaped magnesium casting with mounting surfaces machined to close tolerances. It has been designed for optimum strength-to-damping ratio. Steel inserts provide for attaching specimens or fixtures to the carriage, as shown on the back cover.

Shock Pulse Generators

A variety of elastomer pads, lead pellet molds, and pneumatic pistons for generating half sine, sawtooth, and square wave pulse shapes are available for this machine. The pads are easily changed to meet a wide range of pulse requirements. Elastomer pads have proved to be the most economical and versatile generators for half sine wave forms. Molds are supplied for casting lead pellets to generate terminal peak sawtooth pulse shapes.

Maintenance

AVEX pneumatic machines are designed and constructed for long service life and minimum maintenance. The pneumatic, electronic, and electrical systems are arranged for easy access by maintenance personnel or technicians.

Controls

The machine's pneumatic components are controlled by a self-contained microprocessor. A key pad, conveniently located on a remote control panel, programs the microprocessor for charge pressure, drop height, braking, cycle count, and instrumentation trigger. A 20-foot cable enables the machine to be controlled from a less noisy location. Electrical power is provided by the top control panel key lock switch. Depending on the number of cycles programmed, the microprocessor will direct the machine to initiate one or multiple drop cycles at a rate of up to 8 cycles per minute. A valve plate supporting the assembly of valves, pneumatics, electrical connections, and microprocessor is mounted on the machine to provide easy access for maintenance and adjustments.

Operation

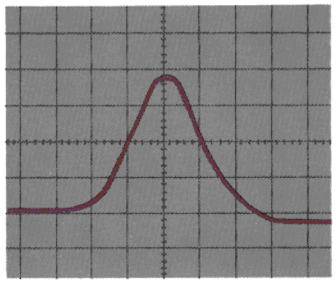
The machine is powered by compressed air with pressure ranging from 100 to 125 psi. The following describes a typical drop cycle: Compressed air is introduced to the lower side of the piston, raising the carriage to a selected height as determined by microprocessor programming. Once the height is reached, the holding brake is applied. The lift air is dumped and compressed air is introduced to the upper side of the piston to a desired "charge" pressure, which is measured by a transducer. As soon as the desired charge pressure reaches the proper amount, the microprocessor actuates the valve which releases the pressure on the holding brake. The carriage is then driven downward by the charge pressure, impacting on a pulse generator mounted on the anvil. Upon impact, the microprocessor directs the brake to be actuated, holding the carriage in a rebound position and preventing secondary impact. At the same time, the microprocessor will trigger the sweep of an oscilloscope or other instrumentation for recording the shock pulse.

Standard Shock Pulse Capability Envelopes

The parallel lines of constant velocity (black) and constant deflection (red) are characteristic parameters indicating dynamic requirements for the classical waveforms.

Standard AVEX shock pulse generators are available for impulse requirements falling within the envelopes shown in light red. Consult AVEX engineering for impulse requirements outside of the envelopes.

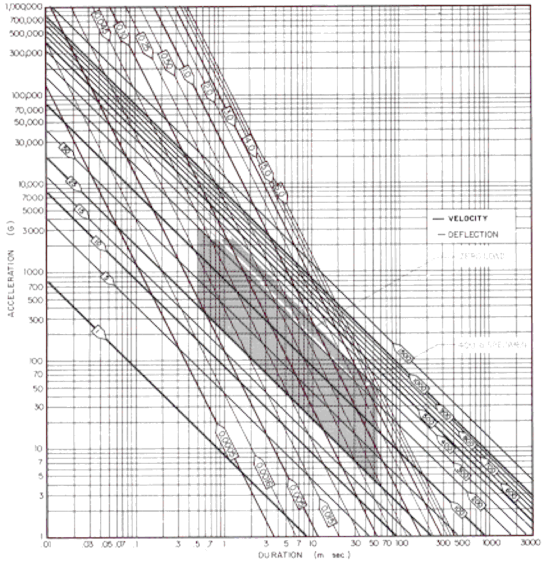
Specific shock generator performance data is available upon request. Indicated data is subject to change without notice.

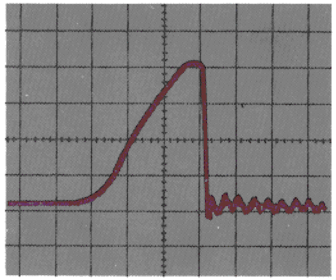


Half Sine Shock Generators

SM-220-MP HALF SINE WAVEFORMS

VELOCITY IS IN INCHES PER SECOND
DEFLECTION IS IN INCHES

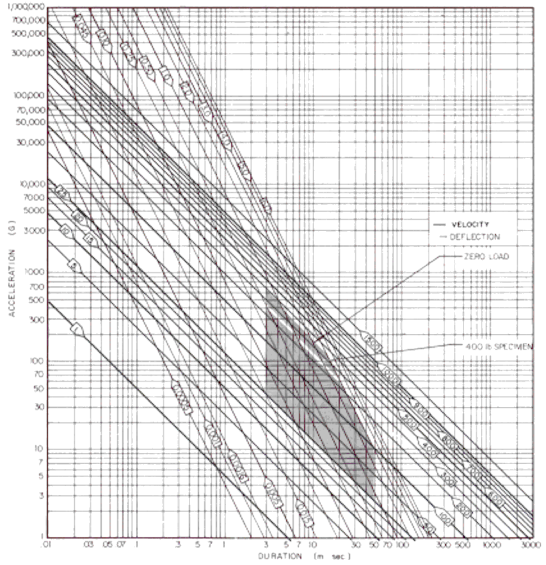


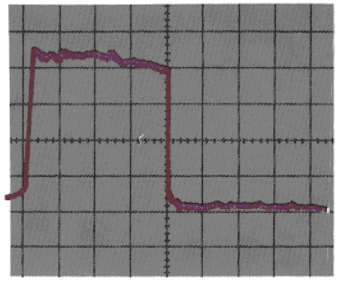


Sawtooth Shock Generators

SM-220-MP SAWTOOTH WAVEFORMS

VELOCITY IS IN INCHES PER SECOND
DEFLECTION IS IN INCHES

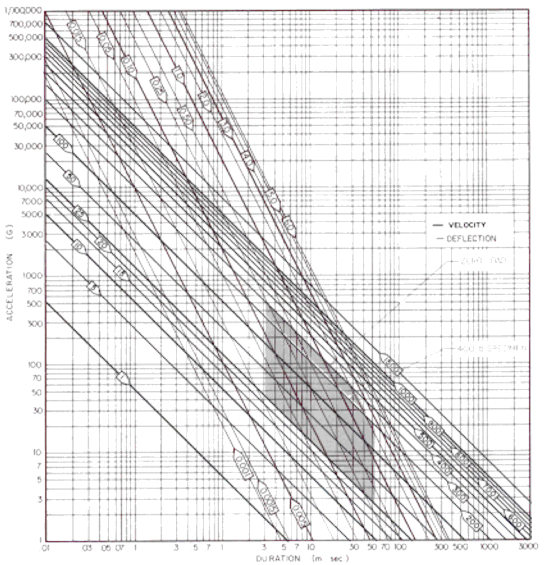


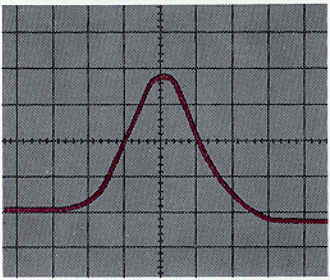


Square Wave Shock Generators

SM-220-MP SQUARE WAVEFORMS

VELOCITY IS IN INCHES PER SECOND
DEFLECTION IS IN INCHES





Half Sine Shock Generators

SM-220-MP HALF SINE WAVEFORMS

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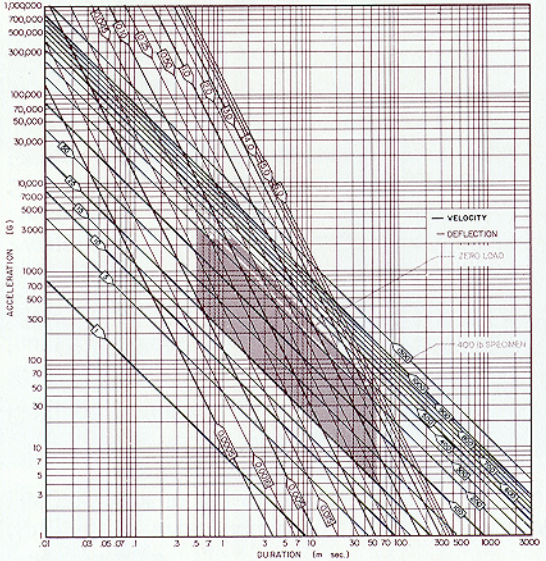

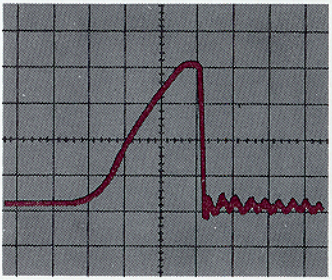

Sawtooth Shock Generators

SM-220-MP SAWTOOTH WAVEFORMS

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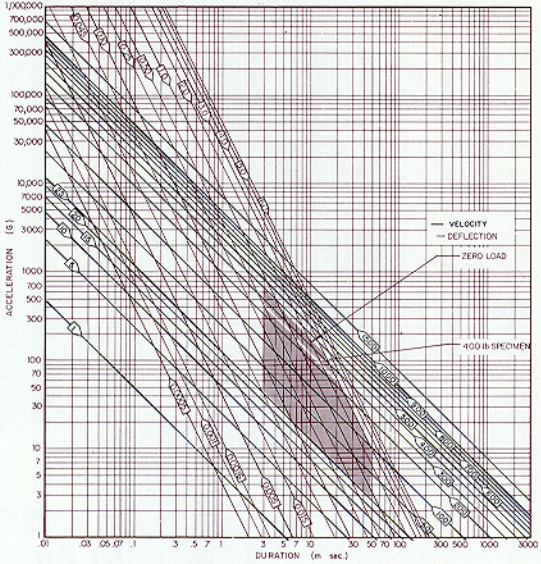
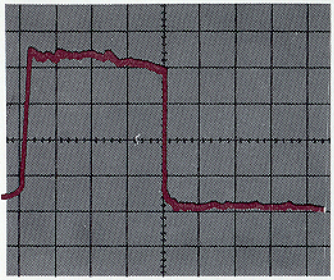
DEFLECTION IS IN INCHES





Square Wave Shock Generators

SM-220-MP SQUARE WAVEFORMS

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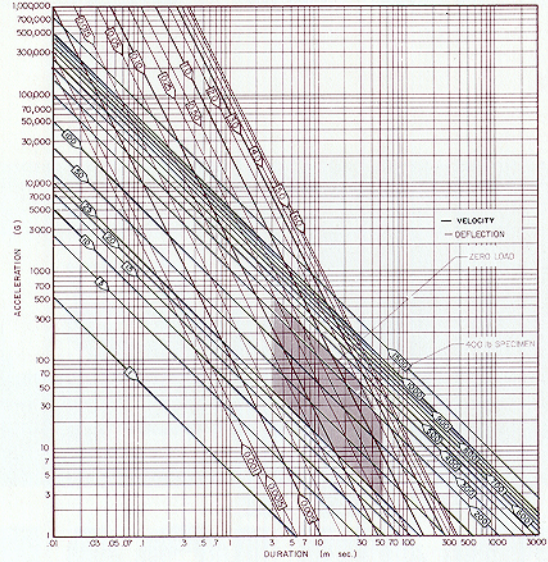
DEFLECTION IS IN INCHES



Specifications—SM-220-MP

Dimensions

Base (Floor area required) _____ 44 in.×50 in.
* Height (Floor to top of control panel) _____ 54 in.
(Floor to carriage, down position) _____ 67 in.
(Floor to top of safety shield) _____ 80 in.
Carriage Surface _____ 24 in.×24 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.

Performance

Stroke _____ 21 in. maximum
Terminal Velocity _____ 330 in. per sec. (no load)
260 in. per sec. (400 lb. specimen)
Cycling Rate _____ up to 8 cycles per minute

Pulse Generators

Elastic Pads _____ Half Sine
Lead Pellets _____ Terminal Peak Sawtooth
Special Generators _____ Square Wave

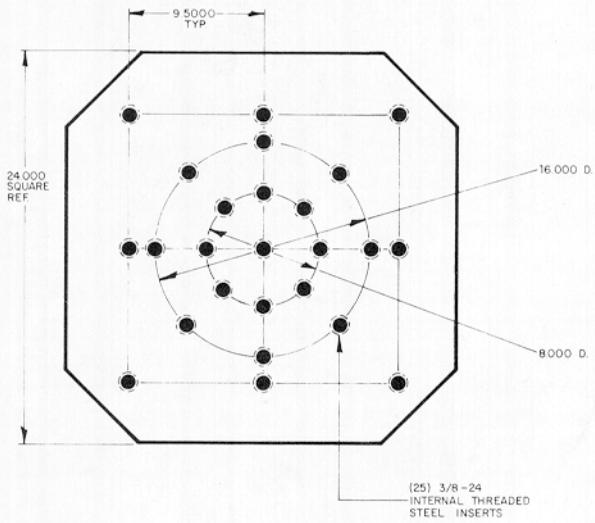
Utilities

Power _____ 115VAC, 60 Cycle, Single Phase
Air Pressure _____ 100-125 psi Filtered
Air Requirements, Maximum _____ 32 S.C.F.M.

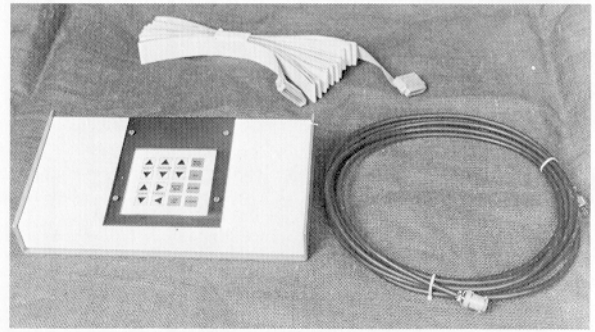
Microprocessor

Program _____ 1 to 10 Test Conditions can be programmed with repetition of up to 100 Drop Cycles.
Key Pad located on a Remote Control Panel with 20 feet of cable.

Carriage Mounting Hole Pattern SM-220-MP



Remote Control Panel



Shock Pulse Instrumentation Systems

The **IS-910** is a simple screen memory scope with a camera to record the pulse.

The **IS-911** is a digital scope with an XY plotter to record the pulse.

The **IS-912** is a computer scope which displays acceleration, duration and MIL-STD performance envelopes. It uses a graphics printer to record the pulse.

Each system comes complete with accelerometers, cables, charge amplifier and low pass filter, mounted in a rollaround cabinet.