Wilcoxon Research

Model F3/Z602WA
Electromagnetic shaker system

The model F3 vibration generator is a reaction-type shaker generating dynamic forces for structural excitation in vibration research and testing. The reaction principle of operation, light weight and compact configuration allow this generator to be stud mounted in any position, directly to structures without external support or critical shaft alignment problems.

The model F3 electromagnetic shaker is a cylindrical permanent magnet shaker. The magnet is in rigid contact with the outer case. A moving coil wound on an aluminum bobbin surrounds the magnet. This coil and bobbin is suspended from two natural rubber diaphragms ensuring pure axial motion. A low center of gravity minimizes rotational excitation by the shaker. The added dynamic weight is low since the suspended weight does not effect rotational or axial inertia above its resonance. This prevents inconsistencies often encountered whenever the rotational impedance of structures is low compared to the axial impedance.

The model F3 is designed for operation over a very wide range of audio frequencies. It can be supplied with a sensing transducer containing an accelerometer and a force gage (model Z602WA impedance head). The shaker drives the tested structure through the impedance head.

The model Z602WA impedance head is a cylindrical structure containing a piezoelectric accelerometer and a piezoelectric force gage. The transducer base can be used to measure applied force and structure motion. From these measurements mechanical impedance can be obtained. The high impedance charge signals from the piezoelectric force gage and accelerometer are internally amplified using the Piezofet® low noise charge amplifier. Each amplifier requires a constant current DC supply.

The model Z602WA impedance head has a specimen contact diameter of 0.56 inches preventing excessive stiffening by impedance head attachment. The very low mass below the force gage (20 grams) makes it possible to take measurements on relatively light structures, such as airframes, models and light machinery.

Usable frequency range		25 - 10,000 Hz
Blocked force output[1]		see graph
Maximum continuous current		0.75 amp rms
Nominal electrical impedance		16 Ω
DC electrical resistance		6 Ω
Resonant frequency, blocked		‹ 50 Hz
Connector[2]		BNC
Cable for use with PA8HF amplifier		R1-22-J93-10-P1

Accelerometer nominal values

Voltage sensitivity		100 mV/g (10.2 mV/m/s²)
Frequency response:	±0.5 dB	20 - 6,000 Hz
	±1.0 dB	15 - 10,000 Hz
	±3.0 dB	10 - 20,000 Hz
Power requirements:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Bias output voltage, nominal		8 VDC
Output impedance		‹100 Ω
Electrical noise, equiv g:		
Spectral	10 Hz	15 µg/√Hz
	100 Hz	5 µg/√Hz
	1000 Hz	1 µg/√Hz
Connector[2]		BNC
Output cable		R1-22-J93-10-L1

Force gage nominal values

Voltage sensitivity		100 mV/lb (22.5 mV/n)
Power requirements:	voltage source	18 - 30 VDC
	current regulating diode	2 - 10 mA
Bias output voltage, nominal		12 VDC
Output impedance		‹100 Ω
Electrical noise, equiv lb:		
Spectral	10 Hz	5 µlb/√Hz (22 µN/√Hz)
	100 Hz	2 µlb/√Hz (9 µN/√Hz)
	1000 Hz	1 µlb/√Hz (4 µN/√Hz)
Connector[2]		BNC
Output cable		R1-2-J93-10-L2

Mass below force gage (including stud)	20 grams (0.044 lb)
Effective stiffness	6 x 10^6 lb/in (1 x 10^9 N/m)
Diameter of mounting surface	0.55 inch (1.4 cm)
Mounting stud, stainless steel	10 - 32
Recommended screw down torque	20 in-lb (2 Nm)
Temperature range	0 to 80°C
Base material	anodized aluminum
Weight of parts rigidly attached to structure	0.30 lb (0.14 kg)
Suspended weight	0.53 lb (0.24 kg)
Total weight	0.83 lb

Notes: [1] Blocked force output refers to the output against a mass of infinite mechanical impedance.
[2] Refers to connector at the end of cable.

Accessories supplied: All input and output cables; mounting stud; spanner wrench; calibration data.

Accessories available: Power supplies, signal conditioners, power amplifiers.

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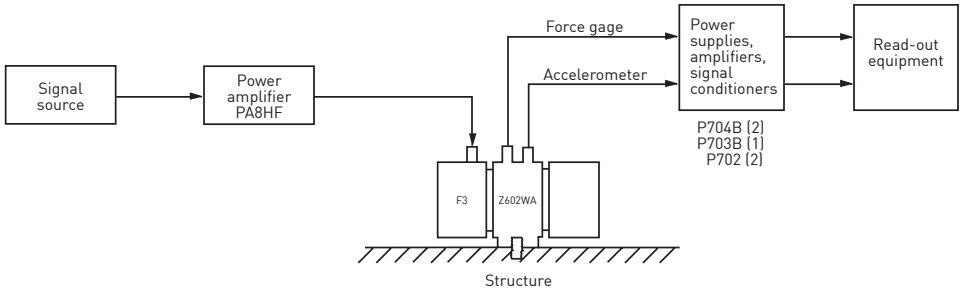
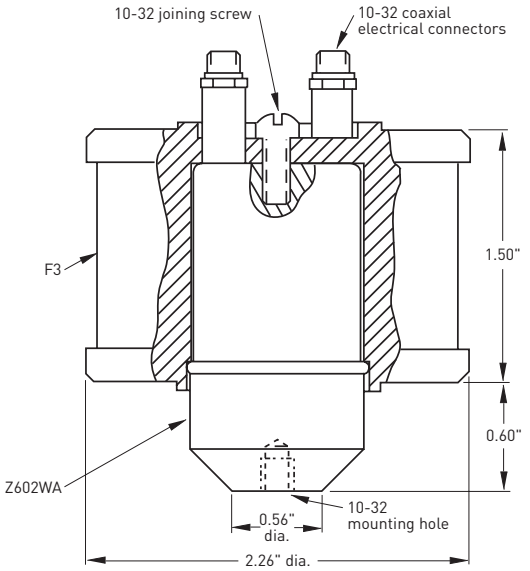
Recommended system diagram





Typical blocked force output
(F3 shaker powered by PA8HF)