

# TEST & MEASUREMENT



# SHAKERS



# Wilcoxon Sensing Technologies shakers



Wilcoxon piezoelectric and electromagnetic shakers are used to provide reliable structural excitation of a test article within a controlled, localized environment. By simulating such dynamic forces and natural frequencies, shakers can be used along with accelerometers and other vibration monitoring devices to reveal cracks, defects, weaknesses or other abnormalities, allowing engineers and test technicians to better predict structural behavior over time.

- » Structural testing
- » Material studies
- » Product testing
- » Quality assurance
- » Research and development
- » Modal testing

## Piezoelectric shakers

- » Compact, lightweight
- » Sonic and ultrasonic structural excitation
- » High frequencies
- » Stud-mounted directly to structures in any position
- » No external support or critical shaft alignment problems

Wilcoxon's piezoelectric reaction shakers utilize the expansion and contraction properties of piezoelectric crystals to generate sonic and ultrasonic structural excitation. These lightweight, portable shakers generate large dynamic forces at very high frequencies, where materials such as semiconductor components and high-strength metals begin to break apart.



Wilcoxon model	F7	F7-1	F4 / F7
<b>Description</b>	Piezoelectric shaker	Piezoelectric shaker	Electromagnetic/piezoelectric dual shaker system
<b>Impedance head</b>	Integral	N/A	Integral
<b>Frequency range</b>	500 - 20,000 Hz	1,000 - 80,000 Hz	F4 = 10 - 7,500 Hz F7 = 500 - 20,000 Hz
<b>Nominal force output</b>	100 lbs (45.36 kg)	10 lbs (4.54 kg)	100 lbs (45.36 kg)
<b>Diameter</b>	2.20 in. (5.59 cm)	2.20 in. (5.59 cm)	5.10 in. (12.95 cm)
<b>Weight</b>	2.5 lbs (1.1 kg)	2.8 lbs (1.3 kg)	8.2 lbs (3.7 kg)
<b>Recommended matching network</b>	N7FS	N8HFS	N7FS

# Electromagnetic shakers and impedance heads

- » Low frequency applications
- » Integral impedance heads measure acceleration and force
- » No matching network required
- » Can be combined with piezoelectric shakers for wider operational bandwidth

Electromagnetic shakers operate on the principle of magnetism. A magnetic field is formed as electrical current runs through a wire. As the wire is wound in a coil, this effect is multiplied and can be manipulated by changing the direction and amplitude of the current. When magnets are fixed on either side of the coiled wire, and alternating electric currents are allowed to flow into the coil, a vibratory motion will develop. This motion is then directed towards the object under test, essentially "shaking" it. Electromagnetic shakers excite

primarily at low frequencies and can be used to measure components such as the first bending mode of airframes or ship hulls. The shaker is available on its own or with an included impedance head.

The impedance head is a transducer consisting of two sensing elements – a force gage and an accelerometer. The force gage references the force acting between the shaker input connection and the test item connection, while the accelerometer senses the acceleration on the shaker face.



Wilcoxon model	F3 / Z602WA	F4 / Z820WA	F10 / Z820WA
<b>Description</b>	Electromagnetic shaker system	Electromagnetic shaker system	Electromagnetic shaker system
<b>Impedance head</b>	Z602WA	Z820WA	Z820WA
<b>Frequency range (Hz)</b>	25 - 10,000 Hz	10 - 7,500 Hz	5 - 2,000 Hz
<b>Nominal force output</b>	1 lb (0.45 kg)	10 lbs (4.54 kg)	20 lbs (9.07 kg)
<b>Diameter</b>	2.26 in. (5.74 cm)	5.10 in. (12.95 cm)	8.25 in. (20.96 cm)
<b>Weight</b>	0.83 lbs (0.38 kg)	6.8 lbs (3.08 kg)	28.0 lbs (12.70 kg)



Model F3



Model F4



Model F10

# Support equipment

## Matching networks

Matching networks provide the interface between power amplifiers and piezoelectric shakers, providing voltage increases to allow the shaker to be driven at its full voltage level. At very high frequencies, lower output voltages are used to better match the reactive load. Additional functions can include channel separation, distortion reduction, and fusing.

Wilcoxon model	N7FS	N8HFS
Output voltage, max	100, 200, 300, 500, 800 V	360 V
Compatible shakers	F7	F7, F7-1
Dimensions, WxHxD (including handles)	19x7x13 in. (48.3x17.8x33.0 cm)	19x7x13 in. (48.3x17.8x33.0 cm)
Weight	37 lbs (16.8 kg)	25 lbs (11.4 kg)
Recommended amplifier	PA8HF	PA8HF

## Power amplifier

The PA8HF is designed to operate with all Wilcoxon piezoelectric and electromagnetic shakers, as well as both the N7FS and N8HFS matching networks, and acts as the direct drive of models F4 and F10.

Wilcoxon model	PA8HF
Max power output	electromagnetic shaker load: 800 watts piezoelectric shaker load: 225 watts
Frequency response (-3 dB)	electromagnetic shaker load: 0.5 - 20,000 Hz piezoelectric shaker load: 500 - 150,000 Hz
Maximum signal	1.75 V rms ( $\pm$ 2.5 V peak)
Signal gain	29 dB
Maximum output	70 V peak
Power requirements (2,000 watts max)	115 VAC (model PA8HF) or 230 VAC (model PA8HF-230)
Dimensions, WxHxD	19x5.75x17.5 in. (48.3x14.6x44.4 cm)

## Contact us

For application support, customer service, or general inquiries, contact Wilcoxon via email at [info@wilcoxon.com](mailto:info@wilcoxon.com), by phone at +1 (301) 330-8811, or through the contact form on our website at [wilcoxon.com/contact-us](http://wilcoxon.com/contact-us).

## Resources

Shaker operating manuals can be found online at [wilcoxon.com/resources/user-manuals](http://wilcoxon.com/resources/user-manuals).

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