Brüel & Kjær

type 4810

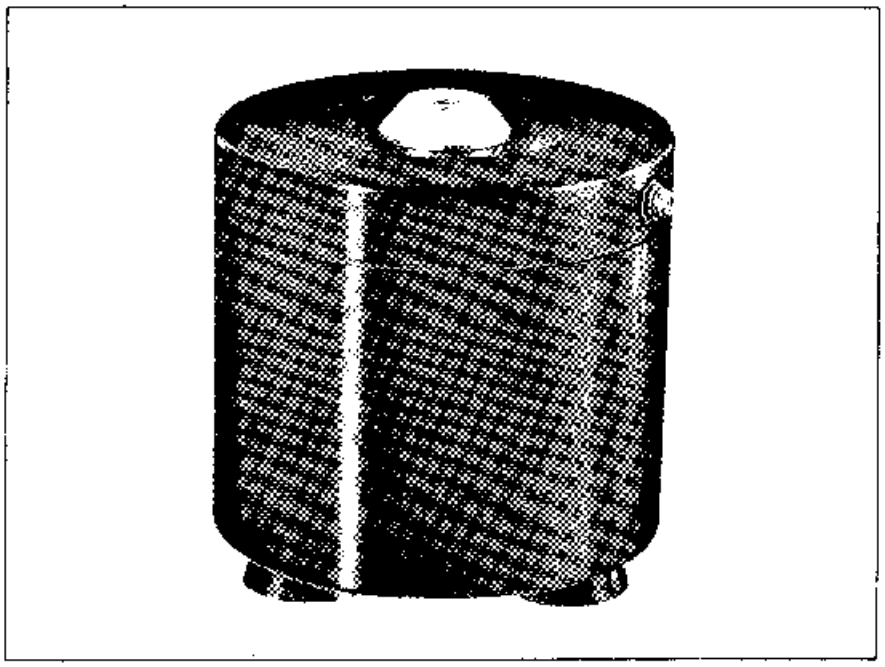
Mini-Shaker

FEATURES:

- Force rating 10 Newton (2,25 lbf) Sine Peak
- Frequency range DC to 18 kHz
- First axial resonance above 18 kHz
- Max. bare table acceleration 550 ms^{-2} (56 g)
- Rugged construction

USES:

- Calibration of accelerometers
- Vibration testing of small objects
- Educational demonstrations
- Mechanical impedance measurements



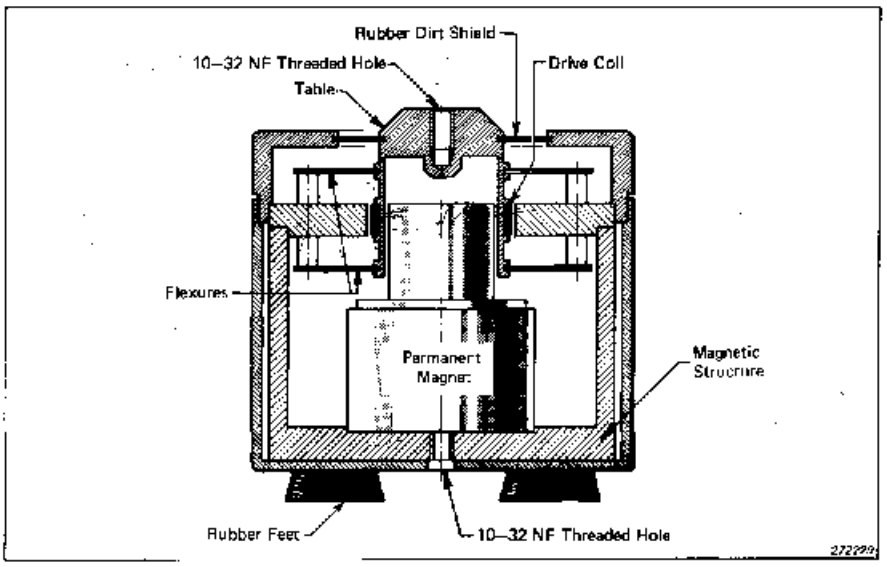


Fig.1. Sectional drawing of the Mini-Shaker Type 4810

The Mini-Shaker Type 4810 is a small machine for the dynamic excitation of lighter objects. It is manufactured from quality materials to a high degree of precision and has proved to be a reliable and versatile tool in dynamic testing.

Type 4810 is well suited as the motive force generator in mechanical impedance measurements where only smaller forces are required.
It can also be used in the calibration of vibration transducers, both to determine their sensitivity by comparison with a standard accelerometer, and to determine their frequency response up to 18 kHz.

The Mini-Shaker is of the electrodynamic type with a permanent field magnet. A coil, which is an integral part of the table structure, is flexibly suspended in one plane in the field of the permanent magnet. An alternating current signal, provided by an external oscillator is passed through the coil to produce a vibratory motion at the table. A sectional drawing illustrating the method of construction is shown in Fig.1.

The suspension system consists of radial flexure springs which restrict the moving element to almost perfectly rectilinear motion. Laminated flexure springs provide a high degree of damping to minimize distortion due to flexure resonances. The frequency response curves

shown in Fig.2 show the highly damped flexure resonance around 50 to 60 Hz.

The object to be vibrated is attached to the table by means of a 10 — 32 NF screw; the thread size commonly used for mounting accelerometers. Performance limits which are defined by the maximum displacement (6 mm), maximum force (10 N or 7 N depending on frequency), and the first axial resonance of the moving element (above 18 kHz), are graphically shown in Fig.3.

Within these limits, the attainable acceleration can be determined by the expression.

$$a = \frac{F}{W}$$

where a = acceleration in ms^{-2} ($1\ ms^{-2} = 0{,}102$ g)
F = shaker rated force in Newtons
W = exciter moving element weight + test object weight in kg

Examples of maximum test object weight for accelerations of 20 g and 5 g are drawn in on the curve.

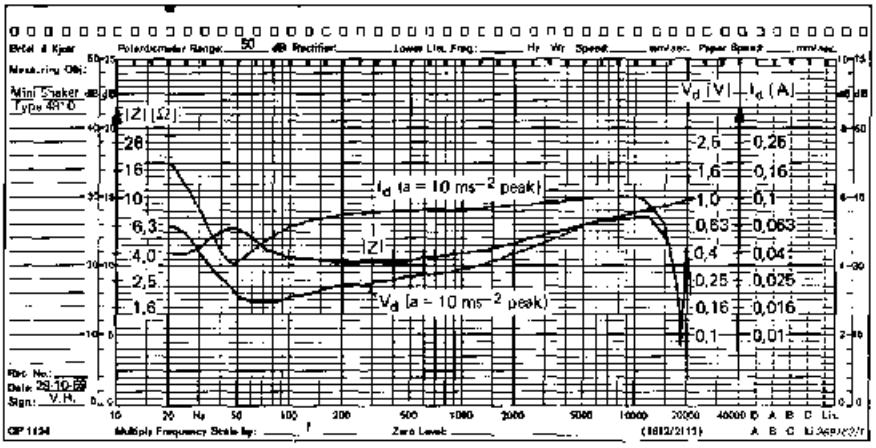


Fig.2. Frequency response of the 4810 for impedance (Z), current (I) and voltage (V)

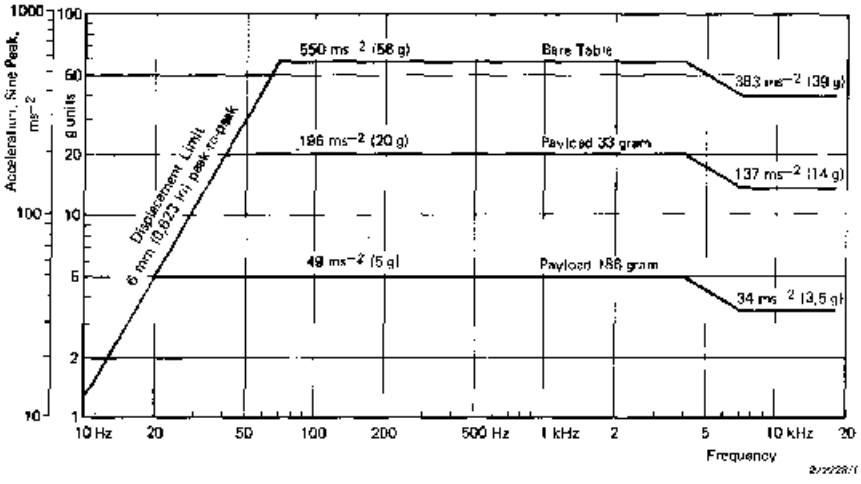


Fig.3. Sine performance curves for the 4810

In order to attain full rated output force from the 4810 it should be driven by Power Amplifier Type 2706. This is a power amplifier specially designed to drive small vibration exciters and has a current limiter to prevent overdriving the 4810. The Mini-Shaker can also be driven at a lower level by Sine Generator Type 1023. This has an output of 7,0 W which will drive the Mini-Shaker to a rated force of approximately 3,9 N (0,9 lbf) peak.

Specifications 4810

Frequency Range:
DC to 18 kHz

First Major Armature Resonance:
Above 18 kHz

Force Rating (Peak):
10 Newton (2,25 lbf), 65 Hz to 4 kHz
7 Newton (1,5 lbf), 65 Hz to 18 kHz

Max. Bare Table Acceleration (Peak):
550 ms^{-2} (56 Hz to 4 kHz)
383 ms^{-2} (4 kHz to 18 kHz)
($1\ ms^{-2} = 0{,}102$ g)

Max. Displacement (Peak-to-Peak):
6 mm (0,236 in)

Dynamic Flexure Stiffness:
2 Newton/mm (11,5 lbs/in)

Dynamic Weight of the Moving System:
18 grams

Magnetic Field:
Permanent magnet

Max. Input Current:
1,8 A. RMS

Coil Impedance:
3,5 Ω at 500 Hz

Connection:
Microsocket NF 10 — 32

Table Size:
14 mm (0,55 in) diameter

Fastening Thread:
NF 10 — 32

Weight:
1,1 kg (2,4 lb)

Dimensions:
Diameter: 76 mm (3 in)
Height: 75 mm (2,9 in)

Accessories Available:
Cable for connection of Mini-Shaker to Power Amplifier AO 0069

Mounting Accessories (includes isolated studs YP 0150 and non-isolated studs YQ 2960) UA 0125