

EVX-180B

18-Inch Low-Frequency Reproducer

- Exceptionally resistant to long-term failure in real-world low-bass applications
- Utilizes findings about failure modes not revealed in normal high-power testing
- 1,000 watts continuous program
- Advanced, HeatWick™ design “wicks” away heat from the voice coil
- Long, 4-inch voice coil has nearly twice the surface area of any other woofer, virtually eliminating power compression
- Ribbed, Kevlar® fiber composite cone resists collapse¹

Description

The EVX-180B low-frequency transducer is designed for professional sound reinforcement or studio monitoring applications that require maximum output with low distortion. The EVX-180B woofer provides unprecedented power capacity, linearity and excursion, made possible by the HeatWick™ total-thermal-engineering design. The proprietary HeatWick design actually “wicks” heat away from the voice coil, significantly increasing power handling and long-term reliability. A special frame extension and elongated pole piece provide a metal surface with close proximity to the entire length of the voice coil, providing a major heat-transfer path. Also, the 100-mm (4-in.) diameter voice coil is longer than conventional medium-efficiency woofers to give additional power handling and virtually eliminate dynamic-range power compression. Additionally, a Flux Demodulation Device (FDD™) reduces distortion in the critical mid band by providing a “short circuit” effect to prevent amplifier-signal modulation of the static magnetic field.

A ribbed, Kevlar® fiber composite cone with an extremely high stiffness-to-weight ratio and exceptional strength gives the EVX-180B increased resistance to cone collapse and deformation, without sacrificing efficiency.¹ A rubber mounting flange gasket provides a reusable seal for front or rear mounting, completely surrounding the frame flange.

Directional Performance

The directional characteristics of the EVX-180B in the TL3512 256-liter (9-ft³) vented enclosure were measured by running a set of polar responses in EV’s large anechoic chamber. The test signal was octave-band-limited pseudo-random pink noise centered at the ISO standard frequencies.

The curves show horizontal (side-to-side) dispersion when the enclosure’s long axis is vertical. The vertical (up-and-down) polar responses deviate only slightly from the horizontal responses due to box geometry. Typical data is provided in Figures 3 and 4, which indicate 6-dB-down beamwidth versus frequency and directivity factor, respectively, for an EVX-180B in the TL3512 enclosure.

Power-Handling Test

To our knowledge, Electro-Voice was the first U.S. manufacturer to develop and publish a power test closely related to real-life conditions. First, we use a random noise input signal because it contains many frequencies simultaneously, just like real voice or instrument program. Second, our signal contains more energy at extremely high and low frequencies than typical actual program, adding an extra measure of reliability. Third, the test signal includes not only the overall “long-term average” or “continuous” level—which our ears interpret as loudness—but also short-duration peaks which are many times higher than the average, just like actual program. The long-term average level stresses the speaker thermally (heat). The instantaneous peaks test mechanical reliability (cone and diaphragm excursion).

Specifically, the EVX-180B is designed to withstand the power test described in EIA Standard RS-426A. The EIA test spectrum is applied for eight hours. To obtain the spectrum, the output of a white-noise generator (white noise is a particular type of random

1. Kevlar® is a registered trademarks of DuPont.

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crest factor. This procedure provides a rigorous test of both thermal and mechanical failure modes.

The EVX-180B has also been power tested with a two-hour sine wave at minimum impedance so that competitive comparisons can be made using consistent methods. Continuous program power is defined as 3 dB above (double) the continuous sine-wave power rating.

Recommended Enclosures

The most extended bass, lowest distortion and best control is usually realized in properly designed vented enclosures. In such designs, the vent, or port, actually provides the lowest octave of output. The vent is driven to full acoustic output by a relatively small motion of the speaker cone itself, acting through the air contained within the enclosure. The excursion of the EVX-180B at these frequencies is much reduced compared to sealed or open-back enclosures, directly reducing harmonic distortion and the possibility of speaker “bottoming.” Several specific vented-enclosure recommendations are shown on the following pages. Alternate tunings are given so that designers can tailor the low-frequency response to their specific needs. Figure 5 shows the maximum long-term SPL versus frequency. The maximum output is limited by either: (1) the long-term thermal power-handling capacity or (2) the speaker’s maximum cone-excursion capability, whichever occurs first. Also provided are recommended enclosures for multiple driver configurations.

Step-Down Operation

For extra-low bass use, the vent area can be reduced by one-half, thereby tuning the enclosure to the “step-down” mode. In step-down, the tuning frequency is reduced by half an octave (a factor of 0.7). The resulting alignment is then equalized for flat response. This procedure results in one-half-octave lower bass.

Architects’ and Engineers’ Specifications

The low-frequency transducer shall have a nominal diameter of 460 mm (18 in.), over-

all depth not greater than 198 mm (7.92 in.), and weigh no more than 11 kg (25 lb). The frame shall be made of die-cast aluminum to resist deformation. The magnetic assembly shall have an extended pole piece to reduce inductive variances with excursion, and provide a symmetrical magnetic field at the voice-coil gap. Two aluminum rings shall encircle the pole piece above and below the magnetic gap, and shall have internal diameters concentric with the internal diameter of the steel top plate. The upper ring shall be part of the loudspeaker frame. Both rings act to reduce flux modulation and provide a heat-transfer path from the outer diameter of the voice coil.

The voice coil shall be 100 mm (4 in.) in diameter and 20 mm (0.8 in.) in winding length, and shall be made of edge-wound aluminum ribbon. When centered in the magnetic gap, the voice coil shall produce a force of not less than 21.9 newtons (tesla-ampere-meters) with a dc current of 1 ampere. Performance specifications of a typical production unit shall be as follows: measured sensitivity (SPL at 1 m (3.3 ft) with 1-watt input, 100- to 800-Hz pink noise) shall be at least 96 dB. The half-space reference efficiency shall be at least 3.0%. The usable frequency response shall be 20 Hz to 2,000 Hz, and the nominal impedance shall be 8 ohms. The rated power for the loudspeaker shall be 1,000 watts continuous program power. The low-frequency transducer shall be the Electro-Voice EVX-180B.

AES Specifications

EVX-180B specifications are in accordance with the “AES Recommended Practice for Specification of Components Used in Professional Audio and Sound Reinforcement” (AES2-1984; ANSI S4.26-1984).

Mounting

The EVX-180B may be front or rear mounted against either surface of the mounting flange and requires a 422-mm (16.6-in.) diameter cutout and a 441-mm (17.38-in.) bolt circle. Normal fasteners up to 6 mm (¼ in.) will fit through the eight holes in the frame. Front mounting is simplest using the optional SMH-1 speaker mounting hardware.

Electrical Connections

The EVX-180B is fitted with a pair of chrome-plated, frame-mounted connectors with color-coded ends. Electrical connection is made by pushing down, inserting wire completely through the rectangular slot and releasing pressure. One conductor of #9 AWG stranded, #8 AWG solid, a pair of twisted #15 AWG stranded or a pair of #14 AWG solid conductors will fit. A positive electrical signal applied to the red (+) terminal will displace the cone away from the magnet, thus producing a positive acoustic pressure.

Multiple-Driver Applications

When used in arrays and multiple-driver bass boxes, the system Thiele-Small parameters can be synthesized as follows. This data should be used for multiple-driver configurations.

Two Drivers:

- f_s : 28.1 Hz
- Q_{ts} : 0.275
- V_{as} : 835 liters (29.5 ft³)

Four Drivers:

- f_s : 26.9 Hz
- Q_{ts} : 0.286
- V_{as} : 1,671 liters (59.0 ft³)

Designers will find the following equation useful in tuning their enclosures:

$$L_v = \frac{S_v}{3.7 \times 10^{-4} V_B f_B^2} - K r$$

Where:

- L_v = Length of vent in inches or thickness of baffle for hole in baffle
- S_v = Area of vent in square inches
- V_B = Volume of box in cubic feet
- f_B = Box tuning in Hz
- r = Radius of vent
- K = 1.7 for a hole in baffle, 1.5 for a tube in inches

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Limited warranty

Electro-Voice products are guaranteed against malfunction due to defects in materials or workmanship for a specified period, as noted in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual, beginning with the date of original purchase. If such malfunction occurs during the specified period, the product will be repaired or replaced (at our option) without charge. The product will be returned to the customer prepaid.

Exclusions and Limitations: The Limited Warranty does not apply to: (a) exterior finish or appearance; (b) certain specific items described in the individual product-line statement(s) below, or in the individual product data sheet or owner's manual; (c) malfunction resulting from use or operation of the product other than as specified in the product data sheet or owner's manual; (d) malfunction resulting from misuse or abuse of the product; or (e) malfunction occurring at any time after repairs have been made to

the product by anyone other than Electro-Voice or any of its authorized service representatives. **Obtaining Warranty Service:** To obtain warranty service, a customer must deliver the product, prepaid, to Electro-Voice or any of its authorized service representatives together with proof of purchase of the product in the form of a bill of sale or receipted invoice. A list of authorized service representatives is available from Electro-Voice at 600 Cecil Street, Buchanan, MI 49107 (616/695-6831). **Incidental and Consequential Damages Excluded:** Product repair or replacement and return to the customer are the only remedies provided to the customer. Electro-Voice shall not be liable for any incidental or consequential damages including, without limitation, injury to persons or property or loss of use. Some states do not allow the exclusion or limitation of incidental or consequential damages so the above limitation or exclusion may not apply to you. **Other Rights:** This warranty gives you specific legal rights, and you may also have other rights which vary from state

to state.

Electro-Voice Speakers and Speaker Systems are guaranteed against malfunction due to defects in materials or workmanship for a period of five (5) years from the date of original purchase. The Limited Warranty does not apply to burned voice coils or malfunctions such as cone and/or coil damage resulting from improperly designed enclosures. Electro-Voice active electronics associated with the speaker systems are guaranteed for three (3) years from the date of original purchase. Additional details are included in the Uniform Limited Warranty statement.

Service and repair address for this product: Electro-Voice, Inc., 600 Cecil Street, Buchanan, Michigan 49107.

Specifications subject to change without notice.

Figure 1—Axial Frequency Response, 1 Watt/1 Meter, 10-Cubic-Foot Enclosure

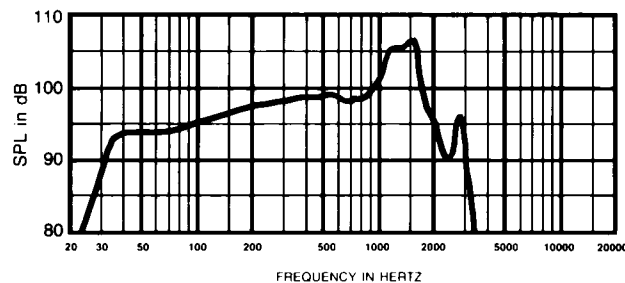


Figure 2A—EVX-180B Single-Driver Low-Frequency Performance in 170-Liter (6-ft³) Enclosure

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Figure 2B—EVX-180B Single-Driver Low-Frequency Performance in 227-Liter (8-ft³) Enclosure

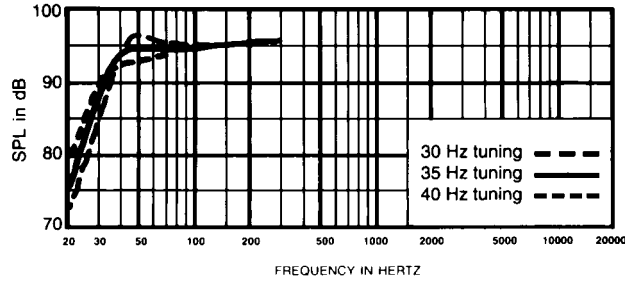


Figure 2C—EVX-180B Single-Driver Low-Frequency Performance in 283-Liter (10-ft³) Enclosure

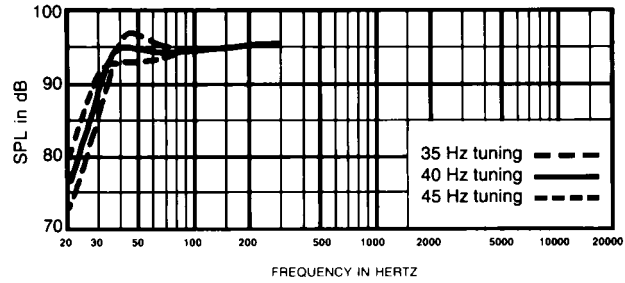


Figure 2D—EVX-180B Multiple-Driver Low-Frequency Performance, Two Drivers in a 566-Liter (20-ft³) Box or Two 283-Liter (10-ft³) Boxes in Close Proximity Tuned to 30 Hz

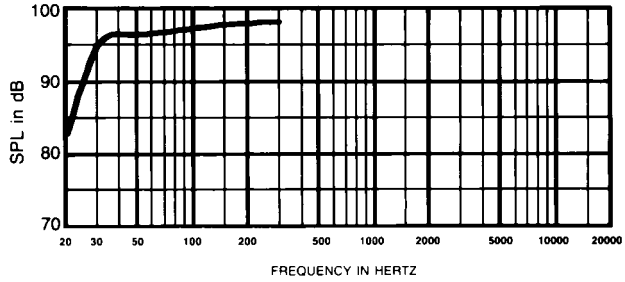
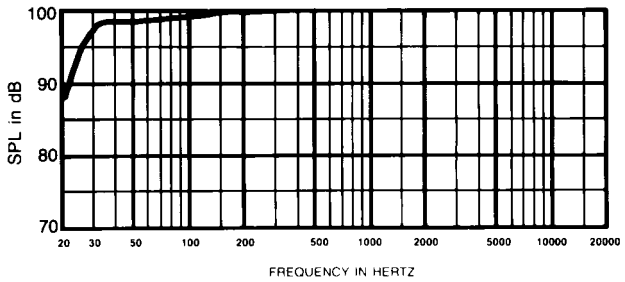


Figure 2E—EVX-180B Multiple-Driver Low-Frequency Performance, Four Drivers in a 1,132-Liter (40-ft³) Box or Four 566-Liter (20-ft³) Boxes in Close Proximity Tuned to 28 Hz



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Figure 3—Beamwidth vs. Frequency
EVX-180B (TL3512) in a 255-Liter
(9.0-ft³) Enclosure

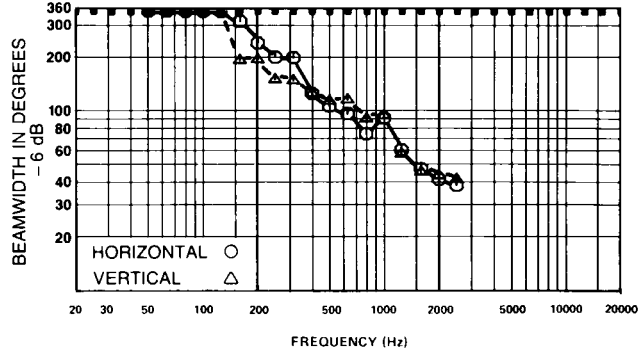
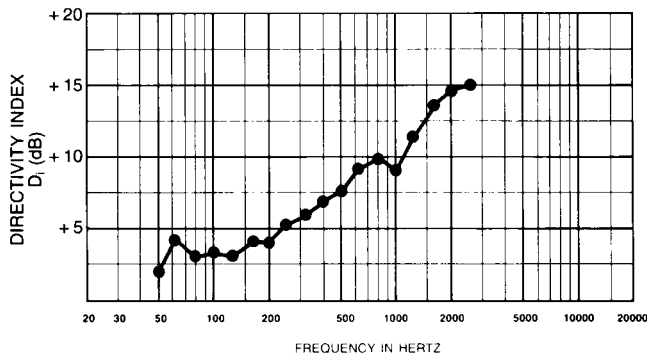


Figure 4—Directivity Index vs. Frequency



**Figure 5—Theoretical Low-Frequency Maximum SPL vs. Frequency, 227-Liter
(8-ft³) Enclosure Tuned to 35 Hz**

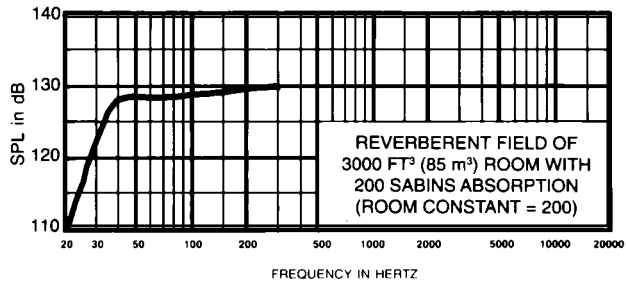
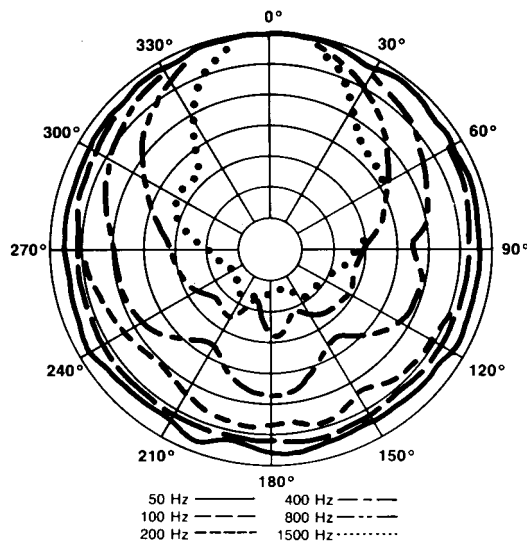


Figure 6—Polar Response



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Figure 7—Distortion Response, 6 Watts

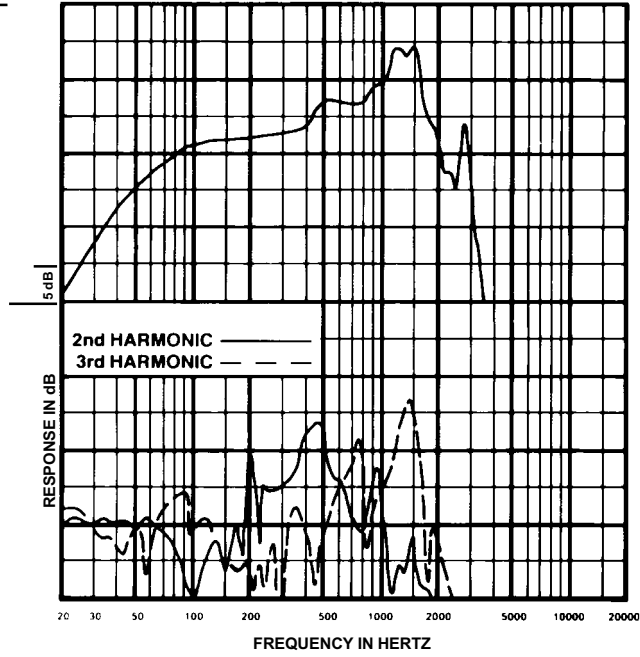


Figure 8—Distortion Response, 60 Watts

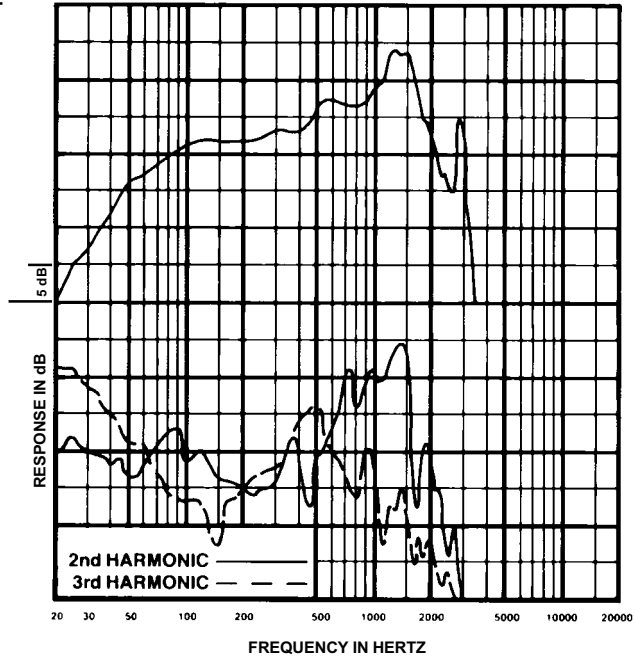
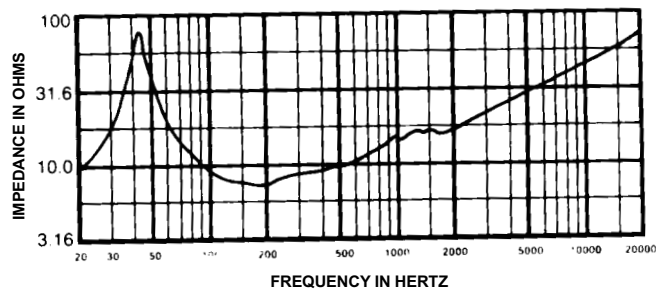
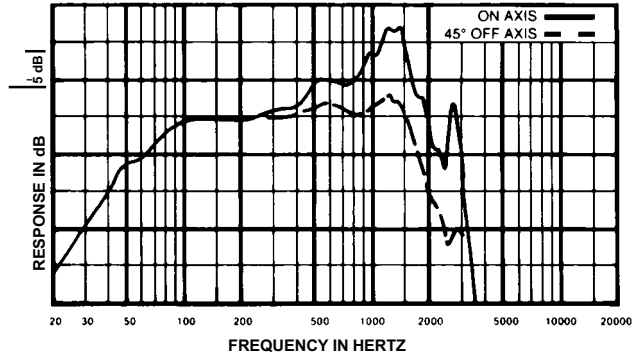


Figure 9—Response in Standard Baffle



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Figure 10—Impedance Response
(EVX-180B)



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Specifications

Power Handling (see Power-Handling Test section):

1,000 watts continuous program

Voice-Coil Diameter:

102 mm (4.0 in.)

Sensitivity (SPL at 1 W/1 m), 100-800-Hz average):

98 dB

Impedance,

Nominal:

8 ohms

Minimum:

7 ohms

Frequency Response (see Figure 1, 2 and 10):

20-2,000 Hz

Highest Recommended Crossover:

500 Hz

Magnet Assembly Weight:

8.3 kg (18.3 lb)

Physical Constants,

Effective Piston Diameter:

394 mm (15.5 in.)

Total Moving Mass:

0.127 kg (0.280 lb)

Voice-Coil Winding Depth:

20.3 mm (0.80 in.)

Top-Plate Thickness at Voice Coil:

8.9 mm (0.35 in.)

BL Factor:

21.9 tesla-meters

Thiele-Small Parameters,

f_s : 29 Hz

V_{AS} : 416 liters (14.7 ft³)

Q_{ES} : 0.285

Q_{MS} : 4.00

Q_{TS} : 0.266

R_E : 5.0 ohms

η_0 : 3.42%

S_D : 0.122 m² (189 in.²)

M_{MD} : 0.127 kg (0.280 lb)

L_E :

C_{MS} : 0.200 mm/N

R_{MS} : 6.86 mechanical ohms

$P_{E(max)}$: 600 watts

x_{max}^1 : 6.4 mm (0.25 in.)

X_{lim}^2 : 25 mm (0.98 in.)

Thermal Rise after Power Test:

82° C (147° F)

Typical Vented Enclosures (see Recommended Enclosures section):

170-283 liters (6-10 ft³) tuned from

28 Hz to 45 Hz

Electrical Connections (see Electrical Connections section),

Connector Type:

Push terminals for bare wires

Polarity:

A positive voltage applied to the positive (red) terminal produces a positive pressure at the front of the cone

Additional Descriptive Information,

Magnet Weight:

2.2 kg (4.9 lb)

Magnet Material:

Barium ferrite

Frame:

Cast aluminum

Frame finish:

Voice-Coil Material:

Aluminum

Voice-Coil Insulation:

Polyimide, 220° C (428° F) rating

Voice-Coil Form:

Polyimide

Plating of Steel Parts:

E-coat (XXX???)

Dimensions,

Outer Diameter:

460 mm (18.2 in.)

Depth:

200 mm (7.92 in.)

Bolt-Hole Diameter:

7.1 mm (0.281 in.)

Net Weight:

11.3 kg (25 lb)

Shipping Weight:

14.1 kg (31 lb)

1. X_{max}^1 is the one-way peak excursion that produces 10% distortion of the current waveform when driven at f_s .

2. X_{lim}^2 , or displacement limit, is the one-way peak excursion which, when exceeded, will cause physical damage to the drive mechanism.

Electro-Voice®

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