M-Force

Moving Magnet Linear Motor Transducer for low frequency applications

M-Force is an innovative and unique transducer based on a patented moving magnet linear motor structure.

Unbelievable performance in terms of power handling, electromagnetic conversion, reliability and maximum SPL are a few of the incredible innovative features and improvements with respect to conventional moving coil arrangement.

The **M-Force** motor is the result of years of FEM magnetic and mechanical simulations, careful integration of the latest magnetic materials, digital signal processing, acoustic design and power electronic conversion.

Robust and reliable, its performance withstand years of abuse and operation: **M-Force** is a true paradigm shift from the old and fashionable coil and cone.

Powersoft's DPC – Differential Pressure Control –, as a powerful tool to create a full boundary condition acoustic processing, has to be considered as a complimentary active control and performance enhancing method.



- Very high power and energy efficient Subwoofer
- Low distortion high SPL applications
- Steerable low frequency arrays
- Low frequency noise and standing waves active removal systems
- Dipole low frequency acoustic generation
- Moving floors
- Acoustical stress testing devices
- Mechanical to electrical conversion applications
- Vibrational energy harvesting
- Structural active damping control

M-Force is available in two models:

- **M-Force 01** for extremely low frequency applications:
  - $(Bl)^2/Re = 2215\ (T{\cdot}m)^2/\Omega$
  - Maximum acceleration 3800 m/s^2
- **M-Force 02** for low frequency applications:
  - $(Bl)^2/Re = 3000\ (T{\cdot}m)^2/\Omega$
  - Maximum acceleration 4800 m/s^2

- Extremely low distortion levels
  - ✓ Zero Power Compression.
  - ✓ Very easy to match with different radiating surfaces / shapes.
- Very easy to combine in large arrays to create "wall diaphragms"
  - ✓ Dual diaphragm / Push-Pull capability (for multi-resonator acoustical loads / multi-horn load).
  - ✓ Different transducer to cabinet combination concept.
- Extremely reliable and efficient
  - ✓ No service needed for years of abuse.
  - ✓ Age - Usage independent magnetic compliance.
  - ✓ Extremely insensitive to forces acting outside displacement axis (rocking).
  - ✓ Unique performances in terms of reliability.
  - ✓ Extreme performance in terms of overall efficiency.
- Extremely High SPL performances
  - ✓ More than 3 times output SPL capability for the same driver weight with respect to any other conventional design.
- Robust
  - ✓ No moving conductors in the active part of the transducer.
  - ✓ No electrical connection with moving parts and stationary parts
  - ✓ Premium Motor Strength
  - ✓ Outstanding acceleration performances
- Environmental Friendly
  - ✓ 1/20 of Neodymium usage for the same SPL in comparison to conventional design.

Data are subject to change without notice
© 2014 Powersoft | All right reserved
powersoft_MForce_brochure_en_v3.0
DO000183.00

M-Force 01

Mechanical / Electrical / Thermal parameters	
Type	Push-Pull Moving Magnet Linear Motor
Nominal Size (H x W x L)	280 mm x 266 mm x 126 mm 11 in x 10.5 in x 5 in
Linear Displacement	±15 mm / ±0.6 in
Max Displacement	±25 mm / ±1 in
Peak displacement	±37 mm / ±1.45 in
Peak Force Output	4000 N
Weight	21.5 kg
Peak Current Handling	170 A
Peak Voltage Handling	400 V
Power Handling	5 kW / AES
Peak Power Handling	25 kW
Thermal Resistance (pink noise)	0.06 °C/W
Thermal Capacity	11100 J / °C

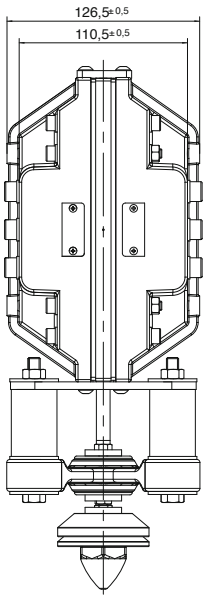
Electromechanical Parameters Motor only – no diaphragm	
Re	0.260 Ω
Motor moving mass	0.950 kg
Bl	24.0 T·m
Le @ 1 kHz	0.00430 H
L1 (LR-2 model)	0.00430 H
L2 (LR-2 model)	0.00190 H
R2 (LR-2 model)	1.10 Ω
Mechanical resonance	19.5 Hz
Mechanical spring	0.00007 m/N
Mechanical loss	23 N·s/m
Motor strength $(Bl)^2/Re$	2215 $(T·m)^2/Ω$
Maximum acceleration	3800 m/s^2

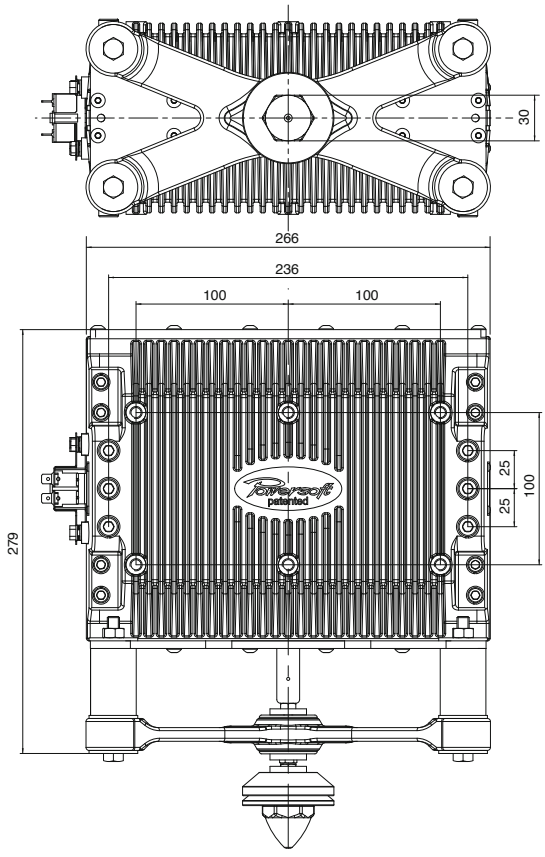
M-Force 02

Mechanical / Electrical / Thermal parameters	
Type	Push-Pull Moving Magnet Linear Motor
Nominal Size (H x W x L)	280 mm x 266 mm x 126 mm 11 in x 10.5 in x 5 in
Linear Displacement	±10 mm / ±0.4 in
Max Displacement	±20 mm / ±0.8 in
Peak displacement	±37 mm / ±1.45 in
Peak Force Output	4000 N
Weight	21.5 kg
Peak Current Handling	170 A
Peak Voltage Handling	400 V
Power Handling	5 kW / AES
Peak Power Handling	25 kW
Thermal Resistance (pink noise)	0.06 °C/W
Thermal Capacity	11100 J / °C

Electromechanical Parameters Motor only – no diaphragm	
Re	0.192 Ω
Motor moving mass	0.950 kg
Bl	24.0 T·m
Le @ 1 kHz	0.00312 H
L1 (LR-2 model)	0.00312 H
L2 (LR-2 model)	0.00142 H
R2 (LR-2 model)	1.05 Ω
Mechanical resonance	19.5 Hz
Mechanical spring	0.00007 m/N
Mechanical loss	23 N·s/m
Motor strength $(Bl)^2/Re$	3000 $(T·m)^2/Ω$
Maximum acceleration	4800 m/s^2







M-Force 01 + Diaphragms

30”/ 4 mm HWU diaphragm STRAIGHT/REVERSED/ SHORT	
Qes	0.2115
Qms	8.3671
Qts	0.2063
Fs	32.02 Hz
Vas	0.17 m^3
Re	0.26 Ω
Mms	2.329 kg
Bl	24.0 T·m
Le @ 1 kHz	0.00430 H
L1 (LR-2 model)	0.00430 H
L2 (LR-2 model)	0.00190 H
R2 (LR-2 model)	1.1 Ω
Cms	0.0000106 m/N
Rms	56 N·s/m
Sd	0.342 m^2
Vd max	0.00855 m^3
Ref. Efficiency	2.60 %
EBP	151

Bandwidth: 20 Hz - 120 Hz
- Bandpass enclosure
- Horn loaded

30”/ 3 mm HWU diaphragm STRAIGHT	
Qes	0.1708
Qms	7.2672
Qts	0.1668
Fs	30.04 Hz
Vas	0.23 m^3
Re	0.26 Ω
Mms	2.004 kg
Bl	24.0 T·m
Le @ 1 kHz	0.00430 H
L1 (LR-2 model)	0.00430 H
L2 (LR-2 model)	0.00190 H
R2 (LR-2 model)	1.1 Ω
Cms	0.0000140 m/N
Rms	52 N·s/m
Sd	0.342 m^2
Vd max	0.00855 m^3
Ref. Efficiency	3.51 %
EBP	176

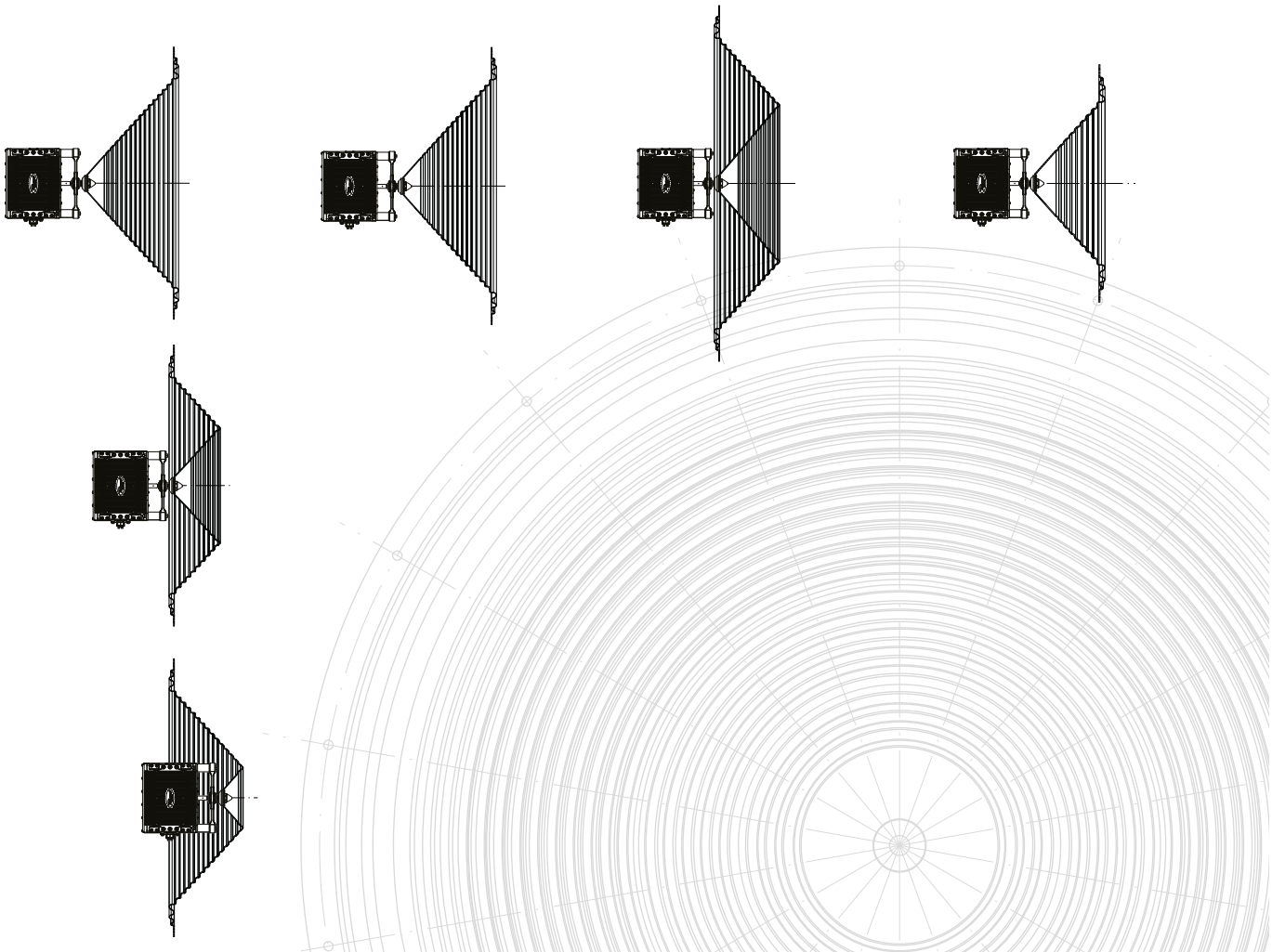
Bandwidth: 20 Hz - 120 Hz
- Bandpass enclosure
- Horn loaded

40”/ 4 mm HWU diaphragm REVERSED	
Qes	0.2530
Qms	10.0078
Qts	0.2467
Fs	26.77 Hz
Vas	0.50 m^3
Re	0.26 Ω
Mms	3.332 kg
Bl	24.0 T·m
Le @ 1 kHz	0.00430 H
L1 (LR-2 model)	0.00430 H
L2 (LR-2 model)	0.00190 H
R2 (LR-2 model)	1.1 Ω
Cms	0.0000106 m/N
Rms	56 N·s/m
Sd	0.581 m^2
Vd max	0.014525 m^3
Ref. Efficiency	3.67 %
EBP	106

Bandwidth: 16 Hz - 80 Hz
- Direct radiation

22”/ 3 mm HWU diaphragm STRAIGHT	
Qes	0.1223
Qms	6.0210
Qts	0.1199
Fs	29.74 Hz
Vas	0.08 m^3
Re	0.26 Ω
Mms	1.45 kg
Bl	24.0 T·m
Le @ 1 kHz	0.00430 H
L1 (LR-2 model)	0.00430 H
L2 (LR-2 model)	0.00190 H
R2 (LR-2 model)	1.1 Ω
Cms	0.0000198 m/N
Rms	45 N·s/m
Sd	0.166 m^2
Vd max	0.00415 m^3
Ref. Efficiency	1.58 %
EBP	243

Bandwidth: 20 Hz - 160 Hz
- Bandpass enclosure
- Horn loaded
- Direct radiation



M-Force 02 + Diaphragms

30”/ 4 mm HWU diaphragm STRAIGHT/REVERSED/ SHORT	
Qes	0,1562
Qms	8,3671
Qts	0,1533
Fs	32,02 Hz
Vas	0,17 m^3
Re	0,192 Ω
Mms	2,329 kg
Bl	24,0 T·m
Le @ 1 kHz	0,00312 H
L1 (LR-2 model)	0,00312 H
L2 (LR-2 model)	0,00142 H
R2 (LR-2 model)	1,05 Ω
Cms	0,0000106 m/N
Rms	56 N·s/m
Sd	0,342 m^2
Vd max	0,00855 m^3
Ref. Efficiency	3,52 %
EBP	205

Bandwidth: 20 Hz - 150 Hz
- Bandpass enclosure
- Horn loaded

30”/ 3 mm HWU diaphragm STRAIGHT	
Qes	0.1261
Qms	7.2748
Qts	0.1239
Fs	30.04 Hz
Vas	0.23 m^3
Re	0.192 Ω
Mms	2.004 kg
Bl	24.0 T·m
Le @ 1 kHz	0.00312 H
L1 (LR-2 model)	0.00312 H
L2 (LR-2 model)	0.00142 H
R2 (LR-2 model)	1.05 Ω
Cms	0.0000140 m/N
Rms	52 N·s/m
Sd	0.342 m^2
Vd max	0.00684 m^3
Ref. Efficiency	4.76 %
EBP	238

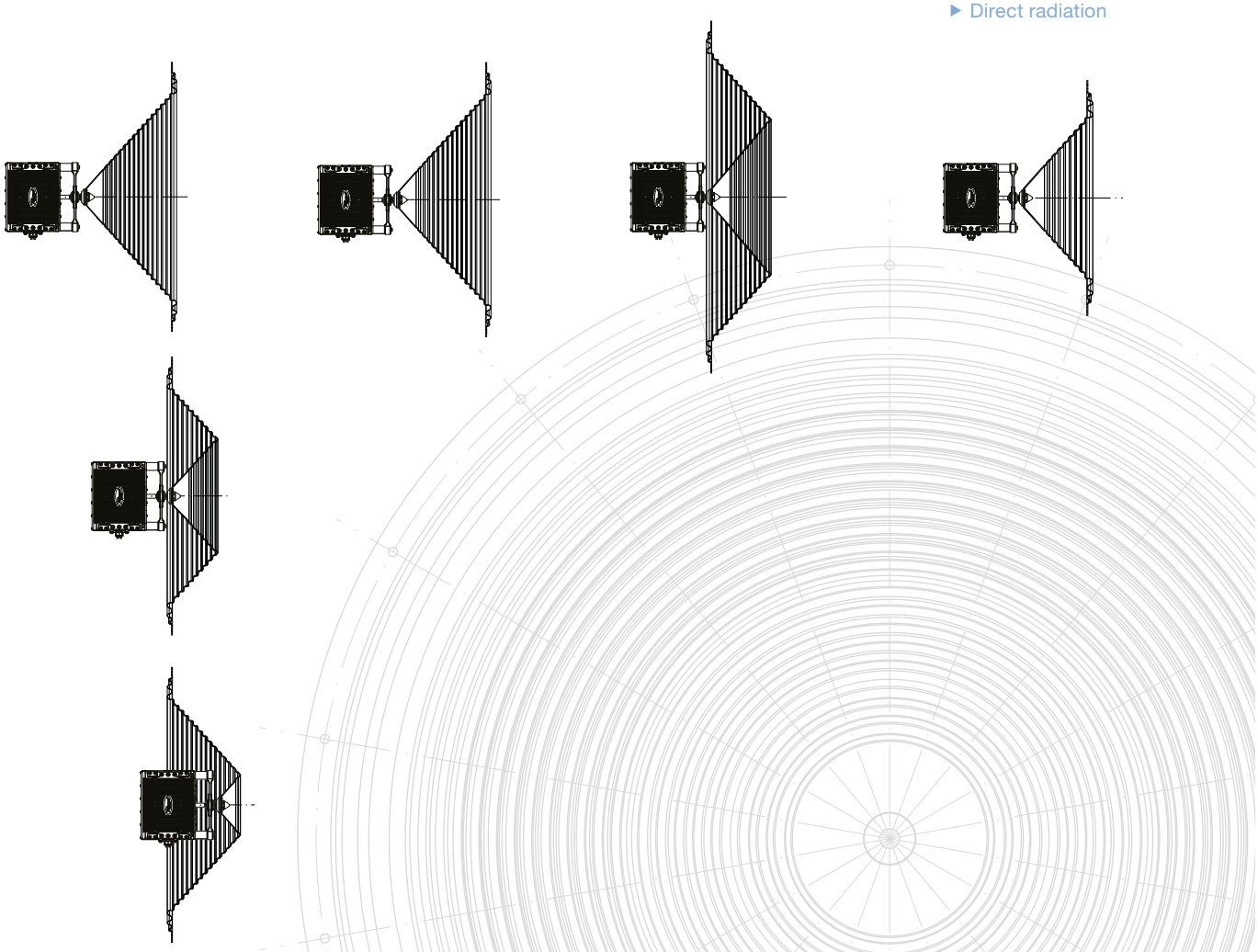
Bandwidth: 20 Hz - 150 Hz
- Bandpass enclosure
- Horn loaded

40”/ 4 mm HWU diaphragm REVERSED	
Qes	0,1868
Qms	10,0078
Qts	0,1834
Fs	26,77 Hz
Vas	0,50 m^3
Re	0,192 Ω
Mms	3,332 kg
Bl	24,0 T·m
Le @ 1 kHz	0,00312 H
L1 (LR-2 model)	0,00312 H
L2 (LR-2 model)	0,00142 H
R2 (LR-2 model)	1,05 Ω
Cms	0,0000106 m/N
Rms	56 N·s/m
Sd	0,581 m^2
Vd max	0,014525 m^3
Ref. Efficiency	4,97 %
EBP	143

Bandwidth: 16 Hz - 100 Hz
- Direct radiation

22”/ 3 mm HWU diaphragm STRAIGHT	
Qes	0,0903
Qms	6,0210
Qts	0,0890
Fs	29,74 Hz
Vas	0,08 m^3
Re	0,192 Ω
Mms	1,45 kg
Bl	24,0 T·m
Le @ 1 kHz	0,00312 H
L1 (LR-2 model)	0,00312 H
L2 (LR-2 model)	0,00142 H
R2 (LR-2 model)	1,05 Ω
Cms	0,0000198 m/N
Rms	45 N·s/m
Sd	0,166 m^2
Vd max	0,00415 m^3
Ref. Efficiency	2,14 %
EBP	329

Bandwidth: 20 Hz - 180 Hz
- Bandpass enclosure
- Horn loaded
- Direct radiation



Powersoft S.p.A.
Via Enrico Conti, 5 - 50018 Scandicci (FI) Italy
Tel: +39 055 735 0230 - Fax: +39 055 735 6235
www.powersoft-audio.com