



THE **EAGLE** HAS LANDED!



WHITE PAPER

A new approach to electrostatic speakers in a lifestyle appearance!

Electrostatic Speakers

a lifestyle appearance

Electrostatic speakers are known for their clarity and transparency, as well for the very low distortion of the medium and high tones. The low distortion is a result of the very low mass of the moving diaphragm.

Disadvantages from the past

Besides the very high sound quality, traditional electrostatic speakers had also a number of principle disadvantages such as a very low impedance as soon as the frequency goes above 1000hz dropping often to below 1 Ohm at 20000hz (requires expensive and powerful amplifiers).

Another known disadvantage for traditional electrostatic speakers is the beamy pattern (laser beam like) of the sound distribution. Because of the very principle of the sound reproduction, electrostatic speakers need very large surfaces to reproduce bass tones.

Solutions

PIOSound has overcome those disadvantages by building up its product line in different solutions such as the Eagle line (larger and full range electrostatic speakers) and the Falcon line as Hybrid solutions for the smaller electrostatic speakers.

The PIOSound flat panel loudspeakers make use of the complex electrostatic technology. An electrostatic loudspeaker produces sound by allowing a thin flexible diaphragm to move between two fixed plates (stators). The unmatched sound quality of the PIOSound Eagle electrostatic speakers has been achieved because of the application of the PIOSound patent pending, Electrostatic Elements (ESE) technology with ADS (Active Diaphragm System) with dynamic damping and nano-fiber technology for the diaphragm. With the PIOSound ADS technology the converted audio signal is fed to the diaphragm or membrane through a proprietary electrical module which

uses a new and innovative transformer technology while a high voltage + and – DC signal is applied on the stator plates. This creates the electrostatic field and as a result of the audio signal which runs through the conductive layer of the membrane, the membrane starts to move following the music signal. Because of the ultra low mass of the moving diaphragm the sound waves will follow the music signal much faster and more accurate than other competing loudspeakers. In particular the patent pending PIOSound technology for damping the harmonic distortion and own resonance results in a purer and more natural sounding speaker.

The build up of the PIOSound ESE with multiple diaphragm segments and separate high tones and low tones segments, creates a broad distribution of the sound waves resulting in an optimum spatial effect.

PIOSound has also solved the issue of harmonic distortions and diaphragm resonances in a fundamental way by applying a new technology which optimally dampens and practically eliminates the resonances. The harmonic distortion is reduced to extremely low levels which is especially noticeable when being played at high sound levels, the sound of the electrostatic speaker retains its exceptional clarity and transparency.

Harmonic distortion finds its cause in the electrical as well as in the mechanical components. Transformers also cause the electrical resonance and distortions. Therefore, the latter are developed under our direct supervision and are constructed using first class materials. These transformers are optimized for the frequencies of the panel they drive. All transformers produced are rigorously tested by PIOSound's own developed test equipment before they are allowed to be used in our products.

Resonances originated from the mechanical construction and components are an other cause for harmonic distortions. As we are using aluminium extrusion for the frame as well as stainless steel for other mechanical components, we have a very stable and rigid mechanical construction. The electrostatic element consisting of the stator plates with the diaphragm and the spacers are build in a sandwich construction, are vibration free suspended in the aluminium frame, with a specially developed rubber u-profile between the ESE and the aluminium frame. As such the only source for harmonic distortion finds its cause in the own resonances of the various segments of the diaphragm. In order to substantially reduce the harmonic distortions caused by the ESE (electrostatic elements). PIOSound has applied a special fabric at the back side of the stator plates that substantially reduces the harmonic distortion in a patent pending construction for the electrostatic element. The combination of this, with the newly applied diaphragm technology, results in a pure and transparent sound reproduction which uniquely distinguishes itself from competing systems.

The additional benefit of this new technology not only substantially reduces the harmonic distortion over the whole frequency range but also keeps the distortion low even at high load.

Another technology breakthrough is the application of carbon nanofiber for the conductive layer of the diaphragm.

The benefit of the application of carbon nanofiber is a more stable conductive layer as it can be printed in a more homogeneous and thinner layer, resulting in less added mass with a better sound reproduction. The nanofibers are about ten thousand times smaller than a human hair and applied as a very fine and dense pattern. This results in an extremely flexible layer which is very stable and durable.

Another important benefit of the application of the patent pending technology to strongly reduce the harmonic distortion, is the elimination of the phase shifts between the left and the right speaker which is essential for **3D sound reproduction**.

The Eagle series

The Eagle series consists of a separate high tone ESE and a separate low tone ESE with several segments. This enables us to optimize the ESE for its acoustical performance for both high and low tones independently.

The sizes and quantity of the segments for the low tones ESE are optimized for as well the lowest frequencies to maximize the acoustical output level. For the high tones a different construction is chosen, with as design goal a wide dispersion of sound and optimal acoustical output. For both panels low distortion and resonance free design were mutual optimization parameters.

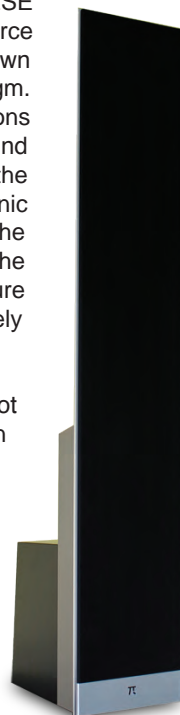
Because of the mechanical and galvanic separation of the high tones and the low tones, as well as the optimized geometrical dimensions and segments, the Eagle series are perfectly designed to have a broad sound stage with a perfect and smooth transition from the low tones to the high tones. This optimizes the tone balance keeping the benefits par excellence of the electrostatic technology in place such as clarity and transparency without the limitations from traditional electrostatic transducers.

Because of the separate high tones and low tones ESE the Eagle series allows for a far better low tone reproduction than competitive solutions.

The separation of high and low tones asks for a separate driving electronic module optimized for each panel.

So actually two driving modules are used with separate transformers for the high tones and low tones with separate high voltage and processor modules. The transformers for both panels are optimized for their specific frequency range and performance. This separation enabled us to design completely different transformers which has resulted in a quality practically impossible with only one transformer. Also the high voltage for each panel is separately produced and adjusted independently for each panel for optimum performance. Each panel has its own processor which regulates and continuously checks the high voltage level and audio input.

When a malfunction is detected, the controller can switch off the high voltage and/or the audio input depending on the kind of error detected. Only when the error is not detected for at least 5 seconds the controller automatically switches back to normal operation. Another benefit of this 5 seconds period is that the listener is made aware of a possible error.



PIOSound Falcon series



Because of the patent pending technologies of PIOSound, the Falcon as well as the Eagle series have a number of important benefits compared with competing speaker systems such as:

- Beautiful lifestyle design
- Low distortion
- Broad stereo image
- 3D ready
- Higher average impedance
- Excellent sensitivity on normal listening distance
- High definition sound reproduction
- Sound reproduction less effected by room reflections

Also when no audio is detected for about 10 minutes the high voltage is switched off as this minimizes the dust attraction and also reduces standby power. Next to this the speakers are protected by a front and back cloth which reduces the influence of dust and prolongs the longevity of the panel. The high voltage is switched on immediately after detection of a music input signal.

The high voltage supply is designed to charge the diaphragm well within 0.1 sec, so this is hardly noticeable when music is switched on. Besides the above mentioned checks and adjustments the controller adjusts more than 30 extra parameters for a detailed control of the ESE.

During the design of the modules very low standby power was one of the major design goals. Not only by switching off the high voltage when possible but also by carefully minimizing the current drawn by the other electronic circuits inside the module.

The Falcon series

The Falcon series consists of an ESE and a build in active cardioid subwoofer especially designed for an optimal integration with the electrostatic panel.

In hybrid electrostatic speakers the transition from the dipole radiation pattern to the omni-radiation pattern of the subwoofer is problematic. PIOSound did not find this an acceptable solution and a new solution was investigated.

The base is now implemented with two active drivers, one configured as a dipole driver and the other one as a closed box. The big advantages of this configuration and construction is a regular, smooth and natural changing of the radiation behaviour from a cardioid at low frequencies to a dipole at higher frequencies. Both speakers are necessary to get the common radiation optimized for normal listening distances! The dipole radiation at higher frequencies blends in perfectly with dipole radiation pattern of the electrostatic panel. Both drivers do have a separate and active amplifier and filtering. Although this is a complex and expensive solution, PIOSound is convinced that the extra costs are a small price to pay for a much improved sound quality.

The Falcon also implements the patented damping system and the wide radiation pattern of the high frequencies for the electrostatic panel with the advantages as described for the Eagle. The result is a beautiful lifestyle and relative small electrostatic hybrid speaker that has the sound of a large electrostatic speaker with the punch of a well designed dynamic subwoofer. The Falcon speaker has also the feature to



PIOSound Eagle series

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