



ESTELON FORZA

TECHNICAL NOTES



1. DESIGN PHILOSOPHY

All Estelon products are produced in a similar fashion using the same general design and construction principles. Through Estelon's advanced and innovative engineering concepts, the loudspeakers form a synergy with the room and its acoustics to re-create an emotionally involving listening experience that exposes the soundstage and musical details of the recording, as it was meant to be heard. The goal of the loudspeaker, and the associated system electronics, is to create a life-like (live) and engaging musical experience.

In the design and construction process it is crucial to consider room and environmental acoustics. All listening rooms have walls, floors, ceilings, furniture, and various décor and treatments which affect the listening experience. Together with the loudspeaker they participate in acoustical sound reproduction.

Sound waves below 50-100 Hz

Room measurements and characteristics have a significant effect on the listening experience. In typical room measurements, the longest distance between reflective surfaces is smaller than the length of the low bass sound waves at 50-100 Hz. The pressure at these frequencies always changes equally in every position, similar to pressing on a balloon. In these conditions it is impossible to detect the exact position of the bass drivers. This situation allows the placement of the low frequency drivers to be separate from other drivers.

The Estelon Forza woofers are positioned close to the floor so that the woofers acoustically couple with the surface of the floor maximizing their efficiency and output. Another large benefit of this design is that the low bass is powerful, dynamic, and evenly spread throughout the room, even if the room has high ceilings or is large in overall size and volume. Conventional loudspeaker designs will typically experience bass loss and erratic peaks and dips in output in large size rooms, and especially rooms with high ceilings.

Sound waves over 100 Hz start mirroring and interfering with each other

In frequencies over 100 Hz there are numerous sound waves created between the loudspeakers and the walls, ceiling, floor, and furniture/décor. In these conditions the sound waves start mirroring and combining with each other. The drivers that reproduce sounds over 100 Hz (mid-woofer, midrange and tweeter) are grouped together and physically placed higher in the cabinets, and in a neutral position. In this configuration there is much less impact on mirroring so they can create a realistic and stable stereo image.

The midrange is positioned above the tweeter to further reduce the reflections from the floor and thereby decreases sound coloration. This design principle also improves time-arrival (phase) of the frequencies from the different drivers, allowing for a coherent, accurate, dynamic, and tonally balanced sound.

2. CABINET & TECHNOLOGY

The unique shape of the cabinet is highly complicated and differs greatly from a classical box design. In fact, it's not a box at all!

Proprietary marble-based composite material and molding technology

Estelon engineering took many years of research and testing to find the right material that would allow the highest quality of cabinet and construction for the loudspeaker's acoustically engineered shape. We developed a proprietary marble-based composite material and special molding technology to be able to make such advanced cabinets with multifunctional shapes, inside and out.

The combination of the high-density, solid mass of the molded marble-based composite cabinet and the purposeful shapes, contours, and various internal chambers result in technical characteristics exactly as Estelon Chief Designer, Alfred Vassilkov has calculated. The cabinet is therefore extremely rigid, highly dense, resonant-free, and with exceptional internal dampening and acoustical control.

Curved surfaces and a system of interior chambers

The combination of curved cabinet walls and a complex system of interior chambers make the cabinet completely “dead” and non-resonant. Such a highly advanced and complex cabinet design and construction allows only pure and uninfluenced sound to emanate from the various high performance driver elements.

The 150 kg weight of each speaker gives a reactive and dynamic stability, which also supports the explosive acceleration of the driver membranes. There are no losses in powerful dynamics or subtle micro-dynamics in the sound.

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3. A COMBINATION OF THE BEST DRIVERS

Each speaker has two woofers, one mid-woofer, one midrange and one tweeter. In order to reproduce the full spectrum of sound with the absolute highest quality, a combination of four different driver types has been carefully chosen. The high-quality drivers are designed and produced by German driver manufacturer Thiel & Partner GmbH under the brand name Accuton, and are revered globally as the best.

Woofers - stiff aluminum sandwich membrane with a long linear excursion (custom made)

The two 250 mm (11-inch) aluminum sandwich woofers have been designed together with Accuton engineers especially for the Estelon flagship loudspeakers. These drivers have an extremely stiff and lightweight membrane and very long linear excursion. They can reproduce a truly deep, accurate, and fast bass. In the Extreme, the combination of the cabinet design, construction, woofers and their positioning, crossover, and mating with the room acoustics and associated electronics has been said to sound like “live bass”, which is a difficult engineering achievement.

Mid-woofer - stiff aluminum sandwich membrane (custom made)

The 190 mm (8-inch) aluminum sandwich mid-woofer has also been specially developed together with the Accuton engineering team. Much like the 250 mm woofers, this mid-woofer also has an extremely stiff and lightweight membrane, which allows for accurate and lightning fast higher bass.

Midrange – ceramic; super-fast and accurate

The 168 mm (7-inch) ceramic membrane midrange driver is also from Accuton and is extremely light, stiff, super-fast, and with high internal dampening characteristics. This allows the mid frequencies to be played without coloration or distortion. Everything from vocals to piano, strings, horns, and cymbals sound extremely natural, accurate, fast and dynamic.

Diamond Tweeter - extremely stiff, precise and stable until 60 kHz

The 25 mm (1-inch) diamond membrane tweeter from Accuton can reproduce sounds at the highest frequencies, up to 60 kHz, with no distortions in the human hearing range. Diamond is the hardest known material on Earth. It transmits the driver membranes acceleration almost entirely undistorted in an exact (perfect) soundwave.

A similar version of the Accuton diamond tweeter can also be found in the dashboard of the supercar Bugatti Chiron, whose incredible sound system was designed and produced by Accuton.

4. SPECIAL CHAMBERS IN THE LOUDSPEAKERS CABINET

Woofers and mid-woofer have
anti-resonance chambers

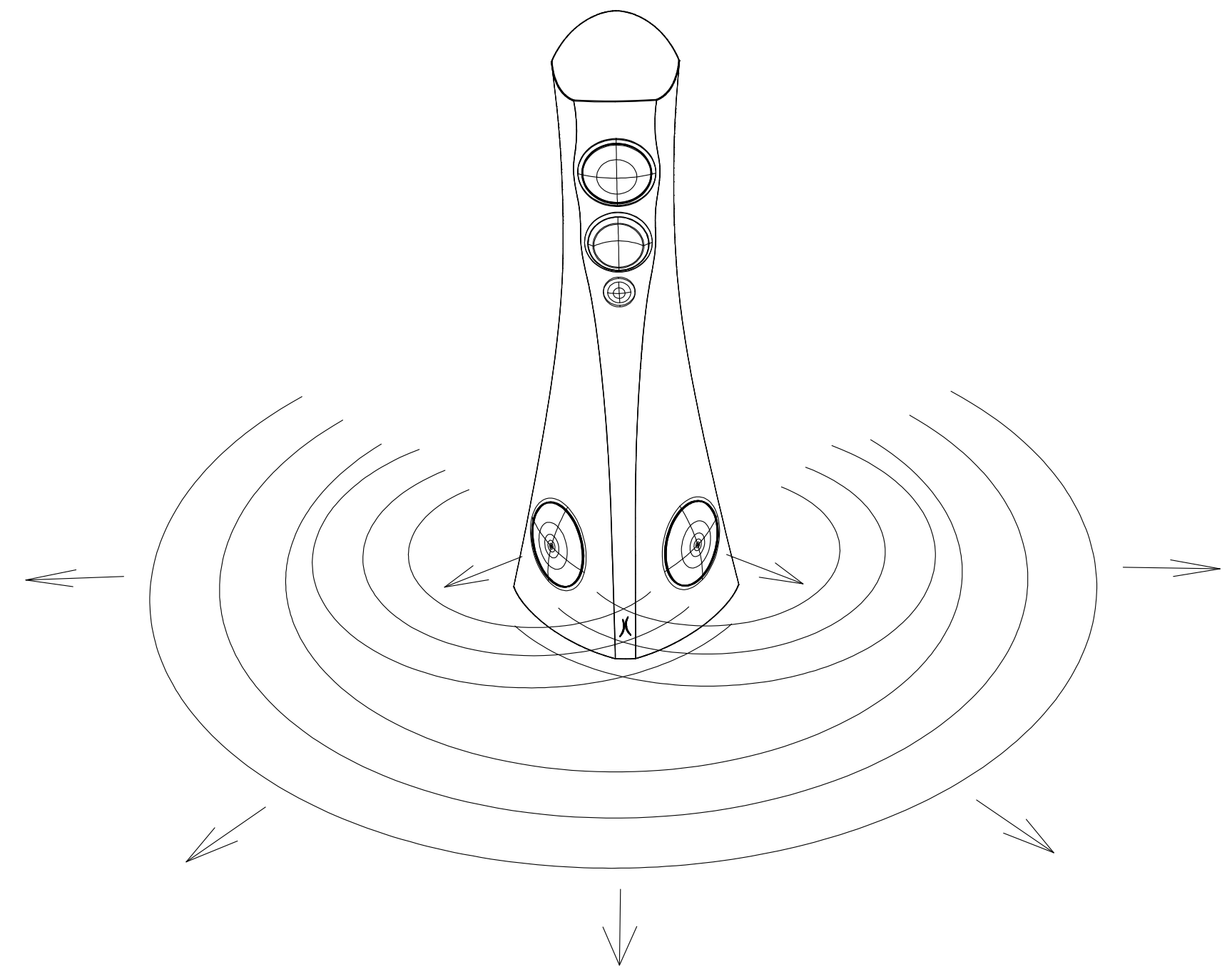
The woofers coexist in one optimized chamber. The chamber configuration has no parallel or flat walls, which eliminates internal mirroring effects, internal resonance and soundwave cancellation as well as reduces distortion. This allows the drivers to perform without the typical cabinet-related acoustical problems.

The chamber of the mid-woofer is isolated and constructed by the same principles as the woofer chamber, free from resonances and well dampened. The sound is free from colorations and distortions, and is extremely accurate.

Symmetric Driver Loading (SDL) technology provides extraordinarily precise bass

Both Symmetrical driver positioning - both woofers have exactly the same acoustic load outside the loudspeaker as inside. Because of this feature, both woofers move identically and without competing with each other (Graph 1). It is precisely the same as having one much larger bass driver.

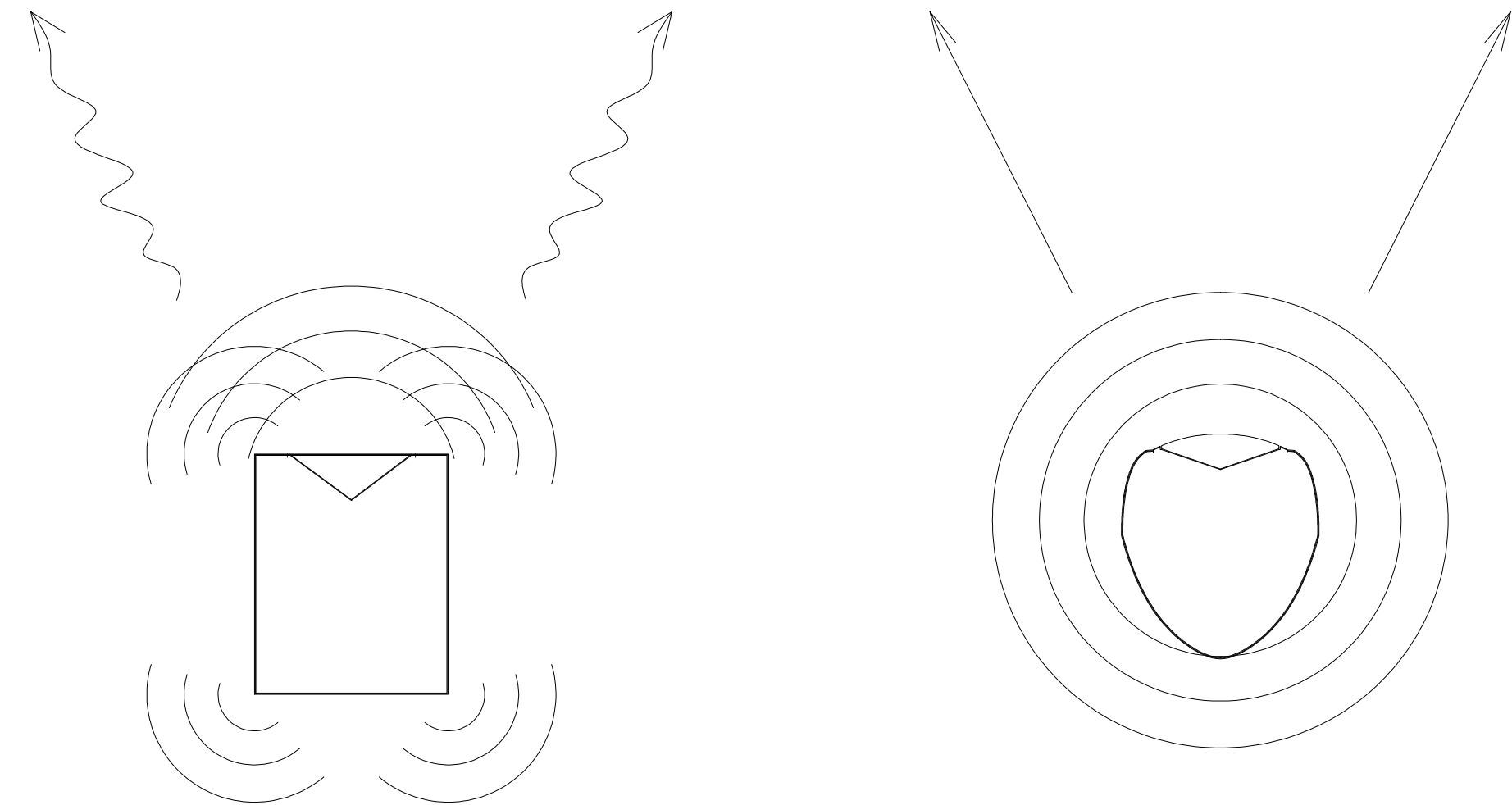
The positioning of the drivers on both sides of the loudspeaker, at an angle and close to the floor, creates a half-spherical signal source that delivers the soundwaves most efficiently. We call this Symmetric Driver Loading (SDL) technology. With this technology, the Forza loudspeaker produces extraordinarily precise bass with power, authority, and speed.



Graph 1. Front view of Estelon Forza loudspeaker

The cabinet around the midrange is curved to eliminate diffraction

The entire Forza cabinet has been designed in a way that there are no sharp edges (Graph 2). The soft curves of the cabinet eliminate the effects of reflective diffraction from the drivers output, and the frequency characteristics of the dispersion (SPL graph) remain straight and linear not only in front of the loudspeaker but also at various angles. This widens the ideal listening position.

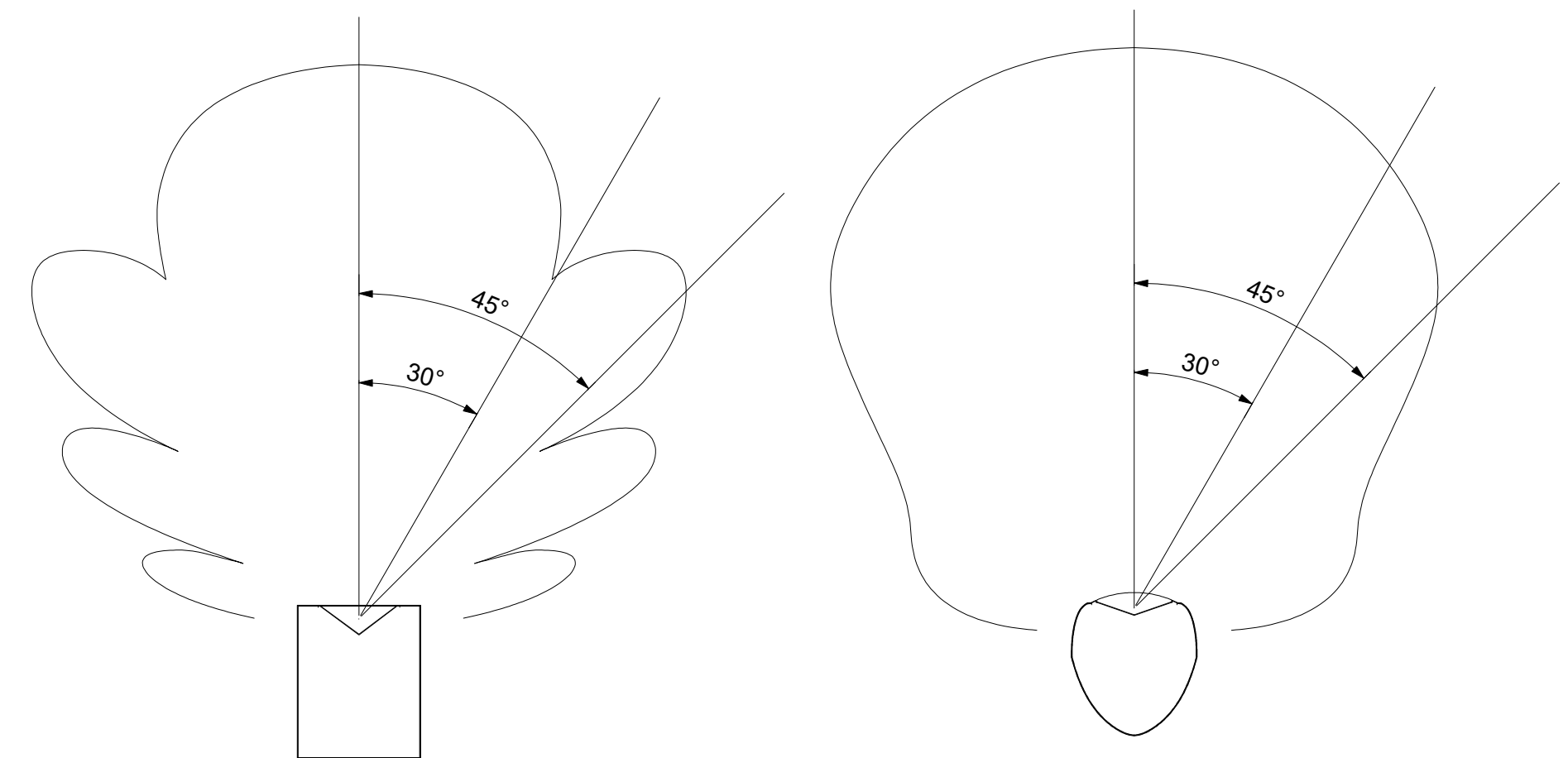


Graph 2. Top view. A traditional box shaped speaker on the left, Estelon Forza Mk II on the right.

The separated chamber together with the surrounding cabinet surface create dispersion control

The tweeter chamber is separated to reduce the oscillation of the internal air within the cabinet, while the surrounding external cabinet surface is extremely important for the performance of the high frequency's driver. The relatively narrow cabinet surface and smooth curves (at a calculated radius) help create a dispersion controlled screen.

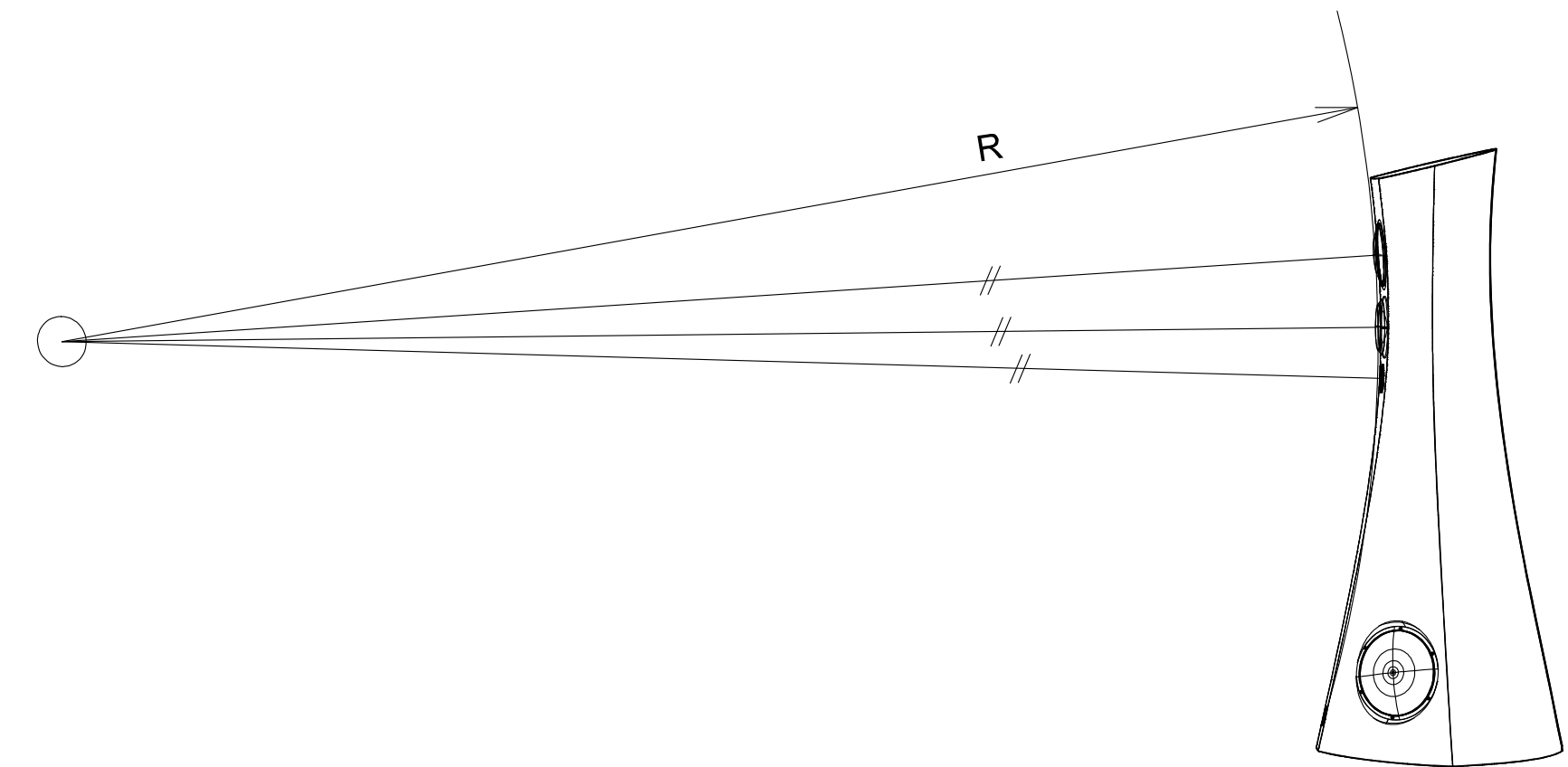
This screen helps to create a linear and even directional dispersion that enhances the overall high frequency performance (Graph 3), allowing the high frequencies to be clearly heard at different listening locations while also improving imaging.



Graph 3. Top view. A traditional box shaped speaker on the left, Estelon Forza on the right.

Drivers are positioned on the intentionally curved front panel for increased coherency

All the drivers are positioned on the curved front panel in a way that from the listening position they are all at the same distance from the listener. This means that the sound from each driver reaches the listening position at the same time, resulting in a fast and precise sound signal (Graph 4) with incredible dynamics, tonal balance, and realistic imaging and staging.



Graph 4. Side view depicting the curved front panel of Estelon Forza

5. CROSSOVERS

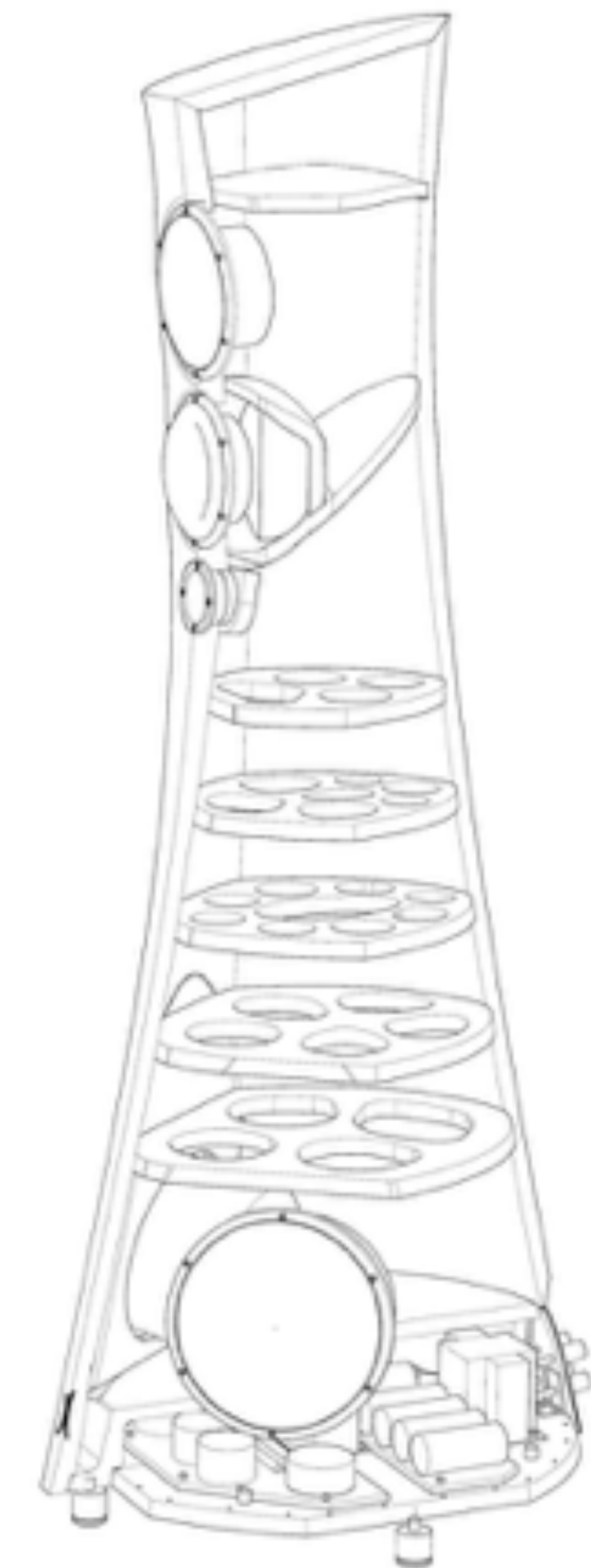
We use specifically engineered and highly precise third order crossovers for the woofers and second order networks for the mid-woofer, midrange and tweeter.

Countless hours of R&D and real-world listening test have been conducted of each crossover design and related parts, right down to physical placement of each part and positioning within the cabinet.

The crossover components have been chosen from among the best parts producers from around the world. We use custom transformer-core coils, OFC (oxygen free copper) foil coils, Mundorf Silver-Gold-Oil capacitors and Carbon-Silver resistors, Duelund Silver Graphite resistors, and all of which are measured and speced to extremely tight tolerances before using in the crossover production. To maintain the smallest of details in the audio signal we use direct mounting techniques with hand-soldered connections with short cable runs to each respective driver and binding posts. All internal cabling is of the highest quality and from the renowned cable manufacturer Kubala-Sosna.

The crossovers are in a special chamber (Graph 5) to reduce the microphonic effect and vibration influence. Each crossover construction process involves careful attention from our engineers and designers, where every process is carefully measured and each component tested to make sure that the final outcome is perfect. In addition to technical measurements, there is also a final listening and evaluation process done by our highly experienced engineers.

Graph 5. Internal cabinet construction showing cross-bracing and the individual chambers for the woofers, mid-woofer, midrange, and crossovers



6. CUSTOM FINISHING

Each cabinet is professionally painted and wet-sanded between each of the 12 coats of the highest grade of paint, and then carefully hand-polished to perfection.

Because of the highly sophisticated cabinet shape, all the processes in the finishing stage are hand-made with extreme care by highly experienced specialists using the best technology and procedures.

We offer a wide range of color options in gloss and matte, with custom finishes upon request. It is a time consuming process to finish each cabinet and takes several weeks to complete this intense artisan procedure, but is indeed worth the wait.

7. PACKAGING

The packaging is precisely thought-through so despite the weight of 150 kg of each speaker, they can be quickly and safely transported to their final position in the room.

The transport cases (industrial grade custom flight-cases) and the speakers themselves are equipped with wheels to ease the transportation and setup. The speaker wheels can be easily replaced by the designated special floor spikes or flat bases (supplied) once the ideal placement and positioning has been determined. We would like to also remind that leaving the speakers on wheels will negatively impact the sound, so please use the supplied spikes.

8. EASY SETUP

Considering the mentioned special characteristics, the Forza loudspeaker is easy to set-up and achieves a natural tonal balance with realistic 3D image. To decrease the vibrating effect from the floor, we offer special stainless-steel stand options – with a flat bottom surface for hard floors and with spiked cones for carpeted floors. Both types are included with the loudspeakers.

It is important to note that setting up these speakers will require at least two or three able-bodied individuals.

9. TECHNICAL SPECIFICATIONS

Type:	Passive loudspeaker with sealed box design
Frequency response:	25 - 60 000 Hz
Power rating:	400 Watts
Nominal impedance:	3 ohms (min 2.0 Ohms at 42 and 110 Hz)
Sensitivity:	91 dB/2.83 V
Min amplifier power:	20 Watts
Internal cabling:	Kubala-Sosna
Cabinet material:	Marble-based composite

Drivers:

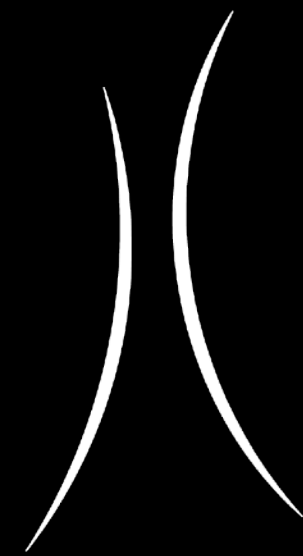
Woofer:	2 x 250 mm (11 inch) CELL aluminum sandwich from Accuton (custom design)
Mid-woofer:	190 mm (8 inch) CELL aluminum sandwich from Accuton (custom design)
Midrange:	168 mm (7 inch) CELL ceramic membrane from Accuton
Tweeter:	25 mm (1 inch) CELL diamond from Accuton

9. DIMENSIONS

Height: 1675 mm (65.9 inches)
Width: 617 mm (24.3 inches)
Depth: 682 mm (26.9 inches)

Net weight: 150 kg (330 lbs) per piece

Recommended room size: 40 - 125 m² (430 – 1345 square feet)



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