



estelon

ESTELON EXTREME

TECHNICAL NOTES

1. DESIGN PHILOSOPHY

Before we started to design our flagship series speaker Extreme, we performed many tests in larger than normal sized listening rooms. We noticed that these spaces quite often vary greatly in terms of the proportions between the ceiling height, room width and depth. To sum it up, there are many different room configuration possibilities. Each detail could have a significant role in the final tonality and sound imaging. We found that by adjusting the speaker height, we were able to improve the overall sound quality and coherency, especially for the seated listener.

Some high-end speakers can perform extremely well in certain rooms, but if taken to another room, the results may not be so good. That is the reason we wanted to create a speaker that could be adjusted according the room specifics and listener position.

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 Extreme 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.

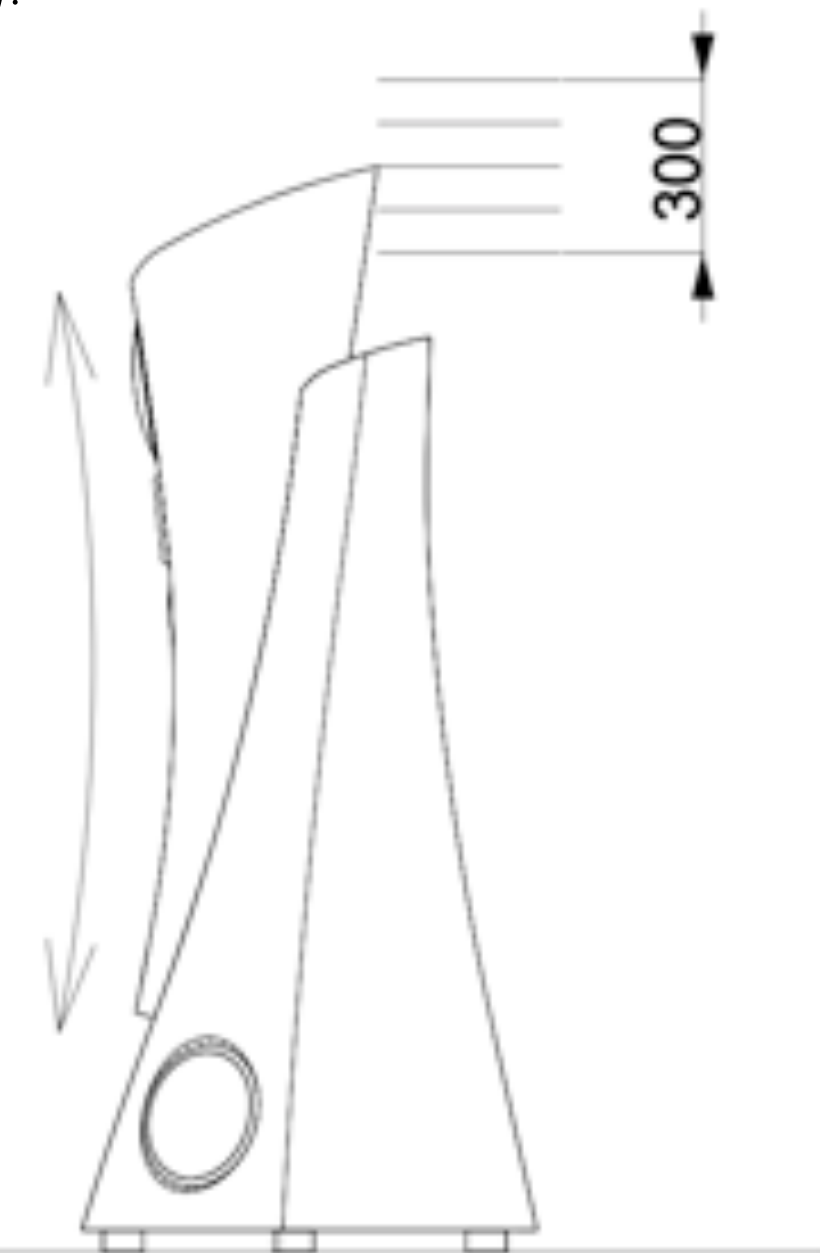
The combination of the high-density, solid mass of the molded marble-based composite cabinet and the purposeful shapes, contours, and various internal chambers result in technical characteristics exactly as Estelon Chief Designer, Alfred Vassilkov has calculated. The cabinet is therefore extremely rigid,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

Constructed with two modules (upper and lower) – the upper module of each loudspeaker is adjustable

The upper module of the Estelon Extreme can be adjusted in the range of 300 mm in height. To make the positioning process more convenient we set five different steps in this range, so the speakers can be moved up and down making the set up very easy.

Both speakers are connected with the controller box and the height can be changed with a dedicated remote control and both upper modules are moved up or down at the same time. This adjustment process is crucial in setting up the loudspeakers.

The upper module has a curved front panel to keep the acoustic focus in the listening position and when adjusting the height, the module also moves in a curved direction. This is necessary to maintain the focus in the listening position after the height adjustment (Graph 1).



Graph 1.
Side view depicting the upper module adjustment possibilities of Estelon Extreme

The crossover for the upper part drivers is also located within the module to reduce the length of the filtered signal to the drivers, reducing the signal loss. The upper module is supported with two custom stainless-steel spikes on the lower part ball bearing. Such connection decreases the effects of vibration. The moving mechanism is made with extra precision, similar to industrial machine requirements. We use the same elements as CNC machines.

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.

Advanced internal dampening

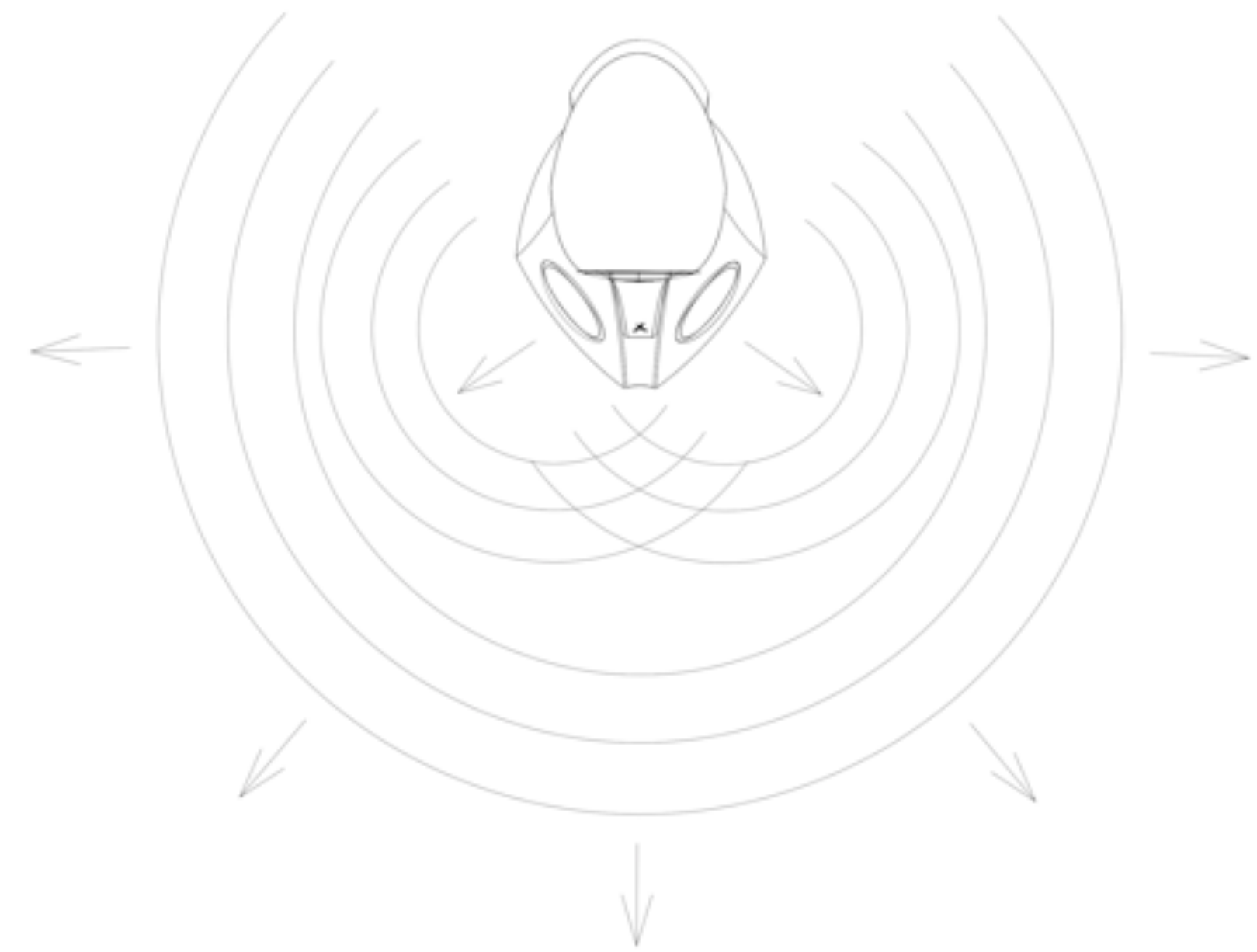
In order to assist the loudspeaker to unveil its purest musicality, advanced internal dampening has been implemented. The dampening was designed through a long testing process to have the best effect and overall balance throughout the musical spectrum.

We have chosen different natural and synthetic dampening materials that are strategically and scientifically placed, which together create the best effects at different frequencies. The benefits are both audible and measurable.

Bass reflex technology

The Extreme loudspeaker uses a bass reflex technology with two bass drivers. The loudspeaker also features Symmetric Drivers Loading (SDL) technology, which means that the drivers are symmetrically positioned - both woofers have exactly the same acoustic load inside and outside of the loudspeaker and both woofers move identically, without competing with each other (Graph 2).

The bass reflex tunnel is integrated in the rear side. From inside it is carefully covered with dampening materials to decrease the effects of the noise from air movement inside the tunnel. That makes the sound much purer in the lower frequencies.



Graph 2. Top view of Estelon Extreme

Fine tuning the tweeter position

To fine tune the focus in the listening point, there is a possibility to regulate the tweeter position (Graph 3). This is done by a special mechanism, which allows the tweeter to move inwards or outwards in regards to the speaker cabinet and also this separates the tweeter from the cabinet to decrease vibration effects. The tweeter is produced with diamond technology by Accuton and to reduce the mirroring effects from the cabinet when moving the tweeter, there is a foam ring which is covered with suede around the driver.



Graph 3. Side view depicting the curved front panel of Estelon Extreme

250kg weight of each speaker provides stability

Each Estelon Extreme loudspeaker weighs 250 kg and the heavy weight is necessary to make the speaker stable and non-vibrating. We have installed the Ultra 5 Stillpoints under the speaker for support and noise reduction.

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 250 mm (11 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 upper bass.

Midrange – ceramic; super-fast and accurate

The 173 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 45 kHz

The 30 mm (1.2 inch) diamond membrane tweeter from Accuton can reproduce sounds at the highest frequencies, up to 45 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

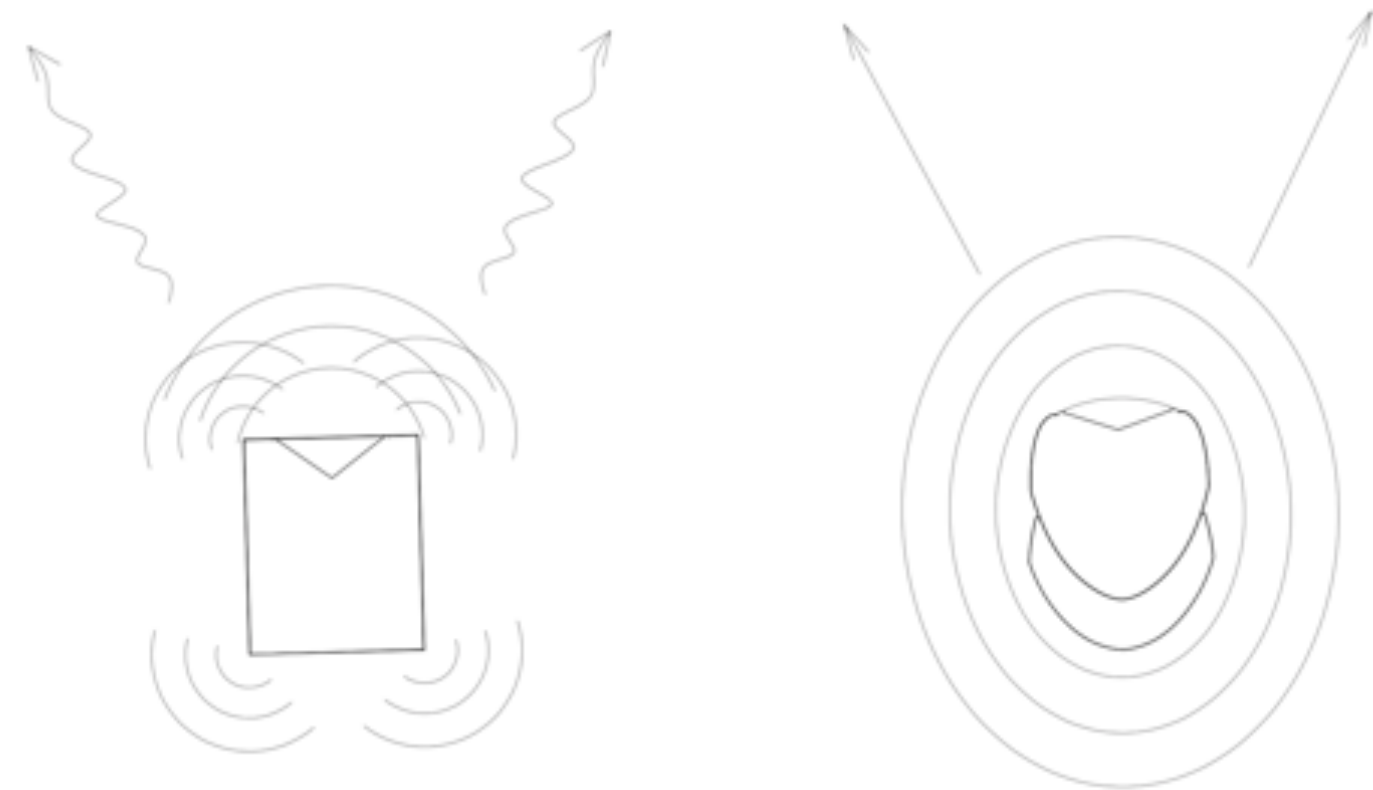
Woofers and mid-woofer have
anti-resonance chambers

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.

The cabinet around the midrange is curved to eliminate diffraction

Both modules of the Extreme cabinet have been designed in a way that there are no sharp edges (Graph 4). The soft curves of the cabinet eliminate the effect of diffraction and the frequency characteristics (SPL graph) remain straight not only in front of the loudspeaker but also at various angles. This widens the ideal listening position.

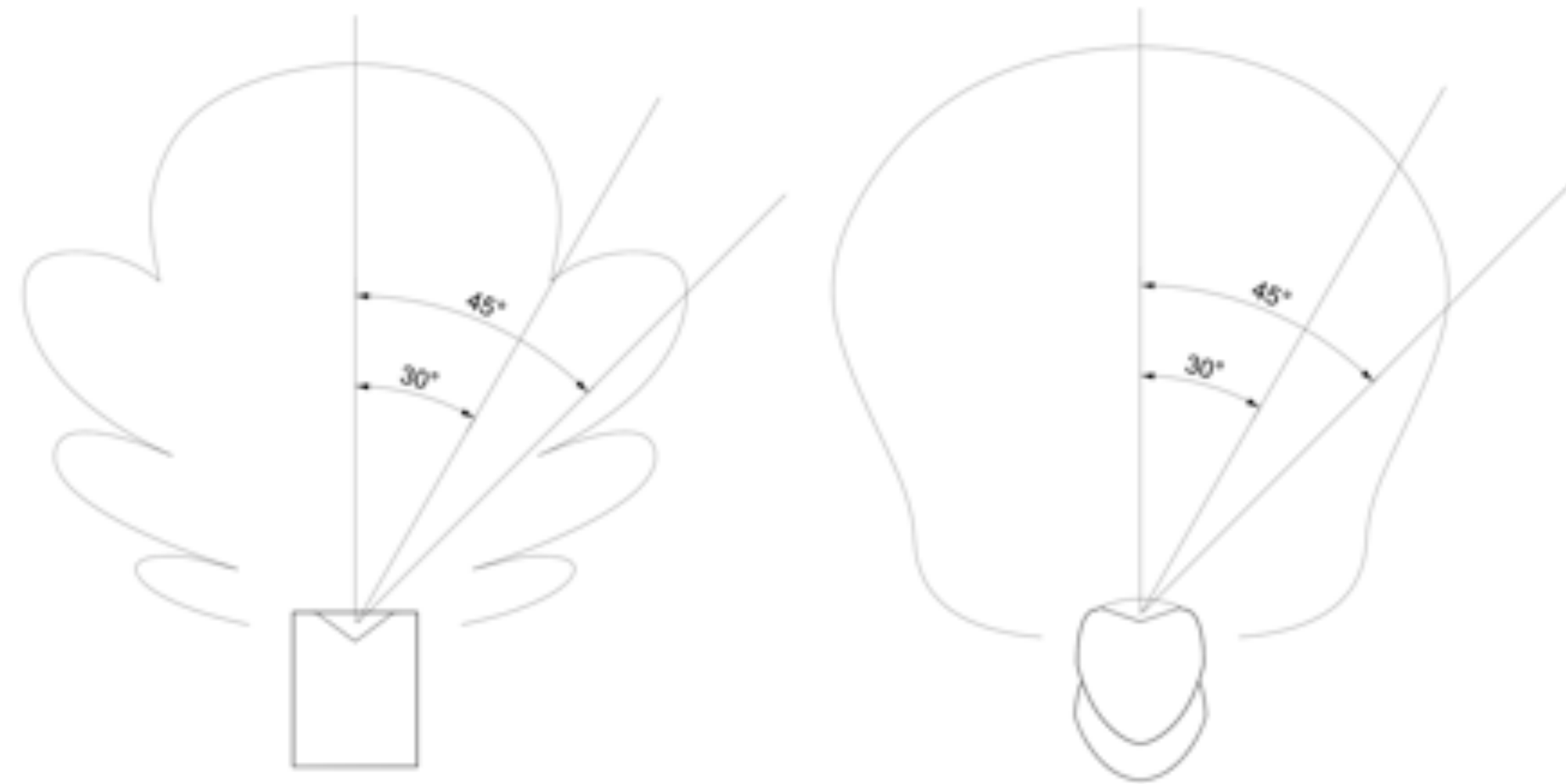


Graph 4. Top view. A traditional box shaped speaker on the left, Estelon Extreme on the right.

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.

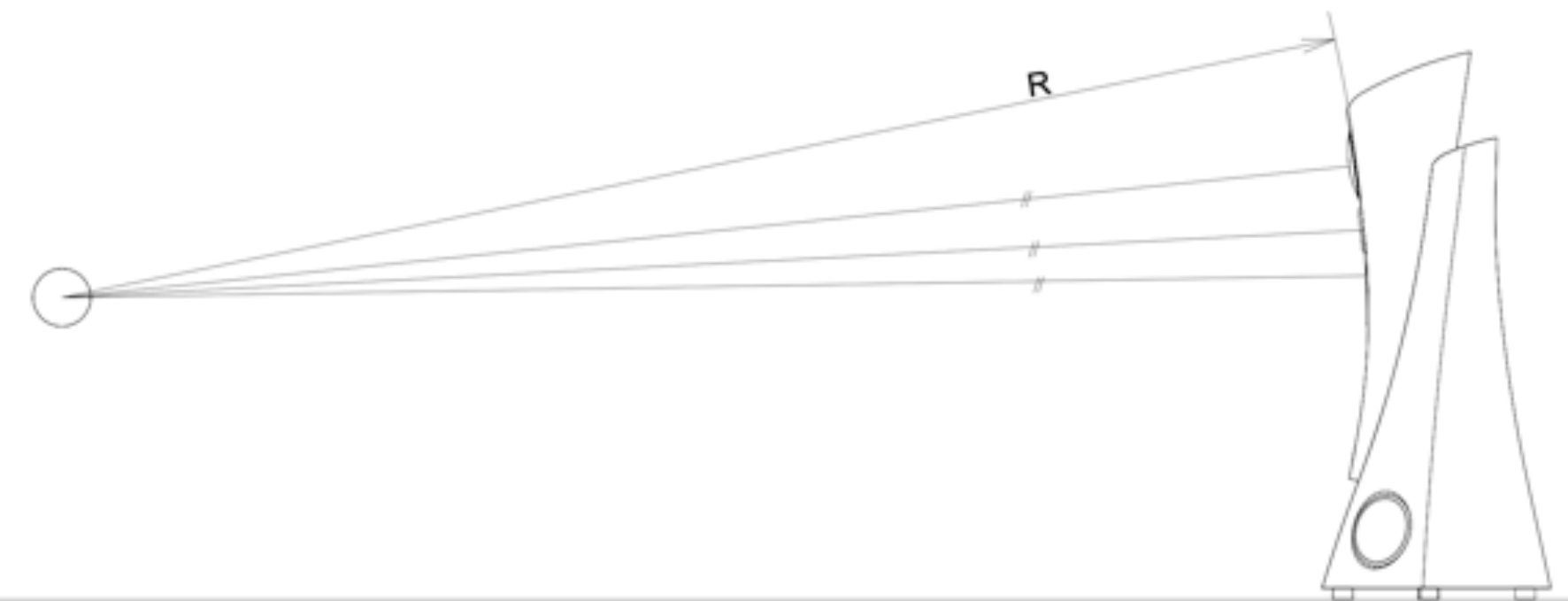
The relatively narrow cabinet surface and smooth curves (at a calculated radius) help create a dispersion controlled screen. This screen helps to create a linear and even directional dispersion that enhances the overall high frequency performance (Graph 5), allowing the high frequencies to be clearly heard at different listening locations while also improving imaging.



Graph 5. Top view. A traditional box shaped speaker on the left, Estelon Extreme 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 6) with incredible dynamics, tonal balance, and realistic imaging and staging.



Graph 6. Side view depicting the curved front panel of Estelon Extreme

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 special chambers 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.

6. CUSTOM FINISHING

Each cabinet is professionally painted and wet-sanded between each of the 14 coats of the highest grade of paint, and then carefully hand-polished to perfection.

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

We offer a range of color options (including Rolls Royce Tudor Gray) in gloss and matte, with custom finishes upon request and use a combination of two colors: black matte (upper module and back side of lower module, and variants of gloss finishes for the sides). Finishing is a time consuming process and takes a minimum of 6 weeks to complete, but is indeed worth the wait.

The rear connector panel is made of carbon fiber and it has two pairs of Furutech connectors, which allows bi-amping or bi-wiring. One pair is connected to the upper module and the other with the lower module.

7. PACKAGING, TRANSPORT & SET UP

The packaging is precisely thought-through so despite the weight of 250 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.

To decrease the vibrating effect from the floor, we are offering 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 three able-bodied individuals.

The transport of the Extreme is done with four flight cases and an additional box. One flight case for each module and the fifth box includes a special frame that makes it easier and safer to install the upper module on the lower part, which requires precision.

Considering the mentioned special characteristics, the Extreme loudspeaker is easy to set-up and achieves a natural tonal balance with realistic 3D image and truly impressive dynamics, especially with the ease of remote adjustability (up/down) motorized movement of the mid/high cabinet to ensure proper phase and timing for the seated listener.

8. TECHNICAL SPECIFICATIONS

Type:	Passive speaker. Bass reflex concept
Frequency response:	20 - 45 000 Hz
Power rating:	500 Watts
Nominal impedance:	4 ohms
Sensitivity:	91 dB/2.83 V
Min amplifier power:	20 Watts
Internal cabling:	Kubala-Sosna
Cabinet material:	Marble-based composite

Drivers:

Woofers:	2 x 250 mm (11 inch) CELL aluminum sandwich from Accuton (custom design)
Mid-woofer:	250 mm (11 inch) CELL aluminum sandwich from Accuton (custom design)
Midrange:	173 mm (7 inch) Ceramic membrane from Accuton
Tweeter:	30 mm (1.2 inch) Diamond from Accuton

9. DIMENSIONS

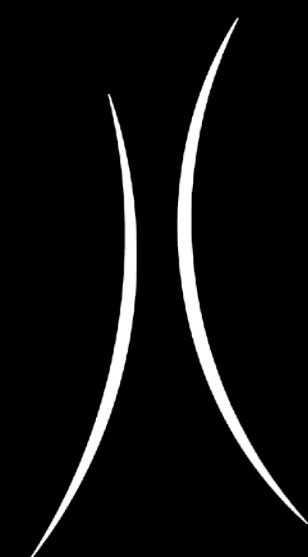
Height: 1770 - 2070 mm / adjustable (69.7 – 81.5 inches)

Width: 690 mm (27.2 inches)

Depth: 820 mm (33.3 inches)

Net weight: 250 kg (551.2 lbs) per piece

Recommended room size: 50 - 200 m² (538 – 2153 square feet)



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