



50 YEARS OF ITALIAN TRADITION

**Research and Products Development**

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50 YEARS OF ITALIAN TRADITION



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ITALIAN TRADITION



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## LAND OF CULTURE & LAND OF MUSIC

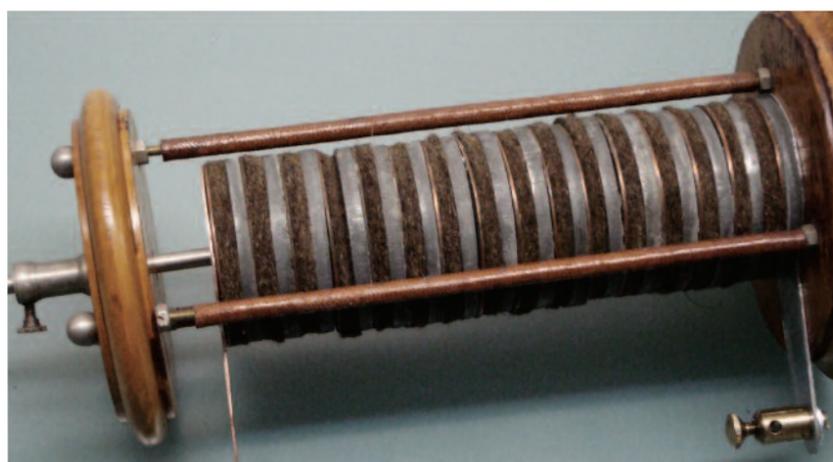
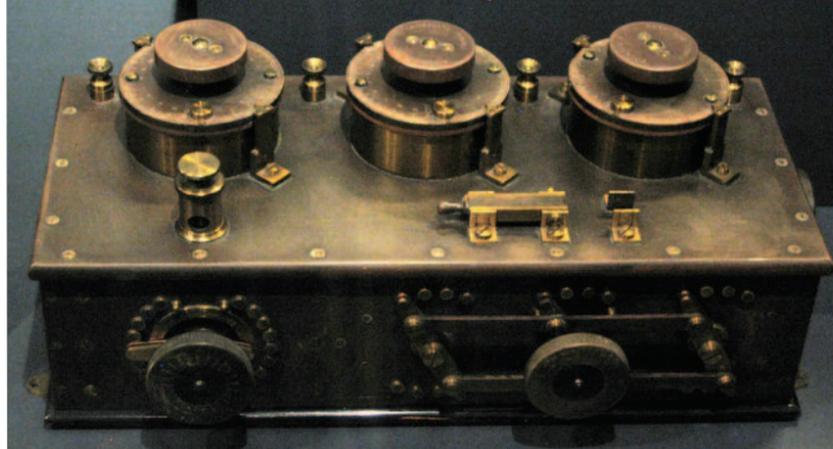
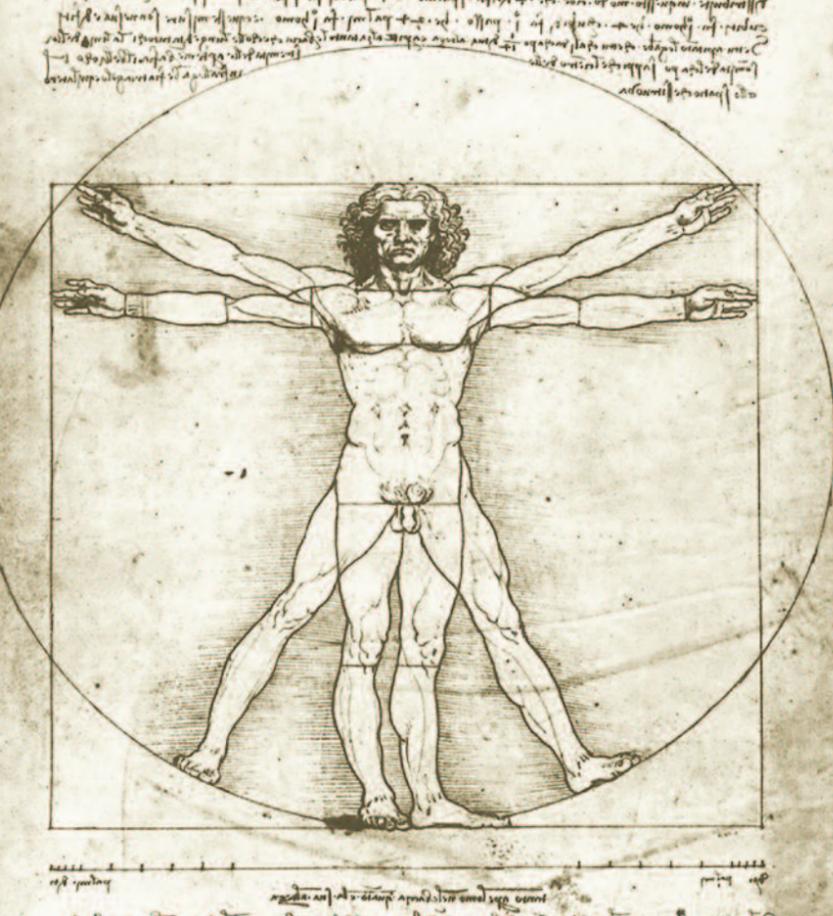


The Italian culture is the collective heritage of Italy knowledge. Fulcrum of the Roman Empire and site of the Catholic Church, a meeting point of many Mediterranean civilizations, the birthplace of many artistic movements, Italy has since ancient times among the most flourishing cultural centers of Europe.

Music has traditionally been one of the cultural markers of Italian national and ethnic identity and holds an important position in society and in politics. Italian innovation in musical scales, harmony, notation, and theatre enabled the development of opera in the late 16th century, and much of modern European classical music, such as the symphony and concerto. Gioacchino Rossini, Vincenzo Bellini, Gaetano Donizetti, Giuseppe Verdi and Giacomo Puccini, the biggest names, whose works are still performed all over the world. At the same time, since the last century, Italy is the home of the world's best known conductors, including Arturo Toscanini, Claudio Abbado, Riccardo Muti and Ennio Morricone and the best tenors such as Enrico Caruso, Giuseppe Di Stefano, Beniamino Gigli, Tito Schipa and Luciano Pavarotti.

About musical instruments, the first piano model was developed by Bartolomeo Cristofori, a Paduan at the Florentine court of Cosimo III de' Medici, in Italy since 1698. Antonio Stradivari (1644 - 1737) was an Italian luthier and a crafter of stringed instruments such as violins, guitars, violas and harps. Stradivari is generally considered the most significant and greatest artisan in this field.





## LAND OF ENGINEERING



As well as Italy can be described as a land of culture and music, we can say that Italy is a land of inventors, engineers and revolutionary technological discoveries.

Leonardo Da Vinci, engineer, scientist and universal talent of the Renaissance, fully incarnated the spirit of his time, leading to higher forms of expression in the various fields of art and knowledge. He is considered one of the greatest geniuses of mankind.

Alessandro Volta was an Italian engineer and physicist, best known for the invention of the first ever made electric generator, the battery. Antonio Meucci was an Italian inventor, famous for developing a voice communication device credited by various sources, such as the first phone, the so-called "teletrofono".

Guglielmo Marconi was a physicist and inventor. He was responsible for the development of a communication system with wireless telegraphy radio waves.

And in Italy, in the last century, they were born become legendary car and motorcycle world famous brands, such as Ferrari, Lamborghini and Ducati. Companies that enclose genius and ability to excel in their respective fields.

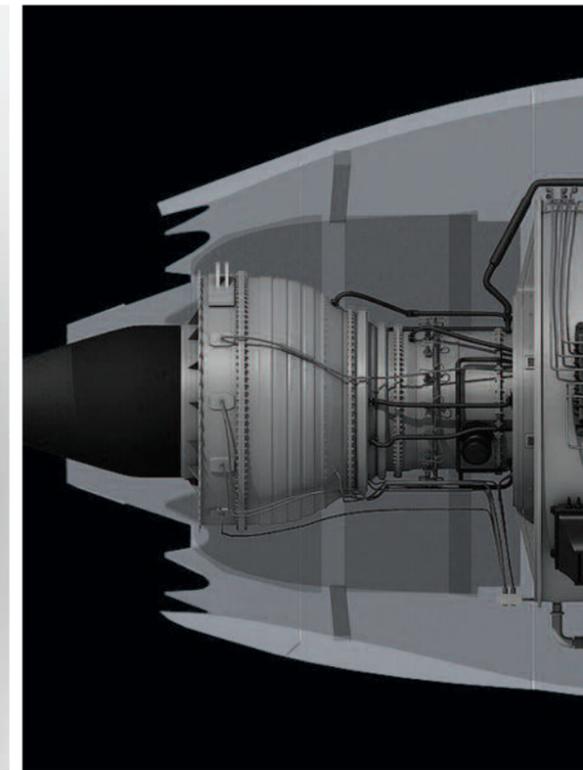
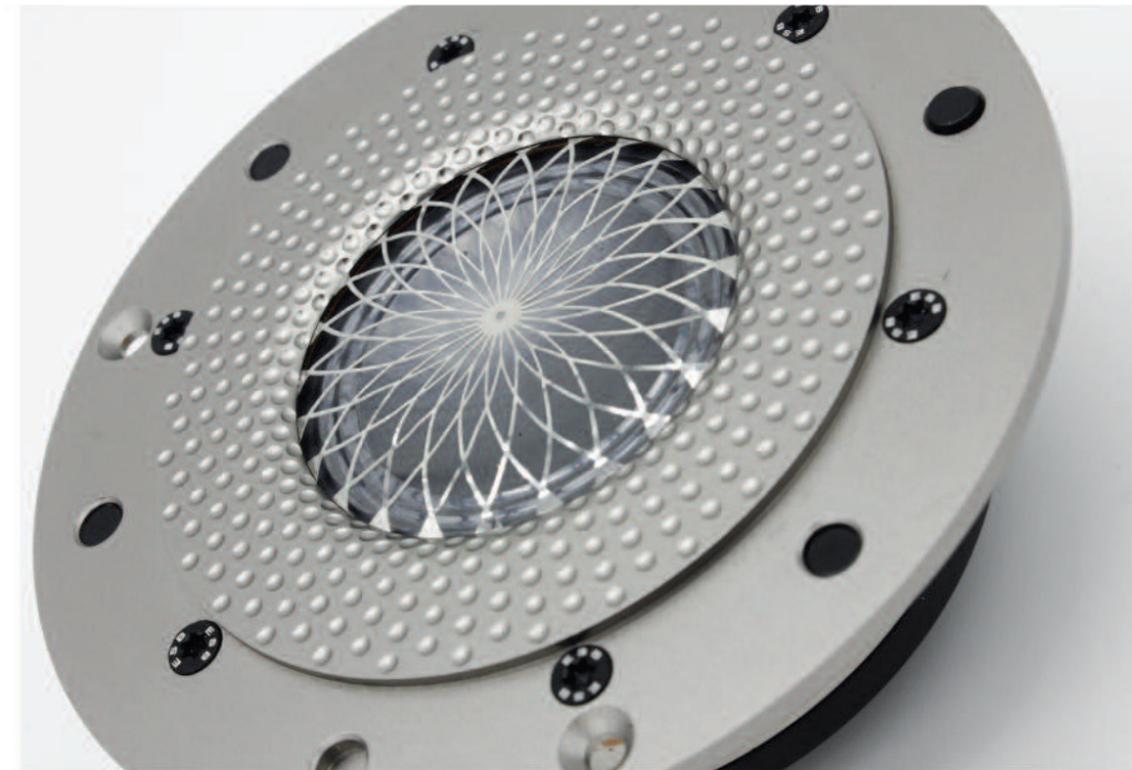
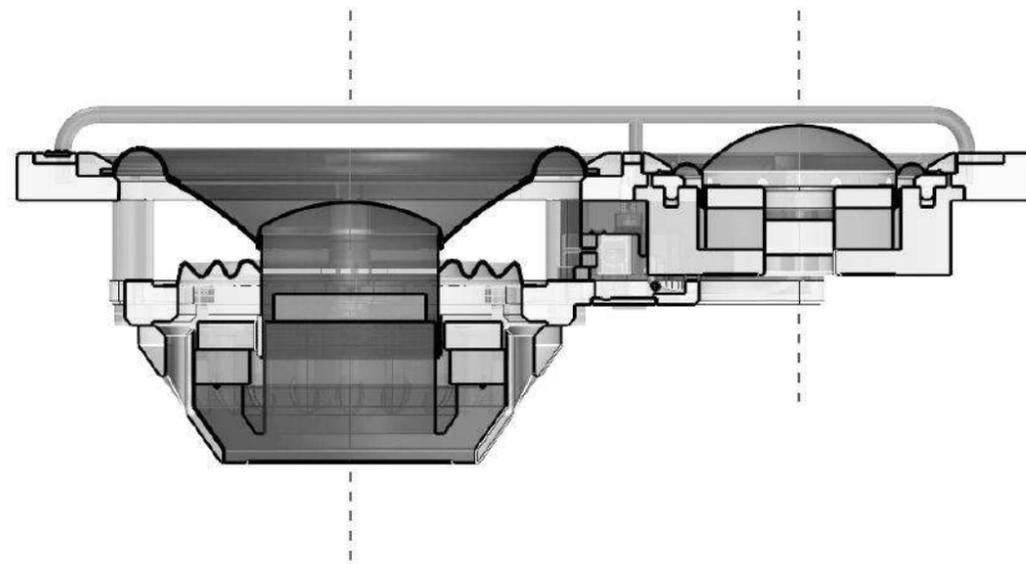


## LAND OF ESB

ESB, the corporation, was officially born in 1972. But three years earlier we had already entered the market with the historic 240L loudspeaker. Since then it's been 50 years, we have traveled the market of high fidelity (home and automotive) in all its evolution, acquiring an heritage of experience and knowledge that are hard to find elsewhere. An assembly of people, labor, investment and insights.

Some of the most important milestones in the history of high fidelity audio have been marked by the ESB company. On this page are some of them: ideas, insights, basic applications of electro-acoustic principles and above all a passion for high fidelity audio. These are the foundation of our history.

In 1984, an ESB department was born dedicated entirely to car stereo, always with a strong connection with magazines and a circle of audio knowledge that formed the Italian school of Hi-Fi audio. ESB moved to the car market not only the passion for hi-fi but also the knowledge to build excellent facilities in the car. So was born another era... the Car Audio era.



# FUTURE ORIENTED SINCE 1969

## 1969 - The ESB 240L and the L-Series

The rise of ESB began in the late '60s. The first loudspeaker built by Vincenzo Biasella (at the time the company ESB did not yet exist) was the 240L. This impressive speaker, with nine drivers and a woofer 45 cm in diameter, was designed with an architect who was commissioned to his house. The resulting product played so well that others who heard it ordered their own sets. Vincenzo Biasella saw he would perhaps have to build a lot of speakers and wrote ESB on the back at the connection terminals. Thus was born the ESB brand. Within a few years, ESB designed and manufactured a series of speakers embracing the principle of the sealed box and putting itself directly in competition with the american brands. These new ESB L-Series compact bookshelf speakers, in addition to having a relatively better price, set new standards for sound quality. The ESB would become the first company in Italy in the sector of loudspeakers.

## 1975 - The UMA Unit

Thanks to the dedication of Vincenzo Biasella (then "Boss", but also the engineer) and the contribution of Eng. Ferrer, ESB took a major step to advance the art of loudspeaker design. With the purchase of a set of Bruel & Kjaer tools (which at that time cost more than a house), and the building of an anechoic chamber, ESB reached, within a few years, an industrial dimension. This was the birth of the Italian school of HiFi. First speakers, then Italian amplifiers and other audio electronics. During those years ESB became large advertiser in audio magazines and grows to know audio engineer Renato Giussani, who will then join the ESB engineering staff at the end of 1979, assuming the role of chief engineer, alongside the founder Vincenzo Biasella. Together, they will develop the 7 Series, which would be the evolution of the philosophy that had already generated the UMA (Unità Medio Alti) aiming at optimizing the listening front, something that no one had done until then.

## 1979 - New production factory

In 1978, the ESB company responded to the need for "limited changes" to the company if future growth plans were to be achieved. ESB begins the construction in Aprilia, Italy of an immense building for a Hi-Fi company (14,000 mt. Square covered surface for manufacturing and offices). The construction takes several years to complete, but that immediately allows ESB to make a qualitative and quantitative leap. Thanks to the commissioning of super modern machinery for the wood working and a design office that could be envied by anyone in the world, with probably the largest anechoic chamber owned by a manufacturer of speakers of that time (2,000 Cu mt), productivity quickly grows to 1000 loudspeakers per day.

## 1983 - The DSR and the 7-Series

The ESB 7-Series represented and still represents one of the greatest expressions in the field of music reproduction. It is a line of speakers designed and built with the sole objective of achieving the highest listening quality, of any musical genre and in any environment. But success must be considered to the project, which sees at its heart the DSR, the "distributed spectrum" emission, a revolutionary technique, entirely developed by the ESB research center and thanks to the work of Eng. Giussani. These incredible speakers finally allow you to recreate the image of the stage and its performers down to the smallest detail. Just like alive. Not only Doug Sax will say this, but those who own Series 7 speakers at home still say it today.

“I can’t remember the last time that listened through a complete work. The result was stunning, way beyond accurate; a seamless, effortless recreation of the instruments, the room, the musician’s interplay and emotion - I have never heard a speaker re-create the spatiality of these Italian wonders. The ESB 7/06, a restorative experience” (Doug Sax about the ESB 7/06 at CES, 1983).

## 1984 - ESB Car Audio

The department dedicated entirely to car stereo was born in 1984. Always with a strong connection with specialized magazines, Vincenzo Biasella knows and introduces into the company Gianni Caserta (who later will become a publisher of specialized magazines such as Giussani). Gianni Caserta is passionate about cars and convinces Biasella to make car speakers. So, given the success of the 7 Series, Giussani was asked to develop a similar series of car speakers. Only the impedances of the speakers change, but the aesthetics remain the same, including a 45 cm subwoofer which then will be a great success together with the medium-low 1000 MB and the UMA unit. The range is soon enriched with very special dedicated crossovers and thanks to a sales force made up of more engineers than sellers, not only the passion for hi-fi but also the knowledge to build excellent systems in the car is transferred to the market. Thus was born another era, that of Car Audio.

## 1985 - NCA Nazionali Car Audio

It was March 1985 and the ESB was organizing winter weeks skiing in the beautiful mountains of Northern Italy and inviting some clients and some journalists to relax and... talk about high fidelity again. It occurred to someone to listen to the systems in the cars of the participants in the ski holiday and it was decided to evaluate its characteristics. A discussion and a ranking emerged. The first competition, perhaps in the world, was born, without anyone noticing it yet (the IASCA trophy will come later). What happened? The result was that many Car Audio enthusiasts wrote asking to participate in the following white weeks in order to obtain a qualified judgment and perhaps some advice from the journalists themselves. The requests were so many that a series of competitions were soon organized throughout the Italian territory which, with the very rapid development of a regulation and a Judges School, brought the First Italian Car Audio Trophy to see hundreds of competitors compete in as many provincial and regional competitions. It will be called the NCA Trophy. The know-how acquired over the years, the result of the great commitment that the trophy required, was transmitted to all the Italian installers who were able to enjoy an absolutely new and rare experience. The Italian Car Audio Installation School was born.

## 1993 - The new 7000 Series

ESB has operated over the last decade with an output of absolute reference for what concerns loudspeakers, designed and manufactured solely for use in the car. These excellent speakers were added in 1993. This new line was named the 7000 Series, as they were a match of the famous 7 Series home speakers. The 7000 series was greeted immediately with a real critical acclaim and audience, thanks to their remarkable sonic characteristics and absolutely top level construction. Particularly notable were the UMA-800 unified mid-high unit and the 480-S2 46cm subwoofer.

## 2005 - MB Car Audio School

When the ESB corporate, engineering, and manufacturing facilities were built in Aprilia, Italy, a small “mall” was built in the basement area that contained a small but totally realistic cobble stone street with several HiFi shops stocked with audio gear. Here audio professionals could train reps and salespeople on current audio advances. Knowledge is power, and more knowledge in the industry advances the industry and everyone in it. As car audio was growing and ESB was entering the car audio market, new levels of education were needed. A full installation and fabrication center was added to the training mall for the training of car audio sales and installation personnel. The National Car Audio Trophy has been a unique and overwhelming experience for the ability to transfer know-how quickly and effectively by ESB and NCA members to Installers. MB Car Audio School was the complement that allowed the same installers to refine techniques of work and to gain knowledge in an environment that can be fairly compared to a graduate school, with the equivalent of a Master's Degree. ESB has invited National Car Audio Professional installers and also installers and installation trainers from the USA (where there has always been high knowledge of the materials and workmanship of the same) to teach to all those who need it the most advanced techniques. MB Car Audio School has had regular and advanced classes for several years throughout the first decade of 2000, centered on several topics, from the use of specialized tools and test equipment to complex technologies like the DSR for a perfect "Sound Quality" drive and the SPL (Sound Pressure Level) for the dB Drag car for the maximum sound pressure.

# INNOVATIONS

In Phase stability, the DSR system, words from Doug Sax (of Sheffield Labs). Fully developed in the ESB research center, after considerable acoustic field research, these technological goals have now been adapted by many other manufacturers. Here is a brief summary of the technical innovations introduced by ESB.

The basic steps of our history.



Among today's engineers, rather than phase shifts, they prefer to speak of signal delay; the difference in time it takes signals from each driver to reach the ears of the listener. This does not change the nature of the problem, it is simply looking at it from a different angle. Practical controlled tests show, in this case, that the human ear is unable to perceive quality differences in the signal when these delays are contained within a few tenths of a millisecond for the medium-high frequencies and up to a millisecond and then for the lower frequencies. Evaluated in these terms and making more practical considerations at listening and theoretical, the "phase" remains a topic whose importance is a theory yet to be demonstrated, and not the absolute one that is assumed in many manufacturers' advertising pages.

About ESB, engineers have said: it is preferable to have the speakers perfectly in phase with the original recording, but the price of the required constructive solutions are not justified when other factors can have a greater effect on the quality of reproduction. A more important consideration is to make the speakers work around crossover frequencies not only on the speaker axis, but on the wider front possible.

The crossover frequencies simultaneously operate on two speakers. If at the listening point, their signals arrive in opposing phase they will interfere with one another, creating a hole in the frequency response that theoretically matches the annulment total. It can also be of 10dB or more.

This is easily noticeable because the width of this hole is generally equal to 2 or 3 third-octave bands. For signals to maintain a proper phase relationship, it is necessary that the speaker distances (at the acoustic centers) from the listening position to differ as little as possible. The maximum difference is preferably not higher than one third of the wavelength; in this case the hole is of only 3dB. Let's take an example. Suppose we have two speakers whose frequency bands are crossed around 5000 Hz. The wavelength of this frequency is equal to 6.8 cm. We will have a correct response in amplitude in space in front speakers only when the difference of the distances of the two acoustic centers from the listening point will be less than 2 cm. Clearly, the closer the acoustic centers are between them and the more distant the listening point, the greater the face will be over which the response is linear.

In the case where the speakers (arranged on a vertical axis) are separated by 18 cm between them, and the listening is carried out at 3 m distance, the response is linear at every point of the space between +/- 30 cm with respect to the horizontal axis. In normal listening conditions that makes the positioning of the speakers more critical and the listening is correct only on a narrow front field. In the case of considering a cross between woofer and midrange to 600 Hz, as one third of the wavelength is about 20 cm, it is easy to verify that if the acoustic centers, even not perfectly aligned (+/- 5 cm), do not fall among them more than 30 cm, more than two meters from the response is linear throughout the environment.

To optimize the linearity of the response to the environment also crossover between midrange and woofer, the speaker 100 LD designers of ESB have approached as much as possible the acoustic centers of these speakers. Reducing the distance to 9 cm has obliged the assembly of the two speakers on a single flange. The new complex called 100 MTD (Midrange Tweeter Dome), later UMA, Unità Medio-Alti (Mid-High Unit) enables a linear response on a front 120 cm high. This reduced the critical placement of the speaker.

## THE PHASE AND THE RESEARCH

Until the early 1970's virtually all speaker manufacturers in the world positioned the speakers on the panels of their boxes following a logic of design rather than acoustics. The only thing that was done was to put the tweeters at the top and midrange and woofer in the bottom, a matter of size. A constant of design, small at the top and large at the bottom. Then someone decided it was better to put the speakers in phase, aligning the acoustic centers by making them equidistant from the listening position, so speakers were developed with their drivers being arranged on different planes, but not necessarily aligned vertically.

ESB after considerable acoustic field research, reached some conclusions about sound reproduction and fidelity. These conclusions after further study have now been adapted by many other manufacturers. In short the conclusions were: 1) The equidistance of the centers of the speakers from the listening is not critical for the woofer, and have only to a minimal effect at the coupling of the midrange and tweeter. Therefore it makes no sense to have speakers on different planes (In fact the loudspeakers so "phase aligned" soon disappeared). 2) The centers of the speakers that reproduce the

mid-high frequencies must be aligned on a vertical line.

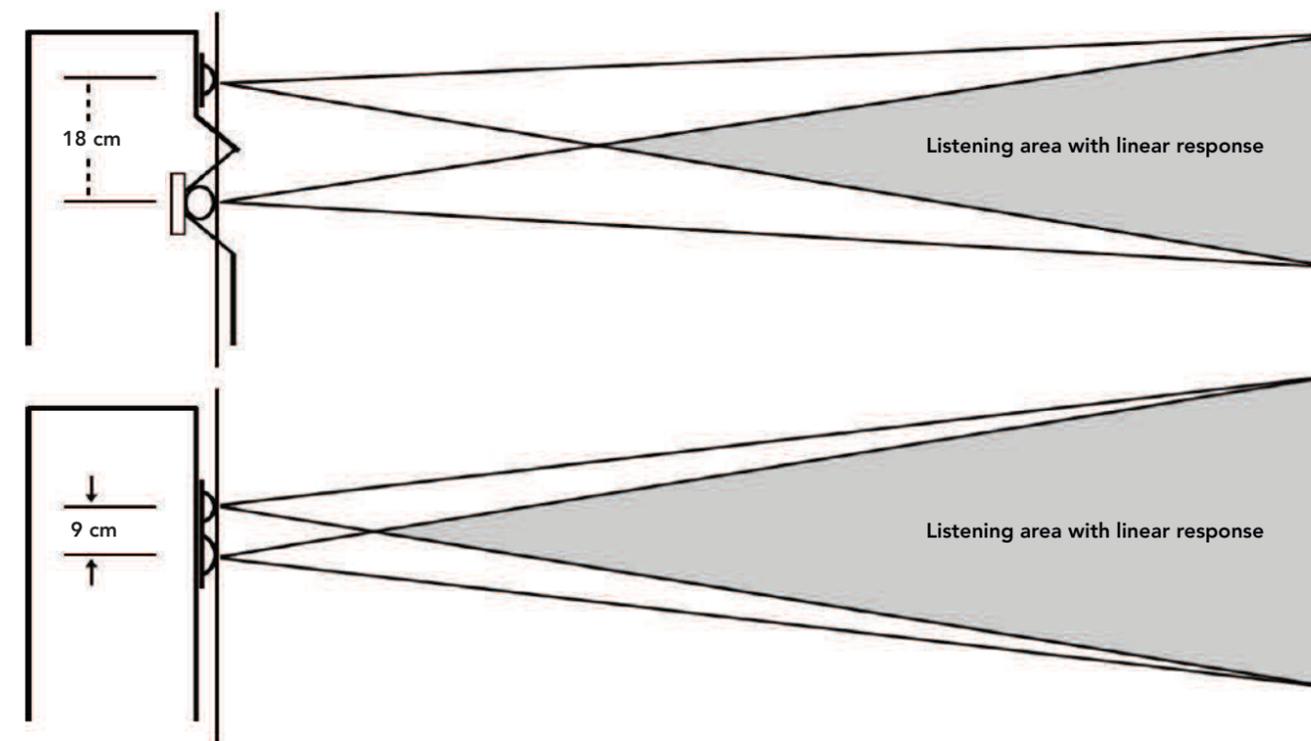
- 3) The location of speakers that reproduce the mid-high frequencies must be asymmetric with respect to the center line of the speaker enclosure.
- 4) The speakers of mid-high frequencies should be as close as possible, with reference to the frequency at which they intersect.

Thus was born what became known as UMA (Unit Medium High) or Mid/Tweeter mounted adjacent on a single flange. UMA distinguished virtually all the future design and production of ESB.

### The Phase and the Research (Published in the 1975 ESB catalog, pag. 16 e 17)

The most relevant and oft discussed topic in the field of loudspeaker design these days is "phase". Speaker builders around the world today, produce models with diffusers and with speakers arranged on different planes. These things are being done in an attempt to align the acoustic centers of the drivers to allow a perfect phase response. They have built a number of very sophisticated tools that can detect phase differences of only a few degrees between the waves from the various drivers in the speaker system. At the same time,

conflicting views on the sensitivity, or lack thereof, of the human ear to detect delays of a few milliseconds, corresponding to phase differences of several hundred degrees, call into question the whole issue. But let's consider, for a moment, that the human ear is at least as sensitive to phase as the best tools. Suppose that the recording of a musical piece is carried out impeccably (unlikely given the presence of microphones in various locations during the recording). Suppose also that the mixer, equalizer, disk or tape, the recorder, and the amplifier do not induce any phase distortion, and the signal reproduced by the loudspeaker maintains the same phase relationships as the original signal. But still, the listener remains the concern. He must be in the position provided for by the loudspeaker manufacturer with regards to the position of each driver on the front panel of the speaker. If the listener is out of position phase lags will be far greater than those that might be introduced by the recording/playback systems. And all this makes sense only if it is proven that the high playback quality of the perfect speaker is actually appreciated by the human ear in normal use with musical program material.



# THE D.S.R.

## The D.S.R. System

(Article published in the 1984 ESB catalog)

The concept of "Acoustic Spectrum Distribution" of audio frequencies is applied in the DSR in two distinct modes that we can, for simplicity, call Horizontal Distribution and Vertical Distribution.

### THE HORIZONTAL DSR

In any stereophonic system the maximum amplitude of the acoustic scene reconstructed is coincident with the distance that separates the speakers. In any listening position the viewer perceives an overall signal consisting of the sum of the value of the direct field (the sound arriving at him directly from the speaker) and the reverberant field (the sound arriving at him from reflections) that form the sound environment. In the pattern of acoustic transmission of the musical signal in the normal home environment, the sound pressure level characteristic of the reverberant field is clearly predominant in the low frequencies while at the high frequencies, the direct sound is predominant.

### THE PROBLEM

If the listener is equidistant from the two speakers and these emit equal signals, the virtual source of what you will hear will be precise and centrally positioned between the two real speakers. But when the listener cannot be in the exact axis of the symmetry of the system then the shift from the ideal location will cause an increase if sound pressure of the direct signal from the near speaker and a decrease from the far speaker. The important thing to note in terms of perceived overall field: Because of the existence of the reverberant field, and the restrictions placed on the listening area in the normal home environment, there will be changes in the levels, and perceived position, of many frequencies, mostly above 1,000/2,000 Hz. Of the level changes that eventually come into play at lower frequencies, they can be of either sign depending on the development of the field of early reflections and standing waves that will be established in that particular environment and, as such, are not to be taken into account for listening position. So, the effect of listening to an asymmetric position, with speakers traditionally oriented whether standard, unidirectional, or wide dispersion, will always be affected by two types of distortions:

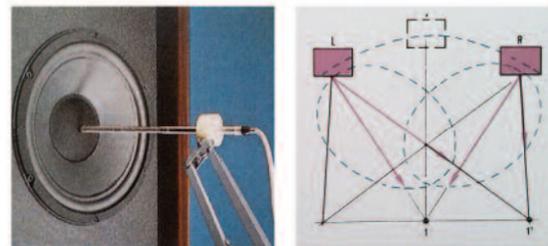
- 1) **Perspective**; following the localization of virtual sources slipping towards the closer speaker. This occurs for all sources except for those generated by signals "only left" or "just right", for which the apparent width of the acoustic scene does not vary, but is deformed by compressing one side and expanding the other.
- 2) **Timbre**; resulting in the decrease in the level of high frequencies perceived by the far speaker and the increase of those received from the near speaker.

### THE SOLUTION

In a classic experiment Stevens and Newman show that to locate the sound sources in the space of our sound field, the auditory system utilizes the information of both time and intensity. Or, in the presence of two identical sound sources working with the position of apparent center the listener will seem to be more close to one signal if it is stronger than the other, or if it arrives before the other. But the experiment also showed that for frequencies below 1,500 Hz, the arrival time was the overriding factor for localizing the position and for frequencies above 3,000Hz the differences in intensity were more dominant. Let us recall what was said on the fields of direct and reverberant origins. Whereas the acoustic field at low frequencies often suffer from irregularities relevant to reflections and standing waves. While the reverberant field and standing waves are largely a function of the listening environment, the stereo speaker system designed to provide correct variations of intensity in the mid and high frequencies can do much to maintain correct spatial information. This new approach to DSR (horizontal), to solve the problem of deformation of timbre and perspective for listening positions not equidistant from the two speakers, consists of the following two propositions:

- 1) Under normal domestic conditions, localization of virtual sources in a correct soundstage depends mainly on differences in intensity 'between the two left and right channels at frequencies above 1,000 / 2,000 Hz;
- 2) The system must compensate for perspective distortion with a speech function of frequency such as to obtain also a correct timbre over the entire listening area provided.

As has been demonstrated above, the invariance of the localization of virtual sources, can be achieved, even in the presence of lateral movement of the listener, by orienting the axis of maximum emission level of the mid-high frequencies of each speaker to the other extreme of the possible listening positions. This situation and better illustrated at the end, in which there are schematically represented the speakers, the virtual source "V", the listening positions <1> and <1'> and carriers, the length of which indicates the acoustic pressure in the two positions caused by the direct radiation of each diffuser.



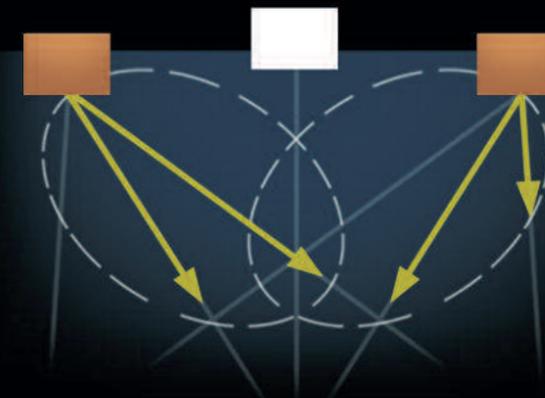
The result from research is that the change in level of the medium-high frequencies caused by the displacement from the listening position <1> to the <1'> (fig.) is compensated by a level variation of opposite sign, as a function of the angle of emission. The orientation of the emission lobes shown gets an effect of the desired type and, by appropriately dimensioning the various parameters, this effect can be made exactly opposite to that caused by a lateral movement, extending the expected listening distance.

In the presence of electrical signals having the same spectrum at the input terminals of the two speakers, the listener will then perceive from "L" and "R" a total, sum of the respective direct fields with that reverberated. The total will be the same for any reasonable position listening; i.e. for each, the desired invariance perspective of the acoustic scene is the invariance timbre of each virtual source it contains. The diffusers 7/06 correspond exactly to the demands of orientation (34 degrees) for a listening distance equal to 1.5 times that separating diffusers (central listening in front of the panel of the woofer inclinator of 18 degrees). This condition is also provided by Kates in its table 1 for  $Y / D1 = 3$ , and the theoretical solution planned to "high frequency" contemplates a width -3dB lobe of dispersion of 90 degrees. In the case of 7/06 the hypothesis of the formation of a reverberant field having a behavior as a function of frequency depends on the acoustic characteristics of a typical domestic environment and the result of the invariance of timbre over the entire listening area resulted in a lobe dispersion of amplitude varying between 110 to 2,000 Hz degrees and 60 degrees to 12.5 KHz. with a value of 90 degrees to 4,000 Hz. The final result is that, compared to the conventional proposal, these speakers, in addition to having the axis of maximum level suitably oriented, are characterized by a dispersion suitably limited and decreasing continuously with an increase of the frequency, according to a predetermined pattern. From the choice to distribute the audio spectrum horizontally as a function of the angle of emission we receive the following advantages:

- 1) The possibility to properly resolve the horizontal structure of the acoustic scene in the various virtual sources from any primary listening position.
- 2) Perception of sonic information from each virtual source that is correct at any listening position within the field.

The DSR system distributes the audio spectrum horizontally in an unconventional way by changing the angle of emission. With this technique, the perspective and the timbre of the acoustic scene remain unchanged for any listening position within a wider area.

THE DSR SYSTEM,  
THE TECHNOLOGICAL HEART  
OF THE ESB 7 SPEAKER SERIES,  
WAS A REVOLUTIONARY INSIGHT.  
ENTIRELY DEVELOPED IN THE ESB  
RESEARCH CENTER, THE  
SYSTEM HAS ALLOWED US TO  
CREATE, FOR THE FIRST TIME, IN  
GREAT DETAIL THE IMAGE OF THE  
STAGE AND ITS ACTORS, PLAYING  
A MUSICAL PROGRAM.  
**JUST LIKE LIVE.**



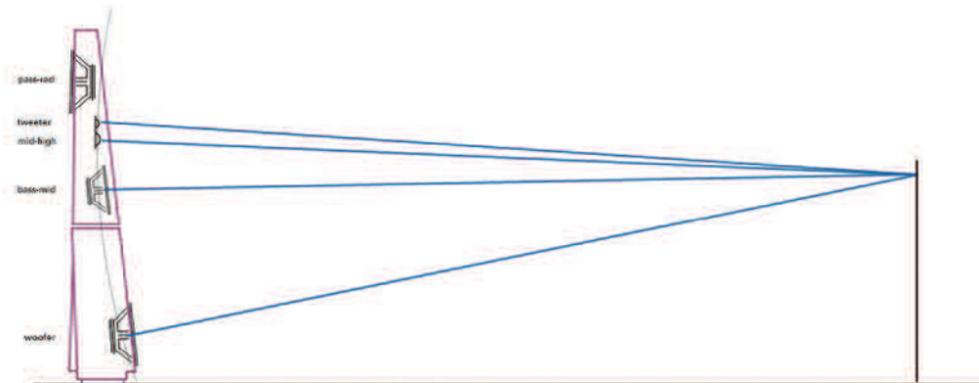
# DISTRIBUTED SPECTRUM RADIATION



## THE VERTICAL DSR

The speakers have a height 7/06 as compared with the other two dimensions, and speakers are located at considerable distances from each other. For example between the center of the woofer and that of the mid-low of 7/06 there are 63 cm.. his is fairly normal for a conventional design. However, the logic of "maximizing" dispersion angle free from alterations leads to choose to arrange the component vertically on the panel of the diffuser at a minimum distance between them, and possibly less than 1/2 of the wavelength of the crossover frequency. In the DSR system such distance is chosen rather than values near a whole wavelength at the crossover frequency (woofer with low average). The considerations that are the basis of this choice take into account the resolution of the springs by our auditory system as a function of the angle of reception and vertical frequency (Rodgers, 3). The actual acoustic sources are placed in a space of three dimensions and they themselves have three dimensions. Our auditory system is able to distinguish the various signals it receives from different directions, both horizontally and vertically,

and thanks to the different location in space, it can select the better signal to which it wants to "pay attention", separating out ignoring others simultaneously present (eg. like when you talk to a person in the confusion of a crowded room, "Cocktail Party Effect"). With an artificial acoustic source (the speaker), which issues all signals from a single point, this operation on the vector intensity is not an issue. The sound simply is. But, distributing the areas of emission on the vertical dimension of the speaker (not as disturbing as the stereo effect horizontal) so that different signals correspond to different areas of emission requires the auditory system to analyze the various signals using differences if the spectrum and the reception angle to find the sum result. There is no doubt that this listening situation is more realistic than that in which the three dimensions of the real world are reduced at the center of a "pulsating sphere". A distance of the transducers higher than that chosen (by contradiction of some meters) would lead to the difficulty where-in the auditory system must consider each speaker as the acoustic source coherent; as saying that various portions of the spectrum emitted by elements would appear as completely separate.



The DSR system plan to deploy vertically the audio spectrum according to the angle of reception. The result is a realistic soundstage with a vertical dimension within which it is more easy to distinguish the different music sources in their correct locations.

This would prevent the possibility to reconstruct the feeling of unique signal originating from a single extended source, uniquely positioned in the space. This condition must be necessarily respected independently for the issuance of the spectrum of each virtual sound source, regardless of the maximum vertical size and the portion that will be subjectively attributed. From the choice of distributing in the vertical direction the audio spectrum, as a function of the angle of reception, we receive the following advantages:

- 1) Possibility to solve the overall programs in the various elementary signals;
- 2) Contribution to the soundstage of a realistic virtual vertical dimension;
- 3) size sensing of the zones of emission as a function of the emitted spectrum congruent with the actual situation.

From the choice of distributing the audio spectrum in both horizontal and vertical, finally it derives the advantage of giving the acoustic scene a three dimensional space in which the physical presence of the speakers is less perceptible.

# DOUG SAX AND THE 7/06

"...we hear a vocal - Amanda's, it so happened-coming from some unknown speaker. It is instantly obvious that this is the best I've ever heard her sound, save for standing next to her. We went in and sat down and really listened. Everything sounded glorious and musical. I introduced myself to Arthur Regal from Cedarhurst, N.Y. He is president of ESB USA and will be importing the ESB line from Italy. He asked me if I would like to hear some other Sheffield records. No. anything but that. He then put on a Proprius recording, Cantate Domino. Again, the best reproduction of voice have ever heard.

Impressed out of my shorts, we bade adieu to ESB and ventured further down the hall where I had a rather joyous meeting with my old friend Leode Gar Kulka of Sonic Arts. I met Leo in 1961 when Lincoln and I were attempting to make a direct-to-disc recording of a solo piano -and mono at that. He had the only Neumann cutting system in Los Angeles. He played some of his new recordings for us, and I ran around the show until I collared a pressing of our disc of Arnold Steinhardt and Lincoln doing the Strauss sonata, it sounded unfamiliar on the set-up in Leo's shared room, and next door we tried it on some weird-looking speaker that sounded even weirder. Since I feel this is the best recording I have ever made, was disappointed that I couldn't show Leo its virtues.

Bob suggested that we go back to ESB to listen to the Strauss, great idea, Bob. We went and listened to the whole sonata. I can't remember the last time that listened through a complete work. The result was stunning, way beyond accurate; a seamless, effortless recreation of the instruments, the room, the musician's interplay and emotion- I have never heard a speaker re-create the spatiality of these Italian wonders. The ESB 7/06, a restorative experience.

It was then 9 p.m. and everyone famished. We went to the buffet at Circus with Bob Neil, Arthur Regal, and Renato Giussani (the designer of the ESB 7/06). I pumped Renato concerning the design parameters of his wondrous loudspeaker. Apparently he has done much research into what a speaker must do to allow the ear to receive space and depth information. What we all heard was no accident. As a professional, I can guarantee that the speaker will fail in many areas; as an audiophile for a day, I know it is the finest loudspeaker I've ever heard."

Doug Sax is the founder of the Sheffield Lab (specialty record and disk production company and creator of many of the best Direct-To-Disc recordings ever made, and the object of veneration of audiophiles world-over). After one visit at the CES, performed in Las Vegas, Jan. 1983, these are just some words of a letter he sent to The Absolute Sound (Best audiophile magazine of USA). Doug Sax passed away on April 2 2015 at age 78 in Los Angeles.



# CAR AUDIO SPEAKER SERIES

ESB, for over thirty years, has specialized in the engineering and construction of speakers for automotive applications, offering different product lines, united by the fact of true fidelity to the musical source.

**True to quality. True to the music.  
Pure performers, accurate reproducers.**

# 10000 Series

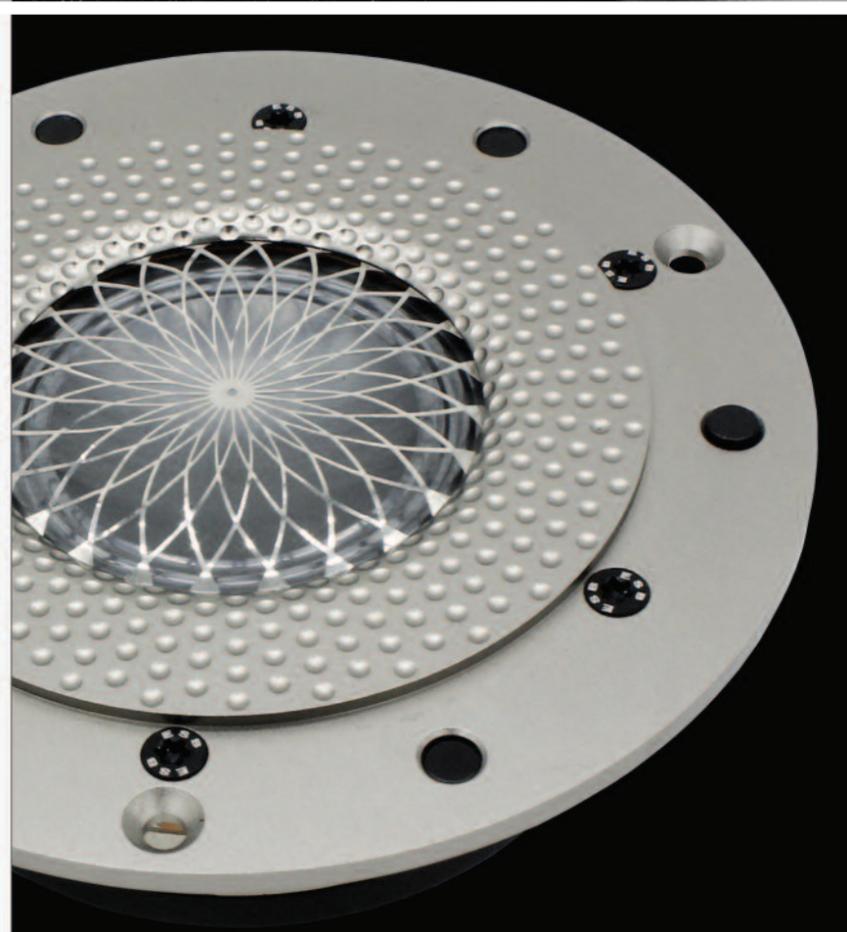
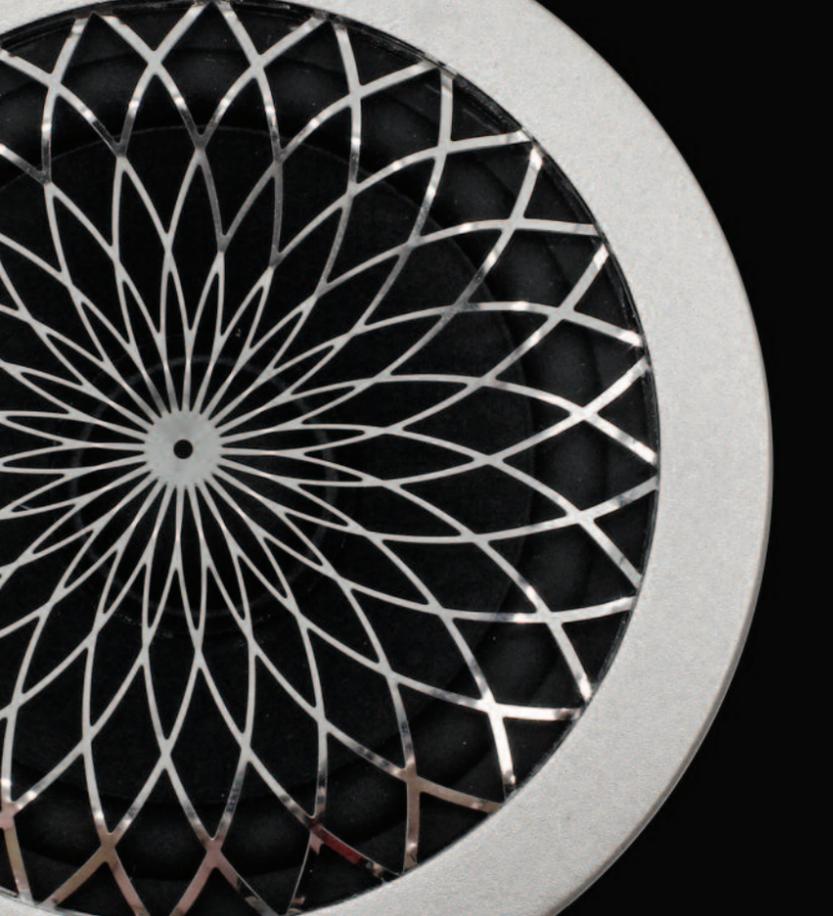
Super High-End Series for absolute sonic purity in music reproduction.



The DIECIMILA series has been designed without considering any kind of economic, constructive and technological limitations, in order to obtain absolute sonic purity in music reproduction.

We have focused our research and development laboratory on the ability to have full control over all speaker features and parameters, allowing us to build these products without the typical compromises that many high-end speaker manufacturers have to make.







## 10.TB

### Super High-End Beryllium Tweeter

Advances in the development of beryllium processing technology, an intense study of the geometric shape of the special oversized inverted dome that incorporates the suspension in a single piece, and our innovative MT-1 motor system, have led to the development of the 10.TB tweeter. The 10.TB is a tweeter with significantly wider range, lower distortion, greater power handling and higher efficiency than any other available on the market today.

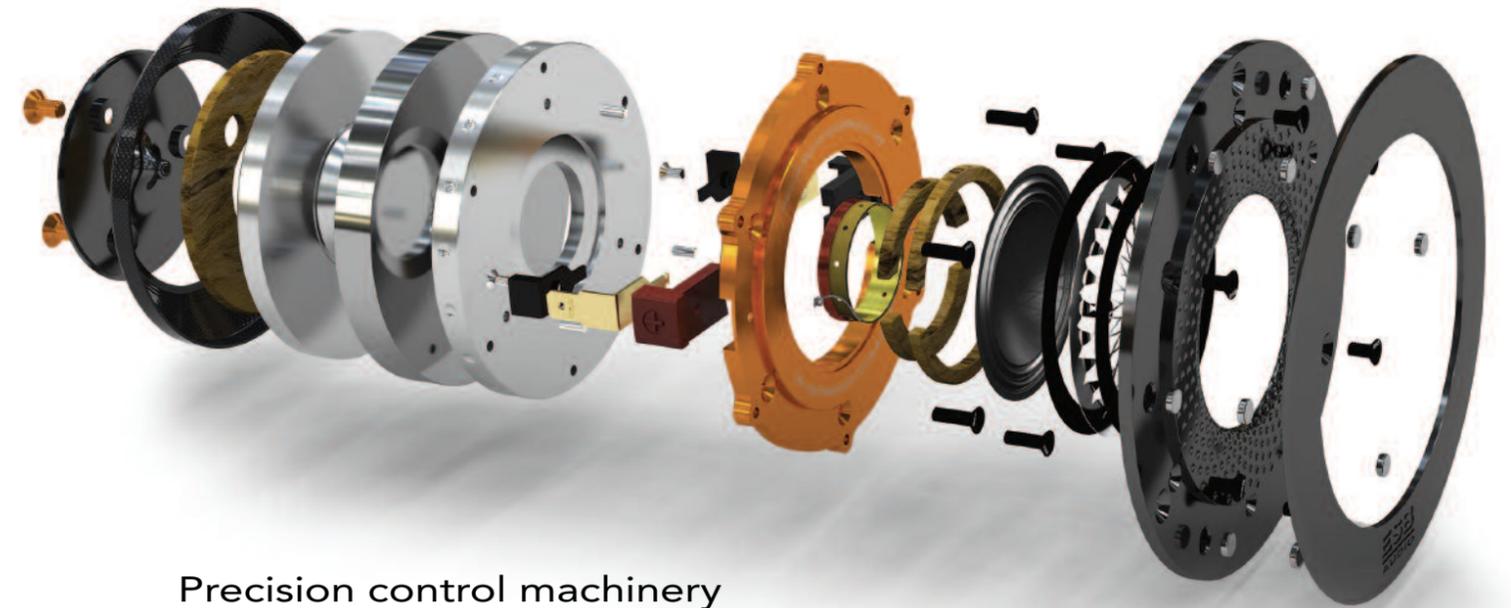
The tweeter is also available in a different version with a silk dome, called 10.TS.

### The magnet

A huge high grade neodymium magnet was combined with polar plates built of material of very high magnetic permeability. This generates a field of unparalleled magnetic flux, perfectly linear and symmetrical. This means the delicate tweeter coil will always have the same power of magnetic field at any point in its travel, giving a considerable reduction in distortion and an increased ability to reproduce the lowest frequencies in the tweeter's range.



A careful study was also dedicated to the development of the central part of the motor assembly, where the innovative design was able to eliminate any phenomenon of air compression under the very thin beryllium dome. This arrangement avoids any deformation of the dome with obvious benefits of less distortion. In order to dampen the rear acoustic waves generated by the dome, a carbon bottom has been designed, where its particular exponential shape cancels them by dispersing them laterally, where a special acoustically absorbing material, completes the work.



### Precision control machinery

All the parts that make up the tweeter have been made with sophisticated precision control machinery in order to have a precision of assembly and therefore of centering between the voice coil and the magnet with an unimaginable tolerance compared to the other tweeter, a degree of precision absolutely not within reach of any tweeter that uses plastic parts.

# 10.W

## Super High-End Woofer

The 10.W woofer diaphragm is the first in the world that uses a double carbon fiber skin made with pure carbon nanotubes. The choice of a double skin crossed at 45° means that the distribution of the stresses along the axis of the nanotubes always occurs along their normal direction, thus creating a membrane that is extremely very light but has a rigidity and non-deformability never seen in any other speaker in the world.

The entire hemispherical membrane is made in a single piece, without the use of the classic dust cover. This method, combined with the gluing of the suspension on the rear face and the extension of the diaphragm well beyond the point of union with the suspension, prevents the classic discontinuities that exist in any other woofer, ensuring absolutely neutral and faithful sound reproduction.



### The cone

The stiffness of the cone, much higher than that of many metals, combined with an excellent internal damping guarantees the perfect "piston" effect, where the performance does not vary with the frequency, minimizing the deformations caused by internal vibrations. The playback speed at transients is astounding and hard to match.

A carbon ring couples the moving coil with the membrane, and its particular shape ensures a large contact area both on the coil side and on the cone side. This guarantees a perfect energy transfer from the coil to the cone with no loss and above all, no concentration of effort. Normally this important point of contact where all the energy released by the voice coil passes to the cone is made with a simple glue ring. This does not guarantee a constant reproducibility with precision, but mainly due to its small size, it concentrates all the effort in a small area, causing stress to the parts resulting in deformation and distortion.



### The basket

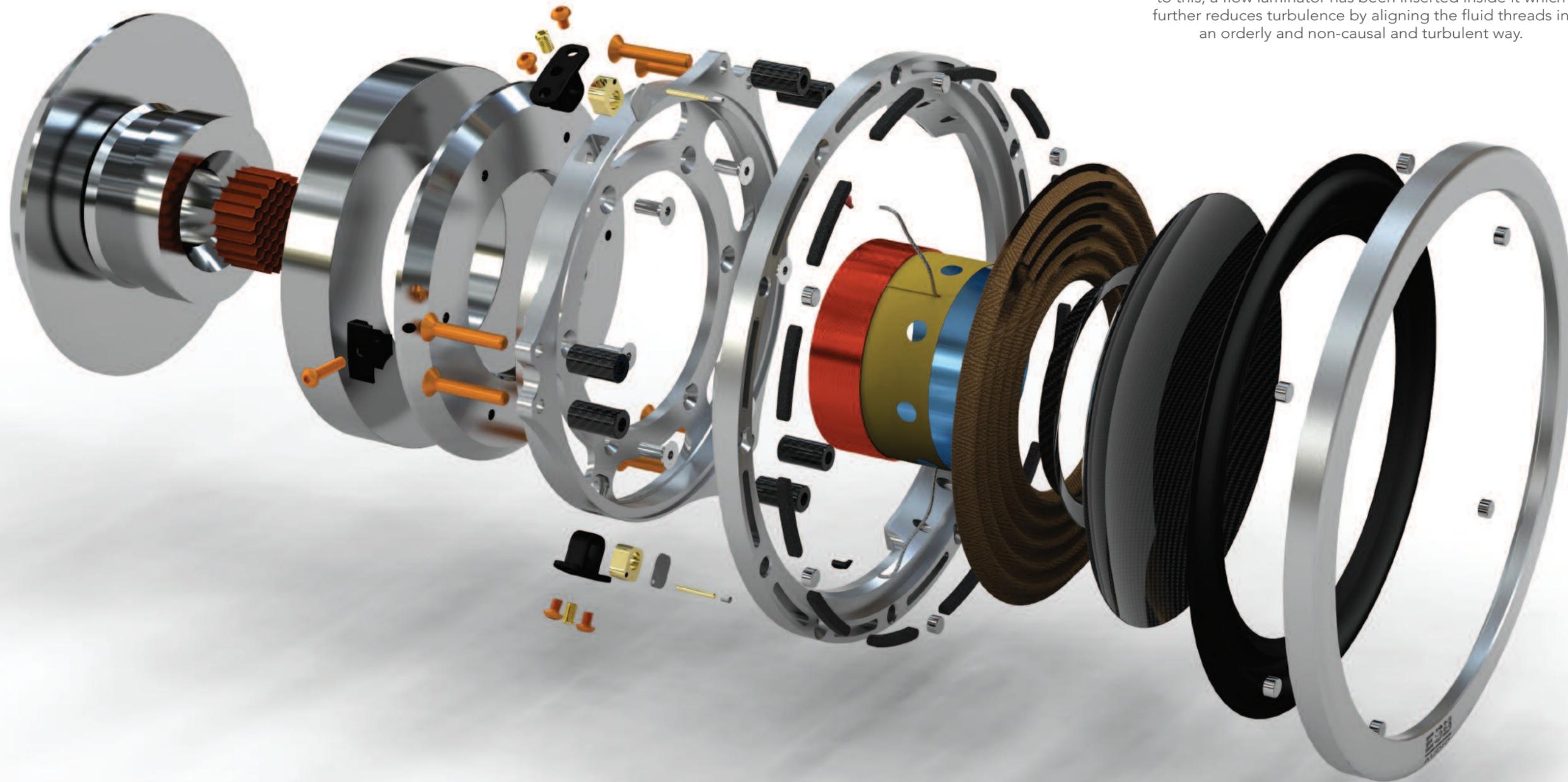
Resonances in the body of a musical instrument are an essential part of defining its nature and quality. For a speaker, the exact opposite is true. Speaker basket resonances are a significant cause of sound coloration. ESB's R&D department has devoted a great deal to developing materials and shapes to balance the mass, stiffness and damping of the ideal basket.

The result was obtained with a mix of aluminum and carbon fiber. The use of aluminum alone, while having excellent characteristics, such as extreme rigidity, has the negative characteristic of not being particularly damped. Our design, which combines two aluminum plates for aerospace use (Avional) with high thickness carbon fiber couplers making the baskets virtually inert. These have no discernible coloring, allowing the speakers to operate with maximum clarity and dynamics. Although expensive to implement, the use of aluminum in our speakers plays a fundamental role in our design philosophy.

## A look inside

The robust MW-1 motor which includes the large titanium voice coil, and a neodymium magnet, reduces distortion levels to a fraction of those found in even the best alternatives available on the market. A copper sleeve encapsulates the entire distance of the voice coil, decreasing the inductance to about 1/10 of its original value. This feature substantially reduces driver non-linearity and intermodulation distortion by increasing its overload handling capability.

In the development of the 10000 series loudspeakers, a colossal effort was made to minimize eddy currents in the iron parts of the engine and suspension system. Eddy currents are created by the movement of the moving coil and produce a chaotic magnetic field that works "against" the fixed magnetic field, thus creating distortions. The best way to reduce these currents is to saturate the metal parts of the motor as much as possible. When the metal around the coil is completely saturated, induced bending (i.e. eddy currents) cannot develop. To do this requires very advanced design studies, precision machining of parts and huge magnets.



## Ventilation system

A ventilation hole in the central part of the magnet ensures both a correct heat exchange between the coil and the external air, and the reduction of pressure under the woofer membrane. Although it looks simple, this hole required a great deal of aerodynamics to create its ideal double opposed cone shape in order to reduce the turbulence that could cause unwanted noise. But in addition to this, a flow laminator has been inserted inside it which further reduces turbulence by aligning the fluid threads in an orderly and non-causal and turbulent way.



The new 10000 series is designed with the same principles applied to the construction of cars or airplanes: the intricate internal structure constitutes an extremely rigid frame on which all the mechanical, passive and active parts are mounted to maximize the efficiency of each component. The end result is the most suitable speaker chassis ever built.

Particular attention was also paid to the connection cables: in addition to the exclusive design terminals that accept cables of generous dimensions, a special computer blocks the two connection cables, preventing them from hitting the basket or the magnet during the car's running.

# 10.M

## Super High-End Midrange

For the midrange cone, given its much less heavy stress than the woofer, we opted for a more classic choice, but more suitable for medium and high frequencies. Like a "paper", but not a classic paper, it is a mix of cellulose pulp nanocrystals used as a binder with the addition of Dolomite spruce fiber, the same type of wood used for the construction of Stradivari violins and called "wood resonant". In addition, a percentage of jute and sisal fiber is added, both of these materials offer compact and very long fibers.



### The cone

A surface layer of phenolic resin spread on both sides of the cone to balance it perfectly and increase its rigidity with a negligible increase in weight. Furthermore, this transformation makes the material virtually insensitive to moisture.

The cellulose nanocrystals used as a binder have a Young's modulus higher than aluminum and other metals, but with a much higher internal damping. Additionally, its mass is only a small percentage of that of a metal, in short, it is the ideal mix for lightness, stiffness and damping, all for maximum natural reproduction.



### The basket

The 10.M midrange uses the same type of basket technology used for the woofer, with a mix of aluminum (Avional) and carbon fiber, allowing the speakers to operate with maximum clarity and dynamics.

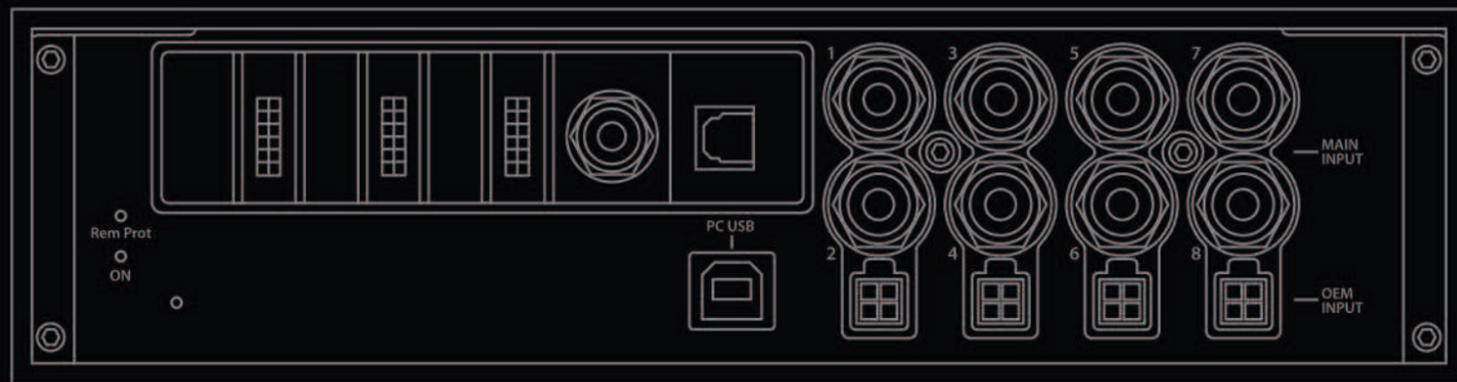
Although expensive to implement, the use of aluminum in our speakers plays a fundamental role in our design philosophy. The 10.M also implements a radial voice coil ventilation system.





# 10000 ACX - ACTIVE X-OVER/DSP

ESB introduces active crossover. Not only crossover, but true advanced full-function DSP to bring sound quality of your speakers to another level. ESB active crossover / DSP are designed for the best possible sound quality and the most versatility. It is possible to improve dramatically the sound performance in the listening environment using crossover functions for the speakers, EQ and time delay for compensation. We now provides a perfect line of signal path to the speakers and through the listening area.



## Digital Control Program

The GUI of the DSP has been designed to be simple and intuitive for everyone. It is divided into three main sections which are the front, the rear and the effects. The main screen provides simultaneous viewing of all 16 channels with all adjustments. It is a summary screen for fine adjustments made channel by channel, while dedicated pages for each major function allow you to focus on one function and conveniently set all the channels together.

Still other pages will allow you to make true phase adjustments to a channel when needed, using all-pass filters, and to compensate for active equalization in OEM systems for seamless sound at all volume levels using volume sensitive equalization. This is especially useful in many cars that reduce the level of bass frequencies at higher volume.

## Crossover, Dealey, EQ and more

The crossover page makes crossover setting easy and clear. You can choose the filter style you want and the slope (from 6dB~48dB). The graphs at the right will always show all the crossovers for each section, and the large graph below will always show the active channel's crossover.

The Delay/Polarity page allows you to set the signal delay for each channel. You can also set the polarity of each speaker to make sure they are all in phase with each other. Each channel can be assigned to one of three delay groups so a group of speakers can be moved (in time) together during fine tuning.

The EQ page holds the Equalizer Graph. Each of the channels 1~12 has 30 parametric filters, and the channels 13~16 have 6 parametric filters each. The filters can be put at any frequency and the Q of each is variable from 0.5 to 15. The filters allow the gain to be applied from +6dB to -15dB. When a channel is chosen the graph of that channel is always displayed. You can also pick any other channels to be displayed along with the active channel.

You can also set the Input/Output Matrix to determine which input will be used for each output, the AP/Phase with all pass filters to give the complete control of phase, and VSEQ to correct factory bass roll-off seamlessly with a graduated change.



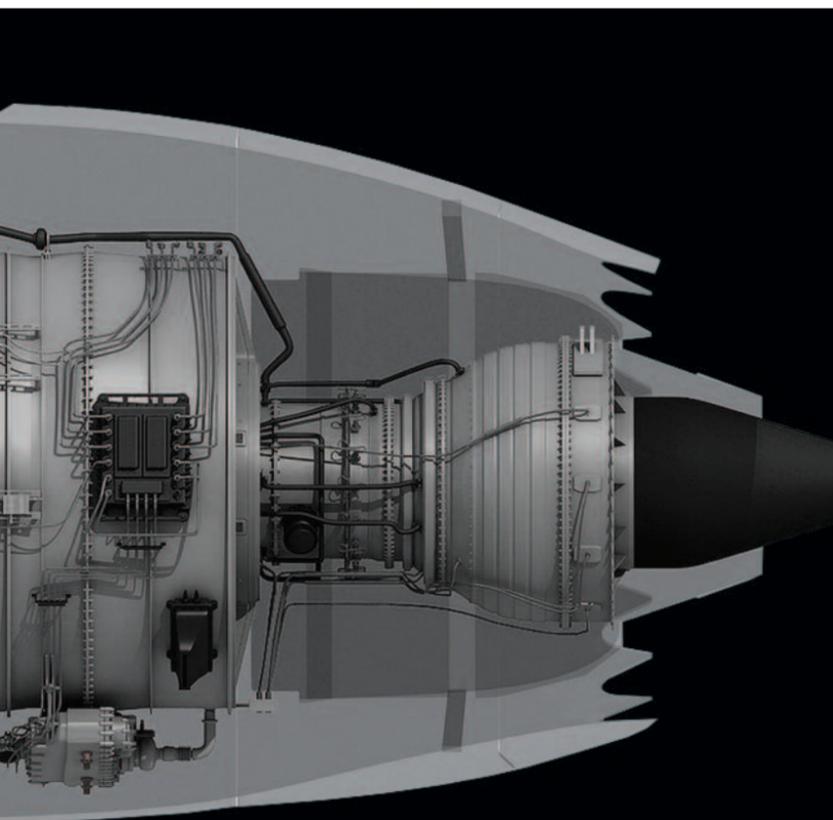
## 9000 Series

Most advanced aircraft engine  
and speakers technology

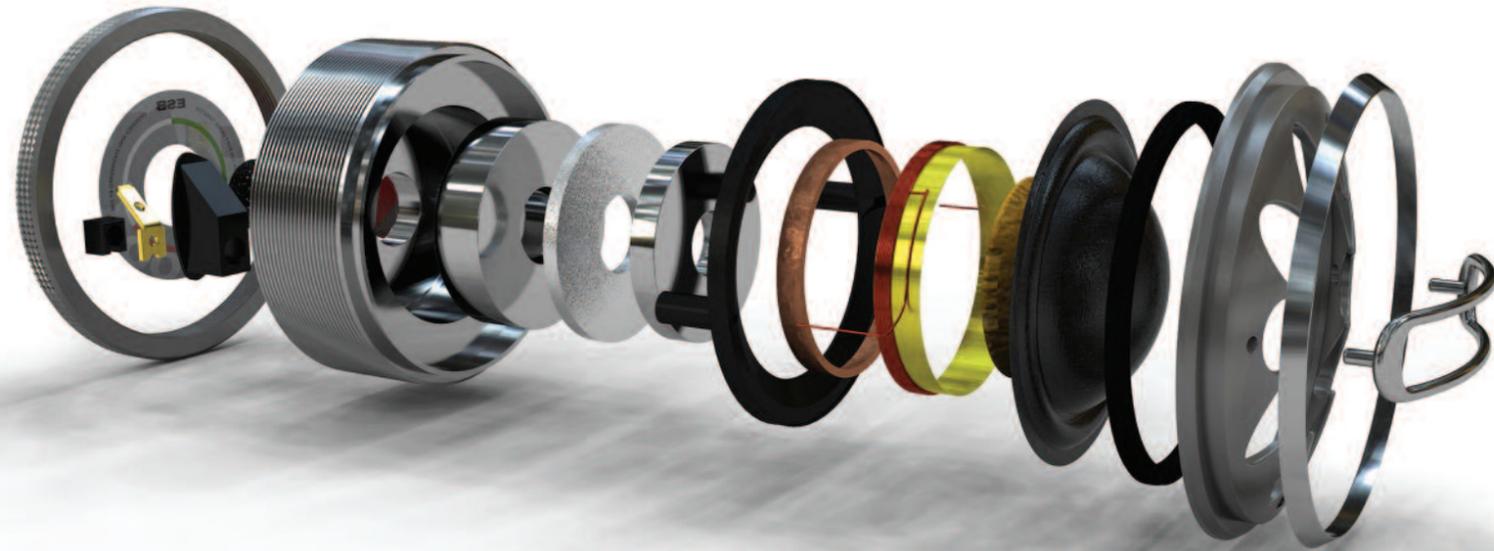


Technology and design come together in a new and unusual aesthetic, thanks to the particular flower shape of the flanges around the speaker dome, then also in the baskets of the cone speaker. But the particular shape is born of an aesthetic factor. It is an expression of an innovation that requires that the acoustic refraction on the edges of the dome speakers (which have normally large dispersion) may be less damaging if the board is not equidistant from the dome's center, but varies discontinuously according to the new design of the 9000 series speakers.

An analogy can be found in the new Rolls Royce engines for the last aircraft that reproduce the same form on the back edge (precisely where the air comes out and where they form the major turbulence). With the new design these engines have achieved great advantages such as reducing the noise in the cabin (about 10dB) and the reduction of fuel consumption (about 10%). This is not just a random analogy, both are constructive choices and both came from the same premise: Reduce the harmful turmoil in the edge of the speakers.

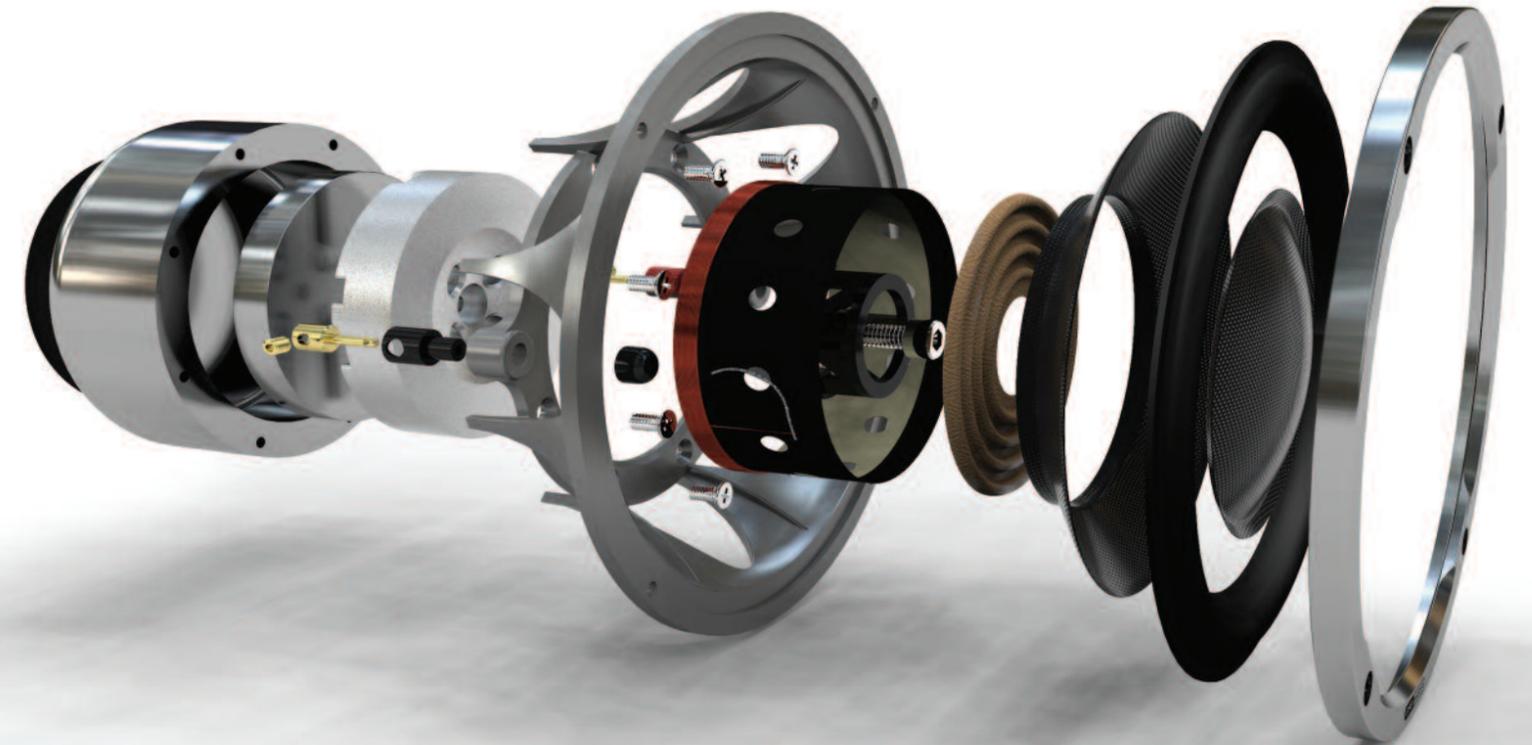


# A LOOK INSIDE



## Tweeter

- Dust filter to linearize the impedance peak and making the impedance module more linear and homogeneous for passive crossover and amplifier advantage.
  - Plastic "stopper" for fixing the gold-plated fast-on terminal.
- Low carbon steel pole piece. Worked with very high precision CNC machines in order to use very tight tolerances to increase efficiency, power and performance. The large mass helps to reduce the temperature so that the tweeter can work safely. All magnetic group has been designed with the help of sophisticated FEM software in order to optimize performance and reduce distortions.
- Neodymium high grade and high temperature magnet (tweeter) ensures great magnetic force even after hours of use when the tweeter will be hot (the degree of neodymium exceeds 120°).
- The "butterfly" is the mobile unit holder drawing to obtain perfect dimensional stability. It guarantees coaxial of all parts with very low tolerances, this reduces distortion and improves performance.
- Damper under the dome made of pure long fiber wool, the best material to absorb to attenuate medium and high frequencies.
- Laminated aluminum former with CCAW wire for perfect balance on power handling and weigh. This voice coil is very light and can work easy over 20 KHz. Aluminum on former guarantee a fast transient response and a very natural sound.
- Light semi-transparent silk is a perfect combination of lightness and rigidity and today it is probably the best material for an extremely realistic musical reproduction.
  - Pure natural felt ring just over the dome surround helps to damp reflection for a better focus of sound stage.
- Special front plate design is energized for controlling side tweeter reproduction, reducing car glass reflection and creating a wider listening angle.



## Midrange and Woofer

- CNC aluminum cover of the magnetic motor.
  - 99.9% pure copper Faraday ring inside the voice coil reduces coil inductance of about 90% and this is the reason why this midrange can work perfectly at very high frequency, drastically reducing II/III harmonic distortions.
- High grade neodymium dual magnets ensures great magnetic force even after hours of use (the degree of neodymium exceeds 120°), and generates an incredible driving force for a perfect control of the coil, and an incredible speed of transient response.
- Die cast aluminum basket, extremely rigid to ensure maximum stability for all moving parts, but also very "open" to let the rear pressure of the cone pass. This ensures uniform pressure on the two faces of the cone, reducing deformations and distortion.
  - Flat Conex spider. The draw of this important part is energized for a perfect linear run on both direction.
- 25 mm (midrange), 75 mm (woofer) voice coil. Special super light material are used for this voice coil. This is the goal for a very wide extended range and an incredible power handling.
- The cone is made with real woven carbon fiber with epoxy resin. A mix about lightness and rigidity for balance long excursion run at low frequency and very high frequency response.
- Special design surround in pure NBR is a perfect and fluid continuation of cone shape to match the basket. A fluid fitting eliminates unwanted resonances and cone deformations. Even the waves standing inside the cone sell dissipated in a much better way than a traditional suspension. In addition, the thickness of the suspension is differentiated to facilitate small movements and increase the overall sound of the speaker.
  - Laminated aeronautical aluminum used for dust cup. This help the speaker at high frequency as a similar way a tweeter dome.
    - Aluminum CNC machined finishing ring helps to clamp the surround edge.

## 9.T

### 1.1"/28 mm Dome Tweeter

Silk dome tweeter.  
CNC Low carbon steel pole piece.  
High grade neodymium magnet.  
Laminated aluminum voice coil.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: N/A  
Frequency Response: 1.8 KHz ~ 22 KHz  
Sensitivity: 91.5 dB 1W/1m



## 9.M

### 4"/100 mm Cone Midrange

Real woven carbon fiber cone.  
NBR special design surround.  
Die cast aluminum basket.  
High grade dual neodymium magnets.  
Flat Conex spider. 25 mm voice coil.  
Aeronautical aluminum dust cup.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: N/A  
Frequency Response: 100 Hz ~ 5 KHz  
Sensitivity: 89.5 dB 1W/1m



## 9.W

### 6.5"/165 mm Cone Woofer

Real woven carbon fiber cone.  
NBR special design surround.  
Die cast aluminum basket.  
High grade dual neodymium magnets.  
Flat Conex spider. 75 mm voice coil.  
Aeronautical aluminum dust cup.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: N/A  
Frequency Response: 43 Hz ~ 3 KHz  
Sensitivity: 90.5 dB 1W/1m

# 9000 ACX

## Active Crossover/DSP

As for 10000 Series, ESB introduces active crossover for 9000 Series. Not only crossover, but true advanced full-function DSP to bring sound quality of your speakers to another level. ESB active crossover / DSP are designed for the best possible sound quality and the most versatility. It is possible to improve dramatically the sound performance in the listening environment using crossover functions for the speakers, EQ and time delay for compensation. We now provides a perfect line of signal path to the speakers and through the listening area.



## Full control of your speakers

The GUI provides simultaneous viewing of all channels with all adjustments. It is a summary screen for fine adjustments made channel by channel, while dedicated pages for each major function allow you to focus on one function and conveniently set all the channels together.

Still other pages will allow you to make true phase adjustments to a channel when needed, using all-pass filters, and to compensate for active EQ in OEM systems for seamless sound at all volume levels using volume sensitive equalization.

You can choose the filter style you want and the slope (from 6dB~48dB). The graphs at the right will always show all the crossovers for each section.

The Delay/Polarity page allows you to set the signal delay for each channel. You can also set the polarity of each speaker to make sure they are all in phase with each other. Each channel can be assigned to one of three delay groups so a group of speakers can be moved (in time) together during fine tuning.

The EQ page holds the Equalizer Graph. Each of the channels 1~12 has 30 parametric filters, and the channels 13~16 have 6 parametric filters each. The filters can be put at any frequency and the Q of each is variable from 0.5 to 15. The filters allow the gain to be applied from +6dB to -15dB. When a channel is chosen the graph of that channel is always displayed. You can also pick any other channels to be displayed along with the active channel.

You can also set the Input/Output Matrix to determine which input will be used for each output, the AP/Phase with all pass filters to give the complete control of phase, and VSEQ to correct factory bass roll-off seamlessly with a graduated change.





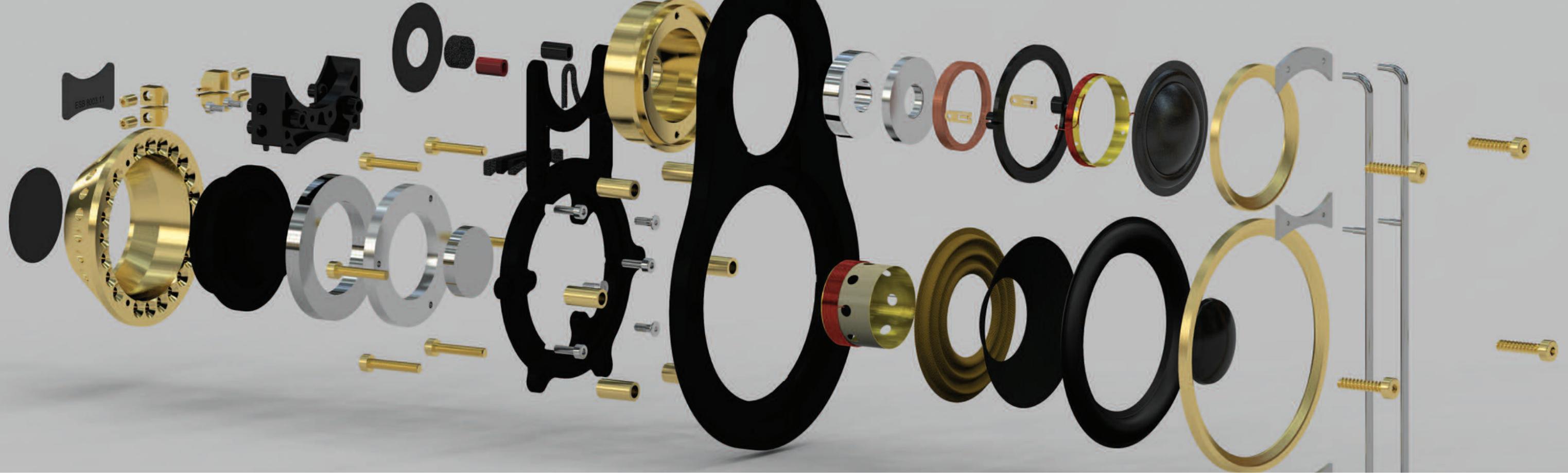
## 8000 Series

Elevated to perfection



The 8000 series can be considered the direct heir of the legendary 7000 series. The goal was to renew a variety of speakers in itself exceptional, with the help of the latest technologies and the use of the best materials available today; always with an eye to the versatility of installation. Key to the development of this type of system in the car was so take full advantage of their exceptional musicality. In the 8000 series every detail was taken care of with the utmost care, from the choice of materials to the forms, from the construction and finishing of the baskets to the ventilation systems of magnets and coils. It has improved what was thought to be difficult to improve and we strongly believe that it has laid the foundation for another decade of success.



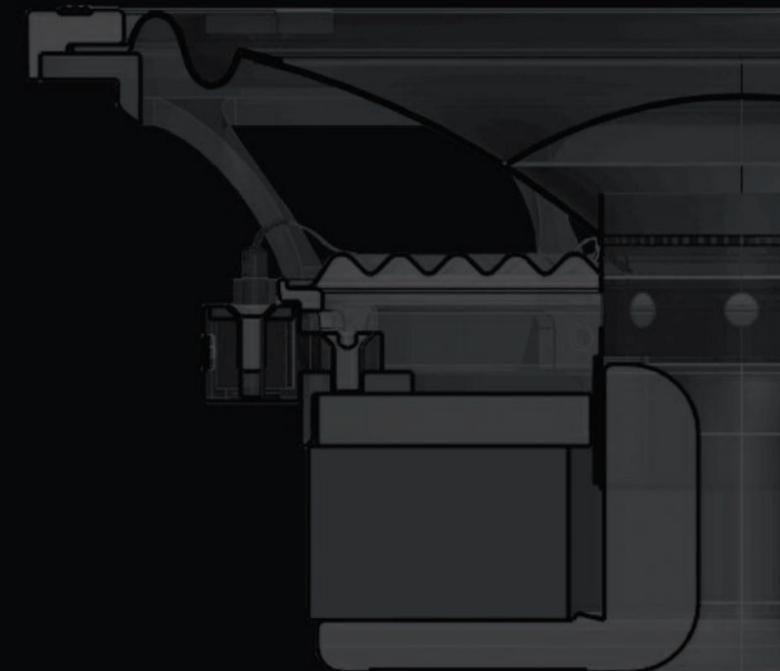


## CONSTRUCTION TECHNOLOGIES

- Most of the parts that make up the speakers have been made with the CNC process, this is very expensive and long, but ensures perfect geometry and impeccable aesthetics. A mix of precious materials such as brass, stainless steel and Avional aluminum are used together for a unique product.
- The tweeters and the midrange use a very large vented neodymium motor magnet optimized with computer simulations (FEA) to obtain a great efficiency and improve linearity along all the voice coil's excursion. Neodymium magnet is a high-grade type to kill magnetic loss at elevated temperature and concentrate more force in less volume.
- Torcon® soft dome (tweeters), of an exclusive Polyphenylene Sulfide (PPS) with a high-performance fiber that offers superb heat resistance, low weight, excellent self-damping, and a free resonance frequency response above the audible range. The semi-catenary profile on our diaphragm provides maximum stiffness at the tip of the dome.

- The center ventilation hole provides an optimal cooling of moving coil to be able to handle high power without dynamic compression and reduces the compression of the air at the back of the dome with a great reduction of distortion and extended response to lower frequency.
- A special acoustic resistance helps to control the tweeter Qts.
- Residual resonance is killed by the dB Cloth® under-dome damping material (tweeters), which extends the frequency response to the lower limits and reduces harmonic distortion.
- 25.5 mm CCAW (Copper Clad Aluminum Wire) double layer voice coil (midrange) is wound on an aluminum former for exceptional power handling and compression-free reproduction, for even the most demanding musical passages.
- The axial ventilation system ensures high thermal dissipation capacity, power handling and reliability.

- Non pressed cellulose pulp exponential cones (midrange and woofer) has a vinyl ester resin coating, ensuring a perfect balance between rigidity, weight, and self-damping. The cellulose pulp guarantees an extremely natural and linear reproduction in all musical passages, with an excellent extension at high frequencies without audible break-up. An aluminum dust cup fixed directly on voice coil former, increases and linearizes the extreme top of bandwidth.
- The exclusive rubber surround offers maximum linearity of travel and high reliability in extreme conditions.
- Large Conex™ spider (midrange and woofer) allows a smooth and gentle run at low excursions, and gently holds the cone at high excursions, this increases the useful range of use.
- The CNC aluminum basket ensures a drastic reduction of the cone's back reflections and a great torsional rigidity. These are a goal for perfect parts alignment.





## The UMA unit, since 70's to today

This special and exclusive component driver is a concept born way back in 70's, its aim is to concentrate midrange and tweeter emissions in a virtual single point. This minimizes phase delays and irregularities at the crossover point. All the parts that make up this component have been made with the CNC process. This is very expensive and time consuming, but ensures perfect geometry and impeccable aesthetics. A mix of precious materials such as brass, stainless steel and Avional aluminum are used together for a unique product. Combined, the two components are able to reproduce with perfect linearity all the spectrum from 95 Hz to 25 KHz.

## Limited Edition speakers

We provide a Limited Edition for 8000 Series, entirely worked by the numerical control (CNC). This makes the structure very rigid and with practically zero tolerances to the benefit of consistent performance and maximum energy transfer with an increase in efficiency and absence of resonances.



### 8.028

#### 1.1"/28 mm Dome Tweeter

Torcon® dome tweeter.  
28 mm aluminum voice coil.  
High grade neodymium magnet.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: 110 W / 220 W  
Frequency Response: 940 Hz ~ 25 KHz  
Sensitivity: 91 dB 1W/1m



### 8.028S

#### 1.1"/28 mm Dome Tweeter

Torcon® dome tweeter.  
28 mm aluminum voice coil.  
High grade neodymium magnet.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: 110 W / 220 W  
Frequency Response: 940 Hz ~ 25 KHz  
Sensitivity: 91 dB 1W/1m

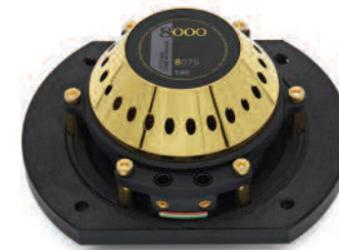


### 8.003UMA

#### 1.1"/28 mm Dome Tweeter 3"/75 mm Cone Midrange

Torcon® dome tweeter.  
NPPV™ exponential cone midrange.  
Large neodymium magnet.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: 120 W / 240 W  
Frequency Response: 95 Hz ~ 25 KHz  
Sensitivity: 91 dB 1W/1m



### 8.075

#### 3"/75 mm Cone Midrange

NPPV™ exponential cone.  
Copper and aluminum voice coil.  
Large neodymium magnet.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: 120 W / 240 W  
Frequency Response: 95 Hz ~ 16 KHz  
Sensitivity: 91 dB 1W/1m



### 8.165

#### 6.5"/165 mm Cone Woofer

Non-pressed paper cone.  
Y-35 ferrite oversized magnet.  
Large diameter voice coil.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: 160 W / 320 W  
Frequency Response: 45 Hz ~ 4 KHz  
Sensitivity: 89 dB 1W/1m

# CROSSOVER NETWORK

## 8000 ACX - Active Crossover/DSP



As for 10000 and 9000 Series, ESB introduces active crossover for 8000 Series. Not only crossover, but true advanced full-function DSP to bring sound quality of your speakers to another level. ESB active crossover / DSP are designed for the best possible sound quality and the most versatility. It is possible to improve dramatically the sound performance in the listening environment using crossover functions for the speakers, EQ and time delay for compensation. We now provides a perfect line of signal path to the speakers and through the listening area. The GUI provides simultaneous viewing of all channels with all adjustments. It is a summary screen for fine adjustments made channel by channel.

Just measure the distance from the listening position to each speaker and click Delay Calc. The system does all your signal delay calculations for you, but if needed you can re-adjust the delay as needed for your individual system.

Drop-down menus for each of the 8 output channels allow you to identify each speaker by its function. When you do that, the system will apply default crossovers, so your speakers are always protected. We expanded the crossover type to include Linkwitz-Riley, Butterworth, and Bessel, from 6 to 48dB/oct. EQ link bar allows you to link channels together for equalization. You can link them to adjust them together, or unlink them for minor changes to one channel.

The band you're using, the frequency, the level and the Q are all on display here and you can switch between GEQ and PEQ, you can temporarily bypass the EQ or you can reset the channel completely.

## 8000 Passive Crossover

These crossovers have been specifically designed for the 8000 series speaker systems, as below:  
 8.6K2CX > 2-Way speaker systems with 8.165 or 8.165 LE woofer, 8028 or 8028S tweeter (8.6K2 and 8.6K2S)  
 8.6K3CX > 3-Way speaker system with 8.165 or 8.165 LE woofer, 8075 midrange, 8028 or 8028S tweeter (8.6K3 and 8.6K3S)  
 3-Way speaker system with 8.165 or 8.165 LE woofer; 8.003UMA mid-high unit (8.6K3U)

- Multi-amp or single amp connection
- Aluminum structure machined from solid with CNC machines
- Clear acrylic cover for better ventilation and component protection
- Gold plated spacers and screws
- Gold-plated parameter adjustment jumpers for zero resistance and large diameter for ultra-high load capacity
- Air-wounded coils to minimize distortion
- Coil wire with large diameter (1.5 mm) and 99.9% pure copper
- Anti-inductive resistors with dissipating aluminum body, helps to manage very high powers in order to remain relatively cool, in this way the resistance does not vary
- Very high quality bi-metallized capacitors for maximum transparency of details in the medium and high frequencies. To increase the response speed the tweeter uses a configuration of lower value capacitors in parallel
- Compact size and practical and sturdy fixing system with 4 screws



### 8.6K2CX

#### 2-Way Passive Crossover

Multi-amp or single amp connection.  
 Air-wounded, 99.9% pure copper coils.  
 CNC aluminum structure.

Multi-amp or single amp connection  
 4 tweeter attenuation levels:  
 0; -2; -4; -6 dB  
 2 levels of adjustment for the woofer / tweeter transition zone

### 8.6K3CX

#### 3-Way Passive Crossover

Multi-amp or single amp connection.  
 Air-wounded, 99.9% pure copper coils.  
 CNC aluminum structure.

Multi-amp or single amp connection  
 4 tweeter attenuation levels:  
 0; -2; -4; -6 dB  
 4 midrange attenuation levels:  
 0; -3; -6; -9 dB  
 2 different cutting slopes for the tw, 12 or 6 dB/oct.  
 3 different midrange high pass frequencies  
 2 different cutting slopes for midrange, natural or 6 dB/oct.  
 4 levels of adjustment for the woofer / midrange transition zone





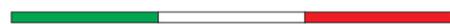
## 5000 SERIES - A LOOK INSIDE

- The carbon fiber reinforced, polymer matrix, composite dome, ensures extraordinary rigidity combined with a very low weight (tweeter and midrange).
- The 28 mm (tweeter) and 50 mm (midrange) aluminum voice coil allows the use of very high power for this kind of component.
- The dome speakers use a very large, vented neodymium motor magnet optimized with computer simulations (FEA) to obtain a greater efficiency and improve linearity along all the voice coil's excursion. Neodymium magnet is a high-grade type to reduce magnetic loss at elevated temperature.
- Great attention was paid to the axial and radial ventilation of the moving coil, this to ensure high power handling, with reduced distortion, and increased durability. The axial ventilation holes reduce the compression of the air at the back of the dome with greatly reduced distortion and extended response into lower frequencies.
- All motor parts are made by CNC process. This gives tighter tolerances and improved performance.
- Residual resonances are killed by the under-dome, dB Cloth® damping material, this extends the frequency response to the lower limits and reduces harmonic distortion.
- The eight twin-spoke anti-resonant and self-extinguishing carbon fiber reinforced ABS frame (woofer), ensures a drastic reduction of the cone's back reflections. The frame design assures high structural and torsional rigidity. This is the goal for perfect parts alignment and very tight construction tolerances.
- The carbon fiber reinforced, polymer matrix composite, exponential cone ensures an extraordinary rigidity combined with a very low weight. The exclusive ESB design of the TSW (Twin Symmetrical Wave) rubber suspension allows an excursion with perfect progression and linearity. This feature ensures natural low-frequency reproduction at low as well as at high volume.



## 5000 Series

Elegance and Technology, all Italian



The philosophy of this project is to create a loudspeaker system with an extremely high transient response (dynamic), in order to obtain a music reproduction with a more realistic impact and involvement. To achieve this, the main goal was to reduce the moving masses in order to make the mobile part of the loudspeaker light and fast in its movements, favoring the sudden variations of movement transmitted by the piece of music through the amplifier.



### 5.028

**1.1"/28 mm Dome Tweeter**

Carbon fiber dome.  
Fixed radius hemispherical dome shape.  
High rigidity aluminium structure.  
Neodymium magnet.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: 110 W / 220 W  
Frequency Response: 900 Hz ~ 25 KHz  
Sensitivity: 91 dB 1W/1m



### 5.050

**2"/50 mm Dome Midrange**

Carbon fiber dome.  
Fixed radius hemispherical dome shape.  
High rigidity aluminium structure.  
Neodymium magnet.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: 120 W / 240 W  
Frequency Response: 500 Hz ~ 6 KHz  
Sensitivity: 91 dB 1W/1m



### 5.165

**6.5"/165 mm Cone Woofer**

Carbon fiber cone.  
Y-35 ferrite oversized magnet.  
Large diameter voice coil.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: 160 W / 320 W  
Frequency Response: 50 Hz ~ 3.5 KHz  
Sensitivity: 92 dB 1W/1m



### 5.UMA

**1.1"/28 mm Dome Tweeter  
2"/50 mm Dome Midrange**

Carbon fiber dome.  
Fixed radius hemispherical dome shape.  
High rigidity aluminium structure.  
Neodymium magnet.

Nominal Impedance: 4 Ohm  
Nominal / Transient Power: 120 W / 240 W  
Frequency Response: 500 Hz ~ 25 KHz  
Sensitivity: 91 dB 1W/1m



### 5.6K3CX

**3-Way Passive Crossover**

Passive Crossover for 3-Way Systems.  
Polypropylene or Mylar dielectric capacitors.  
Oversized non-inductive resistors.

High Frequency Level: 0/-3 dB  
Mid Frequency Level: 0/-2 dB



### 5.6K2CX

**2-Way Passive Crossover**

Passive Crossover for 2-Way Systems.  
Polypropylene or Mylar dielectric capacitors.  
Oversized non-inductive resistors.

High Frequency Level: 0/-2 dB



## 3000 Series

Research at the highest level



The ESB 3000 speaker system was developed as a series of speakers and passive crossover networks. All components have been developed and assembled with a great commitment in the research and development of materials and engineering solutions of the highest level, with great attention to detail.

The baskets have been engineered in order to obtain the maximum in terms of torsional rigidity (bending). Pressed paper with waterproof treatment are the best marriage of lightness, stiffness and the ability of the cone to dampen any unwanted vibration.

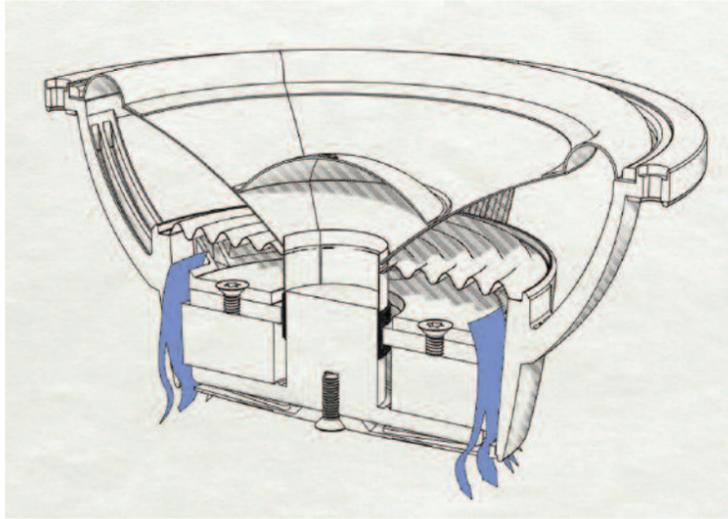
All the woofers are equipped with a motor with a grade Y-35 Ferrite magnet, with significantly higher performance than the classic "standard" ferrite magnets.

The tweeters use a silk-impregnated thin fabric dome diaphragm for a smooth sound, and oversized voice coils, ventilated and damped with iron-fluid oil. Both tweeters are supplied with accessories that offer great flexibility in positioning and installation.



### Woofer, midrange and widerange cones

It is widely recognized that cones made of paper are the best marriage of lightness, stiffness and the ability of the cone to dampen any unwanted vibration (read: distortion). The paper cone, widely known for its excellent sound attributes, is waterproof, thanks to a polymer developed exclusively by ESB. The treatment does not change the appearance and parameters of the speaker like the shiny polymers that add an appreciable amount of mass to the cone itself and significantly modify the sonic result. The treatment protects the cone from water dripping (like inside a door panel), as well as accidental splashes on the front of the cone.



### Basket and ventilation system

The ABS basket, reinforced with fiberglass, have been engineered in order to obtain the maximum in terms of torsional rigidity (bending), but at the same time offer the minimum resistance to the passage of air displaced by the cone from the rear face. This is clearly visible from the numerous stiffeners and ribs. The basket plays a fundamental role in aligning the coil in the magnetic circuit, its rigidity is crucial. A factor of no secondary importance is the damping of this component, often metal baskets tend to resonate, and this significantly alters the final sound result of the speaker. The material used, in addition to not being as sensitive to thermal changes, is non-flammable, and also non-resonant. In addition, the ABS frame allows for a better clamping force torque than typical pressed steel frames and ensures that the voice coil remains well centered within the magnetic field.

### Suspension

High Damping Single Wave Perbunan Rubber. The Perbunan rubber edge is much more stable when the temperature changes than the classic rubber, its range of use goes from -20 ° to + 100 ° while maintaining its elasticity performance almost constant.

Its profile ensures a dual function of high damping and great transversal stability, this means that the cone is "forced" only to the vertical movement, eliminating the transversal movements that could cause contact with the coil and the magnet, this means that these speakers can operate safely at high power and high excursions.

### Centering

The centering device (spider) is that yellow / brown wavy component that connects the cone-voice coil assembly to the basket. ESB's research and development department has spent a lot of time researching the ideal shape of this fundamental component which must guarantee the perfect and linear travel of the cone at both low and high power, but must limit its excursion before it can get out of control. .

The material used is a special balanced cotton impregnated with phenolic resin. Its undulations ensure a perfectly symmetrical excursion already from the first mW of power, and then attenuate it when it reaches the value of Xmax. The design of this component, integrated with that of the basket, ensures perfect ventilation of the voice coil, evacuating the heat from the lower part of the speaker, and at the same time avoids any counter-pressure given by the movement of the cone, ensuring perfect linearity of movement in both directions.

### Moving coil

The voice coil of the woofers uses an aluminum support and a winding with a double layer technology of copper wire with an aluminum core. The diameter for the 3.165 and 3.69 woofers is 25 mm, 21 mm for the 3.90 medium and 20 mm for the 3.65 widerange. The long stroke design was chosen to improve sensitivity and efficiency while keeping distortion to a minimum.

### The magnetic motor

All these speakers are equipped with a motor with a grade Y-35 Ferrite magnet, a type of magnet with significantly higher performance than the classic "standard" ferrite magnets, this ensures greater ease of management of the power applied to the speaker and a its superior efficiency. The metal parts of the engine use low carbon steel and have been designed to obtain the maximum magnetic saturation, this guarantees the best electroacoustic parameters as the eddy currents that are generated by the movement of the cone are largely canceled.

### Tweeter

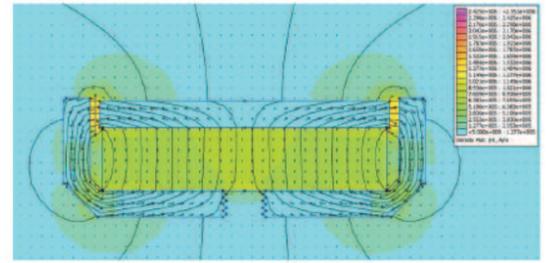
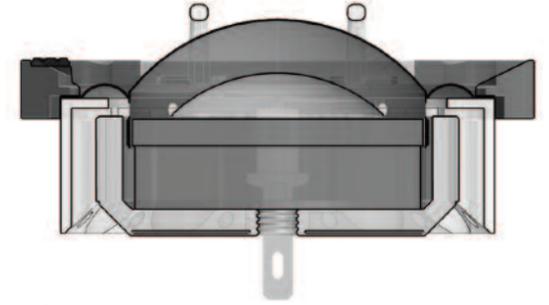
The 3000 series tweeters use a silk-impregnated thin fabric (3.25) and Torcon® (3.28) dome for a smooth, smooth sound, with an outer suspension of the same material but covered with a high-loss damping material to eliminate edge vibration and resonance. The dome is of extremely low mass and is much less susceptible to mechanical deformation than other models, yet it provides a smooth, linear and very extended response.

Two 28 and 25 mm voice coils for the two tweeters respectively. Both on aluminum support and very light copper-coated aluminum wire. The coils are ventilated and damped with iron-fluid oil. "Classic" system for the 3.25 tweeter, while ventilated with anti-resonance chambers for the 3.28 model.

Both use high-grade neodymium magnets such as N-42, optimized with computer simulations to get better efficiency and improve linearity, to ensure greater and better power management and increase the bandwidth and efficiency.

The special ventilation design, SVS (Surround Vented System) provides two benefits: optimal cooling of moving coil to be able to handle high power without dynamic compression and avoiding compressing the air at the back of the dome, with a great reduction in distortion and extending response to lower frequency.

Both tweeters are supplied with accessories that offer great flexibility in positioning and installation. A practical "cup" allows mounting above the dashboard or above the pillar using different type of orientation.



## 3.65 A special speaker

The 3.65 wide-range speaker is designed to operate in a 3-way system, with a woofer and a tweeter, or in two way system where it can where it can replace the tweeter. This speaker was born from our long experience in mid-high drivers and benefits from our most advanced development tools and a comprehensive commitment to precision manufacturing.

Conceived and purpose-built from the ground up, it offers exceptional transient response and outstanding linearity, resulting in unsurpassed clarity and natural mid-range reproduction. Distortion and non-linearities have been minimized through critical optimization of dynamic motor and suspension behaviors.

The CNC aluminum center plug allows control, linearization and an increase in extension of the high frequencies. Its properly calculated sharp-edges determine refraction that linearize and extend the spectrum of reproducible frequencies. The 20 mm voice coil offers good power handling capability, and its reduced mass allows this component to be pushed well beyond the 20 KHz threshold.



## Convertible speakers

The 3000 series includes two convertible speakers, with a 6.5"/165 mm or a 6x9"/150x230 mm woofer, and a 1"/25 mm dome tweeter. By removing the tweeter from the woofer, it allows the system to transform from a coaxial system to a separate 2-way system.



**3.165C**

**2-Way Convertible Speaker System**

Convertible Speaker with 6.5"/165 mm Woofer, 1"/25 mm Dome Tweeter and a 2-Way Crossover.



**3.69C**

**2-Way Convertible Speaker System**

Convertible Speaker with 6x9"/150x230 mm Woofer, 1"/25 mm Dome Tweeter and a 2-Way Crossover.

**ABS phase plug**

When using the woofer in "component" mode, the tweeter support is replaced by mounting an ABS phase plug on the pole piece. This detail is essential to focus the high frequency information in the center of the cone. The ABS phase plug innovative design ensures that the speaker response remains linear at mid-high and high frequencies. Its concavities arranged on a very open angle help to increase linearity even at accentuated listening angles. This is very important for the reproduction of the medium and medium-high range when the woofer is installed in the lower part of the door.



**3.69**

**6x9"/150x230 mm Woofer**

Treated Paper cone.  
ABS basket reinforced with fiberglass.  
High-grade Y35 Ferrite magnet.



**3.65**

**2.5"/65 mm Cone Widerange**

Treated Paper cone.  
ABS basket reinforced with fiberglass.  
High-grade Y35 Ferrite magnet.



**3.UMA**

**1"/25 mm Dome Tweeter  
2.5"/65 mm Cone Midrange**

2-Way Mid-High Unit with 2.5"/65 mm Midrange and 1.1"/28 mm Tweeter.



**3.165**

**6.5"/165 mm Cone Woofer**

Treated Paper cone.  
ABS basket reinforced with fiberglass.  
High-grade Y35 Ferrite magnet.



**3.28**

**1.1"/28 mm Tweeter**

28 mm voice coil.  
Ventilated chamber.  
N42 Neodymium magnet.



**3.6K3UCX**

**3-Way Passive Crossover**

Passive Cx for 3-Way Systems.  
High thickness PCB copper.  
**Alu E-Cap capacitor**

**3.6K3CX**

**3-Way Passive Crossover**

Passive Cx for 3-Way Systems.  
High thickness PCB copper.  
Not inductive ceramic resistors.



**3.90**

**3.5"/90 mm Cone Midrange**

Treated Paper cone.  
ABS basket reinforced with fiberglass.  
High-grade Y35 Ferrite magnet.



**3.25**

**1"/25 mm Tweeter**

25 mm voice coil.  
Ventilated chamber.  
N42 Neodymium magnet.



**3.6K2CX**

**2-Way Passive Crossover**

Passive Crossover for 2-Way Systems.  
High thickness PCB copper.  
Not inductive ceramic resistors.



## 2000 Series

A reference product for your category



The 2000 Series is range of speakers with great performance, as well as easy to install. The ABS woofer has mechanical high resistance, superior to traditional metal baskets. The pressed paper cone assures the best balance between performance, resistance and stability, with high internal damping factor (low distortion). The dome of the tweeter is made of silk fabric, impregnated with phenolic resins with integrated suspension. A special magnetic oil absorbs any unwanted vibrations and at the same time improves heat exchange between the coil and the metal body, ensuring superior power management.

### A look inside

#### Tweeter

The 2000 series tweeters use a silk-impregnated thin fabric dome diaphragm for a smooth, smooth sound, with an outer suspension of the same material but covered with a high-loss damping material to eliminate edge vibration and resonance. The dome is of extremely low mass and is much less susceptible to mechanical deformation than other models, yet it provides a smooth, linear and very extended response.

The 28 mm voice coil has an aluminum support and very light copper-coated aluminum wire, ventilated and damped with iron-fluid oil and with anti-resonance chambers. The special ventilation design, SVS (Surround Vented System) provides optimal cooling to be able to handle high power and avoiding compressing the air at the back of the dome, with a great reduction in distortion.

High-grade neodymium magnets such as N-42, is optimized with computer simulations to get better efficiency and improve linearity, to ensure greater and better power management and increase the bandwidth and efficiency.

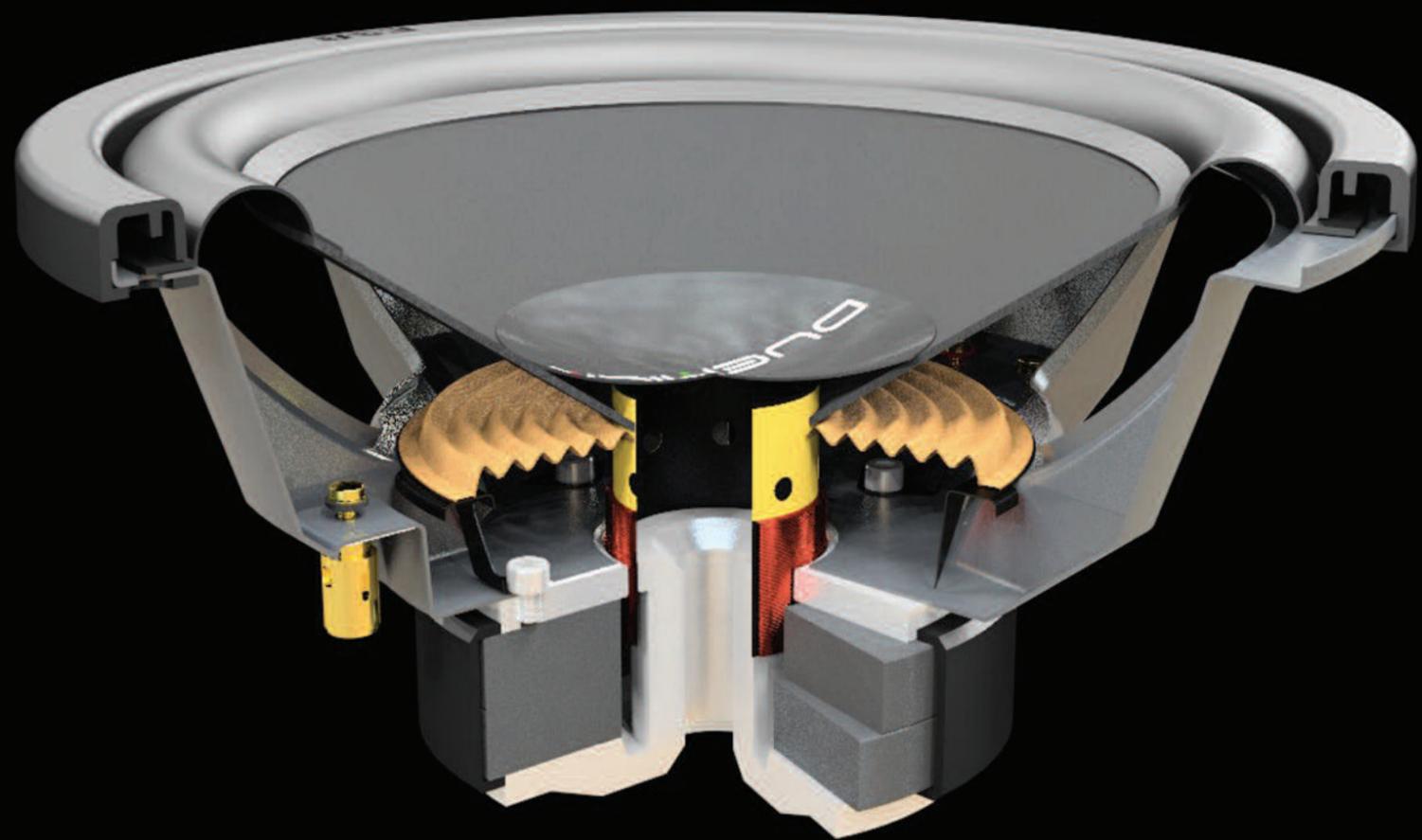
#### Woofer

Cones made of paper are the best marriage of lightness, stiffness and the ability of the cone to dampen any unwanted vibration. The Perbunan rubber ensures a dual function of high damping and great transversal stability, this means that the cone is "forced" only to the vertical movement, eliminating the transversal movements that could cause contact with the coil and the magnet. The 25 mm voice coil of the woofer uses an aluminum support and a winding with a double layer technology of copper wire with an aluminum core.

The ABS basket, reinforced with fiberglass, have been engineered in order to obtain the maximum in terms of torsional rigidity (bending), but at the same time offer the minimum resistance to the passage of air displaced by the cone from the rear face. The material used, in addition to not being as sensitive to thermal changes, is also non-resonant. In addition, the ABS frame allows for a better clamping force torque than typical pressed steel frames and ensures that the voice coil remains well centered within the magnetic field.

All these speakers are equipped with a motor with a grade Y-35 Ferrite magnet, with significantly higher performance than the classic "standard" ferrite magnets, this ensures greater ease of management of the power applied to the speaker and a its superior efficiency. The metal parts of the engine use low carbon steel and have been designed to obtain the maximum magnetic saturation, this guarantees the best electroacoustic parameters as the eddy currents that are generated by the movement of the cone are largely canceled.





# SUBWOOFERS

- Motor made of very low carbon steel for the highest magnetic permeability, resulting in a greater magnetic flux on the coil with benefits on de-traction, power and efficiency.
- Processing of the plates with numerical control machines to decrease tolerance and in this way increase the efficiency and consistency of quality.
- Y30 grade ferrite magnets, a high level material, normally used on higher category products.
- Motor design optimized to reduce the eddy currents generated by the movement of the voice coil. With this design the distortion decreases dramatically.
- Support of the voice coil in Kapton®, a synthetic material invented for space use able to withstand very high temperatures without deforming and at the same time having a very low mass.
- The VC is wound on 4 layers of copper wire for an extra long stroke.
- The spider is made of Conex®, a semi synthetic material that maintains an excellent constancy of elasticity over time in order to have optimal performance even after years of intense use.
- Steel was chosen for the basket, but with a shape designed to obtain a rigidity equal to aluminum.
- An additional internal stiffening ring connects the spider directly to the motor, this prevents unwanted vibrations from reaching the cone through the basket.
- A rubber perimeter ring finishes the 8 fixing points and at the same time acts as a sealing gasket.
- Treated cellulose pulp cone gives excellent damping for deep, detailed bass.



**2.200**  
8"/200 mm SVC Subwoofer

4-layers single voice coil  
Kapton® VC support  
High grade Y30 magnet  
Low carbon steel motor  
Long travel rubber surround  
Treated cellulose pulp cone

**2.200+**  
8"/200 mm DVC Subwoofer

4-layers dual voice coil  
Kapton® VC support  
High grade Y30 magnet  
Low carbon steel motor  
Long travel rubber surround  
Treated cellulose pulp cone



**2.250**  
10"/250 mm SVC Subwoofer

4-layers single voice coil  
Kapton® VC support  
High grade Y30 magnet  
Low carbon steel motor  
Long travel rubber surround  
Treated cellulose pulp cone

**2.250+**  
10"/250 mm DVC Subwoofer

4-layers dual voice coil  
Kapton® VC support  
High grade Y30 magnet  
Low carbon steel motor  
Long travel rubber surround  
Treated cellulose pulp cone



**2.320+**  
12"/320 mm DVC Subwoofer

4-layers dual voice coil  
Kapton® VC support  
High grade Y30 magnet  
Low carbon steel motor  
Long travel rubber surround  
Treated cellulose pulp cone

## Enclosed Subwoofers

With our new boxes, we provide our subwoofers with the right box to express themselves at their best. Designed and built with MDF and high precision cutting machinery, and finished with carpet or synthetic leather.

### 2.250 BOX

2.250 with Carpet Box and Embroidered Logo

### 2.200+ BOX

2.200+ with Carpet Box and Embroidered Logo

### 2.250+ BOX

2.250+ with Carpet Box and Embroidered Logo

### 2.200+ LUXB

2.200+ with PU (Synthetic Leather) Coated Box

### 2.250+ LUXB

2.250+ with PU (Synthetic Leather) Coated Box

### 2.320+ LUXB

2.320+ with PU (Synthetic Leather) Coated Box

# SPEAKER SYSTEMS

2-Way and 3-Way suggested speaker systems of actual and incoming series.

10000



**10.6K3**

**3-Way Speaker System**

**10.W:** 6.5"/165 mm Cone Mid-Woofer  
**10.M:** 4"/100 mm Cone Midrange  
**10.TB:** 1.75"/45 mm Beryllium Tweeter  
**Crossover:** Active DSP, optional

9000



**9.6K3**

**3-Way Speaker System**

**9.W:** 6.5"/165 mm Cone Mid-Woofer  
**9.M:** 4"/100 mm Cone Midrange  
**9.T:** 1.1"/28 mm Dome Tweeter  
**Crossover:** Active DSP, optional

8000



**8.6K3U**

**3-Way Speaker System with UMA**

**8.165:** 6.5"/165 mm Cone Mid-Woofer  
**8003.UMA:** 3"/75 mm Cone Midrange,  
 1.1"/28 mm Dome Tweeter  
**Crossover:** Active DSP or Passive, optional

**8.6K3**

**3-Way Speaker System**

**8.165:** 6.5"/165 mm Cone Mid-Woofer  
**8.075:** 3"/75 mm Cone Midrange  
**8.028:** 1.1"/28 mm Dome Tweeter  
**Crossover:** Active DSP or Passive, optional

**8.6K2**

**2-Way Speaker System**

**8.165:** 6.5"/165 mm Cone Mid-Woofer  
**8.028:** 1.1"/28 mm Dome Tweeter  
**Crossover:** Active DSP or Passive, optional

8.6K3 and 8.6K2 come also with 8.028S squared tweeter (Speaker Systems are **8.6K3S** and **8.6K2S**)

5000



**5.6K3U**

**3-Way Speaker System with UMA**

**5.165:** 6.5"/165 mm Cone Mid-Woofer  
**5.UMA:** 2"/50 mm Dome Midrange,  
 1.1"/28 mm Dome Tweeter  
**Crossover:** optional

**5.6K3**

**3-Way Speaker System**

**5.165:** 6.5"/165 mm Cone Mid-Woofer  
**5.050:** 2"/50 mm Dome Midrange  
**5.028:** 1.1"/28 mm Dome Tweeter  
**Crossover:** optional

**5.6K2**

**2-Way Speaker System**

**5.165:** 6.5"/165 mm Cone Mid-Woofer  
**5.028:** 1.1"/28 mm Dome Tweeter  
**Crossover:** optional

3000



**3.6K3U**

**3-Way Speaker System with UMA**

**3.165:** 6.5"/165 mm Cone Woofer  
**3.UMA:** 2.6"/65 mm Cone Midrange,  
 1"/25 mm Dome Tweeter  
**Crossover:** optional

**3.6K3**

**3-Way Speaker System**

**3.165:** 6.5"/165 mm Cone Woofer  
**3.90:** 3.5"/90 mm Cone Midrange  
**3.28:** 1.1"/28 mm Dome Tweeter  
**Crossover:** optional

**3.6K2**

**2-Way Speaker System**

**3.165:** 6.5"/165 mm Cone Woofer  
**3.28:** 1.1"/28 mm Dome Tweeter  
**Crossover:** optional

**3.69K2.5**

**2-Way Speaker System**

**3.69:** 6 x 9"/152 x 228 mm Cone Woofer  
**3.65:** 2.5"/65 mm Cone Midrange

**3.69C**

**2-Way Convertible Speaker**

6 x 9"/152 x 228 mm Cone Woofer  
 1"/25 mm Dome Tweeter  
**Crossover:** included

**3.165C**

**2-Way Convertible Speaker**

6.5"/165 mm Convertible Woofer  
 1"/25 mm Dome Tweeter  
**Crossover:** included

2000



**2.6K2 HF**

**2-Way High-Efficiency Speaker System**

**2.165HF:** 6.5"/165 mm Cone Mid-Woofer  
**2.28:** 1.1"/28 mm Dome Tweeter  
**Crossover:** included

**2.6K2**

**2-Way Speaker System**

**2.165:** 6.5"/165 mm Cone Mid-Woofer  
**2.028:** 1.1"/28 mm Dome Tweeter  
**Crossover:** included



## CAR SPECIAL

Get the best audio  
replacing your original speakers.



All the Special Car speakers are different from the other ESB Car Audio speakers. Not different for sizes and dimensions only. Different because of the technology used to match limited spaces and low power factory amplifiers. They have high grade neodymium magnets, lighter cones, lighter, rigid aluminum baskets, and a new voice coil complex. Each model has a dedicated adapter to match exactly the space requirement and mounting holes. All the speaker connections are plug and play with the original factory wires. Then each speaker is equalized for the specific car's environment by an individually designed crossover.





THE FIRST SPECIAL SPEAKERS, A NEW PROJECT, WAS MADE FOR THE AUDI CARS. AFTER AN INTENSIVE DEVELOPMENT PROCESS, NOW WE HAVE A FULL LINE OF HIGH PERFORMANCE SPEAKERS.



**A6 FRONT 200**  
Front Speaker System for Audi A6

**A6-F81:** The A6-F81 uses the ESB CS-W81 8"/20 cm component woofer, with special adaptor to fit the Audi A6 original woofer housing in the front seats.  
**A6-FTW1:** The A6-FTW1 uses the ESB CS-T31 1.2"/3.2 cm component tweeter, with special adaptor to fit the Audi A6 original tweeter housing in the front seats.  
**A6-FTW1-C1:** ESB A6-FTW1 dedicated crossover.



**A4/Q5 FRONT 200**  
Front Speaker System for Audi A4/Q5

**A4-F81:** The A4-F81 uses the ESB CS-W81 8"/20 cm component woofer, with special adaptor to fit the Audi A4/Q5 original woofer housing in the front seats.  
**A4-FTW1:** The A4-FTW1 uses the ESB CS-T31 1.2"/3.2 cm component tweeter, with special adaptor to fit the Audi A4/Q5 original tweeter housing in the front seats.  
**A4-FTW1-C1/Q5-FTW1-C1:** ESB A4-FTW1 dedicated crossover.

# AUDI SPECIAL SPEAKERS



The first Special speakers, a new project, was made for the Audi cars. Audi A4, Audi A6 and Q5. The ESB team found immediately problem to match the unique Audi speaker's housing and the original amplifier (with too low power to drive properly high quality speakers). It was not possible to change the amplifier, integrated in the car electronic system with own Most bus and DSP, then the challenge was to develop new higher quality speakers with same or more efficiency of the originals. The depth of the speaker housing was also very limited (only a few centimeters), than it was impossible to adapt cone speakers with traditional voice coils and magnet group. Then we developed new speakers (in the 8" and 6.5" size), with neodymium magnet and special voice coil group. The name of that speakers are ESB CS-W81 and ESB CS-W61, and you will find also in other cars. That speakers have low depth and can be adapted with special car's adapters (in elegant aluminum Ferrari red color) to match exactly the car spaces. Also the connectors can match the original car wire's connectors, plug and play. With the 8" and 6.5" speakers, for the Audi we made two new tweeters also, the 1.2" ESB

CS-T31 and the 1" ESB CS-T21. Also these two tweeters you will see used for other cars. All the speakers included in the Car Kits have a different name because are supplied in the kit just integrated with the car adapters. So the ESB CS-W81 become ESB A6-F81 used in the front of the Audi 6 and become ESB A4-F81 used in the front of the Audi 4 and Audi Q5. The same for the other Audi speakers.

Like for the front and rear speakers also the subwoofer was difficult to produce to replace the original with exactly the same problems (the original space got in the top of the car boot is too limited). Then the ESB team decided to produce an amplified subwoofer to be installed in the car trunk with its dedicated box. We used a special wood box, covered with synthetic leather, and with a 400 watts amplifier inside (the amplifier is produced from the Zapco company). But was also developed a very unique subwoofer (the ESB CS-W10S1), very shallow, to have a box with limited depth. That box match perfectly the Audi A6 and Audi A4 trunk, and can be used also in the Audi Q5.



**A6/A4/Q5 REAR 165**  
Rear Speaker System for Audi A6/A4/Q5

**A6/A4-R61:** The A-R61 uses the ESB CS-W61 6.5"/16.5 cm component woofer, with special adaptor to fit the Audi A4/Q5 original woofer housing in the rear seats.  
**A6/A4-RTW1:** The A-RTW1 uses the ESB CS-T21 1"/2.5 cm component tweeter, with special adaptor to fit the Audi A4/Q5 original tweeter housing in the rear seats.  
**A6/A4-RTW1-C1:** ESB A-RTW1 dedicated crossover.

**AUDI SUB 1**  
Amplified Subwoofer for Audi

The Audi SUB contains the ESB CS-W10S1 10"/25 cm component subwoofer in a sealed enclosures. We used a special wood box covered with synthetic leather, and with a 400 watts amplifier inside (the amplifier is produced from the Zapco company). The speaker driver is a very unique subwoofer (the ESB CS-W10S1), very thin, to have a box with limited depth. That box match perfectly the Audi A6 and Audi A4 trunk, and can be used also in the Audi Q5.

# BMW SPECIAL SPEAKERS

The most important original speakers of the BMW series 5 cars is the front audio system (1" tweeters and 4" midranges) and the 8" subwoofers under the front seats. The BMW three way audio kit is today produced from many brands and also the ESB did it in the 2013. Now ESB introduces the new audio system, made with the Ferrari red color. A real "Special Car" system.

The 1" tweeter ESB BMW-FTW1 is just the ESB CS-T21 used also for the Audi car, just in one different adapter and with BMW connector, of course. The 4" midrange ESB BMW-F41 uses the ESB CS-M41 that is a new midrange developed for the BMW. Like the tweeter, this midrange uses a special high grade neodymium magnet.

The totally new subwoofer driver is a very special component, specifically developed for the BMW with the latest technology.



## BMW FRONT 100

### Front Speaker System for BMW 5

**BMW-F41:** The BMW-F41 uses the ESB CS-41 4"/10 cm component mid-woofer, with special adaptor to fit the BMW 5 Series original woofer housing in the front seats.

**BMW-FTW1:** The BMW-FTW1 uses the ESB CS-T21 1"/2.5 cm component tweeter, with special adaptor to fit the BMW 5 Series original tweeter housing in the front seats.

**BMW-FTW1-C1:** ESB BMW-FTW1 dedicated crossover.



## BMW SUB 1

### Subwoofer for BMW 5 (2 x CS-S81)

The totally new subwoofer driver is a very special component, specifically developed for the BMW with the latest technology. The BMW Sub 1 contains the ESB CS-S81 8"/20 cm component subwoofers, with special adaptor to fit the BMW 5 Series original underseat subwoofer housing.



# UNDERSEAT SUBWOOFERS



For those with limited space inside their car, we provide a small sized powered subwoofer to be installed directly under the front seats of the car. The amplifier has low level input through RCA jacks and high level input through a four-pin modular connector. Low level inputs provide an exceptionally clean sound from a source unit through RCA cables. High level inputs make your amplifier virtually adaptable to any source unit with the use of speaker outputs. The gain control allows you to match the input level of the amplifier to the output level of your source unit. You also have subsonic filter, phase control, bass boost, low pass filter, and auto power-on (with high-level input).



## UNSEAT-8

### Underseat 8"/200 mm Amplified Subwoofer

High level auto power on  
Soft delayed remote turn-on  
Remote control for subwoofer level  
Input sensitivity, RCA level: 0.2V - 6V (RCA), 1V (High level)  
Phase switch: 0 - 180° / Bass boost: 0 - 12 dB  
Subsonic filter: 20 - 50 Hz / LPF filter: 50 - 150 Hz  
T.H.D.: < 0.38 % / S/N ratio: 88 dB  
Power: 170 W (RMS) - 250 W (Max)  
Frequency response: 15 - 125 Hz  
Dimensions in cm (L x H x W): 35.5 x 8.1 x 25.2

MORE ARE COMING...



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