

SOPRA

N°1 - N°2



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SOPRA

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Sopra incorporates a 20-year heritage of Utopia technology in an attractive compact design



Sopra

At Focal, innovation doesn't stop at technology. We're obsessed with the comprehensive result: a harmonically rich, lush sound; a transparent and precise reproduction of the musical work. Still, we've never lost track of our core expertise, loudspeaker drivers, the very stepping stones along the path to great sound.

The original Grande Utopia was designed in 1995 as a prototype to apply and validate new speaker technologies. Twenty years later, Utopia is undeniably a worldwide reference, praised for its incredible musicality. We continue to learn and to progress by systematically putting our research into development, to evaluate distinct contributions by listening to them in practice.

Every innovation – from cone materials ("W" Composite Sandwich Cone and Inverted-Dome Beryllium), to magnets (multi-ferrite magnet, EM woofer, and IAL-2 tweeter), to crossovers (OCP+ circuit), and even to cabinets (Gamma Structure) –

plays a role in our technological legacy. Fittingly, we may draw on this legacy whenever it is feasible to improve our technology and to set new benchmarks.

We most recently reaped its rewards with the Sopra project, a reasonably compact and elegant incarnation of many of the innovations that, until now, had only been realized in the uncompromising Utopia. As you shall discover in these pages, Sopra incorporates several major technological breakthroughs.

It's still possible to advance the state of the art of speaker driver technology with digital analysis capable of revealing the subtlest performance aspects, and enabling us to improve the transparency, precision, and harmonic richness of sound reproduction...
"The Spirit of Sound"



"W" sandwich cone



Pure Beryllium



OCP Crossover



Gamma Structure

Focal was recognized as a Living Heritage Company for its unique expertise in the field of loudspeakers

Loudspeaker Legacy

Made in France



Entreprise
du Patrimoine
Vivant

L'excellence
des savoir-faire
français

Loudspeaker technology remains the focus of our craft. The mechanics of sophisticated materials run in our blood. Thanks to the unique expertise of our team, the Focal story is constantly evolving and advancing the state of the art of sound reproduction. We proudly maintain our own manufacturing facilities in France. It is the only viable means by which to advance our R&D, and earned the classification "Entreprise du Patrimoine Vivant (Living Heritage Company)".

Fine-tuning the transducers for *Sopra* would not have been possible without our own production facility. There, we could manufacture the hundreds of prototypes necessary to confirm the results of new simulation software, which was eventually used to optimize magnetic circuits and suspension.



Assembling the new *Sopra* midrange driver on our *Ariane* production line. Based on the principle of lean manufacturing, we employ highly-qualified workers who have completely mastered every step of the procedure from start to finish.

NIC Neutral Inductance Circuit

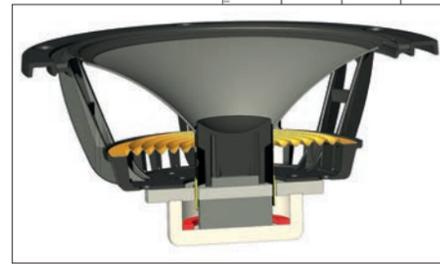
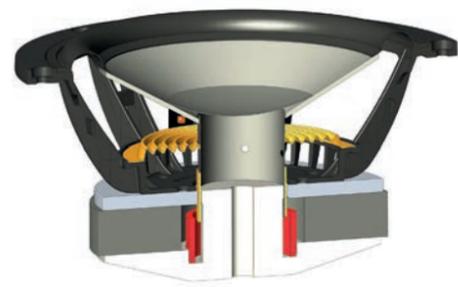
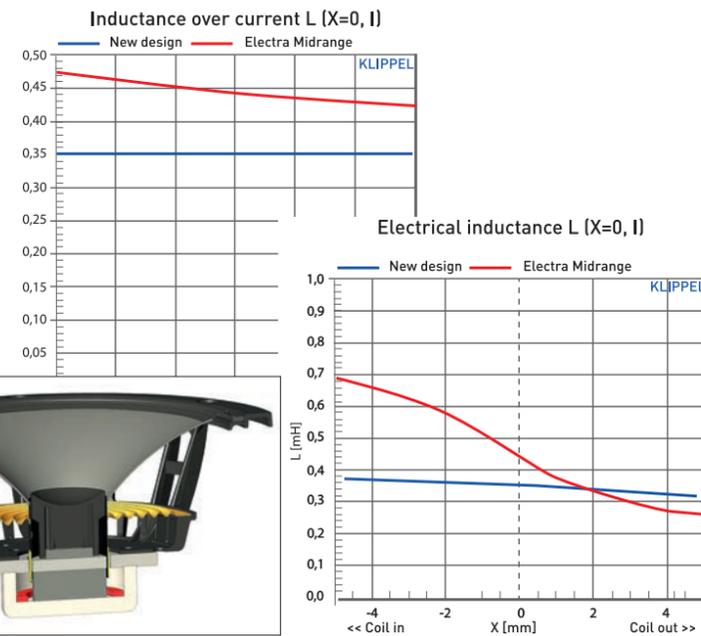
Stabilizing the magnetic field

The accuracy and detail of audio reproduction relies on the stability of the magnetic field

We have always been interested in magnetic circuits, an essential element in speaker drivers. Having developed the electro-magnetic technology for the Grande Utopia EM and the Stella Utopia EM, we came to appreciate an attribute of magnetic fields that had yet been ignored.

Besides the uniformity and intensity of the field was a dynamic aspect over which we had no control. Regardless of its intensity, the magnetic field destabilizes due to additional factors: the movement of the voice coil (Lenz's Law) and the eddy current passing through it, and the frequency. Consequently, the moving part – the voice coil – moves into the magnetic field and disturbs it, causing a variation that results in a loss of precision. This presents a significant obstacle to high resolution, like a shaky hand holding a camera.

We developed new simulation software over the course of three years, enabling us to visualize these complex interactions, and paving the way for the development of an extremely stable magnetic circuit. Applying modern tools to an old solution, a Faraday Ring, we calculated its ideal dimensions, composition, and positioning with a recently inconceivable precision. This effectively renders the magnetic field immune to the position of the voice coil, as well as to the intensity and frequency of its current, and represents a new benchmark of extreme definition.



In red, the Faraday ring on a Sopra N°2 woofer. Its composition, dimensions, and positioning were optimized with computer simulations. The impressive result achieves the best possible bass performance and control, regardless of the voice coil's excursion.

Response of a 6" midrange driver measured with the Klippel analyzer: blue curve represents the new NIC (red ring in this cross section); red curve represents the conventional 6" midrange driver with a ferrite magnet. Above: The variation of inductance in relation to current passing through the voice coil, varying according to the audio signal. The NIC is perfectly stable. Below: The variation of inductance in relation to the excursion of the voice coil. The result is spectacular.



Visual analogy of magnetic disturbances



Without Faraday ring



With typical Faraday ring

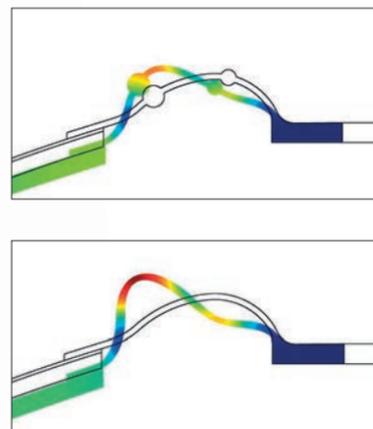


With Focal Faraday ring

Variations due to the position of the voice coil and to the current passing through it in a conventional circuit result in blurring.

The Faraday ring is known to improve definition, usually at the cost of dynamics and contrast.

Our new simulation software enables us to model a Faraday ring that combines the best of both worlds: extreme definition with dynamics and contrast.



Our tuned mass damper (TMD) incorporates two bulges molded into the surround. This simple solution, adapted with our new software, stabilizes the surround from adverse resonances, which avoids cone deformation without disturbing its dynamics.

TMD Tuned Mass Damper

Midrange obsession

Midrange drivers are without a doubt the most difficult to master in an acoustic system. Timbral consistency and imaging depend on an even transition of energy from the bass woofer to the midrange, and its subsequent coherence with the acceleration and dispersion of the tweeter. A substantial 6" (15cm) midrange satisfies the first requirement, which in turn complicates its coherence with the tweeter.

Over the past 20 years, we refined the "break up" (the frequency at which a cone deforms and generates distortion) of our 3rd-generation "W" Composite Sandwich Cone and drastically reduced resonance in the IAL-2 tweeter.

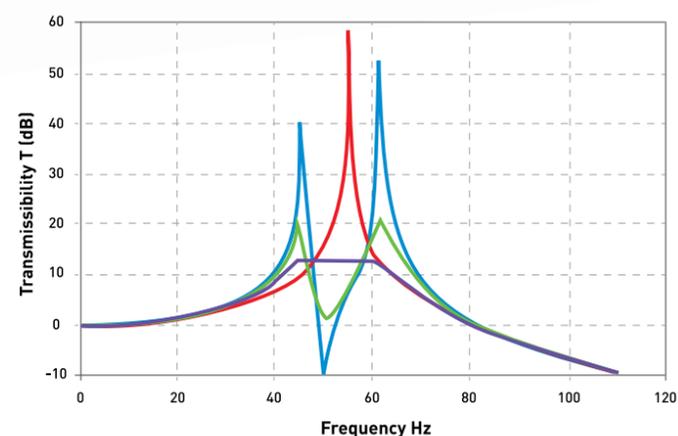
Now, we can go one step further thanks to finite element limit analysis (FELA). Our team developed simulation software to visualize the dynamic behavior of the surround that binds the cone to the basket, thus exposing suspension performance issues that required closer attention.

One common solution consists of increasing the mass of the surround, which unfortunately decreases definition. Our solution derives from

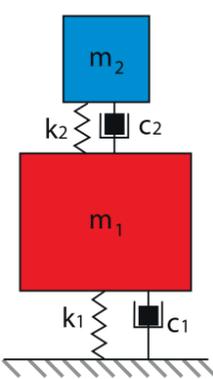
Sopra's midrange driver produces astounding realism thanks to its new magnetic circuit and TMD suspension

technology used for passive seismic vibration control and racecar suspensions: a Tuned Mass Damper (TMD), controlling resonance by counteracting it. Applied to speaker drivers, our patented TMD suspension incorporates two bulges molded into the surround, the dimensions and positions of which are calculated to counter balance each other.

Having eliminated distortion issues at their source, we could then create a hyperbolic cone to increase frequency response – and correspondingly, impulse response – to further increase definition.



- without absorber
- with absorber, no damping
- with absorber, small damping
- with absorber, optimized damping



The graph on the left demonstrates the principle of the tuned mass damper. In red, an m_1-k_1 mass-suspension system displays a pronounced resonance. Adding an m_2-k_2 device (upper section of the diagram on the right), generates two resonance spikes (represented by the blue curve on the graph). The anti-resonance dip associated with the resonance of the main system produces the green curve. Finally, by tuning the damper, we obtain the purple curve, practically quashing the resonance entirely.



IHL Infinite Horn Loading

Getting the most out of the Beryllium tweeter



Our Beryllium tweeter dome is incredibly light and extremely rigid. It is essentially only limited by the air compressed in the cavity behind it. Ideally, a practically infinite volume would void that constraint. To keep Sopra compact requires devoting the cabinet to the bass, forcing us to explore other options for loading the tweeter.

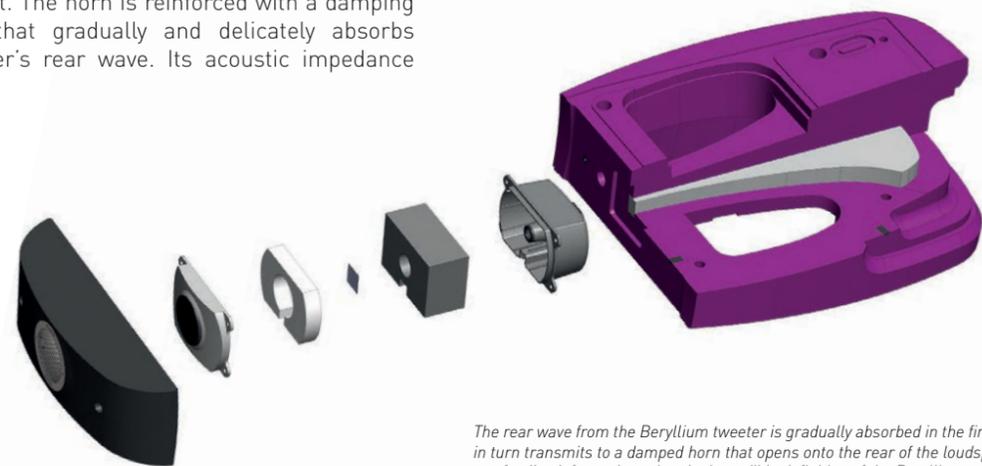
The requirement for Sopra to be compact meant rethinking tweeter loading

We developed and patented the Infinite Horn Loading system (IHL). The tweeter is lodged in a monocoque of injected polyurethane for ideal mass and damping in a reduced space.

A small cavity conveys air from the rear of the tweeter through a horn that extends out the back of the cabinet. The horn is reinforced with a damping material that gradually and delicately absorbs the tweeter's rear wave. Its acoustic impedance

is negligible, inhibiting resistance that would otherwise alter the movement of the dome and enhancing definition.

The advantage of this design is that it not only isolates the tweeter from invasive vibrations, but barely reduces the cabinet's internal volume. We could therefore retain the majority of the cabinet for optimal bass performance from the woofers and ideally position the tweeter, all in a reasonably-proportioned cabinet.



The rear wave from the Beryllium tweeter is gradually absorbed in the first chamber, which in turn transmits to a damped horn that opens onto the rear of the loudspeaker, preventing any feedback from obscuring the incredible definition of the Beryllium tweeter.



Design



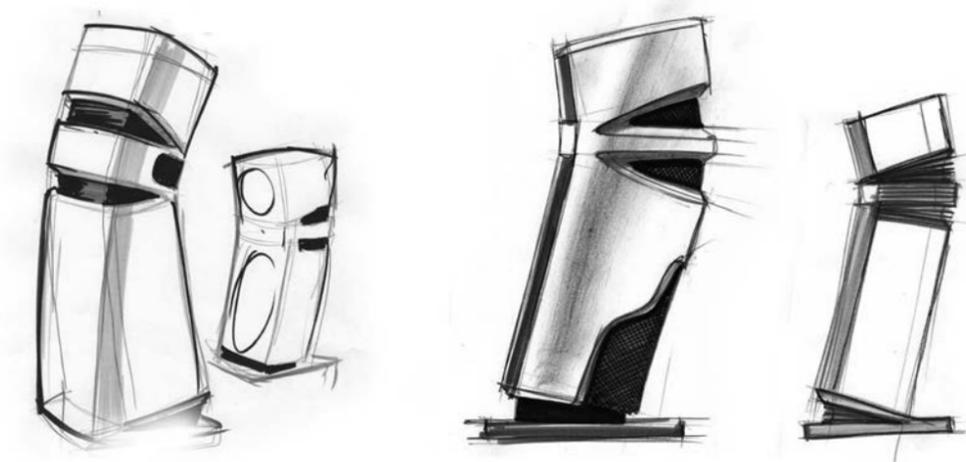
The primary goal of the compact Sopra design was to ensure that its proportions would nonetheless satisfy the minimum volume requirement to yield extended bass.

The height of the tweeter is crucial to imaging and must reach the ears of a seated listener, no more than one meter high. This situates the tweeter beneath the midrange, requiring Focus Time (physical time alignment to normalize the distances of each transducer from the listener), particularly significant in the largest model.

With its modest footprint however, Sopra lacked the necessary volume in its lower section to generate sufficient bass energy, which forced our engineers to cross through the tweeter section to exploit superfluous volume in the upper section.

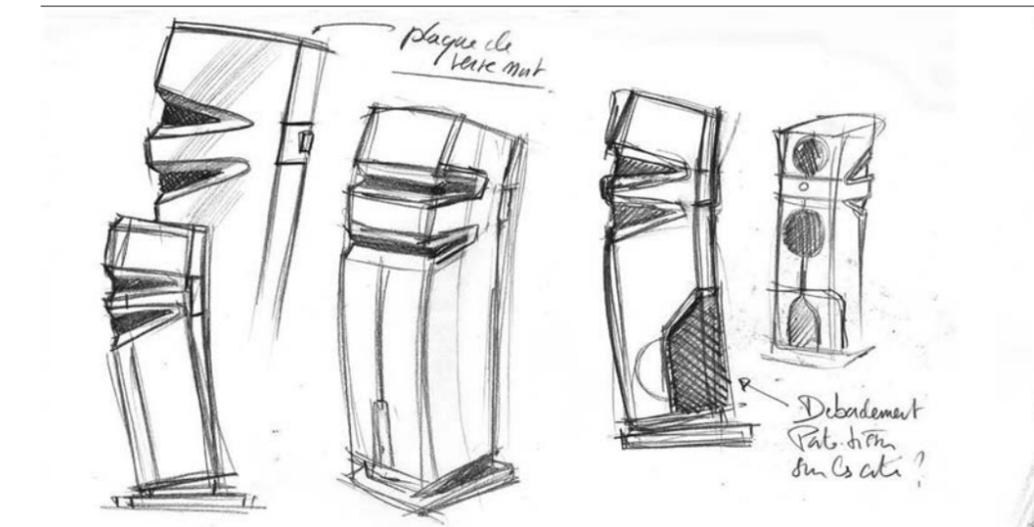
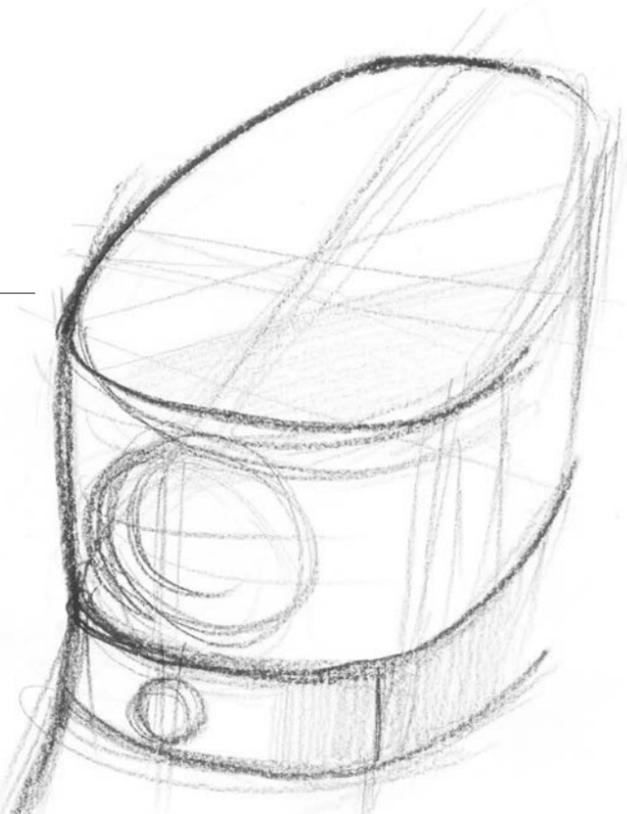
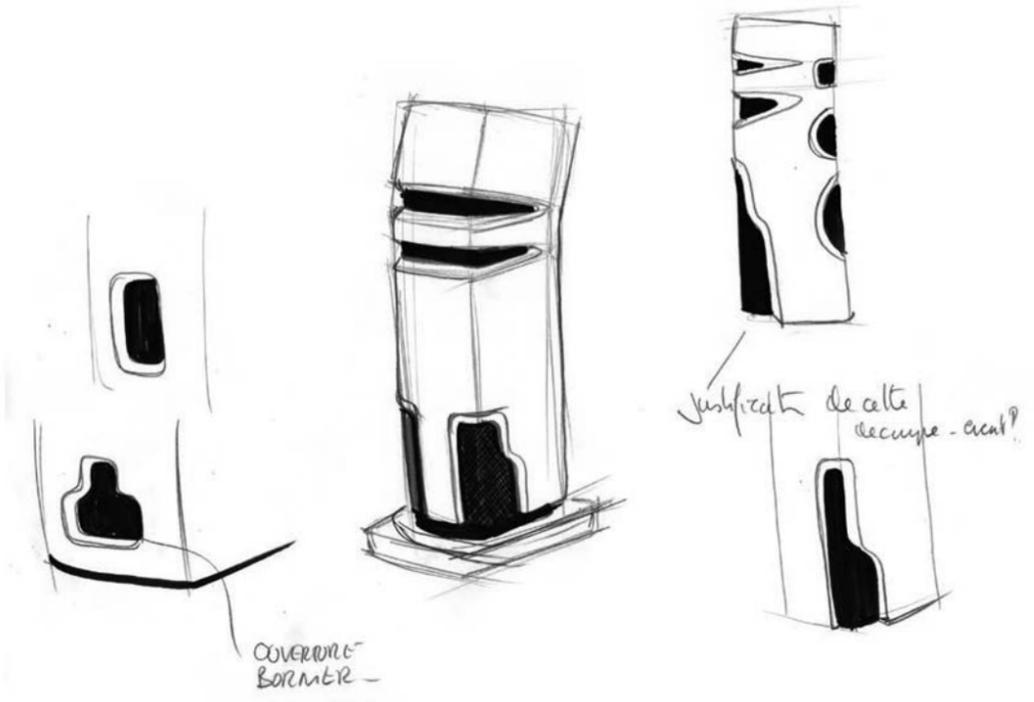
The IHL system presented an ideal solution, allowing two large canals to splice the upper and lower sections together, and reclaiming the unused space behind the midrange driver.

The well-damped polyurethane tweeter mount sufficiently isolates the tweeter from the bass vibrations and protects the midrange. This improves the overall rigidity of the structure and prevents any loss of precision. Of course, it also adorns Sopra with its signature look.



"The Sopra line is meant for the most passionate audiophiles. When expectations are this high, the design must provide solutions that go far beyond aesthetics and shape. It's quite the challenge of industrial design; serving acoustic experts and favoring performance, while marrying the qualities expected of an object that will be integrated into very elegant interiors and decors.

With the very first sketches, we wanted to emphasize the brand image of Focal loudspeakers: a trapezoid section, the recognized signature of the tweeter housing; angled cabinets for acoustic coherence (Focus Time), etc. All these strengths that are inherent to the brand image had to be emphasized, all while updating conventions and even daring to reinvent new ones, and applying the latest technological advances in R&D. In this sense, Sopra represents an exemplary collaboration between Focal's engineers and designers over the course of three years...



...“Sopra’s very architecture was assembled around the intermediate section, which, besides giving the line a very strong identity, is a structural element that solves several technical issues. This injected polyurethane component enables the inclinations of the upper and lower cabinets in “Focus Time” (acoustic convergence of the voices). It also provides the necessary freedom for the acousticians to achieve the desired enhancements of the high frequencies (decompression, isolation...). Finally, it optimizes the volume allotted to the midrange, whilst maintaining a compact design and contributing to the very high rigidity of the structure as a whole.

Needless to say, the compactness and proportional harmony of this line are the results of tireless research. How would it be possible to reconcile the volume requirements established by acoustics research with acceptable dimensions for contemporary interiors? Besides 3D models, many full-scale models and prototypes made it possible to balance the finely-tuned robust volumes we desired with ease of integration. Drawing on work from the Aria line, particular attention was paid to the tidiness of the front baffle, especially around the speaker drivers. We wanted to celebrate and highlight the core Focal expertise, while smoothing over any rough edges that could upset the acoustics or the appearance. Lacquered finishes, flush against the cabinet, allow for uniform treatment all around. From the start of the project, we intended to offer various combinations of colors and materials, a real manufacturing challenge for our cabinet factory in Bourbon Lancy.

Mineral black, brushed steel, and textured charcoal-gray tones all perfectly compliment wood and lacquered finishes. The entire range of Sopra is deliberately minimalist, yet still offers connoisseurs a wealth of details to discover. The mesh-like grille protects and brands the Beryllium tweeter, a pattern that repeats over the opening in the curved back panel of the middle section. The terminal board, the thumbnuts, and the adjustable spikes were all designed specifically for Sopra. The few visible screws were also designed specifically for Sopra, manufactured by expert watchmakers.

As with Utopia and all Focal loudspeakers, the design of Sopra is the fruit of a very close collaboration between designers and engineers; a passionate mission to reconcile complex constraints and experiences with sophisticated and innovative solutions. Ultimately, all of this work should go unnoticed, exposing something much more obvious, the simple pleasure and purity of an unforgettable listening experience.”

Audrey Pineau



Sopra N°2 “Carrara White” finish



With Alain Pineau in charge of the design, the Sopra signature quickly became obvious: a compact fusion of strength and modernity.

Mastering the Cabinet



The front baffle is machined from a 2" (69mm) sandwich of MDF using the "Gamma Structure" principle. Its density is substantial enough to exploit the mechanically inert structure for maximum definition.

The absence of parallel internal walls and small Helmholtz resonators in the lower section prevent vertical standing waves. The glass bass of the loudspeaker quickly transmits energy to the ground through spikes to eliminate any halo effects in the bass.

Our cabinetry factory in Bourbon-Lancy manufactures Sopra cabinets employing the same manufacturing processes developed for Utopia.



Sopra n°1

Compact and brawny, Sopra N°1 is crammed with technological innovation. Featuring a Neutral Inductance Circuit (NIC) magnet, a Tuned Mass Damper (TMD) midrange suspension, and an Infinite Horn Loading (IHL) tweeter system, this model is a testament to their contribution to the overall sound quality.

Immediately, listeners are seduced by the precise imaging they've come to expect of bookshelf loudspeakers. Sopra N°1 translates its low distortion into resolution and transparency, conjuring a spectacular soundstage. Captivated by that first impression, listeners come to discern the texture and smoothness of the sound, its fleshy midrange and articulate bass. This precision, coherence, and harmonic richness are by no means superficial or products of mere treble, yet are essential the listener's appreciation of the musical program.

Ideal for small rooms under than 25m² (270sq-ft), Sopra N°1 could even fill a space up to 50m² (540sq-ft). Thanks to its high sensitivity and excellent power handling, Sopra N°1 is a formidable little monitor for the home.

Its custom stand was designed to expedite parasitic vibrations from the cabinet to the floor, avoiding any coloration. Steel bracing throughout the shaft, coupled through a glass base ¾" (19mm) thick to four adjustable stainless steel spikes, provides very high transmission speeds and guarantees reliable reproduction.



Sopra N°1 "Carrara White" finish



Sopra N°1 & Sopra N°2 "Carrara White" finish

Sopra n°2

Sopra N°2 clearly inaugurates a new era for the premium high end and stipulates new performance criteria. Hitting all the right notes to coalesce seamlessly within any contemporary space, the design is at once compact, modern, and minimalist with a unique character. This philosophy naturally imposed new challenges on our transducer technology and inspired the major innovations described in the previous pages.

Employing NIC and TMD technologies, Sopra N°2 is equipped with best midrange driver ever developed by Focal, a new benchmark for transparency in a compact enclosure. Indeed, contrary to the uncompromising Utopia, Sopra is compact by design to ensure its integration into realistic listening environments.

Two 7" (18cm) woofers with NIC magnets generate the bass frequencies, taking advantage of every cubic centimeter of the cabinet's volume, including the additional space gained by accessing the upper structure through the IHL tweeter enclosure. Moreover, the cabinet's Gamma Structure, with its 2^{3/4}" (69mm) front baffle, provides astonishing inertia for its size. Weighing 55kg (120lbs), Sopra N°2 has nothing to envy of its larger competitors, balancing impressive bass weight and articulation in its densely compact cabinet.

Sopra N°2 is easy to integrate with most systems thanks to its remarkable bass control. Perfectly at ease in rooms under 30m² (325sq-ft), its design is ideal for larger spaces, filling rooms up to 70m² (750sq-ft). The attention to amplifier quality and to precise room positioning is the key in resolving their deep soundstage.

Consolidating state-of-the-art innovations in a resolutely modern looking compact speaker, Sopra N°2 clearly defines a new standard in premium loudspeakers.



Sopra N°2 "Carrara White" finish



Sopra N°2 "Electric Orange" finish

Innovations Abound



New Structure

- 1 > Circumventing the tweeter to creatively consolidate internal volumes to improve bass quality in a compact design

Patented transducer innovations

- 1 > IHL*: novel compact configuration for loading the tweeter
- 2 > NIC & TMD*: enhancements to the midrange driver, in the DNA of the Focal sound
- 3 > NIC: impressive bass weight and control

Exceptional speaker drivers

An ongoing 35-year legacy "Made in France":

- 4 > W Composite Sandwich Cones for the bass and midrange
- 5 > Inverted-Dome Beryllium tweeter

Implementing Focal's most recent exclusive NIC & TMD* innovations

Contemporary premium quality

A choice of materials and finishes:

- 1 > Matte black polyurethane monocoque tweeter module
- > Integrated mesh-like grille
- 6 > Glass top and base
- > Lacquered cabinets

Brand image

- 1 > "Focus Time" aligns the audio sources around the IHL tweeter system

*Patents Pending

A monument of modernity

Technology is seamlessly implemented in a compact and minimalist design that would naturally be at home in any current space.





Sopra N°2

Sopra N°1

Type	Three-way Bass-reflex floor standing loudspeaker	Two-way Bass-reflex bookshelf loudspeaker
Speakers	Two 7" (18cm) "W" woofer 6 1/2" (16.5cm) "W" midrange with "TMD" suspension, with "NIC" motor 1" (25mm) "IHL" Beryllium inverted dome tweeter	6 1/2" (16.5cm) "W" bass midrange with "TMD" suspension, "NIC" motor 1" (25mm) "IHL" Beryllium inverted dome tweeter
Frequency response (±3dB)	34Hz - 40kHz	45Hz - 40kHz
Low frequency point -6dB	28Hz	41Hz
Sensitivity (2.83V/1m)	91dB	89dB
Nominal impedance	8 Ohms	8 Ohms
Minimum impedance	3.1 Ohms	3.9 Ohms
Crossover frequency	250Hz / 2 200Hz	2 200Hz
Recommended amplifier power	40 - 300W	25 - 150W
Dimensions (HxWxD)	46 ^{27/32} x14 ^{3/32} x21 ^{17/64} " (1 190x358x540mm)	16 ^{47/64} x10 ^{63/64} x15 ^{19/32} " (425x279x396mm)
Weight (unit)	121.25lbs - (55kg)	41.89lbs - (19kg) [stand: 40.78lbs (18.5kg)]

Lacquered standard finishes (face + side panels)



Carrara White Black Lacquer Imperial Red Electric Orange

Standard wood veneer finish



Graphite Black (face) Dogato Walnut (side panels)