EXPERT PRO

AUDIOPHILE EVOLUTIVE SYSTEM

White *paper*
AXD®

DEVIALET

DEVIALET AXD®

Expert Pro Active X-over Design Technology

Why did we develop AXD®?

At Devialet, we were the first to develop an exclusive technology capable of adapting our amplifier performance to the characteristics of the loudspeaker it is connected to, in real time and without additional hardware. This technology is called SAM® (Speaker Active Matching) and is based on a mathematical model deducted from measurements made on each loudspeaker, so Expert Pro can tailor the sound signal to fit their precise requirements. For the first time, SAM® made it possible to achieve perfect temporal alignment between the recorded signal and acoustic pressure from your loudspeakers.

Today, more than 1000 speaker models are SAM®-ready but we wanted to push the technology further and offer a solution to the most demanding audiophiles, capable of maximizing the performance of ultra high-end loudspeakers. That is why we partnered with some of the world's leading speaker manufacturers, to design the shortest analog signal path between an audio source and speaker drivers while limiting analog sections to a minimum. The result of this quest for perfection is AXD®, the ultimate conduit between Expert Pro and some of the finest loudspeakers ever built.

What is AXD®?

AXD® (Active X-over Design) combines the endless possibilities of Devialet Expert Pro DSP (Digital Signal Processor) with the crossover networks of some carefully selected high-end speakers, to create a complete, perfectly optimized setup. AXD® is the only technology capable of extracting the best performance out of these extreme audio systems delivering sound in its purest form.

AXD® is:

— an active crossover (X-over) design for the speakers, performed in the digital domain, using DSP-based crossover filters already available inside Expert Pro systems. Each speaker active profile is a faithful implementation of the formulas provided by their creators and designers, and then validated and signed by them, with no exception.

— the shortest analog signal path in the history of audio, with even less distortion and noise, defining a new level of transparency, precision and therefore faithfulness.

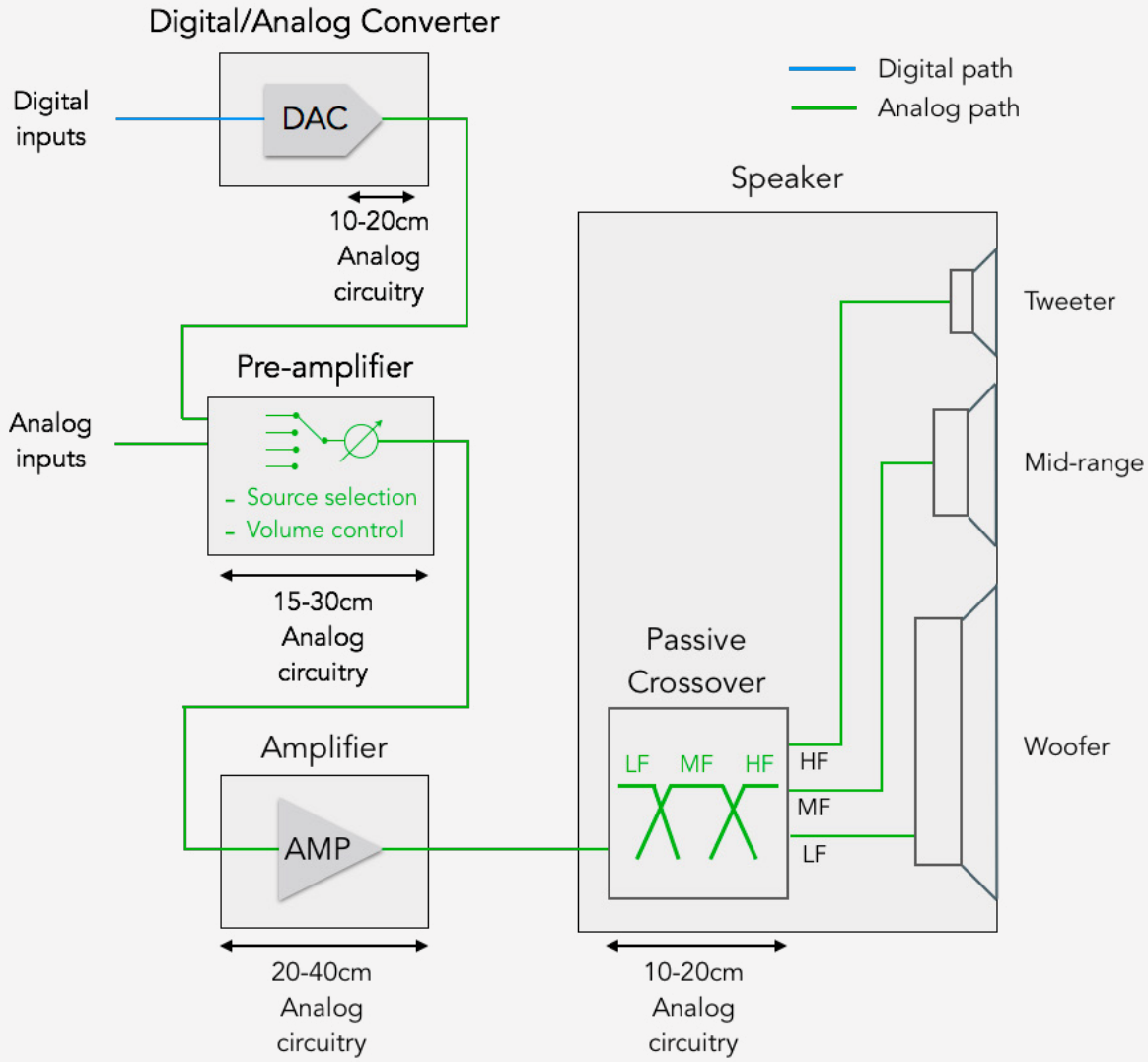
— the future of extreme high-end audio systems, giving loudspeaker designers whole new possibilities only available in the digital domain.

How does AXD® work ?

Modern multi-way high-end speakers are difficult to design and to drive, with drivers of different characteristics and massive passive crossover filters which have to be designed with many constraints such as counter electromotive force on drivers (woofers can load other drivers), sensitivity driver leveling, etc.

Here is an example of a classic high-end setup, with passive crossover filters.

Classic High-End set-up

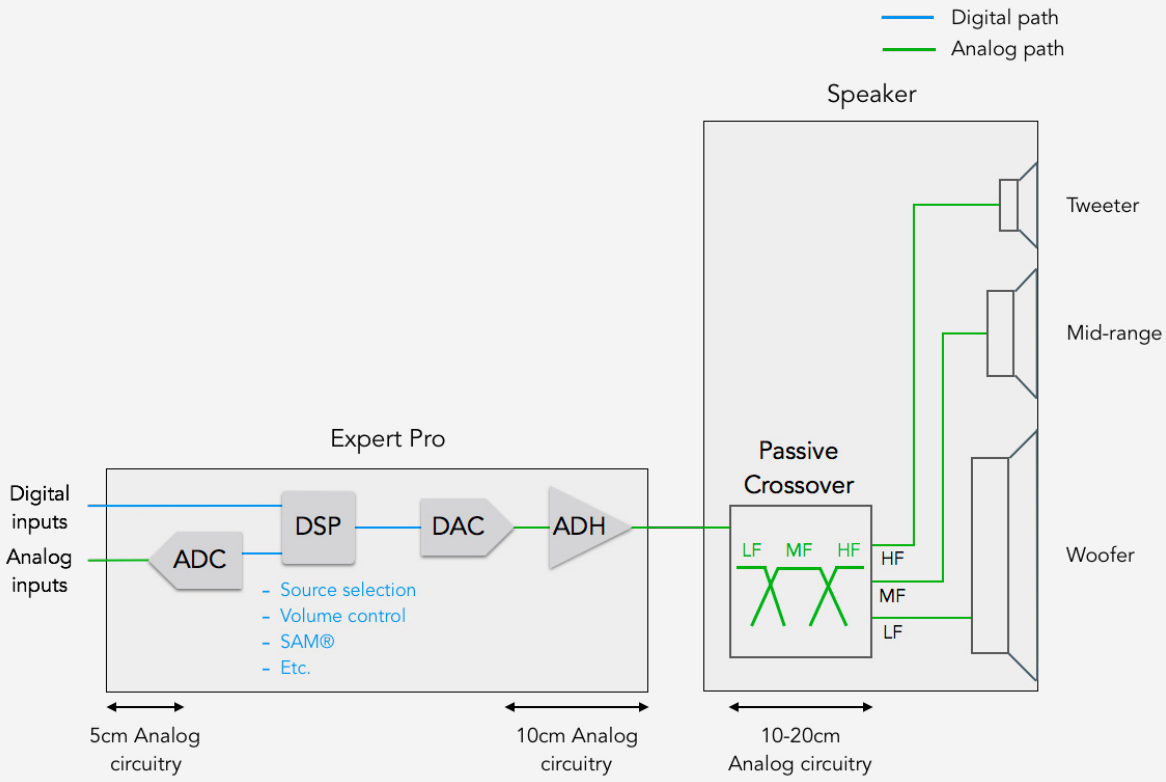


- Analog circuitry length for Digital inputs: 55-110cm
- Analog circuitry length for Analog inputs: 45-90cm

Every input signal has to go through a number of analog devices before being transformed into music by the drivers. On average, the length of analog electronic circuitry in a classic setup is 55-110 cm, excluding interconnect and speaker cables. Along this distance, according to the number of in between components in the signal path, the signal loses integrity, and distortion appears.

In Expert Pro systems, the analog path has been reduced to a minimum, achieving a huge improvement in sound quality associated with signal processing capabilities such as our exclusive SAM® technology:

Expert Pro set-up



- Analog circuitry length for Digital inputs: 20-30cm
- Analog circuitry length for Analog inputs: 25-35cm

The number of analog devices the signal has to go through before being transformed into music has been drastically reduced, so the total analog path of the audio signal is already the shortest in the world. In this setup, the full range signal is sent to the speakers, and the frequencies repartition is handled by the passive crossovers.

Another solution is to place the crossover filters before the amplifiers, and to amplify each driver with a different amplifier. This is called active crossover filtering.

Active crossover filtering has long been regarded as an ideal solution for crossover filters for the following reasons:

Accuracy:

— Active crossovers are an easy way to vary or fine tune each frequency band to the specific drivers used, the frequency response is then independent of the dynamic changes in a driver's electrical characteristics.

— It provides a better isolation of each driver from signals handled by other drivers, thus reducing intermodulation distortion.

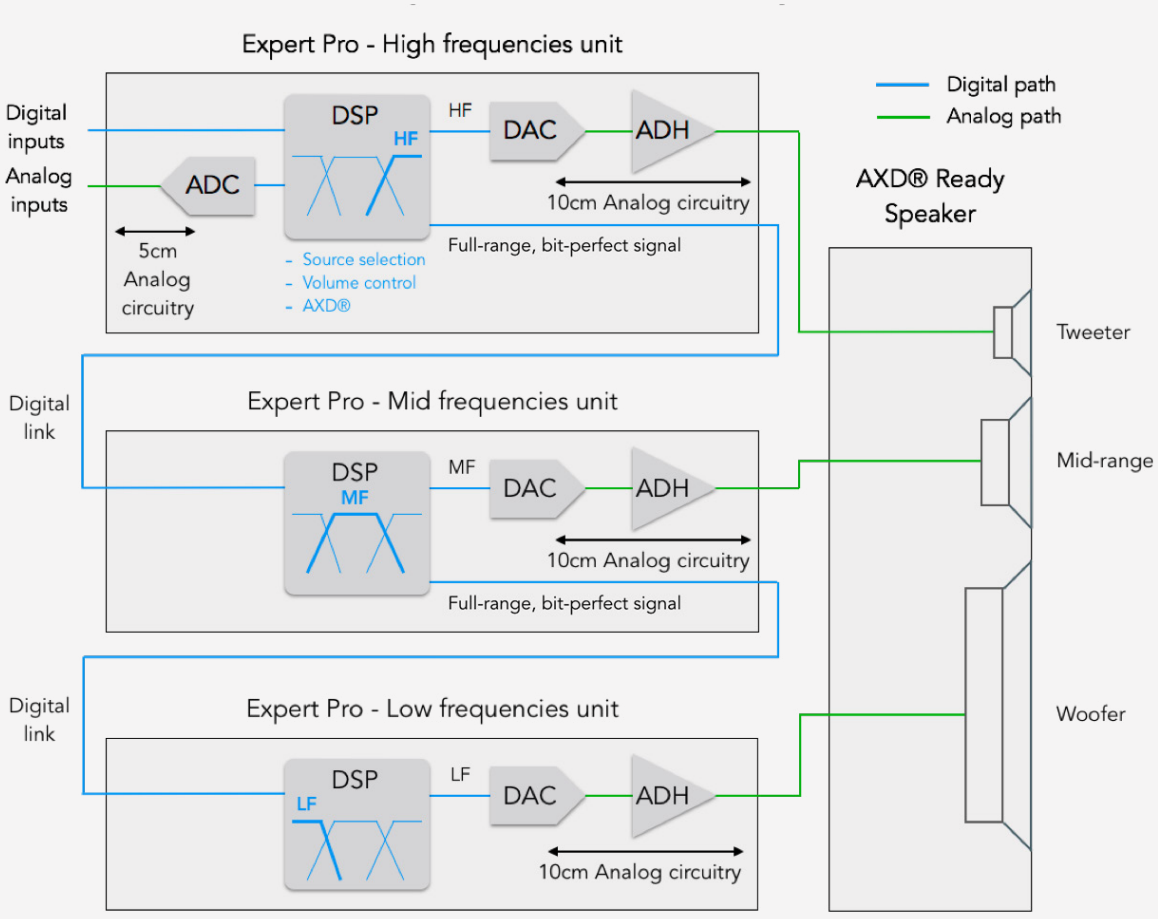
Efficiency:

— The power amplifiers are directly connected to the speaker drivers, thereby maximizing amplifier damping control of the speaker voice coil, reducing consequences of dynamic changes in driver electrical characteristics, all of which are likely to improve the transient response of the system.

— It reduces power amplifier output requirements. With no energy being lost in passive components, less powerful and more accurate amplifiers can be used, especially for tweeters and mid-range drivers, which potentially increases quality.

To achieve active filtering, Devialet developed an easy-to-use technology. Together with the speaker manufacturers, we developed a dedicated R&D tool and invested resources to make sure it is easy to create the most accurate active profile for each speaker.

Expert Pro AXD® set-up



- Analog circuitry length for Digital inputs: 10cm
- Analog circuitry length for Analog inputs: 15cm

In a AXD® setup, the crossover filtering is done in the digital domain, inside the Expert Pro DSP, so each amplifier output can be directly connected to its corresponding driver.

The result is a more dynamic, open, detailed and natural sound.

At the same time the system is elegant and easy to use, just a set of dedicated configuration files and the connection of Expert Pro to the speakers. In several minutes you can enjoy the original sound from the speaker designer.

What are the benefits of AXD® ?

Three key advantages of AXD® to remember:

— AXD® provides **superior possibilities** to the loudspeaker designer, compared to passive crossover constraints.
— AXD® enables **higher precision and purity:** no tolerance spread on component values, no distortion nor noise induced by the passive components of the passive crossover (inductance non-linear distortion, thermal distortion and resistors noise,...). The shortest analog signal path in the history of audio. Less is even more.
— AXD® **maximises the efficiency and linearity of the amplification system:** 100 % of the power delivered by the amplifier is used by the speaker driver. The amplifier does not have to deliver extra useless power dissipated as heat by the passive crossover. The overall distortion level is further reduced, the dynamics enhanced.

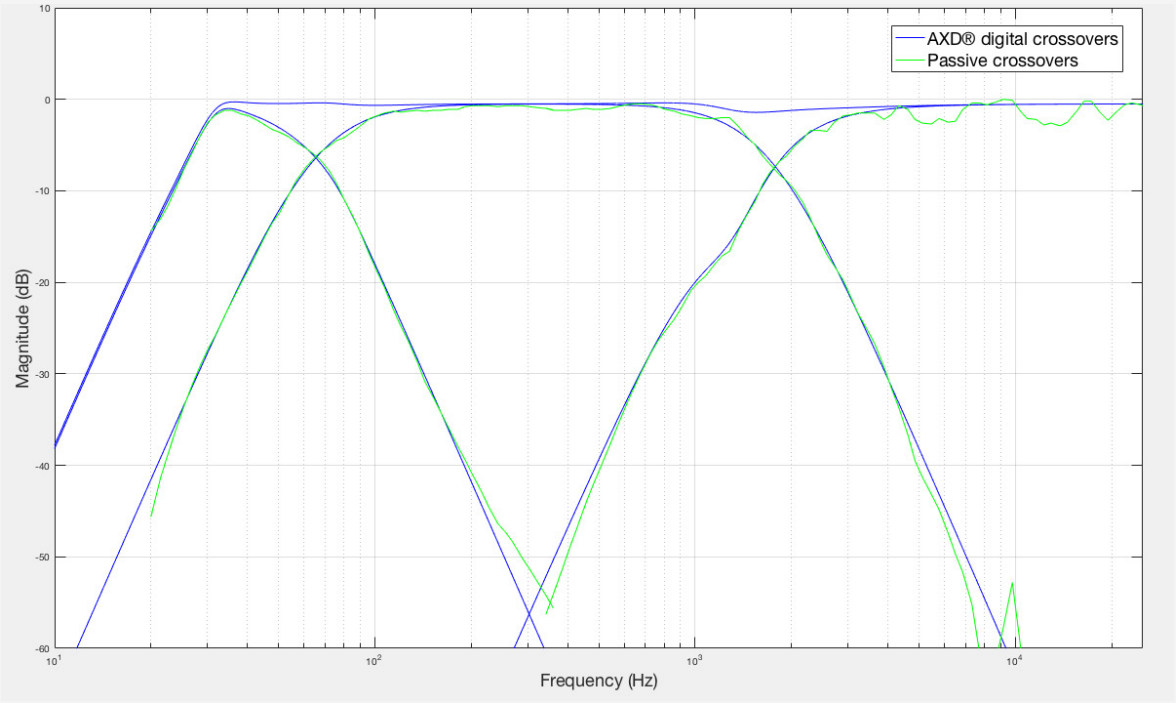
Passive X-over:

— Analog domain
— Filter network composed of resistors, capacitors and coils
— Loss of efficiency (can only lose energy) -> more distortion from the amplifier
— Tolerance issues (variance between analogue components)
— Thermal distortion issues (analogue components)
— Aging of analog components
— Imperfect L/R matching

Active X-over Design AXD®:

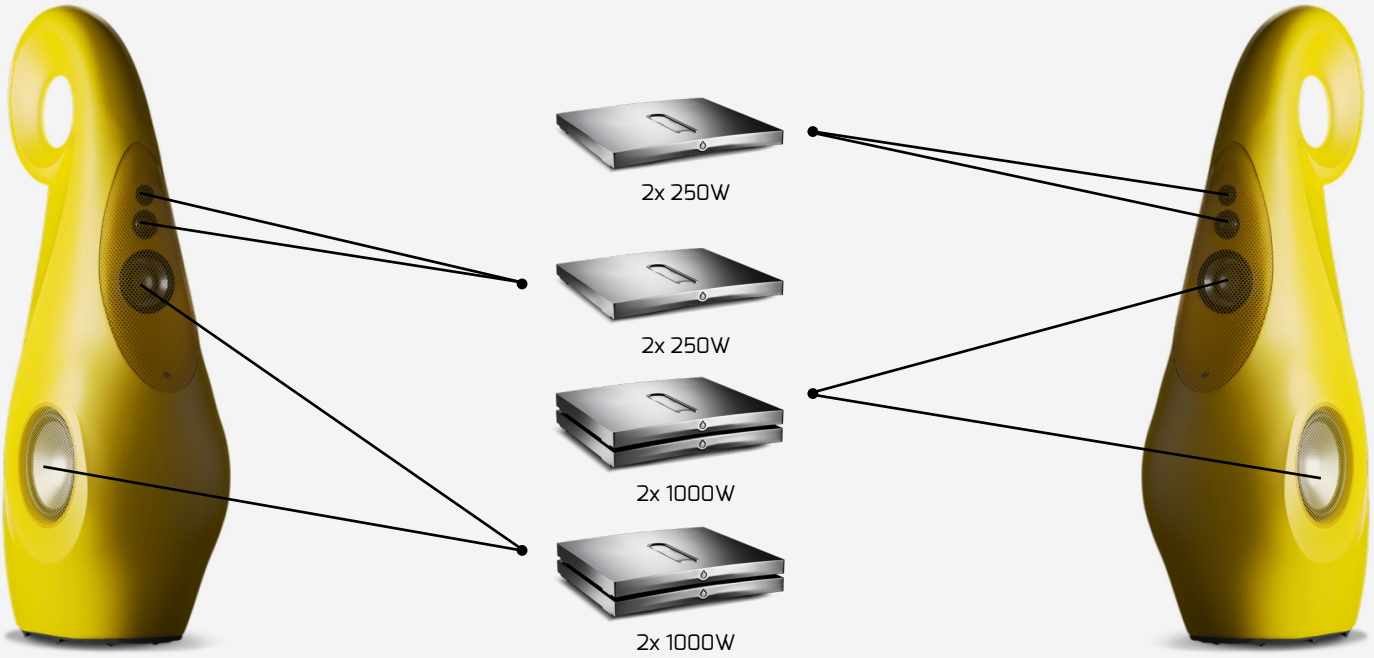
— Digital domain
— DSP-based digital filters
— No tolerance issues (100% reproductible from one DSP to another)
— No thermal distortion (digital computation)
— More overall power (more Expert Pro units)
— Shortest signal path in the history of audio (straight wire between Class A transistors and Speaker Driver's coil)
— Software upgradable
— Multiple structure
— More phase-accurate oriented
— No aging issues of analog components
— Non linear corrections, upon request

AXD® crossover filters response VS passive filters response

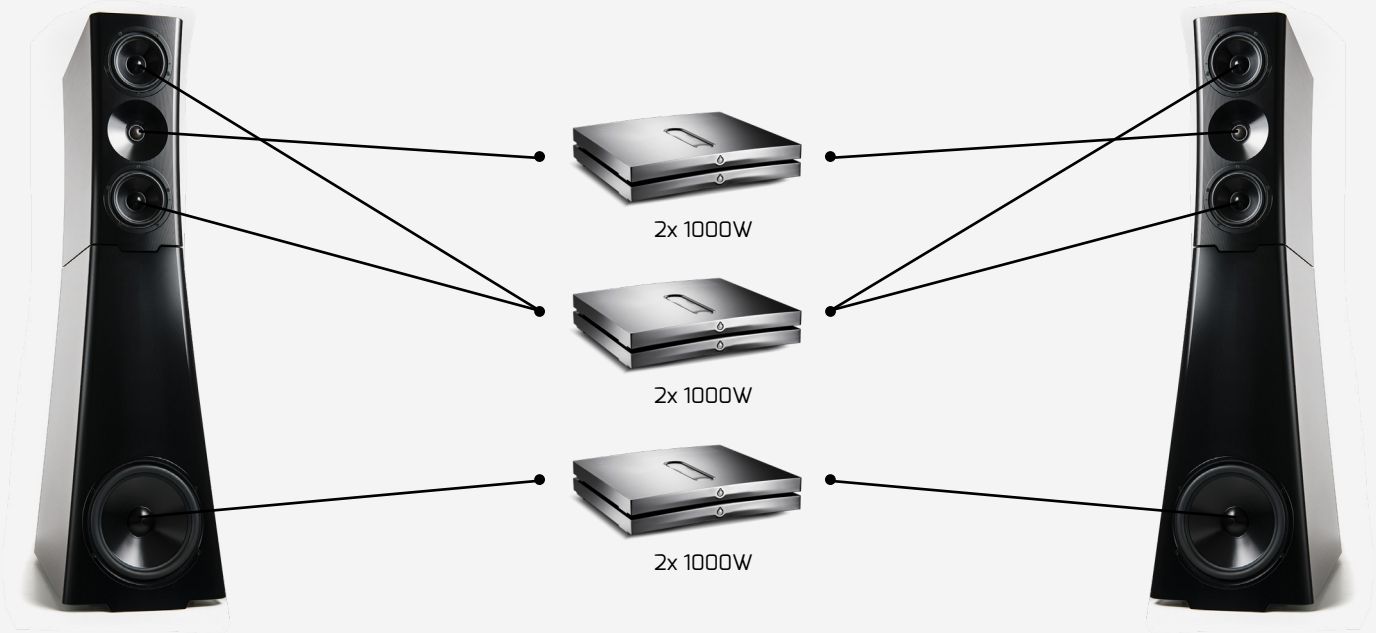


Two examples below to illustrate the above:

Devialet AXD® — Vivid Giya G1 Spirit



Devialet AXD® — YG Acoustics Sonja 2.2



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