DIY kit

SEAS 403 Revisited

A High-Performance classic loudspeaker kit featuring the SEAS Prestige drivers 22TFF, MCA12RCY and CA26RE4X

Designed at the SEAS R&D laboratory.

Introducing the SEAS 403 Revisited—a modern revival of a classic SEAS speaker design. This kit is the result of a unique collaboration between SEAS, cultural entrepreneur Martin Revheim, and expert craftsmen, combining our rich history in high-fidelity audio with contemporary precision manufacturing. Designed for both seasoned DIY enthusiasts and newcomers alike, the SEAS 403 Revisited brings an iconic sound back to life with upgraded drivers and a fresh, accessible approach to speaker building.

Drivers

The drivers were chosen from SEAS' Prestige line as the best options that share the same heritage as those in the original SEAS 403 kit, but with modern updates to further enhance performance.

The woofer CA26RE4X is a classic 10" hand-coated paper cone woofer. The four-layer voice coil and strong magnet system give this driver excellent low-end performance, while the coated paper cone ensures a smooth roll-off, making it easy to integrate with the midrange.

Midrange duties are handled by the MCA12RC driver – a dedicated midrange unit with a short voice coil and hand-coated paper cone. The result is a very smooth response with good sensitivity and wide bandwidth, making it the perfect choice for a midrange in a 3-way system like this.

While the woofer and midrange stay true to the original 403 design, the tweeter 22TFF uses a ¾" dome compared to the 1" dome of the original kit. The reason for this change is that the smaller dome provides better top-end dispersion, and since the midrange extends smoothly to higher frequencies, the additional low-end extension of a larger dome is unnecessary.

Enclosure

We had several targets for the enclosure design. It needed to be a beauty with similar dimensions as the original kit, internal volumes that optimised the performance of the driver, it should be easy to build and a driver layout that minimized diffraction issues.

The woofer gets a 44L ported volume with a tuning of 30Hz. Combined with the crossover tuning this gives a nice and powerful bass without muddying the midrange.

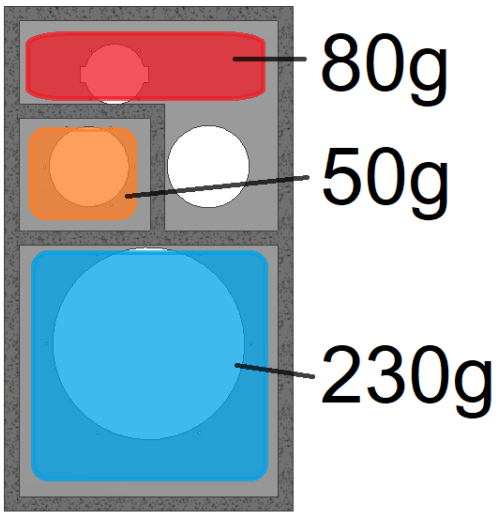
For the midrange we chose a closed box design to get that dynamic and tightly

controlled response. The internal volume is 6.5L. The driver placement is symmetric with the port, and we chose a port with the same OD as the midrange for the pretty cosmetic looks.

The tweeter is positioned off-centre on the front baffle, following golden ratio distances to the cabinet's sides and top. This helps to smooth edge diffractions at various frequencies. The cabinets must therefore be built in mirrored pairs.

Alongside the documentation we have a full CNC layout for the cabinets available. The parts are made with hidden finger joints so that they fit together easily in the correct position. Please advise with your local tool shop on how to manufacture the parts.

We recommend using polyester foam for the internal damping. Most distributors have a version of this and they come with many different brand names: Acousto-Q, Acoustilux, Acousta-Stuf and so on. The sketch below shows the amount and placement of the damping material. The exact weight might be different from the different vendors, but you should fill the marked areas lightly and leave some space around the drivers and port.



It's a good idea to paint the wall behind the port black, or even the damping material. Otherwise, it will be visible through the port.

The cable holes between the main chamber and the midrange chamber should be filled with glue so that there is no air leakage.

The CNC file has a cutout for a SpeakOn connector on the back. This should be changed to fit the terminals you intend to use.

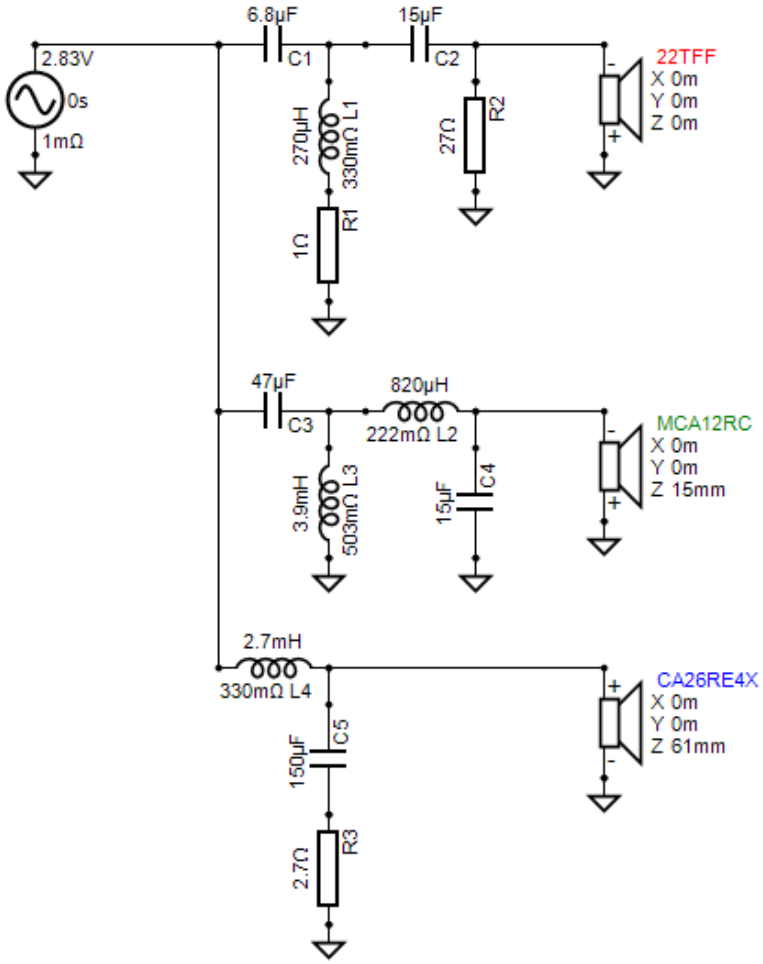
The port used is Monacor BR-70TR. This has a about the same OD as the midrange so it matches the design nicely. This has an ID of Ø67mm and a length of 139.5mm, which result in a tuning of 30Hz. If you want to use a different port, then you need to recalculate the length to get the same tuning.

Crossover

In the crossover design we aimed for a smooth and slightly falling response in the listening window while maintaining good phase tracking between the drivers. The listening window is here defined as the average response within 0-30 degree off axis. We kept a small lift at the top end to compensate for the slightly narrowing dispersion from the tweeter.

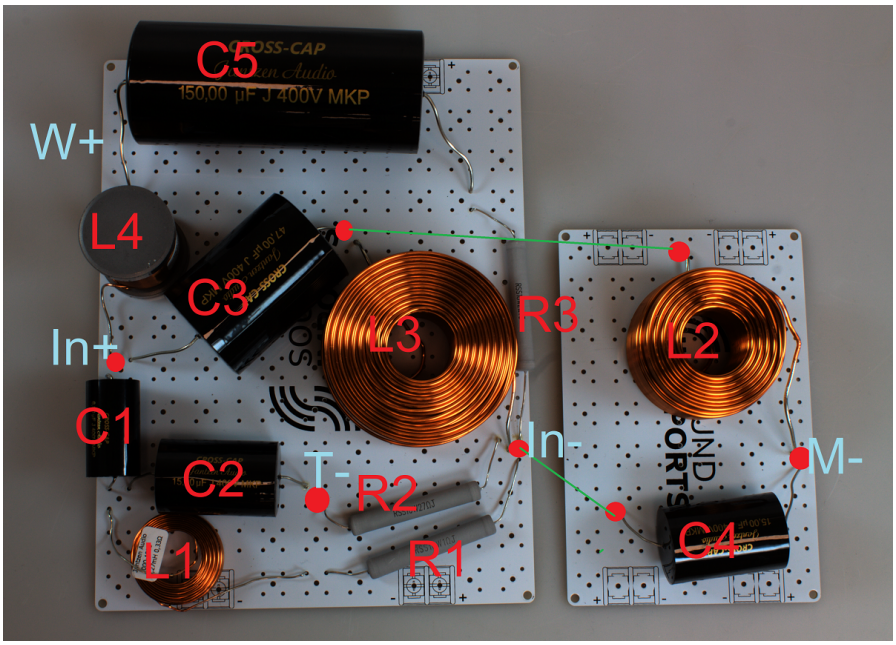
The acoustic slopes of the drivers follow a 2nd order Linkwitz Riley at 430Hz between the woofer and midrange, while it follows a 4th order Linkwitz Riley at 2350Hz between the midrange and tweeter. Following this the woofer needs to be connected in opposite polarity to the midrange and tweeter.

To achieve this, we used a 3rd order high pass crossover for the tweeter, a 2nd order band pass for the midrange and a 2nd order low pass for the woofer. Then we added a few resistors to fine tune the level and response.



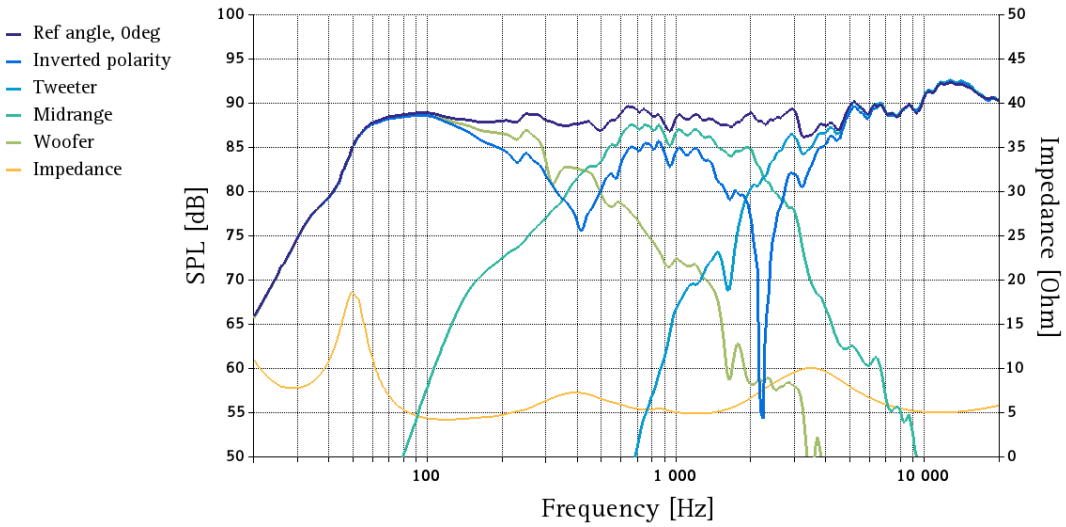
The VituixCad file and the measurements of the drivers are available to download. Then the advanced DIYer can further tune the crossover to their liking, try other topologies, or even make an active dsp setup.

Below you can find a suggested layout for the crossover.

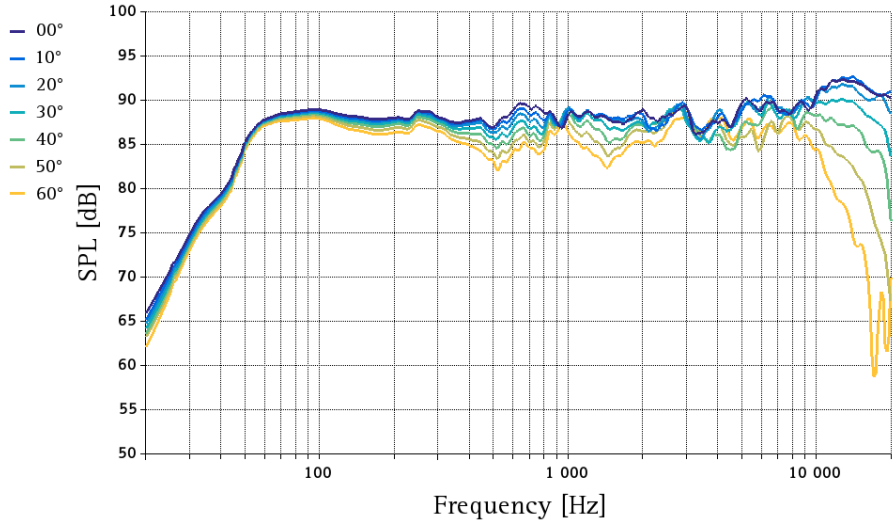


Measurement Results

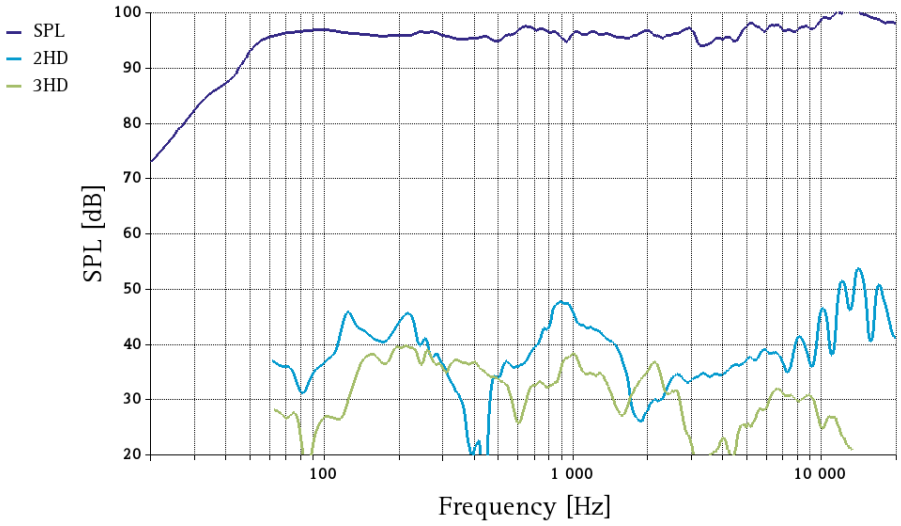
The on-axis measurement of the SEAS 403 Revisisted kit, including the individual drivers and a measurement with the midrange polarity inverted is shown below. The response is flat and neutral witht a small lift in the very top end to compensate the narrowing dispersion and keep a smooth power response. We can see that the drivers have a symmetric roll-off and from the inverted polarity measurement we see that it gives a deep and symmetric cancellation that tells us that the drivers are in phase over a wide frequency range.



The next graph shows the off-axis response. Here we can see a controlled and wide off-axis dispersion. Then we know that the room reflections also have a smooth frequency response so that we get a large and natural sound stage.



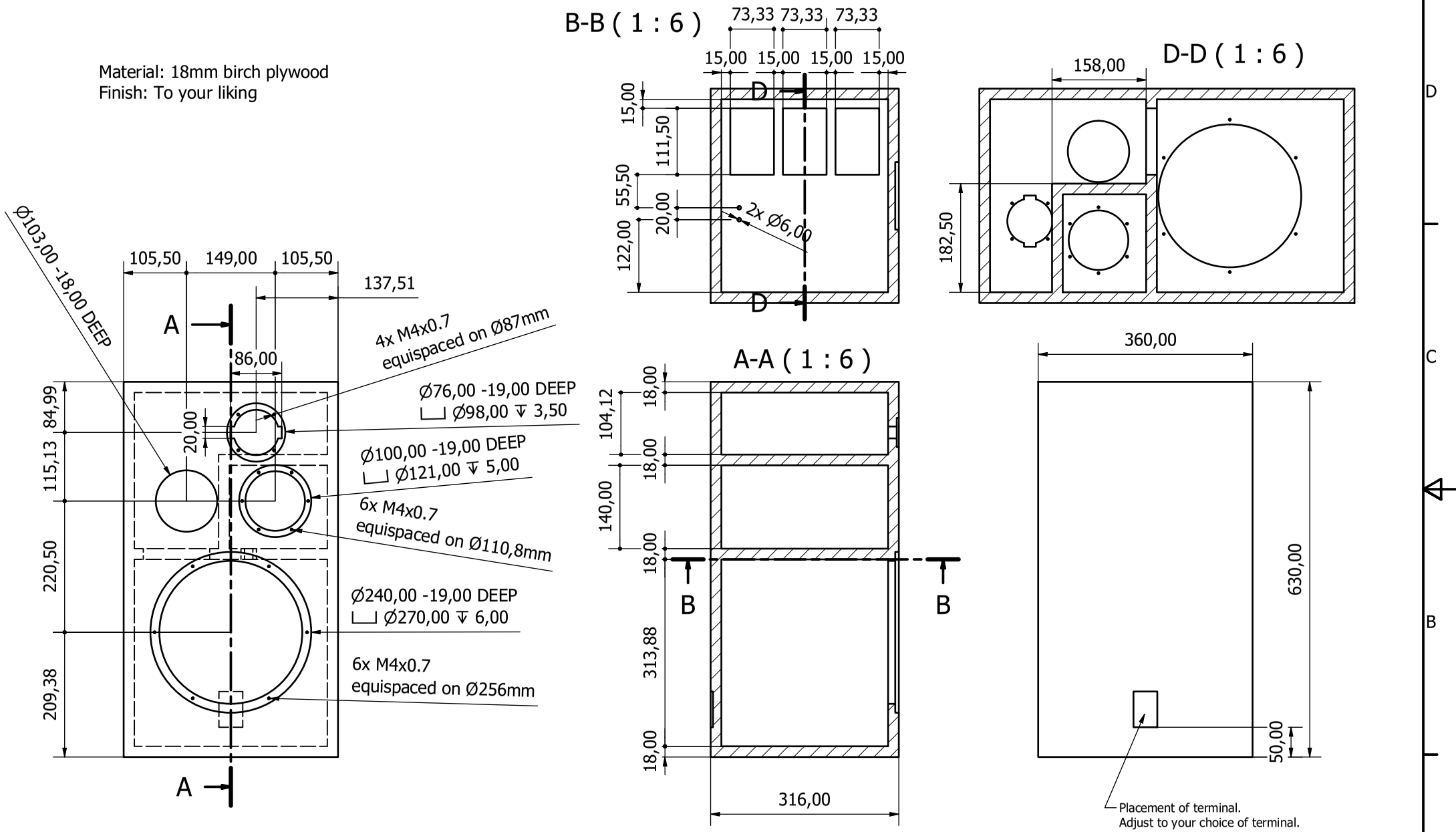
The harmonic distortion is shown in the last graph below. Here we have set the on-axis SPL to be 96dB averaged from 100Hz-10kHz. Then we can see that this speaker has a nice low distortion without any large peaks that stand out, even at a high SPL output.



Listening Room and Placement

High quality stands should be used to position the tweeter approximately at, or slightly above, ear level. Even in well-designed listening rooms, it is important to find the optimal placement where the loudspeakers perform best. Positioning the cabinets near walls or corners will enhance bass output but may also cause irregularities in the bass/midrange region. Some experimentation is recommended to find a position and toe-in angle that provide balanced tonality, a well-defined soundstage, and minimal coloration.

Material: 18mm birch plywood
Finish: To your liking



Designed by	Checked by	Approved by	Date		Date	
haavard					14.12.2023	

seas
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