



# Extremon

## Extremon - Compact with bass

Small loudspeakers that produce deep bass are few and far apart. After all a loudspeaker must move lots of air if it is to be able to produce low frequencies. Lots of cone area is physically not possible with a small stand-mount speaker, the Extremon takes a different approach and makes it possible to get impressive bass from a small speaker.



### Long-throw-woofer

The only way to get deep bass from a 17cm woofer in a small 15 litre cabinet is to use a woofer with a low resonance frequency, a Qts that isn't too low, relatively low Vas and a long-throw motor. A woofer that meets these criteria is the Adire Audio Extremis 6.8 - the T/S parameters of the Extremis 6.8 lend themselves to vented boxes in the 14 to 28 litre range, and with tunings in the 30-40 Hz range. The Extremon is tuned to a low 34Hz. To make the long-throw possible, Adire Audio uses the so-called XBL<sup>2</sup>™ motor structure. This motor structure uses two front pole-pieces closely placed after each other instead of the standard one. When the relatively short and light-weight aluminium voice-coil leaves the first air-gap it meets the magnetic field of the second air-gap and visa-versa. A bit like an under hung motor (short voice-coil in a long gap) but with less material - this keeps the cost of the woofer down and the total magnet structure can be kept relatively small. A normal woofer with the same X-max would have to have a thick front pole piece and a heavy voice-coil of several centimetres long. The linear stroke of this woofer is +/-13-mm with a maximum stroke of +/-15-mm, so 30-mm peak to peak! These values are normally associated with large subwoofers and not with 17cm midwoofers!

Furthermore the woofer has copper rings and a copper-clad T-shaped pole-piece to lower the voice-coil inductive rise. At 0,13mH it makes it easy to match this woofer with nearly any tweeter. The polypropylene cone with its exponential curved shape has a smooth top-end roll-off and is mounted in a butyl rubber surround. The shielded magnet is very compact and therefore minimizes reflections at the rear of the driver. All the parts are held together by a cast aluminium basket with four mounting holes. I would have liked to have seen six or eight because with the existing four you can easily bend the chassis a little when tightening the screws. But of course you can drill four extra holes yourself.

### Long-throw-tweeter

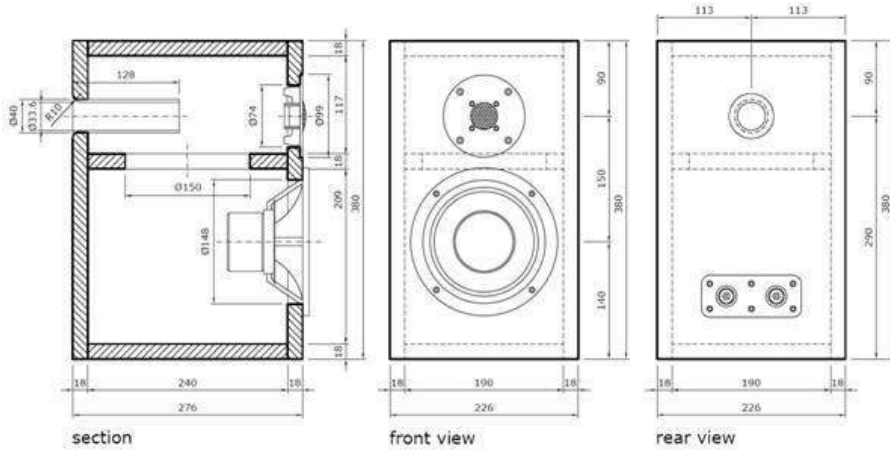
At a first glance the Seas 22TAF/G - H1283 looks like a miniature subwoofer! The coated textile suspension looks enormous compared to the size of the aluminium/magnesium dome. But in reality it's not a long-throw tweeter, the short voice-coil in the 2mm air-gap has an Xlin of only 0,5mm. The large surround is probably used to give this metal dome a smooth character, I found this tweeter to sound nicely calm and detailed at the same time. Absolutely no sign of hardness or edginess. Seas themselves state a combination of the top-end of a 19mm dome combined with the low-end of a conventional 25mm dome. The tweeter uses ferro-fluid with a low viscosity that is less syrupy than the old ferro-fluid Seas used to use. It does result in a higher impedance peak at the resonance frequency, but the voice-coil sees less of a "brake" which results in a more transparent presentation.

### Simple cabinet

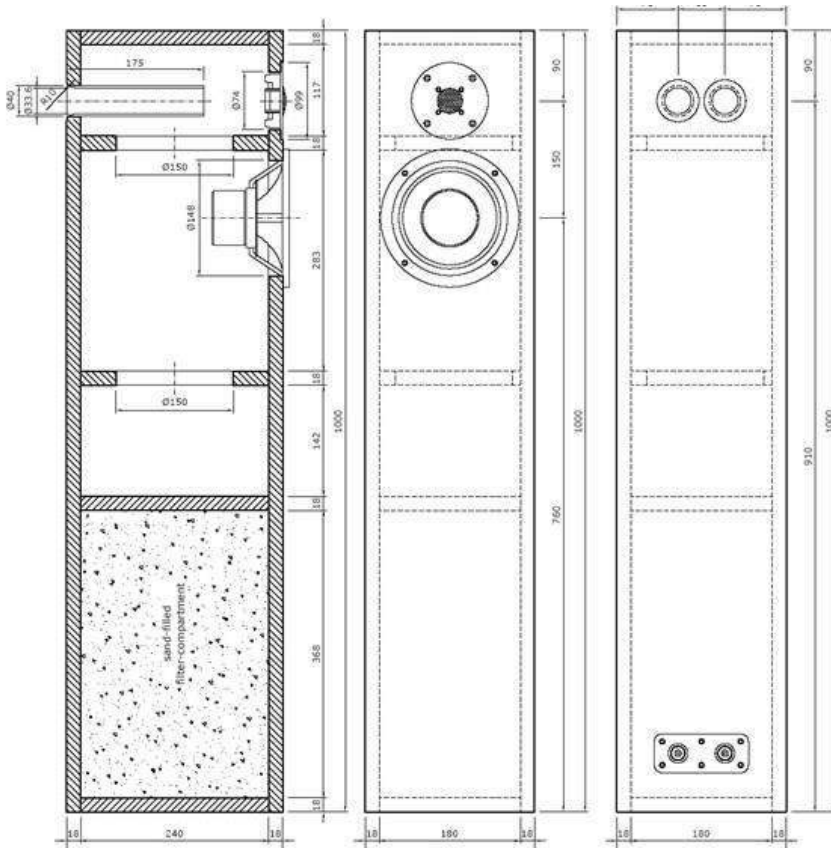
The main advantage of a small cabinet is that they are quite easy to build. The drawing shows six panels and one internal bracing,

that's all. The bracing is a panel with a 150mm diameter cut-out. There is also a drawing of a 24 litre floor standing version for those or you who prefer even deeper bass and don't want to use loudspeaker stands. This floor standing version also has a separate compartment for the crossover that can be filled with dry sand to give more stability and improve bass detailing and dynamics.

All internal walls of both cabinets (except for the inside of the front baffle) should be covered with self adhesive bitumous sheets like Intertechnik Bitumex. Furthermore the inside of the rear wall and the top and bottom panels are covered with 40mm high wedge-moulded foam like Intertechnik Pritex / Tyrotex or Monacor MDM-40. The internal volume is then lightly filled with fibre-fill. I like to use Monacor MDM-3 that is made from  $\frac{3}{4}$  sheep's-wool and  $\frac{1}{4}$  polyester fibres. One bag of Monacor MDM-3 is enough for two cabinets and it should be placed lightly rolled-up in the centre of the cabinet through the bracing cut-out. The stand-mount cabinet is tuned to 34Hz resulting in a -3dB point of 40Hz. The floor standing cabinet is tuned to 33Hz - in combination with the larger volume this results in a -3dB point of 32Hz.



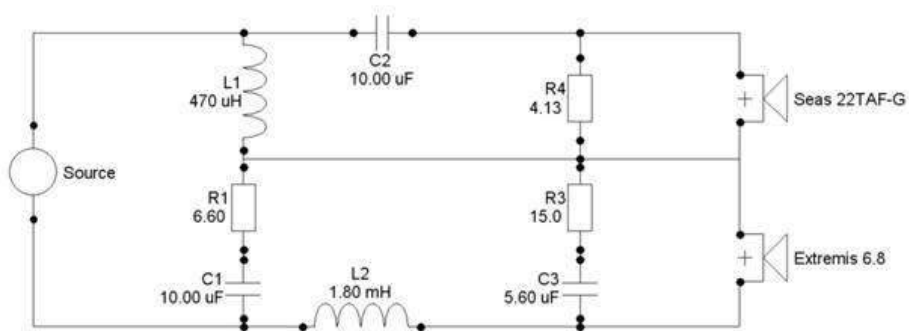
### Humble Homemade Hifi - Extremon



*Higher resolution drawing available.*

### Crossover and listening

The Extremon uses a standard 2nd order series-crossover with a low crossover point of about 1750Hz. The low-pass for the woofer is formed by L1, L2 and C1. The tweeter high-pass consists of C1, C2 and L1. As you can see with a series crossover the low-pass and high-pass share components. The tweeter level is adjusted by R1 and R2 in which R4 also flattens the impedance peak of the tweeter at resonance. Capacitor C3 and resistor R3 smooth the impedance rise of the woofer and also shape its top-end output level. The woofer output level has a little hump around 700Hz but I left out a notch filter for this because adding such a correction network seemed to rob the speaker a little of its dynamics.



L1 = 0,47 mH air-core inductor 1,4mm wire; R = 0,19 ohms

L2 = 1,80 mH air-core inductor 2,0mm wire; R = 0,25 ohms

C1 = 10uF Mundorf M-Cap or Clarity Cap PX

C2 = 10u>F Mundorf M-Cap or Clarity Cap PX

C3 = 5,6uF Mundorf M-Cap or Clarity Cap PX

R1 = 6,60 ohms carbon film resistor (5x 33 ohms / 1 watt parallel)

R4 = 4,13 ohms carbon film resistor (8x 33 ohms / 1 watt parallel)

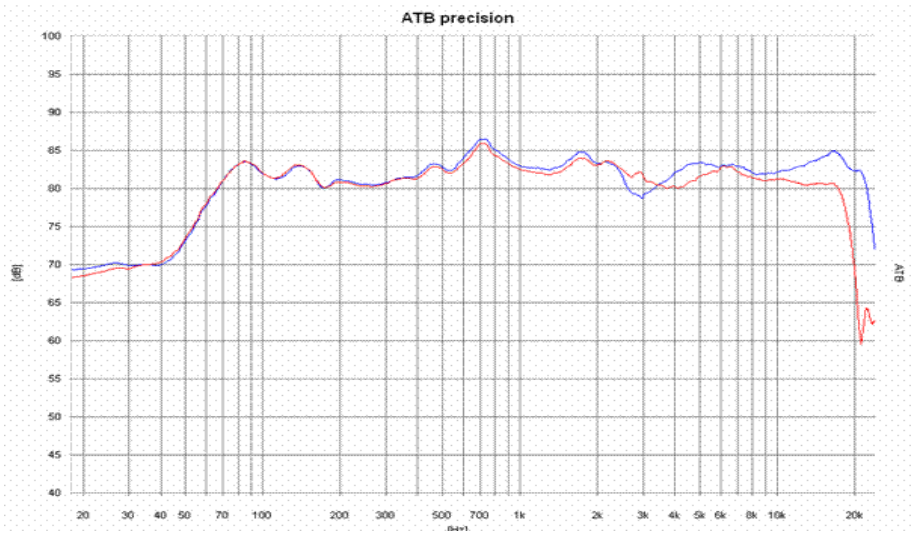
R3 = 15 ohms carbon film resistor (10x 150 ohms / 1 watt parallel)

\*All capacitors should be bypassed with a small Styroflex or Vishay MKP1837 capacitor of between 0,010uF and 0,047uF.

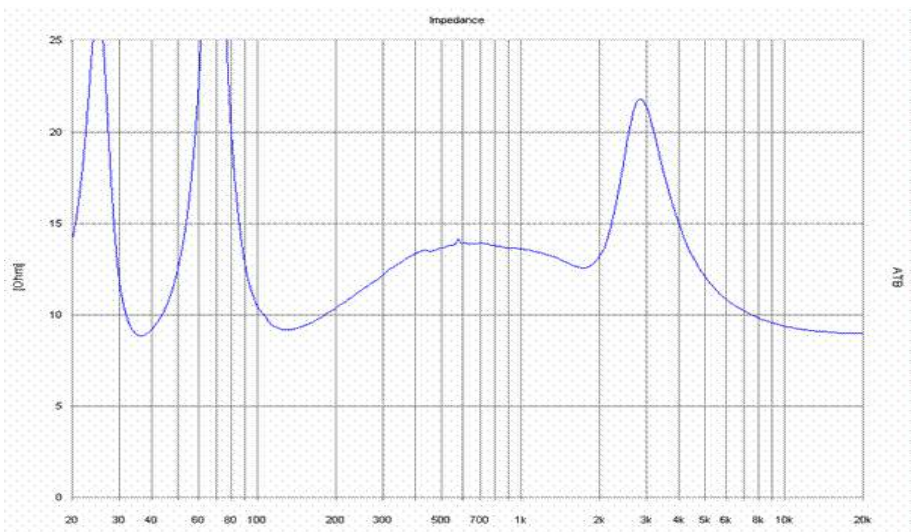


To come straight to the point: this speaker is a surprising little monster! Considering the low cost of the drivers and crossover components it is quite amazing what this speaker does. Most obvious is the deep and strong bass, never too heavy but they do create the impression of listening to much larger speakers. What the Extremon also does well is the natural balance between smoothness and detail; it is a smooth sounding speaker that leaves no details hidden. Furthermore spatial information is very good, left/right and front/back positioning of the individual instruments and voices in an orchestra or choir are easy to locate. The only point of criticism I have (and I am very picky) is that I would have liked to have a fraction more pressure in the upper-bass region. A bass-drum has plenty of depth but could do with a little more "power". Probably this is due to the use of a polypropylene cone; metal drivers like used in the DD8 do have that nice "drive".

### Measurements



Output level.



Impedance.

The measurements show a reasonably flat frequency response with a slight preference for the midrange. Between 200-400Hz the woofer is a little down in level which corresponds with the upper-bass character explained earlier. The impedance curve shows the twin peaks centred around the port tuning frequency. The overall impedance is rather high and never drops below 9 ohms so this speaker isn't current hungry at all. The overall sensitivity of the speaker isn't that high so I would advise to driver them with at least 2x 50 watts to have enough dynamic head-room.



NOTE: This design is strictly for the home DIY enthusiast and not to be used professionally without my permission!

Tony Gee, The Netherlands

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