



Classic / Classic-XL

Classic – all the ingredients are here to become one

On the outside a classic floor standing speaker with a footprint not much larger than an A4 size piece of paper with a height of about 1 metre. A classic two-way design using an 8" coated-paper cone woofer with a soft-dome tweeter. Hopefully it is destined to become a classic.



The Classic in semi-gloss white

The tweeter

A two-way system with a relatively large midwoofer needs a tweeter that can be crossed at a lower frequency than usual. The tweeter used is the [Scanspeak D2904-7100](#) and is based on the Scanspeak R2904-7000 reference tweeter but uses a full soft-dome instead of the ring-radiator of the 7000 tweeter. It uses a so called SD-2 neodymium magnet system enclosed by a cast aluminium non-resonant irregular shaped rear chamber designed to reduce compression. The 6mm thick face-plate is made from machined aluminium and sports 6 mounting holes to make mounting the tweeter very professional. It is a 4-ohm driver with a high sensitivity, good radiation pattern and a high upper frequency limit, so called SACD-compatible.

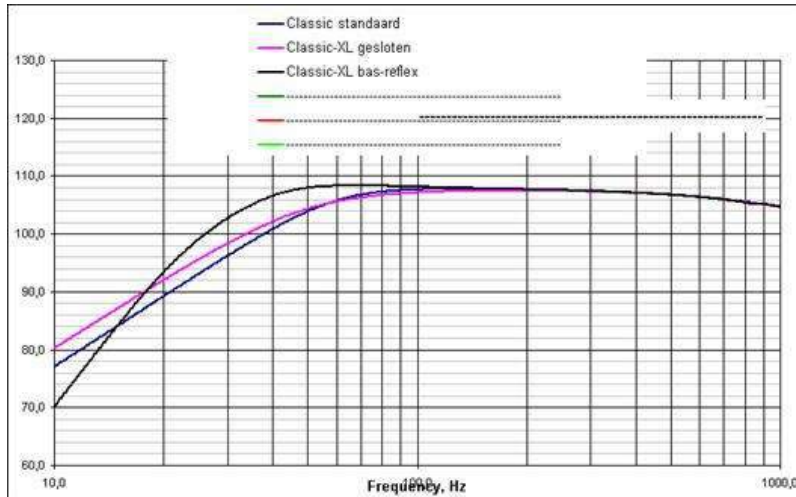
The woofer

The [Seas CA22RNX - H1288](#) is a 22cm mid-woofer. The classically hand coated, relatively light-weight paper cone and matching natural rubber surround produce a well behaved roll off characteristic and reduce potential resonance problems. A long, high temperature voice coil wound on an aluminium voice coil former is design to give low distortion and high power handling capacity. The large magnet system provides high efficiency and good transient response. A bumped back plate in the magnet system allows

maximum utilization of the long voice coil without mechanical limitation. An extremely stiff and stable injection moulded metal basket keeps the critical components in perfect alignment. Large windows in the basket both above and below the spider reduce sound reflection, air flow noise and cavity resonance to a minimum. As with all Seas drivers the build quality is superb. Coated paper cones are still very popular; this exact model for example is used in the Sonics Arkadia.

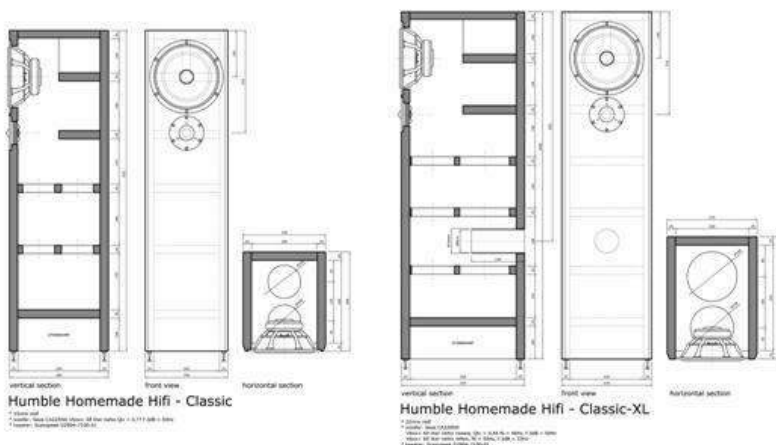
The cabinet inside and out

The Classic comes in two sizes: a standard closed box version measuring 250x300x970mm with an internal net volume of 38 litres for the woofer and a larger "XL" bass-reflex version measuring 270x370x1050mm. The smaller closed box is tuned to a Qtc of 0,77 it gives a -3dB point around 50Hz and works very well in small to medium sized listening rooms placed not too far from the rear wall. The XL-version has an internal net volume of 60 litres for the woofer. The closed box type is tuned to a Qtc of 0,66 and also gives a -3dB point around 50Hz but rolls off more gradual compared to the standard version. The 60 litre ported version is tuned to a low 30Hz and gives a -3dB point of 33Hz. The larger designs work very well in medium to large sized listening rooms. The port is made of thick-walled pvc drain-pipe with an internal diameter of 68,6mm and a length of 159mm. If you prefer a warmer bass, at the cost of a slightly poorer impulse response, you can shorten the port to 105mm length. This results in a tuning-frequency of 35Hz with the same -3dB point. The closed cabinet should be placed not too far from the rear wall, the reflex cabinet works best free-standing. But for all three cabinet versions it will also depend on personal taste which one you choose.



The various cabinet combinations

On all the cabinet variations the inside of the mdf walls is lined with 4mm thick bitumen (for example Intertechnik Bitumex of Monacor MDM-830) and high-pile carpet tiles to minimise cabinet vibrations and standing waves. The carpet must be fully glued to the bitumen, small nails or staples can help to keep things in place while the glue dries. Feel free to choose your own jazzy styled carpet; you won't see it anyway once the cabinets are finished! Furthermore the rest of the space is lightly and evenly filled with Monacor MDM-3 damping material that consists of 2/3 sheep's wool and 1/3 polyester fibre. One bag per speaker should be enough. For the reflex version, the area about the port is kept clear. Depending on the positioning of the speakers in the room and personal taste this fibre can be rolled up densely or loosely to give a tighter and dryer or a fuller and warmer sounding bass – or left out completely. I had the best results with a 50% fill positioned in the upper half of the cabinet. As with all loudspeakers: fine tuning the amount of damping material must be done when the drivers are fully burnt-in. When the woofer has had a few weeks of use, the bass will become deeper, fuller and more defined compared to a woofer straight out of the box. All internal wiring is Teflon insulated solid-core pure silver.



Higher resolution drawings are available on request



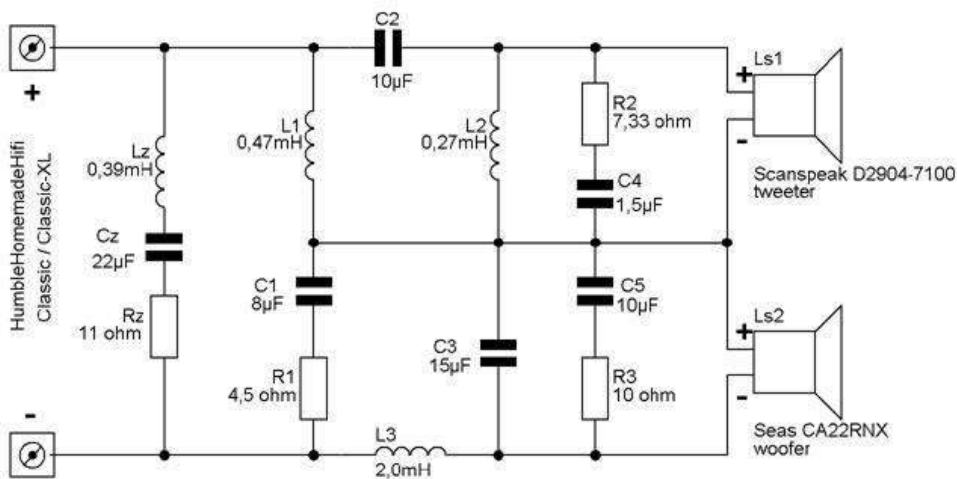
Mdf + high-mass damping sheet + carpet tile

Crossover and listening

In order to give the tweeter enough protection and keep distortion low with such a low crossover-point, I chose to use a crossover with steep slopes. In this case the midwoofer / tweeter network is the not often seen symmetric 3rd order series crossover that gives high attenuation outside the pass-band meaning the relatively large woofer can be filtered out steeply before cone break-up and beaming start; the tweeter can have a very low crossover point (in this case 1750Hz) without getting stressed and off-axis response is very good around the crossover point. Also interference between both drivers is reduced to a minimum. The electrical slopes for both the woofer and the tweeter give 21dB per octave attenuation outside the crossover point. Furthermore a Zobel-network is placed across each driver to flatten the inductive rise of their voice-coils. Finally there is an LCR correction network parallel across the terminals to flatten the impedance curve around the crossover-point.

Capacitor C3 can be varied a little: 10uF will add a little more openness to the midrange. If you make this capacitor by paralleling 4,7uF with 10uF you can see which combination suits your taste and system best (also see the measurements further down).

Combinations of standard components and ultra high-end components through-out the crossover can be made giving enough room to match you budget and personal taste.



The crossover schematic.

Crossover components standard:

L1 = 0,47 mH Alpha-core Goertz 12AWG or Mundorf 10AWG copper-foil inductor, R = 0,07 ohms (tolerance max 2%)

L2 = 0,27 mH Alpha-core Goertz 12AWG or Mundorf 10AWG copper-foil inductor, R = 0,05 ohms (tolerance max 2%)

L3 = 2,0 mH Alpha-core Goertz 12AWG or Mundorf 10AWG copper-foil inductor, R = 0,20 ohms (tolerance max 2%)

Lz = 0,39 mH air-core inductor 1mm wire, R = 0,29 ohms (tolerance max 5%)

C1 = 8uF (3,3uF +4,7uF) Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus (tolerance max 2%)

C2 = 10uF Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus (tolerance max 2%)

C3 = 15uF Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus (tolerance max 2%)

C4 = 1,5uF Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus (tolerance max 2%)

C5 = 10uF Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus (tolerance max 2%)

Cz = 22uF MKP polypropylene foil capacitor (tolerance max 5%)

R1 = 5,00 ohms, 15 watts** Caddock MP915 thick film resistor (tolerance 1%) with 2x 100ohms, 3 watts carbon film resistor parallel

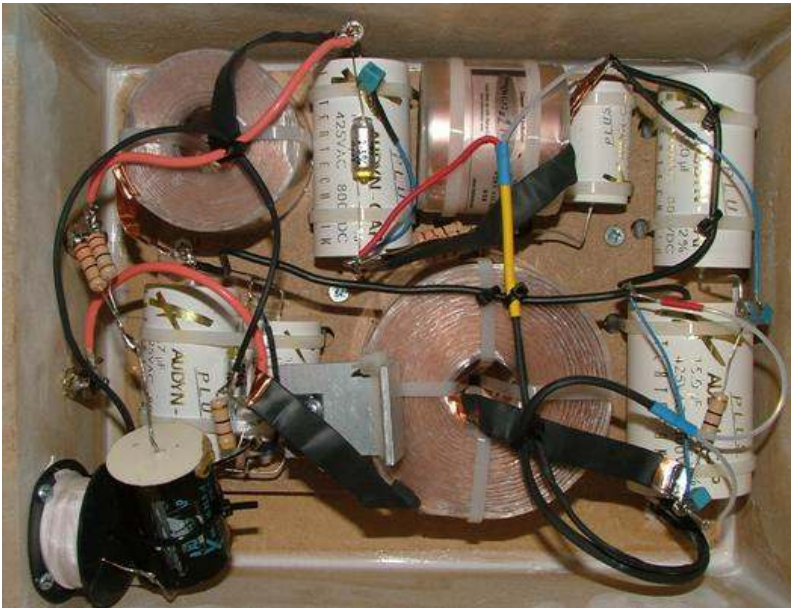
R2 = 7,33 ohms (3x 22 ohms parallel), 3 watts carbon film resistor (tolerance 2%)

R3 = 10 ohms, 3 watts carbon film resistor (tolerance 2%)

Rz = 11 ohms (2x 22 ohms parallel), 3 watts carbon film resistor (tolerance 2%)

* Bypass all Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus capacitors with a 0,01uF Styroflex or Vishay MKP1837 capacitor

** The Caddock MP915 should be mounted on a heat-sink for maximum power handling.



The standard high-end crossover

Crossover components ultra high-end:

L1 = 0,47 mH Alpha-core Goertz 12AWG or Mundorf 10AWG copper-foil inductor, R = 0,07 ohms (tolerance max 2%)

L2 = 0,27 mH Alpha-core Goertz 12AWG or Mundorf 10AWG copper-foil inductor, R = 0,05 ohms (tolerance max 2%)

L3 = 2,0 mH Alpha-core Goertz 12AWG or Mundorf 10AWG copper-foil inductor, R = 0,20 ohms (tolerance max 2%)

Lz = 0,39 mH air-core inductor 1mm wire, R = 0,29 ohms (tolerance max 5%)

C1 = 8uF (3,3uF +4,7uF) Duelund Coherent Audio Virtual Stack Copper Foil inductor (tolerance max 2%)

C2 = 10uF Duelund Coherent Audio Virtual Stack Copper Foil inductor (tolerance max 2%)

C3 = 15uF Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus (tolerance max 2%)

C4 = 1,5uF Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus (tolerance max 2%)

C5 = 10uF Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus (tolerance max 2%)

Cz = 22uF MKP polypropylene foil capacitor (tolerance max 5%)

R1 = 4,7 ohms, Duelund Coherent Audio Resistor (tolerance 2%) with 1x 100 ohms, 3 watts carbon film resistor parallel

R2 = 7,33 ohms (3x 22 ohms parallel), 3 watts carbon film resistor (tolerance 2%)

R3 = 10 ohms, 3 watts carbon film resistor (tolerance 2%)

Rz = 11 ohms (2x 22 ohms parallel), 3 watts carbon film resistor (tolerance 2%)

* Bypass all Mundorf M-Cap Supreme or Intertechnik Audyn Cap Plus capacitors with a 0,01uF Styroflex or Vishay MKP1837 capacitor

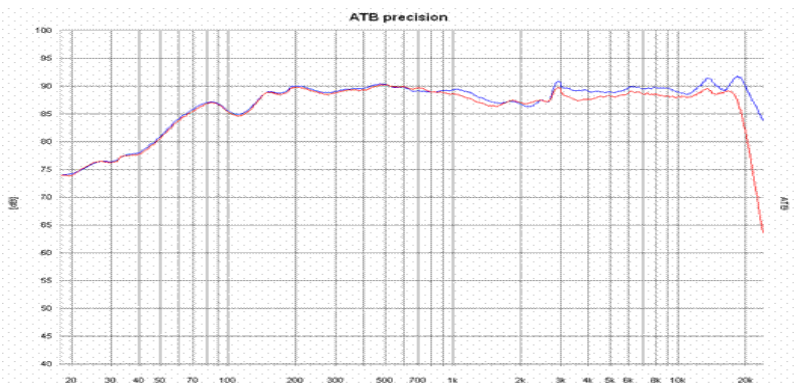


The ultra high-end crossover

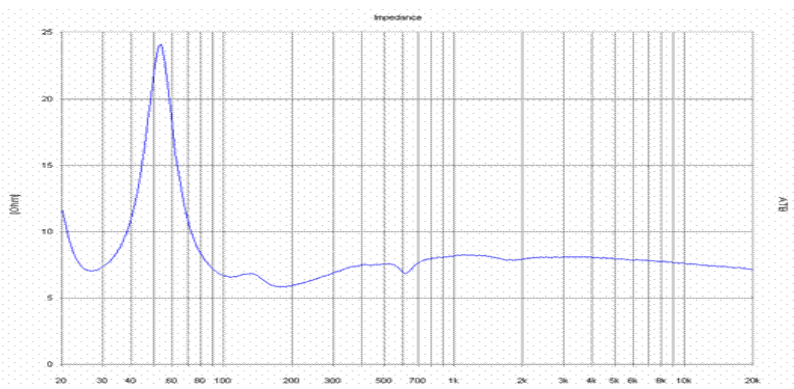
Both the Classic and the Classic-XL were listened to in various sized rooms to get an impression of the different bass-alignments. Due to the different driver loadings it is possible to get the right cabinet for the right application resulting in an even sounding bass response. Deep enough and never bloated. This even-sounding character is continued into the midrange that is also has a dynamic approach to it. The Scanspeak tweeter produces a clean and transparent treble, every detail in the recording can be heard easily. This loudspeaker lets you hear everything. Herein lays a potential problem: system matching becomes very important with this speaker. The Classic isn't a "beauty-maker", badly recorded cd's sound bad. But if the recording engineer has done his homework properly you are rewarded with a nicely outlined image with a natural tranquillity about it. At higher sound levels the image stays standing. The loudspeaker should be placed on a set of high-quality spikes so that the midrange detail is maintained all the way down into the bass.

Measurements

This time I had the opportunity to measure the loudspeakers using the professional ATB Precision system, the results can be seen below. Both the frequency curve and the impedance curve are relatively smooth; the small dip around 2 kHz in the frequency curve gives the calmness to the midrange presentation. As mentioned earlier, reducing the value of capacitor C3 will fill this dip and add more openness to the midrange. Due to the various correction networks, the impedance curve is near flat between 90Hz to 20 kHz and only varies between 6 to 8 ohms – a very easy load for most amplifiers. In the bass the two bass-reflex peaks can be seen indicating a tuning frequency centred at just under 30Hz.



Frequency plot 20-20.000Hz, hor. division 5dB.



Impedance plot 20-20.000Hz, hor. division 5ohms.



The Classic-XL in natural oak

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

Tony Gee, The Netherlands

December 2006