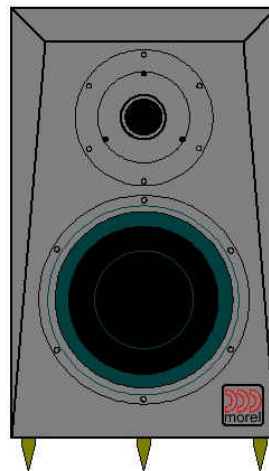
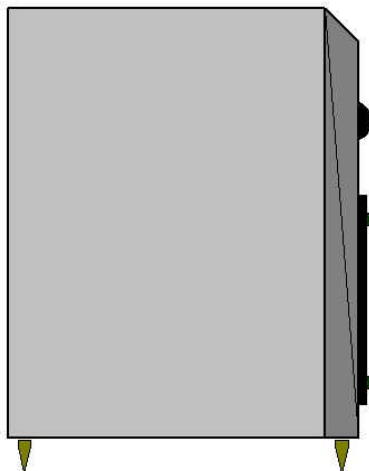


True high-end compact 2-way stand/shelf speaker

Designing an easy to build, nice looking and very high quality speaker was our goal with this Elite 620 speaker. We believe we succeeded in this effort.

With this model we entered a unknown field again, due to the fact that we didn't know anything yet about the behaviour of the completely new MOREL woofer EW 638. About the improved and slightly smaller version of the famous MDT-33, called ET 338-104 we learned with designing the Elite 621 already.

The result of our work is an easy to build, nice looking and very well sounding speaker indeed.



Tweeter: MOREL ET 338-104
Woofer: MOREL EW 638
Freq.range: 45-20.000 Hz
Efficiency: 87dB
Nominal load: 150Wrms
Impedance: 8 ohm
Crossover: 6/6dB serial
Crossoverpoint: 2200Hz

Design:
Louis Timmers
March 2009

www.eltim.eu

Introduction

While designing this system we decided to let the tweeter do the most of the job, since it has a nearly flat response from 2kHz up and the power envelope is that wide, that you can hardly overload it. The remaining lower range is an easy task for the fantastic looking and sounding woofer. The new milled DPC cone and Uniflow diecast aluminium frame obviously do their job very well.

We try to build our systems as phase linear as possible, meaning that we use only 6/6dB crossover, which is no problem for any MOREL drive unit. Choosing a crossingpoint where the tweeter starts to drop (nearly as a crossover slope actually) we gained an acoustic 12dB slope. To maximise phase linearity we even made it a serial crossover. We used MUNDORF Supreme capacitor and Foil coil to match the quality of the units. With some compensation networks (Mcaps, metal oxide resistors and a backed coil) we loaded the actual crossover components with a constant impedance, also resulting in a nearly flat 7 ohms load from 100Hz up. This in combination with a nearly flat frequency response within 2dB meaning that phase behaviour is outstanding as well.

Low frequency response appears to be dramatic low for this size and with a pressure, speed and accuracy you expect from a sealed cabinet, yet this is a (bottom) ported system. Due to the fact that the port is at the bottom (angling 45° forward), this model needs spikes or similar in order to lift the bottom at least 1cm up.

With only 25 grams of our TWARON Angel Hair as damping material the speaker presents the lowest signals audible by human ear with a very nice 3D presentation.

The units



For the woofer we use the 6" model **EW 638** of the new "Elite" range. With the new diecast aluminium Uniflow basket the unit breaths a lot better as the former models with steel baskets did. The new unit shows even it's anatomy; actually you can see the voicecoil due to the External Voice Coil (EVC) principle, where the magnets are mounted inside the gigantic 75mm aluminium Hexatech coil with hexagonal wire. The produced heat is moving away from the inner magnet system, with the result that it hardly ever will compress the sound. Small holes in the former even cause an air flow through the open pole center to increase cooling.



Also new is the cone material, being a DPC (Damped Polymer Composite) cone which is milled to get an even lighter cone and better looks.



The tweeter **ET 338-104** is a modified MDT-33, the most famous MOREL tweeter. It is known as one of the best performing, detailed tweeter available for many years. Besides that, efficiency of 92,5dB and power load capability of 200Wrms are off scale.

Through the fine silk 28mm handcoated dome you can see the effective damping and the entrance to the well damped rear chamber. It is running from 1800 Hz up, without any serious spikes and dips. Due to the new designed faceplate the off-axis response increased compared to the former model MDT-33. Times change and finally it is in the international used Ø 104mm. By the way, also the successors of the well known MDT-29 (CAT 298), MDT-30/32 (CAT 308) and Supreme tweeter (ST 1048) are available in this size now. With the 6 instead of only 3 holes the wish of many people came true.

The cabinet

With a width of 20cm and a height of 32,4cm this design finds its place in any bookshelf or on a stand, even in smaller living rooms. Also in this design we use the “golden number”, in the width/height of the baffle, location of the units and shape of the inner rib.

Side and top/bottom panel are angled 45°, so they fit perfectly without visible sides of the 22mm MDF. The 28mm MDFT baffle is milled on both sides. At the back we milled it 4/22mm all around. This way the side panels can be positioned quite easy without slipping while the glue is drying. At the frontside just the tweeter is sunk for a clean look and best performance. With this redesign (from 19 to 20cm width) we could also mill the woofer and now it also sunk in the baffle.

The edges can be angled as in our prototype picture and the panels we supply have this shape.

With our drawings we supply a help tool for easy cutting these edges with a saw machine.

The backpanel holds the Mundorf crossover components for easy assembling. We supply our kits with thermal and mechanical stressfree mounting help.

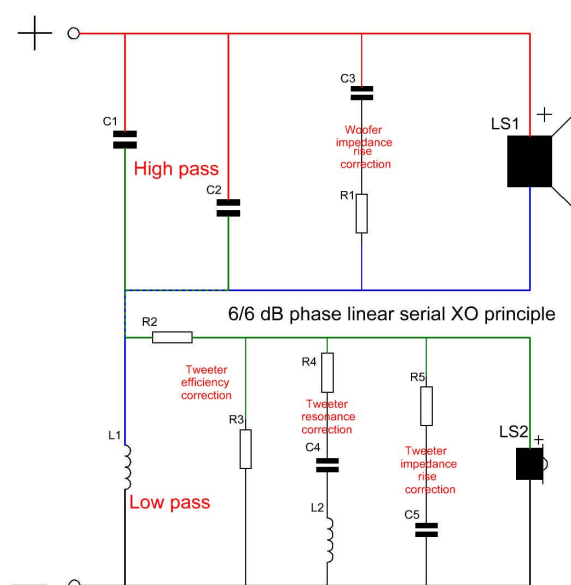
Drawings are only available together with our kits.

The crossover

Our designer has the opinion that in combination with MOREL units most simple crossovers bring the best musical results. We mostly just listen and listen and... while tweaking our designs. Bringing perfect graphs too often the sound became dead, something we don't want.

He used a simple 6/6dB crossover and to increase phase linearity even more, it became a serial crossover. For a correct functioning this type of crossover must “see” a flat impedance load in the woofer and tweeter circuits. To gain this we added some circuits parallel to the woofer (C3/R1) and the tweeter (R5/C5), preventing rise of impedance with frequency. Besides that a circuit (R4/L2/C4) counteracts the tweeter behaviour around the resonance frequency of 700Hz. Resistors R2/R3 bring down tweeter efficiency to the level of the woofer, being 88dB. The 6/6dB (L1, resp. C1+C2) filter is crossed at 2250Hz.

For proper functioning the -3dB points must be exactly the same. This is the basic reason why this crossover is hardly used, since with just “tweaking” you will not get proper results or spend way too much time in designing. Therefore we made our own software, where we enter all driver parameters and all crossover parts values and try to find a crossing point bringing best results for the purpose. The value of L1 (CFC14) is set first, since we need to use the E12 range, while we can add a small capacitor (C2, Sup8) to the basic HP capacitor C1 (Sup8). Even then we cannot get it exactly right, so we alter the compensation networks a bit to get it right. Practice showed that our software works right.



The damping

After listening for hours we believed we must add 25 grams of our TWARON Angel Hair since this speaker deserves it. The small mass hardly increases total price, so we did it.



Twaron Angel Hair is made of extremely thin synthetic wire, which is made “woollike” elastic due to a special process. In the picture it is compared with a human hair. As you can see it is a very open material, resulting in a very wideband and efficient damping material. 10 grams brings similar damping in the midrange as 50 grams of sheepwool, but the range of TWARON is much more effective in the lower ranges. While using it you will also find out that small signal response, like echo’s of a room or mechanical noises of instruments will be noticed much more. You are simply more “there”.

It is permanent elastic and it stay’s in place forever.

People can discuss a lot about functionality and price of damping material. Fact is that price is no issue, since it is only a fraction of the total costs, so save your time..... About functionality people could discuss, but they have to try it first. Without noticing the obvious positive effects of this Twaron you have a problem.

We glued our Royale 700 rubber mat in full interior to dampen small vibrations of the panels. At the same time it has a rough surface and damping standing waves that way.

Note:

Theoretically a first order crossover causes a slightly downward soundlobe around crossing frequency. If you put it in a cabinet or on a bookshelf, position will be above your head. In that case it is just perfect.

Putting the speakers on a stand you could alter the design a bit, by reversing tweeter polarity. This effect will raise then, being perfect for stand positioned speakers.

All our designs can be ordered in five building stages:

ELTIM Elite 620:

Units + screws + damping + complete building description	€ 310,-
All milled MDFT 28/22mm panels	€ 69,-
All needed MUNDORF crossover components + mounting material	€ 102,-

All prices are per speaker, 19% VAT included.

Kits and components can be ordered at our dealers or in our webshop (at 5% discount).

Detailed drawings are not for sale separately. Publishing them in any way is prohibited.

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