



Product Information

FinkTeam Launch of the BORG EPISODE 2 loudspeaker

The story of the BORG EPISODE 2

OK, let's be honest, the original idea was a completely different one. Last year, we sat down with the team in our office, and we thought about what to do next. Our big flagship to follow the WM4 was still under development, and the sales team asked for a model between KIM and BORG.

So the development started, and several prototypes have been made, tested and rejected. Whatever we tried - the sound was not good enough, or the price to make it was so high that it would not make sense to produce it. So finally, we decided to skip the model „in-between“. So you could think we ended up frustrated, but it was really not the case. As we looked into every detail of our existing speakers, we found that we did it right.

So we sat together again and discussed what to do next. And what was the result? BORG EPISODE 2.

The original BORG has been on the market for five years, launched in 2018 on the High-End in Munich. So what could be improved, using what we have learned in the last five years?

The cabinet

Typical loudspeaker cabinets have pronounced structural resonances that are audible and reduce the speaker's 'signal-to-noise ratio'. FinkTeam takes this aspect of loudspeaker performance very seriously because we know that a quiet cabinet allows the reproduction of low-level detail in a recording which is otherwise swamped by spurious cabinet output. Coloration and time smear are reduced, stereo image focus is improved, and listener fatigue is avoided.

The design emphasis is on panel damping. It is impossible to force all the panel bending resonances above the passband, so instead, they are damped to reduce their amplitude to below audibility. This is achieved using a multilayer construction that combines multi-thickness MDF panels with a damping layer whose internal friction converts vibration into heat. FinkTeam developed algorithms help specify ideal material thicknesses to achieve the best results, but the ultimate determination is made by subjective assessment. Enthusiasts spend thousands buying quieter equipment - products that seem to generate [or not in fact] more space between notes to ultimately have the effect considerably reduced by noisy loudspeaker cabinets.



FinkTeam's COMSOL modelling and Laser Scanning allow prediction and measurement of the results of cabinet design, improving performance while reducing physical iterations. An example of this is the cabinet opening to mount the 10.25 inch mid/bass driver. Even with the drivers rigidly mounted, there was some unwanted vibration. Almost invisible to the touch test, it was obvious under the laser scanner. A solid metal ring behind the driver mountings solved the problem and hence increased the signal-to-noise ratio.

And all this was still true after five years. We tried hard to improve it, but the original construction was still as perfect as it was originally. However, one thing we changed. Was the original BORG standing upright, we tilted the new BORG EPISODE 2 slightly back. This improves the imaging and sound stage and is something we learned during the development of your KIM speaker.

Mid/Bass Unit

As one would expect, the mid-bass driver of Borg is custom designed and manufactured exactly for the purpose. 10.25-inch mid/bass units are relatively unusual, and crossing them well to HF units is not trivial but FinkTeam is relatively unusual: a technical challenge is just a design exercise that may take a little longer to solve. The benefits of a 10.25 inch mid/bass, once heard, are difficult to forget. A level of dynamics and naturalness around voices that is unusual and a richness to the sound without bloom or boom (in a well-designed system) that just sounds right. Smaller 2-way systems sound anaemic after

hearing a '10 incher'. The Borg's mid/bass unit features similar thinking to the WM-4's bass driver: low hysteresis surround (it too looks like a pro driver), a large three-inch voice coil for better control and power handling and a light, stiff paper cone. Of course, it includes all the normal FinkTeam design essentials: an aluminium shorting ring on the centre pole to reduce voice coil inductance change with position and to reduce flux variation as a function of voice coil current.

The die-cast aluminium chassis is fully vented for low airspeed, as is the voice coil former, both reducing distortion and compression. All this brings a dynamic, low-coloration drive unit with high power handling and low thermal compression.

So there was no reason to change the woofer sign and that's the reason the drive unit is still the same as used in the original BORG.



Tweeter

The tweeter is an Air Motion Transformer (AMT) operating according to the principles developed by its inventor Oskar Heil. Developed and manufactured in-house by Mundorf and finally assembled at the FinkTeam production place in Essen. The AMT has a strong, 25µm-thick pleated Kapton diaphragm with 50µm aluminium strips. This material has extremely good internal damping, resulting in particularly low distortion. A special etching process was developed to produce it, and the diaphragm configuration was optimised through many tests. Given the 10.25 inch mid/bass unit and a lower-than-average crossover frequency of 1600Hz, a larger AMT driver with a 6464mm² surface area was ideal. Frequency response easily reaches up to 30kHz while distortion is very low and mainly second harmonic. The AMT's almost constant impedance also facilitates a simplified crossover design (in theory). For the new model, a small modification to the tweeter's housing was made to improve the decoupling of the tweeter from the cabinet. Together with the floating screw, it helps avoid any leakage of cabinet vibrations into the tweeter.

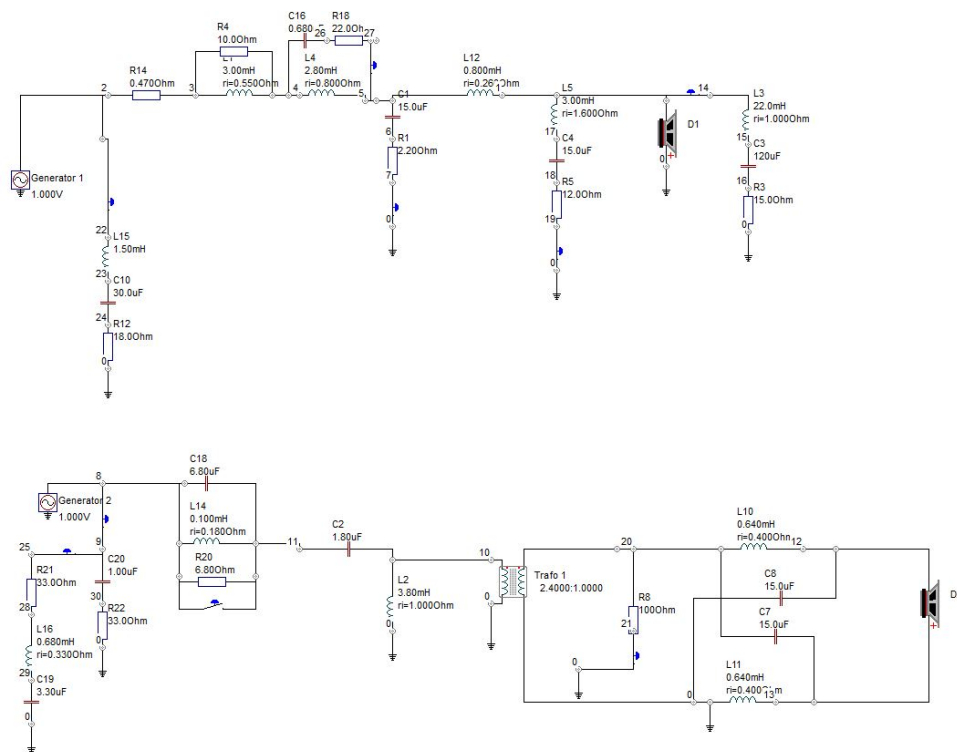


Crossover



The crossover is the heart of a passive speaker, and this is exactly where we made the biggest changes for the new generation BORG. The crossover is 4th order acoustic Linkwitz-Riley with a time delay addition between LF and HF. And we still use air cores even for the woofer part (laminated steel core for impedance compensation). A lot of components have been auditioned to find the best combination for the sound character we wanted to create. Those components are not possible to be found by measurements - only our ear can help to select the right one. Did we use, for example, a Polyester based capacitor in the Impedance compensation (150uF), it was replaced with 12 single MKT capacitors in parallel, giving lower losses than a one-piece Polypropylene based capacitor.

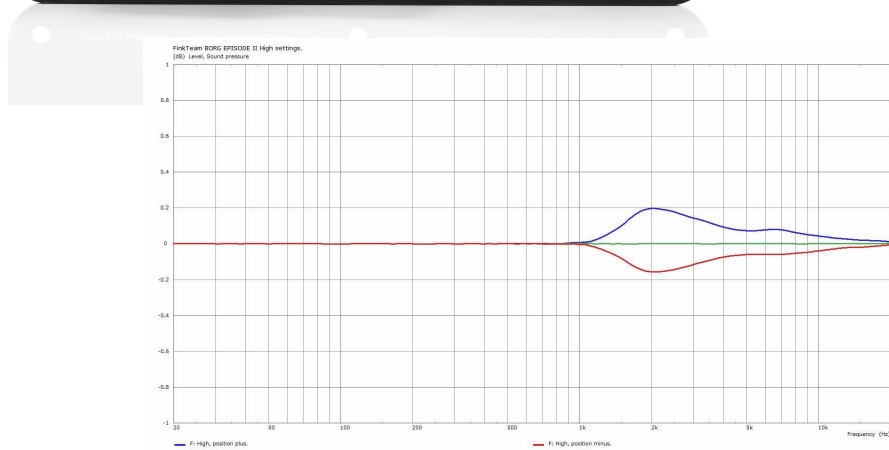
The tweeter part of the crossover uses a transformer to adjust the sensitivity of the HF unit to the Woofer level. The tweeter level needs to be reduced by $> 6\text{dB}$, and in the past, this was done by high-quality resistors. That works, of course, but even so, it's not very well-known, resistors in crossovers can change the sound. Working on the big WM4 successor, we started using transformers to adjust levels and the sound improvement was really big. Those transformers (Autoformers) have been using in classic BBC monitors a lot, JBL and TANNOY used them in big monitors, and in all three cases, the transformer not only reduced the level but also acted as a part of the filter. That's also the case in the BORG EPISODE 2 and so, the filter of the AMT was getting a lot simpler compared with the original design. As the transformer not only changes level but also impedance, the main capacitor for the tweeter could get lower in value. This capacitor is essential for the sound quality and we listened to many different ones, ending up with a new type from Danish specialist DUELUND [PP and Silver Hybrid], paired with a second from MUNDORF. The transformer is made in Germany on an HQ Ferrite core and potted in wax for the best mechanical damping. The crossover is located in a cavity at the bottom of the cabinet.





Control panel

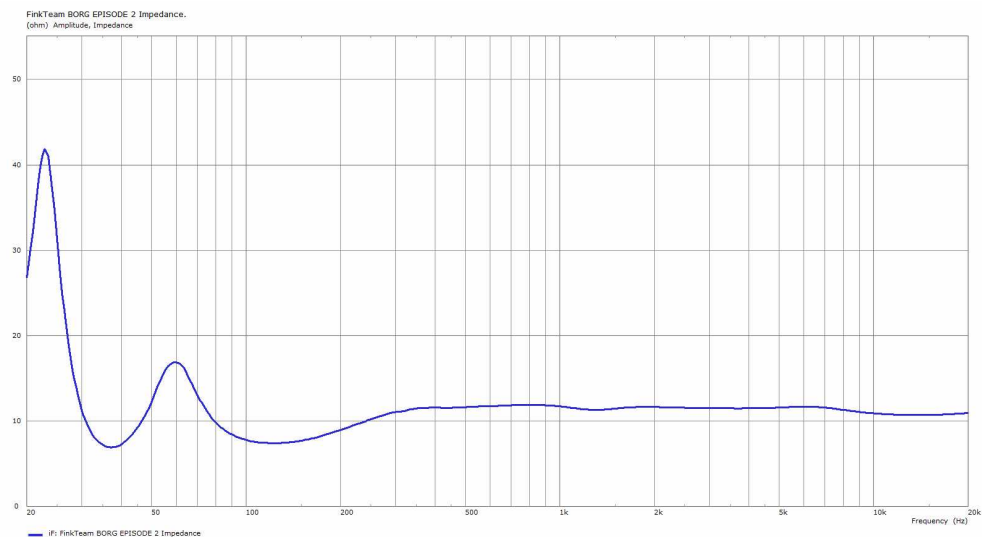
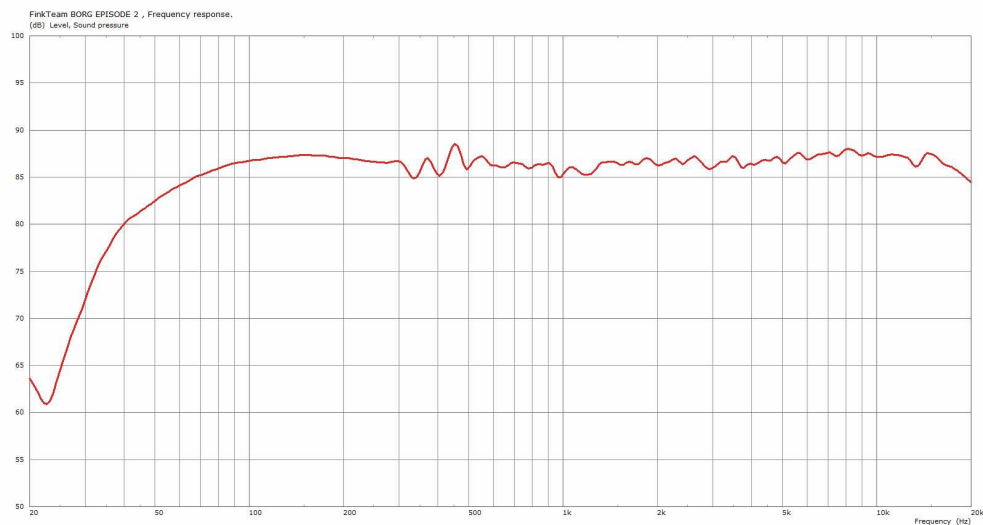
Like the original BORG a terminal plate with separate binding posts for woofer and tweeter is used. The Binding posts are made from Copper, not from the usual Brass. The original BORG used four control switches; the new model got only two controls. The mechanical switches have been replaced with bridges. The decision to reduce the number of controls is based on the experience of five years. The most used control was for the woofer damping, so it is still there. The tweeter and presence control was not easy to use for consumers, so we replaced it with a new HF control that does a combination of both, but not by changing any series resistor or adding capacitors. The middle position is obviously natural, the Plus setting makes the presentation a bit more forward, and the Minus setting gives a more relaxed sound. The lower mid-band one was never used, so we cancelled it altogether. The new front and the new controls, together with a completely new layout, helped reduce the cable length that was needed.

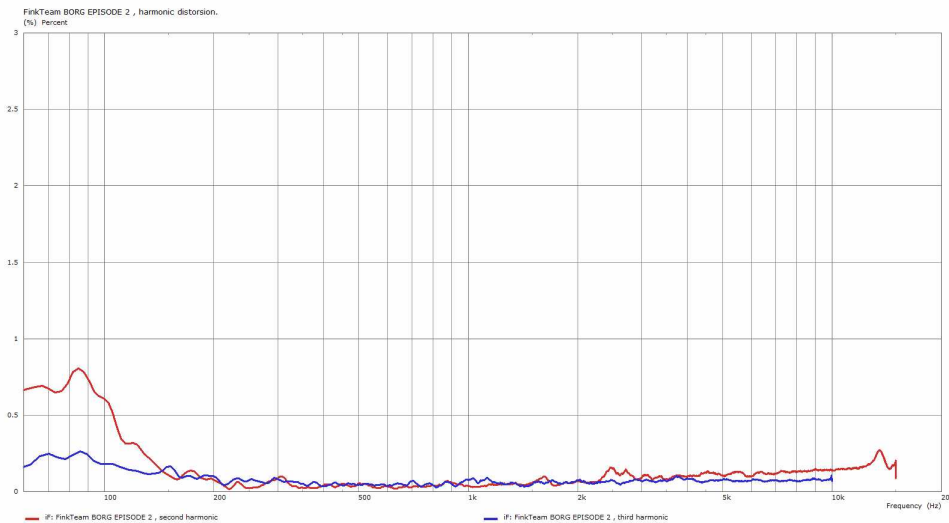




Measurements

A FinkTeam speaker with bad measurements will never hit the market, so the BORG EPISODE 2 is no exception. In fact, it is similar to the original BORG, even so, we changed a lot on the topology of the crossover. Frequency response and distortion figures are almost identical, with slight improvements at the crossover region. The biggest change we have is in the impedance. Due to the transformer in the crossover, the impedance got really big at higher frequencies, so a more complex impedance compensation was necessary, split between woofer crossover and tweeter crossover. These compensations are not critical in terms of components (even so, we still use high-quality parts there), but they offer a constant load of more than 10 Ohms, together with a low phase shift above 200Hz, making life easy for cables and amplifiers. The sensitivity is „only“ 87dB @ 2.83V, - however, the „real“ sensitivity is higher at 1 Watt.





Production

The BORG EPISODE 2 gets assembled in Germany (Essen, Rommerskirchen). Some parts are made in a European wood factory, but the final production of the cabinets is in-house. The production process is pretty complex and so all steps are documented. A fully equipped KLIPPEL QC system measures every driver and selects matching pairs. The tweeter gets tuned to specifications one by one by hand. The crossover will be tested, of course, and the whole speaker goes through extensive tests. All details are documented, so we could replace a broken unit with one that fits (only happened once in 5 years, blown amp) All speakers are running in for days, and every pair will be listened to in our listening room by members of the development team.

About FinkTeam

For those of you who don't know FinkTeam, it is 'what it says in the name'. A team of experts in their respective fields, who decided, with Karl-Heinz Fink as their head, to create a brand and to design products that they wished to. Their day jobs, in general, are as specialists working for Fink Audio Consulting, Europe's leading acoustical consultancy. FinkTeam products are designed combining the skills of the team to allow designs that deliver more than the sum of their parts. Their first commercial product was the WM-4 – a behemoth of a speaker – designed initially as a reference. The WM-4 allowed them to hear small differences in set-up/optimisation of other products they were designing that would have been missed on less revealing loudspeakers. For more information on the team members, visit www.finkteam.com

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