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Dynacord AXM 12A

(...) The Dynacord AXM 12A monitor "with an extended application range" can do virtually everything you could ask of a compact box. (...)

Powered 12" universal cabinet

Dynacord AXM 12A

Loudspeaker boxes in the format of the AXM 12A cover a wide variety of applications from monitor to mini PA. Its coaxial construction and additional electronic features set the AXM 12A apart from the pack.

*T*ypical PA loudspeakers can be divided into three broad categories: large PA, compact boxes and monitors. The distinction between the second and third categories is blurred on occasion by enclosure designs that support both applications. The most commonly encountered are compact boxes with two differently angled sides that allow the box to be used on the stage as a floor monitor, inclined more or less steeply. Frequently the tweeter and woofer of these loudspeakers are positioned side by side, which due to interference effects on the horizontal plane is less than ideal and can be regarded at best as a compromise solution. For this reason, Dynacord has adopted the opposite approach with the AXM 12A, employing a classic wedge design with the front panel at the optimal angle and the height of the enclosure kept to a minimum. To get round the problem of interference altogether, a coaxial chassis has been chosen, with both drivers arranged on a single axis. This theme is even more important in

The AXM 12A without front grille: the coaxial tweeter radiates through the fine mesh of the polepiece cover

Coax system with neodymium compression driver for the high frequencies mounted

the case of monitors than in that of normal PA loudspeakers because the listener is far closer to the loudspeaker, which means that angle-dependent effects are exacerbated. Furthermore, since the listener in question is a performer moving about in all directions in front of the monitor, no single plane can be prioritized. To do justice nontheless to the idea of universality, this box, whist optimized for use as a monitor, has been enhanced with a variety of accessories that allow it to serve pole mounted as a compact PA or combined with a subwoofer.

Thanks to the possibilities afforded by modern switching power supplies and amplifier technology, the AXM 12A has been designed as a fully active system equipped with two integrated power amplifiers and a complete 2-way digital controller. To qualify the AXM 12A for still further applications, a small two-channel mixer with two mic inputs and two line level inputs has also been integrated. The box therefore covers an extremely wide spectrum of applications, from stage monitor to small PA box and even complete mini PA for a solo entertainer or a speaker delivering an address on the market place. For the hirer, therefore, the AXM 12A is a neat

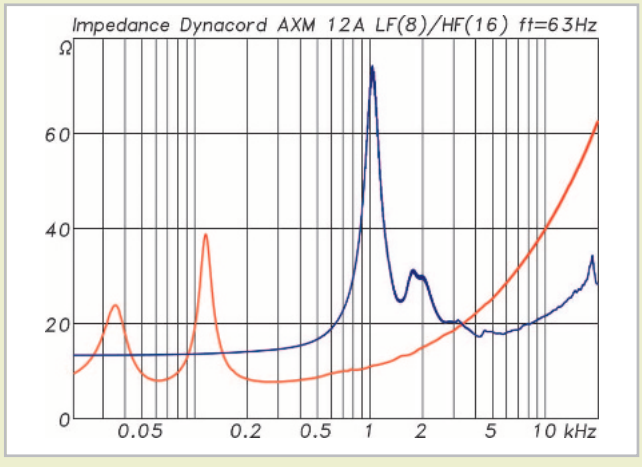


Fig. 1: Impedance curve of the LF (red) and HF (blue) drivers; the bass-reflex enclosure is tuned to 65 Hz

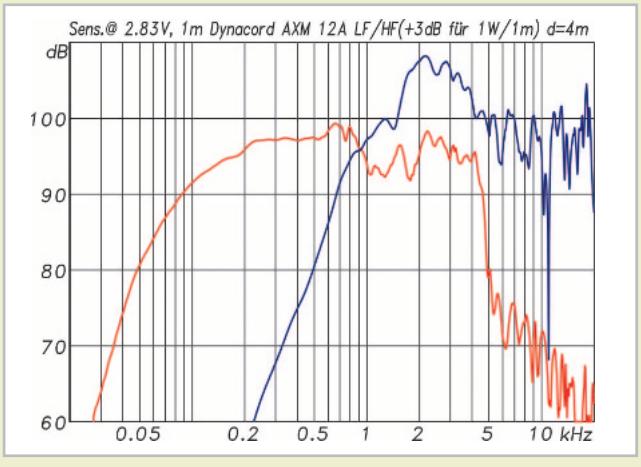
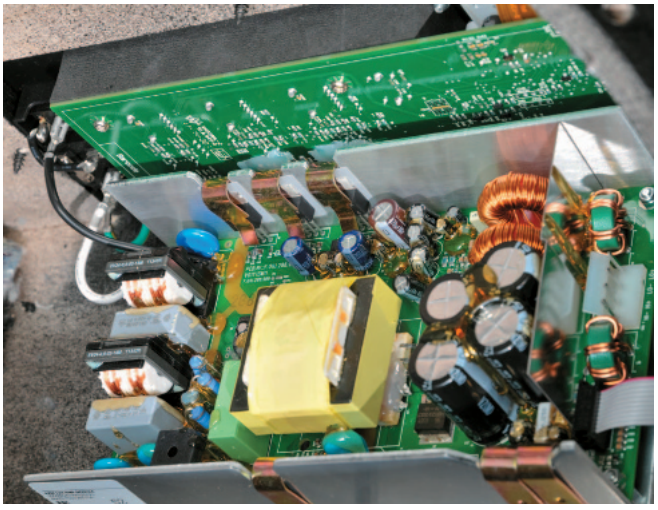


Fig. 2: Individual frequency responses LF (red) and HF (blue) measured without the integrated electronics; the sensitivity of both drivers is referenced to 2.83 V / 1m

Side view showing control elements including the small mixer for two microphone or line level signals



The solidly constructed electronics module with switching power supply and controller

universal tool. Besides which, monitors are something you can never have too many of, and if these can be used for a variety of other tasks as well, so much the better.

The cabinet of the small monitor is solidly constructed, as the application requires. Everything creates a robust and stable impression. For the cabinet, a resilient 15-mm multiplex has been chosen. The electronics are well protected and recessed in the side panel. The grille is particularly robust, as befits that of a monitor, and also very firmly attached, with sufficient mechanical pre-tension to ensure that it springs back into the correct shape after pressure is applied to it. The box, which weighs no more than 14.9 kg, is easy to manipulate thanks to the two handles worked in the side, and stands securely in all positions on large rubber feet. For tripod mounting there is an integrated pole socket. When combined with subwoofers, the models PowerSub 212 and A118A are recommended.

Basics

Let us look briefly at the construction. The flat cabinet (334 mm high) contains a 12" coaxial chassis supplied by a major OEM. On the large ferrite magnet of the woofer, a neodymium high-compression HF driver has been mounted that radiates outwards

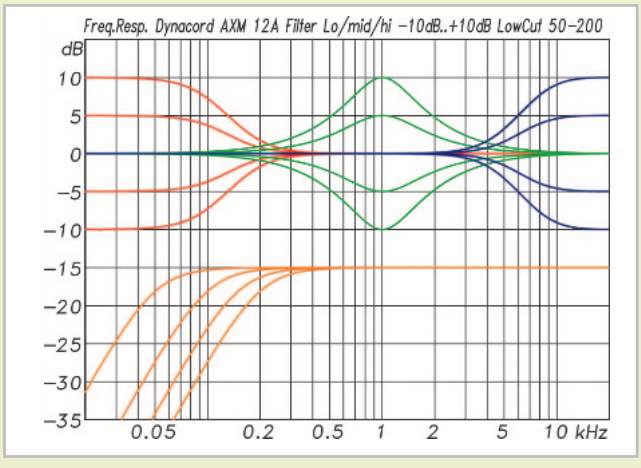


Fig. 3: EQ function in the DSP with Lo, Mid and High EQ plus Lo Cut filter (the additional notch filter for feedback suppression is not shown here)

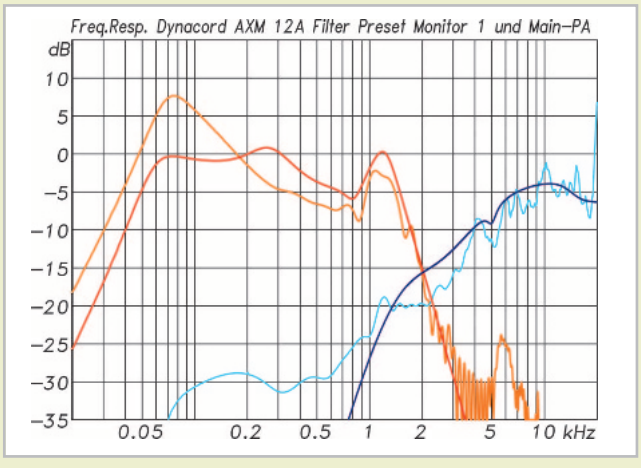


Fig. 4: Filter frequency responses for the presets Monitor 1 (red and blue) as well as Main PA with FIR filters (orange and light blue)

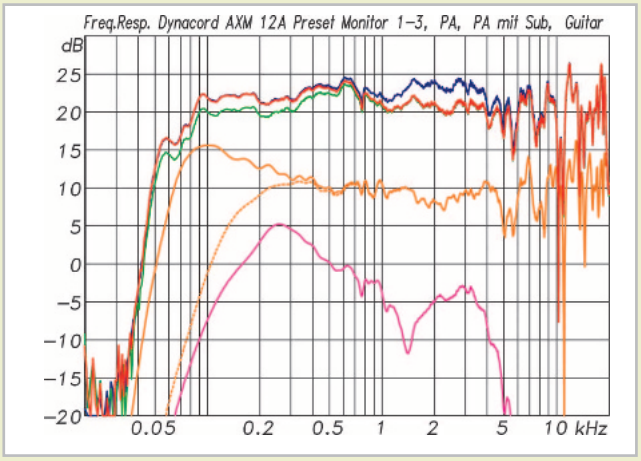


Fig. 5: Frequency response with the setups Monitor 1-3 (above), Main PA with/without subwoofer (middle) and Guitar (below)

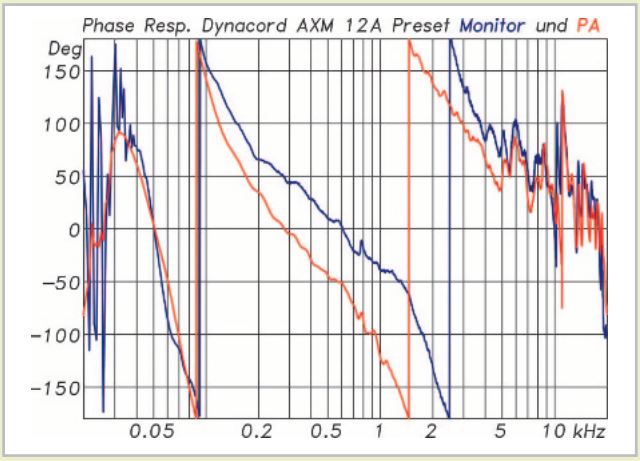


Fig. 6: Phase responses for the presets Monitor 1 (blue) and Main PA (red). In both cases, the curve corresponds to the minimum-phase component. The X-over function is always implemented with IIR filters.

through the perforated pole piece and acoustically transparent dust cap. The tweeter, with its 1.75" coil, is coupled to the woofer at 1.6 kHz.

The impedance curves of the two drivers in Fig. 1 show a 16-ohm tweeter and an 8-ohm woofer with a bass-reflex tuning frequency of around 63 Hz. The resonance frequency of the tweeter is around 1 kHz – already well below the crossover frequency.

Fig. 2 shows the frequency responses of the two drivers measured directly without filters. The sensitivity given here is referenced to 2.83 V terminal voltage. For the 8-ohm woofer that is also the value for 1 W / 1 m. For the 16-ohm tweeter, the 1 W / 1 M value is 3 dB higher than the curve. Typically for a "light" 12-incher, the woofer shows a high sensitivity of 98 dB from 200 Hz upwards and an agreeable response in the midrange. Above 4 kHz, it rises steeply – a characteristic some may remember from the legendary EV12L – although the two devices are unrelated.

The tweeter referenced to 1 W / 1 m attains just over 100 dB and remains serviceable up to 20 kHz with 100 dB. The somewhat troubled detail of the path should be attributed to the coaxial structure, which always involves compromises. With a separate horn, things would presumably look different, but then one would have to dispense with the coaxial structure.

Electronics, presets and filters

The electronics module is mounted in the side of the cabinet. The control surface features a small mixer with three channels. Inputs 1 and 2 are balanced mic/line inputs with +40 dB maximum gain and switchable 15-volt phantom power. The third is a stereo line input with cinch (RCA) sockets that is mixed to mono internally. There is a balanced Mix Out for the sum signal of the mixer, which is also routed to the controller of the loudspeaker. The integrated controller is operated using an incremental encoder with a small display. As well as showing level ratios and possible limiter activities, the presets and EQs can be set here. All the filters and limiters are realized using digital signal processing. The analogue signal, as is typical of a Dynacord DSP, is implemented with a gain-ranging AD converter with 15 dB differential and a very good S/N. This is followed by a gain control and a delay for distances up to 100 m. The latter is mainly important when the box is used as a delay line to another system and has to be adapted. Next come a low-cut filter, a notch filter and a three-band EQ. The Lo and Hi EQ are shelving filters; the middle band is a bell filter sweepable between 20 Hz and 20 kHz. All the filters have a gain of ±10 dB. The notch filter can be used in case of feedback to suppress the critical frequency. Next in the signal path come the filters for operation as a floor monitor or as a free-standing box and the X-over filter. All the filters are realized as IIR filters. After this, the signal path is divided in two, with delays, level adjustment, speaker EQs and RMS- as well as peak-limiters. The speaker EQs are, for the monitor function, classic IIR filters, and with the Main PA preset, FIR filters. The FIR filters allow here detailed equalization of both drivers and also take over the X-over function. The additional delay caused by the FIR filters is less than 1 ms and therefore negligible. The filter functions for the presets Monitor 1 and Main PA are shown by way of example in Fig. 3.

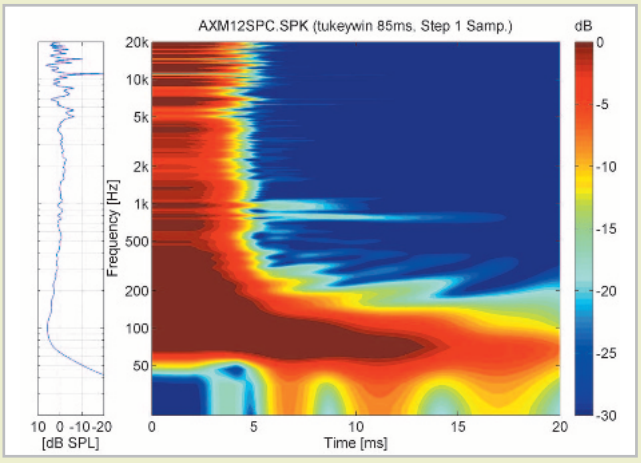


Fig. 7: Spectrogram showing a few minor resonances of the kind generally unavoidable with a coax chassis

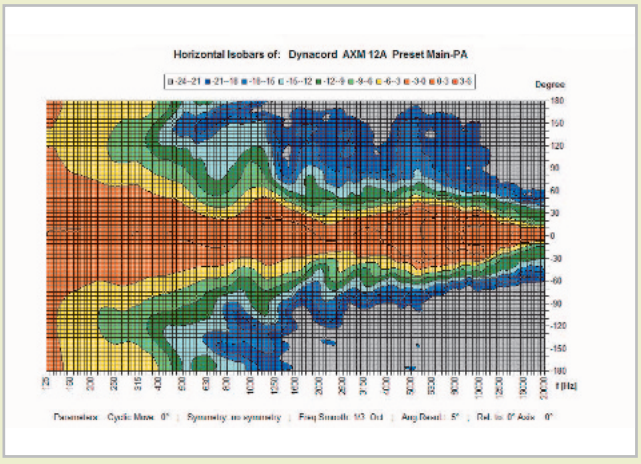


Fig. 8: Horizontal isobars; the mild asymmetry around 1 kHz is due to the slightly off-centre installation of the driver

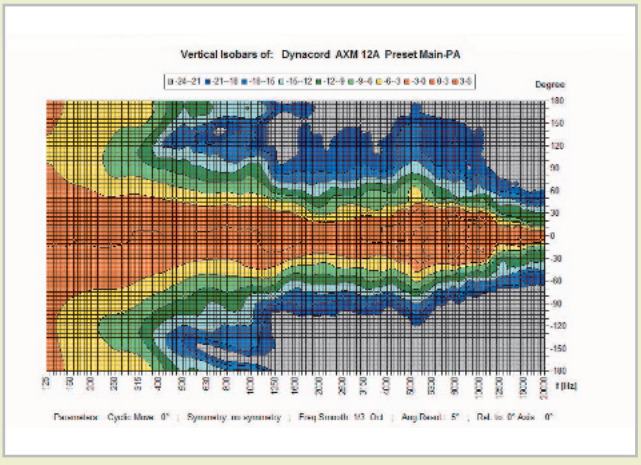


Fig. 9: Vertical isobars of the AXM 12A; the 90° is attained in the midrange from ca. 1 kHz upwards; above 10 kHz the dispersion is more tightly focussed

Viewed as a whole

The results of the five presets together with the loudspeakers are shown in Fig. 5. The monitor presets were measured with the AXM 12A in the floor position from a distance of around 2 m at ear level. The PA presets were measured free-standing from a distance of 4 m. The PA preset shows a slight "bathtub" in the frequency response, with c. 5 dB of lift at each end; this undoubtedly makes the sound of the AXM 12A for typical applications even easier on the ear. The monitor presets are designed to provide a linear response over a wide range.

A further, somewhat exotic-sounding preset emulates a 4 x 12" guitar cabinet. Developer Thomas Schlittmeier, being himself a guitarist and having conducted numerous measurements and experiments with his 4 x 12" Marshall cabinet, is now very satisfied with the sound of the AXM 12A for his guitar. Naturally it is only the linear effects of the 4 x 12" box that can be simulated with the filter. For the typical valve sound, a suitable preamp is required, this being then fed into the AXM 12A directly at line level. Whether or not the promise in the manual: "Take two of them in a stereo setup and you'll never miss your full stack" holds true for you is surely a matter of taste and depends also on playing style, so each person should form their own judgement.

In the spectrogram from Fig. 7, the AXM 12A gives a good account of itself. There are a few minor resonances and only one that is more pronounced just below 1 kHz.

Directivity

The advantages of a coaxial configuration of the two drivers are most evident in terms of directivity. Here there are no angle-dependent propagation time differences that could lead to constructive or destructive interference in the vicinity of the crossover frequency. The data sheet gives the radiation angle as 90°. This value holds for all directions.

Figs. 8 and 9 nonetheless show the isobars separately measured for the horizontal and vertical planes. The planes in this case refer to the setup as a PA box. In both cases, the 90° is attained in the midrange. Above 10 kHz, inevitably, a somewhat sharper focus sets in, due to the absence of a dedicated horn. In both planes, there are slight deviations from the expected symmetry that can be explained in the one case by the shape of the cabinet and by the fact that the driver is slightly off centre.

Distortion

The maximum level of a loudspeaker is a function of its sensitivity and power handling or the maximum linear excursion of the driver. Depending upon the design of the power amplifier, this, too, can be a limiting factor. The two power amplifiers of the AXM 12A are rated at 260 W (LF) and 75 W (HF).

First the maximum possible level referenced to 1 m for a maximum of 3% or 10% distortion was measured. Between 200

Hz and 2 kHz, the two curves in Fig. 10 largely coincide. Here, the 10% limit had still not been reached when the limiter in the box put a stop to any further increase in the level. Beneath 200 Hz and above 2 kHz the two curves diverge clearly, as here, due to the large excursion (LF) or compression (HF), more distortion occurs. Overall the path of the Maximum SPL curve is nicely even and constant. Loud in the midrange and falling off lightly at the edges, the response is as you would expect from a monitor. Beneath 100 Hz, the AXM 12A begins to weaken slightly, which is hardly surprising given the size of the box. No one would expect any more in this area—or even want it for monitoring applications. For monitoring drums, of course, a little help from a subwoofer would not go amiss. The measurement with the multi sine wave signal with the EIA-426B spectrum and a 12 dB crest factor yields for 99 dBA equivalent continuous sound pressure level at a distance of 2 m under free field conditions 8% distortion. At a distance of 1 m, that equates to 105 dBA or 110 dB(lin). The peak level is 12 dB higher here at 122 dB. With this, however, the potential of the box has still not been exhausted. If you push it to the absolute limit, there's another 3 to 4 dB inside. For standard monitoring applications that should be more than sufficient.

Listening test

In the listening test, the AXM 12A convinced with an appealing dynamic sound. The mild but unavoidable deficiency in the deep bass region is skilfully compensated for by a slight boost between 80 and 100 Hz. If more bass is needed (e.g. for a club PA), a subwoofer, naturally, must be added.
Voices are reproduced very clearly and well to the fore, which is what you want from a monitor. The midrange and treble are always wonderfully clean and the resolution fine. When the woofer is forced to violent excursions, the odd noise can be heard from the cabinet, but this is something that can never be avoided altogether and in any case only arises under extreme conditions.

Summary

The Dynacord AXM 12A monitor "with an extended application range" can do virtually everything you could ask of a compact box. It is primarily destined to serve as a floor monitor on stage. A small PA system, however, can also be built around the AXM 12A, and with the support of a subwoofer, a nice club rig. Thanks to its fully active operation and the small integrated mixer, more still is possible and the AXM 12A can even serve as a complete mini PA. The great thing about all this is that the components are invariably perfectly matched to one another and everything functions reliably. The finish and production quality are of Dynacord's usual high standard—in other words, irreproachable. Another pleasant aspect of the AXM 12A is its price of 1,090 EUR (RRP).

Text and measurements: Anselm Goertz
Photos: Dieter Stork, Anselm Goertz (2)

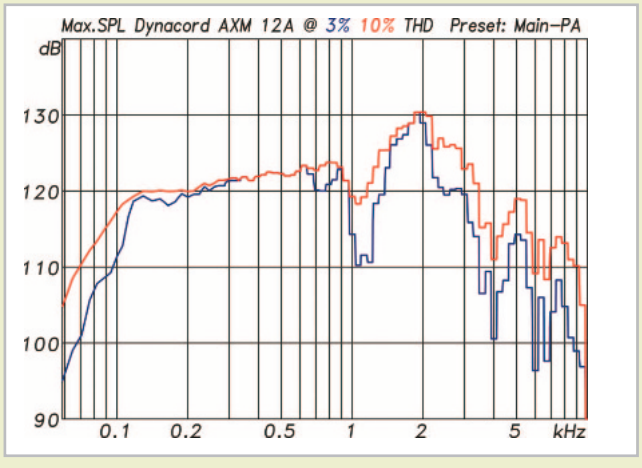


Fig. 10: Maximum level with a maximum of 3% (blue) and 10% (red) THD

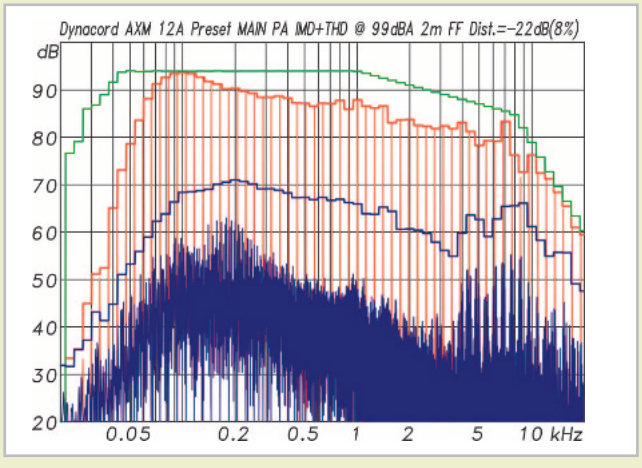


Fig. 11: Intermodulation distortion for a multi sine wave signal with spectral distribution according to EIA-426B (green curve) and a 12 dB crest factor; in red the entire signal, in blue only the distortion components