

# CAR & HiFi

INTERNATIONAL

1/26 · 4,80 €

## European Edition

### Best topics

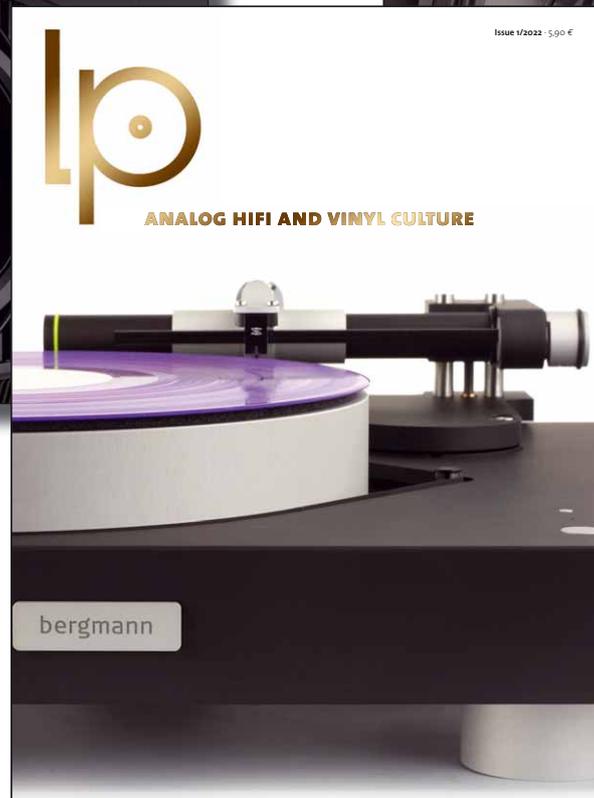
- Classy retro radio
- High-End DSP Amplifier
- Modular "Amplify" series by Helix
- New Reference speakers
- 4 Mini amps for all occasions

### Featured brands

- Audio System Germany
- Blaupunkt • ESX
- Ground Zero
- Helix • Musway



# READ IT !



Now available

# MUSWAY

THE DSP EXPERTS



Also controllable via smartphone with the new MUSWAY TUNEST app

1250 Watts RMS  
8 Amplifier Channels  
plus 12 DSP-Channels



**BEST PRODUCT**  
Absolute Spitzenklasse  
**CAR, HiFi** 5/2025

**EMV-TIPP**  
Ungestörter Radioempfang  
**CAR, HiFi** 5/2025

**Musway M8**  
Absolute Spitzenklasse 1+  
**CAR, HiFi** 5/2025  
Preis/Leistung sehr gut



**myCON NEW**  
Optional AMOLED Touchscreen Controller

## M8 NEW

8-Channel Class D Amplifier with 12-Channel DSP

6 x 80/135 Watts RMS @ 4/2 Ohms

+ 2 x 120/220 Watts RMS @ 4/2 Ohms

Dynamic Headroom up to 156 Watts RMS @ 2 Ohms per Channel (CH1-6)

8 x High Level Input with EPS, 2 x RCA Low Level Input

2 x RCA AUX Input, 1 x Optical Input/Stereo

8 x Loudspeaker Output amplified

4 x RCA Pre-Amplifier Output (configurable via DSP)

Compatible with the new Musway Smart Controller myCON

Dimensions: 150 x 44 x 245 mm

## VERSATILE AND BRILLIANT CONVINCING ACROSS THE LINE



WWW.MUSWAY.DE

MUSWAY is a brand of Audio Design GmbH · Am Breilingsweg 3 · D-76709 Kronau

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**TECHNIK FÜR KLANGBEGEISTERTE**

# Things remain exciting

2026 is still fairly young, but it already promises to be an exciting year for car audio. We have already tested some of 2026's best new products for you in this issue, including highlights such as the extraordinary 70s retro radio from Blaupunkt, sophisticated DSP amplifiers from ESX, while Helix contributes a modular 6-channel amp with or without DSP – you decide! Furthermore, it is safe to say Ground Zero's new Reference speakers will be more than just impressive, they are technology packed and sound truly immersive.

Another highlight is coming up this spring with CarMediaWorld in

Salzburg/Austria. Europe's leading car media event will take place this year from March 27-29 as part of the Customized show. See you there!



*Elmar Michels*  
Editor-in-chief



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## REFERENCE

MADE IN GERMANY



### GZ Reference T-26

- Pure High-End SQ tweeter
- Concave AllAxis titanium dome
- Aluminum housing with machined ring and gold-plated screw terminal
- NRG protection grill
- Powerful neodymium motor
- Copper-cup for impedance linearizing
- Wave-shaped feltmask against diffraction
- 20 mm / 0.79" CCA voice coil
- Power handling 40 W RMS / 70 W max
- Efficiency (SPL) 91 dB / Impedance 4 Ohm



### GZ Reference M-80

- Pure High-End SQ midrange loudspeakers
- GZ-design aluminum cast basket
- High-Tech diamond structured cone with high damping support cone
- Durable rubber surround
- Klippel® optimized neodymium motor
- Aluminum ring for impedance linearizing
- Copper coloured Aluminum magnet cover
- Gold-plated screw terminal
- Power handling 70 W RMS / 110 W max
- Efficiency (SPL) 85 dB / Impedance 4 Ohm



### GZ Reference K-165

- Pure High-End SQ midwoofer
- GZ-design aluminum cast basket
- High-Tech diamond structured cone with high damping support cone
- Durable rubber surround
- Klippel® optimized hybrid motor with neodymium
- Aluminum ring for impedance linearizing
- Copper coloured Aluminum magnet cover
- Gold-plated screw terminal
- Power handling 110 W RMS / 180 W max
- Efficiency (SPL) 85 dB / Impedance 4 Ohm





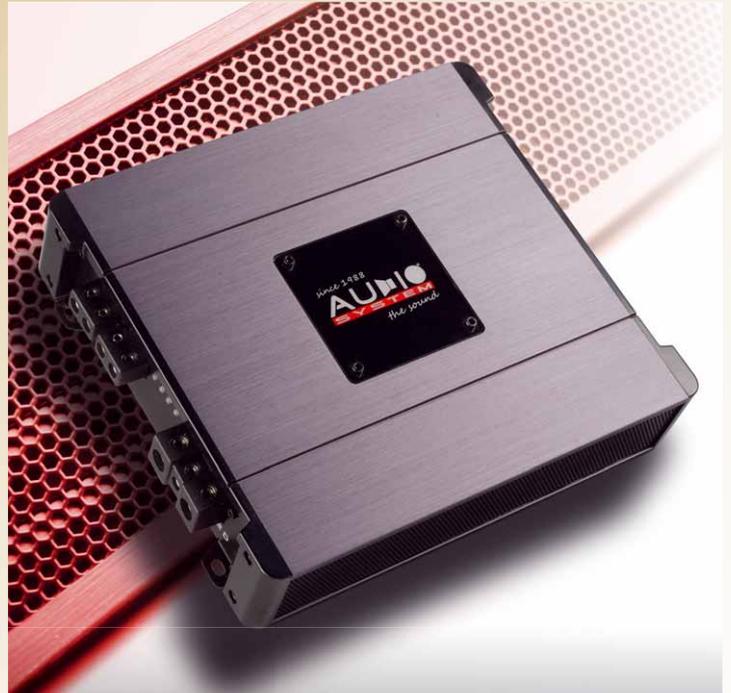
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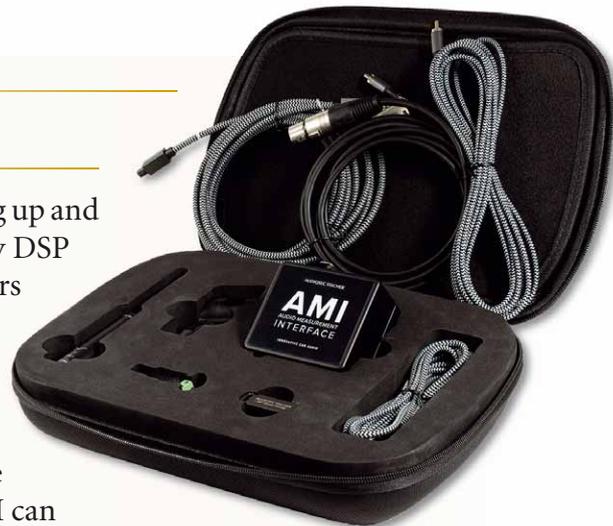
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## Setup Made Easy

Audiotec Fischer's AMI Tuning Kit is an indispensable tool for setting up and calibrating DSPs. The AMI is custom-designed for their proprietary DSP PC tool and includes all necessary components. The interface offers analog and digital inputs and outputs for measuring the incoming signal as well as the result after the DSP. The DSP's aISA (analog oscilloscope) measures the electrical input signal; even high-level sources like factory amplifiers pose no problem. By summing multiple inputs, the AMI can also be used to detect various vehicle-side signal processing. In addition to measuring existing signals, the AMI can also serve as a signal source itself. Finally, the included Beyerdynamic measurement microphone is used to measure the frequency response of the system or parts thereof.

• [www.audiotec-fischer.com](http://www.audiotec-fischer.com)



## Authentic Radio Reception

Blaupunkt brings back a piece of automotive history: With the Autojet 25 automatic rod antenna, there's finally a modern retrofit solution for classic cars from the 80s and 90s. This motorized antenna, with its classic design, is suitable for fender mounting and, when used with a splitter, can receive FM and DAB+ radio.

• [www.bpautomotive.de](http://www.bpautomotive.de)

## ESX's High-End Flagship

With the VE1800.18SP, ESX aims to set new standards in the high-end amplifier market. To achieve this, ESX has equipped this top-of-the-line model with everything a premium amp should offer: 18 amplifier channels, a 20-channel DSP with state-of-the-art technology, 12 x 100 watts RMS at 4 or 3 ohms, and 6 x 200 watts at 2 ohms. In keeping with current trends, the VE1800.18SP also features high-resolution Bluetooth. This technological marvel is controllable via PC and app and is 24V-compatible.

• [www.esxaudio.de/english/](http://www.esxaudio.de/english/)





# VISION

HIGH-END DSP AMPLIFIERS

” The VE1000.6SP feels good in the hand with its die-cast housing and offers top-notch features. Meanwhile, superior engineering ensures exquisitely good measurements and sound. The 12-channel dual-core DSP and converter are among the finest the market has to offer, making it extremely difficult to surpass the VE1000.6SP. (Elmar Michels, Car & Hifi) ”



Optional:

**RC-DQ €79,00\***

Remote Controller with Display and large Knob



**6-Channel Amp Section**  
2 x 100 Watt RMS @ 4/3 Ω  
4 x 200 Watt RMS @ 2 Ω



**ESX TOOLKIT APP**  
Download on the App Store | GET IT ON Google Play

## VE1000.6SP €1199,00\*

**6-Channel Class D Amplifier with 12-Channel Sound Processor**  
2 x 100 Watts RMS @ 4/3 Ω + 4 x 200 Watts RMS @ 2 Ω

Analog Devices™ ADAU1452 Dual 2 x 32 Bit Processor, 294 MHz, Full HD Audio 96 kHz

AKM Velvet Sound™ Series 5 Signal Converter, A/D 32 Bit, D/A 32 Bit

Auto Turn-On with REM Out, Hi Level Inputs with EPS PRO @ 40 V/RMS

Balanced Audio Inputs, Dynamic Loudness Adjustment, Priority Input Mode, Staging Equalizer and much more

Integrated Bluetooth® Receiver for DSP Control via ESX TOOLKIT App and Full HD Audio Streaming

Dimensions: 250 x 50 x 150 mm

**ESXAUDIO.DE**

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\* Manufacturer's suggested retail price. All brand names, trademarks and trade names are owned by their respective owners.

For DIN slot, small radio slot, and axle mounting

Blaupunkt Frankfurt Stereo MB Retro Radio

# Revival of the 1970s



- ▶ Blaupunkt has built a reputation in the classic car radio scene for its retro designs for both young and old-timer enthusiasts. Now, with the Frankfurt Stereo MB, it introduces a model that features a 1970s look.

**DESIGNTIPP**  
**Absolute Top Class**  
**CAR & HiFi**  
INTERNATIONAL 1/26



Retro: The analog scale exudes the flair of the 1970s

Before car manufacturers switched to today's highly integrated head units, the DIN slot dominated most car dashboards for decades. But that wasn't always the case. In the past, installation slots or preparations were often slightly smaller for so-called axle devices. These devices have only a small recess for the radio display and two holes next to it for the axles of the volume control and station selector knob. That's why it's called that.

The Blaupunkt Frankfurt MB comes with the necessary accessories for all three installation options: with an installation frame in the DIN slot, without an installation frame in the small radio slot, and as an axle device. This means it fits in most vintage cars from the late 60s, 70s, and 80s.



The rear panel offers USB-A and USB-C ports

## Analog Scale

Visually—and this is important in a classic car—the Blaupunkt can only be described as a success. The pin-stripe decor, central display, two rotary controls with rockers, and five large buttons are absolutely timeless. The buttons are labeled L, M, K, U, U, which stand for long, medium, short, and ultra-short wave (FM), as was customary in the 1970s. Today, of course, only FM is still relevant, so there are actually just five station presets for FM or DAB. This is because the Frankfurt Stereo MB is equipped with modern technology, including a digital radio receiver.

The display is an eye-catching feature. Although it is a modern 3-inch TFT color screen, it can also display an analog frequency scale that strongly resembles the originals from the 1970s. In the menu, accessible via the right rocker switch, you can choose whether the scale appears when the ignition is turned on, is not displayed during operation, or is displayed automatically after 10 or 30 seconds. This allows you to, for example, enjoy your oldies playlist from your smartphone via Bluetooth at a classic car meet while the



The front panel can be unscrewed for installation in the small radio compartment and for axle mounting



The packaging design is also not off the shelf

display shows the vintage frequency scale. Clever!

## Modern Technology

That's the idea behind Blaupunkt's retro radios: modern technology wrapped in a classic style. The Frankfurt Stereo MB is a perfect example. As mentioned, it features DAB+ digital radio and Bluetooth. The back panel has two USB ports: USB-A and USB-C. It also includes five strong preamp outputs for the front, rear, and subwoofer. This lets users control a high-quality car stereo system in a vintage car without compromising the original look.

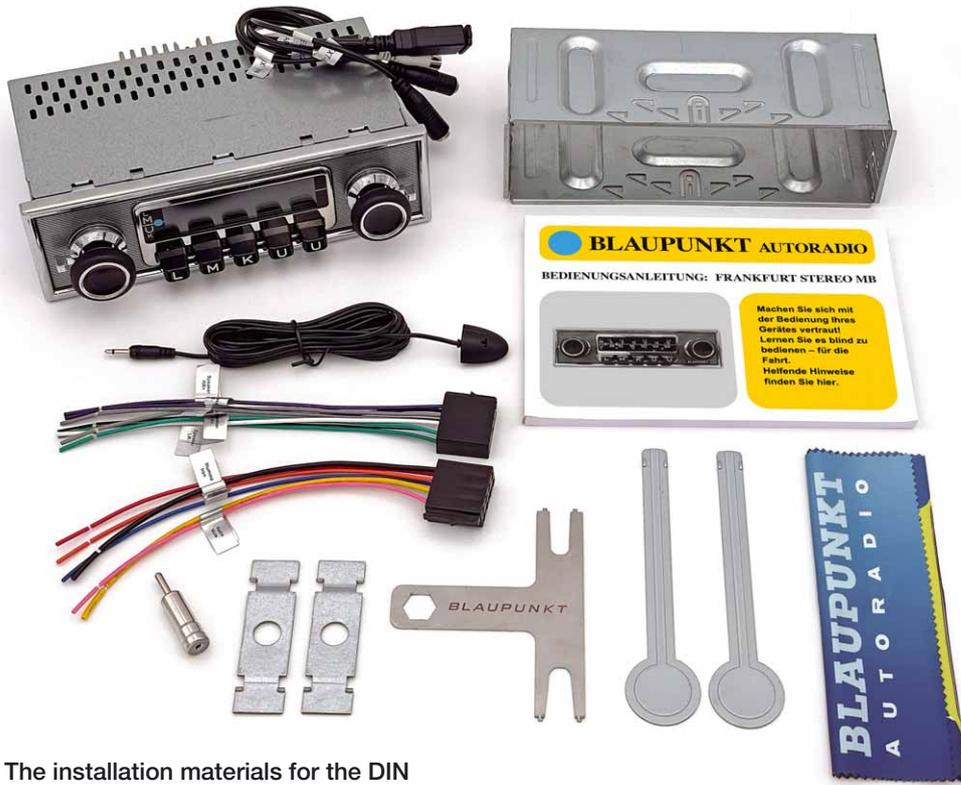
For hands-free calling, there is also a connection for the included external microphone, which can be discreetly installed.

## Audio

The sound optimization features offered by Blaupunkt would have been unimaginable in the 1970s. It includes a graphic equalizer with 14 bands for both the front and rear. Crossover networks (high-pass and low-pass) with adjustable frequency and slope are also available. Classic tone controls for treble and bass, as well as loudness and balance, are included. The subwoofer level can be adjusted.

## Operation

It was certainly not easy for the developers to combine modern features with traditional controls. But the Frankfurt Stereo MB has really pulled it off. Of course, it takes some time to get used to, but after a brief



The installation materials for the DIN shaft, small radio shaft, and axle mounting are included in the scope of delivery

period, the two rocker switches and rotary knobs are very simple to operate. This applies not only to basic functions like source selection but also to various settings within the menu. The clear, multi-line display is very helpful in this regard.

### Price-Performance

Blaupunkt has set a suggested retail price of EUR 799 for this vintage device. That might seem high initially, especially since modern 1-DIN car radios with similar features are already available at much lower prices. However, the price makes sense when you consider that manufacturing the rear-seat device is more complicated and the expected production quantities are probably smaller than for standard radios. Both of these factors lead to higher production costs. And most importantly, this is a one-of-a-kind product for which we are not aware of any comparable alternatives.

Specifications	
Power output	15
Output voltage/V	4
Output impedance/Ohm	600
<b>USB</b>	
THD+N (%)	0,06
SNR (A)	81
<b>Tuner</b>	
THD+N (%)	0,05
SNR (A)	63
Crosstalk (dB)	31
RDS	•
Channel memory	24
MP3/WMA/AAC	• / • / •
Mute/GAL	• / -
Loudness	•
Tone control	•
param./graph. EQ bands	- / 14
Pre-outs	5
Crossovers	•
Time alignment	-
Detachable front	-
Remote control	-
Aux-in front / rear	- / •
USB front / rear	- / 2
iPod control	•
Bluetooth HFP/A2DP	• / •
Others	DAB+

### The Blaupunkt Frankfurt Stereo MB fits here:

Ideal for vintage vehicles with a DIN slot, a small radio opening, or an axle cutout.

### Conclusion

The Blaupunkt Frankfurt Stereo MB is an outstanding car radio designed to match the look and mechanics of classic vehicles. It seamlessly integrates modern technology into cars from the 1970s while preserving their original style.

*Dipl.-Phys. Guido Randerath*

### Blaupunkt Frankfurt Stereo MB

Price	800 Euro
Distributor	Evo Sales GmbH, Germany
Hotline	+49 5151 823820
Internet	www.bpautomotive.de

### Rating

▶ Sound	35 %	★★★★★
Bass foundation	7 %	★★★★★
Neutrality	7 %	★★★★★
Transparency	7 %	★★★★★
Spatial imaging	7 %	★★★★★
Dynamics	7 %	★★★★★
▶ Lab	20 %	★★★★★
• USB	10 %	★★★★★
Distortion	5 %	★★★★★
Signal to noise ratio	5 %	★★★★★
• Tuner	10 %	★★★★★
Frequency response	2,5 %	★★★★★
Crosstalk	2,5 %	★★★★★
Distortion	2,5 %	★★★★★
Signal to noise ratio	2,5 %	★★★★★
▶ Practice	45 %	★★★★★
Operation	10 %	★★★★★
Features	20 %	★★★★★
Reception test	10 %	★★★★★
Build quality	5 %	★★★★★

**Absolute Top Class**



**CAR & HiFi**  
INTERNATIONAL

Germany 1/26

Price/performance: good

„First choice for historic vehicles“

# X SERIES

## DSP-AMPLIFIER



**KLANGTIPP**  
Spitzenklasse  
**CAR & HIFI** 4/2025

Audio System X-100.5 MDSP-BT  
**Spitzenklasse 1,3**  
**CAR & HIFI** 4/25  
Preis/Leistung: sehr gut  
„Sehr gut gemachter DSP, viel Leistung in äußerst kompakter Verpackung.“

### X-100.5 MDSP-BT + X-100.5 MDSP-BT 24V

- 5-channel-amplifier with 9x DSP-channel and BT/App
- 4x 100 (140) WRMS @ 4 (2) ohm + 1x 30 WRMS @ 4 ohm
- 6x RCA input or high level
- **Price: 500 Euro**



**KLANGTIPP**  
Absolute Spitzenklasse  
**CAR & HIFI** 3/2025

Audio System X-100.9 MDSP-BT  
**Absolute Spitzenklasse 1,1**  
**CAR & HIFI** 3/25  
Preis/Leistung: hervorragend  
„9 Kanäle, kompakt und gut.“

### X-100.9 MDSP-BT + X-100.9 MDSP-BT 24V

- 9-channel-amplifier with 13x DSP-channel and BT/App
- 8x 100 (140) WRMS @ 4 (2) ohm + 1x 30 WRMS @ 4 ohm
- 6x RCA input or high level
- **Price: 650 Euro**

since 1988

**AUDIO SYSTEM**

german sound

## PLUS PARTNER

- 01307 Dresden + Car Akustik Dresden
- 01640 Coswig + Sound & Media Coswig
- 02730 Ebersbach-Neugersdorf + Milano24 eGbr
- 03238 Finsterwalde + BaSS-iX Car-hifi
- 04328 Leipzig + Sound Cars
- 04910 Elsterwerda + Pötzsch GmbH & Co. KG
- 10787 Berlin + W&D CAR HIFI
- 10787 Berlin + MASORI
- 32278 Kirchlengern + CARHIFI-STORE BÜNDE
- 35108 Allendorf / Eder + Audiomativ GmbH Co.KG
- 49809 Lingen + Car-HiFi-Shop Lingen
- 53227 Bonn + Audiowave
- 54595 Prüm + Special Car Hifi Systems
- 55252 Mainz-Kastel + Hifi-Zone
- 59439 Holzwickede + CHS Solutions GmbH
- 65929 Frankfurt + ACR Frankfurt
- 66538 Neunkirchen + Hifi Zenit
- 74889 Sinsheim + Vibes Audio Forum
- 76707 Hambrücken + Hifi-Corner
- 90451 Nürnberg + Monsteraudio GmbH
- 94469 Deggendorf + ARS Deggendorf
- 97469 Gochsheim + ACR Schweinfurt
- 99427 Weimar + TSE Abschlag



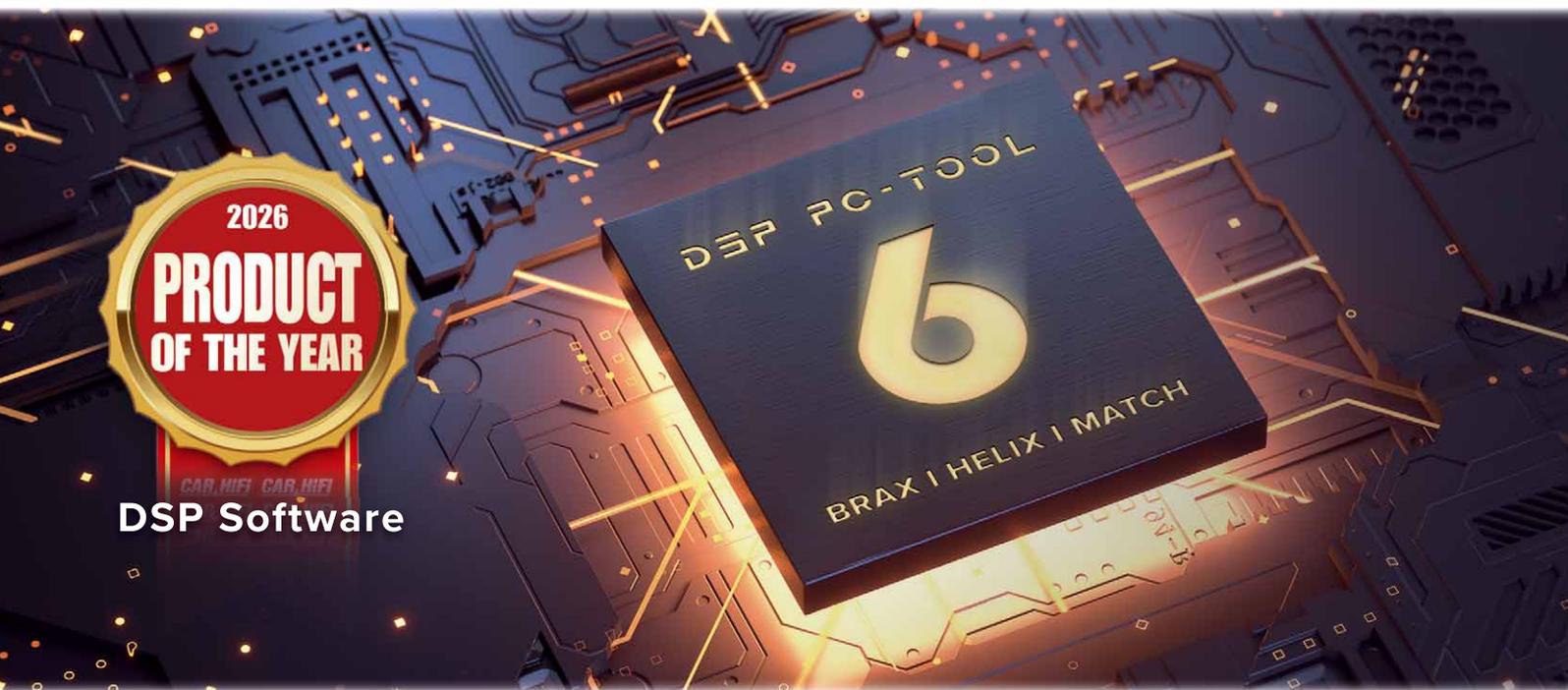
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DSP Amplifier



DSP Software



Amplifier

**WHEN INNOVATION DELIVERS:  
THREE AWARD-WINNING PRODUCTS FROM**

# AUDIOTEC FISCHER

INNOVATIVE CAR AUDIO

Three new awards. One mission: continuously pushing technical boundaries to create outstanding sound experiences – driven by innovation, uncompromising quality and application-focused engineering.

Within a short time, three new Audiotec Fischer developments received the prestigious Car & HiFi “Product of the Year 2026” awards in the categories DSP Amplifier, Amplifier and DSP Software.

Each award confirms our commitment to continuous advancement: from advanced DSP architecture and intelligent system design to confident power delivery and intuitive control concepts – complemented by powerful software that makes tuning not only faster, but measurably more precise, while providing users with comprehensive tools for professional sound optimization.



**AUDIOTEC-FISCHER.COM**

## **HELIX NEXT**

### **V EIGHT DSP ULTIMATE**

The HELIX V EIGHT DSP ULTIMATE represents the next evolutionary step in modern DSP amplifiers. A newly engineered Class HD amplifier architecture combines exceptional efficiency with significantly increased output power and precise control – even in complex speaker configurations. Advanced signal processing, extensive connectivity options and the bi-directional USB audio interface USB PerfectStream enable lossless integration of audio sources and highly precise sound tuning.

### **DSP PC-TOOL 6**

DSP PC-Tool 6 is the all-in-one tuning software for BRAX, HELIX and MATCH DSP products. Its signal-path-oriented interface ensures maximum clarity and a structured workflow – even for complex setups.

Advanced measurement and analysis features, along with technologies such as Virtual Channel Processing, Advanced Input Signal Analyzer, Dynamic Loudness Control, and Tune-To-Target, enable intelligent system tuning.

As a free software solution, DSP PC-Tool 6 provides a powerful and highly precise toolkit for professional DSP sound tuning.

## **HELIX NEXT V TWO**

The HELIX V TWO redefines conventional two-channel amplifiers. Highly efficient Class-D technology combines remarkable output performance with outstanding measurements and excellent control – ideal for demanding speaker or subwoofer applications. A specially tuned input stage, the intelligent Amplifier Control Panel, and a microprocessor-controlled automatic gain adjustment ensure convenient operation and maximum operational reliability.

A refined engineering concept that delivers performance, accuracy and everyday reliability.

ESX VE1000.6SP

– 6-channel amplifier with 12-channel DSP

# First-class

- With the VE series, ESX has effectively established itself in the premium segment of DSP amplifiers. Following the top-tier VE1300.11SP and the budget-friendly VE900.7SP, the VE1000.6SP now joins the lineup as a six-channel amplifier designed to set new standards in quality, performance, and sound.

**BEST PRODUCT**

**Absolute Top Class**

**CAR & HiFi**

INTERNATIONAL 1/26

**BEST EMC**

**Undisturbed FM reception**

**CAR & HiFi**

INTERNATIONAL 1/26



**ASX**  
VISION

OPTICAL  
INPUT

REMOTE

LOW LEVEL INPUT

LOW LEVEL OUTPUT

HIGH LEVEL INPUT

SPEAKER  
OUTPUT

SPEAKER  
OUTPUT

POWER  
+12V

INPUT  
GND

STATUS

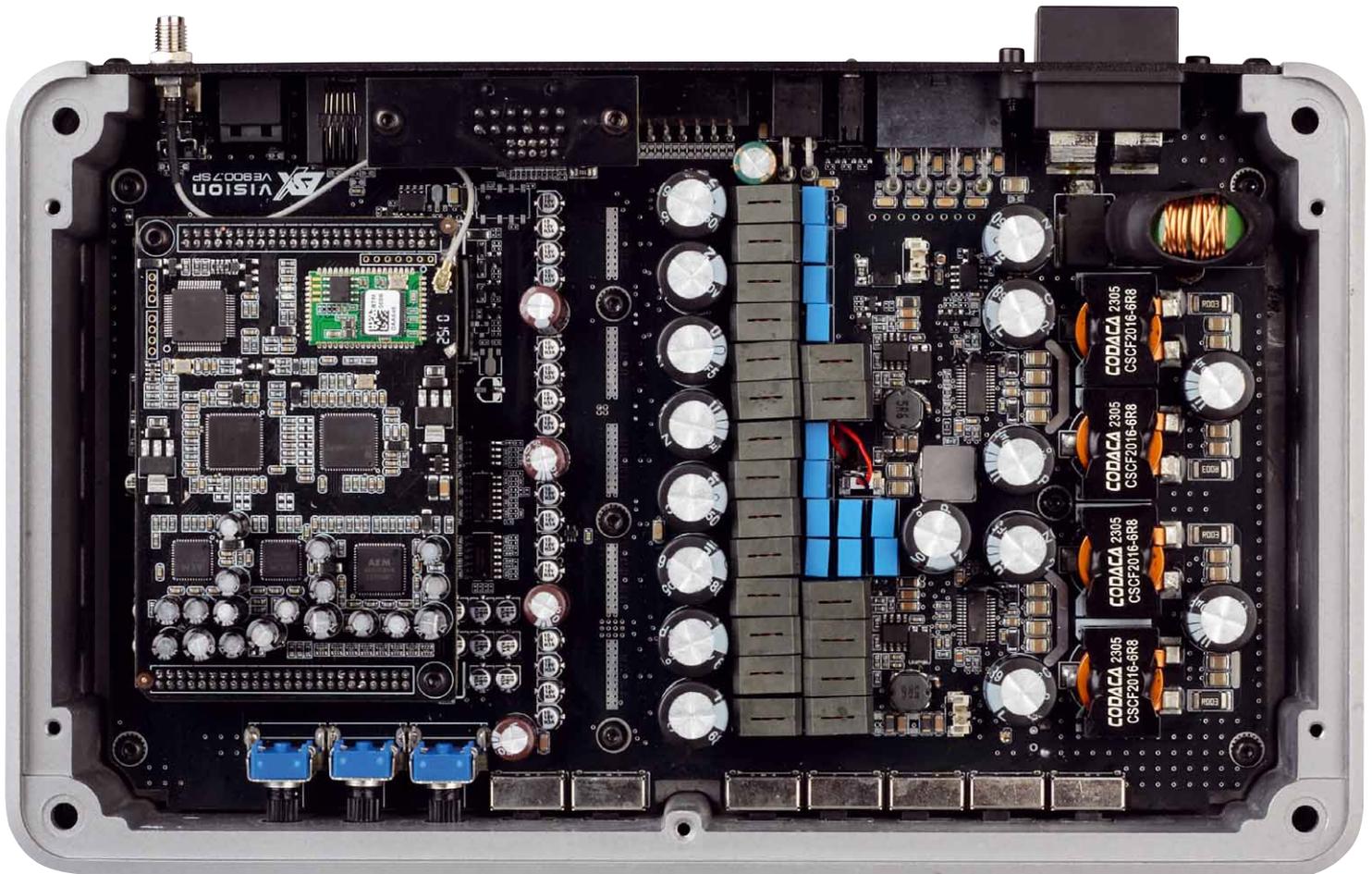
All of ESX's newer stand-alone DSPs have garnered attention for their exquisite component selection. ESX didn't cut corners even with its affordable Direction models, and the top-tier QL and QE models feature the best the market has to offer. This high standard continues with the DSP amplifiers; the VE series, in particular, does not need to hide behind stand-alone DSPs, as it uses the same processors and converters. In the amplifier sector, the VE1300.11SP serves the multi-channel department, offering a whopping 11 amplifier channels to power even complex system configurations. The VE900.7SP is positioned at a lower price point in the



The equalizer and crossovers are configured on the main screen. Master and channel levels can be adjusted, and channels can be linked either absolutely or relatively

market. With fewer channels and a smaller DSP version, it's an alternative for standard applications. This is especially true since no compromises were made regarding amplifier

channels or processor component quality; only the range of functions was reduced, not the sound quality. The VE1000.6SP has now been introduced as a mid-range model, po-



On the right are the four coils of the step-up power supply, in the middle are the five amplifier ICs and the Class D filtering



Optional accessories: The remote control controls SPLs and basic functions

sitioned between the 900 and 1300 series, and represents the high-end VE, which is preferable to the large VE1300.11SP for uncompromising system setups. The VE1000.6SP offers only 6 amplifier channels but also includes 6 processed preamp outputs. While the VE900 and VE1300 offer only two high-power channels for bass applications, the VE1000.6SP features four 2-ohm stable channels, supplemented by two smaller channels. As with the well-known VE amps, TI two-channel chips are used—one for channels 1 and 2, and one each for the larger channels. These channels are interconnected, resulting in 2-ohm stability with double the power output. The ICs are driven at low impedance for reduced distortion, and overall negative feedback is omitted to ensure clean sound quality. The DSP remains unchanged, equipped with two ADAU1452 DSP cores that together provide enough computing power for 12 channels, a staging channel level, and HiRes bandwidth. The converter section comes from AKM's AK555 and AK445 series, which are top-of-the-line, 32-bit, and flawless. Additionally, the EPS Pro provides the most variable and optimal connection to vehicle systems. The maximum signal voltage can be adjusted (40 volts is sufficient even for powerful factory amplifiers), as can the input impedance of 10, 150, or 600 ohms for all ty-



Dynamic loudness uses five EQ bands that can be freely adjusted depending on the master

### Software

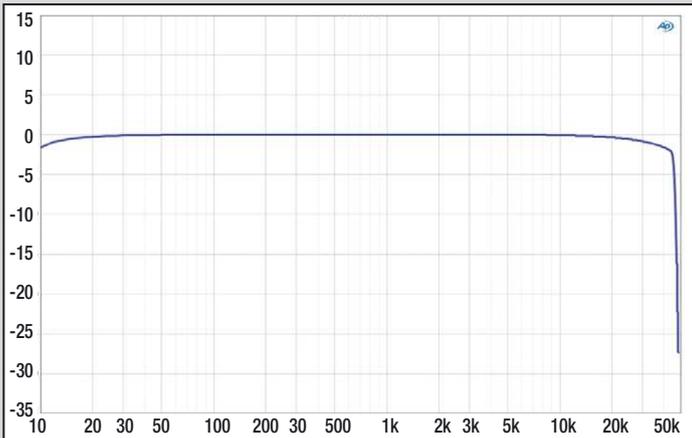
The ESX Toolkit is available as an app (Android and iOS) and as desktop software (Windows), both offering the same range of functions. The app also lets users share setups with others, for example via WhatsApp. The user interface feels immediately familiar, with everything arranged logically and mostly self-explanatory. The settings are organized into four windows so that each one isn't too crowded. In the I/O area, routing is possible, and there is a fully functional input EQ. Users can assign names to inputs and outputs, such as 'front left tweeter.' These names appear elsewhere, and the speakers are even correctly placed in the auto diagram for the runtime. This also applies to the pre-built BMW and Mercedes setups with the corresponding under-seat and footwell woofers. In addition to standard functions, there are several useful features. For example, channels designated as subwoofers—regardless of which ones—are automatically assigned to the subwoofer level of the remote control. The setups indicate which are active, full, or empty, and you can set a start setup that is always active after powering on. The active/used/unused status also appears in the main window, for example, for the EQ bands, of which there are 31 per output, and which can be shelf, all-pass first or second order, or parametric EQ. The runtime can be adjusted in precise 3.5-millisecond steps or 0.01-millisecond steps. The crossovers can be Butterworth, Bessel, or Linkwitz

types, up to 48 dB/octave. The software allows prioritizing the digital input or Bluetooth, automatically switching to S/PDIF or Bluetooth when music plays. If you want to keep vehicle sounds, they can be mixed in, allowing digital and analog sources to be combined. A particularly useful feature is the meter window, which displays level indicators for all analog and digital inputs and outputs. This helps you understand what signals are present where. Not only can you read the levels accurately, but you can also adjust them with level controls for all channels. The auto-save feature, which automatically saves the entire setup on the device every 20 seconds, can save you a lot of hassle.

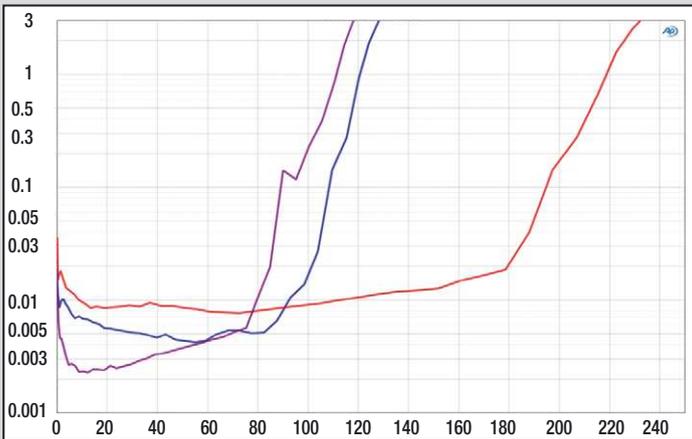
Another bonus feature is the expert mode, which provides 30 bands per input. However, this leaves only four analog inputs (in addition to the digital ones), so you need a full-range stereo signal.

For a simplified setup, channels can also be linked so that SPLs and EQs can be adjusted either absolutely or relatively for the group. In the input EQ section, the DLA uses dynamic loudness, which allocates 5 EQ bands per input for level-dependent sound adjustment based on the master level. This allows for reduced treble with loud music and boosted bass with quiet music, and you can choose between shelf filters or parametric EQs.

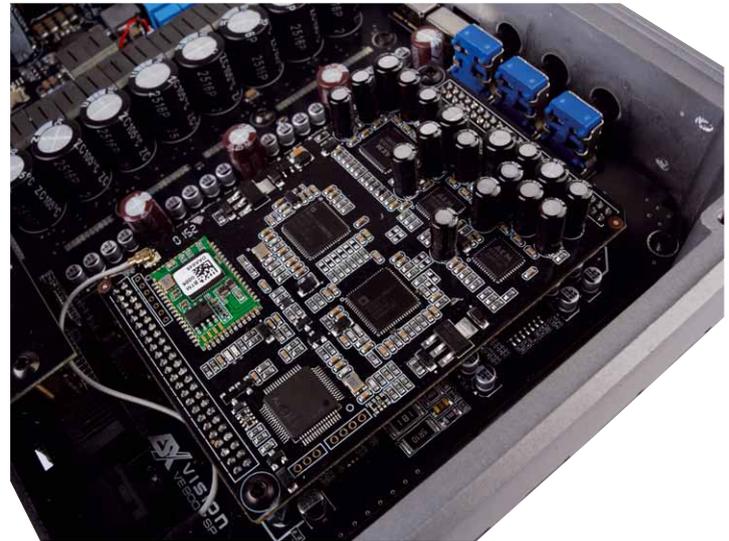
# CAR&HIFI Laboratory



The VE900.7SP operates at a high sampling rate of 96 kHz, sufficient for a HiRes frequency range of over 40 kHz



Extremely low distortion on the 4-ohm channels, but channels 3-6 also operate extremely cleanly and have up to 220 watts of power.



The DSP with two ADAU1452s is located on a separate circuit board together with the Bluetooth chip

pes of OEM systems, as well as the input sensitivity per channel pair for mixed signals. There are 6 analog inputs on board, either low or high level. A few more wouldn't have hurt, but there has to be a limit; at some point, the amplifier can't accommodate any more. ESX pioneered a unique hardware feature: the VE1000.6SP can run on operating voltages up to 36 volts, making it a car and truck amplifier in one and suitable for 24-volt vehicles without restriction. The four flat wire coils in the power supply must be flanked by especially voltage-resistant transistors and capacitors. ESX has spared no expense or effort to make the VE a premium product. Lastly, Bluetooth, which is standard feature, should be mentioned. It offers high-quality music streaming and app control of the DSP and its full functionality.



The EPS Pro controls are hidden behind an aluminum plate after adjustment



## Software innovations

ESX's software has provided excellent audio features from the very beginning. In expert mode, you give up a few input EQs for a new staging channel level, which can then be used to treat an entire front system with EQs, for example. The option to link SPLs and EQs for a channel group either absolutely or relatively is very effective. The staging EQ also includes a special balance link feature. This works like a balance control, and when linking the right and left sides, it removes what it adds to the other side. Of course, this can be done for each individual EQ band, allowing the system's stage image to be finely tuned. And for the first time, the VE1000.6SP includes the patented DLA, which is a dynamic, level-dependent equalizer, also known as loudness. Depending on the master volume, 5 EQ bands can be reserved for the DLA for each input. These can then be used to create shelf filters that either boost quiet bass or reduce treble as volume increases. Everything can be individually adjusted according to the current level, which is especially useful for "SPL setups," where you can achieve impressive tricks for clean bass at high volumes. Of course, this only works if the master volume is controlled, such as with the optional remote control or, if necessary, through the app.

## Measurements and sound

The VE series is always welcome in the measurement lab, and the VE1000.6SP is no exception. Careful signal processing guarantees excellent measurement results across all amplifier channels. The small channels reach down to 0.0025%, with residual noise accounting for most of this. There is almost no distorti-



The six amplifier channels and six pre-outs can be finely tuned. If positions are assigned in the vehicle, the speakers are arranged accordingly in the diagram

on even on the large channels, but they deliver plenty of power. ESX specifies 100 watts into 4 ohms and 200 watts into 2 ohms, and as expected,

we measured even more. With a good 120 watts and just under 220 watts of channel power, the VE is very well supplied, and our 1088

## Specifications

### Inputs

- 6-channel high-level with autosense
- 6-channel RCA
- Sensitivity 6 V (RCA), 15/40 V (high level)
- 1 x digital S/PDIF optical
- 1 x digital bluetooth
- 1 x mode („convertible pin“)

### Outputs

- 6-channel RCA
- Remote-out

### DSP-channels

- 6+2 Inputs, 12 Outputs (+ 4 Staging)

### DSP software

(PC 4.8 Android V1.0.19 in test)

### Equalizer

#### Inputs

- param./shelf/allpass, 31 bands per channel, 6-channel (Standard)
- param./shelf/allpass, 30 bands per channel, 4-channel + digital + 4-channel Staging (only Expert):

#### Outputs

- parametric, 31 band per channel, +12 – -12 dB
- 20 – 20k Hz, 1 Hz steps, Q 0.3 – 15
- optional shelf 25-10k Hz, Q 0.3-2
- optional allpass 1st or 2nd order

### Crossover

- 20 – 20k Hz, 1 Hz steps
- Bessel, Butterworth, Linkwitz, 6 – 48 dB/oct.

### Time and level

- Sample rate 96 kHz, 3.5 mm steps (0.01 ms)

### Outputs

- 0 – 680 cm (20.00 ms), 2048 samples
- Level steps 0.5 dB, Main: 1 dB

### Features

- Operating voltage up to 36 V, also for trucks/buses
- Automatic switch-on after DC or signal
- EPS PRO (Error Protection System) for diagnostic function with 3 x gain control, input sensitivity and impedance adjustment
- Dynamic Loudness DLA with 5 EQ bands for all inputs
- 8 presets
- Inputs and outputs can be routed as desired
- Signal-dependent switching to Bluetooth or S/PDIF
- Absolute and relative channel pairing (gain and EQ) possible
- Setup change via mode pin
- Level meter and software gain for all inputs and outputs
- Bluetooth (audio streaming and app control of all functionality)

### Optional accessories

- RC-DQ remote controller (volume, bass level, setups)

watts of system power from 2 x 4 ohms + 4 x 2 ohms, which constitutes 99 % of the total channel power, is particularly impressive. ESX does not skimp on the power supply, and the VE1000.6SP delivers by far the best results. Next are the preamplifier outputs, which are also among the top on the market. Without the amplifier ICs, the values are even better than on the amplifier channels, with THD+N around 0.001% and SNR of 104 dB making them top-tier. It's no surprise that the DSP runs flawlessly, and we're pleased with the clean filters and high sampling rate. The VEs operate at 96 kHz, providing the amps with an audio range of over 40 kHz and precise 3.5-millimeter/0.01-millisecond steps in the runtime. The two processor cores of our VE1000.6SP and the generous EQs, along with ample reserves in terms of timing, make it a lot of fun. The 1000.6 also sounds like more than just a chip amplifier. It tears at the speaker membranes with impressive dynamics. Rich bass is effortless, while delicate musical details are reproduced with appropriate airiness and musicality. The VE also excels in timbre, delivering the finest voice reproduction and natural-sounding sounds. Clarity and stage imaging are generous and precise; the VE performs excellently in these areas as well.

### Conclusion

The VE1000.6SP feels comfortable thanks to its cast housing and features top-tier capabilities. Its superb engineering guarantees precise measurements and excellent sound quality. The 12-channel dual-core DSP and converters are some of the best available, making it very hard to beat the VE1000.6SP.

*Elmar Michels*



### Specifications

Channels	6
Channel power 4 ohms W	2 x 112 + 4 x 122
Channel power 2 ohms W	2 x 0 + 4 x 218
Channel power 1 ohms W	–
Bridged power W	–
System power W	1088
Sensitivity max. mV	1700
Sensitivity min. V	5,0
THD+N (<22 kHz) 5W	0,003/0,007
THD+N (<22 kHz) half power	0,004/0,005
Signal-to-noise ratio dB(A)	96/95
Damping factor 20 Hz	38/57
Damping factor 80 Hz	38/57
Damping factor 400 Hz	37/57
Damping factor 1 kHz	36/56
Damping factor 8 kHz	13/27
Damping factor 16 kHz	4/11

### Features

Low pass	20 – 20k Hz
High pass	20 – 20k Hz
Band pass	20 – 20k Hz
Bass boost	-12 – 12 dB/20 – 20k Hz
Subsonic filter	via HP
Phase shift	0, 180°/LZK via DSP
High-level inputs	• 6 CH
Auto turn-on	•, DC or Signal
RCA output	•, 6CH, processed
Start/stop capable	• (6,4 V)
Dimensions (L x W x H mm)	250 x 150 x 50
Others	Bluetooth, 12-channel DSP

### ESX VE1000.6SP

Price	1.200 Euro
Contact	Audio Design, Germany
Internet	<a href="http://www.audiodesign.de/english">www.audiodesign.de/english</a>

### Rating

▶ Sound	40 %	★★★★★
Bass	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★★
Spatial imaging	8 %	★★★★★
Dynamics	8 %	★★★★★
▶ Lab	35 %	★★★★★
Power	20 %	★★★★★
Damping factor	–	–
Signal-to-noise ratio	5 %	★★★★★
Noise	10 %	★★★★★
▶ Practice	25 %	★★★★★
Features	15 %	★★★★★
Build quality electronics	5 %	★★★★★
Build quality mechanics	5 %	★★★★★

**Absolute Top Class**



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Price/performance: very good

„Nearly perfect six-channel amplifier“

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Helix Amplify 206 Direct + Amplify 206 DSP  
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# New standard

- ▶ Helix recently introduced Amplify, a new family of amplifiers positioned below the V and P classes. The Amplify 206 is now available as a six-channel amplifier, with DSP available on request!



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AMPLIFY  
CORE

206

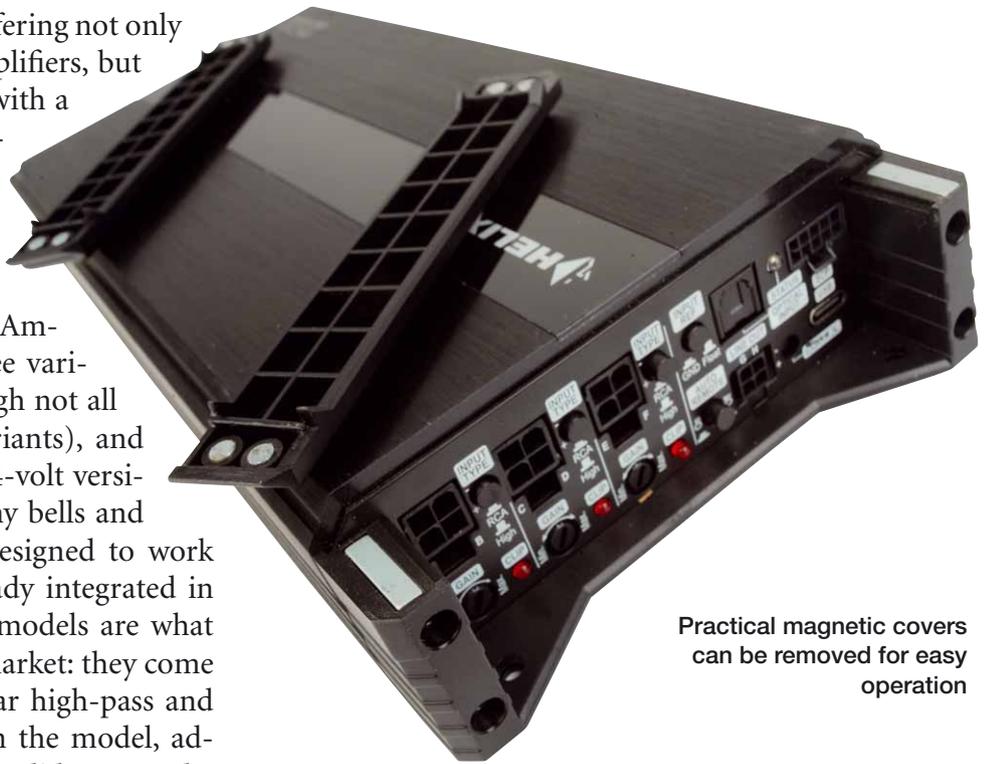
AMPLIFY  
CORE

206  
DSP

ELIX

THE DNA OF PERFECT SOUND

There is nothing new about Helix offering not only high-end “Made in Germany” amplifiers, but also affordable amplifiers, some even with a built-in signal processor. However, Amplify recently introduced a new amplifier family that is reshaping the lineup. First, the Amplify 2 series is the most affordable range, with higher-end series to be released gradually. Second, Amplify has a modular concept with three variants: Direct, X-Over, and DSP (although not all models are always available in all variants), and selected models are also available as 24-volt versions. The Direct models do without any bells and whistles in the signal path and are designed to work with a signal processor, which is already integrated in the DSP models. Finally, the X-Over models are what you would expect to find on the aftermarket: they come with active crossovers with the familiar high-pass and low-pass functions and, depending on the model, additional functions. Our current test candidates are the



Practical magnetic covers can be removed for easy operation

## Specifications

### Inputs

- 6-channel RCA
- or 6-channel High-level or 4 + 2-channel High/Low
- 1 x digital S/PDIF (optical)
- 1 x USB audio
- Sensitivity Low: 8 V, High: 16 V

### Outputs

- 2-channel RCA (8 V)
- Remote-out

### DSP-Channels

- 8 + 8 virtual channels

### DSP-Software (V 6.02)

#### Equalizer

##### Inputs:

- param., 15 bands per channel
- EQ, shelf, allpass filters 1st and 2nd order

##### Virtual channels:

- param., 30 bands per channel
- EQ, shelf, allpass filters 1st and 2nd order

##### Outputs:

- param., 30 bands per channel, +12 – -30 dB
- 20 – 20k Hz, 1-Hz increments, Q 0,5 – 15
- Shelf 25 – 10k Hz, Q 0,1 – 2
- Allpass filters 1st or 2nd order

### Crossovers

#### Outputs:

- 20 – 20k Hz, 1-Hz increments
- Bessel, Butterworth, Chebychev, Linkwitz, User, 6 – 42 dB/Okt.

#### Time and level

- Samplerate 48 kHz, 7 mm increments (0,02 ms)

#### Inputs:

- 0 – 176 cm (5,2 ms), 256 samples

#### Virtual channels:

- 0 – 353 cm (10,4 ms), 512 samples

#### Outputs:

- 0 – 708 cm (20,82 ms), 1024 samples
- Phase 0, 180° (fullrange), 0 – 360° (22,5° increments)
- Adjustable level increments 0,1– 1 dB

#### Features

- 10 setups with fast switching
- Inputs and outputs can be routed as desired
- SCP control connection for programmable remote controls and accessories
- Start-stop capability up to 6 V
- Signal-dependent switching to digital or AUX inputs, freely prioritizable
- Automatic switching of all vehicle sounds
- Power-save mode

- ADEP.3 error protection circuit for factory radios with speaker detection
- RTA real-time frequency response measurement (with optional microphone), automatic EQ adjustment also for filter edges
- FX menu with dynamic bass and center processing
- ALSA for measuring, summing, and correcting inputs with an external sound card or AMI
- Time machine for undoing and restoring settings
- Device monitor (control of temperature and power supply)
- ATM Automatic adjustment of time alignment with special signal
- Import function for data and settings from other setups
- VCP, virtual channels, freely routable, with EQ, LZK, and FX processing

#### Optional accessories

- Cable remote control (programmable)
- Director display remote control with memory, USB, etc.
- Smart remote-control Conductor
- AMI Audio Measurement Interface, also available as a set with measuring microphone



RTA measurement of a woofer/mid-range driver: original curve (red) and result with 24 dB separation (white). The correction via TuneEQ is shown in green, and the EQ bands 4 – 24 are set below. We measured with an accuracy of 1/6 octave and standard smoothing; it can be finer if desired



8 virtual channels such as the front system, center, rear system, and subwoofer have EQs, time correction, and FX functions such as RealCenter and SubXpander

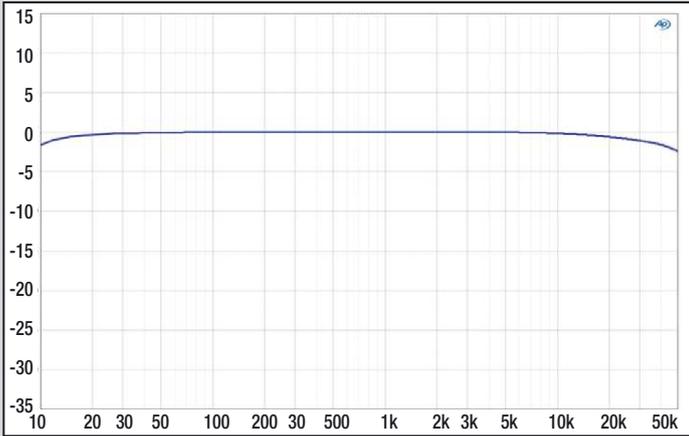
## Software

All DSP products of the Brax, Helix and Match brands are controlled via the DSP PC-Tool, which at the time of testing was just being released as the PC Tool 6. As always, the software is free and will be backward compatible with all DSP products with the ACO platform (since 2018). The DSP PC Tool 6 features an intuitive user interface and is divided into the 5 main sections: Input, Signal Management, Virtual, FX and Outputs, which can be accessed via tabs. In addition, there is an RTA section for frequency response measurement and various setting options for the power amplifier, remote controls and the PC-Tool itself. The inputs can be freely routed to 14 virtual channels sorted by source, so that a 1:1 looping through of all inputs is also possible. A 15-band EQ, time alignment, and dynamic loudness adjustment are available for all inputs. The latter can emulate a classic loudness correction for low listening volumes, and a reduced treble for high levels, always dynamically, i.e., depending on the volume setting. This function is also available when using a retrofitted remote control. The virtual channel level makes it possible to combine channel groups and process them together. For example, a three-way front system with six output channels for the right and left sides can be managed by the virtual channels front left and right. The running times of the individual speakers and the separation of tweeters, mid-range speakers and woofers are carried out in the output channels, and characteristics of the installation situations are also corrected here. However, the sound-decisive equalizing can be easily performed on the virtual front channels, for the entire front system and across all crossover frequencies. The virtual channel can also be used to “shift” the entire three-way side using time correction or to adjust the level using the gain control. The

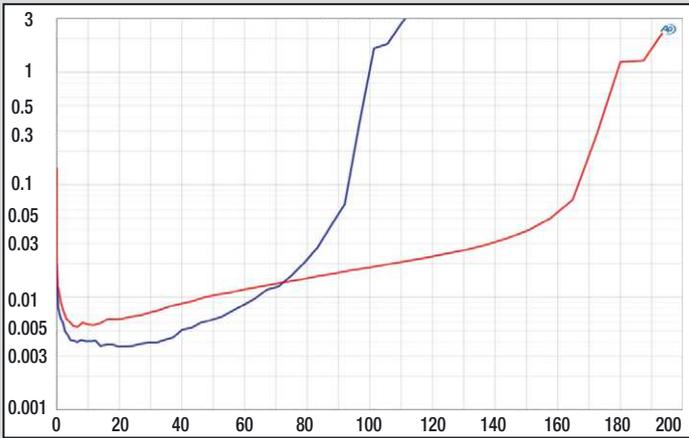
FX sound effects also affect the virtual front, center, and rear channels, allowing two-way centers to be controlled perfectly. Under the FX (effects) section, algorithms for optimizing the center and subwoofer can be activated. The Real Center is a blessing by its very existence; here, a center channel signal is calculated using specially-programmed audio processing. This means that the Real Center is not an emergency solution like a mono sum or a reversed sum of left and right. For the center, there is the Clarity Expander, which can affect the mid-range reproduction of voices (for example). Bass processing includes the SubXpander, which adds low tones to the music by generating subharmonics to existing frequencies. There is also a dynamic bass boost that increases the bass depending on the playback volume. This is very helpful, for example, in factory systems with woofers and subwoofers that have limited load capacity. There are adjustment controls for all FX functions that can be used to specifically influence the extent and function. The measuring functions of the PC-Tool are constantly being expanded. The electrical inputs (AISA) and the acoustic frequency response in the vehicle (RTA) can be measured using a measuring microphone. Thanks to hardware support in the power amplifier, AISA (Advanced Input Signal Analyzer) quickly and accurately records what comes in from the vehicle at each individual input. This allows the installer to track down incomplete or distorted signals, and by summing inputs, factory all-pass filters can also be detected that remain inconspicuous in individual measurements. There are constantly growing automatic functions and adjustment aids for both the input measurement and RTA frequency response measurement. If desired, the EQs can be adjusted automatically, allowing tolerance thresholds and the

number of EQ bands to be used to be specified. Version 5 also allows the adjustment of individual speakers with their crossovers, creating perfect acoustic filter edges that then also form a clean sound when the speakers play together. The same applies to the input EQ; here, too, the frequency range and number of bands can be freely selected. There is also ATM (Automatic Time Measurement), which enables fully automatic runtime measurement and adjustment of the entire system. The advantage here is that the measurement signal is played as a sound file like a piece of music via the head unit; this is possible in all vehicles. The measurement is then carried out using our own, in-house programmed measurement signals and a lot of audio processing, whereby the runtime of all loudspeakers in the system is compared with a reference loudspeaker and then calculated. The new version also includes the advanced import function of setups, which is now also available for the inputs. This makes life easier, especially for professionals, because it allows previously created setups to be transferred in whole or in part to the fresh unit. For example, the existing subwoofer settings of an existing setup can be placed on any two channels with a click. The transfer of high pass, low pass, EQ, gain and name from any channel to any channel is possible for inputs and outputs – practical for power users. Very praiseworthy are the numerous integration features like power save mode for CAN vehicles or bypass circuits for diagnostic programs of some factory radios and a freely configurable source management with automatic switching of sources and vehicle sounds. The in-house ADEP.3 system is capable of bypassing the speaker diagnostics of some vehicles, thus bypassing error codes or even disabling channels.

# CAR&HIFI Laboratory



For a class D power amplifier, the 206 Direct has a very nice broadband response extending to over 50 kHz



With almost no components in the signal path, the 206 Direct achieves excellent distortion values as low as 0.004%



The main window features levels, crossovers, and 31 EQ bands for the channels



Analog and digital inputs can be assigned to channels in the mixer with percentage accuracy

Amplify 206, a 2 series with 6 channels, available as Direct and DSP. This means that there are currently three channel variants: We have already tested the Amplify 201 and 204. All Amplify 2 series amplifiers come in the same contemporary slim housing design, and our 206 models are 263 millimeters long, including the end caps, which again feature practical magnetic covers that allow the amplifiers to be operated clearly and installed with a clean look. As expected, the 206 Direct does not have many controls: In addition to the 6 RCA inputs, there are gain controls with clipping LEDs and mono switches for the three channel pairs, plus an externally accessible ground lift switch to prevent any ground loops. The 206 DSP also features 6 analog inputs with gain potentiometers and LEDs, but also with high-level capability (at least 16 volts), automatic power-on, and the ADEP.3 circuit for factory radios, which not only simulates speakers but

Different input boards with DSP, controller, and converters (top) or op-amps in the Direct (bottom). The amplification is identical

also removes the power-consuming load from the radio output stages after an appropriate waiting period. Furthermore, we find the usual features of the Helix DSPs, such as mode selection buttons, optical input, and the versatile SCP accessory port. The USB C port connects to a PC for programming, which is another difference from the latest top-of-the-line model, the Helix V Eight DSP Ultimate. The V Eight introduced the new USB PerfectStream, which not only allows the DSP to be programmed, but also supports measurement functions and enables wired hi-res audio streaming. The significantly cheaper Amplify 206 DSP can be forgiven for not having these top features. Another limitation is the lack of a card slot for Helix expansion modules, which was also missing from the very compact DSP amplifiers, probably due to space constraints. Otherwise, the Amplify can do everything a Helix DSP can do without restriction, including extensive measurement functions such as RTA measurement with a microphone or electrical measurement of the inputs (AISA). Helix offers the AMI measurement box for this purpose, and in some cases an external sound card is useful. In terms of hardware, the Amplify is absolutely state-of-the-art. The signal processor mounted on its own circuit board features the same top-of-the-line components as the “big” Helix DSPs in the V amplifiers. We have a 32-bit ARM controller and the ADAU1452 DSP core from Analog Devices, plus high-quality converter modules in the form of three two-channel ADCs and an eight-channel DAC. The 206 DSP has 8 DSP channels on board, which means there are two processed outputs for additional amplifiers. There is another

special feature on the input side, i.e., the analog AUX input. This can be activated in the DSP PC-Tool 6 software, and what happens then is very clever. The rear two of the six analog inputs are now the stereo AUX. The two groups of main inputs and AUX inputs can then be treated separately, including routing, equalization, time alignment, etc., and the software allows free prioritization of the main, AUX, and digital sources with automatic switching. On the motherboard, we find the six-channel amplifier, which is largely identical in the 206 Direct and 206 DSP. Both have the same powerful toroidal power supplies and

buffering consisting of 16 small electrolytic capacitors for space reasons. The amplifier is tidy and state-of-the-art. As with the Amplify 204, it features dual-channel chips that integrate the entire amplifier, including MOSFETs, and require no heat sinks thanks to their excellent effici-



#### Helix Amplify 206 Direct

Price	360 Euro
Contact	Audiotec Fischer, Germany
Internet	www.audiotec-fischer.com

#### Rating

▶ Sound	40 %	★★★★★
Bass	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★★
Spatial imaging	8 %	★★★★★
Dynamics	8 %	★★★★★
▶ Lab	35 %	★★★★★
Power	20 %	★★★★★
Damping factor	—	—
Signal-to-noise ratio	5 %	★★★★★
Noise	10 %	★★★★★
▶ Practice	25 %	★★★★★
Features	15 %	★★★★★
Build quality electronics	5 %	★★★★★
Build quality mechanics	5 %	★★★★★

#### Specifications

Channels	6
Channel power 4 ohms W	6 x 100
Channel power 2 ohms W	6 x 188
Channel power 1 ohms W	—
Bridged power W	3 x 376
System power W	858
Sensitivity max. mV	760
Sensitivity min. V	6,6
THD+N (<22 kHz) 5W	0,004
THD+N (<22 kHz) half power	0,006
Signal-to-noise ratio dB(A)	97
Damping factor 20 Hz	200
Damping factor 80 Hz	195
Damping factor 400 Hz	187
Damping factor 1 kHz	162
Damping factor 8 kHz	15
Damping factor 16 kHz	4

#### Features

Low pass	20 – 20k Hz
High pass	20 – 20k Hz
Band pass	20 – 20k Hz
Bass boost	-12 – 12 dB/20 – 20k Hz
Subsonic filter	via HP
Phase shift	0, 180°/LZK via DSP
High-level inputs	• 12 CH
Auto turn-on	•, DC or Signal
RCA output	•, 6CH, processed
Start/stop capable	• (6 V)
Dimensions (L x W x H mm)	263 x 114 x 40
Others	Clipping-LEDs, Mono-Mode

Top Class

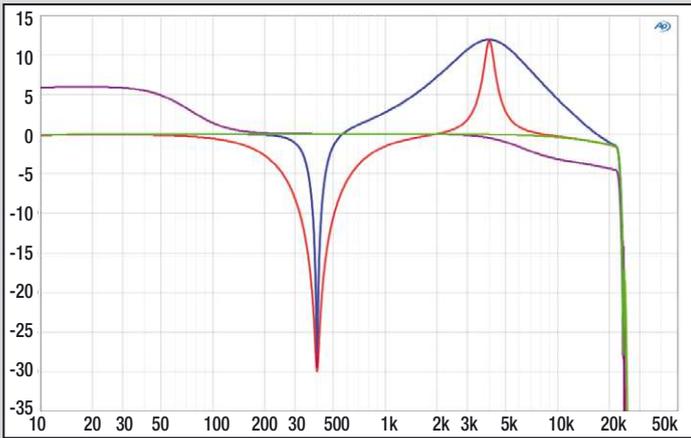


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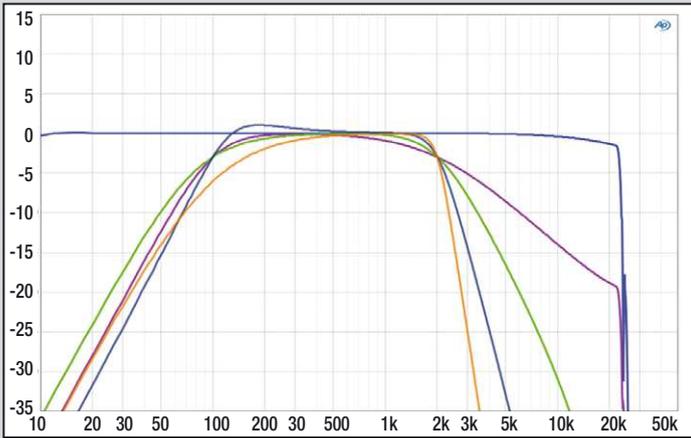
Price/performance: very good

„Amplify 206:  
always an excellent choice.“

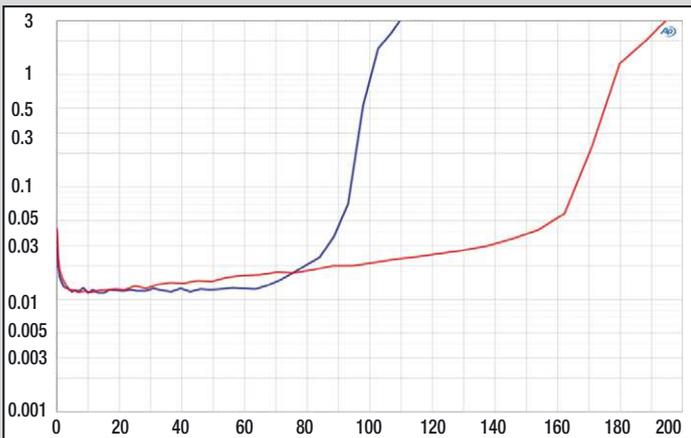
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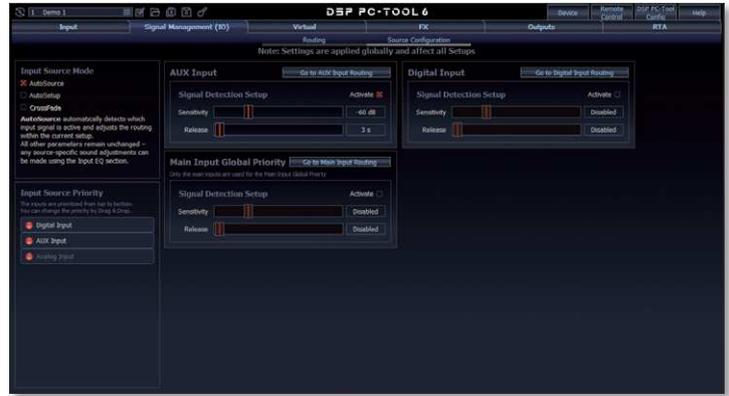
The EQs work perfectly and are practical; shelf is also possible



The crossovers work exactly according to the desired characteristics: with a high pass of 100 Hz, Linkwitz cuts at -6 dB and Chebyshev is steepest, but oscillates 1 dB above



Distortion is naturally a bit higher with the 206 DSP than with the Direct, but as expected, there is almost no difference at maximum power



The inputs can be configured and freely prioritized, even with setup changes. A special feature of the 206 is that AUX can be activated, providing four main inputs and two AUX inputs that can be routed and processed separately

ency. Helix uses branded components from Infineon's innovative Merus series – the stuff that compact class D amplifiers are made of today. Compared to the DSP, the 206 Direct has another special feature in the form of its small microcontroller; even a Direct Helix with almost no signal processing must be at least a little bit smart. The controller is responsible for operational tasks such as temperature management, protective circuits, and switching on and off. The 206 DSP does this with its DSP controller, which is why it does not have the chip on the motherboard.

## Measurements and sound

Let us start with what the 206 Direct and the 206 DSP have in common, which is their power output. Except from a few watts, they are identical, both delivering impressive performance with 100 watts of channel power, and even around 180 watts at 2 ohms. The attenuation



The DSP PC-Tool 6 has virtual channels as standard; routing takes place from the sources to virtual, then from virtual to the outputs



On the right, the 206 Direct with 6 RCA sockets; on the left, the DSP with analog and digital connections

also depends only on the final amplification, and this is the same, but then differences between the Direct and the DSP become apparent. In terms of bandwidth, the Direct shows that frequencies above 50 kHz are easily handled by the circuit, but the DSP, with its sampling rate of 48 kHz, limits the audio range to a good 20 kHz, just as physics demands. The cleanly refined concept of the Direct also shines with sensational measurements for distortion and noise. The DSP has a few components in the signal path, which inevitably affects the measurements. Nevertheless, with only 0.012% THD+N and a noise ratio of 89 dB, it is still very competitive and ranks among the best designs when compared to models of similar size and price on the market. And with the Amplify 206 DSP, you get a lot for 0.008% more distortion, i.e., perfectly functioning EQs and crossovers, fully adjustable with all the bells and whistles, virtual channels with overall equalization, and all the other goodies of PC-Tool 6. That is why, in practice, you cannot hear any difference between the 206

Direct and the 206 DSP – a single setting on the DSP changes the sound more than any effort you put into the details. Both Amplify models perform at an extremely high level with rich sound and refreshing dynamics. They sound lively and convey the joy of music, whether it is delicately breathed vocals or crisp percussion. Both maintain an overview and reproduce the music as a whole; no matter what style

you play, it always sounds good. Of course, there are better amplifiers in terms of detail, but here, everything from the low bass to the highest harmonics is just right. A classic case of “no one needs more than this.”

## Conclusion

With Amplify 206 Direct and Amplify 206 DSP, Helix has definitively established its Amplify 2 series as superbly crafted, top-of-the-line offerings among affordable amplifiers. Whether it is the spotlessly clean Direct or the incredibly functional DSP, both offer excellent value for money.

*Elmar Michels*



## Specifications

Channels	6
Channel power 4 ohms W	6 x 101
Channel power 2 ohms W	6 x 178
Channel power 1 ohms W	–
Bridged power W	3 x 356
System power W	846
Sensitivity max. mV	720
Sensitivity min. V	6,2
THD+N (<22 kHz) 5W	0,012
THD+N (<22 kHz) half power	0,012
Signal-to-noise ratio dB(A)	89
Damping factor 20 Hz	181
Damping factor 80 Hz	179
Damping factor 400 Hz	174
Damping factor 1 kHz	152
Damping factor 8 kHz	14
Damping factor 16 kHz	3

## Features

Low pass	20 – 20k Hz
High pass	20 – 20k Hz
Band pass	20 – 20k Hz
Bass boost	-12 – 12 dB/20 – 20k Hz
Subsonic filter	via HP
Phase shift	0, 180°/LZK via DSP
High-level inputs	• 12 CH
Auto turn-on	•, DC or Signal
RCA output	•, 6CH, processed
Start/stop capable	• (6 V)
Dimensions (L x W x H mm)	263 x 114 x 40
Others	8-Kanal-DSP

## Helix Amplify 206 DSP

Price	600 Euro
Contact	Audiotec Fischer, Germany
Internet	www.audiotec-fischer.com

## Rating

▶ Sound	40 %	★★★★★
Bass	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★★
Spatial imaging	8 %	★★★★★
Dynamics	8 %	★★★★★
▶ Lab	35 %	★★★★★
Power	20 %	★★★★★
Damping factor	–	–
Signal-to-noise ratio	5 %	★★★★★
Noise	10 %	★★★★★
▶ Practice	25 %	★★★★★
Features	15 %	★★★★★
Build quality electronics	5 %	★★★★★
Build quality mechanics	5 %	★★★★★

**Top Class**



**CAR & HiFi**  
INTERNATIONAL Germany 1/26

Price/performance: very good

„Amplify 206:  
always an excellent choice.“

Musway NX – Mono, two-channel and four-channel amplifiers put to the test

# New Mini Power

- ▶ Musway is launching a major „hit of the year“ with its new NX series. The series pushes the idea of „high performance in the smallest of form factors“ to the max—that deserves a closer look.

**SOUND AWARD**

**Upper Class**

**CAR & HiFi**  
INTERNATIONAL 1/26

**BEST PRODUCT**

**Upper Class**

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**BEST EMC**

**Undisturbed FM reception**

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**MUSWAY**  
HIGH QUALITY SOUND SYSTEM

**MUSWAY**  
HIGH QUALITY SOUND SYSTEM

Actually, the article should have been titled „Musway NX Part 1“ because these four amplifiers don't even make up half of the NX series that Musway is gradually introducing to specialist retailers. The series is supposed to include models with 1, 2, 3, 4, and 5 channels, for a total of 11 models, demonstrating that Musway is achieving a remarkable feat by building a true XXL amplifier series from scratch. However, XXL only in terms of quantity; when it comes to the housings, it is quite the opposite: they are very small. Just how tiny the NX really is only becomes clear when you see it sitting on the table in front of you. Our four test models easily fit in front of a computer keyboard, but together they deliver 2400 watts, which is quite impressive. These 2.4 kilowatts are divided into 1 x 600 watts (NX600.1),

2 x 200 watts (NX200.2), 2 x 350 watts (NX350.2), and 4 x 175 watts (NX175.4), each rated at the lowest permissible load of 1 ohm for the mono and 2 ohms for the other amplifiers. The finalized operating instructions reveal that there will be two more mono amplifiers, the NX400.1 and NX800.1. Among the two-channel amplifiers, we have the smallest and second-largest models from the NX200.2, NX275.2, NX350.2, and NX450.2 series. Nothing else is known for certain, so we will just have to wait and see.

At first glance, the housings are typical of Musway, featuring gray, brushed-metallic heatsinks and rounded ends made of cast aluminum. All NX models have a convenient bar shape and are very compact, measuring 89 millimeters wide and 41 millimeters

high. The length ranges from 125 mm for the small two-channel model to 169 mm for the 175.4, which is still quite small. The filter equipment is of good quality without being excessive. The mono model includes a remote control and a full set of features such as boost and subsonic filters, while the two-channel models also provide boost and a choice of high-pass or low-pass filters. The four-channel model omits the boost but still has an active crossover sufficient for tweeters. All models feature modern functions like speaker level inputs with auto-power-on, EPS speaker diagnosis protection, and start-stop capability. Due to the compact design, signals connect to the NX via Molex connectors, with RCA variants for low-level signals and cable harnesses with open ends for high-level signals. The EPS boards are integrated into these cable harnesses but remain outside the small housing. Things become truly interesting after unscrewing the case, revealing where the NX's impressive power comes from. All models share generously dimensioned transformer power supplies. Additionally, all power transistors are mounted as large components on the outer heatsink—a traditional yet ultra-compact design. The small 200.2 requires only two power transistors next to the diodes in the power supply, whereas the three larger models, which are in roughly the



The Mono has good filter equipment and an included remote control

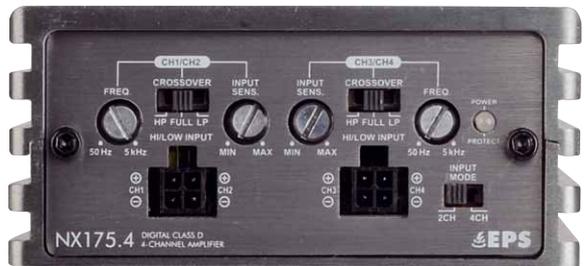


The Mono NX600.1 delivers 600 watts from 15 centimeters. The buffering and low-pass coil are dimensioned accordingly



The two- and four-channel models feature high-pass and low-pass filters

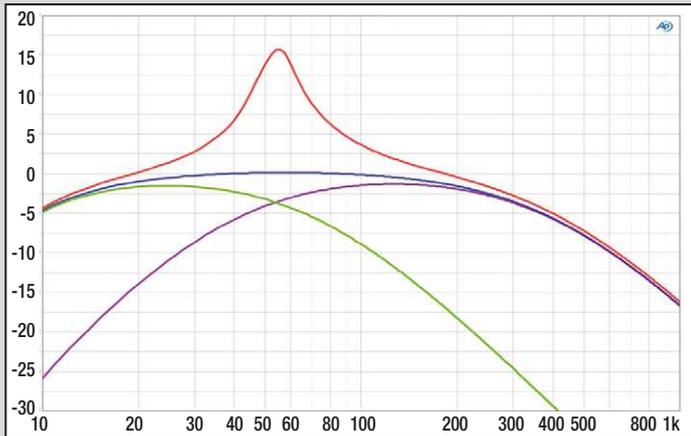
The NX175.4 has a square four-channel driver chip, while the other models rely on one driver per channel



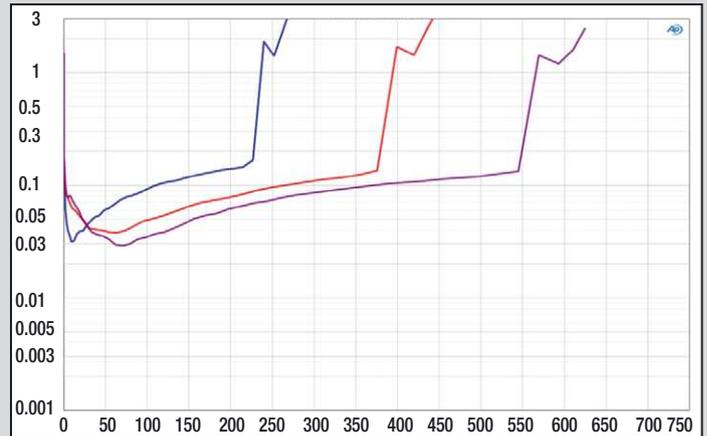
same performance class, each have four transistors in the power supply. At the rear, all NX models have a pair of transistors per channel.

The Class D filter coils are designed as durable toroidal coils and dimensioned appropriately based on the channel power. This also applies to buffering, which becomes slightly larger as the amplifier's power increases. At the core of the amplification are the Class D driver chips, which have recently become common and feature almost all the components of amplifier drivers on a small IC. In the NX175.4, we find a YD7123, which looks very similar to the Infineon IRS2093. In the NX350.2, there are two YD7120s, with the single-channel version matching the popular IRS2092. Our small 200.2 also requires two of these driver

## CAR&HIFI Laboratory



As is often the case, the NX600.1 has the most comprehensive set of features for driving all types of subwoofers, even including a subsonic filter and a boost that starts quite high at 55 Hz



Incredible performance from these small boxes with up to 600 watts at 1 ohm! The NX600.1 is completely unaffected by the load, always drawing extremely little power



chips, but for space reasons, they are placed under the circuit board. The same applies to the Mono, which naturally operates with a single YD7120.

### Measurements and sound

Now it is time to get down to business as the four little Musways take their places in front of the towering load resistors. The little NX200.2 starts with a very clean 4-ohm output of 118 watts, then delivers nearly 200 watts at 2 ohms. The NX350.2 proves to be a power monster with 209 and 330 watts – absolutely incredible for a small amplifier that still fits in the palm of your hand. The NX175.4 impresses with the lowest

#### Specifications

Channels	1
Power 4 ohms	252
Power 2 ohms	422
Power 1 ohms	596
Sensitivity max. mV	400
Sensitivity min. V	8,0
THD+N (<22 kHz) 5 W	0,042
THD+N (<22 kHz) Half Power	0,114
Signal-to-noise ratio dB(A)	89
Damping factor 20 Hz	129
Damping factor 40 Hz	128
Damping factor 60 Hz	131
Damping factor 80 Hz	133
Damping factor 100 Hz	145
Damping factor 120 Hz	136

#### Features

Low pass	50 – 250 Hz
High pass	–
Band pass	10 – 250 Hz
Bass boost	0 – 16 dB/45 Hz
Subsonic filter	10 – 50 Hz
Phase shift	–
High-level inputs	•
Automatic switch-on (Autosense)	–
RCA output	–
Start/stop capable	• (7,0 V)
Dimensions (L x W x H in mm)	148 x 89 x 41
Others	Remote control, EPS

#### Musway NX600.1

Price	230 Euro
Contact	Audio Design, Germany
Internet	<a href="http://www.audiodesign.de/english">www.audiodesign.de/english</a>

#### Rating

▶ Sound	20 %	★★★★★
Bass foundation	5 %	★★★★★
Bass pressure	5 %	★★★★★
Accuracy	5 %	★★★★★
Dynamics	5 %	★★★★★
▶ Lab	55 %	★★★★★
Power	40 %	★★★★★
Damping factor	5 %	★★★★★
Signal-to-noise ratio	5 %	★★★★★
Noise	5 %	★★★★★
▶ Practice	25 %	★★★★★
Features	15 %	★★★★★
Build quality electronics	5 %	★★★★★
Build quality mechanics	5 %	★★★★★

## Upper Class



# CAR&HiFi

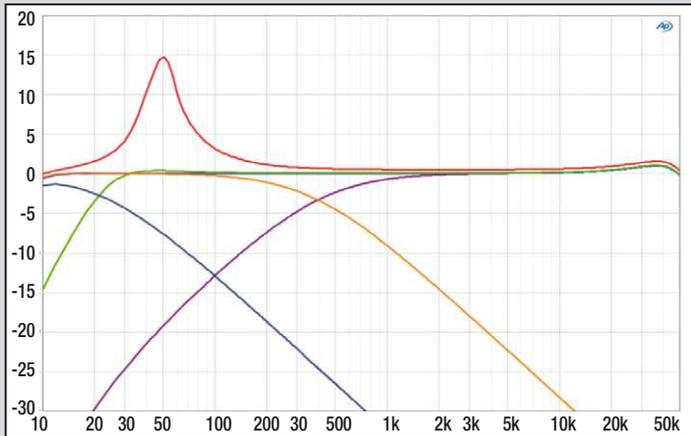
INTERNATIONAL

Germany 1/26

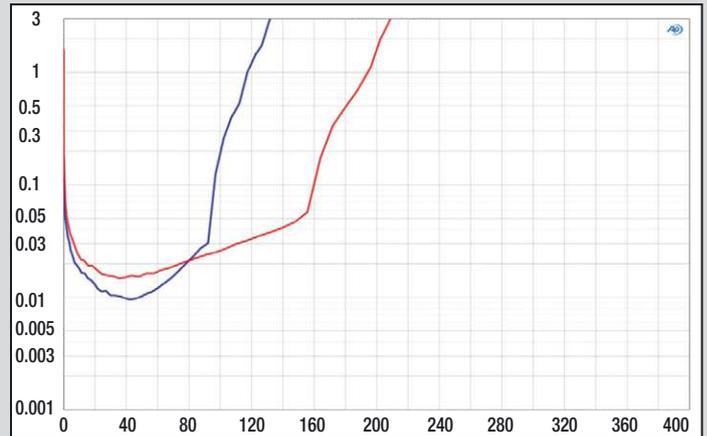
Price/performance: excellent

"Incredible performance  
in a mini format."

# CAR&HiFi Laboratory



Unfortunately, the NX200.2 cannot switch bandpass; you have the choice between low-pass or high-pass for sub/sat crossing



The small two-channel NX200.2 delivers super-clean power, especially at 4 ohms. With 2 x 120 and 200 watts, you are well equipped for all types of speakers



distortion in the series, at least at 4 ohms, delivering an impressive 115 and 191 watts at 4 and 2 ohms, respectively. The 200.2 and 175.4 have extremely low noise, while the other two are “only” very good. Moving on to our mono, which ranks just behind the 350.2 with an impressive 252/422 and 596 watts—almost 600 watts (all at 13.8 V as usual). What is more, the 600.1 is completely unaffected by low loads, producing just as little distortion at 2 and 1 ohms as it does at 4 ohms! Sound-wise, we stay with the mono, and what can we say? The small box impresses enormously with power and control that are hard to believe. Even with full-sized subwoofers, the NX600.1

## Specifications

Channels	2
Channel power 4 ohms W	118
Channel power 2 ohms W	196
Channel power 1 ohms W	–
Bridged power W	392
System power W	392
Sensitivity max. mV	420
Sensitivity min. V	8,0
THD+N (<22 kHz) 5W	0,013
THD+N (<22 kHz) half power	0,011
Signal-to-noise ratio dB(A)	92
Damping factor 20 Hz	83
Damping factor 80 Hz	72
Damping factor 400 Hz	73
Damping factor 1 kHz	68
Damping factor 8 kHz	19
Damping factor 16 kHz	5

## Features

Low pass	20 – 400k Hz
High pass	20 – 400k Hz
Band pass	–
Bass boost	-0 – 18 dB/45 Hz
Subsonic filter	–
Phase shift	–
High-level inputs	•
Auto turn-on	•, DC or signal
RCA output	–
Start/stop capable	• (7,1 V)
Dimensions (L x W x H in mm)	125 x 89 x 41
Others	EPS

## Musway NX200.2

Price	190 Euro
Contact	Audio Design, Germany
Internet	www.audiodesign.de/english

## Rating

▶ Sound	40 %	★★★★★
Bass	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★☆
Spatial imaging	8 %	★★★★★
Dynamics	8 %	★★★★★
▶ Lab	35 %	★★★★☆
Power	20 %	★★★★☆
Damping factor	–	–
Signal-to-noise ratio	5 %	★★★★★
Noise	10 %	★★★★★
▶ Practice	25 %	★★★★☆
Features	15 %	★★★★☆
Build quality electronics	5 %	★★★★★
Build quality mechanics	5 %	★★★★★

Upper Class

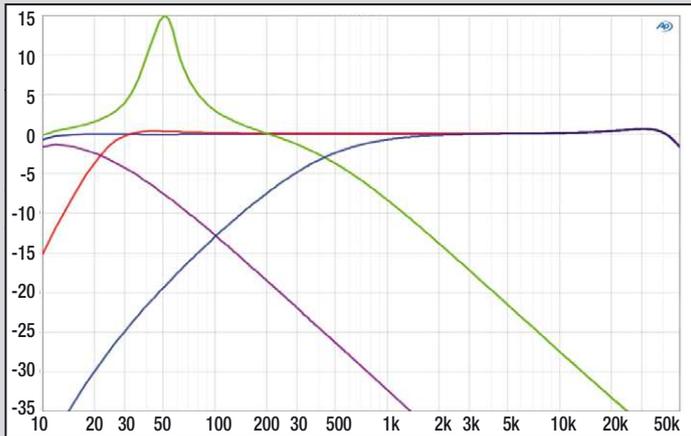


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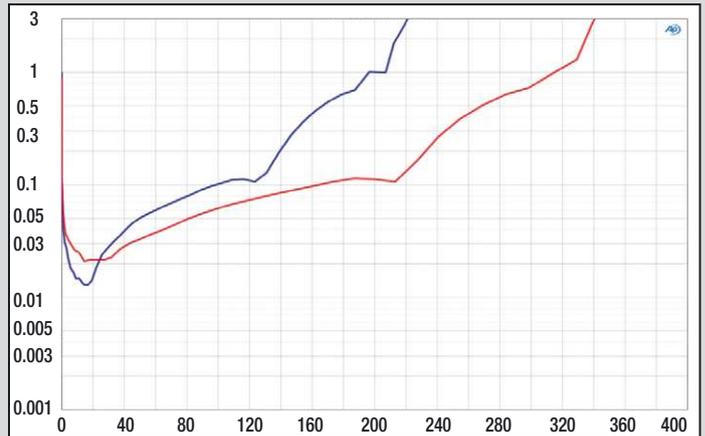
Price/performance: very good

“Incredible performance in a mini format.”

## CAR&HIFI Laboratory



The NX350.2 has the same input section as its little sister, and also features an adjustable bass boost, which the powerful 350 can really use



The NX350.2 offers brutal performance for a tiny two-channel amplifier. With 1222 watts per liter of enclosure volume, it ranks first in our unofficial power density rankings



pushes hard, leaving you with a grin that is impossible to wipe off your face. Switching to the multi-channel amplifiers, the large two-channel 350.2 delivers a strong performance. The way it delivers, there is always a sense that it might have been designed as a subwoofer amplifier. For that reason, we give it our full recommendation specifically for power-hungry stereo setups in modern systems, where there are plenty of suitable applications for this type of amp. Overall, the NX models show remarkable similarity in tone and vocal quality, performing beautifully across the board. However, when it comes to subtle, quiet details, the less powerful amplifiers stand out more. Both the NX200.2

### Specifications

Channels	2
Channel power 4 ohms W	209
Channel power 2 ohms W	330
Channel power 1 ohms W	–
Bridged power W	660
System power W	660
Sensitivity max. mV	420
Sensitivity min. V	8,0
THD+N (<22 kHz) 5W	0,019
THD+N (<22 kHz) half power	0,106
Signal-to-noise ratio dB(A)	89
Damping factor 20 Hz	78
Damping factor 80 Hz	79
Damping factor 400 Hz	78
Damping factor 1 kHz	74
Damping factor 8 kHz	17
Damping factor 16 kHz	4

### Features

Low pass	20 – 400k Hz
High pass	20 – 400k Hz
Band pass	–
Bass boost	-0 – 18 dB/45 Hz
Subsonic filter	–
Phase shift	–
High-level inputs	•
Auto turn-on	•, DC or signal
RCA output	–
Start/stop capable	• (7,0 V)
Dimensions (L x W x H in mm)	148 x 89 x 41
Others	EPS

### Musway NX350.2

Price	250 Euro
Contact	Audio Design, Germany
Internet	www.audiodesign.de/english

### Rating

▶ Sound	40 %	★★★★★
Bass	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★★
Spatial imaging	8 %	★★★★★
Dynamics	8 %	★★★★★
▶ Lab	35 %	★★★★★
Power	20 %	★★★★★
Damping factor	–	–
Signal-to-noise ratio	5 %	★★★★★
Noise	10 %	★★★★★
▶ Practice	25 %	★★★★★
Features	15 %	★★★★★
Build quality electronics	5 %	★★★★★
Build quality mechanics	5 %	★★★★★

## Upper Class

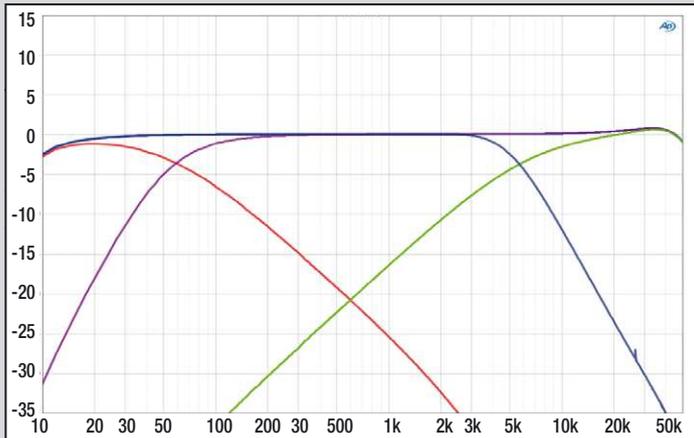


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INTERNATIONAL Germany 1/26

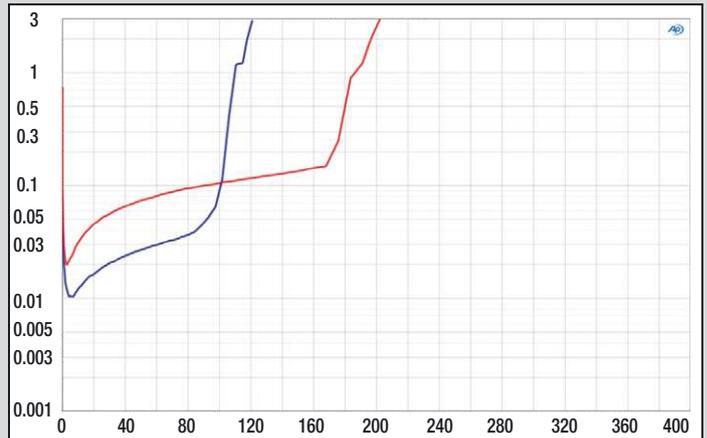
Price/performance: very good

"Incredible performance in a mini format."

# CAR&HIFI Laboratory



The NX175.4 offers high-pass or low-pass filters, which go up to 5 kHz and are therefore suitable for separating everything up to the tweeter



The NX175.4 runs with extremely low distortion, especially at 4 ohms, and delivers a respectable 190 watts of channel power at 2 ohms



and NX175.4 excel in clarity, atmosphere, and audiophile sound quality. They earn our SQ recommendation, while the NX350.2 still claims the top performance spot.

## Conclusion

The NX series from Musway exemplifies what a modern amplifier line should be. It features an appealing, high-quality design, impressive technical performance from compact units, and affordable prices. While it is not the first mini amplifier on the market, with eleven models and advanced technology, the NX stands out as a leader.

*Elmar Michels*

### Specifications

Channels	4
Channel power 4 ohms W	115
Channel power 2 ohms W	191
Channel power 1 ohms W	—
Bridged power W	382
System power W	624
Sensitivity max. mV	410
Sensitivity min. V	8,0
THD+N (<22 kHz) 5W	0,010
THD+N (<22 kHz) half power	0,028
Signal-to-noise ratio dB(A)	92
Damping factor 20 Hz	59
Damping factor 80 Hz	58
Damping factor 400 Hz	57
Damping factor 1 kHz	55
Damping factor 8 kHz	16
Damping factor 16 kHz	4

### Features

Low pass	20 – 5k Hz
High pass	20 – 5k Hz
Band pass	—
Bass boost	—
Subsonic filter	—
Phase shift	—
High-level inputs	•
Auto turn-on	•, DC or signal
RCA output	—
Start/stop capable	• (7,0 V)
Dimensions (L x W x H in mm)	169 x 89 x 41
Others	2 od 4 CH In, EPS

### Musway NX175.4

Price	250 Euro
Contact	Audio Design, Germany
Internet	www.audiodesign.de/english

### Rating

▶ Sound	40 %	★★★★★
Bass	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★★
Spatial imaging	8 %	★★★★★
Dynamics	8 %	★★★★★
▶ Lab	35 %	★★★★★
Power	20 %	★★★★★
Damping factor	—	—
Signal-to-noise ratio	5 %	★★★★★
Noise	10 %	★★★★★
▶ Practice	25 %	★★★★★
Features	15 %	★★★★★
Build quality electronics	5 %	★★★★★
Build quality mechanics	5 %	★★★★★

**Upper Class**



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Price/performance: very good

*"Incredible performance in a mini format."*

HX-235.2 D – Premium digital amplifier  
from Audio System

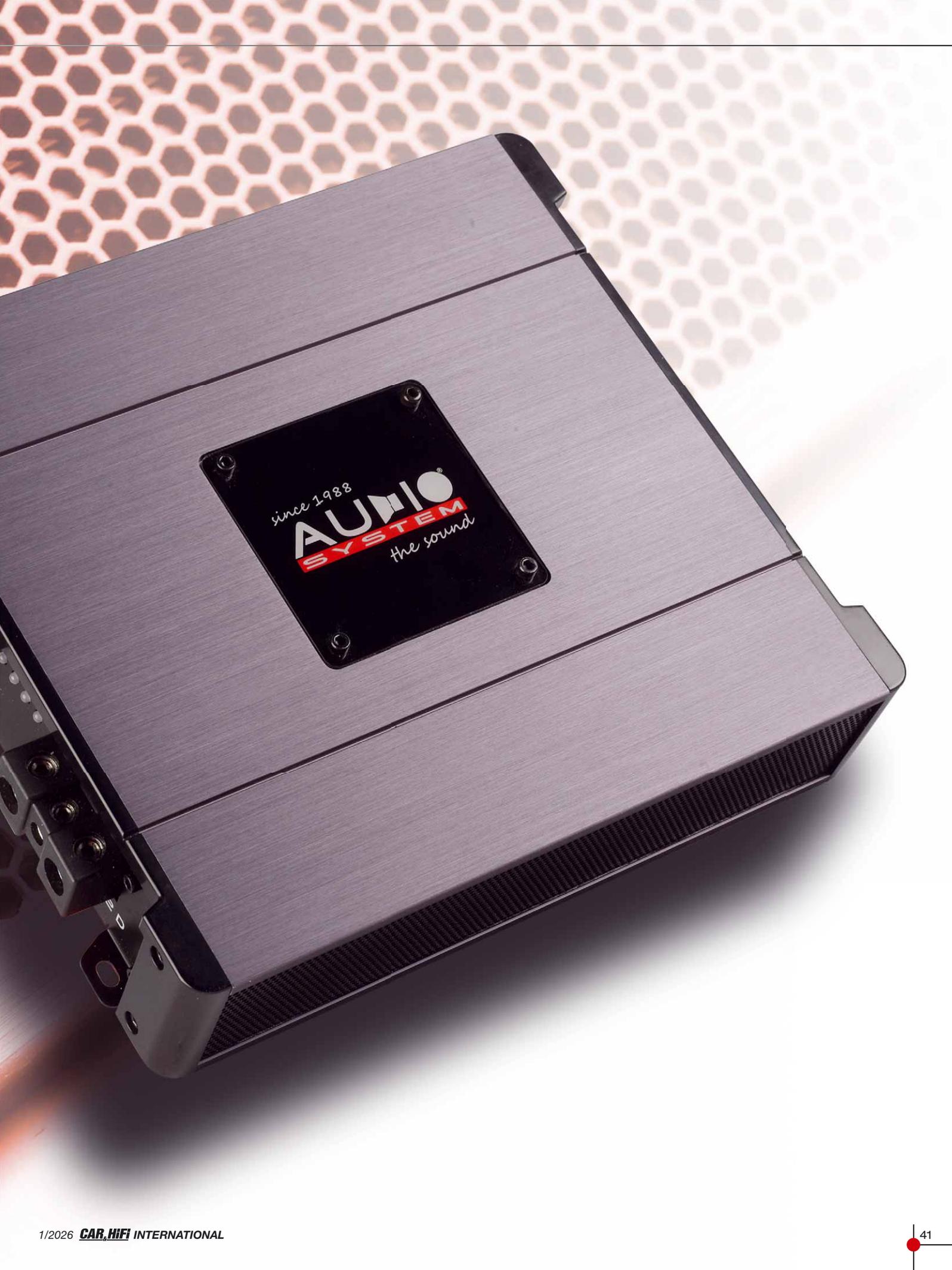
# Paradigm Change

- ▶ The HX-235.2 D is the inaugural model in a new generation of amplifiers from Audio System. We are conducting a comprehensive series of tests on the new HX.

**BEST PRODUCT**

**Top Class**

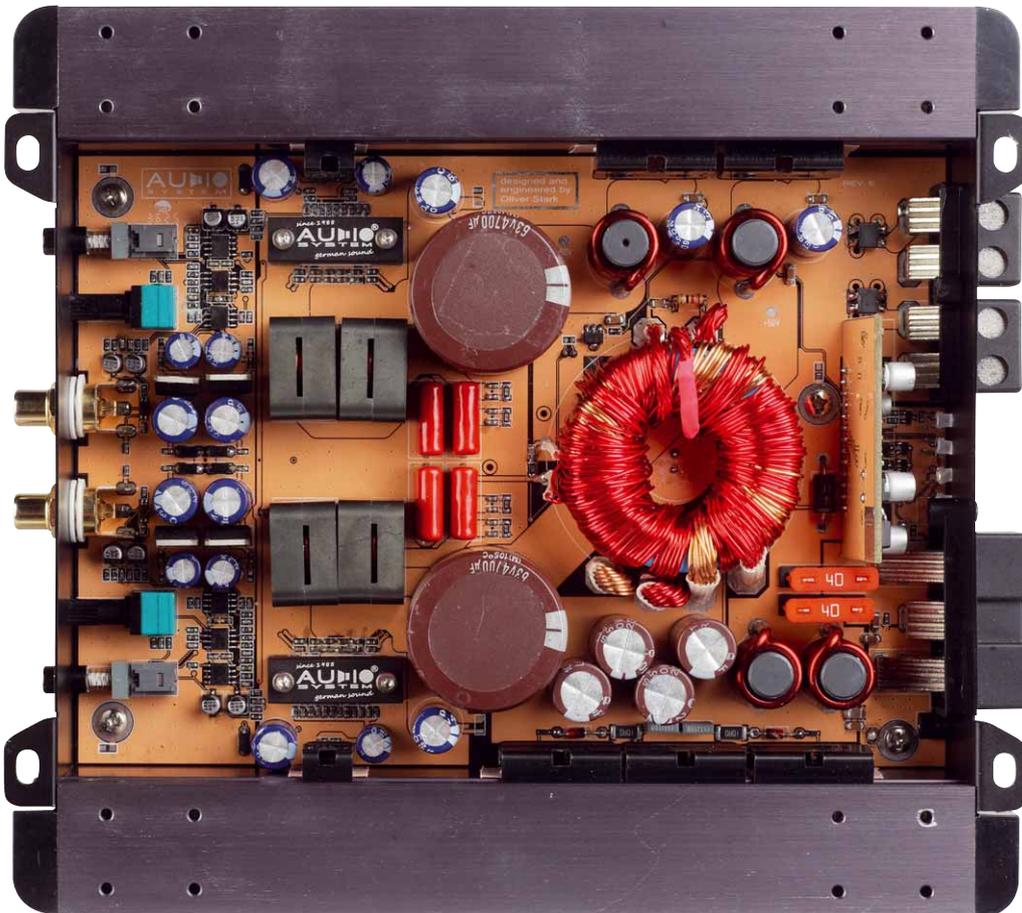
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At Audio System, HX amplifiers always used to represent the peak of excellence, the best amplifiers money could buy. With top-tier features, powerful performance down to 1 ohm, and superior sound quality, HX aimed to be the best in every aspect. The designs were generous, and only the finest components were used to ensure flawless operation. Back in the days when space consumption and efficiency were not concerns, DSP systems were rare, and electric cars seemed like a distant dream. Consequently, the top amplifiers were large “boards“, 20 inches long, equipped with high-quality transformers and analog Class AB circuitry, since “digital” ones were only suitable for subwoofers – at best. That was a long time ago, and it is now time for Audio System to revisit its concept of top-end amplifiers. The first result is the HX-235.2 D, a sleek, almost square amplifier that does not boast sheer size but remains discreet and reasonably compact. The D in the name indicates that this is a „digital“ Class D amplifier—anything else would be outdated today. Unless the amplifier targets

a niche market, two-channel high-end amplifiers still hold their ground.

It is also worth noting that Audio System remains committed to “analog” amplifiers. The first amplifier in the Avalanche series has just been announced, and it will be a high-end Class AB two-channel amplifier. Here at HX, however, we are keeping up with the times and going „digital“. The HX-235.2 D follows another recent trend: the move toward feature-free amplifiers with a direct-in concept. This is sensible if you want to add a signal processor to the system, which is why direct-in amplifiers are generally found in the higher-end market or in the SQ department. Many Audio System amplifiers already allow the active crossovers to be bypassed with a switch, and in the HX-235.2 D, they have been omitted entirely. No high-pass filter, no boost, no extra features—just a gain control in the signal path, and even that can be bypassed with a switch. You cannot get a more direct or cleaner signal path than that. It should be noted that our



The amplifier ICs are hidden beneath the elongated heatsinks bearing the Audio System logo

**AVAILABLE  
IN EPAPER STORES**

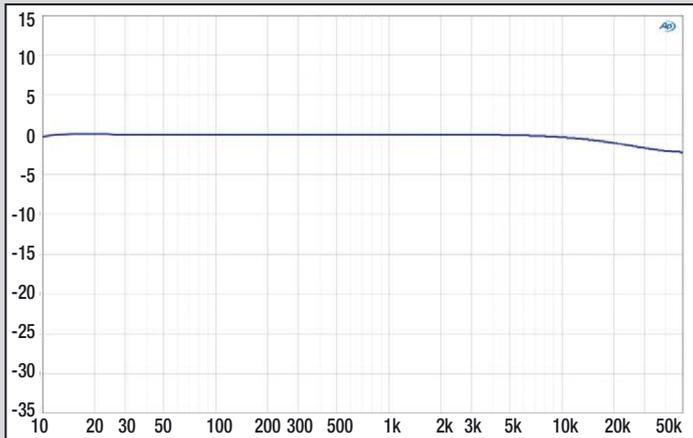
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**International  
LP**

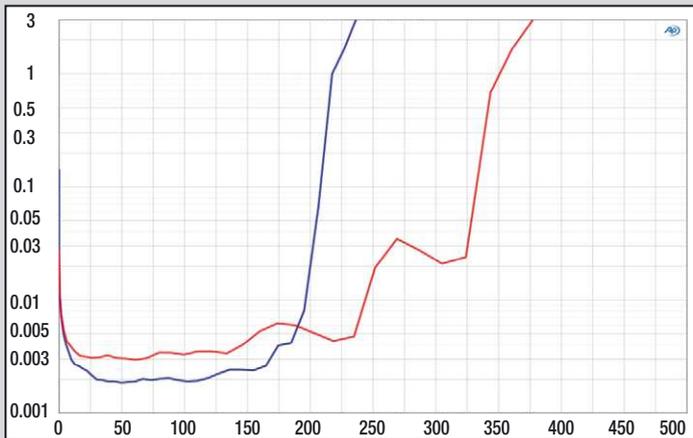


**Michael E. Brieden  
Verlag GmbH**  
The Test-Specialists  
Duisburg · Germany

## CAR & HIFI Laboratory



The frequency response has no noteworthy features, and this is appropriate for direct input; the HX is naturally limited to producing a simple line



The HX-235.2 D not only boasts a high maximum power output. Notably, at 4 ohms, the total harmonic distortion remains at a mere 0.002% across a broad power range—an exceptional figure



The art of omission: even the gain pots can be bypassed via a switch

test unit is not a production model but a hand-built early prototype that is not yet finalized in some areas. Audio System promises that the production HX will include a digital S/PDIF input, or at least one will be available as an option. This aligns perfectly with the concept and would be the only thing that could surpass the current direct-in.

Let us examine the inner workings, where Audio System has excelled. Naturally, the HX features a cutting-edge design and a well-thought-out layout. It appears compact yet not cramped, perfectly complementing its high-quality design. Space is available on the circuit board for the inscription “Made by Oliver Stark,” who has overseen amplifier development for several years. This indicates that the HX is not simply off-the-shelf from a supplier and rebranded by Audio System but is an authentic in-house creation. While the power supply remains fairly traditional with a transformer-based unit and ample buffering, the absence of larger components highlights the modern amplifier design. Outside the power supply, there are no MOSFETs; the only sizable components are two large Class D low-pass coils. Instead, two elongated heatsinks are prominently positioned in the center of the board, each secured to the housing with two screws through the circuit board. This design incorporates not only driver ICs but also the entire amplification system, including output transistors, within the ICs. This approach, common in advanced amplifier design, promises remarkable efficiency and enormous potential power output. As a result, the HX-235.2 becomes the most powerful amplifier with amplifier ICs in our testing facility to date. This capability stems from specialized Texas Instruments chips, rated at up to 315 watts stereo or 600 watts mono—note that this is at 10 % distortion, which is standard in the industry. The chips support up to four channels, which can be interconnected. Here, each channel has its own chip, with two chips used in the HX. This configuration provides the amplifier with abundant, clear power, without the option of bridge operation.

### Measurements and Sound

Before we discuss the lab results, we should remind you that our sample is an early prototype. Three aspects were not yet perfected, especially the EMC, which was subpar. The HX emitted both FM and DAB+ radio frequencies, and Audio System needs reworking this issue. There was also a small flaw in the direct-in circuit: after by-

passing the gain pot, sensitivity was only slightly more than 1 V at full load—unnecessarily low for an amplifier that receives its signal from a DSP. However, the pot itself was fine. Now, let us move on to the HX's capabilities, which are numerous. Starting with the frequency range, it remains completely unaffected by the "HiRes limit" of 50 kHz and shows no signs of interference from the low-pass filter up to our measurement limit of 96 kHz. The 4-ohm power test shows remarkably low distortion. The HX operates at 0.002 % THD+N. Very few amplifiers can match this. At 2 ohms, distortion rises slightly, but the HX remains clean. At maximum power, we measured 218 watts at 4 ohms and a powerful 354 watts at 2 ohms, with almost no residual noise. With this lab performance, the HX has nothing to hide, and the listening tests confirm this impression. The HX-235.2 D is one of those amplifiers where everything becomes clear after just a few seconds. It sounds crisp and almost infinitely transparent across all frequencies. Even bass, which can tend to soften with other amps, sounds well-defined and clean through the HX. High-frequency details and overtones—yes, please—the HX delivers them freely. Even a cozy atmosphere with soft sounds is very enjoyable with the HX. Power and control are always guaranteed, so there is nothing to criticize.

### Conclusion

What looks like a sleek and discreet compact amplifier is actually a small revolution. Audio System is setting new standards with the HX-235.2 D, a prime example of modern high-end amplifier design.

*Elmar Michels*



### Audio System HX-235.2 D

Price	450 Euro
Contact	Audio System, Germany
Internet	www.en.audio-system.de

### Rating

▶ Sound	40 %	★★★★★
Bass	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★★
Spatial imaging	8 %	★★★★★
Dynamics	8 %	★★★★★
▶ Lab	35 %	★★★★★
Power	20 %	★★★★★
Damping factor	—	—
Signal-to-noise ratio	5 %	★★★★★
Noise	10 %	★★★★★
▶ Practice	25 %	★★★★☆
Features	15 %	★★★★☆
Build quality electronics	5 %	★★★★★
Build quality mechanics	5 %	★★★★★

### Specifications

Channels	2
Channel power 4 ohms W	218
Channel power 2 ohms W	354
Channel power 1 ohms W	—
Bridged power W	—
System power W	—
Sensitivity max. mV	240
Sensitivity min. V	5,3
THD+N (<22 kHz) 5W	0,004
THD+N (<22 kHz) half power	0,002
Signal-to-noise ratio dB(A)	91
Damping factor 20 Hz	76
Damping factor 80 Hz	76
Damping factor 400 Hz	75
Damping factor 1 kHz	71
Damping factor 8 kHz	14
Damping factor 16 kHz	4

### Features

Low pass	—
High pass	—
Band pass	—
Bass boost	—
Subsonic filter	—
Phase shift	—
High-level inputs	—
Auto turn-on	—
RCA output	—
Start/stop capable	• (6,3 V)
Dimensions (L x W x H in mm)	218 x 196 x 48
Others	Direct In, optional digital input

**Top Class**



**CAR & HiFi**  
INTERNATIONAL Germany 1/26

Price/performance: very good

„State-of-the-art technology in the Top Class.“

GZ Reference K-165/M-80/T-26  
– Reference three-way system from Ground Zero

# Technology Carrier

► With the Reference (to be precise, the GZ Reference series), Ground Zero presents yet another high-end speaker set that stands out for its exquisite technology.

**SOUND AWARD**

**Absolute Top Class**

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The Reference diaphragm consists of a paper support cone and a faceted aluminum shell



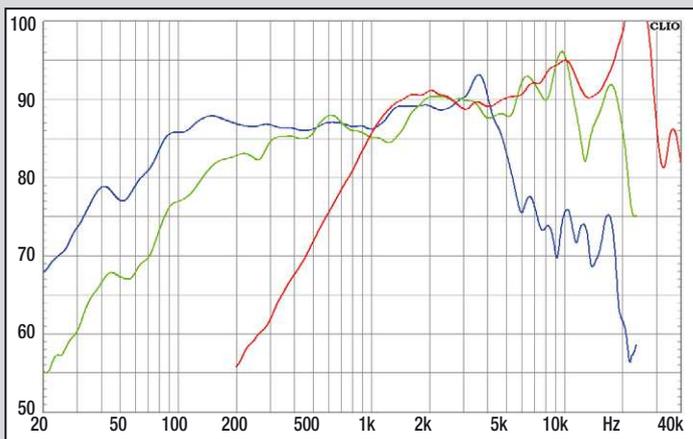
It feels like only a year or two ago that Ground Zero unveiled the Ultra, the most advanced speaker system in the company's history. In reality, it was 2022 when the GZ Ultra woofer and tweeter, each costing 2,000 Euros, were introduced (and awarded prizes). That gave Ground Zero enough time over the last four years to develop its next high-end project, which was possibly even more complex—mainly because it is a three-way system, and because Ground Zero ventured into completely new territory. Specifically, we are talking about the new Reference T-26 tweeter, a 26-millimeter titanium dome that is concave rather than convex, as is usually the case. Yes, this has been done before—originally by Focal, but also by MB Quart and German Maestro, for example. However, the shape, also known as an inverted dome, remains exotic and will likely remain so for the foreseeable future. As we have learned, creating a concave dome is not simply a matter of turning the cone around; it is much more challenging for the speaker developer to get it to work.

Convex dome tweeters also require geometric optimization, but the behavior of the concave cone is highly sensitive to even small changes in the dome. Surprisingly, the inverted dome operates in a noticeably different way from most loudspeakers' dome tweeters, which push air molecules forward. The convex dome mainly pushes

them in its the center, with efficiency decreasing toward the edges due to the steep cone angle, which is less aligned with the motion. The inverted dome functions more like a parabolic mirror—creating a focal point in front of the cone where air pressure accumulates. From this point, sound disperses more broadly, ideally in all directions rather than just straight forward. This approach is especially beneficial in near-field environments, such as a car, as it should improve the spatial imaging of the music.

To achieve these results with the Reference tweeter, advanced simulation software is employed today, specifically the FineCone component from Loudsoft. This system, along with software components for diaphragm suspension and motor, has been in use at Ground Zero for some time. The outcome is a titanium dome featuring an anodized coating for increased durability and a 0.75" voice coil under a 1" cone. The surround is also highly refined, sitting completely flat and made from a special open-cell polyurethane. For precise tuning, a foam ring with a corrugated edge surrounds the components, offering protection against edge interference. The two Reference cone drivers, which have also been developed with Loudsoft, are equally sophisticated, with every detail carefully designed to ensure the speakers deliver truly high-end performance. Beyond the standard components like robust cast frames, terminals, and high-quality manufacturing, the K-165 and M-80 stand out with exceptional cones sourced from the renowned DKM in Krefeld, Germany. Whether these cones are aluminum inverted domes with paper support or paper cones with aluminum dust caps is subjective. What's clear is that combining hard and soft elements is advantageous in loudspeaker design, and faceted embossing disrupts the

## CAR & HIFI Laboratory



While the K-165 is average, the M-80 boasts plenty of characteristic SPL, allowing it to keep up with the woofer

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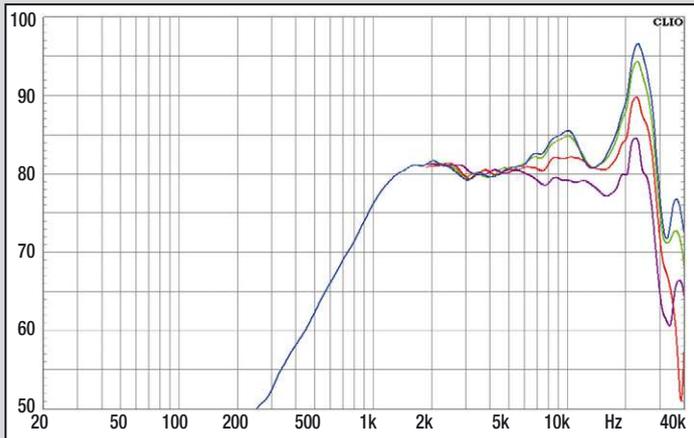
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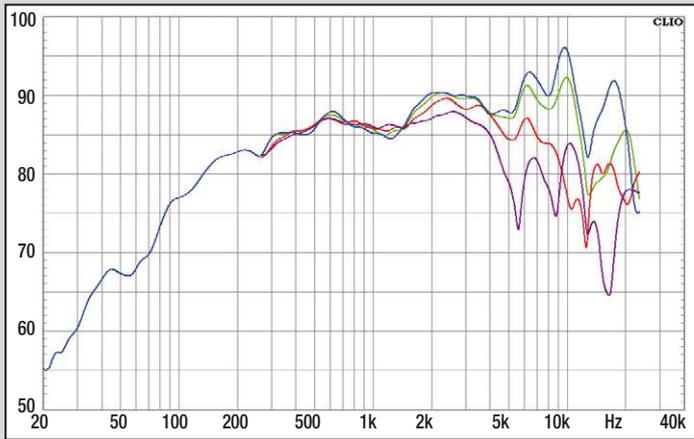


**Horn sound**

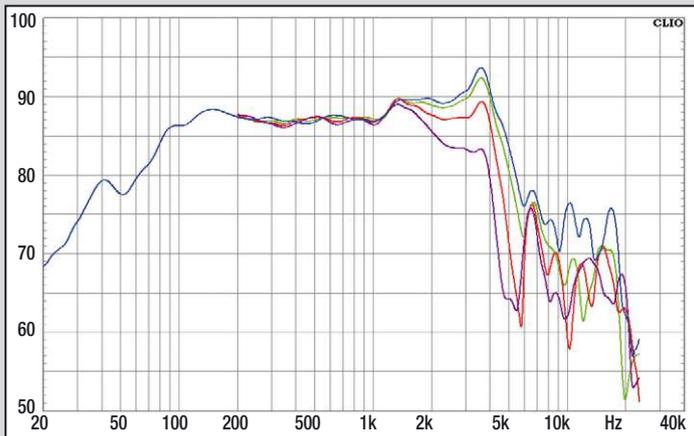
## CAR&HIFI Laboratory



The tweeter not only has good omnidirectional characteristics, it also runs very smoothly at angles between 30° and 45°



The midrange driver “only” runs up to 4 kHz, but thanks to its very powerful motor, it exhibits an upward-sloping amplitude response



The woofer performs almost perfectly and exhibits a very well damped cone. At the bottom end, it has a flat sound pressure drop due to its low resonance frequency and very strong motor

homogeneous metal structure, thereby benefiting the resonance behavior. The woofers and midrange drivers incorporate advanced features not immediately visible but requiring significant development, such as the application of different adhesives with different hardness and elasticity that bond the cones for optimal vibration performance. The midrange motor, like the tweeter’s, uses a full neodymium ring with a T-yoke rather than a neodymium „pill“ with a „pot“ around it. The K-165 also includes a second neodymium magnet on the top plate, polarized opposite to the main magnet, creating a push-pull hybrid motor with added field strength. All three reference motors contain a shorting ring or copper cap to reduce eddy currents and distortion, as we will explore soon.

### Measurements and Sound

All Reference drivers excel in low distortion. The distortion curves resemble an open rectangle; at the lower end, they drop to nearly zero and remain there up to the upper limit of the transmission range—without problematic areas caused by unwanted partial vibrations. The K-165 shows an almost ideal amplitude response up to 3 kilohertz, and the cone resonances of the relatively stiff cone are very low, demonstrating how effectively the hard-soft structure works. This also applies to the midrange driver, which, however, does not perform quite as perfectly. This is typical, as smaller cones in midrange drivers are usually more prone to frequency response ripples than larger ones. Now, let us focus on the ensemble’s secret star: the concave high-frequency dome, which delivers almost perfect distortion behavior within the transmission range, though the titanium cone produces a sharp peak at 23 kilohertz. As expected, the omnidirectional behavior is excellent, although even the Reference dome is influenced by the laws of physics



The T-26 belongs to the rare category of concave domes, in this case with an anodized titanium diaphragm

and eventually begins to bundle. However, the frequency response is notably linear across various angles; the GZ dome behaves very consistently at angles below 30°.

However, how well the device actually works needs to be tested with music.

And indeed, the Reference components deliver a memorable performance. They sound spectacular; so much becomes immediately apparent. This speaker system is not built for cozy background music with tinkling sounds. Instead, it acts more like a precision instrument, willingly revealing every detail of the recording. Unprepared listeners may initially be surprised, partly because of the exuberant spatiality, which can sometimes be overwhelming compared to a fabric dome. However, the honesty and accuracy of the Reference System go beyond just the high range; from the goose-bump-inducing performance of challenging instruments to the exceptionally precise bass, everything is just right here. You can find all of this impressive – in fact, you have to, objectively speaking. Whether it is suitable for long-term use is more of a personal choice; experience shows that your listening experience evolves over weeks and months. It is certain that there are other speakers that sound “more pleasant” or ‘fluffier’ and that you can listen to more “casually.” The GZ Reference System, however, offers character and sound quality rarely found elsewhere.

### Conclusion

With the GZ Reference components, Ground Zero delivers top-quality



The aluminum caps conceal sophisticated motors, with neodymium in the midrange driver and a hybrid in the 6.5" driver



speakers. Carefully designed and offering spectacular sound, they are a true highlight.

*Elmar Michels*

#### Specifications

Basket diameter	165 mm
Mounting diameter	144 mm
Mounting depth	70 mm
Magnet diameter	100 mm
Basket diameter mid	94 mm
Mounting depth mid	77 mm
Membrane tw	26 mm
Casing tw	48 mm
Highest xo freq. wf/mid	3/5 kHz
Lowest xo freq. mit/tw	200/2,3 kHz
xo freq. used	400/3,5 kHz
EQ for test	–
Grilles	• mid
Others	–
Nominal impedance	4 Ohm
DC resistance Rdc	3,38 Ohm
Coil inductivity Le	0,29 mH
Coil diameter	38 mm
Membrane surface	127 cm <sup>2</sup>
Resonance frequency fs	49 Hz
Mechanical Q-Factor Qms	6,43
Electrical Q-factor Qes	0,42
Overall Q-factor Qts	0,39
Equivalent volume Vas	13,2 l
Moved mass Mms	18,0 g
Rms	0,86 kg/s
Cms	0,59 mm/N
B x l	6,43 Tm
SPL 2 V, 1 m	87 dB
Recommended power	30 – 200 W

#### Ground Zero GZ Reference K-165/M-80/T-26

Price	2.600 Euro
Contact	Ground Zero, Germany
Internet	ground-zero-audio.com

#### Rating

▶ Sound	55 %	★★★★★
Bass foundation	11 %	★★★★★
Neutrality	11 %	★★★★★
Sound stage	11 %	★★★★★
Spatiality	11 %	★★★★★
Dynamics	11 %	★★★★★
▶ Lab	30 %	★★★★★
Frequency response	10 %	★★★★★
Max. SPL	10 %	★★★★★
Distortion	10 %	★★★★★
▶ Practice	15 %	★★★★★

**Absolute Top Class**



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Price/performance: very good

*“A great speaker set that deserves the name Reference.”*

Ci5 M50FM-S3 + M80FM-S3  
– the new midrange drivers from Helix

# Clever midrange drivers

► After a 25 mm tweeter and two woofers in 165 and 200 mm formats, Helix is now turning its attention to the midrange drivers in its Compose i5 modular system. We welcome the Ci5 M50FM-S3 and Ci5 M80FM-S3 to the measurement comparison.

**HIGHLIGHT**

**Broadband**

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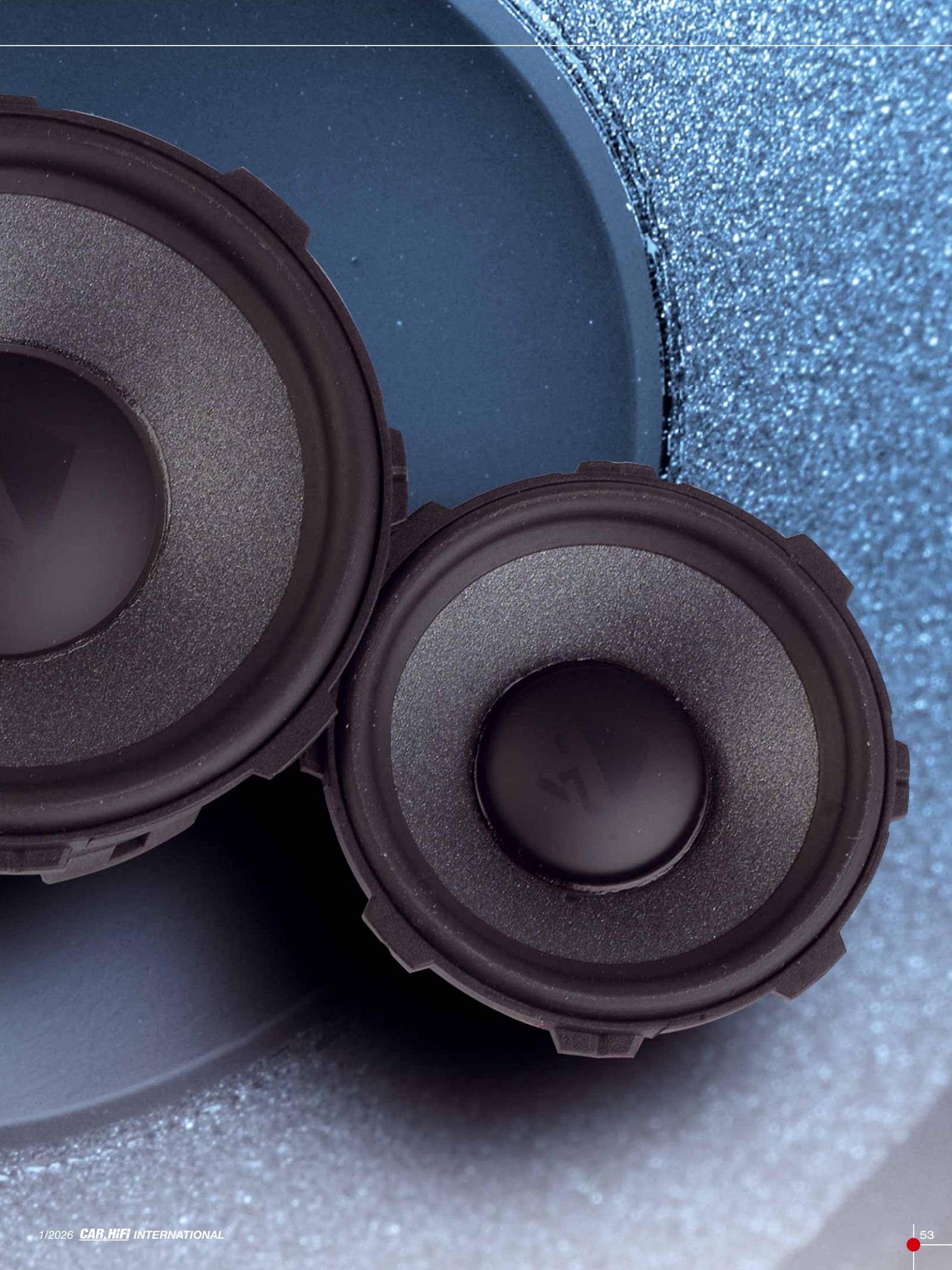
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**HIGHLIGHT**

**Midrange**

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All Ci3, Ci5, and Ci7 cone speakers are equipped with reinforced plastic baskets

In the Compose universe, Helix has come up with the ultimate solution in speaker retrofitting. With the affordable Compose i3 series and the high-end i7 series, there are two speaker series available that can be adapted to a wide range of vehicles with a variety of installations and cable adapters and, with the DIN adapters, can also

be used universally like any normal speaker set. Compose i5 is a collection of specialized single drivers that complement both i3 and i7, such as a 200-millimeter woofer that (also) fits into BMW and Mercedes installation locations. The installation adapters are called FlexMount and are also part of the name of our two midrange speakers. The Ci5 M50FM-S3 is a midrange speaker with a nominal diameter of 50 millimeters, FlexMount bracket, and a 3-ohm voice coil. At the same time, the

M80 is an 80 mm midrange speaker. Both come with optional grilles and FlexMount rings, allowing them to be installed in many vehicles via plug-and-play. In addition, the larger M80 also has a FlexConnect terminal that can be adapted to different vehicle connectors with inserts. Like Compose tweeters, the small M50 comes with a vehicle connector that can be adapted if the installer does not already have the appropriate connection in their drawer. Both



Adapter rings and mounting hardware are included with both models



Both drivers feature FlexMount mounts for various adapter rings

midrange speakers are S3 types, i.e., with a 3-ohm single voice coil, giving them a level advantage over 4-ohm speakers. As usual with Compose, both are equipped with attractive plastic baskets filled with glass beads and emit sound through paper membranes that are tuned with a mineral coating. The M50 has a special feature in the form of an aluminum dust cap that is glued directly to the coil former. This direct connection ensures extended high-frequency reproduction, making the M50 suitable not only as a midrange driver but also as a full-range driver for use without a tweeter. The voice coils are not too small at 3/4 inch or 19 millimeters and Helix specifies an impressive 7 millimeters of winding height for both.

### Measurements

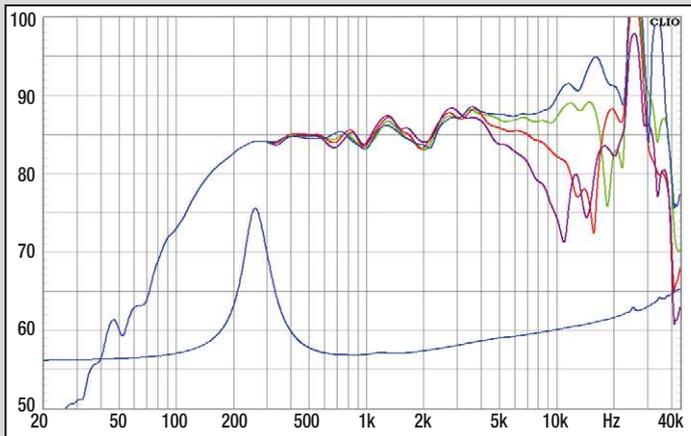
The 3-ohm coils help both speakers achieve very respectable sound pressure levels. At 2 V/1 m, we measure 87 dB for the M80, compared to around 84 dB for the average 4-ohm three-inch speaker. The small M50 achieves

a very good 85 dB – not bad for a 20 square centimeter membrane area. The M80 runs very smoothly with a practical upward slope. The crossover point towards the tweeter is virtually freely selectable; if you want, you can use a super tweeter from 8 kHz upwards. The M50 can also be used without a tweeter if required, as it plays resonance-free up to over 20 kHz. It only rings clearly at

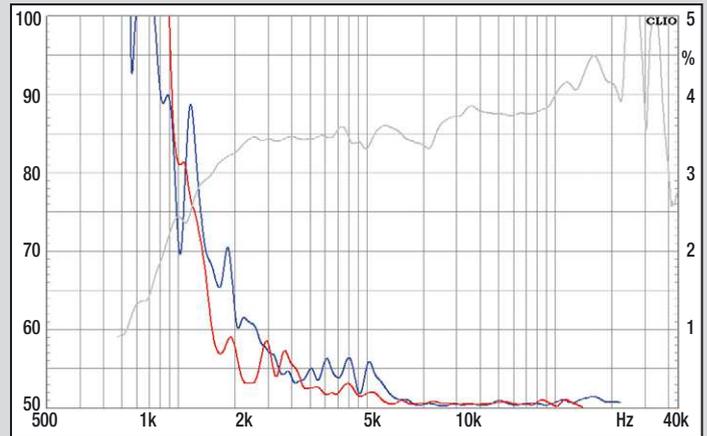


The midrange drivers can be mounted with or without grilles

## CAR&HIFI Laboratory



The M50 runs without resonance phenomena up to over 20 kilohertz; only at 25 kHz does a pronounced resonance become apparent, probably from the aluminum dome

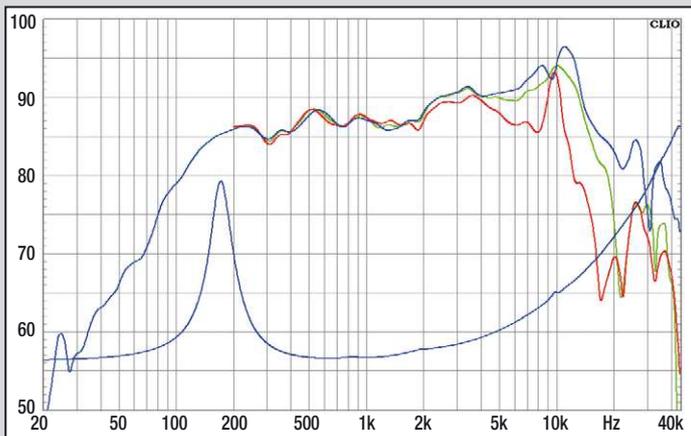


M50, K2 (blue) and K3 at 81 dB: The two-inch driver produces very little odd harmonic distortion below 200 Hz. The harmless K2 is also very low

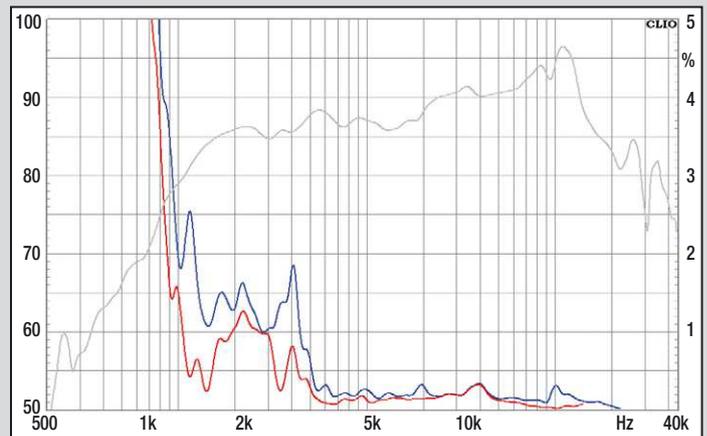
a sensational 25 kHz, which would make many tweeters happy. This high-frequency boost and the low impedance rise suggest that Helix has hidden a short-circuit ring or a copper cap in the motor. In any event, the M50 is a true full-range speaker with sensational laboratory performance. Thanks to the large diaphragm excursion, the level capabilities of both are also worthy of praise. At moderate loads, the distortion is remarkably low: With

an open-air resonance of 250 Hz, the M50 runs with less than 1% distortion down to 200 Hz – a sensational performance for such a small driver, and without a crossover! As a rule of thumb, the usable range is set at twice the resonance frequency, but the Helix can be crossed over much lower. This also applies to the M80, where distortion only increases below 150 Hz, which is why we recommend a high-pass crossover from around 200 Hz.

## CAR&HIFI Laboratory



The M80 has an amplitude response without interference, a wide operating range, and gives installers complete freedom during setup



M80, K2 (blue) and K3 at 87 dB: Even at relatively high volumes, the M80 remains clean, running below its resonance frequency without too much distortion

## Conclusion

With Ci5 M50FM-S3 and Ci5 M80FM-S3, Helix once again demonstrates the ingenuity of the Compose modular system. Now also available with midrange speakers and full-range speakers, both

of which are exceptionally well designed and, like most Compose speakers, can be easily installed in any vehicle thanks to variable adaptation solutions.

*Elmar Michels*

### Helix Ci5 M50FM-S3

Price	170 Euro
Contact	Audiotec Fischer, Germany
Internet	www.audiotec-fischer.com

### Specifications

Outer diameter	79 mm
Mounting diameter	66 mm
Mounting depth	31 mm
Magnet diameter	-
Cone	Paper
Voice coil	Copper
VC former	Aluminum
Magnet	Neodymium
XO freq. highest	-
XO freq. lowest	300 Hz
Weight	83 g
Others	Grid, mounting ring, gasket

Nominal impedance	3 Ohm
DC resistance Rdc	3,00 Ohm
Coil inductivity Le	0,03 mH
Coil diameter	19 mm
Membrane surface	20 cm <sup>2</sup>
Resonance frequency fs	249,0 Hz
Mechanical Q-Factor Qms	3,16
Electrical Q-factor Qes	0,93
Overall Q-factor Qts	0,72
Equivalent volume Vas	0,1 l
Moved mass Mms	1,7 g
Rms	0,86 kg/s
Cms	0,24 mm/N
B x l	2,96 Tm
SPL 2 V, 1 m	85 dB

### Helix Ci5 M80FM-S3

Price	200 Euro
Contact	Audiotec Fischer, Germany
Internet	www.audiotec-fischer.com

### Specifications

Outer diameter	96 mm
Mounting diameter	75 mm
Mounting depth	39 mm
Magnet diameter	-
Cone	Paper
Voice coil	Copper
VC former	Aluminum
Magnet	Neodymium
XO freq. highest	8 kHz
XO freq. lowest	200 Hz
Weight	85 g
Others	Grid, mounting ring, gasket, FlexConnect

Nominal impedance	3 Ohm
DC resistance Rdc	3,07 Ohm
Coil inductivity Le	0,10 mH
Coil diameter	19 mm
Membrane surface	36 cm <sup>2</sup>
Resonance frequency fs	171,0 Hz
Mechanical Q-Factor Qms	3,87
Electrical Q-factor Qes	0,99
Overall Q-factor Qts	0,79
Equivalent volume Vas	0,7 l
Moved mass Mms	2,4 g
Rms	0,67 kg/s
Cms	0,36 mm/N
B x l	2,84 Tm
SPL 2 V, 1 m	87 dB

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Ratings only comparable within their class: ★ (worst) ... ★★★★★ (best)

- **Absolute Top Class** – Uncompromising products with outstanding build and sound quality
- **Top Class** – Products for higher demands with excellent performance, sound, and processing quality
- **Upper Class** – Products for quality-conscious connoisseurs who value good value for money
- **Middle Class** – Solid products that meet average requirements in all respects
- **Entry Level** – Qualitatively convincing products with an excellent price-performance ratio

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Devices are tested and rated according to strict criteria and can reach up to five “stars”. Ratings are only comparable within a class and device type. To score four stars in the top class, the device must meet more demanding requirements than for a 4-star rating in the upper class. The model names, prices (RRP), and equipment specifications for the devices always refer to the German market at testing. For some devices, prices and features may differ in the individual countries.

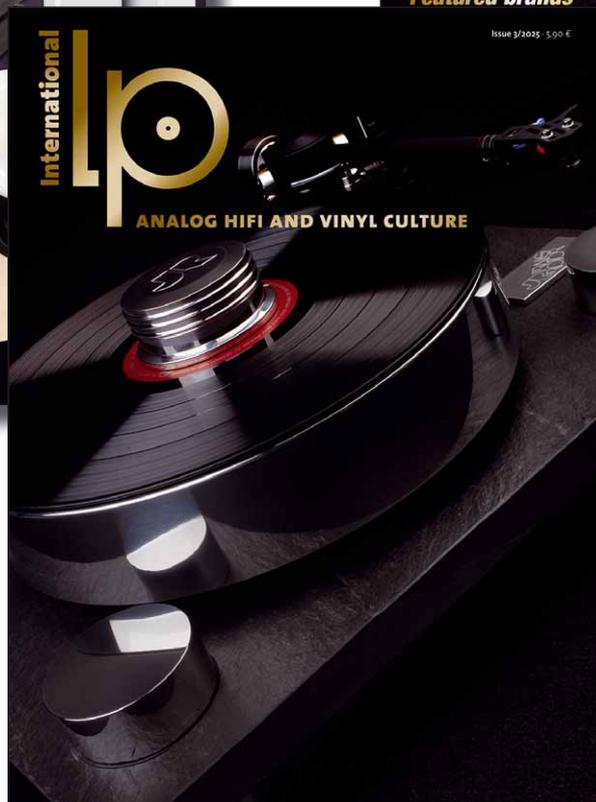
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