

CAR & HiFi

INTERNATIONAL

2/26 • 4,80 €

European Edition



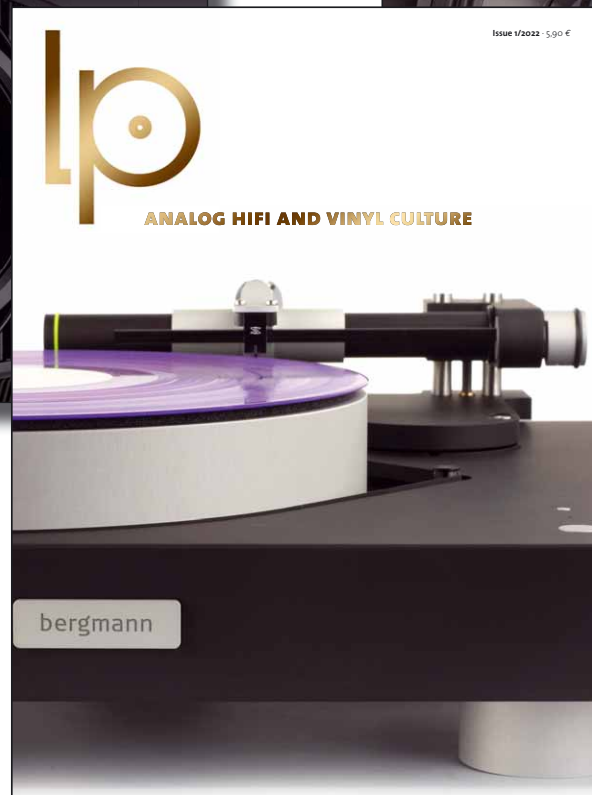
Best topics

- Volkswagen retro radio
- High-end stand-alone DSP • 4 DSP amplifiers
- Giant subwoofer Ground Zero Plutonium NEO-XSPL
- 3 Mini amps with max power • Best speakers 2026

Featured brands

- Audio System Germany • Blaupunkt • Brax
- ESX • Ground Zero • Helix • Musway
- Phoenix Gold

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More DSP!

This issue of CAR&HIFI INTERNATIONAL sets a new record. We cover no fewer than four DSP amplifiers, plus a highlight: a standalone DSP of truly exceptional quality. In doing so, we are keeping pace with the unabated trend toward signal processors—a trend that shows no signs of slowing down. Also right on trend are our three mini-amplifiers, delivering massive power from a tiny footprint across one, two, or

four channels. To top it off, we present top-tier speakers and subwoofers—though their target audiences couldn't be more different. But read on and see for yourself.



Elmar Michels
Editor-in-chief



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Visit www.carhifi-international.com for our free archive containing this issue and all older ones. All issues are also available on readly.com.

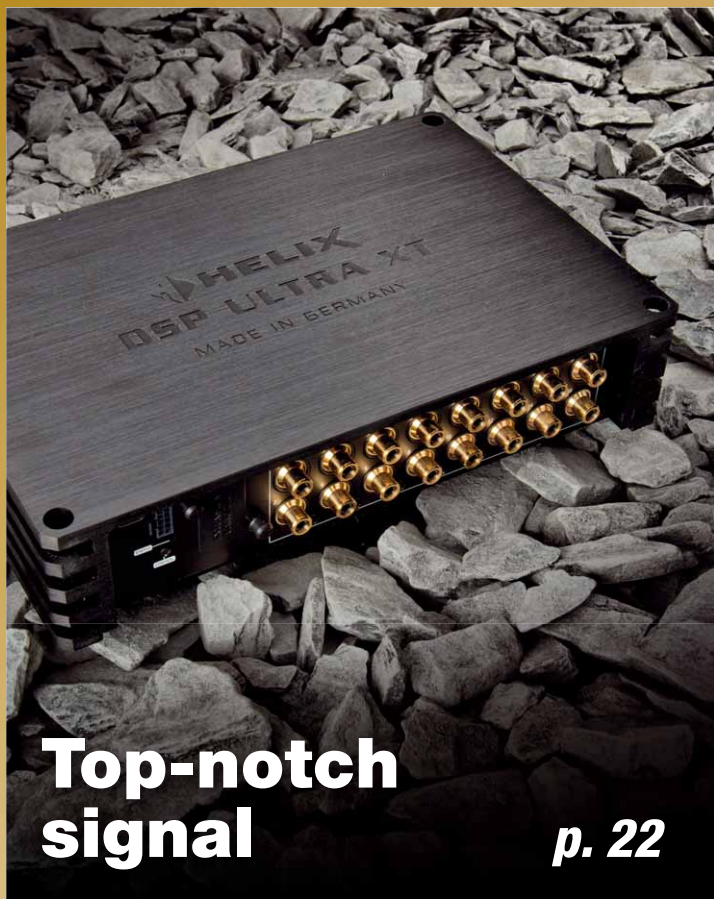


DSP SERIES

GZDSP 6-10SQ

- Digital signal processor (DSP) for highest SQ demands
- 6-channel line input (RCA)
- 6-channel high-level input (with auto-on function)
- Coaxial and optical S/PDIF input
- 10-channel line output (RCA)
- High Performance Analog Devices SigmaDSP Audio Processor
- Premium DAC with differential signal routing
- High-quality OP-amps with lowest noise and distortion behavior
- Extremely low-noise (SNR ≥ 110 dB Analog / ≥ 113 dB Digital Input)
- Realtime setup of all functions (via PC or app)
- Input equalizer (7 bands per source)
- Output equalizer (10 x 31 bands)
- Input and Output channel time alignment
- Adjustable crossover (HPF / LPF / BPF)
- 3 filter characteristics & 6-48dB/Oct slope selectable
- BT 5.0 for wireless music streaming and DSP settings
- **New Software! Now with all-pass filter!**
- Dimensions 5.20" x 5.63 (6.73)" x 1.57" (w x l x h)
- Optional wired remote control GZREM 6-10 available separately





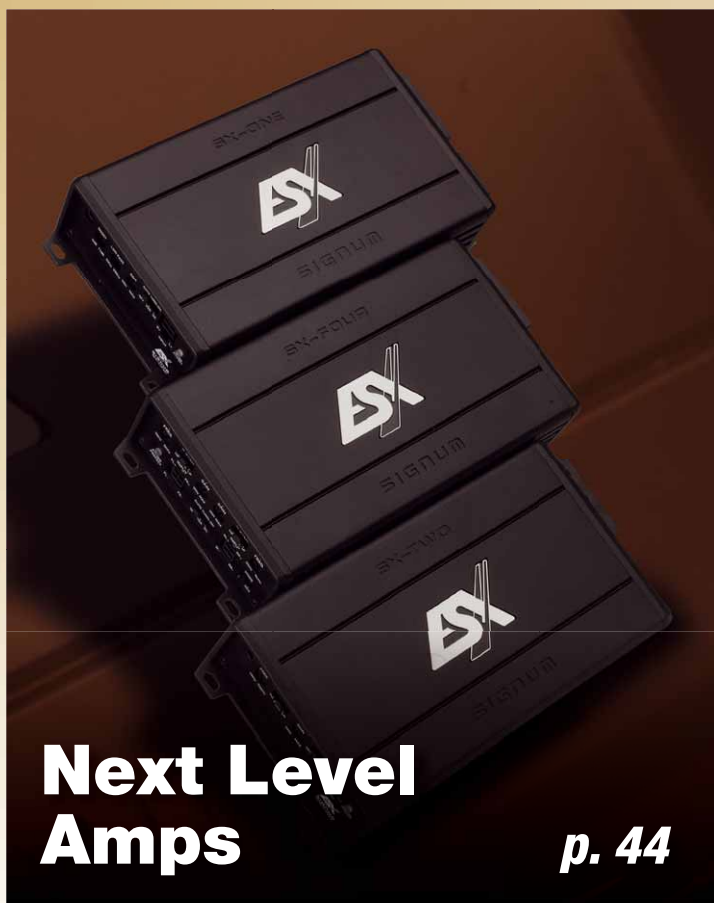
**Top-notch
signal**

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**DSP at a
Competitive
Price**

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**Next Level
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Tests

Nomen est Omen

Blaupunkt Wolfsburg 648

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DSP at a Competitive Price

Phoenix Gold ZDA4.8

- Four-channel amplifier with eight-channel DSP 14

Top-notch signal

Helix DSP Ultra XT

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Mini Control Center

Musway M4nano

- 4-Channel Amplifier with 8-Channel DSP 30

Major Upgrade

Audio System X-100.5 MDSP-BTA and X-100.9 MDSP-BTA

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Next Level Amps

SX-ONE + SX-TWO + SX-Four

- New series of mini amplifiers from ESX 44

Tradition and innovation

Brax Matrix ML165 PRO

+ ML80 PRO + ML28 PRO

- Top three-way system by Brax 50

Extreme Bass

GZPW 15NEO-XSPL

- An exceptional subwoofer from Ground Zero 56

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► Immersive Sound

Pioneer introduces a genuine innovation that makes its debut in a head unit with the new SPH-EVO109DAB. In addition to its renowned range of functions, the device features „Spatial Audio,“ delivering a truly immersive listening experience – regardless of the audio source. Spatial Audio works with both CarPlay and Dolby Atmos; using a proprietary Pioneer algorithm, it generates a four-channel signal (plus subwoofer) that creates immersive, three-dimensional sound coming from all directions.

● www.pioneer-car.eu



► Subwoofer amplifier with DSP

With its form factor and 2 x 200 watts of power, the new ISM 400.2DSP is perfectly tailored for upgrading Helix Impact passive subwoofers. In addition to delivering robust power, it offers decisive advantages when addressing a lack of factory bass or thin-sounding music recordings. The integrated DSP features the new DeepImpact bass algorithm, which can be adjusted directly via the DSP PC-Tool software. This algorithm extends the audible low-end bass and provides a significantly more solid foundation.

● www.audiotec-fischer.com



► 10-Inch Anniversary Woofer

Following the unveiling of its 30th-anniversary products, Ground Zero has heeded the calls of its fan base and is launching a fourth gem to join the four-channel amplifier, 16 cm component system, and 12-inch subwoofer: the GZW 10-30A. This more compact 10-inch version – featuring the same technology as the 12-inch model – now complements the GZW 12-30A. A distinctive feature shared by both models is the carbon-fiber dust cap.

● www.ground-zero-audio.com



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Oberklasse
CAR & HiFi 3/2026

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Oberklasse
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EMV-TIPP
Ungestörter Radioempfang
CAR & HiFi 3/2026

NX125.4

4-Channel Class D Mini Amp
4 x 80/135 W/RMS @ 4/2 Ω
2 x 270 W/RMS at 4 Ω bridged
89 x 41 x 148 mm

NX175.4

4-Channel Class D Mini Amp
4 x 100/175 W/RMS @ 4/2 Ω
2 x 350 W/RMS at 4 Ω bridged
89 x 41 x 168 mm

NX225.4

4-Channel Class D Mini Amp
4 x 125/225 W/RMS @ 4/2 Ω
2 x 450 W/RMS at 4 Ω bridged
89 x 41 x 185 mm

NX400.1

Mono Class D Mini Amp
1 x 200/300/400 W/RMS @ 4/2/1 Ω
89 x 41 x 125 mm

NX600.1

Mono Class D Mini Amp
1 x 250/400/600 W/RMS @ 4/2/1 Ω
89 x 41 x 148 mm

NX800.1

Mono Class D Mini Amp
1 x 350/550/800 W/RMS @ 4/2/1 Ω
89 x 41 x 185 mm

12 Mini models –
limitless variety



BRANDNEW!

„With the new NX series, Musway is launching a real standout product for the year. The series takes the concept of high power in ultra-compact housings to the extreme and deserves a closer look.“

Elmar Michels in Car & HiFi 3/2026

NX200.2

2-Channel Class D Mini Amp
2 x 120/200 W/RMS @ 4/2 Ω
1 x 400 W/RMS at 4 Ω bridged
89 x 41 x 125 mm

NX350.2

2-Channel Class D Mini Amp
2 x 200/350 W/RMS @ 4/2 Ω
1 x 700 W/RMS at 4 Ω bridged
89 x 41 x 148 mm

NX275.2

2-Channel Class D Mini Amp
2 x 160/275 W/RMS @ 4/2 Ω
1 x 550 W/RMS at 4 Ω bridged
89 x 41 x 138 mm

NX450.2

2-Channel Class D Mini Amp
2 x 300/450 W/RMS @ 4/2 Ω
1 x 900 W/RMS at 4 Ω bridged
89 x 41 x 185 mm

NX700.3

3-Channel Class D Mini Amp
2 x 85/150 W/RMS @ 4/2 Ω
+ 1 x 250/425 W/RMS @ 4/2 Ω
89 x 41 x 168 mm

NX900.5

5-Channel Class D Mini Amp
4 x 70/120 W/RMS @ 4/2 Ω
+ 1 x 250/425 W/RMS @ 4/2 Ω
89 x 41 x 185 mm

NX SERIES

A DOZEN OF NEW POSSIBILITIES

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TECHNIK FÜR KLANGBEGEISTERTE

A Perfect Fit for Volkswagen Around 2010

**Blaupunkt Wolfsburg 648: Modern
Screen Radio for Used VW, Seat,
and Skoda Vehicles**

Nomen est Omen

- ▶ Blaupunkt has made a name for itself in the youngtimer and classic car scene with its retro devices. With the Wolfsburg – the name says it all – there is now a screen radio for Volkswagen vehicles from around 2010.

VERSATILITY AWARD**Top Class****CAR & HiFi**
INTERNATIONAL 2/26



A Volkswagen about 15 years old isn't typically in need of scrapping. However, its factory media system is outdated and lacks current features. Many radios or navigation units from that period no longer function. While original replacement parts are available, they are costly and miss some key features. Installing an aftermarket unit can be tricky, as it may not fit the trapezoidal dashboard cutout. Moreover, connection adapters for Quadlock II, Fakra, and the CAN bus are required.

Suitable Replacement Units

The better solution for used Volkswagens is a custom-fit aftermarket unit that retains the VW trapezoidal shape and includes the correct connectors right out of the box. Blaupunkt's latest offering, the Wolfsburg 648, fits this requirement. It features the Quadlock II connection cable and a Fakra antenna jack. The unit also includes a CAN connectivity adapter, allowing it – depending on the vehicle's setup – to utilize the original steering wheel remote and access vehicle-specific information such as ignition status, lighting, speed signals, Park Distance Control, or climate data. Additionally, it has a rear-view camera input that can be operated via CAN or an analog reverse signal. An optional connection cable enables the Wolfsburg to function without a CAN connection.

Online Navigation

The Blaupunkt Wolfsburg 648 is a moniceiver, so it lacks built-in navigation software. However, this isn't an issue because it supports both Android Auto and Apple CarPlay wirelessly. This enables easy and convenient access to your smartphone's navigation through the device's large touchscreen. The same ap-



Android Auto



Apple Car Play



Clearly structured menu

plies to many other smartphone apps, including media players, messaging, phone calls, and more.

Design and Operation

The Wolfsburg 648 features a central 18-cm touchscreen, surrounded by buttons and two rotary controls, all designed in the classic style of original VW units to blend seamlessly with the vehicle's interior. The buttons' backlight color can be customized through the menu. Blaupunkt's on-screen menu, with its square buttons, has a straightfor-



USB cable runs in from the back

ward, functional design. While it may seem somewhat dated by modern standards, it harmonizes well with the similarly utilitarian Volkswagen dashboards from that era. Its clear layout also enhances intuitive usability.



Package includes a CAN adapter



Standard VW mounting dimensions

Features

The Blaupunkt Wolfsburg 648 supports media playback through Bluetooth, analog AV-In, and USB. It features FM, AM, and digital radio tuners for listening. Hands-free calls can be made using the built-in or external microphone. For sound customization, it includes a 12-band graphic equalizer with multiple presets and a loudness option. Crossovers or time alignment are not included.

Connections

The rear of the radio provides all necessary vehicle connections. Along with the USB and AV-In ports mentioned earlier, it includes a backup camera input and five RCA preamp outputs for front, rear, and subwoofer speakers. Speaker, power, and CAN connections use Quadlock II; the FM antenna connects via Fakra, while DAB+ uses SMB.

Conclusion

The Blaupunkt Wolfsburg 648 is a contemporary multimedia radio equipped with wireless CarPlay

and Android Auto. It is designed to suit older Volkswagen models from around 2010, with compatibility in visual, mechanical, and electrical aspects.

Dipl. Phys. Guido Randerath

Blaupunkt Wolfsburg 648

Price	600 Euro
Distributor	Evo Sales GmbH, Germany
Hotline	+49 5151 823820
Internet	www.bpautomotive.de

Rating

► Sound	20 %	★★★★★
Bass foundation	4 %	★★★★★
Neutrality	4 %	★★★★★
Transparency	4 %	★★★★★
Spatiality	4 %	★★★★★
Dynamics	4 %	★★★★★
► Image	20 %	★★★★★
Sharpness	3,3 %	★★★★★
Brightness	3,3 %	★★★★★
Contrast	3,3 %	★★★★★
Color reproduction	3,3 %	★★★★★
Viewing angle	3,3 %	★★★★★
Reflection	3,3 %	★★★★★
► Lab	15 %	★★★★★
• USB	7,5 %	★★★★★
Distortion	3,75 %	★★★★★
Signal to noise ratio	3,75 %	★★★★★
• Tuner	7,5 %	★★★★★
Frequency response	1,88 %	★★★★★
Crosstalk	1,88 %	★★★★★
Distortion	1,88 %	★★★★★
Signal to noise ratio	1,88 %	★★★★★
► Practice	45 %	★★★★★
Handling	10 %	★★★★★
Features	20 %	★★★★★
Reception test	10 %	★★★★★
Processing	5 %	★★★★★

Specifications

Amplifier power (W)	15
Output voltage (V)	1,3
USB	
THD+N (%)	0,007
SNR (A)	95
Tuner	
THD+N (%)	0.021
SNR (A)	79
Crosstalk (dB)	41
Monitor size (in)	7.0
Touchscreen	•
Dual Zone	–
Dolby Digital / Pro Logic decoder	–
param./graph. EQ bands	– / 12
Crossovers	HP / LP
Time alignment	–
Pre-outs	5
AV-in / AV-out	• / •
Digital out	–
Camera-in/nav-in	• / –
USB front/rear	– / •
iPod control	–
Bluetooth HFP/A2DP	• / •
Misc.	CarPlay, Android Auto

The Blaupunkt Wolfsburg 648 is compatible with:

Many VW, Seat, and Skoda models from 2003–2016 equipped with Quadlock II. It replaces the OEM models RNS310/315/510 and RCD310/315/330/350/510. You can find the list of compatible vehicles at: <https://www.blaupunkt.com/product/wolfsburg-648-dab>.

Top Class



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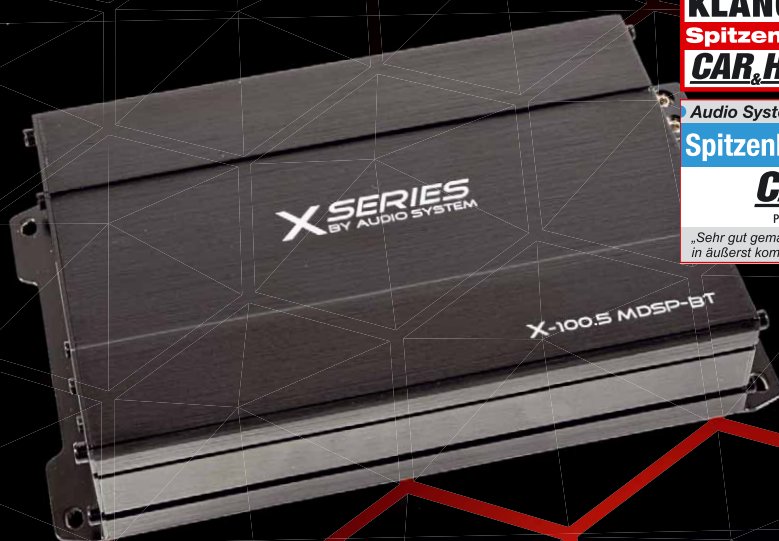
Germany 2/26

Price/performance: good

„Android Auto and CarPlay for Used VWs“

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

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76707 Hambrücken + Hifi-Corner
90451 Nürnberg + Monsteraudio GmbH
94469 Deggendorf + ARS Deggendorf
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Phoenix Gold ZDA4.8 – four-channel amplifier
with eight-channel DSP

DSP at a Competitive Price

- Phoenix Gold has launched the ZDA series, a new range of DSP amplifiers that offer exceptional value, premium features, and wide vehicle compatibility. Let us explore the ZDA4.8 in detail.

BEST VALUE

Top Class

CAR & HiFi
INTERNATIONAL 2/26



Welcome to the ZD Universe! Phoenix Gold refers to its vehicle-specific plug-and-play product series with this term. The amplifiers, called ZDA, come in three models: ZDA4.8, ZDA6.8, and ZDA8.8. Each model features an 8-channel DSP and has 4, 6, or 8 amplifier channels. Standard now, these include “large” and “small” channels; for instance, the 4.8 has four large channels, the 8.8 has eight small channels, and the 4.6 has two large and four small channels. It’s important to note that even the “large” ZDA channels are smaller than the “small” channels from other brands. ZDA amplifiers are not high-end; they are designed to be affordable, focusing on practical features and, most importantly, seamless integration. The ZDA4.8, for example, costs only 400 EUR – an excellent deal for a four-channel amplifier with an eight-channel DSP!



DSP on a daughter board, four analog amplifier ICs mounted on the outside of the heatsink

Integration

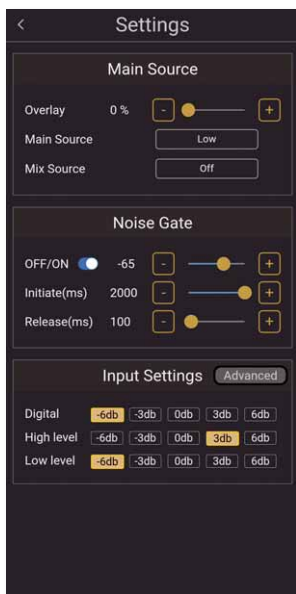
With the ZDA, Phoenix Gold aims to provide customers not just with an amplifier but a comprehensive vehicle audio solution. The ZDA amplifier is simply the starting point. Though the series is still quite new – testers recently used software version V1.0, which had some bugs – the product lineup already includes a range of wiring harnesses, with more being added regularly. All ZDA amplifiers feature a 10-row Molex connector, known as the ZDC, from which wiring harnesses branch out, terminating in a universal ISO connector. This connects to the vehicle wiring harness or ZDT T-harness, and there are also ZDC Direct wiring options that connect directly from the amplifier to the vehicle’s connectors. Phoenix Gold focuses heavily on high-quality wiring



The ZDA has 8 processed outputs if the power amplifier section is not needed

Software

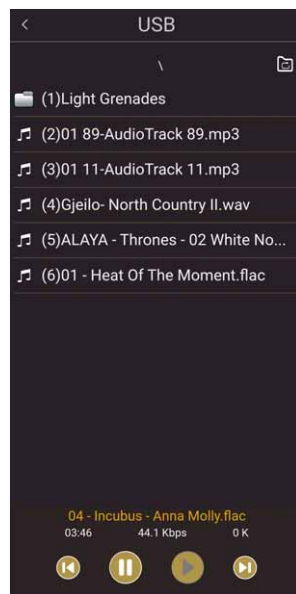
The control software is also called Phoenix Gold ZDA and is compatible with Windows PCs and mobile devices like iPhones and Android phones. The desktop interface features a main window displaying all essential controls simultaneously, allowing you to manage crossovers, EQs, level adjustments, muting, and delay time across 8 DSP channels. Separate windows facilitate routing the extensive inputs to outputs. It also offers a delay time overview and a link menu for syncing filter settings, SPLs, and EQs. The basic sensitivity adjustment for analog inputs is highly effective, adjustable from -6 to +6 dB in 3 dB steps, and is permanently saved in the amplifier after reboot, which locks in the settings—an improvement over software-only gain adjustments. The Android app is intuitively designed, includes all features, and switches to landscape mode during EQ adjustments. It also controls the music player connected via USB-A, enabling playback of audio files stored on a USB drive. It supports playback of music files up to CD quality, including WAV, FLAC, and MP3 formats. You can also stream wirelessly via the built-in Bluetooth. All audio functions are limited to the output channels; for crossovers, the available options are Butterworth, Bessel, and Linkwitz. The first two perform well, but the Linkwitz option is somewhat disappointing, probably due to the early release version. The EQs operate smoothly as parametric equalizers, though they lack additional features like shelf or all-pass filters. The source switch can be set to prioritize switching when a signal is received. Additionally, the ZDA can switch via the preset trigger input; it switches to preset 6 upon detecting a signal (convertible pin).



Switch source and sensitivity settings in the app



Master and bass levels in the app



USB Music player in the app



Landscape orientation for the EQ in the app

harnesses that are mechanically durable and incorporate braided wires for enhanced sound quality. Behind these vehicle solutions lies significant effort, especially considering the variety of factory setups and sound upgrade options available. For example, the BMW 5 Series G38 alone has seven different plug-and-play wiring kits, including three-way and two-way active front systems. Phoenix Gold claims to have built the industry's best vehicle database, featuring information on 2,500 vehicles – covering amplifiers with and without DSP, wiring harnesses, sub-

woofer solutions, and specific speakers. Additionally, they offer complete packages like the ZDAP series, which includes DSP amplifiers and all necessary cables, with vehicle speakers available as optional extras. The aim is to create a comprehensive Phoenix Gold ecosystem that simplifies sound system upgrades across many vehicles, avoiding installation hassles.

Hardware

The ZDA4.8 features a durable cast-aluminum enclosure; it is compact but not tiny, yet it still fits under

Specifications

Inputs

- 6-channel high-level with autosense
- 2-channel low-level,
- 1 x digital S/PDIF (optical)
- 1 x digital S/PDIF (coaxial)
- 1 x digital Bluetooth
- 1 x USB (storage)
- 1 x preset trigger
- Sensitivity Low: 5 V, High: 20 V

Outputs

- 8-channel RCA
- Remote-out

DSP-channels

- 8

DSP software (V1.0)

Equalizer

Outputs

- fully parametric EQ, 31 band per channel
- 20 – 20k Hz, 1-Hz steps
- +12 – -12 dB, Q 0.9 – 12

Crossovers

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

Time and level

- Sample rate 48 kHz, 7 mm steps (0.02 ms)

Outputs

- 0 – 1700 cm (50 ms), 2400 samples
- Phase 0, 180°, mute
- Level steps 0.1 dB, Muting

Features

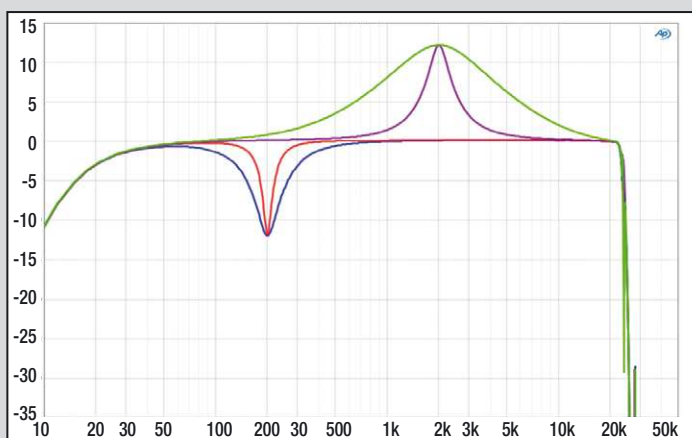
- 8 presets
- OEM Impedance Simulation (OIS) error protection circuit for factory radios
- Smartphone App (iOS und Android)
- Built-in Bluetooth
- In-app music player
- Vehicle specific setups (free download)
- Signal-dependent switching to priority inputs

Optional accessories

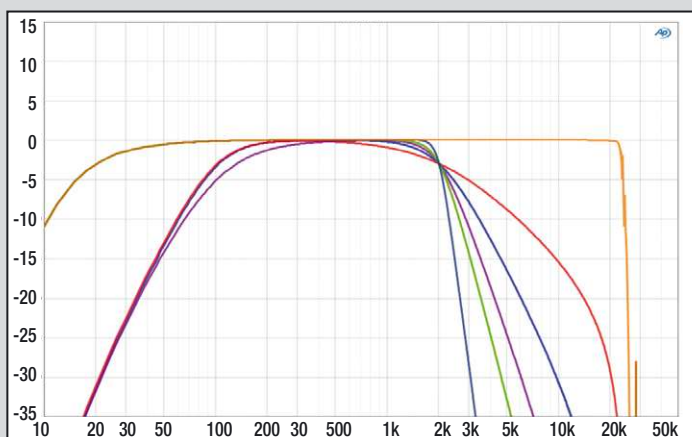
- ZDAWCT infra red remote control
- ZDC device harnesses (ISO or vehicle)
- ZDT vehicle T-harnesses (BMW, VAG, PSA, Toyota etc.)

seats. It includes a large Molex connector, six speaker-level input connectors, remote in/out, and an auto-on switch. The ZDA amp offers features that rival much pricier DSP

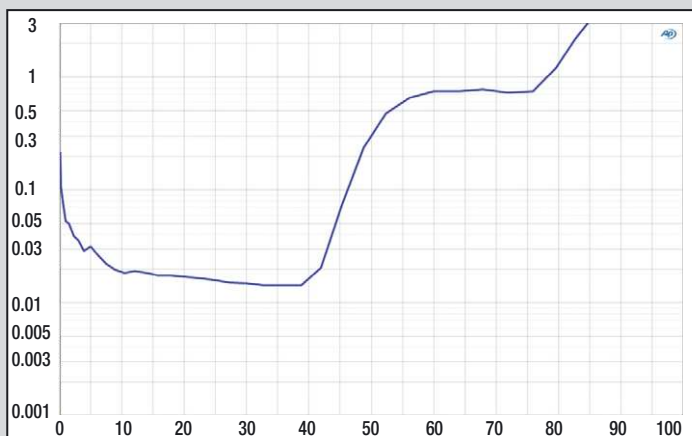
CAR&HIFI Laboratory



The parametric EQs work perfectly; the factory-set roll-off at low frequencies is intentional



There are bandpass filters with a slope of up to 48 dB/octave and a typical cutoff frequency of 22 kHz



The ZDA is stable only at 4 ohms; it delivers 78 watts and has low distortion at low SPLs

Wide selection available:
vehicle wiring harnesses for
plug-and-play connection



The main screen displays all settings for the channel



Flexible routing of inputs and outputs

amps, including two (optional) remote controls (wired and wireless) and a preset trigger for switching setups. It has two USB ports – USB-B for the PC and USB-A for storage devices – and a built-in music player that plays files from a USB drive. Additionally, it has optical and electrical digital inputs, along with built-in Bluetooth. The proprietary OIS (OEM impedance simulation) circuit allows speaker diagnostics management. All this costs just 400 EUR. It also offers analog inputs: stereo AUX and RCA output jacks for all 8 DSP channels, enabling use as a stand-alone DSP if upgraded or if heat becomes an issue, which is likely given its design. The amplifier modules are integrated, featuring four TDA7294 Class-AB chips that generate more heat than Class-D designs, justifying the large aluminum case. The DSP is on a dedicated board, sharing a common DSP

across models – though the DSP type is unspecified, common in budget options. The converters include two Everest 4-channel AD converters and Burr Brown PCM1681 chips. No Bluetooth chip is visible, but the DSP likely manages that. Phoenix Gold states Bluetooth 5.0 compatibility, which is promising.

Measurements and Sound

Phoenix Gold only specifies the 4-ohm power rating for the ZDA; the chip is apparently not stable at 2 ohms. We accidentally tried it anyway, and the ZDA held up – though, of course, we do not recommend trying this yourself. After replacing the two blown fuses, the ZDA delivers a solid 78 watts into 4 ohms, which is perfectly acceptable. The same goes for the stable power supply; with all channels cranked up to full volume, we still measure a very respectable 4 x 70 watts. The distortion is not world-class, but it is acceptable, as is the residual noise. The ZDA's sound-wise performance is more than just "okay." It sounds pleasing and beautiful; the superb vocal reproduction is sure to delight listeners. There is plenty of power for any situation – no one will complain about a lack of SPL. It really does it all – not quite at a high-end level, but definitely very suitable for a sound upgrade.

Conclusion

Phoenix Gold makes an impressive comeback among modern DSP providers. The ZD universe is a well-thought-out, all-around satisfying package for vehicle-specific sound upgrades, offering sensational features and good quality at an incredibly low price point.

Elmar Michels



The optional remote control works wirelessly with a receiver dongle

Specifications

Channels	4
Channel power 4 ohms W	78
Channel power 2 ohms W	0
Channel power 1 ohms W	0
Bridged power W	0
System power W	280
Sensitivity max. mV	190
Sensitivity min. V	–
THD+N (<22 kHz) 5W	0,030
THD+N (<22 kHz) half power	0,015
Signal-to-noise ratio dB(A)	78
Damping factor 20 Hz	52
Damping factor 80 Hz	51
Damping factor 400 Hz	54
Damping factor 1 kHz	55
Damping factor 8 kHz	54
Damping factor 16 kHz	55

Features

Low pass	20 – 20k Hz
High pass	20 – 20k Hz
Band pass	20 – 20k Hz
Bass boost	-15 – 15 dB/20 – 20k Hz
Subsonic filter	via HP
Phase shift	0, 180°/LZK, AP via DSP
High-level inputs	• 6 CH
Auto turn-on (Autosense)	–
RCA output	•, 8CH, processed
Start/stop capable	• (6,9 V)
Dimensions (L x W x H mm)	212 x 160 x 45
Others	8-channel DSP, OIS, Bluetooth

Phoenix Gold ZDA 4.8

Price	400 Euro
Contact	Stinger (European Division), UK
Internet	www.phoenixgold.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



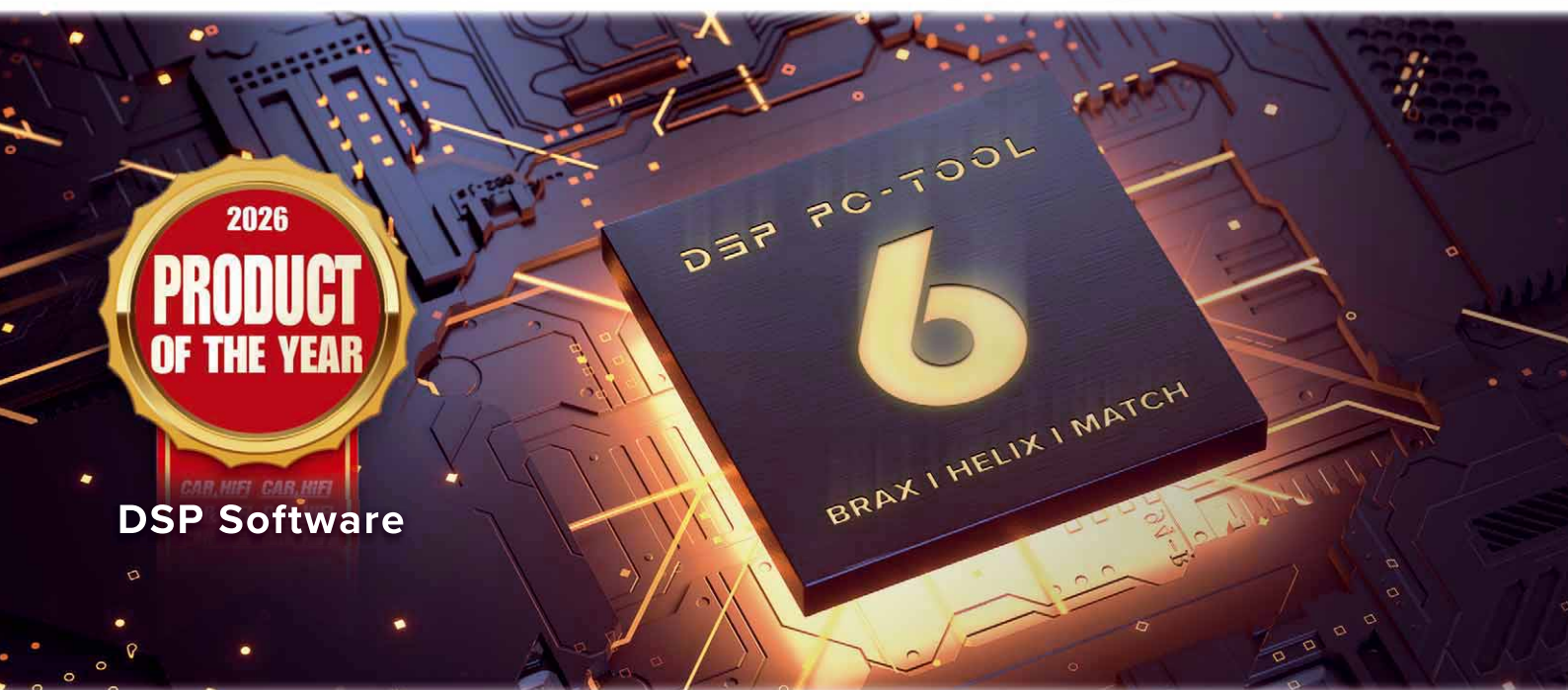
CAR & HiFi
INTERNATIONAL Germany 2/26

Price/performance: excellent

"A well-designed upgrade solution with a huge selection of vehicles."



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.

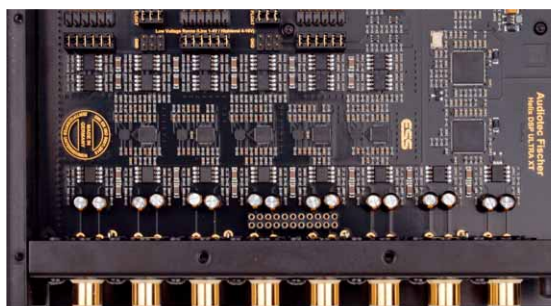




Helix DSP Ultra XT
– 16-channel signal processor from Helix

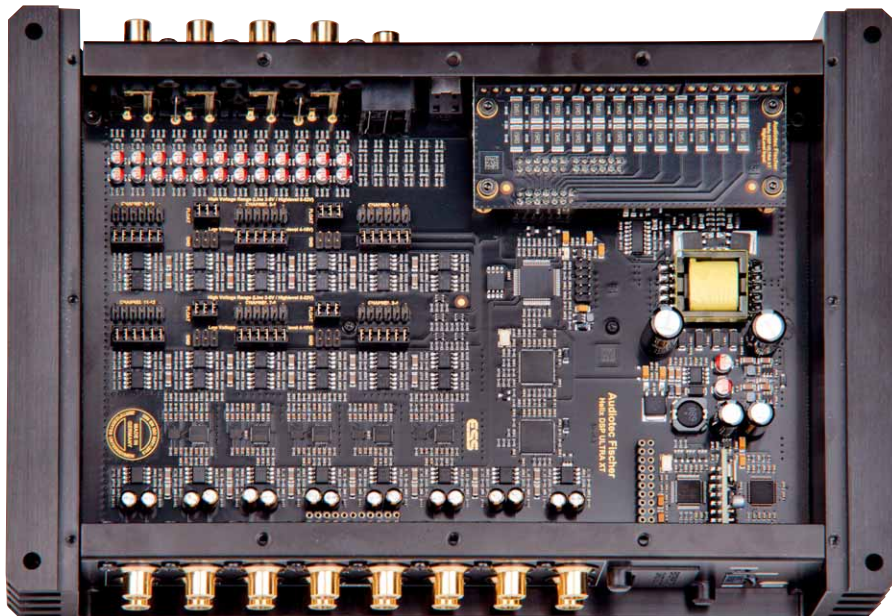
Top-notch signal

► With the DSP Ultra XT, Helix presents a stand-alone DSP that, as the brand's next flagship model, has probably finally arrived in the high-end segment. Let's take a closer look.



The new stars of the converter world: The middle row contains 5 ADCs and DACs from ESS, each with its own small voltage regulator

The DSP Ultra XT is part of a lineage that includes some of the best DSP designs on the market, strung together like pearls on a necklace. The original DSP, simply called DSP, then the DSP PRO and the DSP Ultra with higher-end features, and finally the DSP Ultra S – you might think there's not much left to improve upon. But the new DSP Ultra XT is in a league of its own; just because it hardly differs in name from the smaller models, one should not assume that it's merely a souped-up version of the DSP Ultra S. With its distinctive look, which differs significantly from all previous DSPs, Helix already hints that a new era is beginning for stand-alone DSPs, which Helix launched in 2025 under the Next label. This line features high-end components that are particularly smart and innovative – and, like all DSPs, are Made in Germany. Visually, it's recognizable by its housing with cooling fins, which is modeled after the Next amplifiers like the V Eight DSP Ultimate – even though the DSP doesn't actually need the cooling fins. The DSP Ultra XT has turned out to be a real beast; it feels very solid in the hand and, at 55 millimeters, is actually quite a bit taller than the V power amplifiers.



Clean layout with a top-to-bottom signal flow. The three large ICs are the controller and two ADAU1462 DSPs

In terms of the number of channels, only the V Eighteen offers 20 channels, surpassing the 16-channel DSP Ultra XT. On the DSP, all 16 DSP channels are, of course, routed as analog outputs via 16 stunning, solid, and secure RCA sockets. Next to it on the front of the housing are the slots for the Extension Cards 2.0 and the connectors for the remote control (SCP) and the USB-C port. On Next devices, the latter is known as PerfectStream, which means that it not only connects to a PC for programming purposes but can also transmit audio bidirectionally. In practice, this is used for music streaming at the very highest quality, but also for measurement functions, where the DSP Ultra XT both transmits test signals and analyzes the incoming signal. All other inputs are located on the opposite side of the housing, and the DSP Ultra XT offers a wide variety of them. Once again, we find the great RCA sockets – this time, 8 of them – as low-level



The inputs now feature 15 EQ bands, time correction and the dynamic loudness (DLC)



All 16 outputs come with crossovers, EQs, delay, phase and level adjustments

inputs. There are 12 inputs available for high-level signals from the original system, allowing even larger factory-installed systems or premium hi-fi packages to be connected. With Helix, of course, this is done using the ADEP.3 diagnostic detection, which first simulates speakers and then removes the simulated speakers from the signal once the diagnosis is successful. For digital S/PDIF, we

have optical inputs and outputs, as well as an electrical coaxial input that has a higher specification than the electro-optical signal path. The ground-lift switch has been moved to the outside; only for adjusting the input sensitivity does the housing need to be opened to access the jumpers. You can then select two sensitivity settings for both high-level and RCA inputs; the input can handle

up to 32 volts, which is sufficient for premium factory-installed systems.

Hardware

The circuit board features an array of the finest components, the likes of which we have never seen before. As expected, the DSP processor is powered by a pair of ADAU1462 DSP cores, which are necessary to handle the high number of channels

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 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.

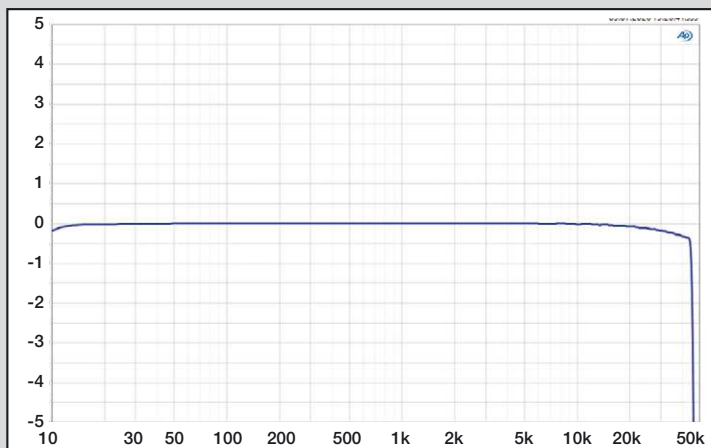
The measuring functions of the PC tool are constantly being expanded. The electrical inputs (AISA) and the acoustic frequency response in the vehicle (RTA) can be measured using a measuring microphone. Thanks to hardware support in the amplifier, AISA (Advanced Input Signal Analyzer) records very quickly and accurately what comes in from the vehicle at the individual inputs. 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.

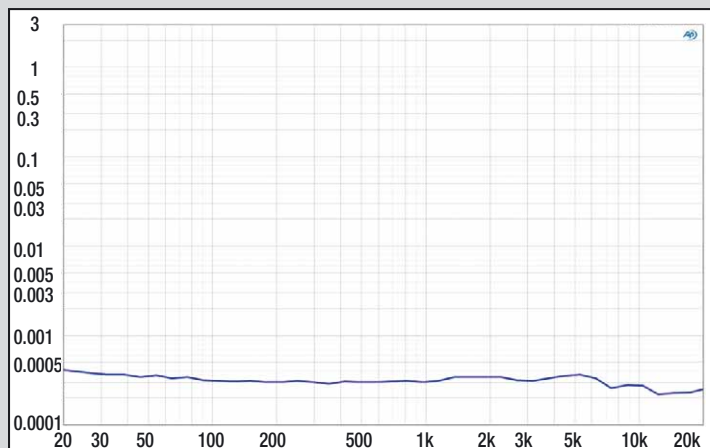
There is also ATM (Automatic Time Measurement), which enables fully automatic runtime measurement and adjustment of the entire system. The advantage here is that the measurement signal is played as a sound file like a piece of music via the head unit; this is possible in all vehicles. The measurement 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

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Audio bandwidth of up to over 40 kHz,
high linearity as expected

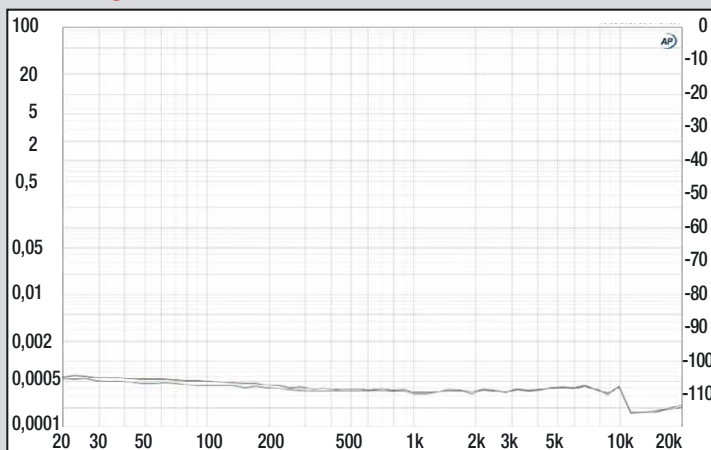


Distortion vs frequency at the coaxial input,
with partial THD+N values of 0.0003%

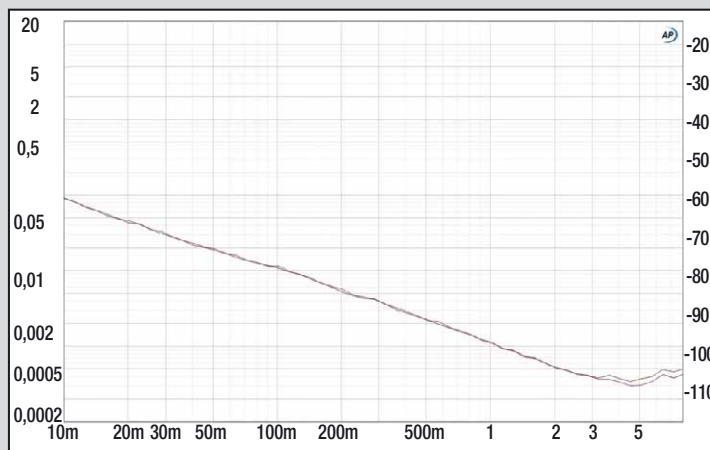
and the high sampling rate. Because hi-res signal processing is, of course, mandatory for the DSP Ultra XT, and that requires processing power. Next to it sits the 32-bit controller, which commands the entire system, but also takes over a steadily increasing part of the audio signal processing in Helix, including measurement functions and the FX functions of the virtual channels such as bass processing and virtual center. Next to the USB and SCP inputs are two multi-pin components that handle data traffic, including PerfectStream feature and remote-control functions. The stars of the design are neatly lined up between the analog input section and the analog outputs. These are the converter modules, proudly

displayed with the ESS logo. ESS is the manufacturer of the converters and enjoys an excellent reputation for its ADCs and DACs, which convert the signal from analog to digital and back again from digital to analog. This is necessary because DSP chips can only perform digital calculations, whereas the signal from the outside world is analog. Digital inputs eliminate the need for ADCs; the signal goes directly to the DSP. ESS converters are generally considered to offer the best sound quality. The component series is called Sabre and is found here in the form of three four-channel ADCs and two eight-channel DACs, perfectly suited for the 12 analog inputs and the 16 outputs. What is unique about ESS is that each

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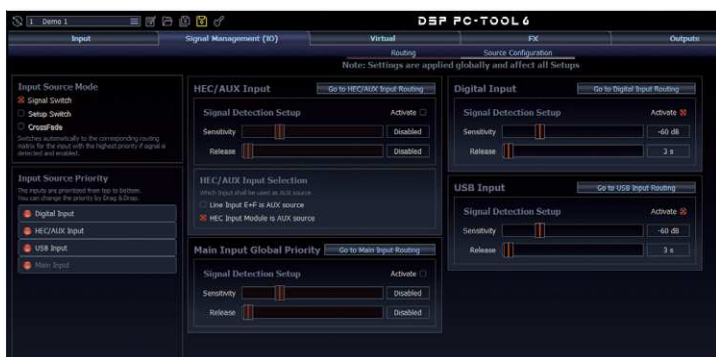
Total harmonic distortion (THD+N) vs frequency at the analog input, with values as low as 0.0005% (ATF measurement)



Distortion vs output voltage at the analog input,
with partial THD+N values of 0.0005% (ATF measurement)



The routing is carried out in two steps: from the inputs to the virtual channel level and from virtual to the outputs



Sound setups can be switched when changing sources or after a control signal; all sources can be prioritized via drag & drop

converter module gets its own “assistant”. On the circuit board, we find a smaller (3 x 3 millimeter) component directly next to each of the larger (5 x 5 millimeter) components. This is a voltage regulator that generates the reference voltage for the converters in the highest quality; ESS is also at the forefront here. Incidentally, the DSP Ultra XT is not the first device with ESS converters, but the second one we have come across. It made its debut in the BRAX RX2 PRO power amplifier, which we tested in 2024, more precisely in the digital input board of the RX2, which is equipped with ESS DACs. The reason for the still limited use in car audio devices was not the price (yes, it's high), but the lack of automotive specification of the ESS components, which were not designed for the



8 virtual channels, such as front system, center, rear system and subwoofer, feature EQs, time alignment and FX functions like RealCenter and SubXpander; in addition, there are eight pass-through virtual channels without any signal manipulation

high temperatures that can occur inside a car. That has changed, so we no longer must look with envy at our home hi-fi colleagues; the latest generation of ESS ADCs and DACs is for the automotive industry. Audiotec Fischer was immediately on board with the RX2 PRO, and that has since developed into a collaborative development partnership. This means that the Sauerland-based company is now a development partner of two chip manufacturers of key digital technologies, since Audiotec Fischer and Texas Instruments have been working together on amplifier chips for some time.

But the analog section in the DSP Ultra XT is also new and offers the highest possible quality. And the RX2 PRO also served as a model for the development of the circuit, which is particularly noteworthy because of its fully symmetrical design for all analog inputs. This has the advantage that RCA and high-level inputs can be processed in a completely equal way, both with the same quality and without the usual compromises. And finally, Helix uses premium components in the analog signal path. First, there are the top-of-the-line 1692 op-amps with excellent noise and distortion characteristics; a whopping 24 of them in the input stage and 8 in the output stage and, as always, these components come at a



A wide range of connections with first-class RCA sockets



price. The outputs also feature coupling capacitors produced exclusively for Audiotec Fischer, and ultra-precise resistors with extremely low tolerances ensure the best possible signal quality.

Measured values

This immense effort is reflected in the best signal quality, and that is something that can be measured. The DSP Ultra XT produces such good measurements that it can make your head spin. You really have to count the zeros after the decimal point. It's worth briefly mentioning here that we need a disclaimer at this point. The reason is our measurement system, an APx515 from Audio Precision, which unfortunately is not as highly specified in some areas as the DSP Ultra XT can perform. It's like trying to measure with a ruler when you need a caliper. For example, our APx515 is specified to be -106 dB THD+N; the system simply cannot measure distortion and noise any better than that. That's enough for the vast majority of test devices, but the DSP Ultra XT is already pushing the limits with its analog inputs. Audiotec Fischer has the better APx555 with -120 dB, which performs better. When measuring distortion across the frequency range, the analog inputs fluctuate around 105 dB THD+N at lower frequencies, which corresponds to 0.0005 %. Our measurement using the digital coaxial input is even better. At 6 volts at the output, we measured 0.00028% at 1 kHz. At 8 volts at the output, the signal-to-noise ratio is 128 dB, exactly as specified in the datasheet. Finally, it goes without saying that all filters, such as EQs and crossovers, work flawlessly; this has always been the case with the DSP PC-Tool.

Conclusion

The Helix DSP Ultra XT is probably the best stand-alone DSP on the market. It scores points both on the digital side with the latest compo-

nents and on the analog side with its sophisticated design.

Elmar Michels

Helix DSP Ultra XT

Price	2.200 Euro
Contact	Audiotec Fischer, Germany
Internet	www.audiotec-fischer.com

Specifications

Inputs

- 8-channel RCA
- 12-channel High-level
- 1 x digital S/PDIF (optical)
- 1 x digital S/PDIF (coaxial)
- 1 x USB audio
- Sensitivity Low: 4/8 V, High: 16/32 V (via jumper)

Outputs

- 16-channel RCA (8 V)
- 1 x digital S/PDIF (optical)
- 1 x Remote-out

DSP-Channels

- 16 + 8 virtual channels

DSP-Software (V 6.03.04)

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, +6 – -15 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 96 kHz, 3.5 mm increments (0.1 ms)

Inputs:

- 0 – 176 cm (5,20 ms), 512 samples

Virtual channels:

- 0 – 708 cm (20,82ms), 2048 samples

Outputs:

- 0 – 708 cm (20,82ms), 2048 samples

- Phase 0, 180° (fullrange), 0 – 360° (22,5° increments)
- Adjustable level increments 0,1– 1 dB

Features

- 10 Setups with fast switchover
- User-defined routing of in- and output ports
- SCP control connector for programmable remote controls and accessories
- Start-stop capability up to 6V
- Signal-dependent switching to digital or Aux inputs
- Automatic putting through of all vehicle tones
- Power-Save-Mode
- ADEP.3 error protection circuit for factory radios with speaker recognition
- RTA real-time frequency curve measurement (with optional microphone), automatic adjustment including filter slopes
- FX menu with dynamic bass, center and front processing
- aISA for measuring, summing and correcting inputs, via USB without additional hardware, bidirectional, signal playback and analysis
- Time Machine for taking back and restoring adjustments
- Device Monitor (temperature and voltage control)
- ATM automatic time alignment with custom signal
- Import of setups and data from other devices
- VCP, virtual channels, routable, with EQ, time alignment and FX processing

Optional accessories

- Wired remote control (programmable)
- Display remote control Director with memory, USB, etc.
- Smart remote control Conductor
- WIFI Control for wireless programming
- AMI measurement interface
- EC 2.0 Extension Cards (Bluetooth, additional analog or digital inputs)

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„High-end stand-alone DSP.“



WOLFSBURG 648

THE CLASSIC CAR RADIO FOR VW, SKODA,
AND SEAT WITH A 2010S LOOK AND
MODERN INFOTAINMENT TECHNOLOGY



- 7" touchscreen
- DAB+ and FM High-End Tuner
- Wireless CarPlay & Wireless Android Auto
- USB Input
- Telephony via internal or external microphone
- Audio streaming with track display
- Reversing camera input
- Digital signal processing
- 12-band equaliser
- Sound presets
- 4-channel preamplifier output
+ Sub-out
- 4x 45 watts max.
- CAN-Bus (for PDC, MFD, GALA u.a.)
- Permanent memory



Musway M4nano – 4-Channel Amplifier
with 8-Channel DSP

Mini Control Center

- ▶ The M4nano is compact and cost-effective. After releasing several larger multichannel models, Musway now offers a mini DSP amplifier featuring a comprehensive 8-channel DSP, making it suitable for various applications.

BEST PRODUCT

Top Class

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BEST EMC

Undisturbed FM reception

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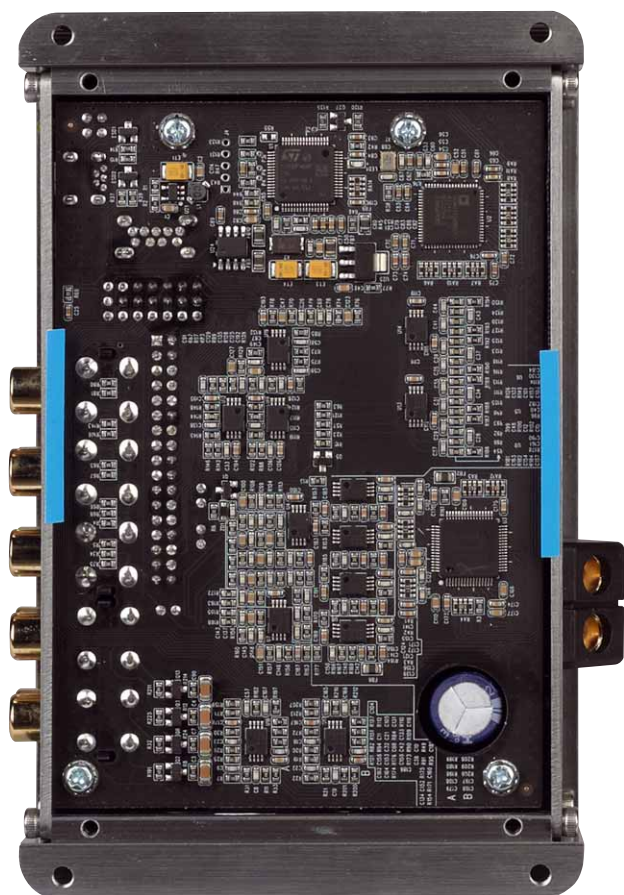


MUSWAY
HIGH QUALITY SOUND SYSTEM



With the DSP board removed, the amplification circuitry is visible. The amplifiers are located under the screw-fastened aluminum bar

Musway now provides one of the broadest ranges of DSP amplifiers available. The company continues to launch new models, now offering versions with 4, 5, 6, 8, 10, and 12 channels. While the original models,



Directly beneath the bottom of the chassis sits the DSP board with the controller, ADAU1452, and PCM3168



Connections for the remote control, Bluetooth, 6 low-level inputs, and 4 processed outputs

particularly the “original Musway” M6, are full-size digital amplifiers, recent trends lean towards smaller designs. This shift is evident in non-DSP amplifiers like the NX Amps, and in DSP models,

The new twist-and-click remote control allows you to select sources, set up configurations, and adjust the volume. Bluetooth streaming is also displayed and controlled



Software

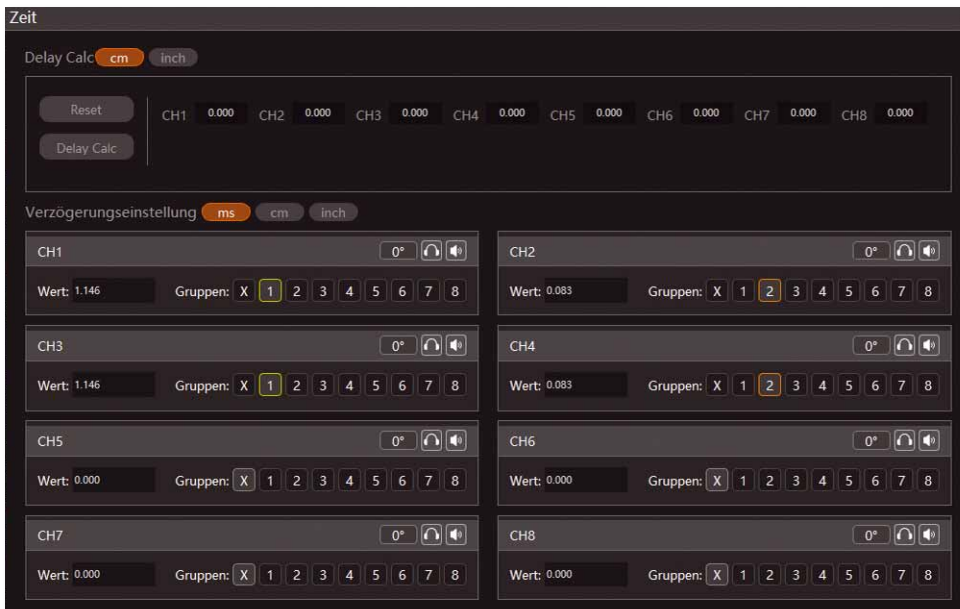
All Musway DSPs can be programmed either using PC desktop software or an Android app, with the latter working in conjunction with an optional Bluetooth module. Except for routing and a few features, all relevant settings are accessible in one window. When routing, it's important to note that selecting inputs in the routing matrix is not enough; you must also check the correct boxes in the main window. All channels feature bandpass filters up to 48 dB/octave across three characteristics. The EQ bands are fully parametric, and there is time alignment for inputs and outputs at 0.02 ms or 7 mm steps. It's very convenient that the time or distance is displayed accurately and plainly, without extraneous controls like coarse and fine adjustments. The frequency window clearly displays what's happening, and the EQs are easy to operate, even via keyboard. Channel grouping works well, a bridge connection can be shown, and up to four channels can be combined into a subwoofer group, which is then recognized by the optional remote control. Separate equalizers are available for the speaker-level inputs – 10 per channel – matching the functionality of those for the outputs. The features are not numerous but are important: there is a power-saving shutdown for Can vehicles, a setting for switching through vehicle sounds, and an auto-mute feature to prevent crackling. Additionally, the input Molex supplies an input pin for reverse gear, which also feeds in vehicle sounds. Overall, Musway software is not the most comprehensive on the market, but it generally allows for smooth operation, and it is being improved steadily. A major advantage is the Musway “Tunest” app, which offers complete DSP programming and remote-control functions such as master and sub-level, as well as source selection.

only the M5 has been available until now. Our latest M4nano shares a similar compact form factor, measuring 150 x 95 x 45 mm. It omits a bass channel but compensates with four full-power amplifier channels, each with ample power, unlike the four small 4-ohm-stable channels of the M5.

On our M4nano, the amplifier board components are arranged within a compact 50 x 120 millimeters space – sufficient for a transformer power supply with buffering and four amplifier channels. No power transistors are visible; instead, it employs the latest amplifier technology with integrated Class-D chips – specifically, two two-channel units sharing an aluminum heatsink. The small enclosure is well-equipped with connectors. One side, near the power supply, features Molex connectors for speaker outputs and speaker-level inputs – offering six channels suitable for small to medium factory audio systems. Adjacent are remote in/out connectors and the familiar “dummy power supply” Molex connection. Opposite side hosts a row of RCA jacks: four-channel processed pre-outs and six-channel line-level inputs. A shared gain pot controls both low- and speaker-level inputs. Nearby are interfaces for PC control,



Each analog input has 10 EQ bands and time alignment



The delays for the 8 outputs are presented in a table format, similar to the routing

Specifications

Inputs

- 6-channel high-level with auto sense
- 6-channel low-level
- 1 x digital accessory
- Sensitivity 6 V (RCA), 24 V (high level)
- 1 x gain controls (low/high level)

Outputs

- 4-channel RCA (processed)
- Remote out

DSP channels

- 8

DSP software (V 1.2.1 in test)

Equalizer

Inputs

- Fully parametric EQ, 10 bands per channel
- EQ, shelf, 1st and 2nd order all-pass
- 20–20k Hz, 1 Hz steps
- +15 – -15 dB, Q 0.2 – 16

Outputs

- Fully parametric EQ, 31 bands per channel
- EQ, shelf, 1st and 2nd order all-pass
- 20 – 20k Hz, 1 Hz steps
- +15 – -15 dB, Q 0.2 – 16

Crossovers

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

Time and level

- Sample rate 48 kHz, 7-mm steps (0.02 ms)

Inputs

- 0 – 177.1 cm (5,2 ms), 256 samples
- Phase reversal 0, 180°

- Level adjustment outputs 0.1 dB steps, mute function

Outputs

- 0 – 708.3 cm (20.833 ms), 1024 samples
- Phase reversal 0, 180°
- Level adjustment outputs 0.1 dB steps, mute function

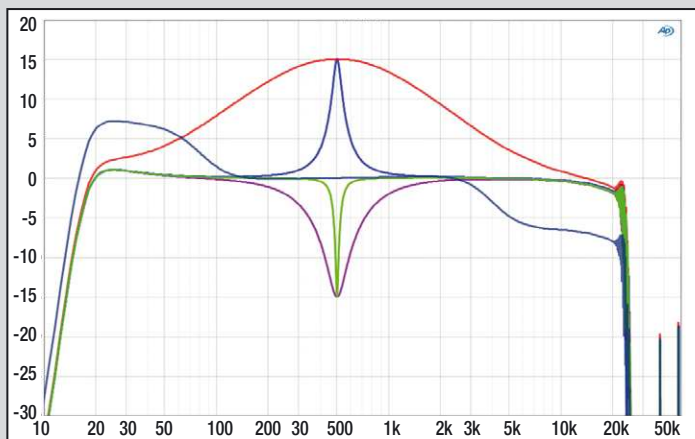
Features

- 6 presets
- Remote Out
- EPS (Error Protection System) for diagnostic function
- Automatic switchover to Bluetooth
- Adjustable switchover to high level for vehicle sounds
- Sub setup (bass channels for remote control)
- Power-save mode
- Settings can be exported and imported via WhatsApp

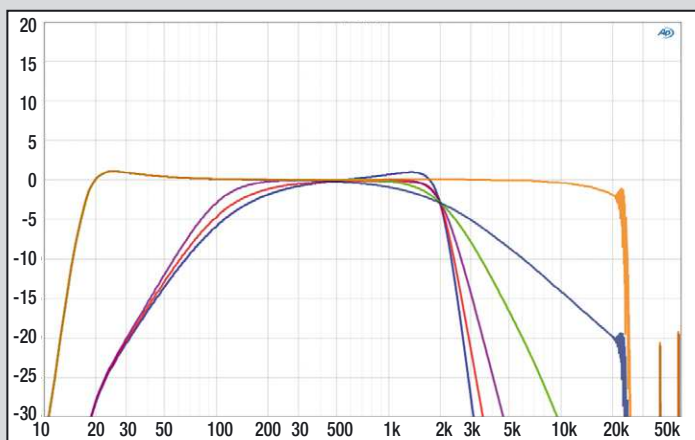
Optional accessories

- Bluetooth dongle BTS (audio streaming)
- Bluetooth dongle BTA-HD (audio streaming in HiRes quality and app control of all functionalities)
- Remote controller MyCon (volume, bass level, sources, setups, BT playback)
- RC1 remote controller (volume, bass level, sources, setups)
- RCA adapters MPK-RCA6, MPK-RCA6-PP for ISO
- Vehicle cable sets (Mercedes, BMW, Audi, etc.)

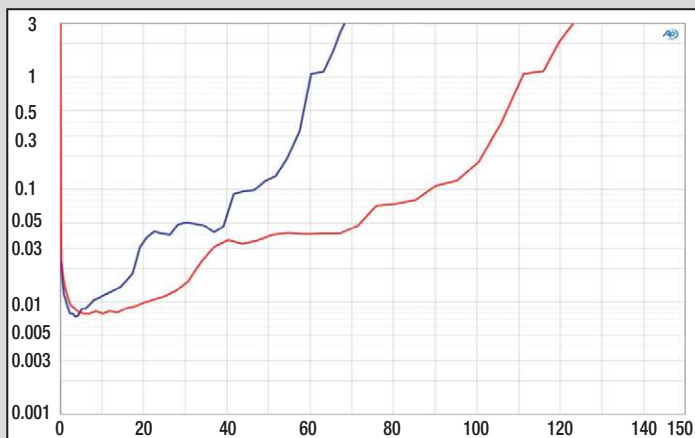
CAR & HIFI Laboratory



The EQ bands can also be used as shelf, notch, or all-pass filters – and, of course, as a parametric equalizer



Below 20 Hz, a fixed subsonic filter kicks in automatically; on the left, a 100 Hz 12 dB Butterworth, Bessel, or Linkwitz high-pass filter; on the right, a 2 kHz Butterworth low-pass filter, 6 – 48 dB



Low distortion at low power levels and full maximum power for the two-channel ICs

The routing is clearly laid out and straightforward

remote controls, and digital accessories. Notably, it lacks an optical digital input to maintain an entry-level price point. Regarding accessories, all Musway products are compatible. Remote control options include the myCon touchscreen controller or the standard display remote. For digital sources, Bluetooth dongles – HD-compatible or not, with or without app control – are available. Additionally, a variety of plug-and-play cable sets enhance ease of use.

The DSP in use here is a well-established model (not only) in the Musway lineup, deserving recognition. Unlike very affordable DSPs, Musway opts for reputable components, including the popular ADAU1452 from Analog Devices as the audio DSP. This is complemented by a classic converter chip – the PCM3168 from Texas Instruments – known for reliability rather than high-end status. The converter provides 24-bit resolution and features 6 ADCs and 8 DACs, which closely align with the M4nano's 6 inputs and 8 DSP channels.

The ADAU1452 is essential because, without it, the M4nano cannot operate with Musway's in-house tuning software Tunest PC, which has significantly improved and is now quite practical. Musway has integrated signal processing features into the software for the inputs, such as time alignment, a 10-band EQ, and level control. A new EQ option has been added for both input and output channels. Besides the existing options – parametric EQ, Hi/Lo shelf, and Allpass 1/2 – there are now also notch filters to target specific frequencies and reduce resonances. These filters are more efficient and slightly more effective than a negative EQ with maximum Q.

Measurements and Sound

During standard testing, the DSP demonstrates no flaws. All filters operate perfectly, and the delay time is reliable. The audio range is capped at 24 kHz, a common restriction stemming from the 48 kHz sampling rate, which is typical for similar, budget-friendly DSPs.





The main screen controls all amplifier channels and RCA outputs, with bridged and subwoofer channels distinctly shown. At the bottom, settings like SPL, mute, polarity reversal, link groups, and delay are grouped together; checkboxes for inputs can also be used for routing

The pre-outs perform well, with a voltage of up to 7 volts at the RCA jacks. Residual noise and distortion remain low, as expected. The M4nano's chip-based amplifiers operate very cleanly, especially at lower power levels, where we record two zeros after the decimal point for total harmonic distortion – highly impressive. The maximum power output is 63 watts into 4 ohms and 116 watts into 2 ohms, slightly exceeding Musway's listed specifications. When in use, the M4nano sounds notably mature, delivering a powerful, full-range sound down to the bass. Even with complex recordings, it maintains composure, and at high volumes, it demonstrates what modern amplifier ICs are capable of, showing ample headroom and delivering an exciting listening experience.

Conclusion

Musway's M4nano is an impressive compact amplifier concept. If you need four channels and plan to expand to eight, the M4nano serves as a versatile mini control hub. Its

affordable starting price makes it suitable for beginners, and you can easily enhance its features and con-

Specifications

Channels	4
Channel power 4 ohms W	63
Channel power 2 ohms W	116
Channel power 1 ohms W	0
Bridged power W	232
System power W	–
Sensitivity max. mV	640
Sensitivity min. V	5,1
THD+N (<22 kHz) 5 W	0,008
THD+N (<22 kHz) Halblast	0,050
SNR dB(A)	89
Damping factor 20 Hz	139
Damping factor 80 Hz	139
Damping factor 400 Hz	134
Damping factor 1 kHz	116
Damping factor 8 kHz	11
Damping factor 16 kHz	2

Features

Low pass	20 – 20k Hz
High pass	20 – 20k Hz
Band pass	20 – 20k Hz
Bass boost	-15 – 15 dB/20 – 20k Hz
Subsonic filter	via HP
Phase shift	0, 180°/LZK, AP via DSP
High-level inputs	•
Auto turn-on (Autosense)	–
RCA output	•, 4CH, processed
Start/stop capable	• (7,3 V)
Dimensions (L x W x H mm)	150 x 95 x 45
Others	8-channel DSP, EPS



venience later – Musway provides high-quality accessories for seamless upgrades.

Elmar Michels

Musway M4nano

Price	480 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 %	★★★★★

Top Class



CAR & HiFi

INTERNATIONAL Germany 2/26

Price/performance: excellent

"Super small, good, and affordable – the perfect entry-level DSP amplifier."

Bluetooth Streaming and High-Resolution DSP
for the Audio System X-100.5 MDSP-BTA
and X-100.9 MDSP-BTA

Major Upgrade

- Audio System has given its latest generation of DSP amplifiers a minor update that makes a big difference in practice. We are conducting a follow-up test to highlight the improvements.

SOUND AWARD

Absolute Top Class

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VEN

X SERIES
BY AUDIO SYSTEM

X-100.5 MDSP-BTA

X SERIES
BY AUDIO SYSTEM

X-100.9 MDSP-BTA

As early as 2025, Audio System introduced the X-100.5 and X-100.9 MDSP-BT mini amplifier duo – highly intriguing DSP amplifiers that made an excellent impression in our test. State-of-the-art amplification with IC amplifiers, an efficient DC-DC power supply, a 9-channel DSP in the X-100.5 and a 13-channel DSP in the X-100.9, featuring top-of-the-line Analog Devices and Burr Brown components – what more could you ask for? Our X-100.9 comes with 8 powerful amplifier channels delivering just under 100 watts each and a small channel capable of driving a center speaker, for example. Its more affordable sibling features 4+1 amplifier channels and 4 processed RCA outputs. It also comes with the DSP Control app, which made an excellent impression right from the start. Superbly programmed crossovers, plenty of EQs with all the bells and whistles, such as shelf and all-pass filters, and a very appealing, user-friendly interface. The fact that the X-100 only had a frequency response up to 22 kHz did not bother us – no comparable design on the market offers more. One minor criticism, however, was the lack of audio streaming; while a Bluetooth module was included for pro-

gramming, music streaming was not supported in 2025. The only inputs were six analog inputs, which, at least, could conveniently be switched in pairs from low-level to high-level signals.

Firmware Upgrade

Here comes the first major new feature: the increase in the DSP's sampling rate from 48 to 96 kHz, which expands the audio range from 24 to 48 kHz, as the range is always half the sampling rate because steep-slope low-pass filters are still in play. You can recognize these by the drop-off in the frequency response curve. But increasing the sampling rate is not the whole story, because it also doubles the DSP's workload – it now must perform 96,000 calculations per second instead of 48,000. And a single ADAU1452 processor core cannot handle 13 DSP channels at 96 kHz; in any case, all multichannel DSP devices with 12 or more channels are limited to 48 kHz. Until now, that is, because with the X-100.9 MDSP-BTA, Audio System has achieved the impossible: they still have 13 DSP channels and now a full 96 kHz. Some tricks were needed to streamline the DSP control as much as

Specifications

Inputs

- 6-channel high-level with autosense
- 6-channel low-level, selectable by pair

Outputs

- 4-channel RCA
- Remote-out

DSP-channels

- 9/13

DSP software (Android V1.2.1)

Equalizer

Outputs

- fully parametric EQ, 30 band per channel
- EQ, High-Shelf, Low-Shelf, Allpass
- 20 – 20k Hz, 1-Hz steps
- +12 – -12 dB, Q 0.25 – 12

Crossovers

- 20 – 20k Hz, Bessel, Butterworth, Linkwitz, 1 Hz steps
- Slope up to 24/48 dB/oct.

Time and level

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

Outputs

- 0 – 515 cm (15.0 ms), 1440 samples
- Phase 0, 180°, mute
- Level steps 0.1 dB, Muting

Features

- 8 presets
- Smartphone App (iOS und Android)
- APS setup switch

Optional accessories

- DSP Box basic module
- DSP Control control/switch
- DSP Display
- DSP RC infra red remote control
- DSP IR infra red eye for DSP or Box



Each of the 30 EQ bands can be used as a fully parametric EQ, shelf, or all-pass filter



A new feature in the app is the APS, a preset switch that can also change the sound setup when switching to Bluetooth

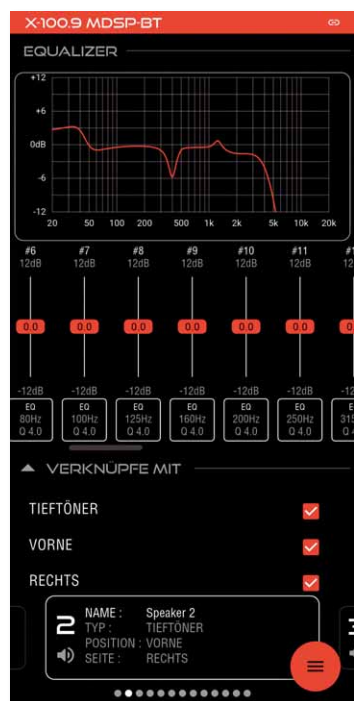
possible; the new app was rewritten with a very lean signal path, which naturally took a few days. However, a compromise was unavoidable: Since the X-100.9 contains two converter modules – only one of which can be used for the higher sampling rate – the full Hi-Res bandwidth is available only for the internal amplifier channels 1 – 8. This means the pre-outs must make do with the original 48 kHz or 24 kHz audio. With the X-100.5, which has “only” 9 DSP channels, this workaround isn’t necessary – here, all channels enjoy 96 kHz. On top of that, Audio System has made Bluetooth music streaming possible – yeah! Best of all, since the hardware remains unchanged, this firmware upgrade is also available for all existing X-100 models. Audio System will make it available so that all previously purchased “older models” can benefit from the upgrade – free of charge!

App Upgrade

Since they were already redesigning the app, they took the opportunity to add a few new features – the app is constantly evolving and regularly improved. A highlight of our current version is the APS feature, introduced

Software

X-100.5 MDSP-BTA and X-100.9 MDSP-BTA are programmed exclusively via an app, which is available for both Android and iOS. The functionality is comprehensive, and the structure is clear. Anyone who has ever programmed a DSP will find their way around immediately because everything is logically arranged. Suitable for small smartphones, the control is divided into sub-items, so you only have one function on the screen at a time. The channel to be set is always displayed in the lower area, above which the selected topic changes from routing to crossovers, equalizers, delay times, and output with mute, SPL, and polarity. There are 30 EQ bands per channel, which can act as parametric EQ, high or low shelf, or as all-pass, the latter even with freely selectable Q as with EQ and shelf. The crossovers offer the characteristics of Bessel, Butterworth, and Linkwitz, which is also written on the box. According to the sampling rate of 96 kHz, there are time alignment steps of 0.01 milliseconds or 3.5 millimeters or 0.14°. The APS function allows you to choose whether—and to which preset—the system switches when changing sources. This is useful when different sources require different settings; for instance, if the original signal needs high-level equalization but Bluetooth streaming does not. The amplifier can easily be updated, and new app versions are readily available at audio-system.de.



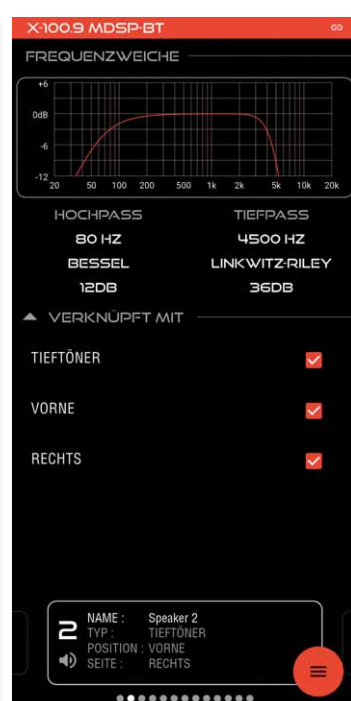
30 fully parametric bands per channel offer all the options; the diagram also shows the crossovers



The “Output” section controls polarity, mute, and individual SPLs

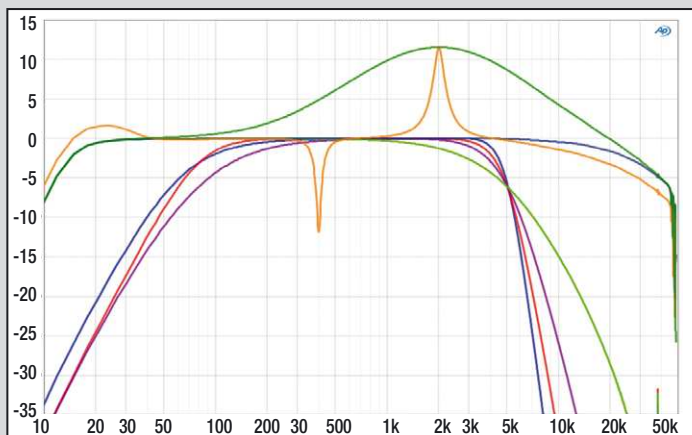


The time alignment is displayed in milliseconds, centimeters, or samples; there are also buttons here for muting and reversing the polarity

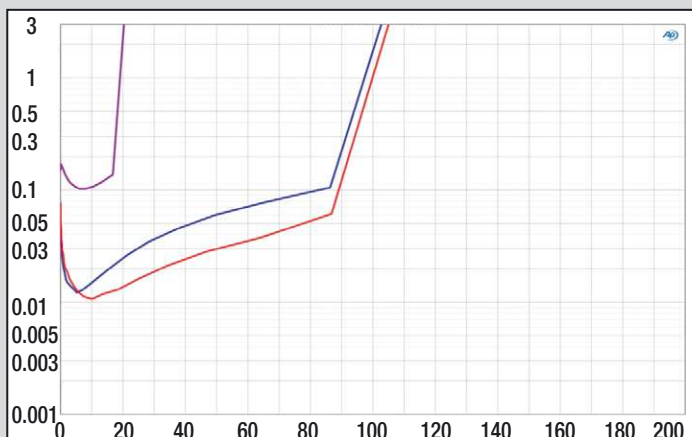


The frequency settings are straightforward; high-pass and low-pass filters are available as Butterworth, Bessel, or Linkwitz filters

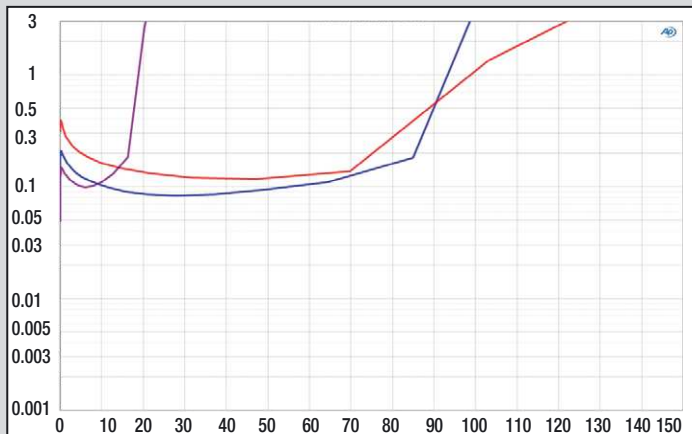
CAR&HIFI Laboratory



In the current BTA version, the audio frequency response extends to 48 kHz, making the X-100s Hi-Res-capable



X-100.5: The small channel delivers just under 20 watts, plus 4 x 100 watts at 4 or 2 ohms, respectively



X-100.9: Same power as the 5-channel model, but with 8 high-power channels

6 analog inputs,
9 amplifier channels, and
4 additional pre-amplifier outputs in
a very compact space

with Bluetooth streaming. Of course, you have to switch the source if you want to go from the stock radio to Bluetooth; this is done via the Play button and also through signal detection. But it is not just about switching the source; you can also switch to a different sound setup at the same time. This is very convenient if you have tweaked the sound a bit due to a suboptimal in-car signal, while the Bluetooth signal is usually clean and requires little further adjustment. Now, with the Setup Switch, the right setup is always running for the source you're using.

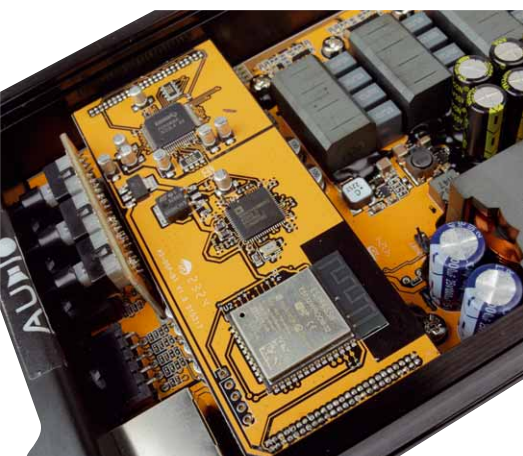
Sound Upgrade

Since, as already mentioned, the X-100.9's hardware remains unchanged, we observe no changes in performance or the other measurement values upon re-testing. The exception, of course, is the frequency response, which now extends to just under 50 kHz. The increased sampling rate also affects the time alignment; there are now steps that are twice as precise – 0.01 milliseconds or 3.5 millimeters – instead of 0.02 ms and 7 mm. The maximum delay has only been slightly affected (namely, from 20 ms to 15 ms), and for that alone, Audio System deserves a big round of applause. After all, if you count twice as fast, you are done in half the time; conversely, you must count twice as far to cover the same amount of time. Here, the sample rate was increased from 960 samples to 1,440 samples, which means a 1.5-fold increase in processor load for channels 1 – 8, a burden that had to be offset somewhere. This alone already represents a fundamental advantage in practice. But does the upgrade also affect the sound when all settings are set to zero during a listening test? We had two X-100.9 units available: an original 48 kHz model and a freshly “up-





world of difference between the two. Yet the music somehow feels more three-dimensional, the vocal lines breathe more freely, and the sound-scape becomes more tangible. The best way to put it is that the clarity



The eight large channels are distributed across four ICs; each channel also includes two encapsulated coils and capacitors forming a Class D low-pass filter

In the foreground, the „universal weapon“: ESP32, microcontroller, and Bluetooth chip in one

graded” version. The differences are subtle, but they are there. The tonal character remains unchanged, and in terms of dynamics, there is no



The two large flat-wire coils are part of the efficient DC-DC power supply



Audio System X-100.5 MDSP-BTA

Price 500 Euro
Contact Audio System, Germany
Internet www.audio-system.de/english/

Rating

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

Specifications

Channels	5
Channel power	
4 ohms W	4 x 95 + 1 x 19
Channel power	
2 ohms W	4 x 100 + 1 x 0
Channel power 1 ohms W	–
Bridged power W	–
System power W	355
Sensitivity max. mV	1800
Sensitivity min. V	1,8
THD+N (<22 kHz) 5 W	0,013/0,101
THD+N (<22 kHz)	
half power	0,062/0,107
Signal-to-noise ratio dB(A)	85
Damping factor 20 Hz	54
Damping factor 80 Hz	54
Damping factor 400 Hz	53
Damping factor 1 kHz	51
Damping factor 8 kHz	14
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	–
High-level inputs	•
Auto turn-on (Autosense)	•, DC or signal
RCA output	•, 4CH, processed
Start/stop capable	• (5,5 V)
Dimensions (L x W x H mm)	163 x 113 x 38
Others	9-channel DSP

Absolute Top Class

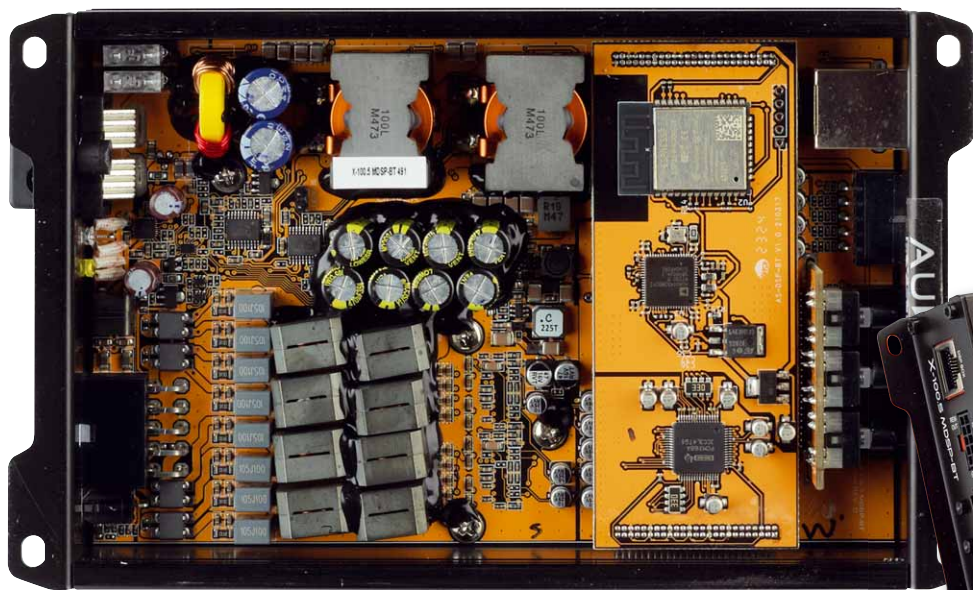


CAR & HiFi
INTERNATIONAL

Germany 2/26

Price/performance: very good

“A major upgrade, including for all existing X-100.5 and X-100.9 models.”



Modern design featuring a step-up power supply with two flat-wire coils, Class-D amplifier chips, and the ESP32 as the controller on the daughter board on the right side



improves – even if, as mentioned, the difference is not huge. That is why we decided to give the X-100.9 MDSP-BTA an extra grade for sound quality – unfortunately for the BTA, this did not improve its Score.

Conclusion

The X-100.5 MDSP-BTA and X-100.9 MDSP-BTA have improved tremendously thanks to the upgrade. Bluetooth music streaming, along with Hi-Res channels, and new app functionality make these amplifiers – which were already highly recommended – better than ever. And it's free, even for existing units – huge kudos to Audio System!

Elmar Michels



The three pairs of inputs can be switched from "High" to "Low" with three switches

Specifications

Channels	9
Channel power	
4 ohms W	8 x 94 + 1 x 19
Channel power	
2 ohms W	8 x 98 + 1 x 0
Channel power 1 ohms W	–
Bridged power W	–
System power W	683
Sensitivity max. mV	1800
Sensitivity min. V	1,8
THD+N (<22 kHz) 5 W	0,125/0,098
THD+N (<22 kHz)	
half power	0,087/0,107
Signal-to-noise ratio dB(A)	84
Damping factor 20 Hz	54
Damping factor 80 Hz	54
Damping factor 400 Hz	53
Damping factor 1 kHz	51
Damping factor 8 kHz	14
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	via DSP
High-level inputs	•
Auto turn-on (Autosense)	•, DC or signal
RCA output	•, 4CH, processed
Start/stop capable	• (5,5 V)
Dimensions (L x W x H mm)	193 x 113 x 38
Others	13-channel DSP

Audio System X-100.9 MDSP-BTA

Price	650 Euro
Contact	Audio System, Germany
Internet	www.audio-system.de/english/

Rating

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

Absolute Top Class



CAR & HiFi
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Germany 2/26

Price/performance: very good

"A major upgrade, including for all existing X-100.5 and X-100.9 models."

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SX-ONE + SX-TWO + SX-Four

– New series of mini amplifiers from ESX

Next Level Amps

► ESX really takes the cake with the new SX Minis. Never have we seen such small amps with so much power. We put these little babies through a thorough test.

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Upper Class

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BEST PRODUCT

Upper Class

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BEST EMC

Undisturbed FM reception

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How many amplifiers are listed on the ESX homepage? The answer is, of course, 42—a huge selection ranging from multichannel DSP amplifiers to 13-kilowatt SPL monsters. Are there modern mini amplifiers? Yes, but they are still rare. We have tested the QS-TWO and QS-FOUR, which are small – ESX calls them “nano – but mainly designed as sound boosters for original speakers. The smallest models include the ONE, TWO, and FOUR from the QM series; these were once considered “mini,” though today only the QM-TWO qualifies. Their performance is quite decent, but current plans show that the QMs are no longer at the forefront of technology.

Let us discuss the new SX Minis, which continue the tradition of a mini-series within the SX amplifier range. In addition to the existing models 800.2, 800.4, and 1000.1, four new Minis now join as the “number-word models”: SX-ONE, SX-TWO, SX-FOUR, and SX-FIVE. We have the first three here in the editorial office. The ONE, TWO, and FOUR share the same dimensions; their heatsinks with side caps measure only 144 x 83 mm in footprint. The length includes the terminals, which stick out a few millimeters past the mounting tabs. Overall, the SX Minis are extremely compact. However, size alone

is not impressive if performance is average – but let us not jump to conclusions. They seem well-equipped in features, although the TWO and the FOUR lack many filters. They only provide high-pass or low-pass filters, with cutoff frequencies suitable for common uses – up to 500 Hz for the TWO and 5,000 Hz for the FOUR. The Mono model also features a boost function and, like the TWO, has a remote level control. Aside from that, all SX Minis come with a full set of modern features: automatic power-on for both DC and AC, EPS speaker simulation for diagnostic head units, interference-free radio reception, and start-stop functionality. Removing the bottom panels reveals that these units are truly state-of-the-art and built to high standards.

As expected, the circuitry features tiny SMD components, including transformer-based power supplies regulated by the classic TL494 PWM controller, and small 50 V and 35 V buffer capacitors. The mono and two-channel versions each have a pair of power transistors and large toroidal coils per channel. They utilize the popular IRS2092 driver chip, a mono Class-D driver from Infineon with an analog input. The SX-FOUR uses small, encapsulated filter coils but lacks visible MOSFETs in the amplifier stage, explained by Infineon’s MA5332MS, a single chip that encompasses the entire amplifier stage with MOSFETs for two channels. It delivers up to 200 watts of stereo output and does not require an external heatsink, as it is cooled solely by the circuit board. Besides the chips, the board is securely screwed to ensure contact with the aluminum housing underneath.

Measurements and Sound

Chip manufacturers’ data sheets usually list “maximum possible” values, with 10% THD being typical. However, our standards are higher. The SX-FOUR outputs 96

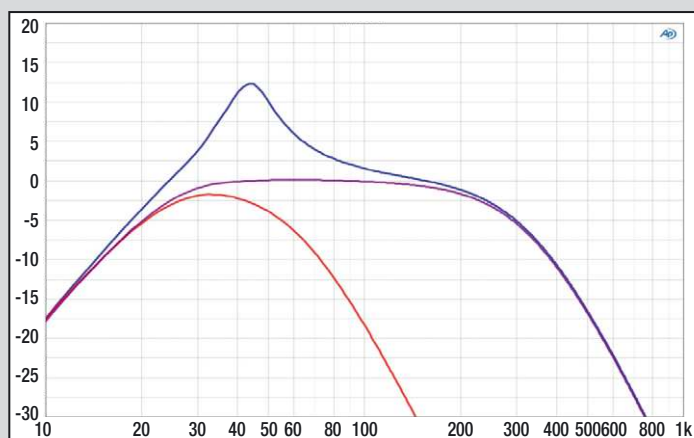


Four-channel amplifier with two square amplifier ICs, two-channel amplifier with driver ICs and transistors mounted on a heatsink

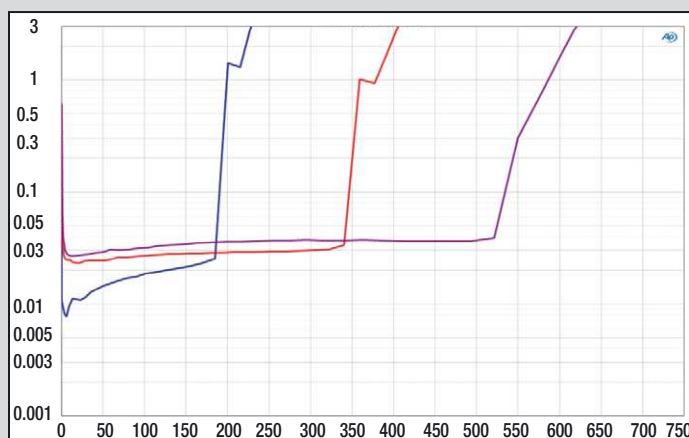


The SX-ONE features a robust power supply and a generously sized toroidal transformer behind the amplifier stage

CAR&HIFI Laboratory



The SX-ONE features a fixed subsonic setting and a boost at 45 Hz



The SX-ONE is stable at 1 ohm with only a half-liter volume and delivers around 600 watts. It also provides plenty of power at 2 and 4 ohms, with approximately 380 and 200 watts, respectively



watts into 4 ohms and an impressive 176 watts into 2 ohms. We also ensure very low distortion – only 0.005% at 5 watts – and residual noise that is nearly negligible by amplifier standards. The SX-TWO surpasses these with slightly better results, providing almost 150 watts into 4 ohms and over 250 watts into 2 ohms, which is explainable given the design, featuring four large 10 x 15 mm transistors mounted on the heatsink. Our mono amplifier delivers over 580 watts into a 1-ohm load – indeed, it is 1-ohm stable! At 2 ohms, it produces just under 380 watts, and at 4 ohms, about 200 watts. And once again, it is incredible how low the distortion levels are; even the mono amp has two zeros after the decimal point at 5 watts. In practice, the SX-ONE gets to put its skills to the test with a subwoofer. And once again, there is that “wow” factor when a



The mono version has a bass boost and a low-pass filter

Specifications

Channels	1
Power 4 ohms	206
Power 2 ohms	377
Power 1 ohms	586
Sensitivity max. mV	220
Sensitivity min. V	6,4
THD+N (<22 kHz) 5 W	0,007
THD+N (<22 kHz) Half Power	0,018
Signal-to-noise ratio dB(A)	95
Damping factor 20 Hz	171
Damping factor 40 Hz	172
Damping factor 60 Hz	173
Damping factor 80 Hz	174
Damping factor 100 Hz	169
Damping factor 120 Hz	174

Features

Low pass	50 – 250 Hz
High pass	–
Band pass	–
Bass boost	0 – 12 dB/45 Hz
Subsonic filter	–
Phase shift	–
High-level inputs	•
Automatic switch-on (Autosense)	•, DC or Signal
RCA output	–
Start/stop capable	• (7,3 V)
Dimensions (L x W x H in mm)	158 x 83 x 38
Others	Remote control, EPS

ESX SX-ONE

Price	200 Euro
Contact	Audio Design, Germany
Internet	www.audiodesign.de/english

Rating

Sound	40 %	★★★★★
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

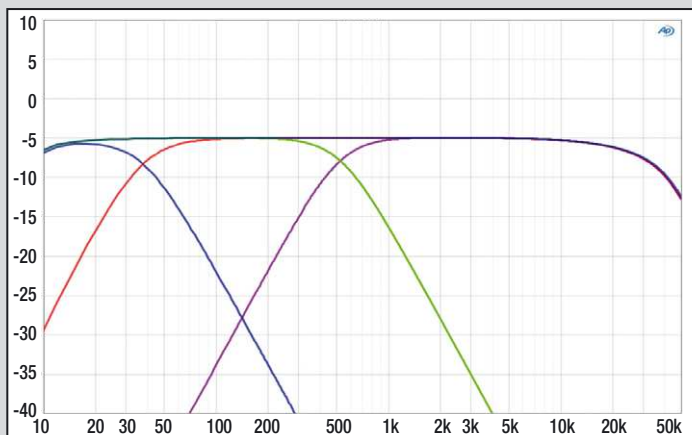
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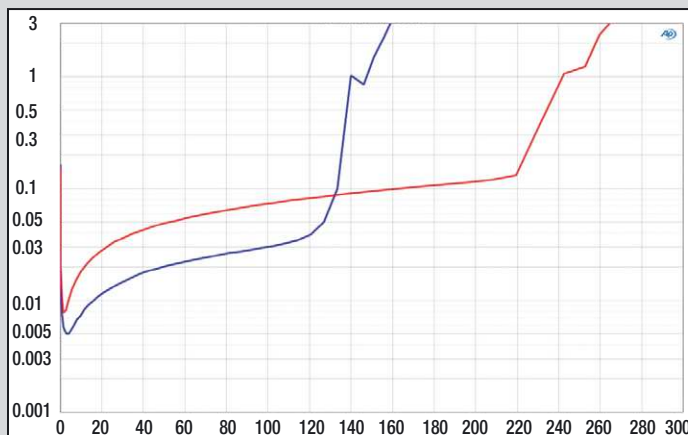
Price/performance: very good

„Top-of-the-line amplifiers with the best power density.“

CAR&HIFI Laboratory



It is possible to cross-over subwoofer/satellite systems or full-range speakers up to 500 Hz



The SX-TWO delivers approximately 150 watts into 4 ohms and 250 watts into 2 ohms with very low distortion



tiny amplifier really drives a 30-inch subwoofer – because that is exactly what the SX-ONE does. Its performance holds its own against any full-size bass amplifier with comparable power. It sounds rich, with deep, dark bass tones, and is even quite dynamic. The SX-TWO, too, is brimming with power. It seems almost oversized for a component system and imposes its will even on the woofers. In terms of volume, it is more than just loud enough – it also plays beautifully. With the right recordings, it brings out the atmosphere beautifully, and with percus-



Like the mono version, the two-channel model comes with a remote control; the four-channel model can filter up to 5 kHz

Specifications

Channels	2
Channel power 4 ohms W	147
Channel power 2 ohms W	254
Channel power 1 ohms W	0
Bridged power W	508
System power W	—
Sensitivity max. mV	190
Sensitivity min. V	5,9
THD+N (<22 kHz) 5 W	0,005
THD+N (<22 kHz) half power	0,022
Signal-to-noise ratio dB(A)	93
Damping factor 20 Hz	86
Damping factor 80 Hz	89
Damping factor 400 Hz	86
Damping factor 1 kHz	81
Damping factor 8 kHz	13
Damping factor 16 kHz	3

Features

Low pass	40 – 500 Hz
High pass	40 – 500 Hz
Band pass	—
Bass boost	—
Subsonic filter	—
Phase shift	—
High-level inputs	•
Auto turn-on (Autosense)	•, DC or signal
RCA output	—
Start/stop capable	• (7,1 V)
Dimensions (L x W x H mm)	158 x 83 x 38
Others	Remote control, EPS

ESX SX-TWO

Price	200 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



CAR&HIFI

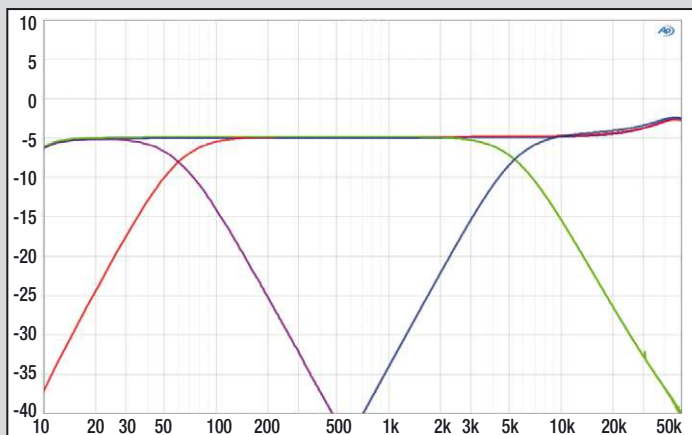
INTERNATIONAL

Germany 2/26

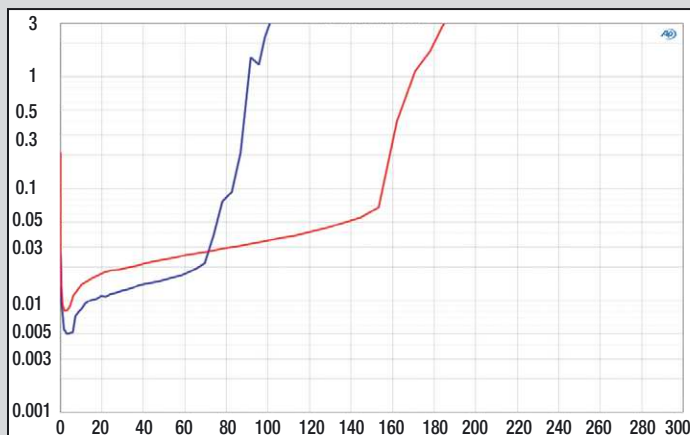
Price/performance: very good

„Top-of-the-line amplifiers with the best power density.“

CAR&HIFI Laboratory



The SX-Four offers simple high-pass or low-pass filters that extend up to 5 kHz, allowing it to drive all types of speakers



Factoring in the zigzag in the 4-ohm trace too—that brings it to over 90 watts. The 2-ohm output comes from just two 7-mm chips – unbelievable



sive sounds, the dynamics are spot-on. Then the SX-FOUR takes over, and we are completely blown away. While this may not be the top amplifier we have tested yet, the compact FOUR surprises us more than some higher-end models. It delivers exceptional power and volume – the output from that small device is remarkably impressive. Even if you think of the SX-FOUR merely as a black box with unknown tech and size, it proves to be a highly capable amplifier. Vocals and acoustic instruments are rendered beautifully, and the harmonic richness adds to the overall sound quality. Everything aligns perfectly, exemplifying the idea that “you don’t need anything more.”

Conclusion

At only 200 EUR per unit, ESX has achieved remarkable technical feats. The SX-Minis overcome the challenge of providing high performance within a very compact space, reaching levels once thought impossible.

Elmar Michels

Specifications

Channels	4
Channel power 4 ohms W	96
Channel power 2 ohms W	176
Channel power 1 ohms W	0
Bridged power W	352
System power W	–
Sensitivity max. mV	210
Sensitivity min. V	5,3
THD+N (<22 kHz) 5 W	0,005
THD+N (<22 kHz) half power	0,015
Signal-to-noise ratio dB(A)	92
Damping factor 20 Hz	132
Damping factor 80 Hz	134
Damping factor 400 Hz	132
Damping factor 1 kHz	127
Damping factor 8 kHz	34
Damping factor 16 kHz	10

Features

Low pass	50 – 5k Hz
High pass	50 – 5k Hz
Band pass	–
Bass boost	–
Subsonic filter	–
Phase shift	–
High-level inputs	•
Auto turn-on (Autosense)	•, DC or signal
RCA output	–
Start/stop capable	• (7,0 V)
Dimensions (L x W x H mm)	158 x 83 x 38
Others	2 or 4 CH In, EPS

ESX SX-Four

Price	200 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



CAR&HIFI

INTERNATIONAL

Germany 2/26

Price/performance: very good

„Top-of-the-line amplifiers with the best power density.“

Brax Matrix ML165 PRO + ML80 PRO + ML28 PRO
– Top three-way system by Brax

Tradition and innovation

- ▶ The Matrix system by Brax makes a very simple claim: to be the best speaker system ever. We have our hands on the three-way combination unit at the editorial office for testing.

SOUND AWARD

Absolute Top Class

CAR & HiFi
INTERNATIONAL 2/26



Brax does not offer a mid-range or similar product line; the brand is completely focused on premium products, and both the Graphic and Matrix series are positioned in the high-end segment. All Brax products (including electronics) have always been Made in Germany; this is tradition and underlines the reputation for the highest quality that Brax components enjoy worldwide. Our Matrix system is the latest iteration after a long line of high-end speakers, identified by the PRO suffix. Our ML165 PRO, ML80 PRO and ML28 PRO also look like Brax speakers, super classy and without any gimmicks; this is what speakers look like that have no need to show off. Technology and know-how are hidden in the details; things like specially developed beads or clever tricks in the motor are not visible to the eye. There are no passive crossovers; all Brax speakers are sold in pairs, in stylish wooden boxes and with hand-signed certificates. At least the tweeters and midrange drivers come in matched pairs, meaning that two identical units are combined in production. It goes without saying that other Brax speakers besides our Matrix PRO can also be combined; for example, the PRO tweeter has the same mounting diameter as the Graphic tweeter or the small 50 millimeter full-range drivers.

The ML165 PRO comes as a beautifully crafted 6.5-inch speaker with DIN dimensions; its cleanly painted die-cast aluminum basket gives the impression of reas-

Like the woofer, the midrange driver uses a high-tech carbon-fiber diaphragm



sembling stability. Finished entirely in understated black, only a fine golden decorative ring around the semi-rigid dust cap adds a visual flair. The cone consists of multi-layered carbon fabric; however, there is no thick rigid foam core, making it thinner and lighter. The layers are not all the same; the fiber is finer on the front, while on the rear we see longer fibers in the material. This makes them very stable despite their thin material thickness; the compound construction provides high internal damping. The cones come from the top manufacturer DKM from Krefeld in the Lower Rhine region; as with almost all individual parts, Brax relies on local suppliers. The cone's shape is approximately cylindrical when unfolded; in other words, it has fairly straight edges in its cross-section (an ideal cone). While this can have disadvantages in terms of bandwidth and partial vibrations, it ensures direct force transmission that is beneficial for music reproduction. At the transition to the surround there is a ring-shaped stiffener; the surround itself is made of genuine butyl rubber and was specially developed to ensure maximum linearity even with significant diaphragm deflection. The motor uses a conventional ferrite magnet, but this



The two cone drivers are also nicely finished on the rears



Befitting packaging with wooden cases and a certificate

is not a cost-cutting measure at Matrix. Depending on the application, ferrite performs just as well as the more compact neodymium, and with these speakers, size or fit into tight original spaces is irrelevant, as custom installation is available anyway. The motor contains a copper cap located on the pole piece; Brax also knows this trick for eliminating disruptive eddy currents. As always, this involves accepting an unnecessarily large air gap, but in this case, low distortion is more important than that last bit of efficiency. The PRO midrange driver uses a slim 80-millimeter basket, also made of die-cast material. The most noticeable difference is the polished stainless steel phase plug in the center of the diaphragm. The diaphragm is also made of carbon fiber; especially for a midrange driver, a lightweight diaphragm can't hurt, and the absence of a dust cap also contributes to this. For the midrange driver, however, Brax relies on neodymium, because otherwise there wouldn't be enough

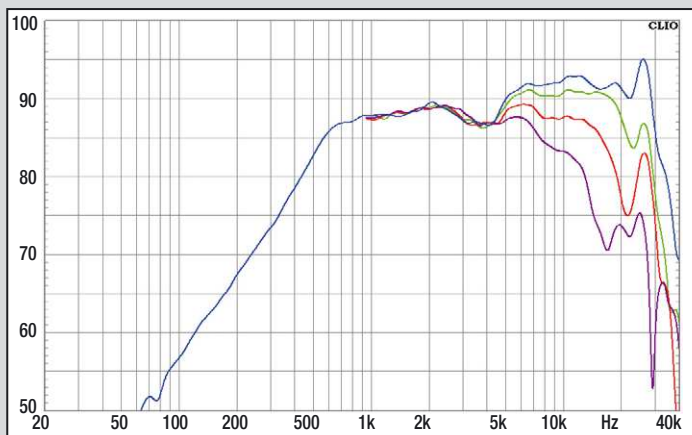
space. The reason is the design of the motor as a push-pull system; two magnetic discs work together, but not as a double ring like in subwoofers, but with one located under the pole plate and a second one with opposite polarity above it. This increases the magnetic field symmetry and "squeezes" the field lines into the air gap. Like the 165, the ML80 PRO is also equipped with a Nomex suspension, slightly raised (pot spider) and with a matched weave; and, most importantly, not plastered with any thick coatings. Our tweeter comes with many features that have been developed over the years in Brax tweeters. Most recently, the concave-slanted front panel was developed, which provided the best diffraction properties at short wavelengths in the high-frequency range. The generous rear chamber must also be designed



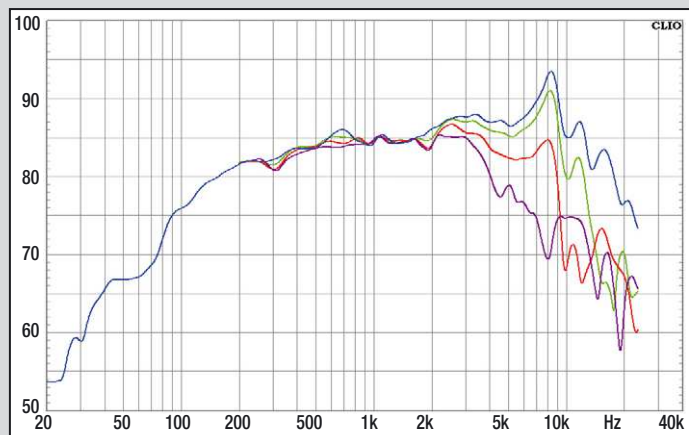
The midrange driver features outstanding ventilation



CAR & HIFI Laboratory



The Matrix tweeter delivers an incredible bandwidth, with sound pressure levels from 600 Hz up to 30 kHz



The midrange driver runs loudly and wonderfully smooth; its omnidirectional dispersion is very good up to 30°

internally according to acoustic principles, since its dimensions lie within the wavelength range reproduced by the speaker. The volume is also dampened with sheep's wool; this may not sound high-tech, but it remains the most effective method. Equally traditional and made of natural fibers is the large dome diaphragm with a 28-millimeter voice coil. It is made of silk fabric and is coated by hand. Instead of the previous metal ring with machine threads, the ML28 PRO is now attached with a non-slip plastic ring, which looks less elegant but works significantly better. The package includes two protective grilles, one with a fine mesh and a stylish hex grille with a slightly coarser hexagonal pattern. This allows operating the tweeter with or without the grille of your choice.

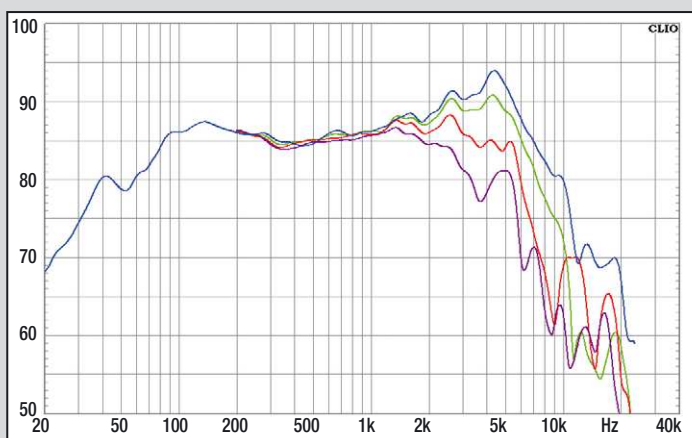
Measurements and sound

Thanks to its large diaphragm and coupled chamber, the ML28 PRO achieves a low resonance frequency of 647 Hz; with a steep crossover frequency, it can already be

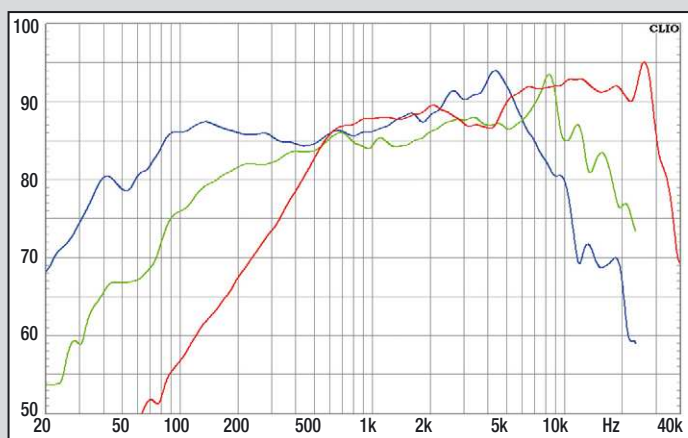
used below 2 kHz. Incidentally, the two grilles are identical; only the absence of a grille makes a measurable difference, but only at certain frequencies in the range of 0.5 dB, so it doesn't matter. Otherwise, the tweeter needs to be aligned somewhat due to its large diaphragm diameter; however, it then runs up to 30 kHz, an excellent value for a 28 mm driver. As you would expect from a fabric dome, the Brax also operates with low distortion. The ML80 PRO has turned out to be fantastic. Thanks to its powerful motor, it achieves a respectable sound pressure level of 86 to 90 dB and runs flawlessly up to 5 kHz. What's truly sensational, however, is its volume handling, as it can be cranked up to a level that's breathtaking without any increase in distortion. However, this is only true above 400 Hz; in practice, though, it goes significantly lower, since we're pushing the little guy to its limits without a crossover. With its large 38 mm voice coil and ultra-low open-air resonance of 48 Hz, the ML165 PRO is a true bass specialist that enables low crossover frequencies to the subwoofer. At 86 dB, the sound pressure level isn't particularly impressive, but it can handle a lot of power. Just like the midrange driver, its distortion behavior is exemplary to perfect, even down to the bass below 100 Hz. In terms of sound, expectations are high, but the current PRO Generation seamlessly continues the Brax Matrix tradition. It's rare to hear such a "mature" sound that immediately makes clear what class the music belongs to. Everything is balanced and sounds wonderfully natural and effortless. The listener can easily pick up on the smallest details but doesn't have to. The Brax system delivers music just as harmoniously or



The tweeter comes with two different grilles



The woofer exhibits only average sound pressure levels; the rigid diaphragm is well-damped and operates without sharp resonance peaks



While the K-165 is average, the M-80 boasts a high level of sensitivity, allowing it to keep up with the woofer



The 28 mm silk dome tweeter is encased in a slightly concave faceplate.

spectacularly as the recording intends. The new carbon diaphragms produce fantastic vocals, and the brass sections shine with a spectrum of overtones that's sure to give you goosebumps every time. And finally, there is endless deep bass for a 16-inch driver, although nobody will run the system without a subwoofer. Nevertheless, we're certainly not the first to want to turn the Matrix into a living room set – our senior partner, Heinz Fischer, already did this decades ago.

Conclusion

Brax Matrix is a safe bet in the high-end speaker sector. The ML PRO series remains true to the Brax tra-

dition but incorporates enough innovation to remain at the forefront in the future as well. In

the end, it's the sound that wins you over.

Elmar Michels

Specifications

Basket diameter	167 mm
Mounting diameter	143 mm
Mounting depth	64 mm
Magnet diameter	90 mm
Basket midrange	92 mm
Depth midrange	36 mm
Dome diameter tweeter	28 mm
Housing diameter tweeter	52 mm
Max. XO freq wf/mr	3.5 / 5 kHz
Min. XO freq mr/tw	300 / 1.8k Hz
XO for test	300 / 2.8k Hz
EQ for test	–
Grilles	– / – / • / •
Others	–
Nominal impedance	4 Ohm
DC resistance Rdc	3,51 Ohm
Coil inductivity Le	0,17 mH
Coil diameter	38 mm
Membrane surface	135 cm ²
Resonance frequency fs	48 Hz
Mechanical Q-Factor Qms	9,00
Electrical Q-factor Qes	0,53
Overall Q-factor Qts	0,50
Equivalent volume Vas	15 l
Moved mass Mms	18,6 g
Rms	0,62 kg/s
Cms	0,59 mm/N
B x l	6,16 Tm
SPL 2 V, 1 m	86 dB
Recommended power	50 – 200 W

Brax ML 165/80/28 PRO

Price	3.470 Euro
Contact	Audiotec Fischer, Germany
Internet	www.audiotec-fischer.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



CAR & HiFi

INTERNATIONAL

Germany 2/26

Price/performance: very good

„Sound in perfection.“

GZPW 15NEO-XSPL – an exceptional subwoofer from Ground Zero

Extreme Bass

► The GZPW 15NEO-XSPL by Ground Zero probably represents their most powerful subwoofer yet. This is notable, given that the brand already offers twelve 15-inch models in its high-end Plutonium and Nuclear series.

BEST PRODUCT

Absolute Top Class

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This thing is a monster. 42 kilograms of carbon fiber, steel, aluminum, and neodymium, with a peak power handling of 25 kilowatts. Ground Zero is highly committed to the GZPW 15NEO-XSPL, especially given the XSPL designation for “extreme sound pressure level.” For bass sound pressure, only raw power and strong materials will suffice. Every component uses extreme materials, and the company has invested not just in heavy materials but also in extensive technical expertise. Modern development relies on specialized simulation software; Ground Zero’s team uses Loudsoft’s finite element method-based tools. These include FineCone for cone simulation, FineSuspension for surrounds and spiders, and FineMotor for the motor. A new version of FineMotor Pro was needed for the GZPW 15NEO-XSPL, which we will explain later.

Here is the woofer in front of us, and we will start at the top. Its cone and dust cap are crafted from thick, real carbon fiber, known for being extremely stiff and having an excellent stiffness-to-weight ratio. The surround is made of a dense foamed material deliberately designed to be very rigid, since in SPL (Sound Pressure Level)



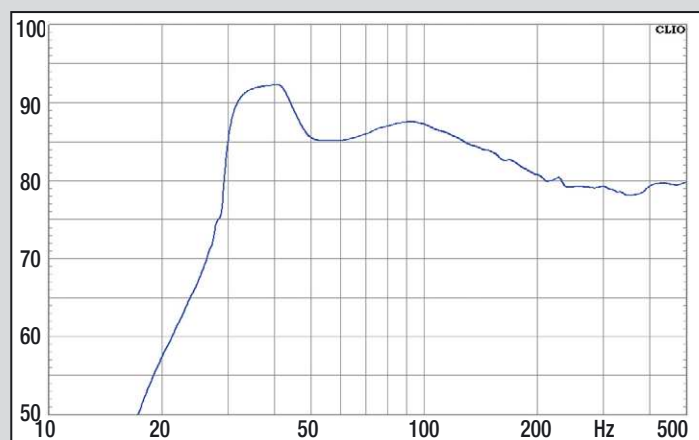
Not a flat subwoofer: The NEO is 32.5 cm deep



Soldered-on leads and 2 x 3 thick tinsel leads per coil

woofers, the surround significantly influences cone movement. At Ground Zero, this feature is called ConeGrip, with a counterpart called ConeGlide – a surround that is ideally almost non-existent, a choice often preferred in SQ (Sound Quality) speakers or the GZPW 10SQX SQ subwoofer. The lower guide system ensures centering; instead of a single fabric spider, there are seven working together here, due to the high mass of a long-throw subwoofer. The leads for the dual voice coil are loosely attached to the spider, with each plus and minus lead being triple in number, every single one most likely having the largest cross-sectional area of any speaker. The frame lacks external terminals, which is beneficial. Spring-loaded terminals provide insufficient cross-sectional area, and screw terminals are not suitable for the vibrations involved.

Our GZPW features permanently attached 10-square-millimeter/8AWG cables that move the connection to a safer distance. Similar to the cone and its suspension, the large cast frame seems delicate despite its size. It was designed using computer simulations and stress-tested before creating the first prototype. Small reinforcements inside the basket struts at the junctions with the mounting flange reflect this process. The voice coil former is substantial, measuring 4 inches in diameter, as thick as an upper arm, and made of aluminum. The copper-coated aluminum flat wire of impressive thickness is used for the voice coil, which is different from small, efficiency-focused speakers that pack many coil turns into a tiny air gap. In this subwoofer, the 8-layer voice coil is laid flat, enabled by the large air gap in the GZPW 15NEO-



Strong peak at the reflex tuning frequency of 37 Hz; otherwise, relatively low sound pressure at 1 W

XSPL. The coil stands 60 millimeters high on the former, the latter being flanged at the end for stability and durability, even resisting bottoming out on the back plate.

Multi-magnet motor

Examining the GZPW 15NEO-XSPL motor reveals several anomalies, indicating it operates differently from typical woofers. The top plate is not truly a top plate because it has an unusually large central hole. Instead, the two thick discs are only for attaching the motor to



19 elements with neodymium magnets form a ring around the voice coil

the frame. So, where is the air gap? The voice coil still requires magnetic field lines to function, as movement depends on the magnetic field passing through the coil. These lines must pass radially through the coil to ensure correct movement direction. What, then, has Ground Zero constructed?

The motor's pie-slice-shaped cavities, formed by 19 surrounding elements, house the individual magnets, with no top plate present. Inside the voice coil is a solid pole piece, ensuring the magnetic field lines pass radially from the outside to the inside, as needed. Unlike a standard motor with axially arranged magnets (north pole up, south pole down), this design features magnets arranged radially, with the north pole facing inward and the south pole outward. The magnetic field flows from the north pole through the voice coil, then via the pole piece and a steel cage to the south pole. Thanks to neodymium magnets, this configuration offers strong magnetic fields and excellent cooling, as the open structure allows fresh air to circulate. The motor cools itself primarily through thermal conduction across the material, complemented by radiative heat dissipation,



Solid pole piece instead of a ventilation hole; cooling is provided by the magnet system



The standard 6.5" coaxial speaker, used as a size comparison, looks minuscule next to the massive subwoofer

ments and does not excel across all aspects. However, it is not designed to be a versatile competitor but rather to dominate its specific niche. At the microphone, it is not very loud for a 15-inch subwoofer, registering only 92 dB at 1 watt, and even worse, it falls short in producing really deep bass.

with all parts black to aid heat radiation. The vent hole in the pole piece is omitted intentionally, as the material itself functions as a heatsink.

Measurements and Sound

Our testing confirms that the GZPW 15NEO-XSPL is far from a typical subwoofer. It struggles to operate due to its immense power require-

This limitation is linked to its enclosure tuned at just 37 Hz, which also matches the woofer's free-air resonance. Not entirely impressive, regarding much smaller subwoofers like 10 or 12 inch models will

Specifications

Basket diameter	39,0 cm
Mounting diameter	36,0 cm
Mounting depth	32,5 cm
Magnet diameter	24,0 cm
Weight	41,9 kg
Nominal impedance	2 x 1 Ohm
DC resistance Rdc	1,63 Ohm
Voice coil inductance Le	2,21 mH
Voice coil diameter	102 mm
Membrane surface	825 cm²
Resonant frequency fs	40 Hz
Mechanical quality Qms	4,50
Electrical quality Qes	0,19
Total quality Qts	0,18
Equivalent volume Vas	17,1 l
Moved mass Mms	872 g
Rms	48,90 kg/s
Cms	0,02 mm/N
B x l	43,94 Tm
Sound pressure 1 W, 1 m	92 dB
Recommended power	>4500 W
Test enclosure	BR 155 l
Port dimensions (d x l)	16,5 x 20 cm

outperform the NEO-XSPL in delivering a balanced, deep frequency response. The GZPW 15NEO-XSPL truly excels when driven within its optimal range. Our equipment cannot fully challenge its limits, given its 25-kilowatt peak power, which we cannot supply. Still, when the massive Ground Zero is powered up, it unleashes tremendous force, leaving nothing standing, yet it remains surprisingly capable for music listening.

Conclusion

Certainly, some may question the purpose of the GZPW 15NEO-XSPL. The answer is simple: car audio should be enjoyable, even if it occasionally defies all logic. We all do it for the fun of it, or not?

Elmar Michels

Ground Zero GZPW 15NEO-XSPL

Price	2.700 Euro
Contact	Ground Zero, Germany
Internet	www.ground-zero-audio.com

Rating

Sound	50 %	★★★★★
Low frequency extension	12,5 %	★★★★★
Sound pressure	12,5 %	★★★★★
Sound purity	12,5 %	★★★★★
Dynamics	12,5 %	★★★★★
Lab	30 %	★★★★★
Frequency response	10 %	★★★★★
Efficiency	10 %	★★★★★
Max. SPL	10 %	★★★★★
Build quality	20 %	★★★★★

Absolute Top Class



CAR & HiFi

INTERNATIONAL

Germany 2/26

Price/performance: very good

"A subwoofer beyond all reason."



No top plate: The two plates between the frame and the magnet elements serve as fasteners



THE NEXT GENERATION OF DSP AMPLIFIERS BUILT FOR PLUG & PLAY



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WITH OVER

2500

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4

CHANNEL
OPTION
ZDA4.8

6

CHANNEL
OPTION
ZDA6.8

8

CHANNEL
OPTION
ZDA8.8



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CLASS A/B
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WIRELESS
STREAMING



APP CONTROL
iOS AND ANDROID



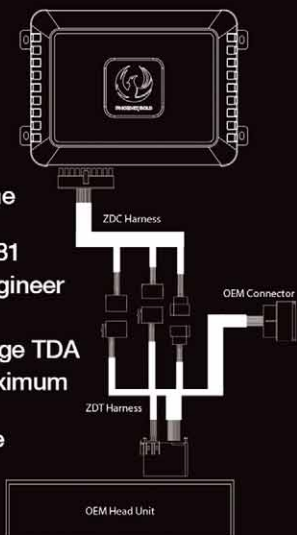
8 CHANNEL DSP
8CH RCA OUTPUTS

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- Gold PCB Design
- Burr Brown OP's the same as the ZQ series
- Burr Brown DAC PCM1681
- Built by our ZQ Audio Engineer
- Wireless Streaming
- Toshiba Transistor package TDA
- Heatsink die-cast for maximum cooling
- 48kHz DSP sampling rate
- Molex connectors



PLUG & PLAY HARNESSES

ZDC ISO HARNESS

2m or 5m ISO harness for direct connection from the ZDA DSP Amp Molex connector to ISO.

ZDT AUDIO T-HARNESSES

Plug-and-play, vehicle-specific T-Harnesses for easy ZDA DSP amplifier installation.

ZDC DIRECT FIT HARNESSES

Vehicle-specific harnesses for direct connection of ZDA DSP amplifiers without a ZDT T-Harness.



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The equipment classes

In **CAR&HIFI INTERNATIONAL**, all products are classified into one of five performance classes:

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

The rating

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.

The star rating provides comprehensive and concise orientation when searching for devices for your in-car entertainment. However, depending on your situation and application, the device with the best star rating is not automatically the best fit for you. For example, an amplifier may score very well overall but may be difficult to connect to your car radio. So additional effort has to be considered for integration or a different model might be the better choice. Therefore, you should additionally consult the detailed information provided in the text of the test reports.

The test equipment of the **CAR&HIFI INTERNATIONAL** editorial team

For our tests, **CAR&HIFI INTERNATIONAL** uses – among others – the following special measuring instruments and reference devices for the comparison of image and sound quality:

- Audio Precision
- CLIO 12
- Kenwood CS-6030
- Microtech Gefell

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Basecap
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NEU

HiFi-Tassen, Serie 2
4er-Set



- Limitierte Auflage „HiFi Edition 2“ (2018) – nur 250 Stk./Motiv
- Inkl. Editions-Stempel auf dem Tassenboden
- Durchmesser: 8 cm, Höhe: 9 cm
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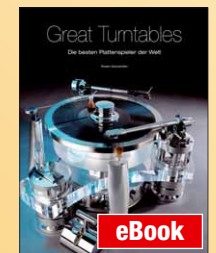


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