

CAR & HiFi

INTERNATIONAL

3/24 · 4,80 €



European Edition

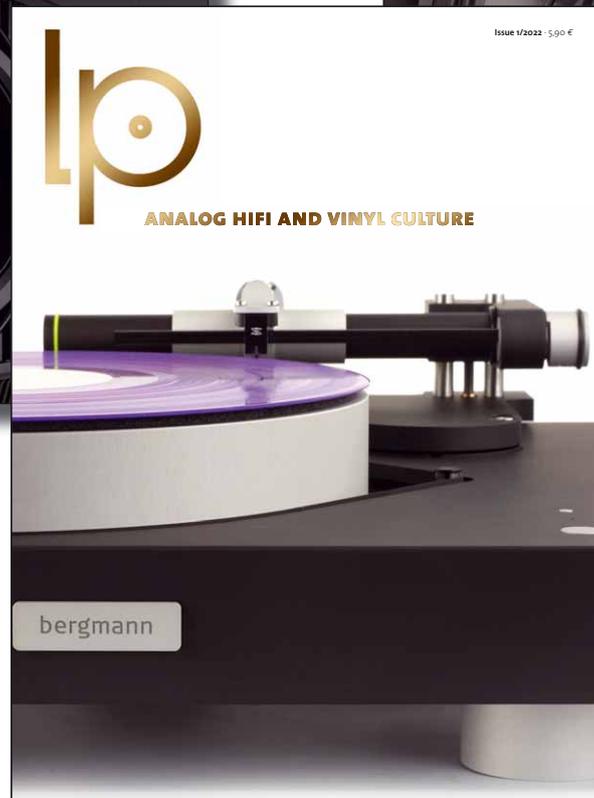
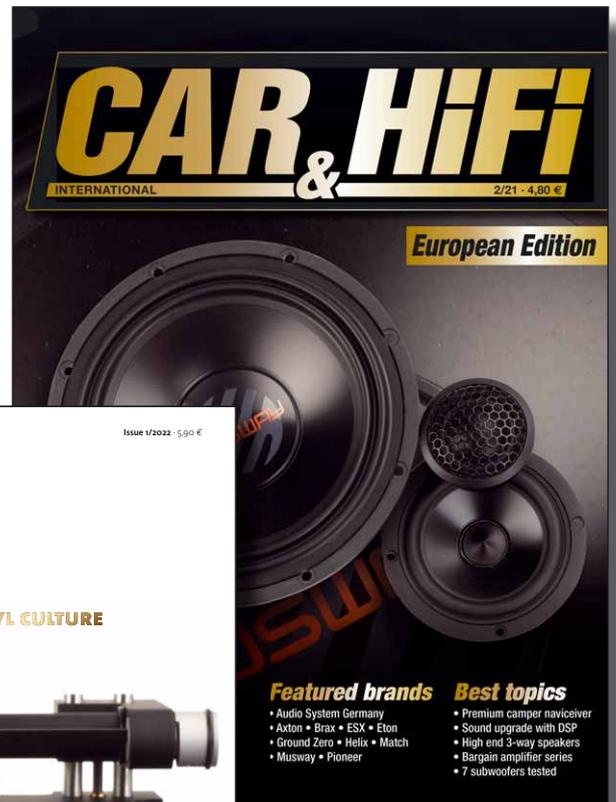
Best topics

- 5 Channel DSP amplifier • Class-D high-end amplifier
- Trunk woofers for sedans and convertibles
- Top stand-alone 12-channel DSP • SPL amps for 12 or 24 V supply

Featured brands

- Audio System
- Brax • ESX
- Helix • Musway

READ IT !



Now available

MUSWAY

THE DSP EXPERTS



Also controllable
via smartphone
with the new
MUSWAY TUNEST app



5 amplifier channels
plus 9 DSP channels

BEST PRODUCT
Top Class
CAR & HiFi 5/2024

BEST EMC
Undisturbed FM reception
CAR & HiFi 5/2024

Musway M5 / M5EVO
Top Class 1,2
CAR & HiFi 5/24
Preisperformance: very good



Size comparison
with an
iPhone 11 Pro Max

M5 NEW

5-CH Class D amplifier with 9-CH DSP including ISO plug+play cable set
4 x 45/50 Watts RMS @ 4/3 Ohms + 1 x 180/300 Watts RMS @ 4/2 Ohms
4 x High Level Input 6 - 18 V/RMS with EPS, 2 x AUX/RCA Input 2 - 6 V/RMS
1 x Optical Input/Stereo PCM 192 kHz / 24 bit
4 x Speaker Output amplified, 1 x Subwoofer Output amplified
4 x Preamplifier Output/RCA (configurable via DSP)
Dimension: 150 x 45 x 105 mm

HIGH FIVE!

THE NEW DSP ALL-ROUNDER IN MINI FORMAT



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TECHNIK FÜR KLANGBEGEISTERTE

End of year highlights

This issue of CAR&HIFI INTERNATIONAL is the last one for this year, but we have packed it full of real high-end fireworks. Already now - just a few weeks after the test and at the product launch - the new Brax amplifier RX2 PRO can certainly be considered a future classic. Now available in limited quantities as a „Founders Edition“, this amp will cause a sensation in the car - promised. But more down-to-earth products have also made it into this issue, such as an affordable DSP amplifier with enough power for a subwoofer, or subwoofer solutions specifically for sedans and conver-

tibles, available here either active or passive. I hope you enjoy reading and see you in 2025 with new issues of CAR&HIFI INTERNATIONAL.



Elmar Michels
Editor-in-chief



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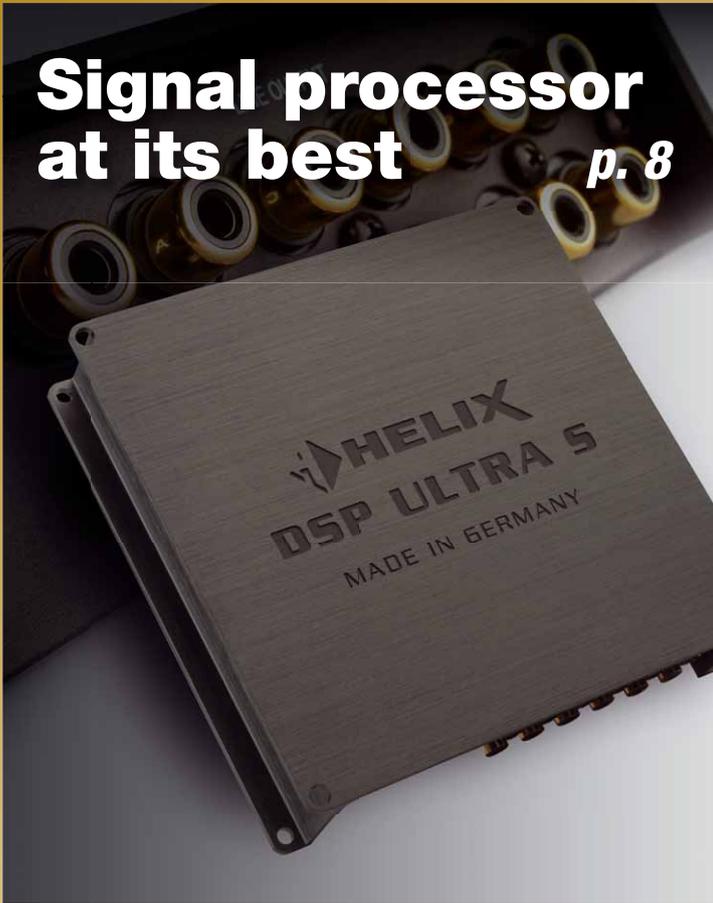
DSP SERIES

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)
- SigmaDSP® audio processor
- Premium DAC with differential signal routing
- High-quality OP-amps with lowest noise and distortion
- Extremely low-noise (SNR ≥ 110dB Analog / ≥ 113dB Digital Input)
- Realtime setup for all functions (via PC or app)
- Input equalizer (7 bands per channel)
- Output equalizer (31 bands per channel)
- Time alignment for in- and outputs
- Adjustable crossovers (HPF / LPF / BPF)
- 3 Filter characteristics and 6-48 dB/Oct
- Selectable crossover slope
- BT 5.0 for wireless music streaming and DSP settings
- Dimensions (w x l x h): 132x 143(171)x 40 mm / 5.20x 5.63(6.73)“x 1.57”
- Optional wired remote control (GZREM 6-10) available separately



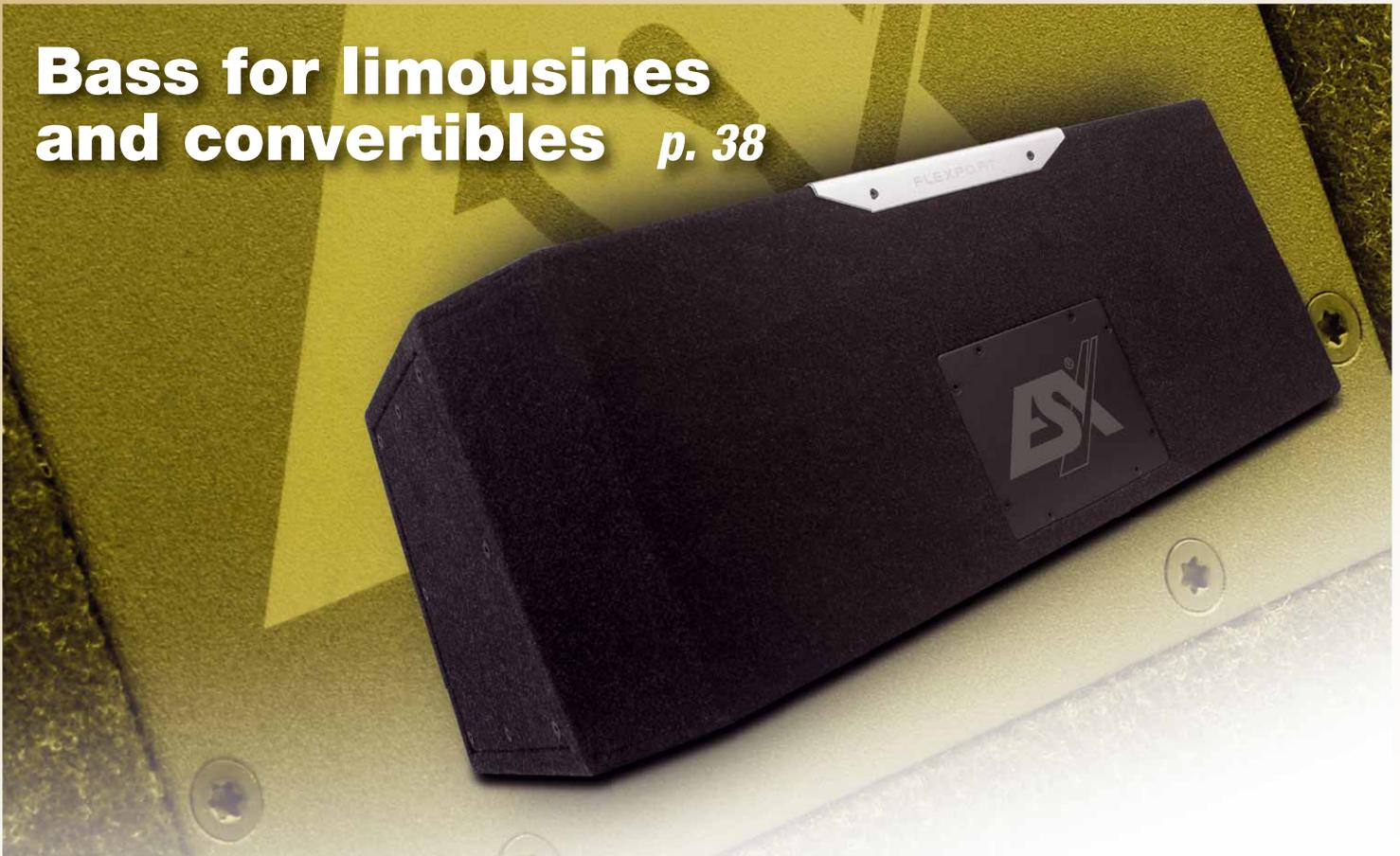
Signal processor at its best *p. 8*



Compact Power *p. 32*



Bass for limousines and convertibles *p. 38*





Engineering perfection

p. 26



Five channels in the smallest of spaces

p. 16

Tests

Signal processor at its best DSP Ultra S

- Top stand-alone 12-channel DSP from Helix 8

Five channels in the smallest of spaces Musway M5

- 5-channel amplifier with 9-channel DSP 16

Engineering perfection Revelation RX2 PRO

- high-end two-channel amplifier from Brax 26

Compact Power

Audio System H-1500.1 D (24 V)

- compact powerhouses (also) for truckers 32

Bass for limousines and convertibles

ESX DBX208BPA + DBX208BPQ

- Bandpass subwoofers with a twist 38

Categories

Editorial 3

News 6

The equipment classes 44

Imprint 46

Coming soon 46

► New DSP amplifier

Phoenix Gold is launching the ZDA4.6, a brand new four-channel amplifier with a built-in 6-channel signal processor. All 6 processor channels are available as RCA outputs, so they can also be operated with external amplifiers. Optional accessories include a Bluetooth module for programming and music streaming, a cable remote control and an ISO wiring harness for plug & play installation of the ZDA4.6.

● www.phoenixgold-eu.com



► Helix (sub-)woofer

With Compose i5, Helix is expanding its Compose platform to include a category of specialists and problem solvers that perfectly complement the Ci3 and Ci7 series. The 200 millimeter woofer Ci5 S200FM comes either as an S2 with a 2 ohm single coil or as a D2 with a double coil and can be used flexibly, both as a pure bass and as a mid-woofer. Thanks to the very low installation depth, its prime application is as an under-seat woofer in BMWs or as a footwell woofer in Mercedes. Suitable FlexMount installation adapters are already available for BMW and Mercedes 205, Mercedes 206 will follow shortly.

● www.audiotec-fischer.com

► Compact bass power

With the H-3300.1 D, Audio System is launching a new model for power-hungry subwoofer applications. The mono power amplifier delivers up to 3300 watts at 1 ohm and, in contrast to previous bass monsters, is very compact at 227 x 59 x 184 millimeters. The H-3300.1 D comes with extensive filter equipment and a cable remote control. Versions for 12 volt on-board power and 24 volt on-board power are available.

● www.en.audio-system.de





VISION

HIGH-END DSP AMPLIFIERS

” It doesn't just stand there with its touch quality like a solid metal block, it is also convincing with finest components, incredible performance at 11 channels and last but not least with perfect features. ”

(Elmar Michels, Car & Hifi)



Optional:



RC-DQ €79,00*

Remote Controller with Display and large Knob



ESX TOOLKIT APP



VE1300.11SP €1499,00*

11-Channel Class D Digital Amplifier with 12-Channel Sound Processor

9 x 100 Watts RMS @ 4/3 Ω + 2 x 200 Watts RMS @ 2 Ω, Dimensions: 226 x 43 x 120 mm
Analog Devices™ ADAU1452 Dual 2 x 32 Bit Processor, 294 MHz, Full HD Audio 96 kHz
AKM Velvet Sound™ Series 5 Signal Converter, A/D 32 Bit, D/A 32 Bit, Hi Level Inputs with EPS PRO @ 40 V/RMS
Integrated Bluetooth® Receiver for DSP Control via ESX TOOLKIT App and Full HD Audio Streaming

VE900.7SP €999,00*

7-Channel Class D Digital Amplifier with 8-Channel Sound Processor

5 x 100 Watts RMS @ 4/3 Ω + 2 x 200 Watts RMS @ 2 Ω, Dimensions: 250 x 50 x 150 mm
Analog Devices™ ADAU1452 32 Bit Processor, 294 MHz, Full HD Audio 96 kHz
AKM Velvet Sound™ Series 5 Signal Converter, A/D 32 Bit, D/A 32 Bit, Hi Level Inputs with EPS PRO @ 40 V/RMS
Integrated Bluetooth® Receiver for DSP Control via ESX TOOLKIT App and Full HD Audio Streaming

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

DSP Ultra S – Top stand-alone 12-channel DSP from Helix

Signal processor at its best

- ▶ With the DSP Ultra, Helix sets standards in the field of sound processors and its immense performance eclipses pretty much everything at the time. Now its successor, the DSP Ultra S, is in the starting blocks and we want to take a closer look at it.

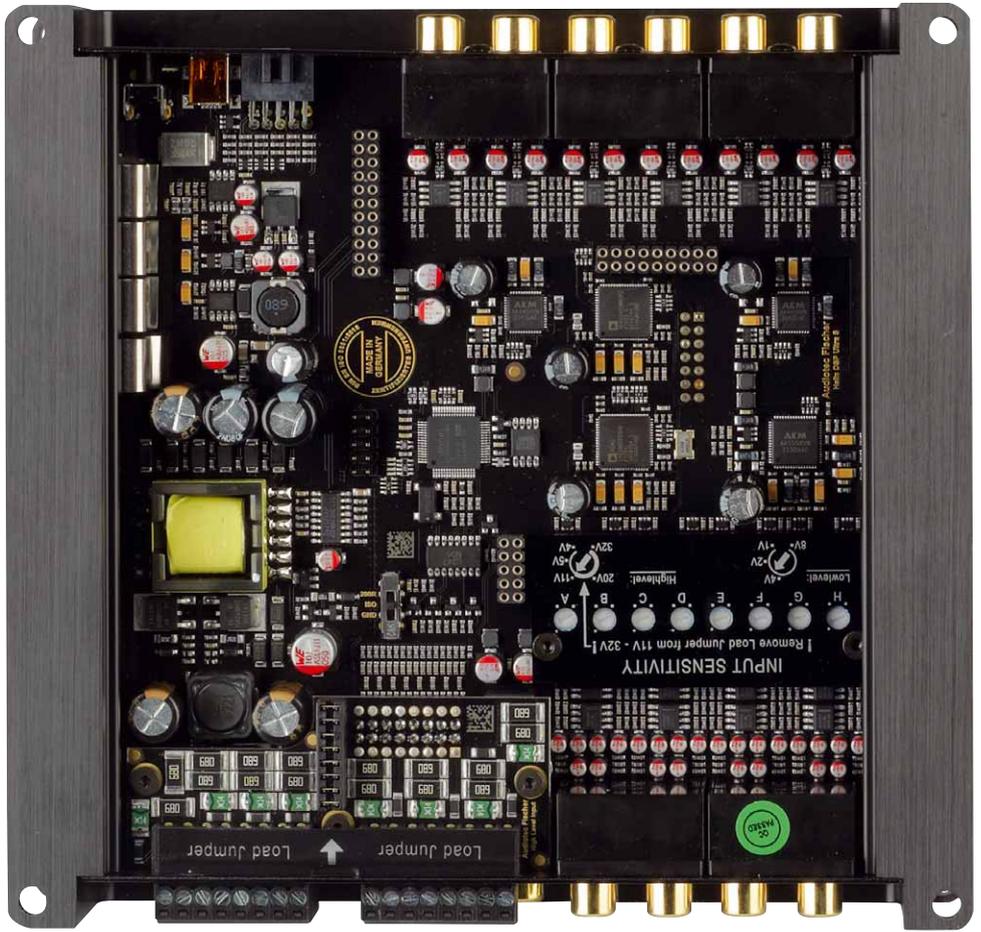


LINE OUTPUT

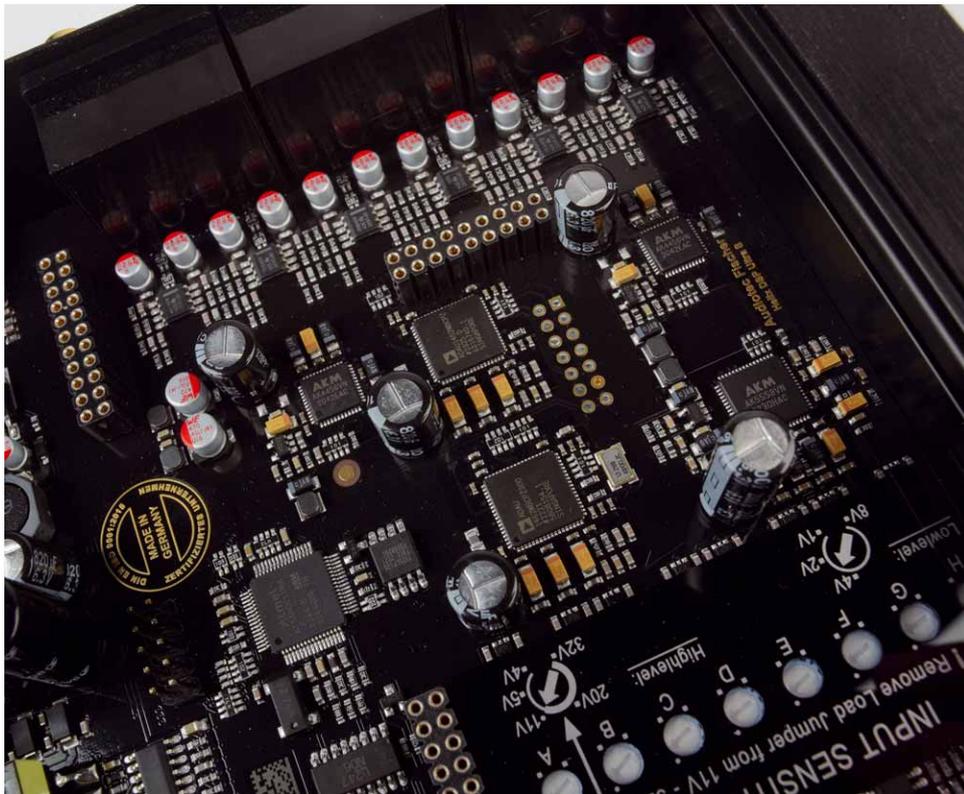
HELIX
DSP ULTRA S
MADE IN GERMANY

With the DSP Ultra, Helix sets standards in the field of sound processors and its immense performance eclipses pretty much everything at the time. Now its successor, the DSP Ultra S, is in the starting blocks and we want to take a closer look at it.

With the DSP Ultra, Helix 2019 has brought together everything that is good and expensive. With dual core DSP, the finest 32-bit converter modules and more than generous features, the DSP Ultra is right up there with the best stand-alone DSPs. Now, five years later, a subtly revised version, the DSP Ultra S is being released to replace the Ultra. In contrast to the MK2 version, the Helix S is more of a facelift than a substantially redesigned successor, which means that the technology in the DSP Ultra S is essentially the same



Two DSP cores are required to process all channels, including the virtual ones, at 96 kHz



as in the excellent Ultra. We have 8 inputs both as RCA and as high level and the latter can still handle up to 32 volts, so that even larger sound packages can be operated ex works. There are twelve RCA sockets for outputs and, of course, the remote out for switching on the amplifier. Helix has not neglected the digital side either: in addition to the optical input, there is also an electrical coaxial digital input, which is officially specified up to 192 kHz. The SCP port not only accepts input from the various remote controls available from Helix, but it is also designed as a genuine bidirectional interface for a wide range of applications.

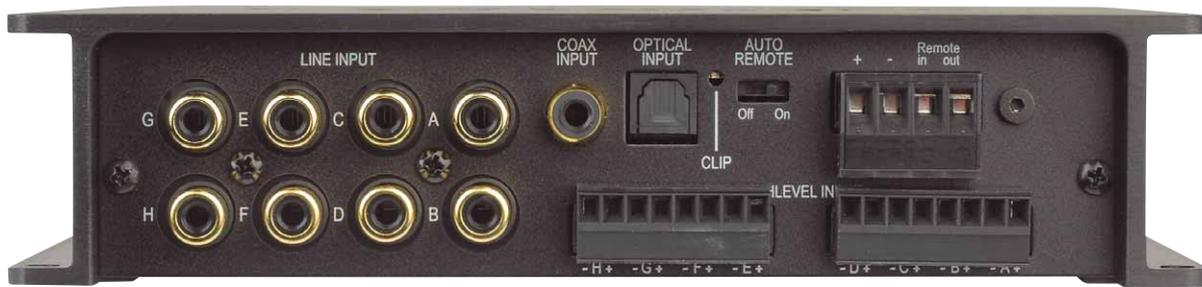
On the input side, an AK5558 converts from analog to digital, the best that you can get from AKM



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

features such as an extended time range. Both are clearly state-of-the-art and can be found in almost all premium DSPs on the market.

As for the converters, we still find the very best components from AKM. On the input side, an AK5558 converts from analog to digital, i.e. the best you can buy from AKM (for automotive applications), while two six-channel AK4456 DACs, also top of the line and equipped with the Velvet Sound feature, take care of the outputs. The coprocessor in ARM 32-bit architecture is fit enough for the ACO platform, which enables



In addition to the 2 x 8 analog inputs, there are digital inputs optical and coaxial



The finest components

Inside, you must take a closer look to recognize the subtle changes in the DSP Ultra S. The names of the chips reveal an upgrade in the two DSPs, which are now available as an ADAU1462 and an ADAU1452, whereas previously there were two 1452s. The 1462 offers slightly more memory, which can be used for nice

The AISA can be used, for example, to track down time differences or all-passes of the factory system



powerful functions such as virtual channel processing or the measurement functions in the DSP PC-Tool 5 software. However, the most significant innovations in the Ultra S are to be found in the analog input section, firstly recognizable by the fact that the ground lift switch has been moved to the board. The analog signal processing is in fact completely new, which also results in a different circuit board layout.

Crossovers, levels and equalizers can be set in the output area



Software

All DSP products of the Brax, Helix and Match brands are controlled by the DSP PC tool, which is now available in version 5 free of charge. Besides 30 EQs per channel, time alignment of both inputs and outputs and of course freely programmable crossovers, there is the VCP (virtual channel processing) with the possibility to process channel groups as virtual channels between inputs and output channels. For example, a three-way front system with six output channels for right and left sides can be managed by the virtual channels front left and right. The time alignment of the individual loudspeakers, the crossings of tweeter, midrange and woofer are carried out at the output channels, here also peculiarities of the installation situations are corrected. The sound-decisive equalizing, however, can be conveniently performed in 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 via time alignment or to level it via the gain control. The FX sound effects now also affect the virtual center and rear channels, which means that two-way centers can also be perfectly controlled.

Under the FX section (effects), algorithms for optimizing the center and bass can be activated. The real center is a blessing by itself; a center channel signal is calculated by specially programmed audio processing. Thus, the real center is not a stopgap solution like a mono sum or a reversed sum of left and right. For center there is the clarity expander, which affects the midrange reproduction, e.g., for voices. Bass processing includes the SubXpander, which adds low tones to music by creating subharmonics to existing frequencies. In addition, there is a dynamic bass boost,

which boosts the bass depending on the playback volume. This helps quite nicely with factory systems that have limited loadable woofers and subwoofers, for example. There are adjustment controls for all FX functions, with which you can specifically influence the extent and function.

Furthermore, the latest measurement functions of the PC-Tool are supported. The well-known RTA (real-time frequency response measurement with optional microphone) has been improved with some new features; there are now even more setting possibilities concerning the measurement, e.g., a microphone calibration. If desired, the RTA can automatically adjust the EQs, tolerance thresholds and the number of EQs to be used can be set here. Version 5 also allows the adjustment of individual speakers with their crossovers, creating perfect acoustic filter slopes that then also add to a clean SPL summation when the speakers play together.

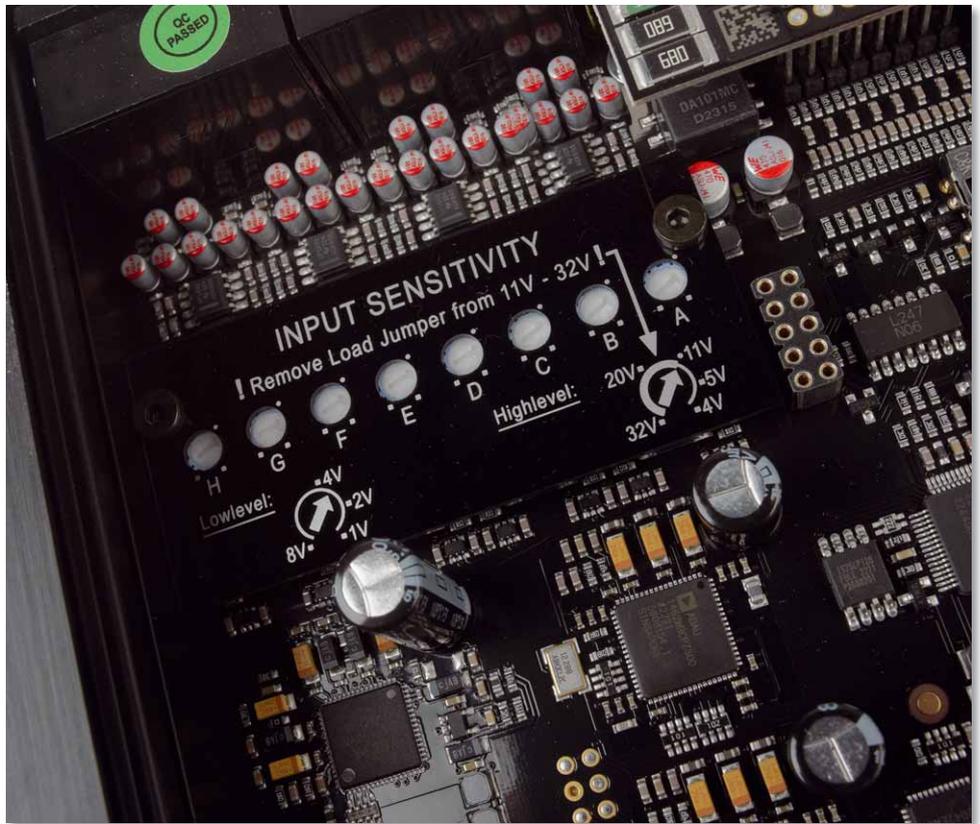
With the ISA, the inputs can be measured electrically, and sums of several inputs are also possible, thus tracking down hidden all-pass filters that remain inconspicuous in individual measurements. The Advanced ISA works together with an external sound card and extends the measurement options to include real-time measurements, including curve information such as set filters and run times. This makes it easy to handle all-pass filters, delay times, and equalizing of a factory system. This electrical measurement of the inputs saves the installer a lot of time when troubleshooting and tuning of the DSP, because the input EQs (and the input time) can be set at the same time as the measurement, with immediate success control. Another innovative feature is the DLC (Dynamic Loudness Control), which

can both compensate for factory loudness ex works and set up its own new dynamic volume control. This functionality is also available for volume control with a retrofitted level remote control, e.g. the Conductor.

Furthermore, there is the ATM (automatic time measurement), which allows a fully automatic runtime measurement and adjustment of the entire system. The advantage here is that the measurement signal is played back as a sound file like a piece of music via the head unit; this is possible in all type of vehicles. The measurement is then carried out using the company's own in-house programmed measurement signals and a great deal of audio processing. The time of all the loudspeakers in the system is compared with a reference loudspeaker and then calculated.

The current 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. Software Individual test Helix DSP PRO MK3 46

While Helix previously relied on a largely common signal processing system for low- and high-level signals, the decision was made with the Ultra S to completely separate the RCA and high level signal paths and only combine them at the ADC. Of course, this means a considerable amount of extra work, and twice as many op-amps are now used. This was also an opportunity to give them an upgrade, so that no fewer than 26 OPA1692s from TI are now used in the signal input, once again the top model with the very best specs. The reward for these efforts is improved noise immunity of the analog inputs and further optimized measurement values such as noise, channel separation and distortion, which ultimately also benefit the sound.



The 8 input channels of the active input section can be adjusted in sensitivity using potentiometers

High-end features

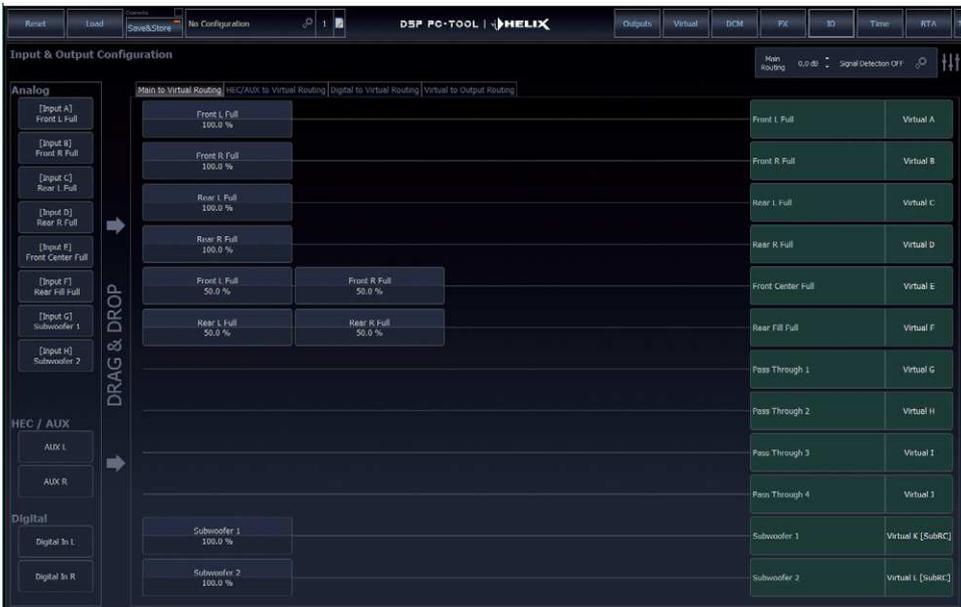
Thanks to the computing power of its two DSP cores, the DSP Ultra S offers impressive performance. Its twelve channels offer a hi-res frequency range up to 48 kHz and at the same time the VCP with the vir-

tual channel level, which has to be calculated in the same way as the output channels. This combination is only available on the top Helix models but that is not the end of the

story. The high sampling rate of 96 kHz also enables fine time steps of 0.01 milliseconds or 3.5 millimeters, another premium feature. In addition, the DSP Ultra S uses 2000 samples each for the time of the virtual and output channels, which enables a generous 7 metres of distance compensation. Time alignment and equalizing are available for both the inputs and outputs, where measurements can also be taken. With the help of a measuring microphone, frequency responses in the car can be measured very easily to optimize equalizing and crossovers, while on the input side, the Input Signal Analyzer can measure the electrical inputs. If you connect a sound card, you can benefit from the Advanced ISA, which enables real-time measurements and can be used to track down equalizing, all-pass filters and time differences at the in-



As an alternative to normal routing, Virtual Channel Processing can be used to combine channel groups and equalize them across the crossover frequencies



The VCP provides an additional channel level between input and output channels. Routing takes place in two steps, first inputs to virtual channels, then virtual channels to outputs

Conclusion

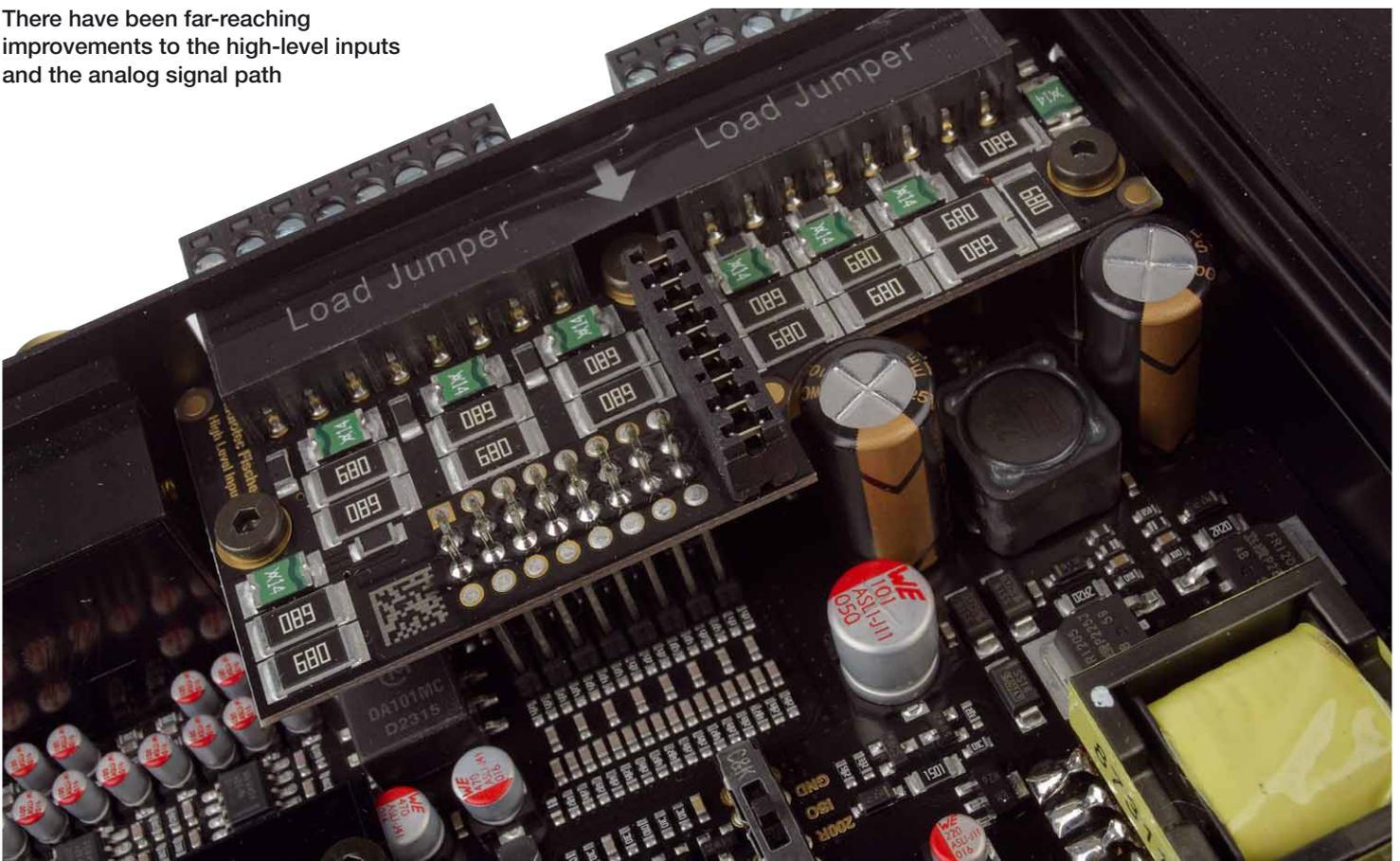
With the DSP Ultra S, Helix has proven that even excellent devices can be optimized a little further. The new Helix flagship offers the very best hardware and features and, like all DSP products from Audiotec Fischer, benefits from the best software on the market, the DSP PC-Tool. The fact that the price has remained the same is of course pleasing and very rare these days. The bottom line is that the DSP Ultra S is the ultimate machine in the DSP landscape and a clear recommendation when it comes to top sound quality.

Elmar Michels

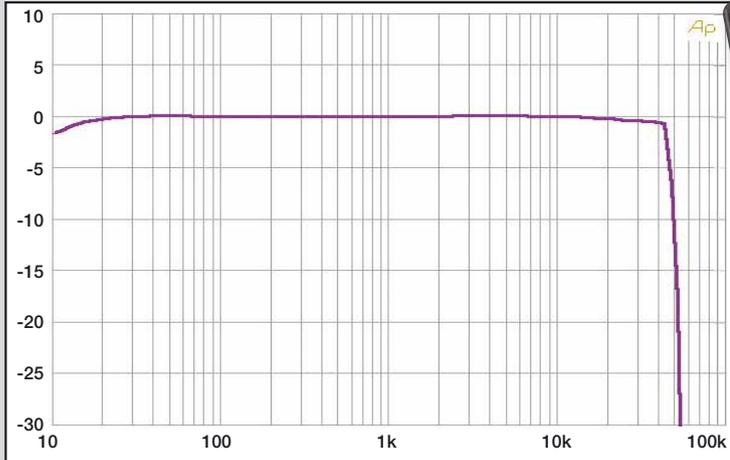
puts. There are plenty of additional expansion options, such as via the HEC slot, from hands-free speakerphone to wireless programming or streaming to hi-res streaming via USB, there are plenty of accessories

available to tailor the DSP Ultra S to your own needs. And the in-house smart remote controls Director and Conductor offer a level of operating convenience that is unique on the market.

There have been far-reaching improvements to the high-level inputs and the analog signal path



CAR & HiFi Laboratory



Thanks to its 96 kHz sampling rate, the DSP Ultra S is ideally equipped for hi-res music and can handle a frequency range of over 40 kHz



Helix DSP Ultra S

Price 1,200 Euro
 Contact Audiotec Fischer, Germany
 Internet www.audiotec-fischer.com

Specifications

Dimensions (L x W x H in mm) 177 x 170 x 40

Inputs

- 8-channel RCA
- 8-channel High-level
- 1 x digital S/PDIF (optical)
- 1 x digital S/PDIF (coax)
- Sensitivity Low: 8V, High: 11/32 V (via jumper)
- 6 x gain control

Outputs

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

DSP-Channels

- 12 Outputs + 12 virtual channels

DSP-Software (V 5.04)

Equalizer

Inputs:

- param., 5 bands per channel

Virtual channels:

- param., 30 bands per channel

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, f and Q adjustable

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 (0,01 ms)

Inputs:

- 0 – 5,20 ms, 512 samples

Virtual channels:

- 0 – 708 cm (20,82 ms), 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

- Ground lift switch against humming
- 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
- 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 (optionally activated), 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
- Measurement microphone MTK1
- HEC Extension Cards



Musway M5 – 5-channel amplifier with 9-channel DSP

Five channels in the smallest of spaces

► After Musway had gained a foothold in the field of DSP amplifiers with the classic M6, the range grew continuously. We examine the latest creation, the M5.

BEST PRODUCT

Top Class

CAR & HiFi
INTERNATIONAL 3/24

BEST EMC

Undisturbed FM reception

CAR & HiFi
INTERNATIONAL 3/24



MUSWAY
HIGH QUALITY SOUND SYSTEM

When Musway presented the first DSP amplifier of the M series in Europe in 2018, the original M6 provided a breath of fresh air in the scene. For the first time, there was a serious DSP product that did not come from the usual suspects. Since then, the M6 is now in its third generation as v3, and with the recently released M6Pro, Musway has delivered a real performance hit. In addition, the top models, M12 and M10, also score points with serious power and can supply even complex audio installations. Now is the time to round off the program at the bottom, so our test candidate, M5, takes to the stage. It is available as the M5Evo for 550 EUR with a short cable set with loose ends, and the

variant called M5 for 580 EUR comes with a 2.5-meter plug-and-play cable set for ISO connectors. There are also specific cable sets available from the Musway dealer for various vehicles. Let's stay with the accessories for a moment because they are impressive. Not only is a plug-and-play adapter for subwoofers included, but DRC1, BTA2, BTS, and BTS-HD, a display remote control, and Bluetooth dongles are also available as optional accessories. The Bluetooth extensions enable audio streaming; the BTA2 also allows programming via the app, and the BTS-HD streaming in BT5.0 quality,

including aptX-LL and aptX-HD. In any case, the M5 offers four speaker-level inputs, equipped with EPS for diagnostic circuits and an automatic turn-on function. In addition, there is a pair of RCA inputs as an analog AUX source. A digital input in the form of an optical S/PDIF is also included. The digital sources (including Bluetooth) can be switched when signals are input, and vehicle sounds and incoming calls can also be added.



The digital board houses the DSP and the inputs for Bluetooth and S/PDIF



Robust power supply and amplifier ICs for the four small channels; the bass channel works with MOSFETs



The M5 offers four processed outputs and two RCA jacks for the AUX input. The speakers dock via a Molex connector



M5 5-CHANNEL AMPLIFIER WITH 9-CHANNEL DSP



The PC software shows all essential functionality in the main window

After opening the tiny (15 x 10.5 x 4.5 centimeter) case, the digital board presents itself, on which we find the DSP, the connections to the PC, BT, and digital source, as well as the RCA jacks. A 32-bit ARM processor takes over control, and we also find two excellent key components that can be found in

a variety of DSPs: the ADAU1452 DSP from Analog Devices and the BB PCM3168 converter from Texas Instruments. The PCM3168 offers 6 AD converters and eight DACs with 24-bit resolution, which is enough for the four speaker level inputs and the stereo AUX input. A small 2-channel DAC for the digital sour-

ces supports the eight D/A converters, so nine DSP channels can be handled – there would even have been room for a tenth. However, we also take note of the four processed outputs since there is often only a single output for a subwoofer. Our M5 doesn't need it at all because after removing the digital board, the

Software

All Musway DSPs can be programmed using PC desktop software or an Android app, the latter in conjunction with the optional BTA2 accessory. Except for routing and minor details, all relevant settings can be found in one window. When routing, it is essential to note that it is not enough to meter the inputs in the routing matrix; the correct checkmark(s) must also be set in the main window. There are bandpass crossovers for all channels up to 48 dB/octave in three characteristics. Programming the crossovers is a bit of a hassle, e.g., with odd orders for Linkwitz or varying attenuation at the set crossover frequency. However,

the crossovers work in principle. The EQ bands can be set fully parametrically, and there is also time alignment of the outputs in 0.02 ms or 7 mm steps. Conveniently, the time or path is displayed precisely and in plain text, without any frills such as coarse and fine adjustment. The frequency window clearly shows what is happening, and the EQs are also easy to operate (also via the keyboard). The grouping of channels is well solved; a bridge circuit can also be displayed, and up to four channels can be combined into a subwoofer group, which is then recognized by the optional remote control. The extras are few, but they are

important. We have a power-saving cut-off for Can vehicles, a setting for switching through vehicle sounds, and an auto-mute function to prevent crackling. Furthermore, the M12 offers an input pin for the reverse gear, which feeds in the vehicle sounds. This means that the Musway software is not the most complete on the market, but in most cases, it enables problem-free operation. A big plus point is the Musway „Tunest“ app, which, in conjunction with the BTS2, allows complete DSP programming and enables remote control functions such as master and sublevel, source selection, and source selection.



Master and sub levels in the Android app



EQ settings in the Android app

amplifier presents itself as a super-compact 4 + 1 channel unit in the smallest of spaces. Two two-channel amplifier chips supply the four small channels, which are filtered by four encapsulated low-pass coils from the Class-D PWM clock in an audio-compatible manner. Channel 5 has four macroscopic output transistors and a significantly larger low-pass coil. The bulky power supply and the 40-ampere fuse show that we should not expect the M5 to be just a tiny sound-booster box for the factory radio but a serious five-channel amplifier.

Measurements and sound

Like all Musway DSP products, the M5 does without a HiRes frequency range and a high sampling rate. The sampling rate is the usual 48 kHz, resulting in 0.02 milliseconds or 7 millimeters steps for time alignment. Mastering the audio functions of the PC software and app takes little time to get used to; everything works transparently and is easy to understand (except for the filter slopes for high- and low-pass, which are only remotely related to the designations Butterworth, Bessel, and Linkwitz). However, the M5 is convincing in

Specifications

Inputs

- 4-channel high-level with autosense
- 2-channel AUX/RCA
- 1 x digital S/PDIF optical
- Sensitivity 6 V (RCA), 18 V (high level)
- 2 x gain control (high level, AUX)

Outputs

- 4-channel RCA
- Remote-out

DSP-channels

- 9

DSP software (V3.4 beta in test)

Equalizer

Outputs

- parametric, 31 band per channel, +15 – -15 dB
- 20 – 20k Hz, 1 Hz steps, Q 0.1 – 10

Crossovers

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

Time and level

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

Outputs

- 0 – 602 cm (17.7 ms), 1024 samples
- Phase 0, 180°
- Level steps 0.1 dB, mute

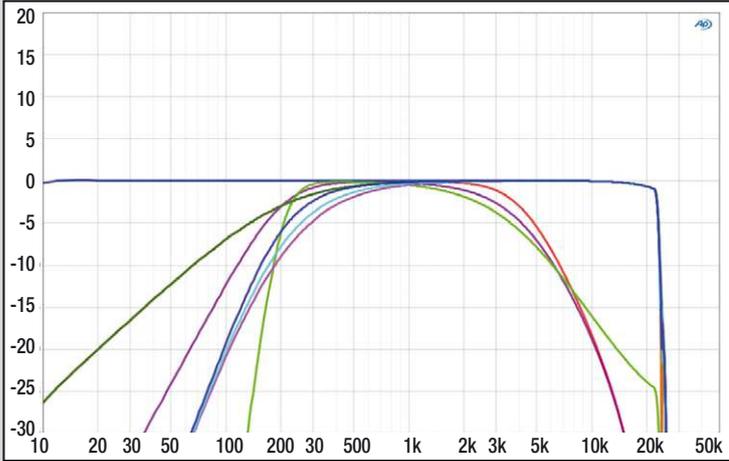
Features

- 6 presets
- EPS (Error Protection System) for diagnostic function
- Signal dependent switching to Bluetooth or S/PDIF
- Signal dependent switching to high-level for vehicle tones
- Sub setup (subwoofer channels on remote control)
- Power save mode
- Export/import setting via Whatsapp

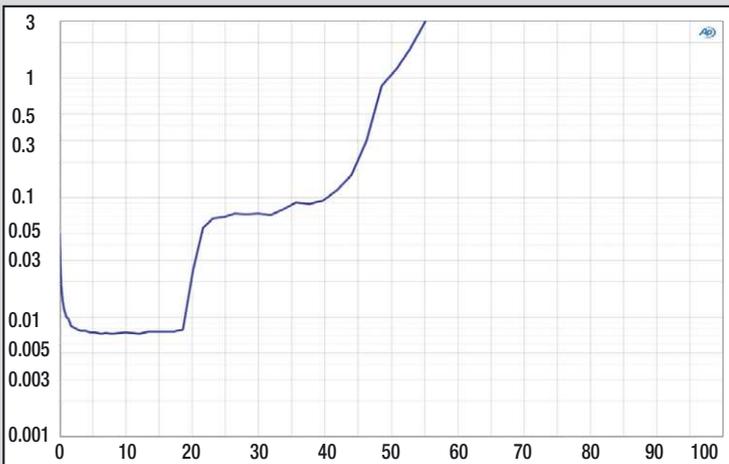
Optional accessories

- Bluetooth dongle BTS (streaming)
- Bluetooth dongle BTS-HD (hi-res streaming)
- Bluetooth dongle BTA2 (streaming + app control)
- Remote controller RC1 (volume, bass level, sources, setups)
- T-harness for various vehicles

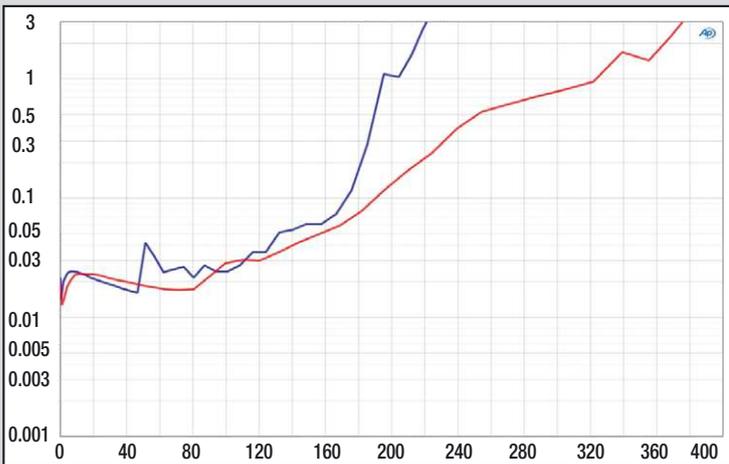
CAR & HIFI Laboratory



The cut-off frequency is 22 kHz due to the sample rate, and the crossovers are programmed without much attention to detail: high pass at 200 Hz (But, Bes, Lin) and low pass at 3 kHz



Channels 1 – 4 are stable at 4 ohms and then deliver approximately 50 watts



The subwoofer channel delivers very clean (full-range) power, namely 200 watts at 4 ohms and 324 watts at 2 ohms



The remote control regulates the master and sub volume, subwoofer groups, and the mute function

practice; with the 9-channel DSP, users have a powerful sound tool at their disposal. The lab test of the power amp channels leaves little to be desired. The four small channels deliver 50 watts at 4 ohms, enough for door speakers; the power is also clean, especially at the lower frequencies, which are more important. However, we would never have expected what comes out of channel 5. It also runs up to 22 kHz and delivers almost 200 watts at 4 ohms, and at 2 ohms, it delivers a stable 324 watts at 1% THD+N – that's just wow! The system power, measured at 4 x 4 ohms + 1 x 2 ohms, is also impressive at 449 watts, a decent 86% of the combined channel power. The M5 also performs admirably in other respects, with very good to excellent values for distortion and residual noise. Sound-wise, the M5 pleases with its lively and



Eine von drei Bluetooth-Quellen: Das BT-HD kann Audiostreaming in HiRes-Qualität



fluid musical performance. Nothing is missing or out of place. Voices and instruments are presented to the ear without coloration, and the bass scores with clean, unexaggerated play and enough punch. The small M5 gets things moving at the subwoofer, where there are also acoustic wow moments when the bass packs a punch and all that with an almost invisible amplifier.

Conclusion

The M5 is not just an affordable amplifier with a plug-and-play option; it's a veritable hit you might easily overlook when standing in front of it. But this little box packs a powerful punch for door speakers and subwoofers, and with the 9-channel DSP, all doors to the XL active system are open. We can only take our hats off to the M5!

Elmar Michels

Specifications

Channels	5
Channel power	
4 ohms W	4 x 49 + 1 x 195
Channel power 2 ohms W	1 x 324
Channel power 1 ohms W	–
Bridged power W	–
System power W	449
Sensitivity max. mV	500
Sensitivity min. V	6,0
THD+N (<22 kHz) 5 W	0,007/0,021
THD+N (<22 kHz)	
half power	0,028/0,024
Signal-to-noise ratio dB(A)	91/91
Damping factor 20 Hz	77/131
Damping factor 80 Hz	76/131
Damping factor 400 Hz	78/128
Damping factor 1 kHz	72/115
Damping factor 8 kHz	16/14
Damping factor 16 kHz	4/4

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	via DSP
High-level inputs	•
Auto turn-on	•, DC
Cinchausgänge	•, 4CH, processed
Start/stop capable	– (7,6 V)
Dimensions (L x W x H in mm)	150 x 105 x 45
Others	9-channel DSP

Musway M5Evo

Price	550 Euro
Contact	Audio Design, Germany
Internet	www.musway.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 %	★★★★★

Top Class



CAR & HiFi
INTERNATIONAL Germany 3/24

Price/performance: very good

„Mini with power
for the whole system.“



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Revelation RX2 PRO – high-end two-channel amplifier from Brax

Engineering perfection

▶ With the RX2 PRO, Brax is announcing nothing less than a superlative power amplifier, packed with innovation and the brand's first Class D design. We were able to get one of the first units to test.



BEST PRODUCT

Absolute Top Class

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BEST EMC

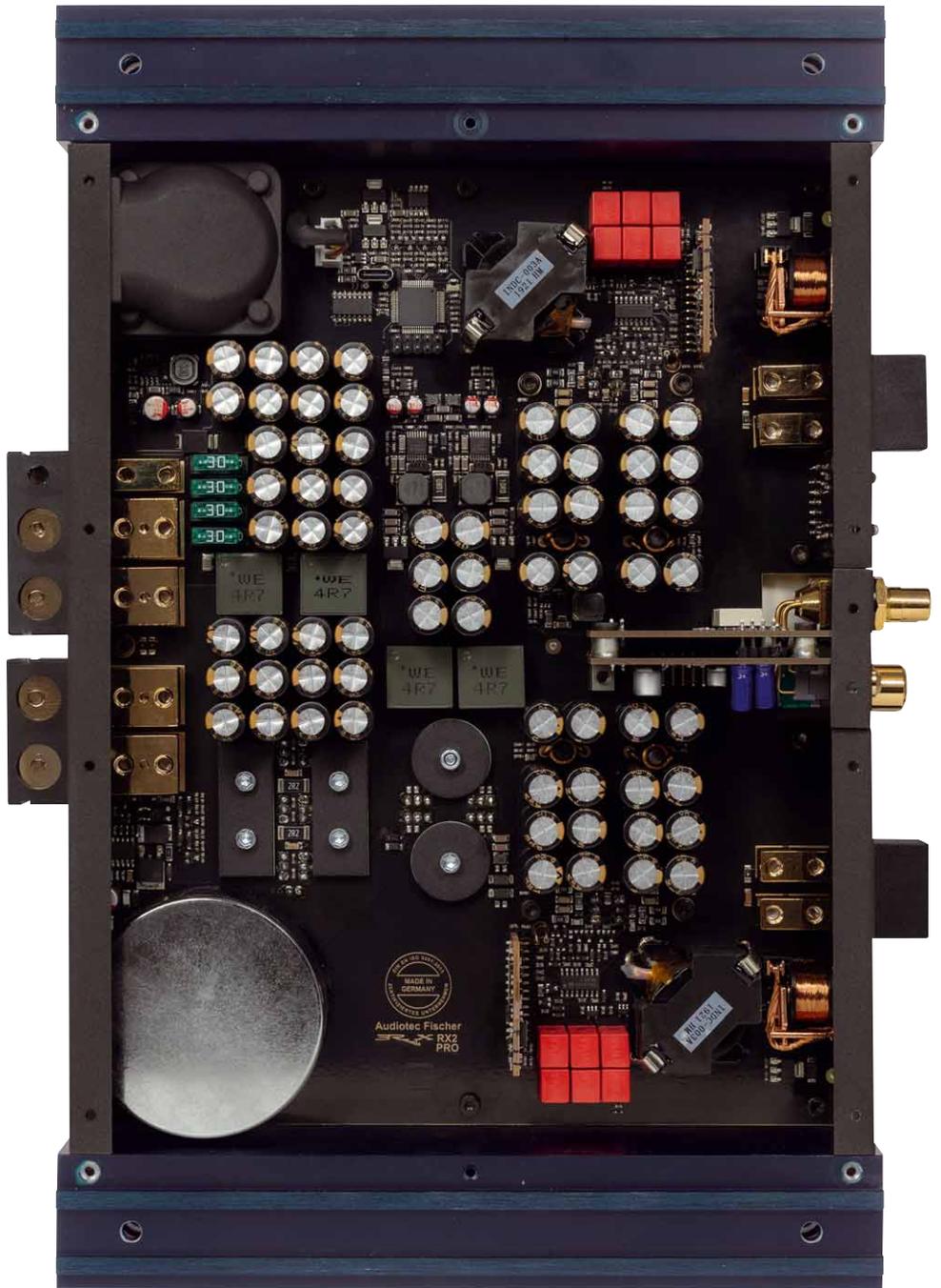
Undisturbed FM reception

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FOUNDERS EDITION
REVELATION
RX2 PRO 0000

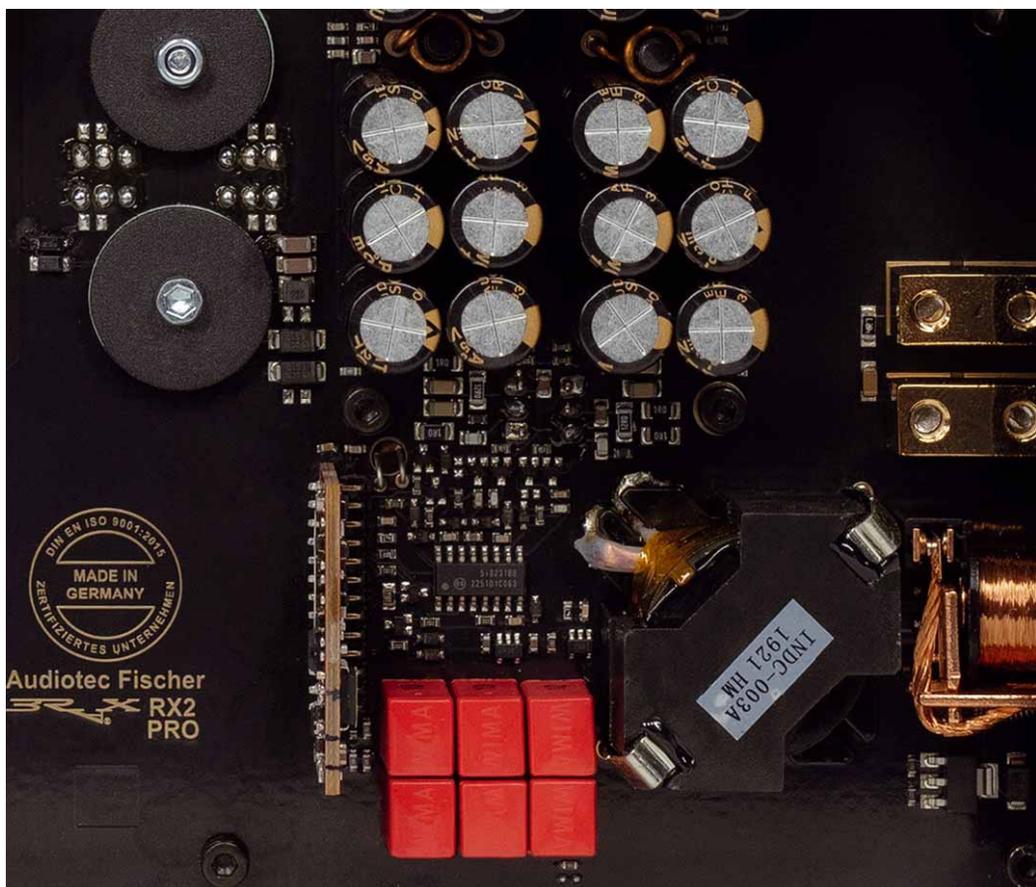
Audiotec Fischer, based in Schmallenberg in the Sauerland region of Germany, maintains the brands Match with small, practical plug-and-play devices, Helix as an all-rounder for everything and Brax as a luxury brand where no effort is spared to deliver the very best. With the two-channel amplifier known simply as the RX2 PRO - or by its full name Brax Revelation RX2 PRO Founders Edition – Brax is now breaking completely new ground. While it has been an absolute necessity so far to only release analog Class AB amplifiers under the Brax name, the RX2 PRO works digitally according to the Class D principle and is comparatively small and compact. For the first time, there is a Founders Edition of 888 units, anodized in “Midnight Blue”. The regular price in silver or black is 3920 euros with analog inputs and 4000 euros with the digital input module;

The left half contains the power supply, buffering and, in the middle, the Brax-typical storage chokes, here in SMD version. At the top left, you can see the air scoop of the fan that blows under the board. The Purifi Eigentakt components with the low-pass filter made of red capacitors and a large coil are easy to see. Next to the speaker outputs are the high-end relays, which have their own control circuit. On the right in the middle is the analog input module

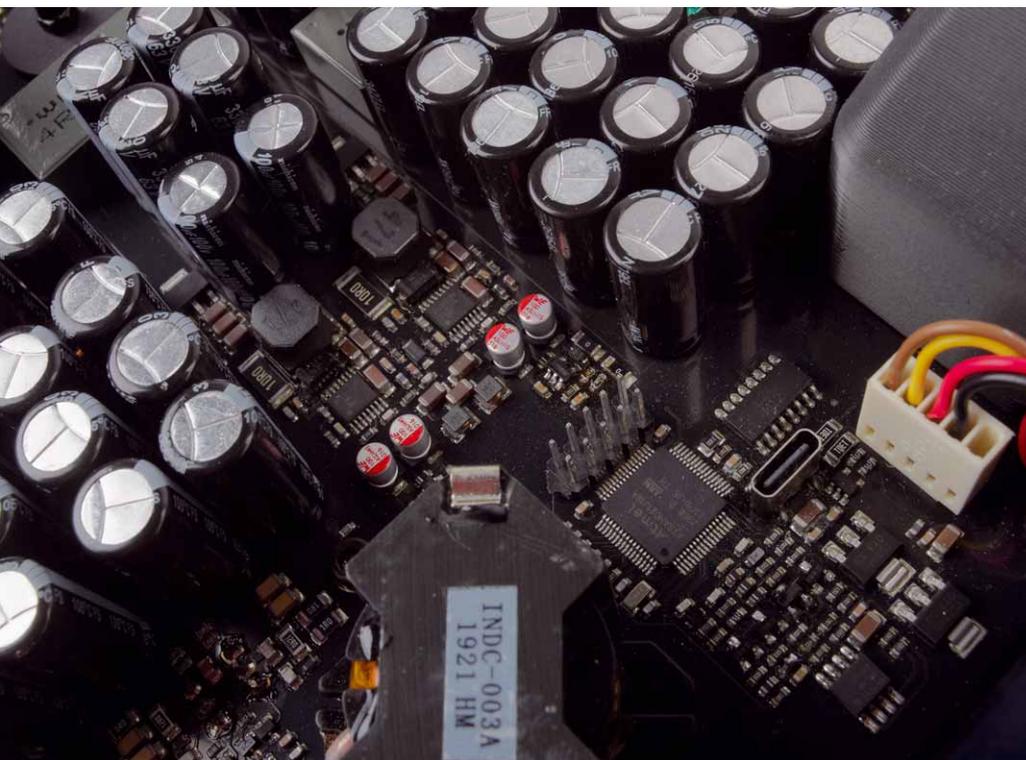


The input module is located in the middle, in our case the analog version with RCA sockets

for the Founders Edition, 500 euros extra need to be spent in each case. The analog input module we used in the test comes with a ground lift switch and, as a special feature, two particularly low-distortion Burr Brown OPA1612s work “against each other” as differential amplifiers, in which interference is canceled out, which is not a disadvantage in a car. The digital option is the first one in the car audio sector to feature a digital-to-analog converter from ESS, which was previously not available in automotive specifications. This wonder weapon aims to impress with measurements that have never been seen before in car audio. The DAC’s power supply is also remarkable, with a dual voltage regulator developed by ESS being used. The capabilities of the digital module and the entire RX2 PRO can be optimally explored with the Brax DSP as the RX2 PRO’s play partner;



Characteristic circuit with buffer capacitors, daughter board, driver chip and low-pass filter



A 32-bit ARM microcontroller monitors the power supply and numerous control functions

incidentally, the power amplifier housing has the same form factor. The digital signal transmission of the two is always optimal thanks to the in-house DiSAC (Digital Signal Analog Controlled) volume control. This is because the bit depth of the signal is not reduced to make it quieter, which leads to a loss of sound quality, but volume information is encoded into the digital music signal and transmitted digitally. In the digital input module, the whole thing is decoded again and the ESS DAC is started with optimal control. The power supply of the RX2 PRO is hidden under a chrome cover and comes from the renowned manufacturer Vakuumschmelze, where special and complex core materials for the transformer are used; this has also been common practice at

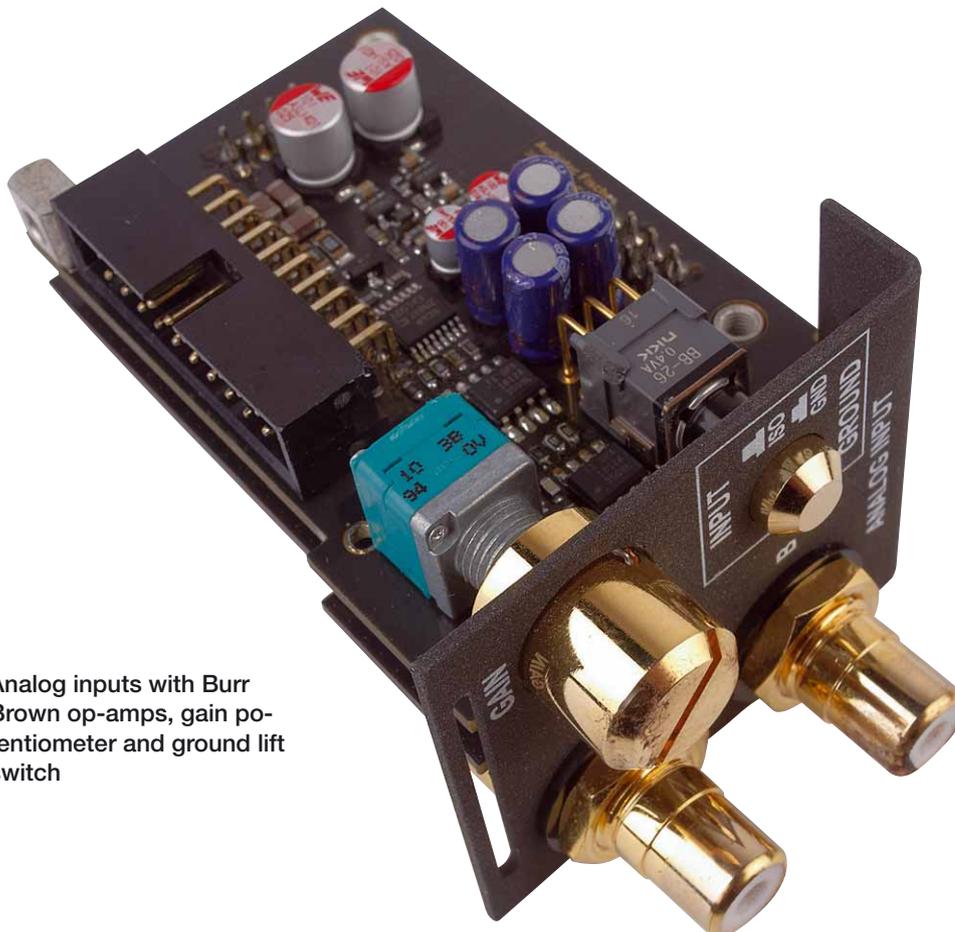


The digital input module offers an optical and a coaxial input, DiSAC volume control is supported

Brax so far. A new feature is the extensive control, which guarantees safe operation with a rock-solid power supply from 6 volts in start-stop vehicles to 18 volts in full-electric vehicles. In addition to many other control and monitoring functions (e.g. short circuit, speaker diagnosis,

ground fault, DC components, etc.), an Atmel ARM processor is responsible for this, as can also be found in DSP products from Audiotec Fischer (ACO platform). On a side note, the power supply has also become more efficient than anything comparable, which is always of the utmost im-

portance for the future. All power components are installed under the main board on the heat sink and are cooled as needed by a fan that blows air from outside directly under the board. Of course, the whole thing is regulated and infinitely variable – so what is the controller for? The actual amplification is a novelty not only in the automotive sector but also for Brax. Here, the engineers at Audiotec Fischer draw on a patented Class D design from the Danish development company Purifi. The Class D principle, which has been highly praised in home hi-fi circles, manifests itself in the form of a “self-clocking” circuit that works extremely broadband with high clocking, independently of the load and with low distortion. Once again, error prevention leads to a better product being developed, but before self-clocking could work in the RX2 PRO, the Brax developers had a huge amount of work ahead of them. Because it is not as simple as just bolting the finished home hi-fi module to a car hi-fi power amplifier and everything will run perfectly. It starts with the operating range of the circuit, which was only suf-



Analog inputs with Burr Brown op-amps, gain potentiometer and ground lift switch

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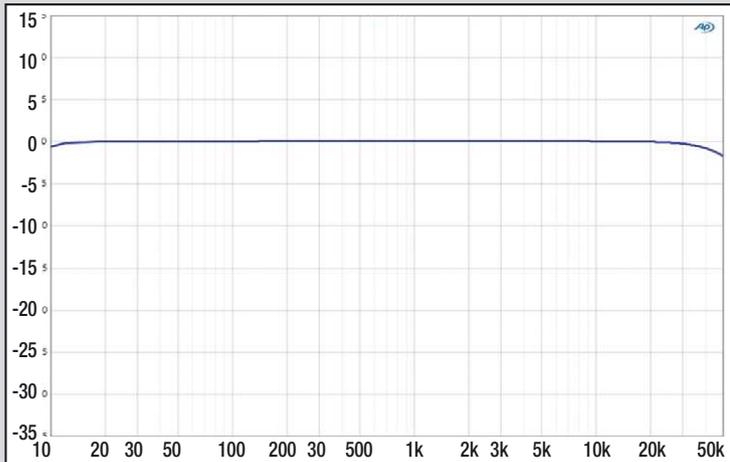
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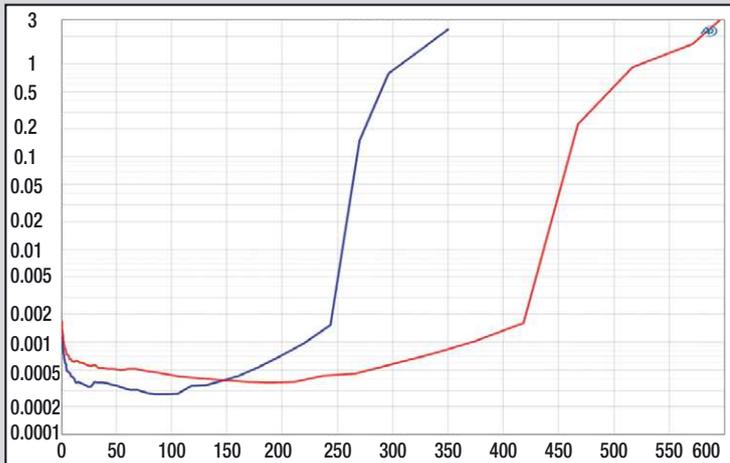


**Michael E. Brieden
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The Test-Specialists
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CAR & HIFI Laboratory



The RX2 PRO makes the famous dash, and without overshoot, thanks to the Class D low-pass filter



The Brax works perfectly even at very low power levels and remains so up to 300 or 500 watts. There is one more zero in the diagram than usual, so THD+N goes down to below 0.0003 % – a new record

Brax-typical power connections with extra access for a buffer capacitor



ficient for up to 70° Celsius, which is unacceptable for automotive applications. Not 100% short-circuit proof? Unacceptable. Lacking perfect electromagnetic compatibility? Unacceptable. Minimal noise when switching on and off? Unacceptable, at least for a Brax. In the end, so much new and additional development work was required that it was also a new development project for the Purifi engineers. Just one example is the numerous control loops; even the Brax-typical output relays were given their own control, as were the output filters. Overall, this joint development project led to a new version being developed, with its own special hardware and firmware. The typical Purifi components such as the six red capacitors, the thick low-pass coil, the upright circuit board with the controller (which also features an OPA1612, by the way) and the gate driver chip can be found on the RX2 PRO circuit board. What you cannot see is the three years of development work that went into this amplifier before you could confidently write Brax on this amplifier. Incidentally, the main board itself is eight-layered, which is probably a record for a two-channel output stage. This was necessary not only because of the high-power density in terms of cross-section and efficiency, but also because the ultra-fast and sensitive control loops require the best shielding, and the extreme measurement values that Purifi is proud of can only be achieved if the compensation circuits function perfectly.

Measurements and sound

The proprietary clock circuit is well known, but what the RX2 PRO delivers here is unparalleled in the automotive sector. Due to the tight negative feedback, the internal resistance of the amplification drops to zero, with correspondingly high damping factors, for which three decimal places are no longer sufficient. In some areas, the Brax exceeds the limits of our already impressive Audio Precision measuring station, which is why we had comparative measurements with AP's top model. Results such as the damping that does not go too high in the frequencies or the lack of overshoot in the frequency response, which is otherwise typical for Class D, prove the compensation of the low-pass filter effects in the RX2 PRO. Sensationally low noise is a given, and when measuring power,

we had to add a zero after the decimal point in the diagram because the RX2 PRO delivers a whole order of magnitude better values than a normal power amplifier. In fact, the RX2 PRO is the best power amplifier we have ever tested. The fact that it delivers 300 and 500 watts at 4 and 2 ohms is nice, but even more impressive is that the ultra-low distortion from less than one watt to maximum power is consistently low and is the same at 2 or 4 ohms.

In the listening test, the excitement reached new heights when the RX2 PRO was allowed to show what the result of all the effort was. Rarely have we heard an amplifier that performs with such clarity and tidiness. The soundstage is crystal clear in front of the listener, and there is so much air between the musical performers that everything else suddenly sounds flat and canned. Perhaps the most impressive thing about the RX2 PRO's performance is the way it demonstrates its dynamic capabilities when played back through excellent recordings. From the blackest silence to the sound turbulences, this power amp seems to have endless reserves. But easy listening is also great fun, with the music flowing effortlessly and lightly into the listening room. Vocal reproduction is simply satisfying, and the balance from the lowest bass to the highest treble is just right. This is an extraordinary performance that opens your eyes and ears.

Conclusion

With the Revelation RX2 PRO, Brax delivers nothing less than a masterpiece of amplifier design. This is what high-end audio should be: no frills, no voodoo, just pure engineering.

Elmar Michels



Brax RX2 PRO

Price um 3,920/4,420 (F.E.) Euro
 Contact Audiotec Fischer, Germany
 Internet www. audiotec-fischer.com

Rating

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

Specifications

Channels	2
Channel power 4 ohms W	306
Channel power 2 ohms W	524
Channel power 1 ohms W	0
Bridged power 2 ohms W	1048
Bridged power 1 ohms W	0
Sensitivity max. mV	1000
Sensitivity min. V	7,8
THD+N (<22 kHz) 5 W	0,001
THD+N (<22 kHz) half power	0,000
Signal-to-noise ratio dB(A)	108
Damping factor 20 Hz	13208
Damping factor 80 Hz	12416
Damping factor 400 Hz	12355
Damping factor 1 kHz	12560
Damping factor 8 kHz	-
Damping factor 16 kHz	-

Features

Low pass	-
High pass	-
Band pass	-
Bass boost	-
Subsonic filter	-
Phase shift	-
High-level inputs	-
Auto turn-on	-
Cinchausgänge	-
Start/stop capable	• (6 V)
Dimensions (L x W x H in mm)	310 x 200 x 56
Others	Analog or digital input

Absolute Top Class



CAR & HiFi
 INTERNATIONAL Germany 3/24

Price/performance: very good

*"Superlative in every respect
 – a masterpiece."*

Audio System H-1500.1 D (24 V)
– compact powerhouses (also) for truckers

Compact Power

▶ Audio System is introducing the new Helon amplifiers.
We have the smaller model, the H-1500.1 D,
in two versions for testing.

SOUND AWARD

Top Class

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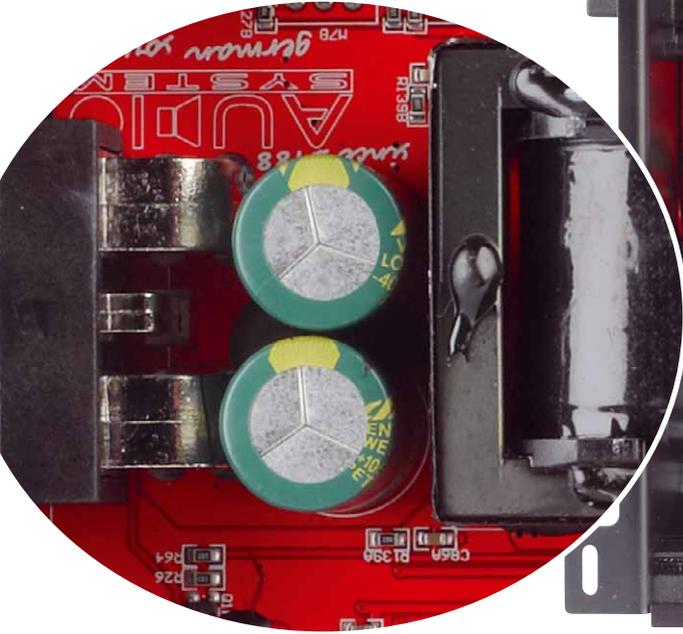
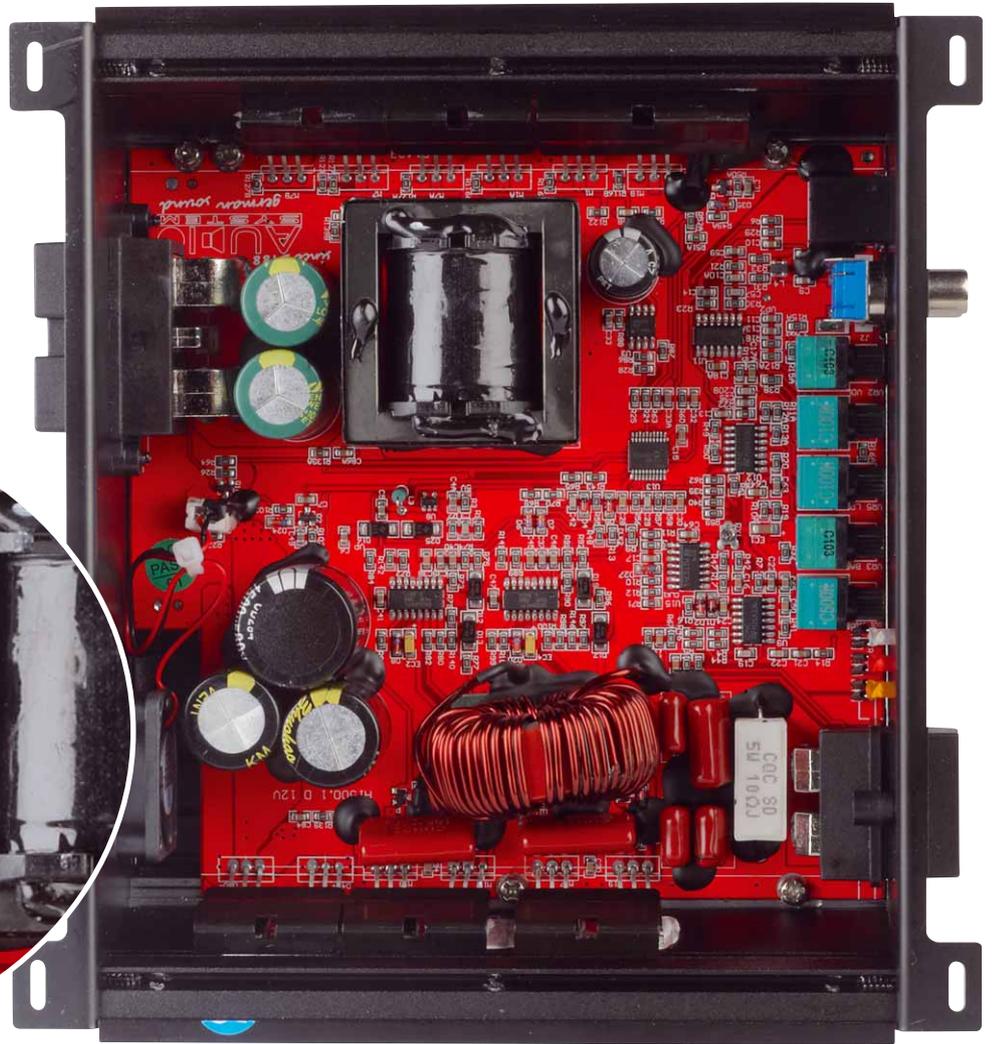
BEST EMC

Undisturbed FM reception

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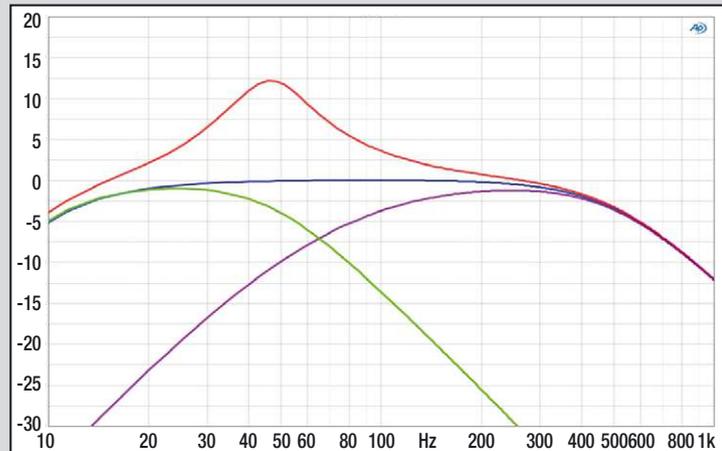
At Audio System, the H or He-Lon amplifiers are synonymous with power ad infinitum. Available only as a mono, the fun starts at one kilowatt. SPL fans are currently being treated to the H-5000.1 D, a 5-kilowatt, 9-kilogram battleship of an amp. The 5000 series was reintroduced last year and is the epitome



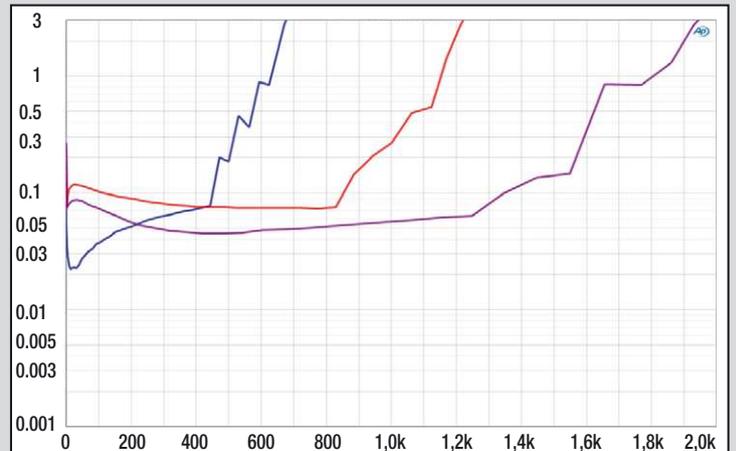
The 12 and 24 V versions differ in the ratio of the transformer, optically only in detail

Modern design with microcontroller and two Class-D drivers

CAR&HIFI Laboratory



The H-1500.1 D's filter equipment is impressive. The bass boost can be turned up to 12 dB



The H-1500.1 D has significantly more power than the stated 375, 750, and 1500 watts; the differences to 24V are marginal

of old-school SPL mono amps, with plenty of copper inside and an armada of power transistors. The new H-1500.1 D is quite different. With a footprint of just 19 x 13 centimeters, it almost seems dwarfed by its big sister, and it is a far cry from its 9-kilo predecessor. The H-1500.1 D is an example of the amplifier design casually referred to as the “Brazilian style”: enormous power with few small components. In the past, this was paid for with a lot of high-frequency interference, but that – let’s say that much – is a thing of the past, at least with the H-1500.1 D. In practice, another thing is more of a problem with the H-1500.1 D, namely the lack of speaker level inputs. While it is still possible to argue that a 5-kilowatt board would always be operated with an aftermarket radio, the small H-1500.1 D could be easily integrated into a modern system. However, Audio System dealers are happy to help with a high-low converter that solves the problem with the original radio at an extra charge. The two RCA sockets on the H-1500.1 D are not stereo inputs that are summed in the amplifier but a mono input and a corresponding output. Otherwise, the H-1500.1 D has all the features you could wish for. A remote control is included, and, in addition to the low-pass filter, there are controls for subsonic, boost, and phase. The speaker connections are enormous, and the power terminals can accommodate cables up to approx. 30 square millimeters in size. Next to the terminals is a small, quiet fan that is one inch in size and is correspondingly loud when it is running.



Specifications

Channels	1
Power 4 ohms	634
Power 2 ohms	1158
Power 1 ohms	1811
Sensitivity max. mV	370
Sensitivity min. V	3,0
THD+N (<22 kHz) 5 W	0,027
THD+N (<22 kHz) Half Power	0,072
Signal-to-noise ratio dB(A)	78
Damping factor 20 Hz	4472
Damping factor 40 Hz	4472
Damping factor 60 Hz	4472
Damping factor 80 Hz	4472
Damping factor 100 Hz	4472
Damping factor 120 Hz	4472

Features

Low pass	50 – 500 Hz
High pass	–
Band pass	10 – 500 Hz
Bass boost	0 – 12 dB/45 Hz
Subsonic filter	10 – 100 Hz
Phase shift	0 – 180°
High-level inputs	–
Automatic switch-on (Autosense)	–
RCA output	• mono
Start/stop capable	• (6,9 V)
Dimensions (L x W x H in mm)	184 x 117 x 59
Others	Remote control

Audio System H-1500.1 D

Price	375 Euro
Contact	Audio System, Germany
Internet	www.en.audio-system.de

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 %	★★★★★

Top Class



CAR & HiFi

INTERNATIONAL

Germany 3/24

Price/performance: excellent

„Plenty of power
in a compact package.“



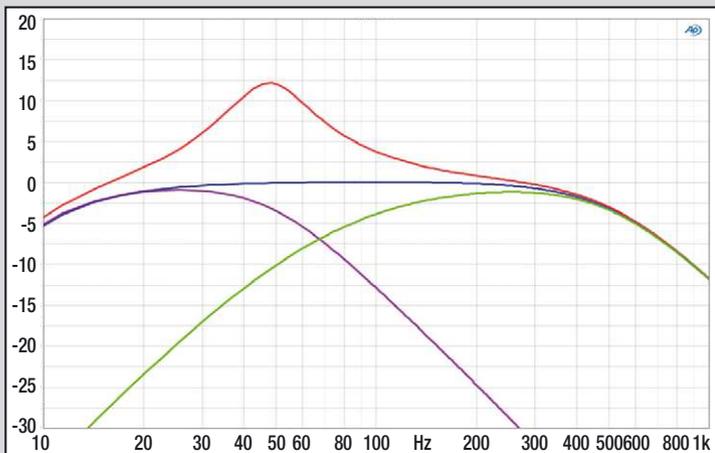
Good features with signal output and the included remote control, plus a subsonic filter and adjustable phase. The speaker terminals are in XXL format

Externally, the test amplifiers differ only in the abbreviation 24V, which indicates operation in 24-volt on-board systems. The H-1500.1 D 24V is intended for trucks and buses, while the H-1500.1 D 12V is designed for passenger cars with a 12-volt on-board electrical system. Inside, you also have to look twice to see the differences. The reinforcements and buffers are the same, but the power supplies differ slightly. The re-

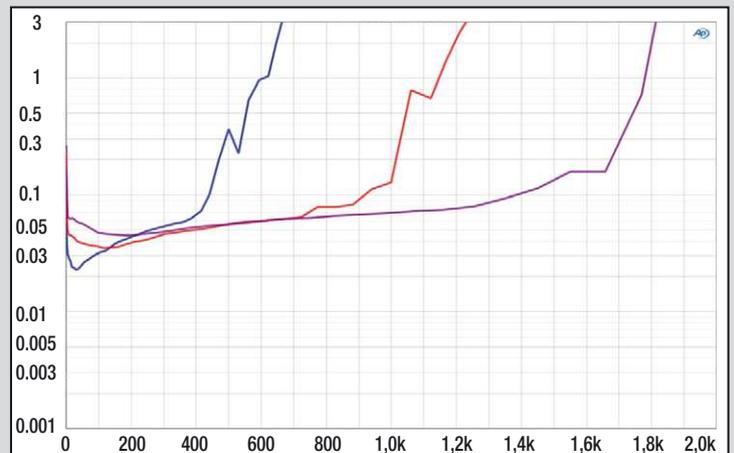
ason for this is that the 24V needs a different transmission ratio at the power supply transformer to generate the required (higher) rail voltage. The 12V has to work harder, so it has two more MOSFETs in the power supply than the 24V, which already has a higher input voltage. The transformers themselves are similarly dimensioned, and in both, a small Motorola controller takes over management, which is “smarter” than the good old TL494 for

controlling the power supply pulse width modulation. In addition to four operational amplifiers for implementing the commands of the filter potentiometers, we also find two class-D driver ICs from Infineon/International Rectifier. The H-1500.1 D affords itself the luxury of processing the two half-waves of the signal separately. Furthermore, the chips have a special feature:

CAR&HIFI Laboratory



The H-1500.1 D 24V has the same input section as its 12V sister, with a subsonic filter, lowpass, and boost; everything is included



The H-1500.1 D 24V has slightly neater distortion curves and is unimpressed by the applied load

a PWM input instead of an analog signal input. Finally, as always, the Class-D low-pass filter recovers the signal, consisting of a large toroidal core coil and some film capacitors.

Measurements and sound

The amplifiers perform excellently in the laboratory test, with no relevant difference between the 12 and 24-volt variants. There is no interference in the FM and DAB spectrum; start-stop should not be a problem. With a signal-to-noise ratio of 78 dB, the amps are in the green range; the damping factors are at the measurement limit. And there is plenty of power, even with extremely low distortion at 4 ohms. At 1 ohm, it is possible to trigger the power limitation by employing severe abuse. Still, the amplifiers do not mind; this only occurs well above the specified power. We determine around 630 watts at 4 ohms, and at 2 ohms there are already 1170 watts. The amplifiers are stable at 1 ohm and can push an impressive 1800 watts into the load resistors. It's no wonder that the H-1500.1 D has no problem driving subwoofers. The bass sounds are controlled and heavy, and even low vibrations are reproduced. But crisp bass drums are no problem either; the amplifiers even play these with a sense of emphasis.

Conclusion

With plenty of power from compact enclosures, the H-1500.1 D is much more modern than the well-known old-school bass amps. The price-performance ratio is spot-on, so the amps will surely find many friends.

Elmar Michels



Specifications

Channels	1
Power 4 ohms	625
Power 2 ohms	1176
Power 1 ohms	1778
Sensitivity max. mV	310
Sensitivity min. V	3,0
THD+N (<22 kHz) 5 W	0,028
THD+N (<22 kHz) Half Power	0,059
Signal-to-noise ratio dB(A)	78
Damping factor 20 Hz	4472
Damping factor 40 Hz	4472
Damping factor 60 Hz	4472
Damping factor 80 Hz	4472
Damping factor 100 Hz	4472
Damping factor 120 Hz	4472

Features

Low pass	50 – 500 Hz
High pass	–
Band pass	10 – 500 Hz
Bass boost	0 – 12 dB/45 Hz
Subsonic filter	10 – 100 Hz
Phase shift	0 – 180°
High-level inputs	–
Automatic switch-on (Autosense)	–
RCA output	• mono
Start/stop capable	• (6,9 V)
Dimensions (L x W x H in mm)	184 x 117 x 59
Others	Remote control

Audio System H-1500.1 D 24 V

Price	400 Euro
Contact	Audio System, Germany
Internet	www.en.audio-system.de

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 %	★★★★★

Top Class



CAR & HiFi

INTERNATIONAL

Germany 3/24

Price/performance: excellent

„Plenty of power
in a compact package.“

ESX DBX208BPA + DBX208BPQ – Bandpass subwoofers with a twist

Bass for limousines and convertibles

► With the new DBX bandpass woofers, ESX has thought very practically. We test the active/passive duo and explain the twist.





FLEXPORT





ESX offers a range of practical subwoofer boxes. Aside from the powerful QXB top series, you can often find space-saving bass boxes for mounting in the spare wheel mold or under the seat, and the “normal” DBX line is typically equipped with small woofer drivers so that the

boxes in the trunk are unobtrusively small. Even the top models are “only” equipped with two eight-inch woofers and are still nice and compact. Now, with our DBX208BP, two models are being added that are no longer quite as compact but all the more practical. Inside are also

two eight-inchers, but not the same ones as in the well-known boxes. They come with woofers specially developed and tailored to the application. With a double ferrite motor, they have plenty of power for their 50-millimeter voice coils. The air-dried paper cones and the stamped



Two of the 8-inch woofers with paper cones work in each enclosure



The bass driver was given a double ferrite motor



Here, the bandpass is open towards the trunk



Stamped metal frame with ventilation openings and punched top plate on the 20 cm woofer

frames are as before. Build quality is top-notch, with the boxes made from sturdy 16-millimeter-thick medium-density fiberboard. The high-quality felt cover stands out pleasantly from cheap boxes, and the metal applications are also pleasing. In contrast to the other ESX woofers, these are not bass-reflex woofers. The DBX208BP work according to the band-pass principle. The two drivers are hidden in the box but do without acrylic panels and lighting for show purposes; instead, these bandpasses rely on a discreet, dignified look. The design of the boxes is such that each woofer plays in an outer closed chamber, while both eight-inchers share the ventilated volume in the middle. The ventilation port, which at 155 square centimeters corresponds to a pipe with a diameter of 14 centimeters, is also located in the middle – enough for two 20s. And it is this port that makes a twist possible, the actual highlight of the DBX bandpasses, which is likely to be the deciding

factor for many buyers. Owners of convertibles or sedans with tightly closed trunks are familiar with the

Specifications

Dimension w	78,0 cm
Dimension h	29,0 cm
Dimension d	29/39 cm
Box type/volume	BP 55 l
Reflex port (d x l)	155 cm ² x 25 cm
Weight	23,4 kg

Nominal diameter	6.5"
Nominal impedance	4 Ohm
Voice coil diameter	2"
Power @ nom. imp.	404 W
Sensitivity RCA max	170 mV
Sensitivity RCA min	5,3 V
THD +N (<22 kHz) 5W	0,07 %
THD +N (<22 kHz) Halblast	0,16 %
SNR (A-wgt)	85 dB

Features

Low pass	40 – 120 Hz
Bass boost	0 – 6 dB/45 Hz
Subsonicfilter	5-35 Hz/12 dB
Phaseshift	Polarity switch
Low-level input	•
High-level input	•
Auto turn on	DC or signal
Start-Stop capability	• (7 V)
Remote control	•, Gain
Misc.	EPSpro

ESX DBX208BPA

Price	530 Euro
Contact Internet	Audio Design, Germany www.esxaudio.de/english

Rating

Sound	30 %	★★★★★
Bass	7,5 %	★★★★★
Pressure	7,5 %	★★★★★
Purity	7,5 %	★★★★★
Dynamics	7,5 %	★★★★★
Lab	40 %	★★★★★
Frequency response	10 %	★★★★★
Max SPL	10 %	★★★★★
Amplifier power	20 %	★★★★★
Practice	30 %	★★★★★
Features	10 %	★★★★★
Build Quality electronics	10 %	★★★★★
Build Quality mechanics	10 %	★★★★★

Top Class

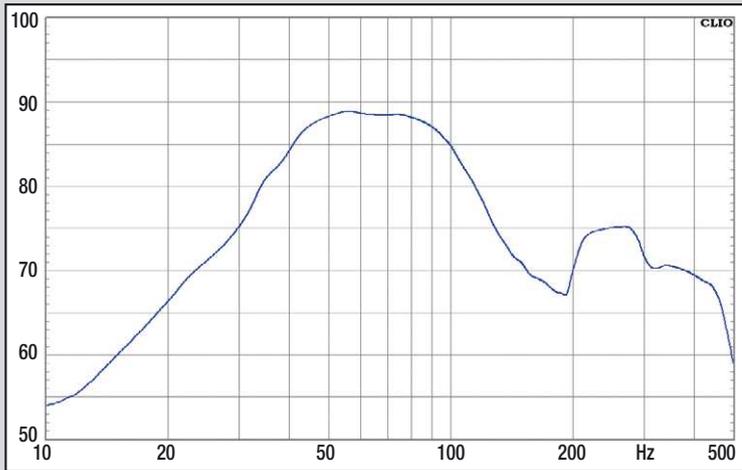


CAR & HiFi
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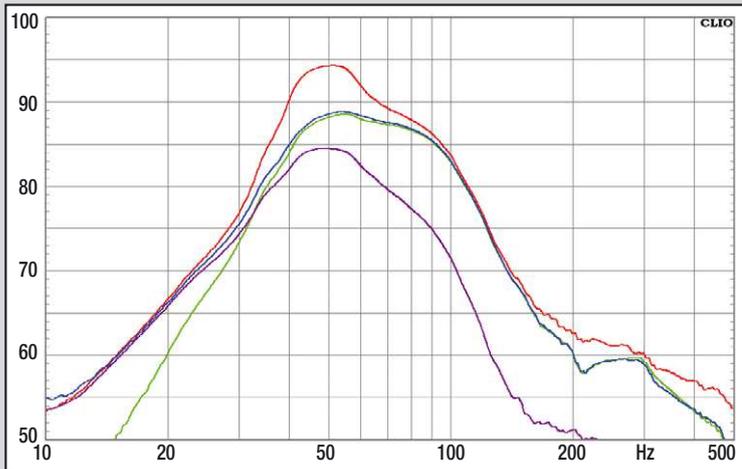
Price/performance: very good

„Thanks to the interchangeable tunnel, it's perfect for the ski bag opening.“

CAR & HIFI Laboratory



The passive bandpass works from 40 to 80 Hz and achieves 89 dB at 1 W



The active bandpass is equipped with a subsonic filter and a boost



The BPQ has a double terminal for the two woofers

problem of the bass not “finding its way out” of the trunk properly. You must either oversize the subwoofer or build a special solution for the ski bag opening. And it is precisely for such vehicles with ski bag openings that DBX bandpasses offer a tailor-made solution: the ventilation port can be moved from the front to the sloping rear wall so that the woofer blows exactly through the ski bag opening. For this purpose, ESX has installed two wooden tunnels for sound guidance in the middle chamber, one at the front and the other above it at the rear. To swap, simply change the aluminum plate with the ESX logo and the aluminum frame of the port. Since the tunnels are the same size, the enclosure’s tuning remains the same; the unused tunnel counts as chamber volume. This is as simple as ingenious because it makes the DBX BPs great problem solvers for ski bag vehicles. The DBX208BPA has an onboard power amplifier module, while the DBX208BPQ is the passive version. This brings us to the next ESX subwoofer in our test, which can benefit from the ingenious Power 4 built-in amplifier because it uses the identical installation opening as the double terminal of the passive version. We recommend the active version here because you won’t get a better amplifier for the moderate surcharge of EUR 180. Of course, if you already have a suitable amp on the shelf, go for the passive woofer.



The BPA impresses with its excellent amplifier, here with a bandpass port for the ski bag opening

Measurements and sound

The power amplifier module, also available individually in 4 or 2-ohm versions, impresses with its excellent integration capability. With EPS Pro, the module offers the best adaptation to all possible factory systems; with its adjustable input impedance, diagnostic head units are not a problem. And with the ability to handle signals up to 40 volts, the active subwoofer also works with premium factory systems with noteworthy amplifiers. In addition, the amplifier is potent for an active subwoofer at 400 watts; in any case, our DBX runs perfectly. Both woofers are identical except for the amplifier, so they are also tuned the same. The tuning is conventional: the woofers take care of frequencies between 40 and 80 hertz, the most essential bass octave. The tuning is not too broad either, and as a reward for this, there is an excellent 89 dB characteristic SPL at just one watt. The clean tuning also makes the woofers sound clean. They hit the beats without any spongy sound and deliver a lot of pressure. The low range is per-



The boxes are not small and weigh over 20 kilograms

fectly adequate for everyday use. If you don't listen to extreme electronic music, you will be very satisfied. Bass drums kick very nicely, and the woofers grant an impressive volume to a bowed double bass, so we recommend them at any time.

bandpass woofers are genuine problem solvers for all vehicles with ski bag openings because they efficiently bring the bass to the front. With top build quality and sensible tuning, they are also excellent woofers for everyone.

Elmar Michels

Conclusion

Whether in a convertible under the hood compartment or in the trunk of a sedan on the back seat, the DBX

ESX DBX208BPQ

Price	350 Euro
Distributor	Audio Design, Germany
Internet	esxaudio.de/english

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 %	★★★★★

Specifications

Basket diameter	21,0 cm
Mounting diameter	18,5 cm
Mounting depth	12,1 cm
Magnet diameter	11,0 cm
Box width	78,0 cm
Box height	29,0 cm
Box depth	29/39 cm
Weight	22,6 kg
Nominal impedance	2 x 2 Ohm
DC resistance R _{dc}	2,17 Ohm
Coil inductivity L _e	1,66 mH
Coil diameter	50 mm
Membrane surface	216 cm ²
Resonance frequency f _s	33 Hz
Mechanical Q-Factor Q _{ms}	6,19
Electrical Q-factor Q _e	0,65
Overall Q-factor Q _{ts}	0,59
Equivalent volume V _{as}	17,4 l
Moved mass M _{ms}	86 g
R _{ms}	2,90 kg/s
C _{ms}	0,27 mm/N
B x l	7,75 Tm
SPL 1 W, 1 m	89 dB
Recommended power	200 – 500 W
Test cabinet	BR 55 l
Reflex tunnel (d x l)	155 cm ² x 25 cm



The aluminum plate with the ESX logo is used to close the unused bandpass port

Top Class



CAR & HiFi
INTERNATIONAL Germany 3/24

Price/performance: very good

„Thanks to the interchangeable tunnel, it's perfect for the ski bag opening.“

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

HX SERIES

SUBWOOFER

since 1988

AUDIO SYSTEM

german sound



Audio System HX12 Flat Evo

Spitzenklasse 1,2

CAR & HiFi 6/23

Preis/Leistung: sehr gut

„Sehr performanter Flachwoofer.“



KLANGTIPP

Spitzenklasse

CAR & HiFi 1/2024

Audio System HX10 Flat Evo

Spitzenklasse 1,2

CAR & HiFi 1/24

Preis/Leistung: sehr gut

„Gut gemachter Premium-Flachsubwoofer.“

HX 10 FLAT EVO

■ 2x 100 WRMS ■ 3 Ohm Impedance

HX 12 FLAT EVO

■ 2x 115 WRMS ■ 3 Ohm Impedance



KLANGTIPP

Spitzenklasse

CAR & HiFi 2/2024

Audio System HX10 Evo

Spitzenklasse 1,2

CAR & HiFi 2/24

Preis/Leistung: sehr gut

„Gut ausbalancierter Subwoofer für Klangfreunde.“

HX 08 EVO

■ 2x 110 WRMS ■ 3 Ohm Impedance

HX 10 EVO

■ 2x 125 WRMS ■ 3 Ohm Impedance

HX 12 EVO

■ 2x 175 WRMS ■ 3 Ohm Impedance



INFORMATIONEN / AUDIO SYSTEM FACHHÄNDLER
FINDEN SIE UNTER:

WWW.AUDIO-SYSTEM.DE



Next issue April, 2025

Coming soon

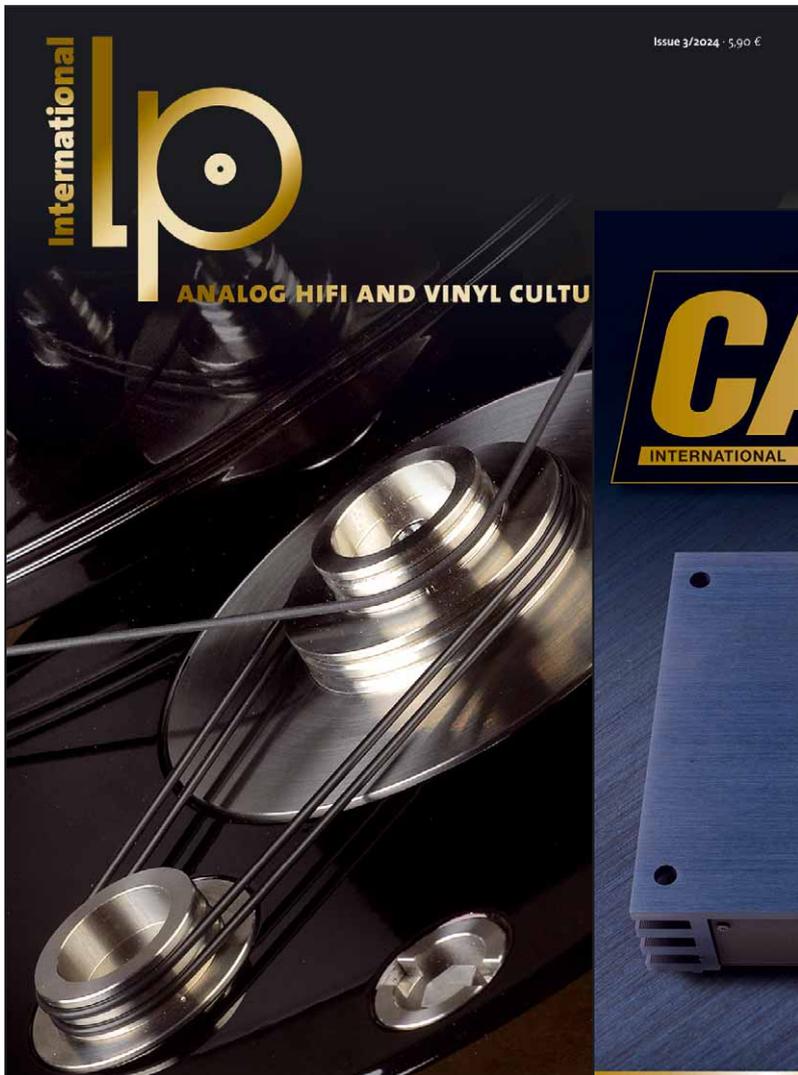


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European Edition

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- Helix • Musway

Now available