

CAR & HiFi

INTERNATIONAL

1/22 · 4,80 €



European Edition

Featured brands

- Audio System Germany • ESX
- Eton • Ground Zero • Nextbase
- Phoenix Gold • Pioneer • Power

Best topics

- High connectivity moniceiver • Sound expert's DSP
- High output 2-way speakers • Built-in subwoofer amplifiers
- SPL subwoofers

ESX QUANTUM

SOUND PROCESSORS

„The most attractive DSP on the market below 2000 Euros.“

(Elmar Michels, Car & Hifi Test Editor)



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

QE812SP € 999,00*

Digital 12-Channel Sound Processor with 12-Channel Output

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, RCA Inputs
High Level Inputs with EPS PRO up to 40 V/RMS, Optical & Coaxial Input, S/PDIF 192 kHz, 24 bit
RCA Outputs @ 6 V RMS (THD+N <0.0004%) each with a 31 Band EQ, PEQ / Highshelf / Lowshelf
Integrated Bluetooth® Receiver for DSP control via ESX TOOLKIT App and Fully HD Audio Streaming
A2DP/AVRCP, Codecs: aptX, aptX LL, aptX HD, AAC, SBC · Dimensions: 226 x 43 x 120 mm

QE810SP € 799,00*

Digital 12-Channel Sound Processor with 10-Channel Output

Same specifications as QE812SP, only with 10-Channel Output Section

ESXAUDIO.DE

ESX is a brand of Audio Design GmbH · www.audiodesign.de
Am Breillingsweg 3 · D-76709 Kronau · Tel. +497253 - 9465-0

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

High season

Welcome to CAR&HIFI INTERNATIONAL! You are now reading the third issue of our magazine, the first two having been published last year. Kicking off the season with #1/2022 (and two more to come later this year), this one again comes with a selection of reviews of the finest car entertainment components available today. For sound lovers, it features two DSP products with completely different approaches to the matter. On one hand, we present ESX' top notch stand alone DSP – not exactly cheap, but with finest components for no-compromise enthusiasts. On the other hand, Audio System's new DSP amp will probably appeal everyday users with it's featuring at a

charming price point. Furthermore, you'll find the whole range of in-car products that are practical, useful or simply enjoyable!



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.

GROUND ZERO
GERMAN ENGINEERING

GROUND ZERO
HIGH EFFICIENT MICRO AMPLIFIER



CAR SPECIFIC

GZCS A-4.80

- High-efficient class D mini amplifier
- Very compact dimensions
- 2 ohms stable in stereo mode
- 4 ohms stable in bridged mode
- Adjustable crossover filters
- Adjustable input sensitivity
- Turn-on delay
- Thermal protection
- Optionally available accessories:



GZCS ISO-CONNECT



GZCS MB-CONNECT



GZCS 4.0BMW-CONNECT



www.ground-zero-audio.com



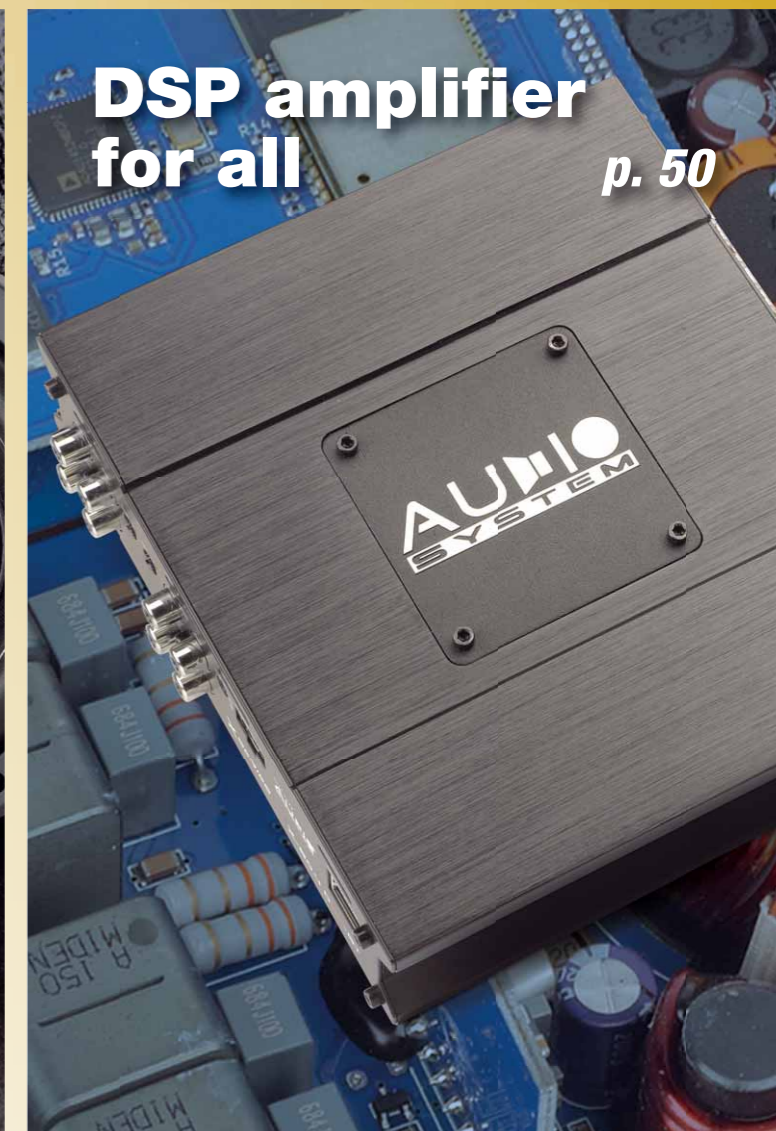
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Dash cam of the future

With the IQ, presented for the first time at CES, Nextbase presents a new concept for the dash cam of the future. IQ is intended to set new standards in the areas of safety, driver assistance and anti-theft features. With three cameras to the front, to the rear and to the interior, the system keeps an eye on everything that is happening in and around the vehicle. And artificial intelligence is of course also involved, for example with Roadwatch AI to check the speed of other road users. IQ monitors cyclists and prevents the driver from falling asleep. IQ works like a black box and can save all data in the cloud in real time via a direct connection, in dangerous situations immediately by voice command – and this is just a small preview. Nextbase IQ will not be available for purchase until autumn at the earliest.

• www.nextbase.com



New PRO+ system

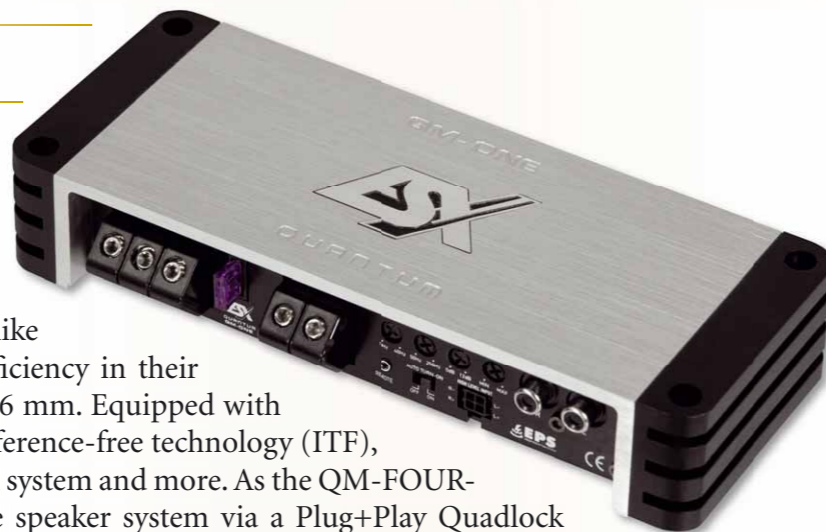
The pride and joy of Eton's superior class, the PRO system, goes into a new round. With the PRO 16+, Eton is introducing an upgrade version that has been improved in a few places. Among other things, the PRO+ comes with a new tweeter with a 28 millimeter fabric dome.

• www.eton-gmbh.com

New ESX mini amps

The popular QM-TWO can look forward to a new addition to the family: With the QM-ONE and the QM-FOUR, ESX provides all space savers and fans of the chic power dwarfs with two new models for further individual system configurations. The new micro-amplifiers contain ESX-like Class D technology with a very high level of efficiency in their aluminum heat sinks, which are just 84 x 39 x 216 mm. Equipped with the finest components, the newcomers offer interference-free technology (ITF), high EMC, high-level inputs with error protection system and more. As the QM-FOUR-PP, the four-channel version is connected to the speaker system via a Plug+Play Quadlock adapter cable.

• www.esxaudio.de/english



MUSWAY

THE DSP EXPERTS



Also controllable via smartphone with the new MUSWAY TUNEST app

All 12 channels are bridgable!



M12 NEW

12-CHANNEL CLASS D AMPLIFIER WITH 16-CHANNEL DSP
 @ 4/2 Ohms 85/120 Watts RMS per channel*
 @ 4 Ohms bridged 240 Watts RMS per channel pair*
 12 x High Level Input 8 – 24 V RMS with EPS
 6 x RCA Low Level Input 2 – 6 V RMS
 1 x RCA AUX Input/Stereo 2 – 8 V RMS
 1 x Optical Input/Stereo (PCM, 192 kHz / 24 bit)
 4 x RCA Pre-Amplifier Output (configurable via DSP)
 12 x Loudspeaker Output amplified
 Dimensions: 340 x 48 x 171,5 mm
 * depending on the application



The State-of-the Art DSP Power Amplifier!

“12 amplifier channels and 16 DSP channels, no aftermarket device has more to offer...”

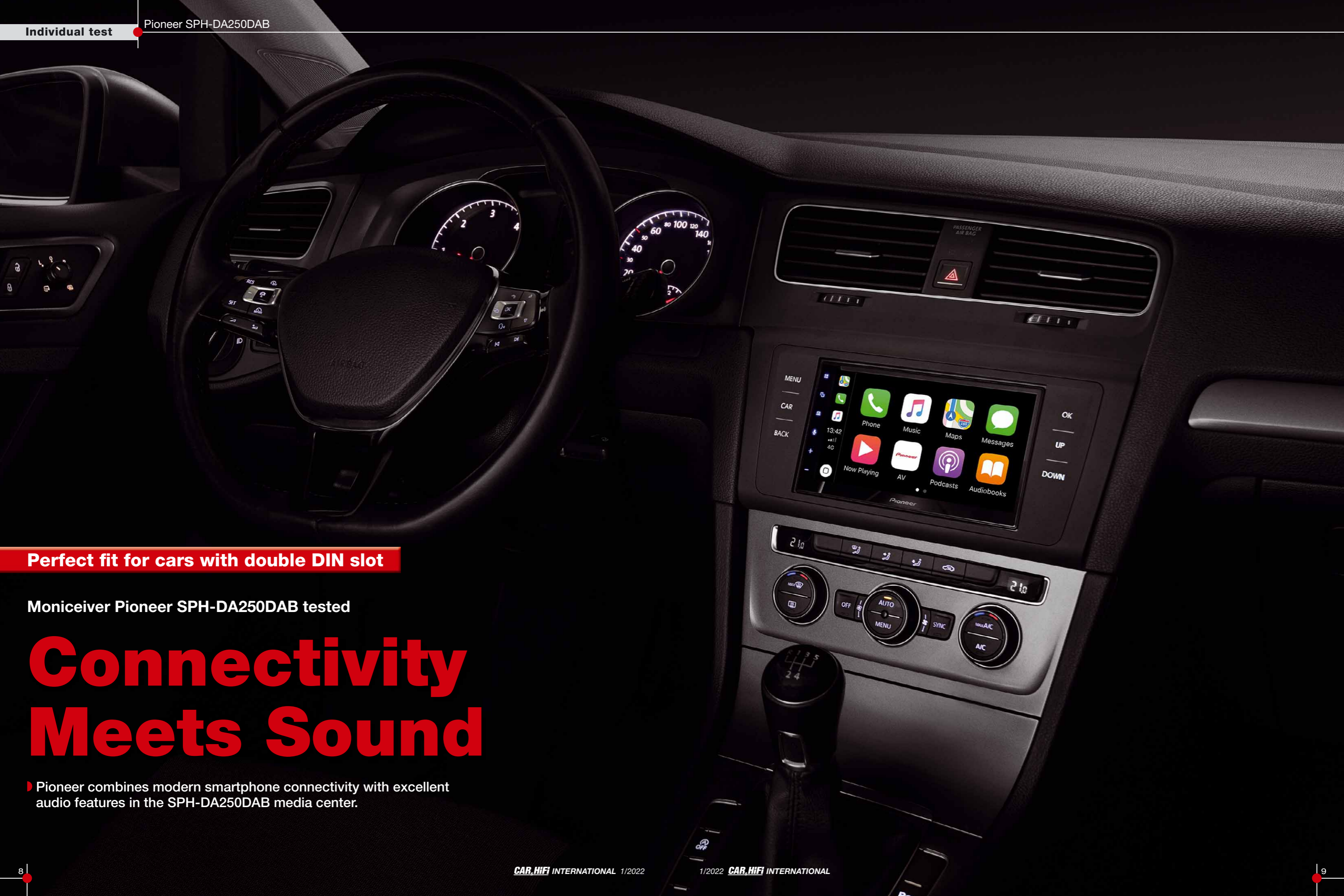
Elmar Michels, Car&Hifi 2/2022



WWW.MUSWAY.DE

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 Tel. +49 7253 - 9465-0 · www.audiodesign.de

TECHNIK FÜR KLANGBEGEISTERTE



Perfect fit for cars with double DIN slot

Moniceiver Pioneer SPH-DA250DAB tested

Connectivity Meets Sound

Pioneer combines modern smartphone connectivity with excellent audio features in the SPH-DA250DAB media center.



Music can be played easily from any source

The SPH-DA250DAB offers comprehensive features. From Bluetooth to DAB+ to dual camera input, everything you would expect from a modern moniceiver is on board. There's a capacitive 6.8-inch touchscreen and softkeys on the left edge for display and control, whose illumination color is adjustable.

Smartphone connection

The Pioneer connects to the phone via the rear USB port and wirelessly via Bluetooth. Two phones can be paired in parallel for hands-free calling, and audio streaming via A2DP is, of course, supported.

Far more telephone functions are available when the radio is connected to the cell phone via USB. This is because the SPH-DA250DAB supports both Apple CarPlay and Android Auto. This means that not only can telephony and music playback



The unit boasts premium connectivity and lots of features like DAB+, Bluetooth and many more



The Pioneer unit fits seamlessly into any car with double DIN slot



WebLink and WAZE are featured via Apple CarPlay or Android Auto

be used and operated via the car radio, but numerous other apps are also available in a user interface optimized for automotive use. Among the many compatible applications, navigation via Maps or Waze and the streaming service Spotify are undoubtedly worth mentioning. It is even possible to mirror the cell phone screen to the Pioneer via Weblink and operate it there.

py, so the Pioneer is recommended as a head unit even on very high-quality sound systems.

Dipl.Phys. Guido Randerath

Specifications

Amplifier power (W)	15
Output voltage (V)	4
Output impedance (ohm)	533
USB	
THD+N (%)	0,01
SNR (A)	86
Tuner	
THD+N (%)	0,04
SNR (A)	62
Crosstalk (dB)	55
Monitor size (in)	6.8
Touchscreen	•
Dual Zone	-
Dolby Digital / Pro Logic decoder	-
param./graph. EQ bands	- / 13
Crossovers	HP / LP
Time alignment	•
Pre-outs	6
AV-in / AV-out	• / •
Digital out	-
Camera-in/nav-in	2 / -
USB front/rear	- / •
iPod control	•
Bluetooth HFP/A2DP	• / •
Misc.	CarPlay, Android Auto

Pioneer SPH-DA250DAB vehicle compatibility

Cars with double DIN slot. Installation and connection adapters are available as accessories for many other models.

Pioneer SPH-DA250DAB

Price 400 Euro
 Contact Pioneer, Germany
 Internet pioneer-car.eu

Rating

Sound	20 %	★★★★★
Bass	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 %	★★★★★

Upper Class
 ★★★★★
CAR & HiFi
 INTERNATIONAL Germany 1/22
 Price/performance: very good
 "Smartphone specialist with great sound features"

READ IT !

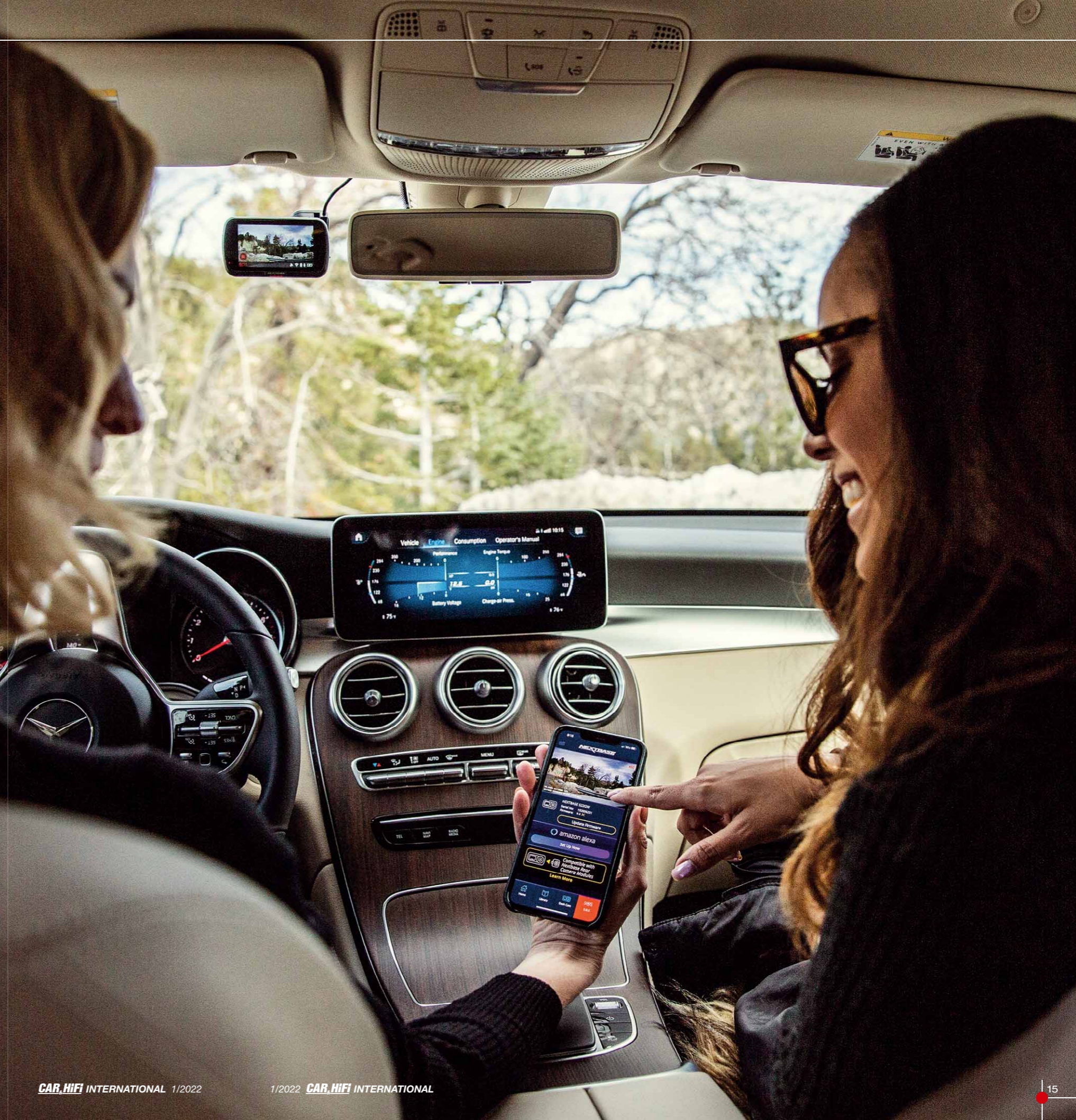


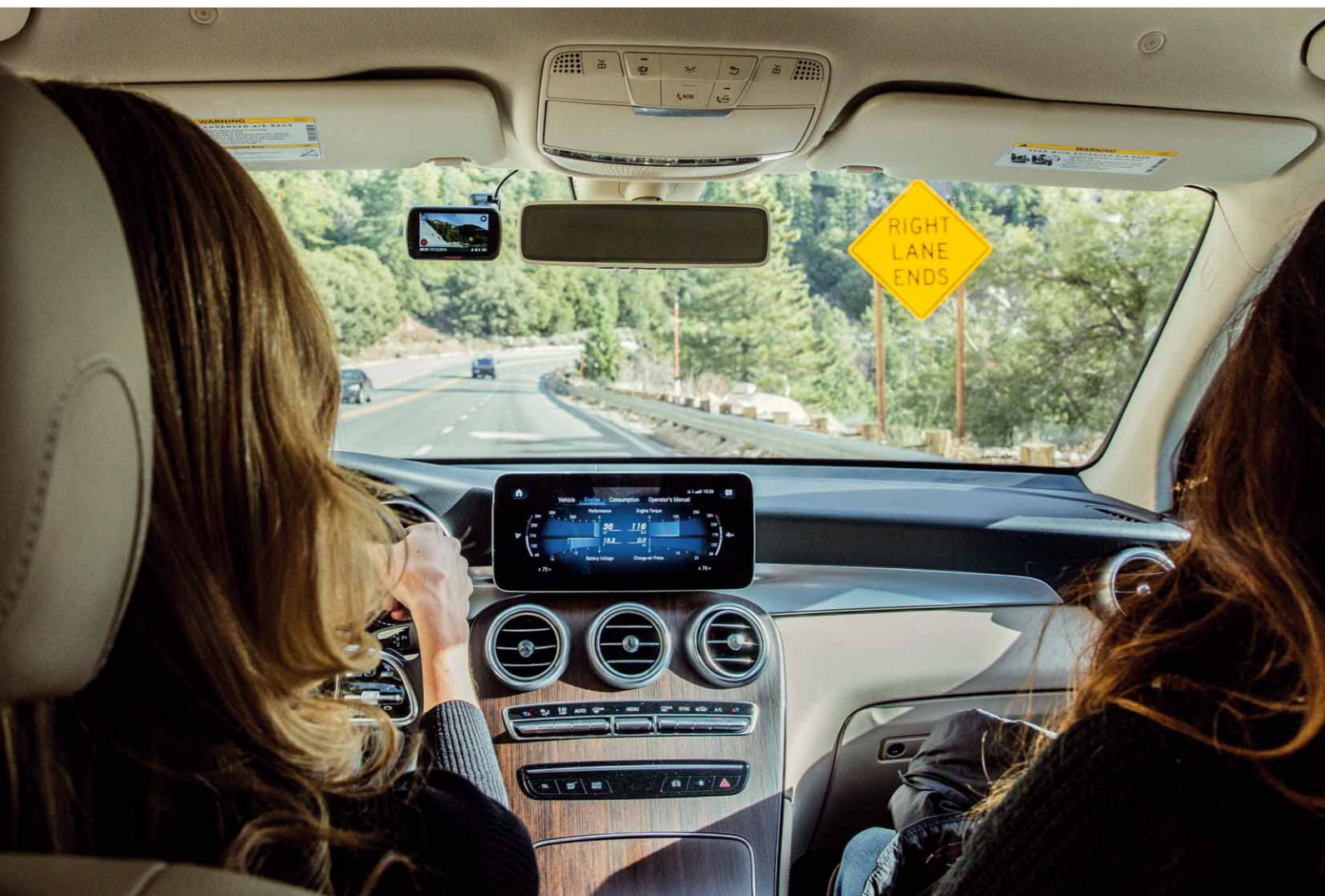
Now available

Top Model Nextbase 622GW Reviewed

4K Dashcam

► With the new 622GW, Nextbase brings a dashcam that has no less of a claim than simply being the best. What's in it?





The small cam does not obstruct the view



Optional rear window camera

There is a wide range of dashcams for well under EUR 100. Nextbase recommends a price of EUR 299 for the 622GW. That is an offer that raises high expectations. With inexpensive cameras with low resolution and cheap optics, the video quality is often modest. The pictures are blurred and shaky while driving. And what good is the video evidence of a hit-and-run, for example, if you can't make out the license plate?

4K quality

The Nextbase 622GW can record video at resolutions up to 4K at 30 frames per second (fps). In addition to the high-quality optics, the 622GW also features electronic image stabilization, which is probably unique for dashcams. This means that even recordings made while driving are not blurred, and all legally and insurance-relevant details such as license plates and traffic signs remain visible in detail even on poor roads. As a result, the Nextbase records exquisite video quality that is



Additional modules can be connected on the left



The camera sits magnetically on the holder

a joy to watch even on a large-screen modern 4K TV and allows every detail to be seen with legal certainty.

what3words

In addition to the outstanding 4K image quality, the 622GW knows how to shine with other special features. For example, it is the only dashcam we know of that supports what3words. What3words divides the earth's entire surface into 3 x 3 m squares. Three words uniquely define each square. For example, you can find the front door of our publishing building under „slicing.dollars.teaspoons“. What3words is thus an exact and, at the same time, simple location specification that can also be used to define individual parking spaces. What3words

is therefore also used by numerous emergency services and NGOs worldwide.

Automatic emergency call

Like the smaller 322GW and 522GW models (see CAR&HIFI 2/22), the top-of-the-range 622GW model also offers an emergency call function when a compatible smartphone is paired. In an emergency, Nextbase's emergency SOS system can send an automatic distress call to the emergency services. If the dashcam detects a (more violent)

accident, a checking process is first started to avoid false reports. The paired smartphone then responds. The driver now has 120 seconds to cancel the operation. If he does not intervene, the phone sends the alarm message. The emergency call center now tries to reach the driver. If he does not answer his phone, the emergency services are dispatched. The position is transmitted as standard. It is also possible to enter additional personal data such as medical history, blood group, or allergies, which are then sent along. This is a handy function that can save your life and that of your passengers in the event of an accident, especially in lonely areas.

Smartphone app

The dashcam offers WiFi and Bluetooth 5.0 and can be paired with a smartphone that has the MyNextbase connect app installed. The app is available free of charge for Android and iOS in the respective app store. It can be used to set up and activate the SOS function. In addition, a fast and uncomplicated transfer of



Full-size touchscreen



The holder sits firmly on the windshield

video recordings is possible, and a live image of the camera can also be displayed. The 622GW supports Amazon Alexa, so even voice control is possible. Of course, the cam can also be connected to the computer via USB, where the videos can be conveniently managed in the Nextbase app.

Additional modules

You can connect additional cameras to the 622GW using the lateral port. The small interior camera is plugged into the side of the dashcam. It then records the vehicle's interior and the immediate surroundings in the rear. Alternatively, the rear window camera can be connected via cable,

which monitors rear traffic and documents rear-end collisions or parking bumps in the back area, for example.

According to the law, the dashcam records in loops and only permanently saves the sequence when triggered by the G-sensor or manually. The usual features like parking mode and the like are also integrated.

Conclusion

We cannot conclusively judge whether the 622GW is the best dashcam in the world, as we have not tested all dashcams. But one thing is sure: The Nextbase 622GW is the best dashcam we have ever tested. The



The interior camera is snapped on from the side

image quality is outstanding; the functionality with what3words and an automatic emergency call is probably unique. Best Product!

Dipl.-Phys. Guido Randerath

Dashcam Nextbase 622GW	
Price	300 Euro
Contact	Nextbase, UK
Internet	nextbase.com

- Specifications**
- Dashcam**
- Video resolution 4K/30fps, 1440p/60fps, HD/120fps
 - 140° wide-angle lens
 - Polarizing filter
 - 3" HD IPS touch screen
 - Video input for a secondary camera
 - GPS and G-sensor
 - WiFi integrated
 - Bluetooth 5.0 integrated
 - App control
 - Emergency SOS
 - what3words
 - loop recording
 - intelligent parking mode
 - Amazon Alexa
 - microSD, U3, up to 128GB
 - Dimensions: 94 x 53 x 45 mm



"The Nextbase 622GW sets the standard for dashcams."



Best image quality thanks to high-quality optics

BRAND NEW DSP-Amplifier with APP-Control

R-110.4 DSP-BT

Audio System R-110.4 DSP-BT
 Absolute Spitzenklasse 1,3
CAR & HiFi 3/22
 Preis/Leistung: sehr gut
 „Analoge Vierkanalerein mit 8-Kanal DSP“



CAR & HiFi:

"The R-110.4 DSP-BT from Audio system elegantly combines the Sound of a class AB amplifier with modern Signal processing via DSP. Its operation succeeds very easy via app."

X-80.4 DSP-BT

Audio System X-80.4 DSP-BT
 Spitzenklasse 1,3
CAR & HiFi 3/22
 Preis/Leistung: sehr gut
 „Starkes Paket für einfachen DSP-Sound.“

BEST PRODUCT
 Spitzenklasse
CAR & HiFi 3/2022

CAR & HiFi: "The X-80.4 DSP-BT is a great offer. It combines a solid class D four-channel power amplifier with a state-of-the-art DSP and app control is already included."

APP



INFORMATIONEN / AUDIO SYSTEM FACHHÄNDLER FINDEN SIE UNTER:

WWW.AUDIO-SYSTEM.DE



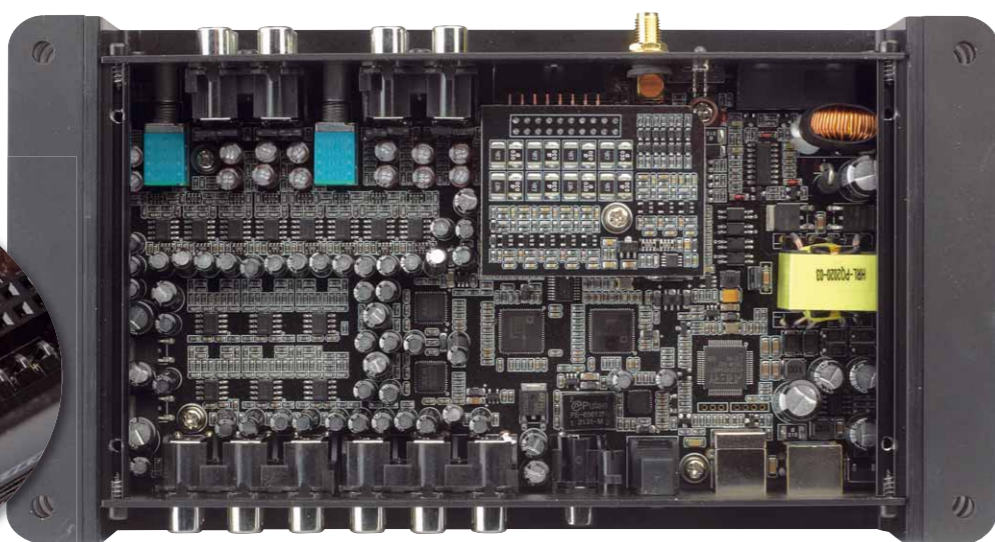
ESX QL812SP – 12-channel DSP for Sound Freaks

High-End DSP



- ▶ With the QL812SP, ESX presents the current top model of its new DSP generation. With top-notch hardware and new software, including an mobile app, the new model is confidently positioned in the 1000 EUR class. This test clarifies what it has to offer.

The Bluetooth chip hides under the small circuit board for the analog inputs



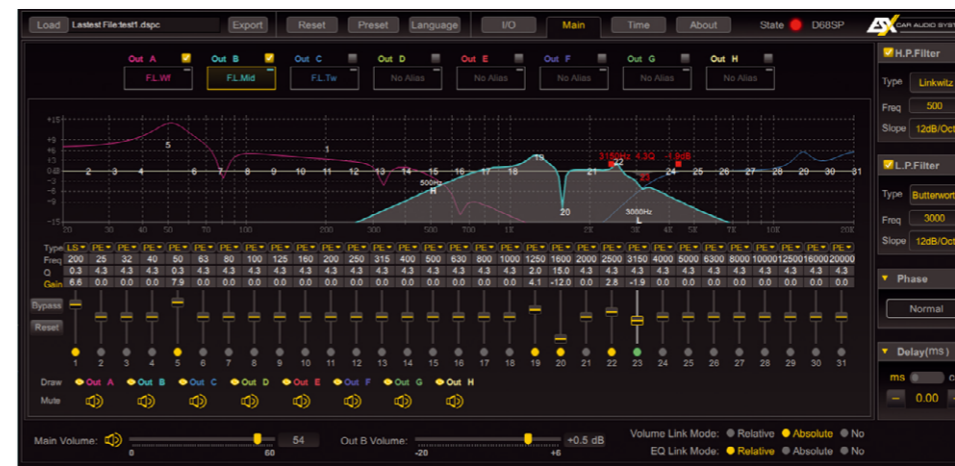
Following the D66SP, D68SP, and QM66SP, ESX present their fourth DSP, the QL812SP, a high-end model representing the DSP range's new pinnacle. As the name suggests, the QL812SP is an 8/12 design

that can drive large, fully active systems with eight inputs and 12 outputs. This also defines the target demographic: sound freaks who want to have the best control possible over their speakers while taking

full advantage of all the possibilities of setting up a car Hi-Fi system. Of course, the QL812SP is also suitable for upgrading sophisticated original sound systems. It provides high-level inputs, covering even the premium range with 45 volts maximum input voltage and EPS. Technically and conceptually, the QL812SP is a device for the top sound league, though ESX has not skimped on everyday usability. Thus, Bluetooth with all the features like BT5.0 standard, aptX, etc., is included. There is also a choice between wireless access via mobile app and desktop software – excellent!

Hardware

As with the smaller DSPs, ESX consistently uses the finest components available on the market. This was already the case with the previous DSPs, so we don't find better converters and DSPs in the QL812SP, but more of them. The analog-to-digital conversion of the inputs, like the digital-to-analog conversion of the outputs, is handled by the finest 32-bit converters from AKM's 5 Series. It doesn't get any better than this when using automotive-



Equalizers and crossovers are set on the main screen. Master and channel levels are available. Absolute or relative linking of channels is possible here

Here the output time alignment is set. The speakers are displayed nicely in the vehicle. Here, we see a Mercedes with footwell woofers as an example

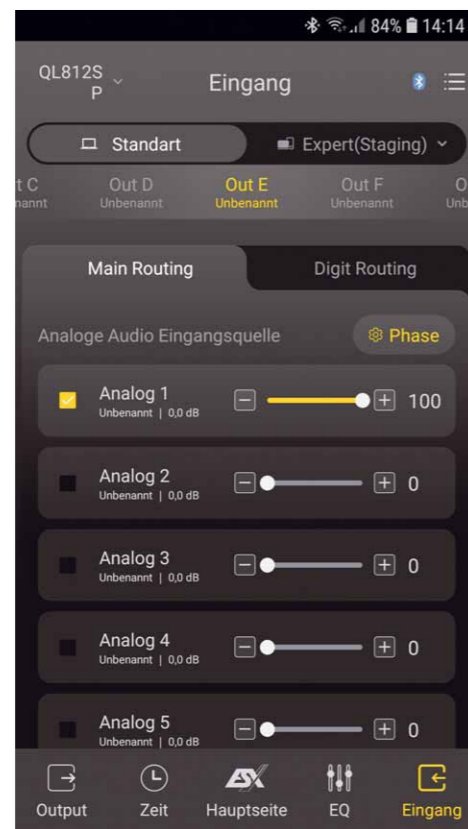


spec components. For the DSP chip, ESX relies on Analog Devices' ADAU1452, which we also find in the small DSPs. The QL812SP has two of them to cope with the immense variety of functions. Because, of course, the QL812SP is blessed with a HiRes frequency range up to 44 kHz. So it needs a 96 kHz sampling rate, which doubles the computing effort compared to a 22/48 kHz device. And we also find everything in terms of digital sources. Besides the high-quality Bluetooth, there are optical Toslink and electrical coax as digital inputs. And also, the „rest“ – mechanical construction, general components, powersupply, etc. – area feast for the eyes. What we have here is a well-made, high-quality DSP.

Software

At the same time as the QL812SP, ESX introduces a new software version available as a mobile app (Android and iOS) and as desktop software (Windows) with an equivalent range of functions. The user interface makes you feel at home right away. Everything is arranged logically and is mostly self-ex-

planatory. The settings are placed in four windows, so it doesn't get too crowded in each. Names can be assigned to the inputs and outputs, e.g., „Tweeter Front Left.“ These names are then found in other places, and in the car diagram, the speakers are even placed in the right spot. This also applies to the predefined BMW and Mercedes setups with the



Like the output EQ displayed here, input EQ and staging EQ can also be adjusted in the mobile app

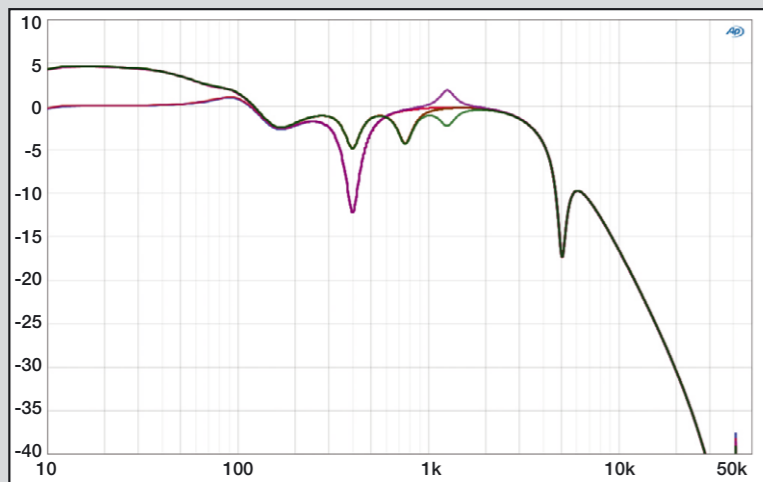
Depending on Standard or Expert mode, inputs can be conveniently routed to outputs or staging channels



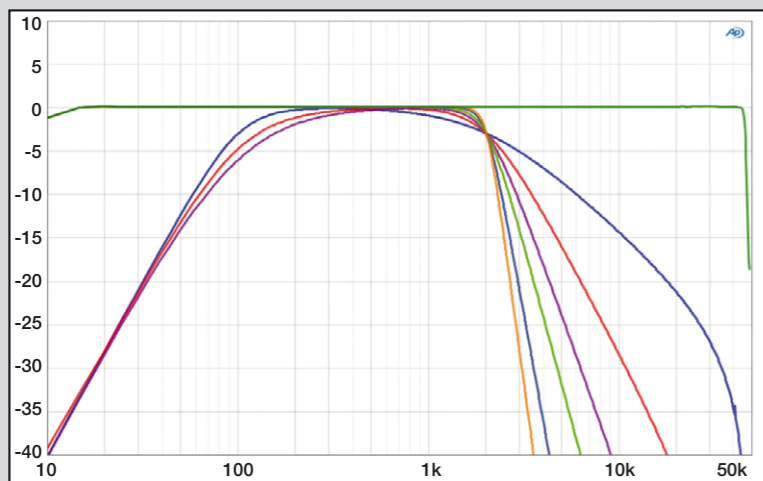
Fully equipped with two digital inputs, high-level up to 45V, and Bluetooth



CAR & HI-FI Laboratory



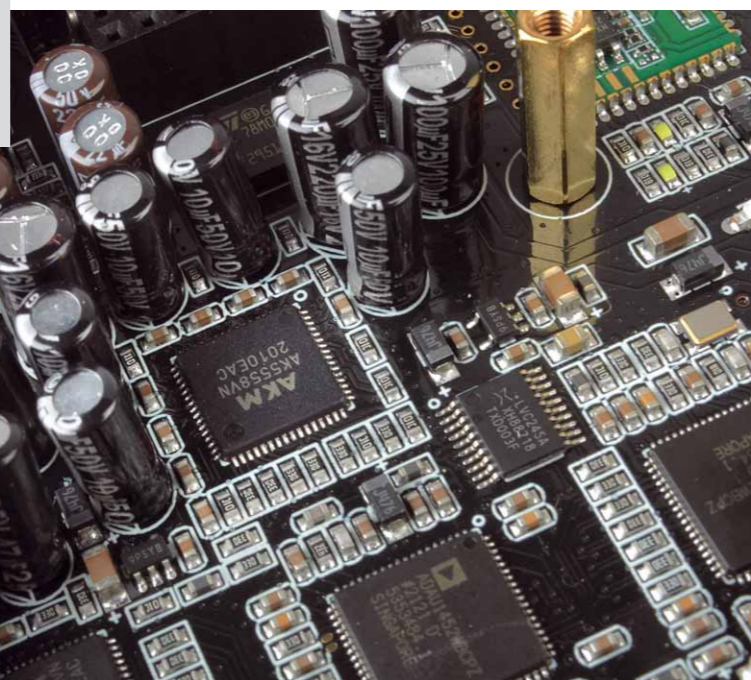
The EQs allow you to build shelf and parametric EQs and adjust them individually or together. The balance link EQ at 1.25 kHz simultaneously adjusts purple louder and green softer



Hi-res frequency range up to 44kHz. 100-Hz high-pass with Butterworth, Bessel, Linkwitz. Low-pass at 2kHz with Butterworth, 6-48 dB/octave

corresponding under-seat and footwell woofers. In general, there are several goodies besides the standard functions. For example, the channels designated as subwoofers (no matter which) are automatically assigned to the subwoofer level of the remote control.

You can see which ones are active, full, or empty in the setups. In addition, a startup setup can be defined that is always active after switching on. The active/used/unused marker is also visible in the main window, for example, in the EQ bands, of which there are 31 per output and which can be either shelf EQ or parametric EQ. Fine 3.5-millimeter steps or 0.01-millisecond steps are possible for the delay time. The crossovers feature Butterworth, Bessel, and Linkwitz filters up to 48 dB/octave – you don't need more. The digital inputs or the Bluetooth can be prioritized in the software, which means it is automatically switched to S/PDIF or Bluetooth when music is played. If you don't want to do without car sounds, they can be added in the mixer, so digital and analog sources can be combined. A new addition is the meter window, where we find level meters for all 8 analog inputs and 12 outputs. This is helpful to be aware of what signal is present where. The correct level can be read and adjusted for all channels with level controls. In the I/O section, there is routing, of course, and there is an input EQ with 31 bands per channel and full functionality.



Finest AKM converters and two ADAU1452 make the QL812SP's first-class equipment



In expert mode, a new staging channel with a dedicated EQ emerges between inputs and outputs

The SPL of all eight analog inputs and 12 outputs is displayed and directly adjusted



In addition to the input EQ, there is a staging EQ with 31 bands per channel as well

New staging levels

Furthermore, we find the switch for the expert mode, which has been highly upgraded in the QL812SP. It reduces the number of analog inputs from 8 to 4, but an entirely new channel layer emerges. There are then four staging channels that lie between the input channels and

the outputs. In this way, a multi-way front system can be assigned to a staging channel, receiving its own 31-band EQ in the staging layer. In this way, the individual loudspeakers are crossed over and time aligned in the output section, and the output EQ is adjusted to the needs of the loudspeaker. From then this remains un-

Who is Audio Design?

Founded 1984 in Kronau (Germany) as a speaker manufacturer, Audio Design GmbH has turned into an international distributor and developer of any kind of car audio aftermarket products. Audio Design is the owner of the HiFonics and Crunch brands in Germany, Austria and Switzerland as well as the ESX and Renegade brands worldwide. Distribution includes famous brands like Rockford Fosgate, Kicker, Autotek and MB Quart. The newest brand in Audio Design's portfolio is Musway, established 2018 and specialized in plug'n'play sound solutions and DSP products.

touched because the sound design is then done via input EQ and via staging EQ for, e.g., „front left fullrange.“ For quicker adjustment, channels can also be linked so that SPL and EQs can be changed either absolutely or relatively for the group. The staging EQ also has the ‚balance link‘ as a special feature. It works like a balance control and takes away from one side what it adds to the other side when linked right-left – for each EQ band, of course, which allows the stage imaging of the system to be fine-tuned.

Conclusion

With the QL812SP, ESX has hit the big time. It is right up front with its fine hardware, and the new software with powerful audio features is a big step forward. Add to that the great features, including Bluetooth and mobile app, and the QL812SP is the most attractive DSP under EUR 2000 on the market for sound freaks.

Elmar Michels



ESX QL812SP

Price	1000 Euro
Contact	Audio Design, Germany
Internet	www.audiodesign.de

Specifications

Dimensions	225 x 120 x 44 mm
------------	-------------------

Inputs

- 8-channel high-level with autosense
- 8-channel RCA, gain control, paired gain control
- Sensitivity 6 V (RCA), 45 V (high level)
- 1 x digital S/PDIF optical
- 1 x digital bluetooth
- 1 x mode („convertible pin“)

Outputs

- 12-channel RCA
- remote-out

DSP-channels

- 8 Inputs, 12 Outputs (+ 4 Staging)

DSP software (PC V2/Android V1.0.0 in test)

Equalizer

Inputs

- param./Shelf, 31 bands per channel, 8-channel (Standard)
- param./Shelf, 31 bands per channel, 4-channel + digital (Expert)

Staging (only Expert):

- param., 31 bands per Channel, 4-Channel

Outputs

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

Crossovers

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

Time and level

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

Outputs

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

Features

- 8 presets
- Inputs and outputs arbitrarily routable
- Start-stop capability up to 7.2 V
- EPS (Error Protection System) for diagnostic function
- Signal dependent switching to Bluetooth or S/PDIF
- Coupling of channels (gain and EQ) absolute and relative possible
- Ground switch against hum interference
- Setup change via mode pin
- input sensitivity adjustable via jumper
- Bluetooth module BT-DQ (audio streaming and app control of all functions)
- Level meter and software gain for all input and output channels
- Exper mode with Staging channels and EQ

Optional accessories

- Remote controller RC-DQ (volume, bass level, sources, setups)

CAR & HiFi
INTERNATIONAL Germany 1/22

"The most attractive DSP under EUR 2000."

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

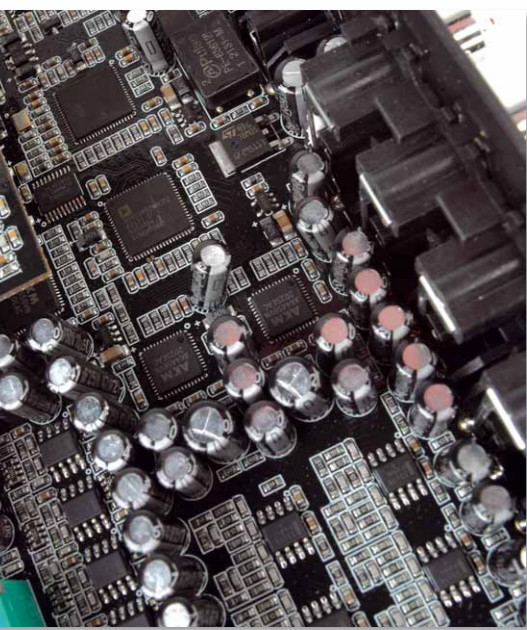
Devices are tested and rated according to strict criteria and can reach up to five “stars”. Ratings are only comparable within a class and device type. To score four stars in the top class, the device must meet more demanding requirements than for a 4-star rating in the upper class. The model names, 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



The vast channel options require two DSP cores to be handled with a sample rate of 96 kHz

Power2 + Power4 – amplifier modules for boxed subwoofers

Activating subwoofer enclosures

It is often more practical and saves space to install an active subwoofer instead of a bass box and a bass amplifier. Now, there is a practical way to retrofit existing passive subwoofers with either of the two Power modules.





The power modules have the same size as a double speaker terminal



It is not a new idea: What if I could simply activate my existing passive subwoofer? This is a question that arises, for example, for up-and-comers who have first used a power amplifier to fire front speakers and

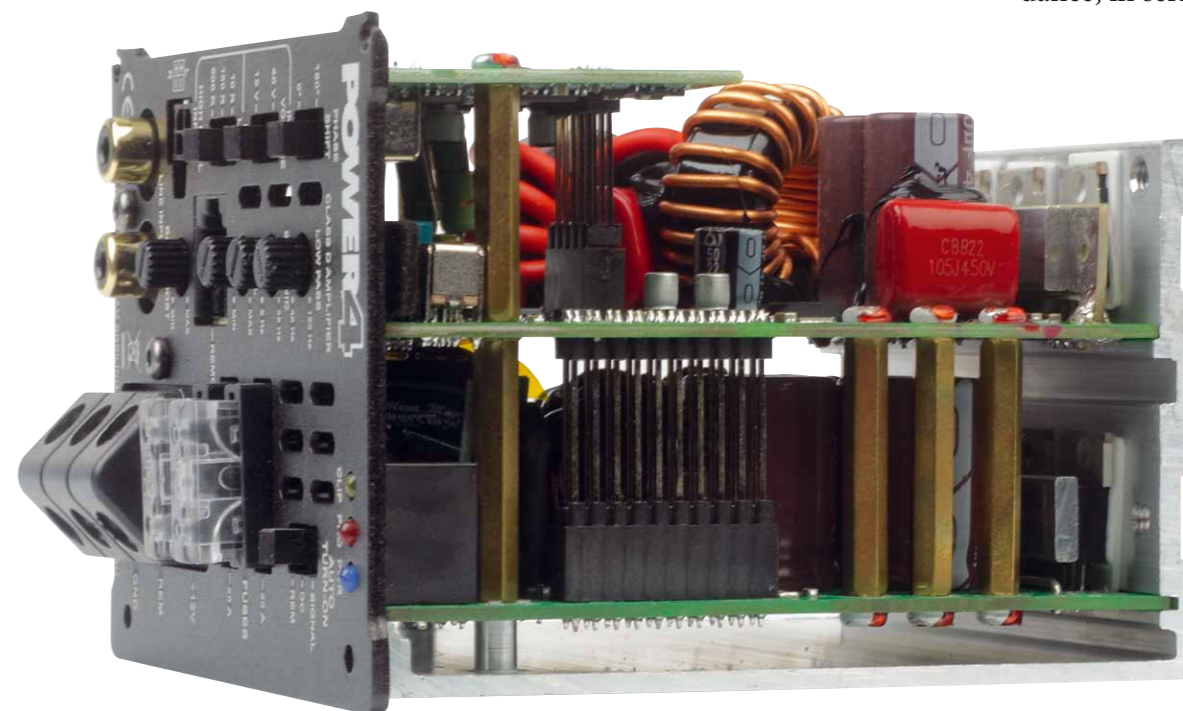
subwoofers but would like to improve in terms of sound and performance. Sure, you can simply screw a bass amp onto the back of the sub box, but there is a much cleaner and more elegant way, especially if the

new built-in module has a nice and compact design that can easily fit in any box. The optimum is achieved when the module has the same format as the connection terminal in the subwoofer. Then the module

can be installed within minutes in the terminal's place. For example, this is the case with ESX and Musway enclosures, which, like the power modules, are made by the Audiodesign company. But all other enclosure subs can also be retrofitted with little effort; it is just necessary to expand the terminal opening to 85 x 109 millimeters. As always with

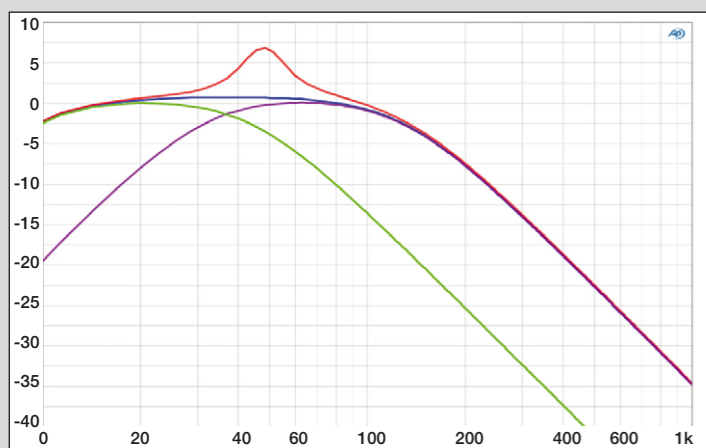
the combination of amplifier and loudspeaker/subwoofer, the correct combination of impedances must be observed. Therefore, there are two modules, the model Power2 for 2-ohm subwoofers and the model Power4 for 4-ohm subs. The numbers refer to the total impedance the power amplifier encounters, i.e., in the case of multiple woofers and/

or woofers with dual voice coils, the impedance of the connected coils. If you have two 4-ohm woofers in the box, connect them to 2 ohms in parallel, and the Power2 is the correct module. In the case of a woofer with 2 x 2 ohm dual coils, the single coils are connected in series to 4 ohms – and the Power4 comes in. According to the rule: parallel halves the impedance; in series, it doubles it.

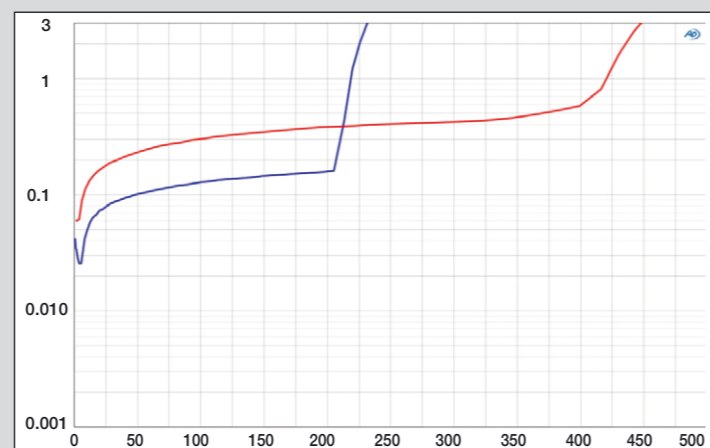


Compact, two-level design with an aluminum heatsink on the rear side

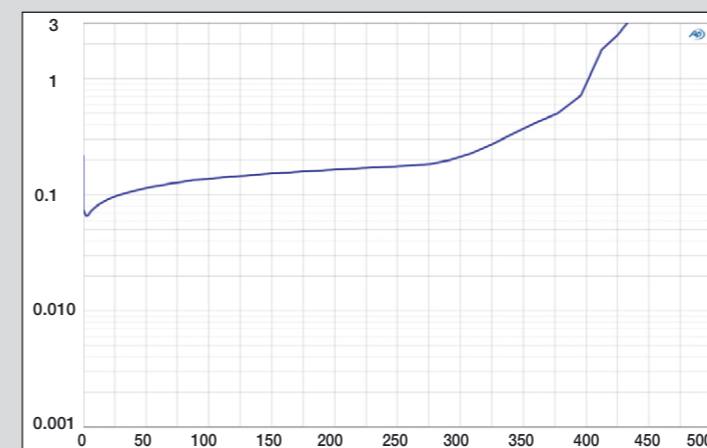
CAR & HI-FI Laboratory



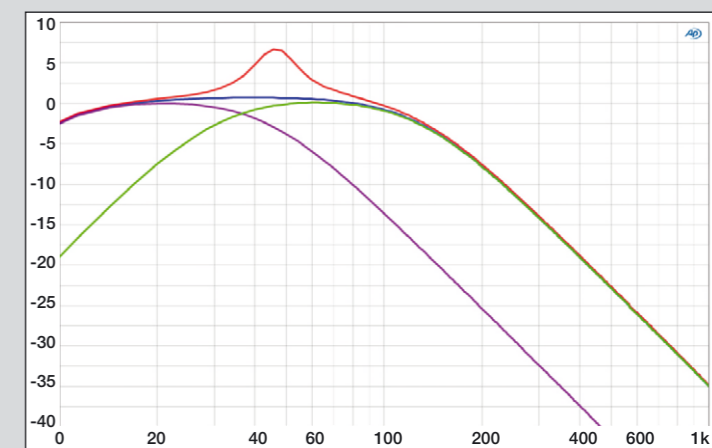
The Power2 comes with a complete set of filters. Besides the obligatory low-pass filter, a bass boost and a subsonic filter are also on board



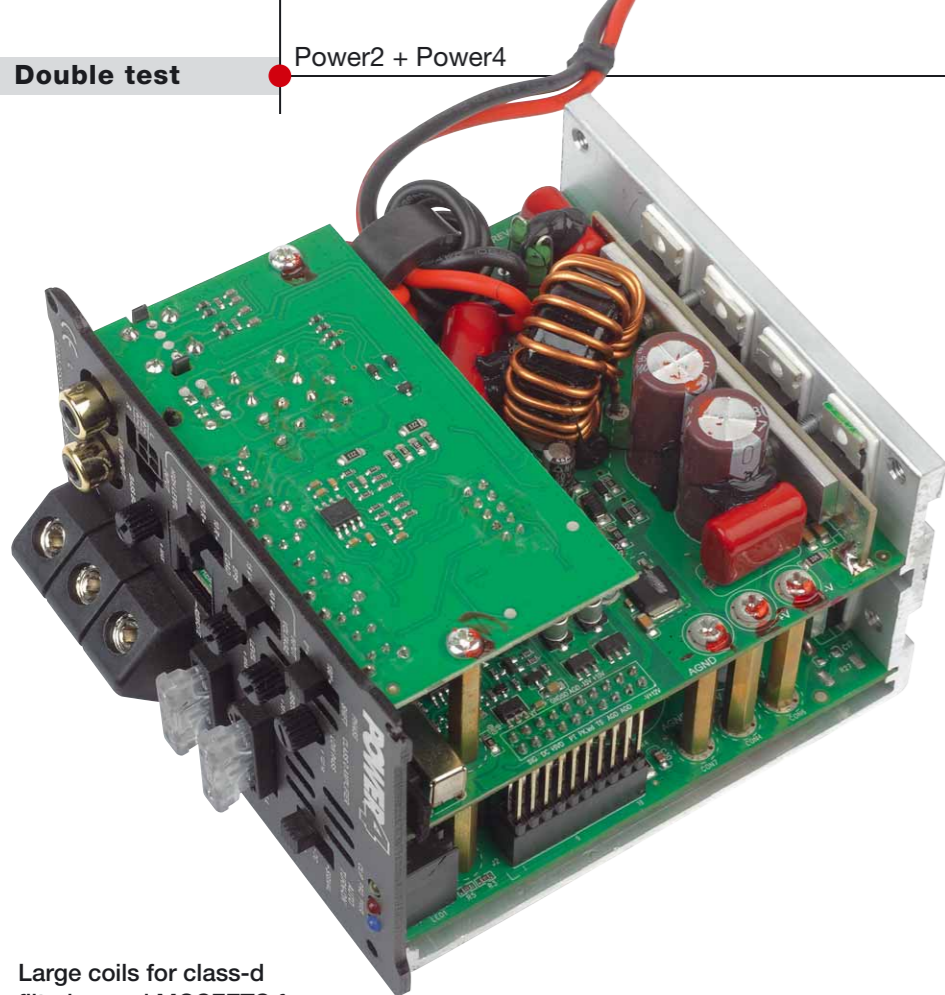
Power2 delivers its maximum power at 2 ohms; at 4 ohms, it's accordingly less



Like the Power2, the Power4 can also reduce the stress on small woofers via subsonic filtering. A discreet boost of up to 6 dB at 45 Hz provides a richer sound if required



The Power4 is not 2-ohm stable at full power but specializes in 4 ohms. Here it pushes an enormous 400 W



Large coils for class-d filtering and MOSFETS for a high current output stage

The housings of the power modules are kept extremely compact and are made of cast aluminum for heat dissipation. However, since quite a bit of power is involved, heat buildup can occur in very small bass cabinets despite the efficient Class D technology. Therefore, the modules have a three-stage switch to limit the power and thus the waste heat. This prevents overloading even with small woofers.

Top features

What makes the power modules unique are their features, which allow multiple adjustments to the conditions of their environment. Low pass, phase, bass boost, and subsonic filter can be found on many bass amplifiers, but then it becomes exciting. The EPS Load switch sets the input impedance to 600 ohms, 150 ohms, and 10 ohms, which is essential with

Specifications	
Channels	1
Power 4 ohms	218
Power 2 ohms	422
Power 1 ohms	0
Sensitivity max. mV	160
Sensitivity min. V	4,7
THD+N (<22 kHz) 5 W	0,026
THD+N (<22 kHz) Half Power	0,130
Signal-to-noise ratio dB(A)	84
Damping factor 20 Hz	140
Damping factor 40 Hz	144
Damping factor 60 Hz	144
Damping factor 80 Hz	136
Damping factor 100 Hz	132
Damping factor 120 Hz	128

Features	
Low pass	40 – 120 Hz
High pass	–
Band pass	5 – 120 Hz
Bass boost	0 – 6 dB/45 Hz
Subsonic filter	5 – 35 Hz/12 dB
Phase shift	0, 180°
High-level inputs	•
Automatic switchon (Autosense)	• DC or signal
RCA output	–
Start/stop capable	• (6,5 V)
Dimensions (L x W x H in mm)	113 x 130 x 125
Others	Remote control, EPSpro



After unscrewing the front plate, an additional power limiter switch emerges

Power2	
Price	200 Euro
Contact	Audio Design, Germany
Internet	www.audiodesign.de

Rating	
Sound	20 % ★★★★★
Bass foundation	5 % ★★★★★
Bass pressure	5 % ★★★★★
Accuracy	5 % ★★★★★
Dynamics	5 % ★★★★★
Lab	55 % ★★★☆☆
Power	40 % ★★★★★
Damping factor	5 % ★★★★★
Signal-to-noise ratio	5 % ★★★★★
Distortion	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
"Bass power for any subwoofer in any vehicle."

some OEM equipment. The 10-ohm setting fools the factory system into thinking it's a speaker and bypasses the corresponding diagnostic functions. 150 ohms works perfectly with some original equipment from VW & Co. with and without factory amplifiers. And 600 ohms is the default setting and best for some BMW with or without factory amplifier and, of course, when the signal is tapped at a car speaker. The second switch controls the minimum sensitivity of the inputs, i.e., the maximum voltage that can be supplied. The range of up to 15V works for low-level and simple car radios. However, if a factory amplifier is present, it switches to 40V, which is sufficient even for potent original systems (theoretically up to 400W into 4 ohms). Thus, Power2 and Power4 are well equipped for all kinds of applications, which is unique on the market in this form.

Measurements and sound

The power modules are designed for an output of 400W, which is easily enough for any average subwoofer up to 15" or even for 2 x 10" woofers if you do not want to power the heftiest hunks or aim towards SPL. A sensible design, especially because the housing must be as small as possible to fit everywhere. The Power4 then also manages the 400 watts at 4 ohms, which is very respectable, especially since only a little distortion adds in. Distortion is less critical with the subwoofer, but we're still happy to see that the Power2 performs even more cleanly. It achieves its maximum output of 422 watts at 2 ohms, with 218 watts still present at 4 ohms. The damping factors are in the 100 range, and there is sur-

prisingly little residual noise. At the subwoofer, the modules show that they can also pack a punch. On an upper-class 12" woofer, they shake the cone vehemently, causing a lot of fun. The pressure is also always proper in the lower frequencies. And the top end never sounds mushy but always relatively clean. Absolutely good enough for any sub.

Conclusion

Bass power for any subwoofer in any vehicle. This is what the Power modules bring with rich performance and excellent features. Power2 or Power4 harmonize with any subwoofer. The many adjustment options then also allow operation with any modern factory system.

Elmar Michels

Specifications	
Channels	1
Power 4 ohms	404
Power 2 ohms	0
Power 1 ohms	0
Sensitivity max. mV	170
Sensitivity min. V	5,3
THD+N (<22 kHz) 5 W	0,070
THD+N (<22 kHz) Half Power	0,163
Signal-to-noise ratio dB(A)	85
Damping factor 20 Hz	136
Damping factor 40 Hz	140
Damping factor 60 Hz	140
Damping factor 80 Hz	135
Damping factor 100 Hz	131
Damping factor 120 Hz	131

Features	
Low pass	40 – 120 Hz
High pass	–
Band pass	5 – 120 Hz
Bass boost	0 – 6 dB/45 Hz
Subsonic filter	5 – 35 Hz/12 dB
Phase shift	0, 180°
High-level inputs	•
Automatic switchon (Autosense)	• DC or signal
RCA output	–
Start/stop capable	• (6,5 V)
Dimensions (L x W x H in mm)	113 x 130 x 125
Others	Remote control, EPSpro



Power2 and power4 share the same fully fledged featuring

Power4	
Price	200 Euro
Contact	Audio Design, Germany
Internet	www.audiodesign.de

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

Upper Class
★★★★★

CAR & HiFi
INTERNATIONAL Germany 1/22

Price/performance: very good
"Bass power for any subwoofer in any vehicle."



Eton POW 16+ – New version of Eton's successful loudspeakers

POW+ Loudspeakers for better sound

► Eton's POW series can rightly be called a speaker legend. With the POW 16+, a new incarnation is now in the house.



Both drivers are very nicely built – Eton still manufactures in Germany

der is not plastered with a coating like in some other speakers. Completely new in the POW+, however, is the tweeter, which replaces the 25-millimeter fabric dome, which has proven itself for years. Here, Eton has managed to accommodate a larger 28-millimeter dome in the same housing and equip the tweeter with a rear chamber. The tweeter benefits from an easy-to-install cable crossover with a 12-dB filter consisting of a film capacitor and core coil hidden under its shrink sleeve. Not high-end, but effective. No one will complain about the crossover of the mid-bass driver because it does not need one. Directly driven, it develops a particularly good efficiency without losses through a crossover, which is the intention of the POW+. It is also recommended for operation without an additional amplifier directly on the car radio.

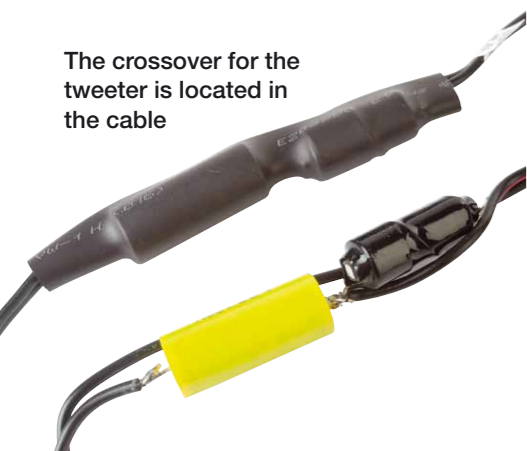
Measurements and sound

In front of the microphone, we then also determine an above-average 89 dB (2V, 1m). A small „trick“ is also responsible for this, namely the voice coil of the 6.5" with an Re of 2.5 ohms, which tickles additio-

Older semesters still think of the legendary, patented Hexacone cone when they think of Eton, but it doesn't always have to be a high-end speaker that makes a lasting impression. Instead, the POW series might be the most popular of all time because a particularly attractive price-performance ratio characterizes the POWs. Super-cheap is different, but one must not forget that Eton is still manufacturing in Germany, so a „Made in Germany“

is proudly emblazoned on the labels of the speakers. The POW cone of the 6.5" woofer with the characteristic embossing on the front has been copied many times, indeed also a form of recognition. The Eton original is made on a paper base and is closed inside by a soft rubber dust cap. The stable steel frame is taken 1:1 from the previous POWs; there was nothing to improve here. The spider and surround are made of high-quality materials, and the spi-

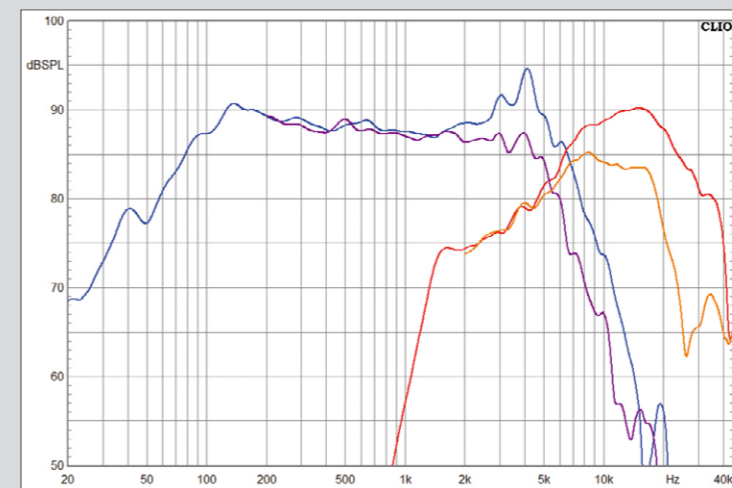
The crossover for the tweeter is located in the cable



The POW+ bass-mid-range driver has a nice and sturdy steel frame. The spider is high-quality



CAR&HiFi Laboratory



The woofer runs smoothly and flawlessly, even without a crossover. The 28mm tweeter runs cleanly and unspectacularly



In the side view, you can see that the new tweeter is a bit thicker because of the rear chamber

rent in very high-priced tweeters. In addition, the woofer and tweeter fit together perfectly so that the sound seems to come from a single source.

Conclusion

The simple POW 16+ convinces us with quality in detail and can compete with more expensive systems in terms of sound. A successful performance.

Elmar Michels

sound simply marvelous. And the new tweeter is a stunner. Here we have all the detail combined with an airiness that is otherwise only inhe-



The swivel housing is known from the 25-mm tweeter. Here, a 28-mm specimen resides in it

nal power out of the amplifier. The new tweeter with a coupled chamber has a resonant frequency of 1.4 kHz, which is thus significantly lower than a standard 25-mm tweeter. This allows the Eton tweeter to separate at low frequencies, and it develops its full sound pressure earlier, helping the crossover range sound. And in terms of sound, the POW 16+ is probably the best POW system to date. It plays incredibly musically and always sounds unobtrusive and pleasant. The basses reach amazingly deep into the frequency cellar; voices and natural instruments

Specifications

Basket diameter	166 mm
Installation diameter	143 mm
Installation dept	66 mm
Magnet diameter	84 mm
Tweeter diaphragm	28 mm
Tweeter cabinet	45 mm
slope woofer/tweeter	-12 dB
Tweeter protection	-
Tweeter level adjustment	-
Grille	-
Other	-
Nominal impedance	3 Ohm
DC resistance Rdc	2,51 Ohm
Voice coil inductance Le	0,27 mH
Voice coil diameter	25 mm
Cone area Sd	137 cm²
Resonance frequency fs	72 Hz
Mechanical Q Qms	3,99
Electrical Q Qes	0,68
Total Q Qts	0,58
Equivalent volume Vas	10,7 l
Moving mass Mms	11,9 g
Rms	1,35 kg/s
Cms	0,41 mm/N
B*1	4,46 Tm
SPL 2v, 1m	89 dB
Amplifier power recommendation	20 – 80 W

Eton POW 16+

Price	270 Euro
Contact	ACR, Switzerland
Internet	www.etongmbh.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 %	★★★★★
Crossover	10 %	★★★★★
Build quality	5 %	★★★★★

Top Class



CAR&HiFi

INTERNATIONAL Germany 1/22

Price/performance: very good

„Quality and sound at a fair price.“

Ground Zero GZCC 165.2SQL + GZCC 200.2SQL
– new component systems for sound and SPL

Loudspeakers for SPL lovers

► In Ground Zero's Competition series, there is a broad selection of loudspeakers for increased SPL requirements. We invited the GZCC 165.2SQL and GZCC 200.2SQL, two interesting component systems, to the test.





There's no neodymium but plenty of ferrite for a powerful motor

In the Competition series, Ground Zero brings together high-power speakers made for an extra helping of SPL in the car. No less than 22 single speakers and some coaxial and component systems are available. Many drivers are immediately recognizable as related to the PA sector, where people know everything about sound pressure. For car HiFi, this results in systems that have to provide one thing above all: a lot of fun. The problem is that the components are not easy to install; only certain loudspeakers fit

into standard mounting holes. Our component systems are the GZCC 165.2SQL, a two-way system with a 6.5" mid-bass driver, and the GZCC 200.2SQL, an 8" system.

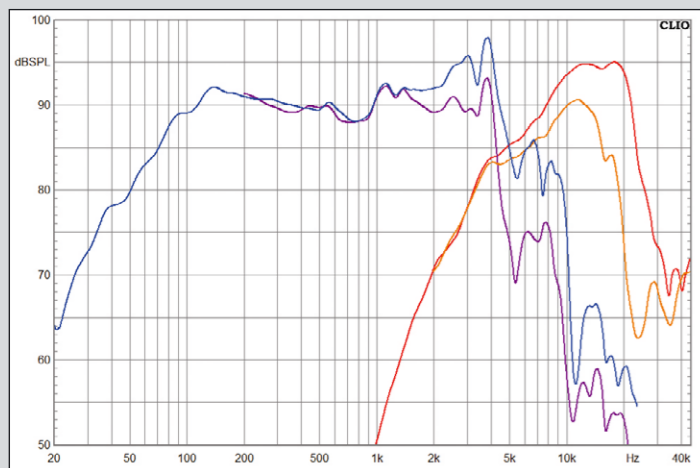
The SQL in the model name indicates the orientation, namely a cross between SQ and SPL. This means that the systems should play both

loud and well, and you can see that in the speakers. For example, the tweeter has a horn as a wave guide. However, it is not a compression driver. So we don't have a real PA horn in front of us, but a fabric dome tweeter from the hi-fi sector with corresponding sound-wise potential, where the horn only very gently focuses the sound forward. The driver has a flange diameter of 74 millimeters and a mounting depth of 36 millimeters, which means reasonably small housings can still be made for it.

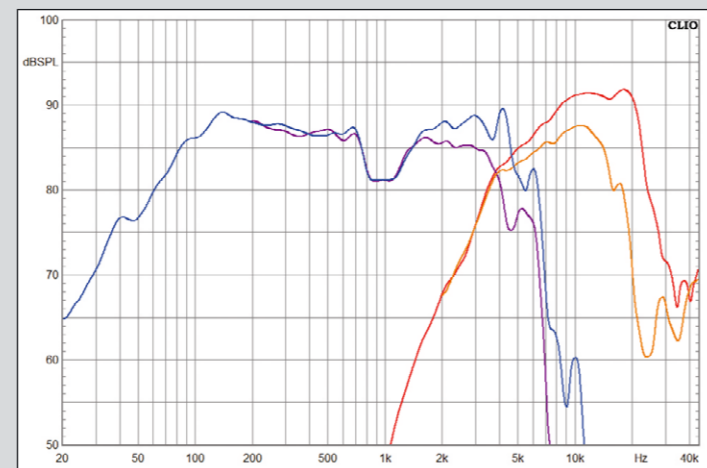
The crossovers are adjustable to the 6.5" and 8" woofers



CAR & HiFi Laboratory



The 6.5" system runs ideally except for the dip around 1 kHz. The mid-bass is crossed with 12 dB. The tweeter is set to low level



In the 8" system, according to the recommendation, the woofer-midrange operates without filtering, and the tweeter fits in the louder position

The midbass drivers correspond to the standard basket dimensions of 6.5" and 8". However, their powerful magnet systems are hefty because you need a lot of magnetic field for a lot of sound pressure. Power handling is also taken care of, as Ground Zero has equipped the woofers with large 1.5" voice coils. The air-dried paper cones are stable and not ultralight since the SQL drivers should also play appreciable bass as two-way bass-midrange drivers.

The crossovers are designed with high-quality components. The circuitry does not pose any riddles. We find classic 12 dB circuits for tweeter and woofer. The woofer can be set with a 6 or 12 dB slope, and the tweeter has two level settings. The crossovers provide a connection to a second woofer – so, if you want, you can also operate the SQL as a double woofer system. The necessary drivers are available individually.

Measurements and sound

In the measurement lab, the SQL design of the woofers can first be recognized by their parameters. Relatively low resonance frequencies, average moving masses, and sus-

pensions make them appear to be bass midrange drivers that can also deliver bass instead of only concentrating on the midrange (and delivering even more sound pressure there). What stands out are the potent motors of the woofers, which provide for decent efficiency. Thus, the 6.5" delivers almost 90 dB at one watt, the 8" around 92 dB. That's good for car HiFi, but still far from PA level. The tweeter fits perfectly; it also supplies 92 dB. It also yields sparkling clean distortion measurements, which unfortunately cannot be said of the two mid-bass drivers. Both deliver powerful SPL, but they distort a bit in the midrange.

The 6.5" midbass features aextra large magnet for high output



Specifications	
Basket diameter	168 mm
Installation diameter	146 mm
Installation dept	73 mm
Magnet diameter	110 mm
Tweeter diaphragm	25 mm
Tweeter cabinet	75 mm
slope woofer/tweeter	6, 12 / 12 dB
Tweeter protection	-
Tweeter level adjustment	0, -4 dB
Grille	•
Other	-
Nominal impedance	4 Ohm
DC resistance Rdc	3,32 Ohm
Voice coil inductance Le	0,37 mH
Voice coil diameter	38 mm
Cone area Sd	137 cm ²
Resonance frequency fs	59 Hz
Mechanical Q Qms	8,15
Electrical Q Qes	0,38
Total Q Qts	0,36
Equivalent volume Vas	12,3 l
Moving mass Mms	15,3 g
Rms	0,70 kg/s
Cms	0,47 mm/N
B*1	7,04 Tm
SPL 2v, 1m	88 dB
Amplifier power recommendation	20 – 120 W

Ground Zero GZCC 165.2SQL	
Price	360 Euro
Contact	Ground Zero GmbH, Germany
Internet	www.ground-zero-audio.com

Rating	
Sound	55 % ★★★★★
Bass foundation	11 % ★★★★★
Neutrality	11 % ★★★★★
Sound stage	11 % ★★★★★
Spatiality	11 % ★★★★★
Dynamics	11 % ★★★★★
Lab	30 % ★★★★★
Frequency response	10 % ★★★★★
Max. SPL	10 % ★★★★★
Distortion	10 % ★★★★★
Practice	15 % ★★★★★
Crossover	10 % ★★★★★
Build quality	5 % ★★★★★



Hybrid of horn and dome in the Ground Zero tweeter

Top Class



CAR & HiFi

INTERNATIONAL Germany 1/22

Price/performance: very good

„Great Sound and SPL“

The tweeter is equipped with a aluminum heatsink at the back of it's motor



Sound-wise, however, the SQL systems are always on the right side. They combine beautiful, detailed sound with an extra portion of fun. The 6.5" system already delivers crisp, well-trained basses that can also be a bit louder. The 8" system doesn't play any lower, but it slams even more, especially with dust-dry bass beats, which sound very good. The sound is consistently suitable for hi-fi, which is also a merit of the very well playing fabric tweeter. It refrains from any horn-typical sharpness and provides fine pearly details on a very high level. In general, music of any style can be enjoyed with both systems. It may also be a jazz trio with double bass, even if these speakers are not necessarily built for it. However, they impressively deliver on their level promise: If the volume control is turned, the Ground Zeros give the listeners a good pounding on the ears. This is precisely how it should be: with a lot of noise, but without undue distortions. This makes listening fun - no matter whether it's soft or loud.

The 8" midbass has similar features as the 6.5", namely a thin paper cone and a steel basket

Specifications	
Basket diameter	210 mm
Installation diameter	182 mm
Installation dept	89 mm
Magnet diameter	117 mm
Tweeter diaphragm	25 mm
Tweeter cabinet	75 mm
slope woofer/tweeter	6, 12 / 12 dB
Tweeter protection	PTC
Tweeter level adjustment	0, -4 dB
Grille	•
Other	-
Nominal impedance	4 Ohm
DC resistance R _{dc}	3,38 Ohm
Voice coil inductance L _e	0,37 mH
Voice coil diameter	38 mm
Cone area S _d	219 cm ²
Resonance frequency f _s	66 Hz
Mechanical Q Q _{ms}	5,95
Electrical Q Q _{es}	0,55
Total Q Q _{ts}	0,51
Equivalent volume V _{as}	18,4 l
Moving mass M _{ms}	20,9 g
R _{ms}	1,47 kg/s
C _{ms}	0,27 mm/N
B ¹	7,30 Tm
SPL 2v, 1m	91 dB
Amplifier power recommendation	20 - 120 W

Conclusion

The GZCC 165.2SQL and GZCC 200.2SQL SQL systems are a very accomplished compromise between level capability and sound quality. Ground Zero has managed not to fall short of either, so the whole thing works very well for listening to music.

Elmar Michels

Ground Zero GZCC 200.2SQL	
Price	400 Euro
Contact	Ground Zero GmbH, Germany
Internet	www.ground-zero-audio.com

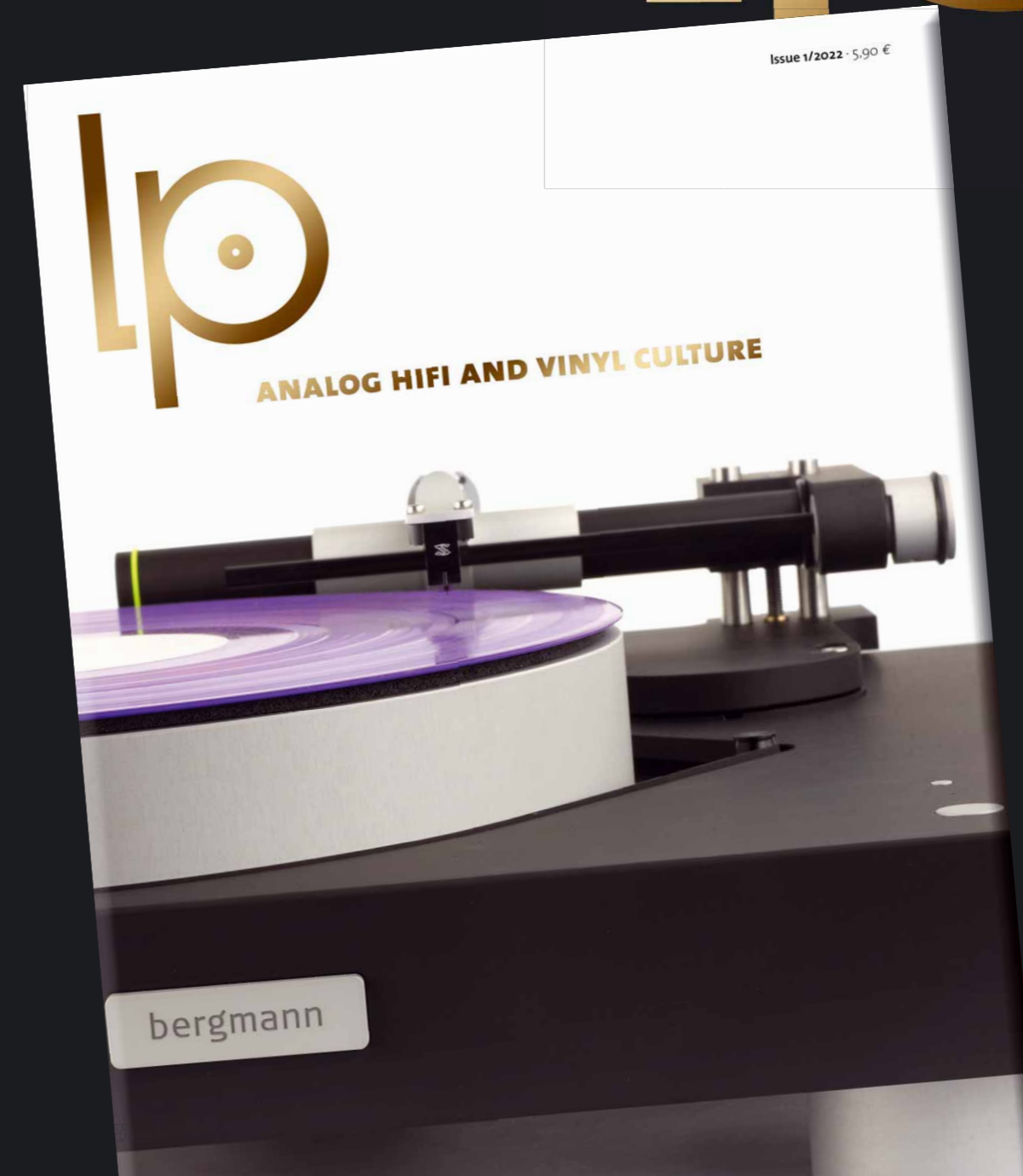
Rating	
▶ Sound	55 % ★★★★★
Bass foundation	11 % ★★★★★
Neutrality	11 % ★★★★★
Sound stage	11 % ★★★★★
Spatiality	11 % ★★★★★
Dynamics	11 % ★★★★★
▶ Lab	30 % ★★★★★
Frequency response	10 % ★★★★★
Max. SPL	10 % ★★★★★
Distortion	10 % ★★★★★
▶ Practice	15 % ★★★★★
Crossover	10 % ★★★★★
Build quality	5 % ★★★★★

Top Class
★★★★★

CAR & HiFi
INTERNATIONAL Germany 1/22

Price/performance: very good
„Great Sound and SPL“

**AVAILABLE
IN EPAPER STORES
AND
WWW.LP-INTERNATIONAL.INFO**



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

ZMAX82 + ZMAX122 – subwoofers with
SPL ambitions from Phoenix Gold

High SPL subwoofers

► Think big! If you want a subwoofer with maximum SPL, you have to bring up a whole lot of material. The engineers at Phoenix Gold know this, too – and with the ZMAX woofers, they present two SPL firecrackers.



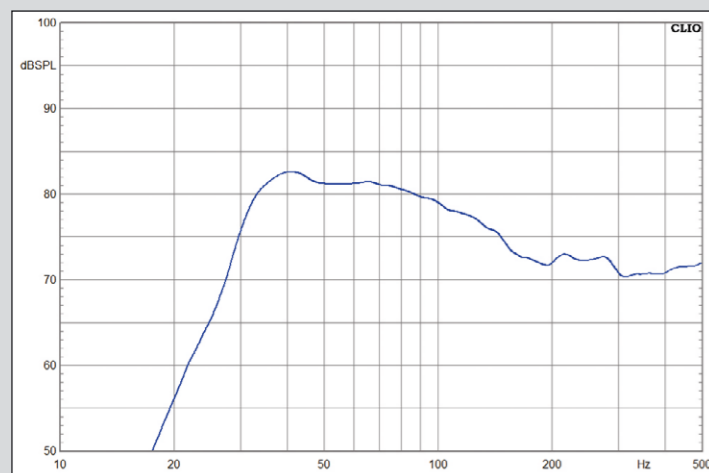
The ZMAX122 has two solid ferrite rings, each is 25mm thick



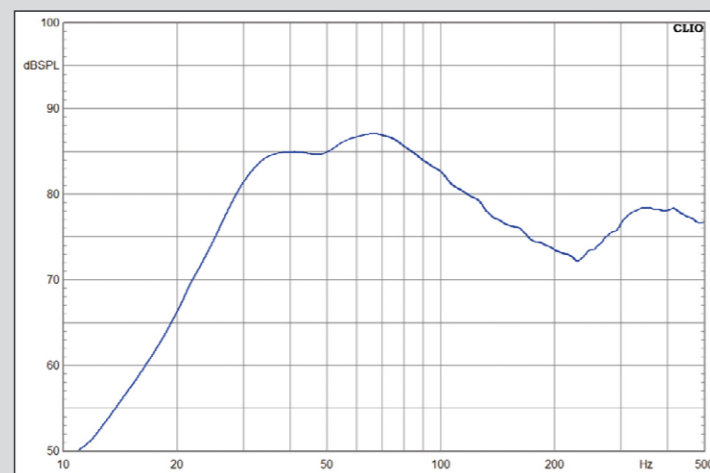
Solid die-cast baskets and double ventilation in the top plates on the ZMAX

For friends of slim, discreet subwoofers, there is now a vast selection of compact models available today. Small is fine and also works splendidly in everyday life. However, anyone who strives for „real bass“ that shakes the body to the core will not be happy with a ‚compact‘ subwoofer. For such bass freaks, Phoenix Gold has designed the ZMAX woofers following the motto, „what’s too much is not too little.“ The smaller ZMAX82 weighs 6.7 kilos, and the full-grown 12" ZMAX122 weighs in at 13.6 kilos. You’ll immediately believe that the ZMAXs are extremely sturdily built. They both feature a massive die-cast basket, stretching very deep to realize extensive throws. Mechanically, the cone assemblies of the woofers have 35 and 40 millimeters of freedom of movement with diameters of 64 and 76 millimeters. The electrically linear throw is an estimated 20 millimeters – also with the ZMAX82. There are colossal voice coils made of thick wire on black aluminum bobbins to match. Even the ZMAX122’s coil winding is blackened for better heat dissipation. The thick, turned top plates are also massive: Kilos of steel have been used here. Vented pole pieces and a ring of holes in each voice coil’s movement area contribute to complete ventilation, so the ZMAXs are thermally well-equipped to handle any amount of amplifier power. The ZMAX models set the air in motion with thick, air-dried paper diaphragms, and around them are high-profile foam surrounds that allow for considerable diaphragm throw with minor loss.

CAR&HiFi Laboratory



The ZMAX82 plays down to 30 Hz at full SPL and likes to step it up a notch in the low end



The ZMAX122 delivers a lot of thrust between 30 and 90 Hz and achieves 86 dB at 1 W

Specifications	
Basket diameter	21,9 cm
Mounting diameter	18,6 cm
Mounting depth	13,8 cm
Magnet diameter	16,3 cm
Weight	6,7 kg
Nominal impedance	2 x 2 Ohm
DC resistance Rdc	3,79 Ohm
Voice coil inductance Le	3,31 mH
Voice coil diameter	64 mm
Diaphragm area	201 cm²
Resonant frequency fs	41 Hz
Mechanical quality Qms	6,48
Electrical quality Qes	0,51
Total quality Qts	0,47
Equivalent volume Vas	5,3 l
Moving mass Mms	158 g
Rms	6,36 kg/s
Cms	0,09 mm/N
B x l	17,51 Tm
Sound pressure 1 W, 1 m	82 dB
Power recommendation	150 – 400 W
Test enclosure	vented 28 l
Port dimensions (d x l)	8,5 x 28 cm

Phoenix Gold ZMAX82

Price	200 Euro
Contact	AAMP European Division, UK/Sweden
Internet	phoenixgold-eu.com

Rating

Sound	50 %	★★★★★
Bass	12,5 %	★★★★★
Pressure	12,5 %	★★★★★
Purity	12,5 %	★★★★★
Dynamics	12,5 %	★★★★★
Lab	30 %	★★★★☆
Frequency response	10 %	★★★★★
Efficiency	10 %	★★★☆☆
Maximum level	10 %	★★★★★
Processing	20 %	★★★★★

Upper Class
★★★★★

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Price/performance: very good
„A value-for-money powerhouse, designed to the point.“

Measurements and sound

As for the boxes, we naturally opted for vented ones. While we gave the small ZMAX82 a rather lush volume of 28 liters, the ZMAX122 gets by with a moderate 44 liters. Thus, the ZMAX82 achieves a low tuning to 39 Hz for an 8" woofer, while the ZMAX122 is at 36 Hz and should therefore not only rumble all the way down but still sound a bit punchy. If you want to exhaust the low bass, you are welcome to envelop 15 liters of air more. In practice, the ZMAX82 already ignites an enormous bass firework that doesn't miss anything in terms of pressure. It needs power but also delivers the corresponding output when you demand it. There's also a lot of pressure down to the lower bass ranges so that even fat beats and synth sounds come across well. The nice thing is that the ZMAX82 is not only really firm to the point but also plays very nice and precise. The ZMAX122 can do that almost as well. As intended, it plays agile and crisp, but always with an extra dose of fat bass that is a lot of fun. If you turn up the volume, it gets down to business and properly shakes the vehicle occupants. That's the way it has to be! But the ZMAX122 can play quite civilized on a high sound level and make great music in everyday life – of course, with an extra dose of pressure.

Conclusion

The ZMAX subwoofers are ideal for bass fans who can't get enough pressure. The ZMAX82 is one of the „wickedest“ 8-inch subwoofers on the market with compact dimensions. The ZMAX122 provides SPL until you drop but also likes to play everyday music.

Elmar Michels



Solid die-cast baskets and double ventilation in the top plates on the ZMAX

Specifications

Basket diameter	32,9 cm
Mounting diameter	28,8 cm
Mounting depth	17,9 cm
Magnet diameter	20,0 cm
Weight	13,6 kg
Nominal impedance	2 x 2 Ohm
DC resistance Rdc	4,20 Ohm
Voice coil inductance Le	4,13 mH
Voice coil diameter	76 mm
Diaphragm area	511 cm ²
Resonant frequency fs	41 Hz
Mechanical quality Qms	8,93
Electrical quality Qes	0,57
Total quality Qts	0,54
Equivalent volume Vas	17,5 l
Moving mass Mms	319 g
Rms	9,13 kg/s
Cms	0,05 mm/N
B x l	24,42 Tm
Sound pressure 1 W, 1 m	86 dB
Power recommendatiog	150 – 400 W
Test enclosure	vented 44 l
Port dimensions (d x l)	10 x 35 cm

Phoenix Gold ZMAX122

Price	380 Euro
Contact	AAMP European Division, UK/Sweden
Internet	phoenixgold-eu.com

Rating

▶ Sound	50 %	★★★★★
Bass	12,5 %	★★★★★
Pressure	12,5 %	★★★★★
Purity	12,5 %	★★★★★
Dynamics	12,5 %	★★★★★
▶ Lab	30 %	★★★★★
Frequency response	10 %	★★★★★
Efficiency	10 %	★★★★★
Maximum level	10 %	★★★★★
▶ Processing	20 %	★★★★★

Top Class



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Price/performance: very good

„A value-for-money powerhouse, designed to the point.“

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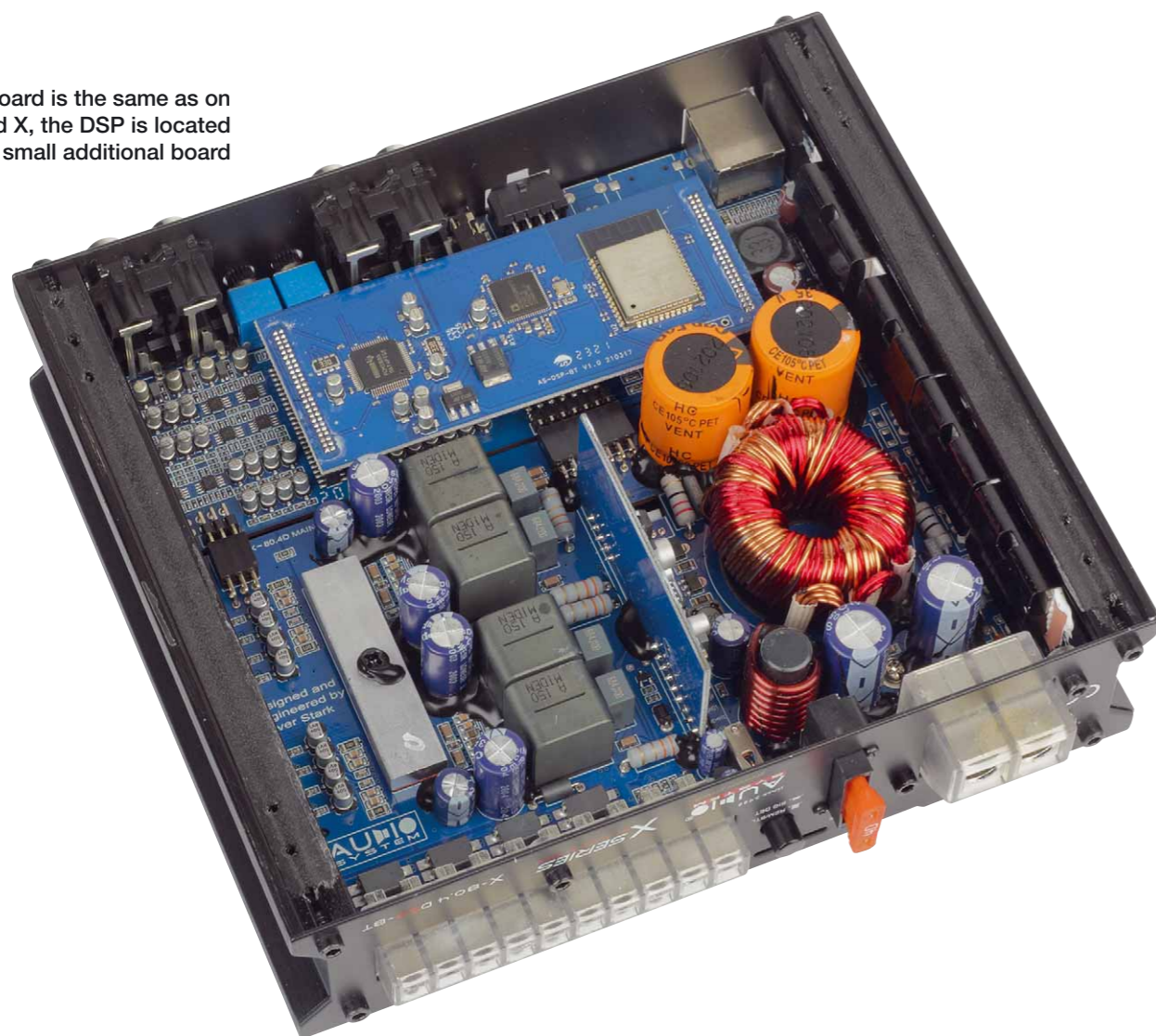
Audio System X-80.4 DSP-BT:
4-channel power amplifier with 8-channel DSP

DSP amplifier for all

▶ A compact, inexpensive digital amplifier that can drive a complete hi-fi system with built-in DSP is all the rage. Audio System presents the new version of the X-80.4 DSP-BT.



The motherboard is the same as on the standard X, the DSP is located on the small additional board



The X-80.4 D was the first multi-channel Class-D amplifier from Audio System. It therefore made sense that this compact four-channel amplifier should also be equipped with a signal processor, which is what happened in 2018 with the X-80.4 DSP. However, the brand-new X-80.4 DSP-BT differs from its predecessor not only because of its BT (Bluetooth) capacity. Audio System is introducing its new DSP platform for the first time, which is based on completely new hardware and thus also new software. Otherwise, the amplifier is based on the proven X-80.4 D, whose ampli-

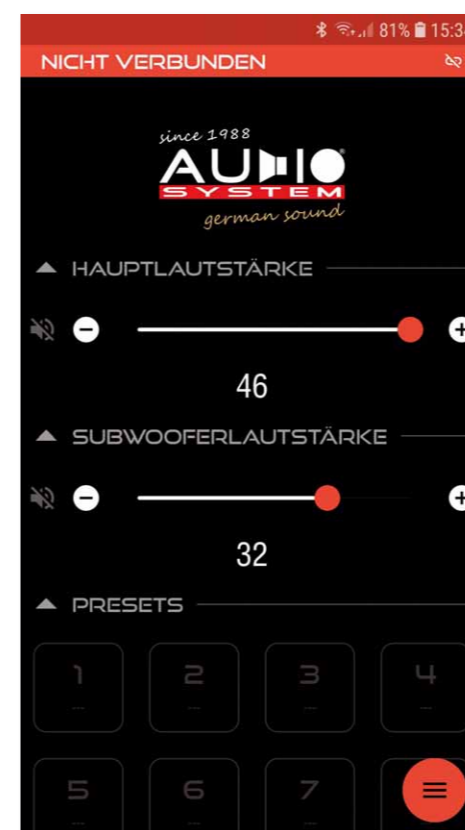
fication has remained untouched. In addition, the DSP provides four processed RCA outputs that can be used to control additional amps. A second X-80 creates an eight-channel system with plenty of power for a fully operational active system, or a powerful two-channel or mono amplifier can be combined for a beefy audio system. The system is then controlled exclusively via smartphone, with a new app that can do everything except confuse you. At a price of 500 euros, the new X-80.4 DSP-BT is an extremely attractive offer, with a very moderate surcharge for the DSP. The aim is

not to have an expensive and high-end system, but rather a sound processor system that offers great value for money. For example, there is no physical digital input and no hi-res streaming, but Bluetooth is incorporated as a standard feature. Also, there is no PC software with a multitude of submenus that you have to familiarise yourself with; rather, a smartphone app that does not make matters worse. So, it appeals to beginners and smartphone music listeners who might not want to delve into the depths of DSP programming.

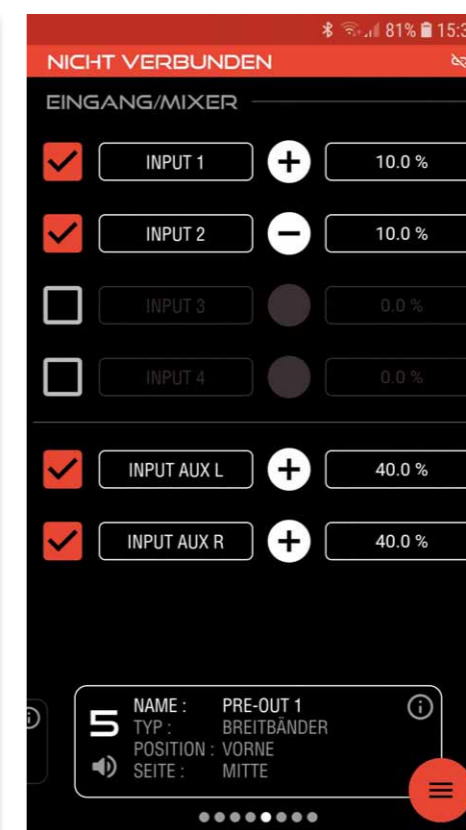
Hardware

Let us take a look at the new X-80.4 DSP-BT; it is strikingly similar to the standard amplifier. We find low- and high-level inputs and the socket for the optional remote control, only instead of analogue crossovers, four RCA outputs and the inconspicuous AUX input in the form of a jack socket indicate the DSP. There is no laptop USB port, nor is there a Bluetooth antenna, because the X-80 does not need either. Instead of programming with a laptop and cable, there is an app, which is available for Android (an iOS version is in the works). The Bluetooth antenna is inside; it is already included in the chip that sits on the digital daughterboard. This chip is a real jack-of-all-trades, because it not

only contains the Bluetooth receiver (unfortunately only on its 4.2 version) and a currently unused Wi-Fi functionality, but it also contains a 32-bit microcontroller that controls the entire signal processor. The converter is the PCM3168 from Texas Instruments/Burr Brown, one of the most widely used audio codecs ever. It can convert 6 inputs and 8 outputs, AD or DA, with a depth of 24 bits. This means that the X-80.4 DSP-BT has a 6-by-8 design. Four main inputs and the stereo aux are available simultaneously and can be mixed and processed as desired. If the AUX is upgraded with a high-low adapter, six-channel factory systems can also be adapted seamlessly. The Bluetooth input is left out as a digital source; it is automatically



Volume and presets

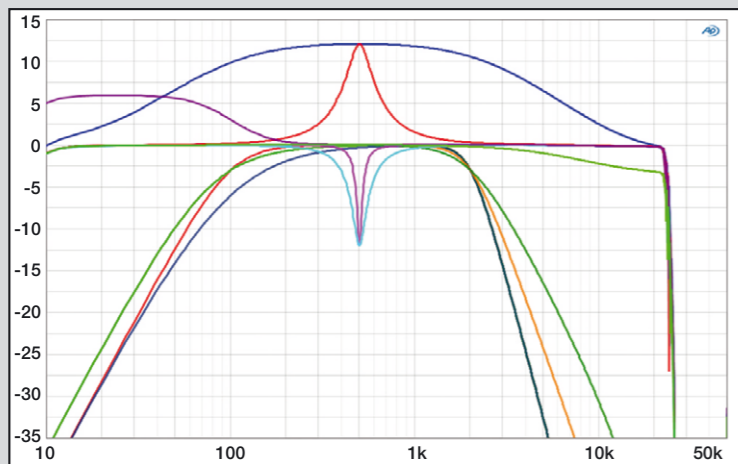


Mixer: Below the output to be set, above the inputs with their components

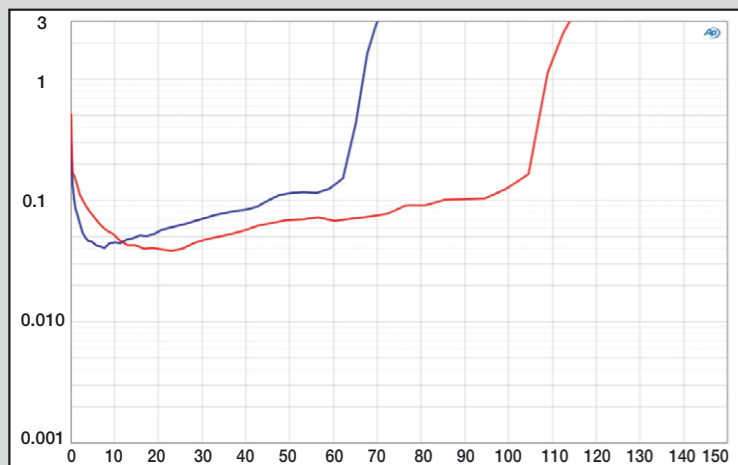
Specifications

Dimensions	180 x 150 x 45 mm
Eingänge	
• 4-channel RCA	
• 4-channel high-level (20 V)	
• 1 x digital bluetooth	
• 1 x AUX (stereo, 3,5 mm jack)	
Ausgänge	
• 4-channel RCA (5 V)	
• remote-out	
DSP-Kanäle	
• 6 inputs, 8 outputs	
DSP-Software (Android V0.1.2 in test)	
Equalizer	
Inputs:	
• param., 7 bands per channel (in progress)	
Outputs:	
• parametric, 30 bands per channel, +12 – -12 dB	
• 20 – 20k Hz, 1-Hz-steps, Q 0,1 – 11,9	
• Shelf 20 – 10k Hz, Q 0,1-2	
• Allpass filters 2nd order, f and Q adjustable	
Crossovers	
Outputs:	
• 20 – 20k Hz, 1-Hz-steps	
• Bessel, Butterworth, Linkwitz 6-24 dB/Okt.	
Time and level	
• Sample rate 48 kHz, 7-mm-steps (0,02 ms)	
Inputs:	
• in progress	
Outputs:	
• 0 – 686 cm (20 ms), 1024 Samples	
• Phase 0, 180°	
• Muting	
• Level steps 0,1 dB	
Features	
• 8 Presets	
• In- and Outputs freely routable	
• Start-stop capability up to 7,2 V	
• Signal-dependent switching to BT/AUX	
• Autosen by remote, DC or signal	
• Master- and subwoofer volume	
• Bluetooth (audio streaming and wirelessly operating all features)	
Optional accessories	
• Wired remote control	
• Various HLC High-Low-Converter for 6 high inputs and/or factory amps	
• Various vehicle harnesses (ISO, Quadlock ...)	
• Illuminated logo plate	

CAR & HI-FI Laboratory



Frequency range up to 22 kHz, crossovers with different characteristics (high-pass) and different slopes (Butterworth)



At 4 ohms, the X scratches the 70-watt mark. At 2 ohms, the distortion is just as low as at 4 ohms, with a maximum of almost 110 watts per channel



looped in when needed. Let us move on to the actual DSP, where we have none other than the ADAU1452 from Analog Devices. This powerful chip is absolutely the state-of-the-art equipment of almost all high-quality signal processors from the upper entry level range to the high-end class. This makes the new X competitive. And we can already look forward to more products with the new signal processor. The four-channel R-110.4 DSP-BT from the Radion series is already available, and more DSP amps and stand-alone DSPs will follow.

As mentioned above, the four-channel amplifier is identical to the X-80.4 D. The motherboard was designed in two parts from the beginning; this way we now have digital instead of analogue signal processing. On the input side we find the low- and high-level inputs with the numerous op-amps for signal processing - all finely and cleanly built in SMD. The motherboard houses a small

power supply with buffering and the amplification is carried out by modern amps ICs, of which the X-80 has two with two channels each on board. On the output side of the housing, the four channels are connected to solid screw terminals. This is a bit fancy nowadays, but it also indicates that the X-80 is no longer really a small or micro amp.

Software

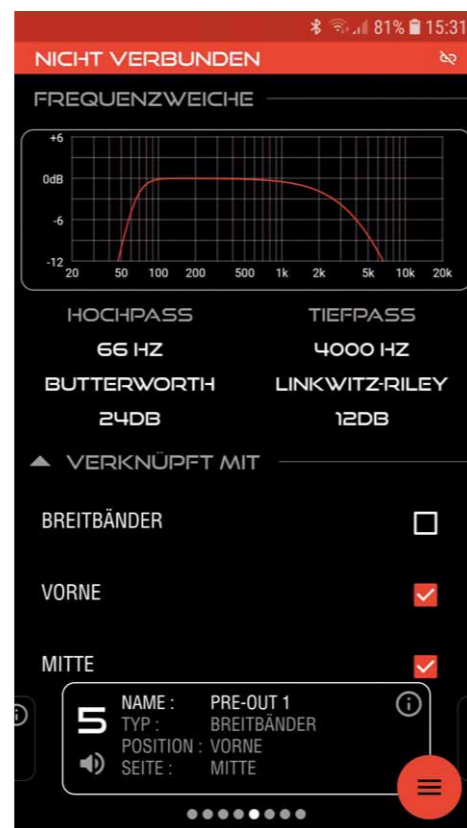
The Audio System DSP platform is controlled with a mobile app. We tested the Android version, which was the first one to be released. An iOS version is being developed but desktop software is not planned. The first point to make is that so far only the very first beta versi-

on exists, which does not yet have all functions. There are still some things that will be added with future updates. What is available, however, works very well and bug-free. Let us take a look at that now. At the start window, the app presents itself as a remote control with two level sliders for main volume and subwoofer volume, including muting of both ranges. Furthermore, there are 8 presets, which are managed in a separate preset manager. The input range contains the mixer, where the 6 inputs can be freely routed to the 8 outputs. The crossovers offer cleanly programmed filters according to Butterworth, Bessel or Linkwitz, which go up to 24 dB/oct. slope. The output EQs have 30 bands per

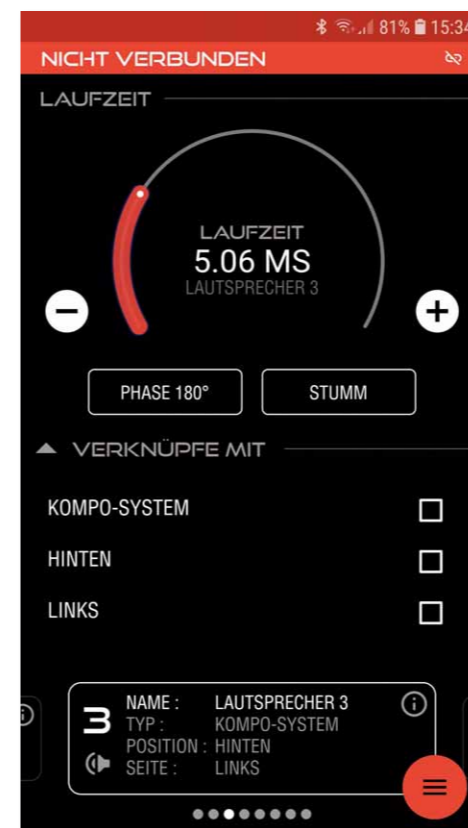
channel, which are displayed graphically and can be fully parameterised in extended DSP mode. Then each band can be used and adjusted as a parametric equalizer, shelf filter or all-pass. Also, the time alignment refers to the 8 outputs; according to the sampling rate of 48 kHz we have steps of 7 millimetres or 0.02 milliseconds, the range is generous at 6.8 metres. Finally, the channels can be adjusted in level and reverse polarity as well as muted. The various linking possibilities of the channels are a great feature. For crossovers, EQs, times and levels. Each channel can be assigned a speaker category (such as combo, full range, subwoofer), an installation location (front, rear boot) and a vehicle side (left, right, center). This way, the assigned channel groups can be changed together very quickly. All in all, this is a range of functions that is trimmed for the best usability and overview and thus deserves the rating "beginner-compatible". The Analog Devices DSP is far from being used to its full capacity, and as mentioned, not everything is ready in our version.

Outlook

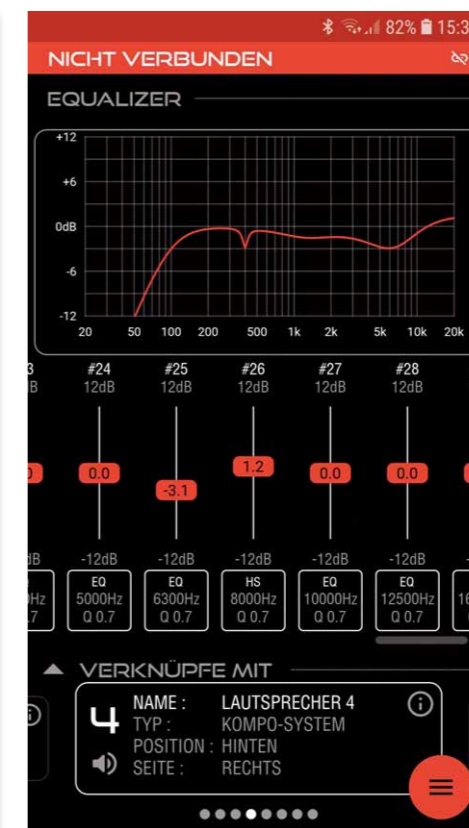
Even though not yet available at the time of testing, we can allow ourselves a brief look into what the future might hold. Audio System is still working on many functions. For example, the inputs will also receive equalizers and time alignment. An input level display as a levelling aid is coming as well as a time calculator for quick conversion of the time settings. The announced online preset database will be something to



Crossover with high-pass, low-pass and groups



Time setting with rotary control and phase



Equalizer: The bands can be crossed over in the middle, the channels at the bottom; tapping opens the EQ parameters



4 processed outputs and the jack input reveal the DSP amplifier, otherwise everything is X-80.4 D

look forward to and even measuring functions with the smartphone microphone are in the works. In addition, an extended AUX mode is to offer its own setting for all settings. All this will come gradually with the updates, which we will report in future tests.

Conclusion

For 500 euros, the X-80.4 DSP-BT is a great deal. It combines a solid Class-D four-channel amplifier with a state-of-the-art DSP, as well as Bluetooth. The X-80.4 DSP-BT does not offer all the refinements that the market has to offer, but it is very easy

to handle for being a DSP power amplifier. And the whole thing can be controlled with the mobile app, so that fun is guaranteed.

Elmar Michels

Measurements and sound

As already mentioned, the power amplifier section is unchanged from the "standard" X-80. Therefore, we do not expect any surprises in the lab test and hearing check. The X-80.4 DSP-BT works with a sampling rate of 48 kHz, so that the audio frequency response extends up to 22 kHz. It has an output of 70 or 110 watts at 4 and 2 ohms. The distortion is always low and the damping factors show the typical behaviour at high frequencies, due to the low-pass filter of the Class D circuit. In terms of sound, the X-80 shows its well-known good side, it sounds tight in the bass and impresses with a precise sound image. The three-dimensionality is convincing with good localisation and there are plenty of fine high-frequency details to admire. In addition, the X can deliver music in a punchy and powerful way, so that the fun factor is also right.

Specifications

Channels	4
Power4 Ohm	68
Power 2 Ohm	109
Power 1 Ohm	0
Bridged power 4 ohms	218
Bridged power 2 Ohm	0
Sensitivity max. mV	90
Sensitivity min. V	1.9
THD+N (<22 kHz) 5 W	0.044
THD+N (<22 kHz) half load	0.076
SNR dB(A)	81
Damping factor 20 Hz	102
Damping factor 80 Hz	104
Damping factor 400 Hz	104
Damping factor 1 kHz	102
Damping factor 8 kHz	22
Damping factor 16 kHz	6

Features

Low pass	10 – 20k Hz
High pass	10 – 20k Hz
Bandpass	10 – 20k Hz
Bass boost	via DSP
Subsonic filter	via DSP
Phase shift	via DSP
High-level inputs	•, 4CH
Automatic switch-on (autosense)	•, DC or signal
RCA outputs	•, 4CH processed
Start-stop capability	• (7.2 V)
Dimensions (L x W x H in mm)	180 x 150 x 45
Other	DSP, Bluetooth

Audio System X-80.4 DSP-BT

Price	500 Euro
Distributor	Audio System, Hambrücken
Hotline	07255 71907-0
Internet	www.audio-system.de

Rating

▶ Sound	40 %	★★★★★
Bass foundation	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★★
Spatiality	8 %	★★★★★
Dynamics	8 %	★★★★★
▶ Lab	35 %	★★★★★
Performance	20 %	★★★★★
Damping factor	5 %	★★★★★
SNR	5 %	★★★★★
Distortion factor	5 %	★★★★★
▶ Practice	25 %	★★★★★
Features	15 %	★★★★★
Build quality Electronics	5 %	★★★★★
Build quality Mechanics	5 %	★★★★★

Top class



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Price/performance: very good

"Compact four-channel amplifier, with DSP and Bluetooth at a very reasonable price."

POWERFUL 10" COMPACT SUBWOOFER

ZR series

400W Max Power, Rugged Underseat Subwoofer

The ZR10P is a 10-inch powerful compact subwoofer suitable for a variety of different vehicles. This powerful subwoofer will enhance your audio experience with pounding bass thanks to its 200W RMS (400W Max) output along with its 0-12db variable bass boost.

The compact size of the sub is teamed with a durable aluminium casing to provide a strong rugged unit that can be installed in a variety of different locations including under vehicle seats to retain the interior space of a vehicle.



Product Specification

- 200W RMS Power
- 400W Max Power
- THD: <0.5%
- Fuse Rating: 25A
- Subsonic Filter: 20Hz
- Bass Boost: 0 to 12dB
- Low Pass Filter: 50Hz – 150Hz
- Signal-To-Noise Ratio: >90dB
- Frequency Response: 20Hz – 150Hz
- Input Sensitivity (High Level): 1.0V
- Input Sensitivity (Low Level): 300mV
- Dimensions: 340x245x78mm (L x W x H)
- Part Number: ZR10P

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