

# CAR & HiFi

INTERNATIONAL

2/24 · 4,80 €

## European Edition

### Best topics

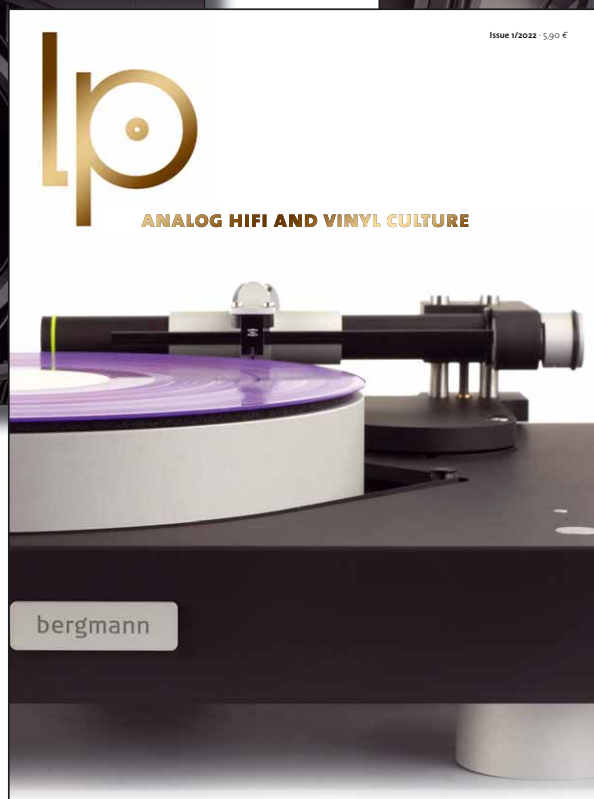
- High power DSP amplifier • Entry level amplifier
- Sound quality subwoofer • Powerful five channel amplifier
- 2 high output subwoofer boxes

### Featured brands

- Audio System Germany • Ground Zero
- Hifonics • Musway • Phoenix Gold



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**EMV-TIPP**  
Ungestörter Radioempfang  
**CAR & HiFi** 5/2023

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Oberklasse **1,1**  
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**LEISTUNGSTIPP**  
Oberklasse  
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### 5 X ANALOG CLASS A/B

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[www.hifonics.de](http://www.hifonics.de) - [www.audiodesign.de](http://www.audiodesign.de)

# New products of the season

Welcome to the summer edition of CAR&HIFI INTERNATIONAL. This time we have the best subwoofers from both worlds, namely a 10-inch subwoofer specially designed for the highest sound fidelity and two bass boxes that already have SPL in their name. The good thing about them: they are all affordable and you don't have to spend a fortune for really good bass. If you are looking for a really powerful DSP amplifier, you will also find what you are looking for. Enjoy the review of a compact 6-channel amplifier that delivers

significantly more power than its counterparts with amplifier ICs, and with a total of 10 DSP channels you are also equipped for the big stuff. We hope you enjoy reading.



Elmar Michels  
Editor-in-chief



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Beyond the range of limits,  
Beyond the ordinary,  
Beyond the others.



### ULTRA

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- Ultra-high-end 80 mm / 3.15" midrange speaker
- 70 / 110 W - 4 Ohms
- Tightly tolerated technical parameters
- High-Tech Kevlar® cone
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- Optimized motor and voice coil ventilation
- Airflow-optimized aluminum cast spokes
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- Documented final technical inspection
- Wooden box packaging / in matching pairs
- NRG protection grills with aluminum ring
- Perfect system combination with  
GZ ULTRA K-165 & GZ ULTRA T-30





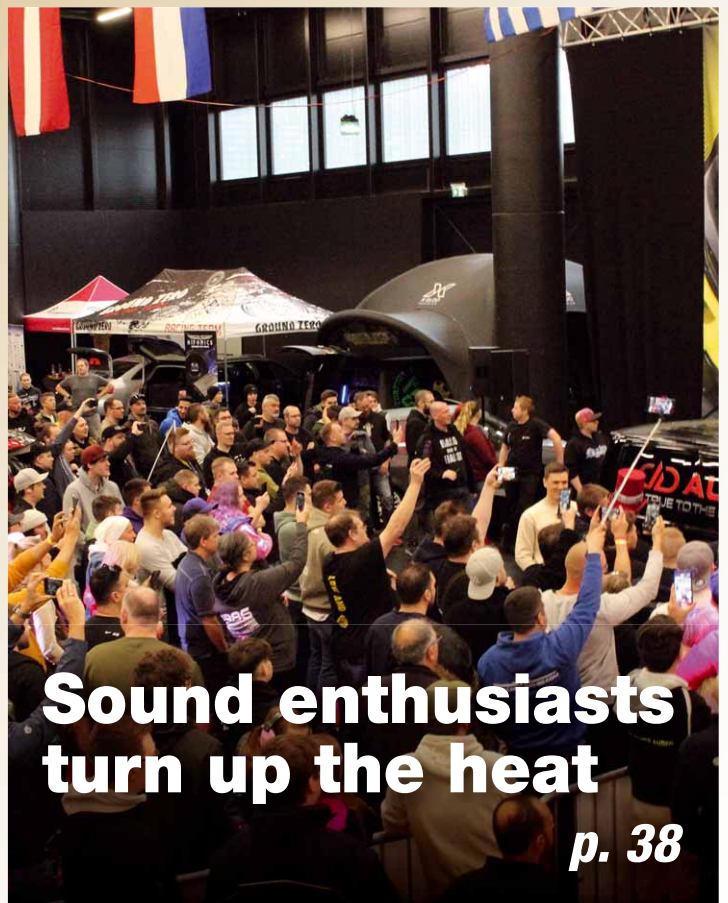
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## ► Ten new Crunch amplifiers

Price-optimized sound optimization: For more than 30 years, Crunch car audio components have delighted beginners and price-conscious connoisseurs alike. Always technically and visually up to date, the traditional brand is making a big splash at the start of the season and is presenting ten new models with the Gravity GTX Micro Class D amplifier series. The three mono amps, three two- or four-channel models and the six-channel model come in a contemporary, stylish black with a red illuminated logo. Their easy-to-install, compact dimensions are pleasing to the eye without disappointing the ear: because inside, you'll find the powerful, efficient amplifier technology you've come to expect from Crunch.

● [www.audiodesign.de/english/](http://www.audiodesign.de/english/)



## ► Downfire double enclosure

With the GDF 10-2, Audio System offers a practical bass enclosure that, at just 86 millimeters high, is designed to work in the double trunk floor or as a downfire bass enclosure that barely restricts trunk use. It can be equipped with one or two 10-inch woofers such as the AX 10 US, which is available as a 2 x 2 Ohm or 2 x 4 Ohm version, so that the subwoofer can be adapted to the existing power amplifier. The matching grilles, which are available as GI10 from Audio System dealers, provide optional protection.

● [www.en.audio-system.de](http://www.en.audio-system.de)

## ► Smart AI dash cam

The Nextbase iQ ensures that every vehicle is safer, smarter and protected at all times by enabling real-time video access from anywhere to both the vehicle's interior and the surrounding area. The iQ is available in three resolutions up to 4K. The Protect Plus subscription includes features such as emergency SOS, cloud storage and live view. The simple plug-and-play setup means the iQ can be installed quickly and safely using the included OBD hardwire kit.

● [www.nextbase.com](http://www.nextbase.com)





# 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)



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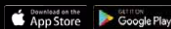


**RC-DQ €79,00\***

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.



Musway M6 Pro – 6-channel amplifier  
with 10-channel DSP

# Powerhouse

▶ The M6 was the first serious DSP product from Musway offered in Europe. Meanwhile, the v3 version has been on the market since 2022, so Musway is launching the M6Pro.

**POWER AWARD**

**Absolute Top Class**

**CAR & HiFi**  
INTERNATIONAL 2/24

**BEST EMC**

**Undisturbed FM reception**

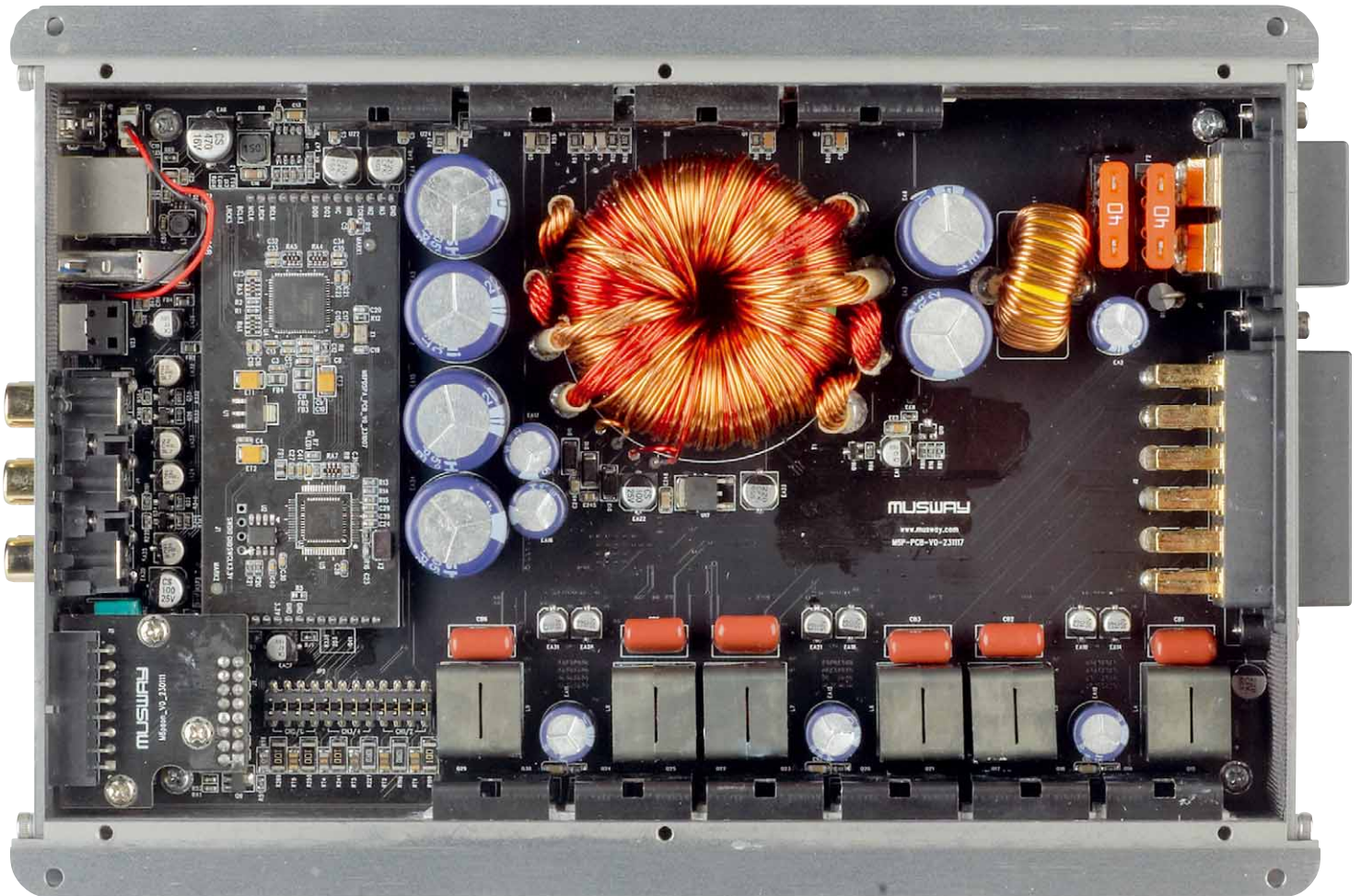
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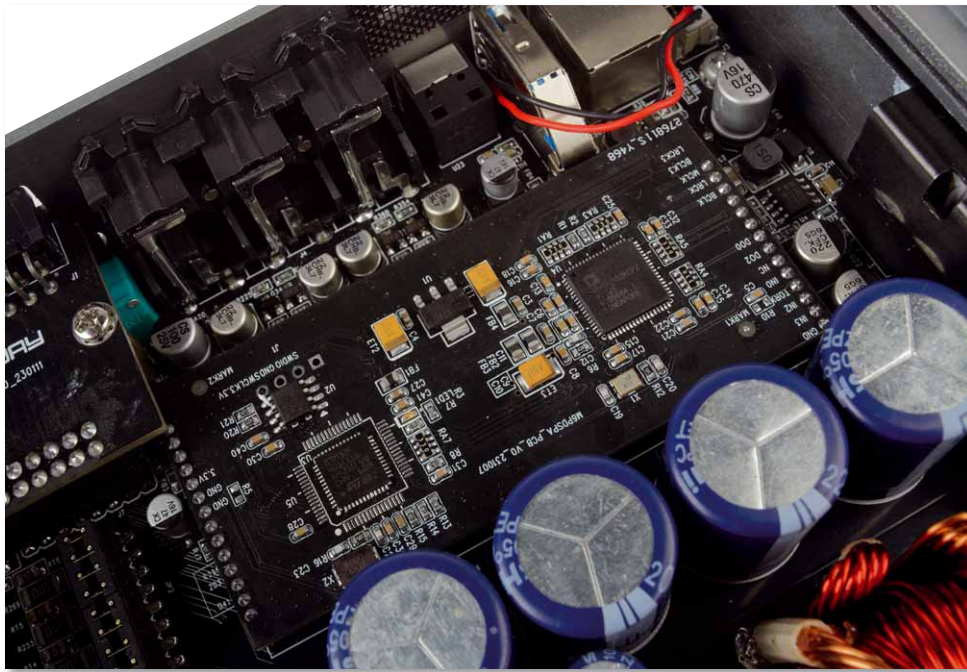
Musway has established itself as a serious supplier of DSP products in recent years. At the last, with the M10 and M12 multi-channel amplifiers, Musway is also retrofitting modern factory systems. Now, with the M6 Pro, a more traditional DSP amplifier is coming to specialist dealers. At first glance, it doesn't look very spectacular. So after M6, M6v2 and M6v3 comes M6Pro? Yes and no, because the new Pro is not just an updated M6 but a completely new amplifier. While the original M6 could pass as an inexpensive upgrade for small factory

systems, the new M6Pro is a completely different caliber – more on that later. The tried and tested basic concept has remained the same: A compact amplifier that readily makes contact with small and medium-sized factory equipment with six speaker-level inputs. The inputs can handle 20 volts, so they are suitable for vehicles with a factory amplifier, up to 100 watts per channel, to give you an idea. The speaker level inputs can also be jumpered for low-level sources such as aftermarket radios; suitable RCA adapters are available from Musway. Generally, there is a

selection of ready-made cable harnesses for connection to the vehicle, for example, to Quadlock or ISO. A pair of RCA sockets for AUX input and an optical digital input are also available. The USB socket accepts various accessories. In addition to a remote control, there is a choice of the simple BTS streaming module, the BTA2, which can also be used to program the DSP, and the BTS-HD, which also enables high-resolution music streaming at up to 24 bit/96 kHz with the latest Bluetooth standard and aptX HD certification. And, of course, the in-house EPS



The massive transformer power supply unit supplies six identical channels powered by MOSFETs



The DSP is located on the daughterboard, here you can see the 32-bit ARM coprocessor and the DSP ADAU1452

is available for speaker-level input to fool factory radios with speaker diagnostics and suppress the corresponding error message.

A look at the front panel reveals that the M6Pro has gained a few RCA sockets. There are now four processed outputs - so we have a 10-channel DSP on board, which is the first upgrade to the previous M6. The DSP works with the popular ADAU1452 DSP core from Analog Devices, which is still the preferred means for high-quality signal processors. The

analog-to-digital-to-analog conversion is handled by the equally established PCM3168 codec with six ADCs and eight DACs, presumably because Musway hides the converters deep under the main board. Two channels of digital-to-analog conversion are still missing, which could be made up for with a small two-channel DAC. So the DSP section of the M6Pro doesn't have to be hidden from other designs. With 24-bit converters and a sampling rate of 48 kHz, we may not be looking at a high-end, but it's certain-



Accessories such as the Bluetooth module make contact via USB. Digital input is also possible via optical S/PDIF

## Specifications

- 6-channel high-level with autosense or 6-channel RCA
- Sensitivity 6 V (RCA), 20 V (high level)
- 1 x AUX RCA stereo, gain control
- 1 x digital S/PDIF optical
- 2 x gain control (high level), 1 x gain control (AUX)

### Outputs

- 4-channel RCA
- Remote-out

### DSP-channels

- 10

### DSP software (PC V3.4 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

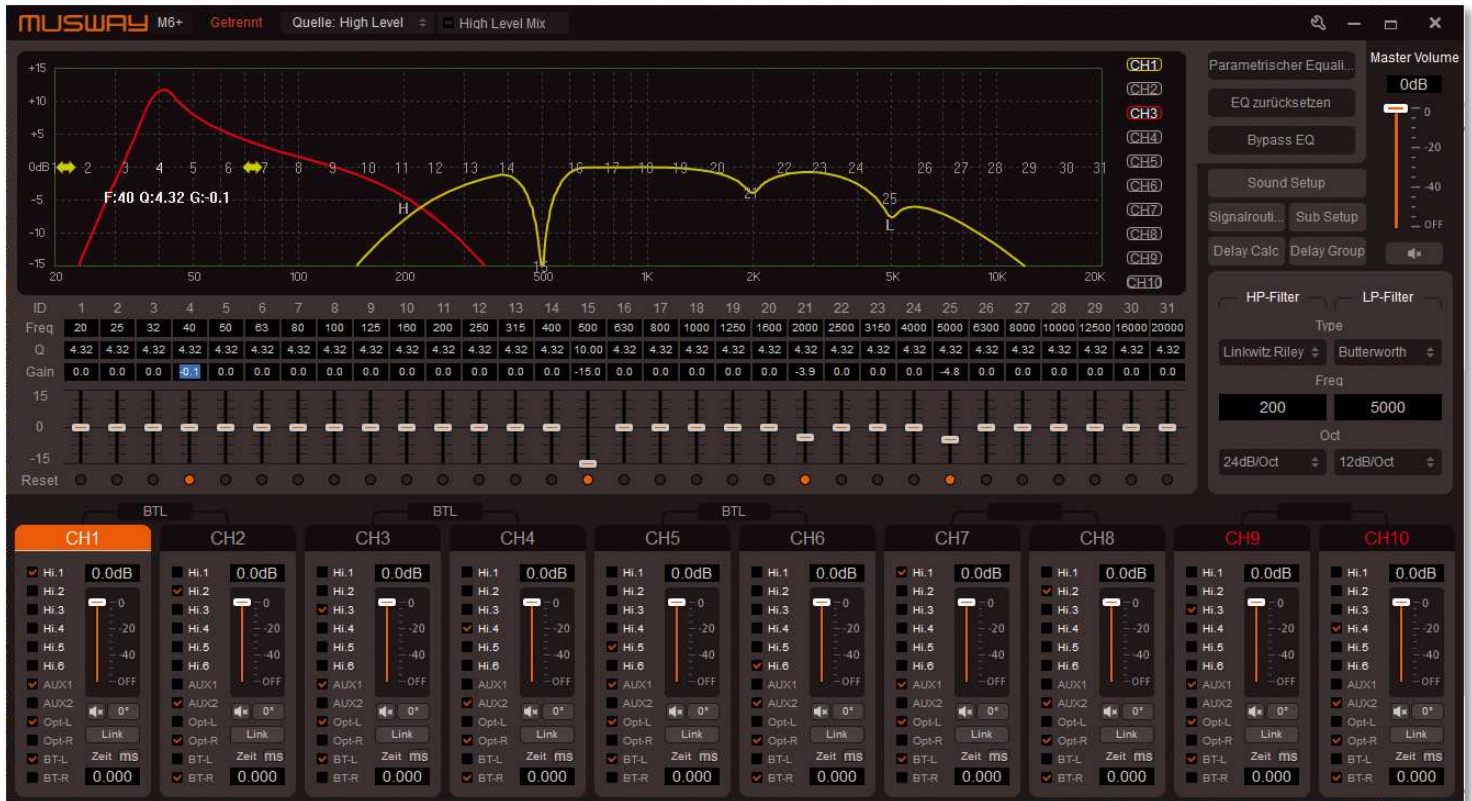
- 0 - 602 cm (17.7 ms), 1024 samples
- Level steps 0.1 dB
- Phase 0, 180°, mute

##### Features

- 6 presets
- Inputs and outputs arbitrarily routable
- Start-stop capability up to 7 V
- EPS (Error Protection System) for diagnostic function
- Signal dependent switching to Bluetooth or S/PDIF
- Signal dependent switching to high-level for vehicle tones
- Either high or low-level inputs

##### Optional accessories

- Bluetooth dongle BTS (streaming)
- Bluetooth dongle BTS-HD (hi-res streaming)
- Bluetooth dongle BTA2 (streaming + app control)
- Remote controller DRC1 (volume, bass level, sources, setups)
- RCA harness MPK-RCA6, MPK-RCA6-PP for ISO
- Vehicle specific harnesses (Mercedes, BMW, Audi, u.a.)



The PC software shows all essential functionality in the main window

ly a very solid product that does a great job. However, the M6Pro's real hit is yet to come: the completely new amplification. Externally recognizable by the speaker screw terminals, which can now accommodate thicker cables instead of the Molex cable harness, we find a

completely new amplification inside the M6Pro. Where the M6v3 was a minor upgrade amplifier with integrated power amplification in the form of three 2-channel amplifier chips, Class D driver chips with large MOSFETs now dominate the power amplification. This has significantly

more power potential, as indicated by the amplified transformer power supply and the chunky Class D low-pass coils.

## Measurements and sound

First, let's take care of the basics, where the M6Pro is a typical Musway.

## 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.



SILENT ANGEL

# Designed for Digital HiFi

Clocks, Switches, Streamers, Linear Power



Ultimate Network Streamer MU

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Audiophile Switch NX

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25MHz/10Mhz Word Clock GX

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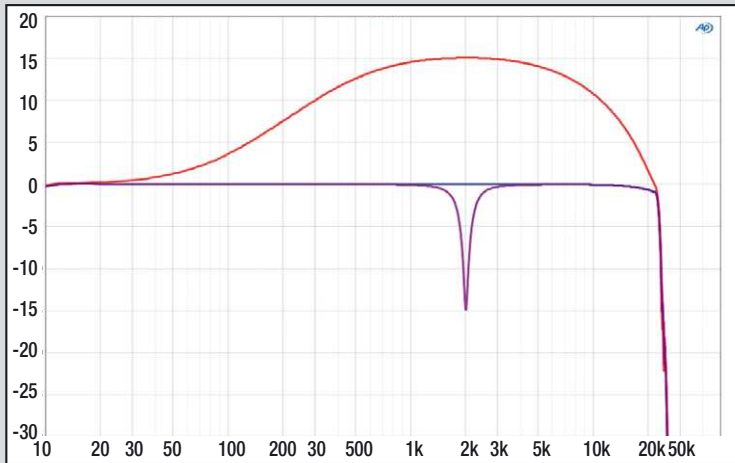
Ultra-Low Noise  
Linear Power Supply FX

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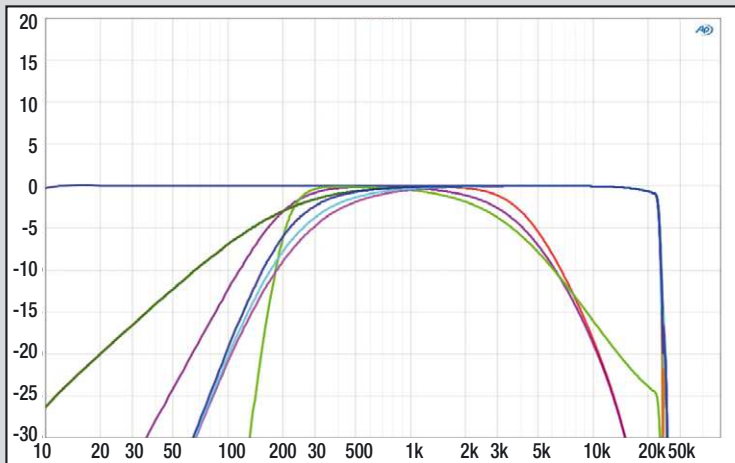


OFFICIAL WEBSITE

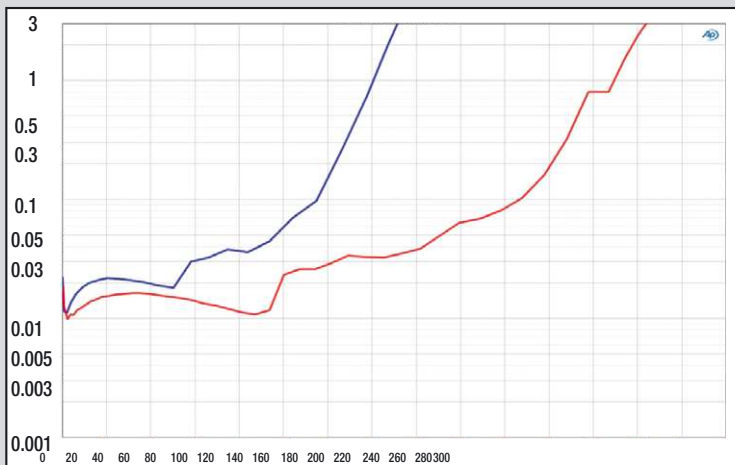
## CAR&HIFI Laboratory



The 31 EQs per channel can be adjusted over a wide Q range with a gain of -15 to +15 dB



The tear-off edge is at 22 kHz due to the sampling rate; the cross-overs are programmed shirt-sleeved, here high-pass at 200 Hz (But, Bes, Lin) and low-pass at 3 kHz

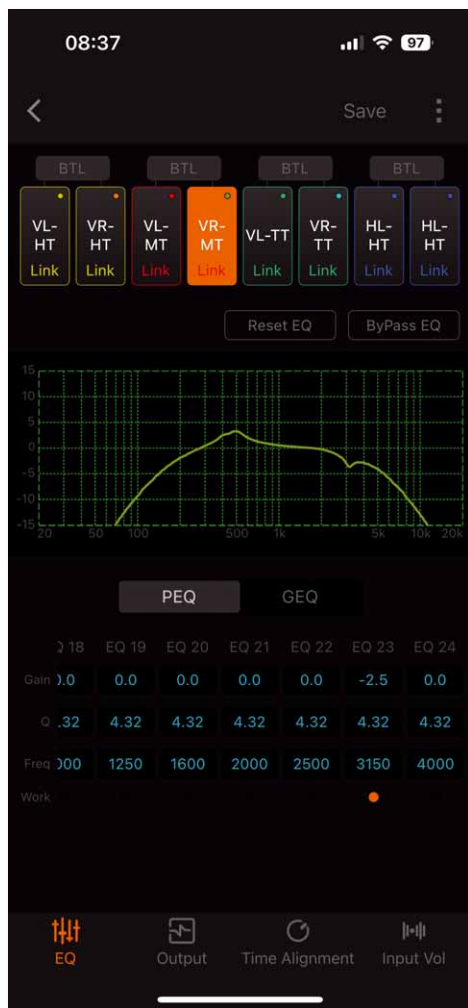


The M6Pro delivers an incredible 250 W into 2 ohms of stereo power



Master and sublevel in the Android app

According to the sampling rate of 48 kHz, the audio frequency response extends up to 22 kHz, and we have 0.02 millisecond steps for time alignment. This is (only) available for the outputs, as are the 31 EQs per channel. As the Musway software is responsible for all newer models, we also find the somewhat sloppily programmed cross-overs that we noticed in the test of the M12 and recently with the M10, with their „drawn“ filter slopes and odd Linkwitz orders (that simply don't exist). Apart from that, everything works, so you can accept that. However, when the load resistors are warmed up during power measurement, the M6Pro's time has come. With two loaded channels, it delivers 142 watts of channel power into 4 ohms, twice as much as the usual power amplifier ICs. At 2 ohms, it puts out 249 watts, almost half a kilowatt for a bridged 4-ohm subwoofer. This is very impressive, especially as the M6Pro also pro-



EQ setting in the Android app

duces well over a kilowatt with our system power of 6 x 2 ohms. This clarifies that the M6Pro is not a regular, slightly souped-up successor to the M6v3 but an entirely new amplifier, even for demanding retrofit systems.

### Conclusion

With the M6Pro, Musway presents a chic six-channel power amplifier with immense power that targets the DSP amplifier Upper Class. Combined with the four processed outputs, XXL systems can be controlled that go far beyond a simple sound upgrade.

*Elmar Michels*



### Specifications

Channels	6
Channel power 4 ohms W	6 x 142
Channel power 2 ohms W	6 x 249
Channel power 1 ohms W	-
Bridged power W	3 x 498
System power W	1074
Sensitivity max. mV	400
Sensitivity min. V	4,0
THD+N (<22 kHz) 5 W	0,023
THD+N (<22 kHz) half power	0,037
Signal-to-noise ratio dB(A)	91
Damping factor 20 Hz	263
Damping factor 80 Hz	263
Damping factor 400 Hz	248
Damping factor 1 kHz	213
Damping factor 8 kHz	15
Damping factor 16 kHz	4

### Features

Low pass	20 – 20k Hz
High pass	20 – 20k Hz
Band pass	20 – 20k Hz
Bass boost	-12 – 12 dB/20 – 20k Hz
Subsonic filter	via HP
Phase shift	via DSP
High-level inputs	•
Auto turn-on	•, DC
RCA output	•, 4CH, processed
Start/stop capable	- (7,6 V)
Dimensions (L x W x H in mm)	235 x 160 x 45
Others	10-channel DSP

### Musway M6Pro

Price	900 Euro
Contact	Audio Design, Germany
Internet	<a href="http://www.musway.de/english/">www.musway.de/english/</a>

### Rating

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

**Absolute Top Class**



**CAR & HiFi**  
INTERNATIONAL Germany 2/24

Price/performance: very good

„Over one kW of power in a compact housing“



# Phoenix Gold ZR12005 – Five-channel amplifier with plenty of power





# Premium Power

► With the ZR12005, Phoenix Gold announces a universally deployable five-channel amplifier that promises plenty of power packed into a very small space.



The amplifier paths work with a Class D driver IC and a large-dimensioned toroidal coil

The ZR series is almost at the pinnacle of Phoenix Gold's product range, topped only by the ZQ reference series. So it's no wonder our ZR12005 comes across as quite classy and well-made on the outside. We find power terminals large enough for decent cables and five pairs of equally solid speaker terminals. A remote control is included to control the level of the subwoofer channel. The bass channel is also fully equipped and can draw its signal from the small channels as required. In addition to the low-pass filter, there is a subsonic filter and a boost that can be adjusted by 12 dB.

The filters for channels 1 – 4 make no difference between the channel pairs, offering a choice of high-pass or low-pass with partly very extensive control ranges. The high-pass filters have „x10“ multiplier switches extending the adjustment range to 5 kHz. Only Phoenix Gold knows why

the low-pass filters have to make do without the switches and, therefore, can't keep up. Nevertheless, the ZR12005 is a very versatile amplifier. It controls the complete hi-fi system, including the subwoofer, for example, in the classic front + rear + sub configuration, but full-range spea-

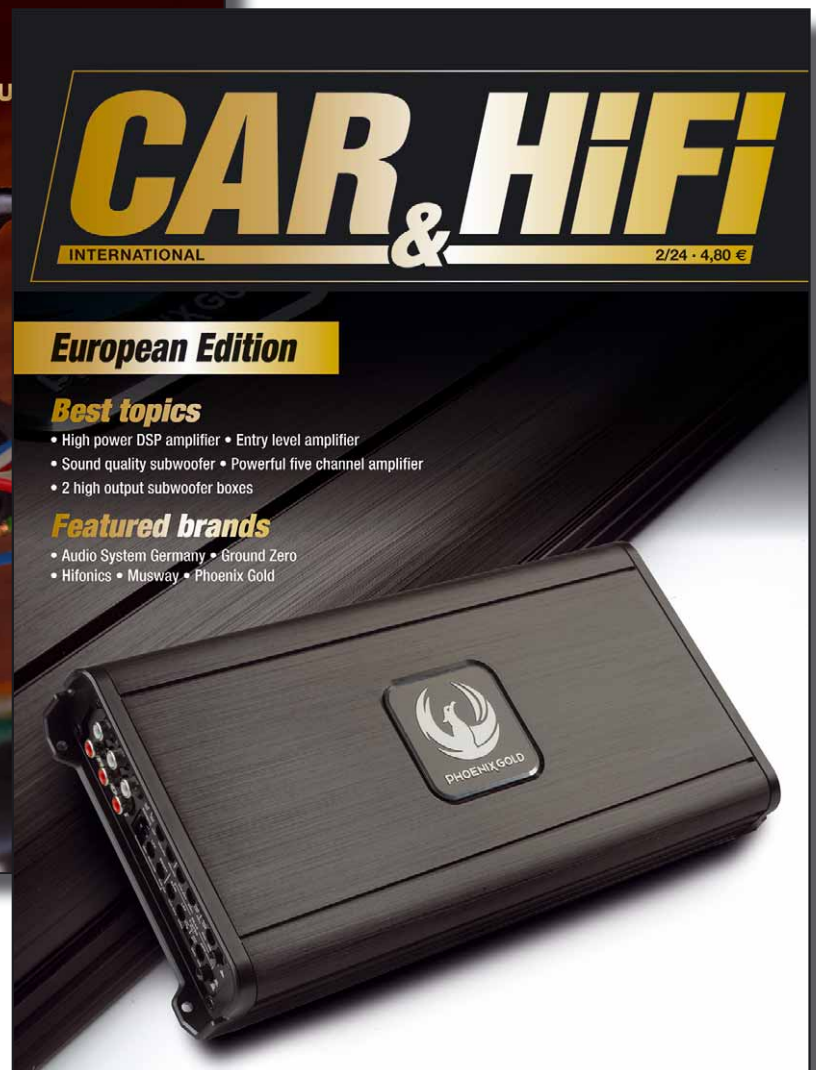


The front panel is packed with controls, and the subwoofer channel has low-pass, subsonic, and boost



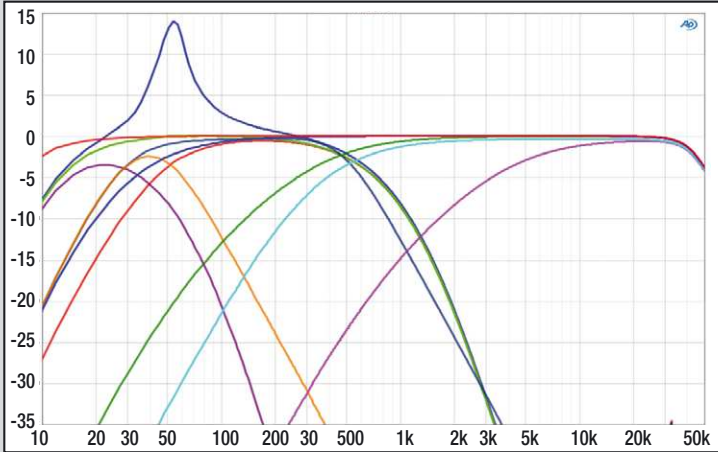
Solid screw terminals make for a high-quality impression

# READ IT !

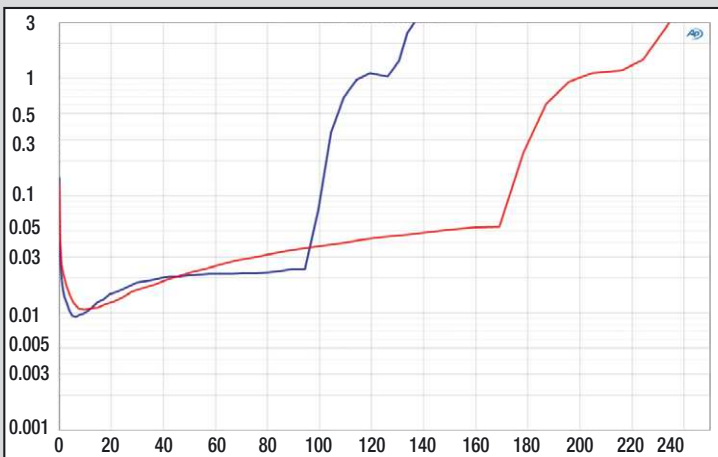


Now available

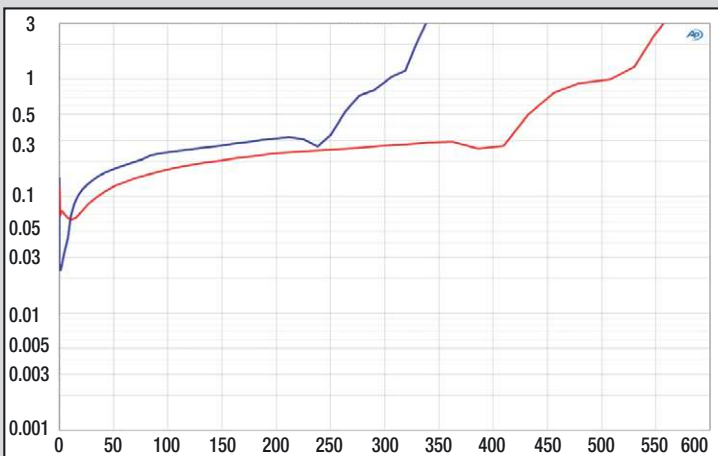
## CAR & HI-FI Laboratory



The full-range channels run up to 45 kHz. The bass channel stops at 500 Hz. x10 switches for the high-pass filters ensure a cross-over frequency of up to 5 kHz



Channels 1-4 deliver rich performance with minimal distortion



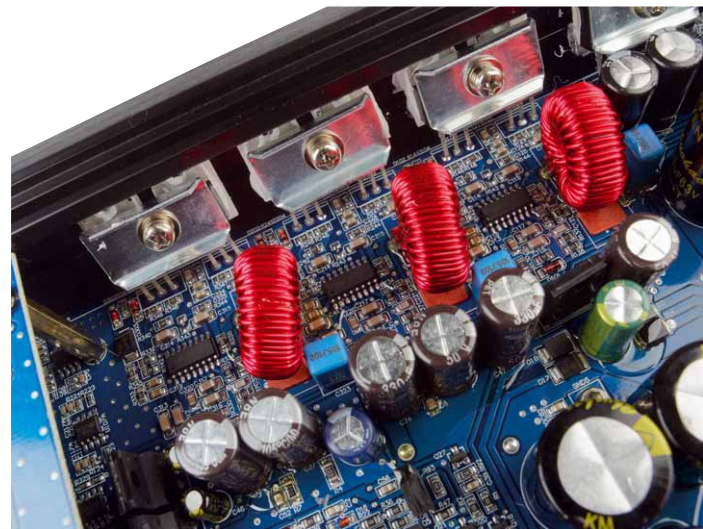
Channel 5 shows slightly increased distortion but delivers over 500 W into 2 ohms

kers and tweeters are also welcome. And if you want to be completely free, you can add a DSP to the ZR.

Things are pretty cramped inside the slim aluminum housing made of brushed black aluminum. Modern SMD assembly shrinks the required board area to accommodate all five channels easily. The power supply employs an ample power supply with a transformer that can deliver a lot of juice. The four small channels have an identical construction; each channel works with a Class D driver chip, and a pair of MOSFETs provides the PWM power amplification. Finally, there is the low-pass filter, each with a prominent toroidal coil. The subwoofer channel has a similar design, except for a larger coil made of thicker wire, which can handle more power. The filter frequency for the bass channel also does not have to be as high as for the full-range channels.

### Measurements and sound

The Phoenix Gold performs very well in the measurement laboratory. The SNR gives no cause for complaint, nor does the distortion. The bass channel can have distortion of up to 0.3 % THD+N, which is not a problem at all at bass frequencies. The four full-range channels are an order of magnitude better; here, we only measured a very low distortion of around 0.02 %. However, there is also some criticism of the ZR12005,



In addition to the input filtering, the third 40 A has found its way into the interior because there was no more space on the front panel

namely in terms of electromagnetic interference. Unfortunately, the amplifier generates interference in the FM radio frequency range, so we cannot guarantee undisturbed radio listening. Compatibility with undervoltage, e.g., in start-stop vehicles, could be better. The ZR12005 performs excellently in our power measurement: 115 W and 198 W stereo power into 4 and 2 ohms is very impressive. And the subwoofer channel outdoes itself. Channel 5 already delivers over 300 watts into 4 ohms and over 500 watts into 2 ohms - that's more than enough power for any reasonably standard subwoofer. Finally, we note that the power supply not only looks powerful but also provides over a kilowatt of system power (measured with all channels loaded at 2 ohms). Soundwise, the ZR12005 is also bursting with energy. The bass channel rips through the subwoofer with such force that nobody will miss a dedicated subwoofer mono power amplifier. The full-range channels also impress with rich bass reproduction and plenty of pressure. The Phoenix Gold can also adequately reproduce finer tones, such as singing voices or the delicate harmonics of natural instruments. Moreover, the music flows naturally, and your feet bounce to the beat during live recordings – it grooves!

## Conclusion

The ZR12005 from Phoenix Gold impresses with plenty of power in compact packaging. The sound is powerful and dynamic, making the amplifier an all-in-one premium-class amp for car audio systems.

*Elmar Michels*



### Specifications

Channels	5
Channel power 4 ohms W	4 x 115 + 1 x 315
Channel power 2 ohms W	4 x 198 + 1 x 510
Channel power 1 ohms W	–
Bridged power W	2 x 396
System power W	1040
Sensitivity max. mV	390
Sensitivity min. V	>8
THD+N (<22 kHz) 5 W	0,01/0,043
THD+N (<22 kHz) half power	0,02/0,293
Signal-to-noise ratio dB(A)	84/90
Damping factor 20 Hz	60/132
Damping factor 80 Hz	60/132
Damping factor 400 Hz	59/132
Damping factor 1 kHz	57/132
Damping factor 8 kHz	14/132
Damping factor 16 kHz	3/132

### Features

Low pass	50 – 500 Hz (CH1 – 4)/ 30 – 500 Hz (CH5)
High pass	50 – 5k Hz (CH1 – 4)
Band pass	–
Bass boost	0-12 dB/45 Hz (CH5)
Subsonic filter	10-55 Hz (CH5)
Phase shift	–
High-level inputs	• (adapter)
Auto turn-on	• DC
RCA output	–
Start/stop capable	– (8,6 V)
Dimensions (L x W x H in mm)	323 x 160 x 49
Others	Remote contr., 4 or 5 CH In x10 switch

### Phoenix Gold ZR12005

Price	400 Euro
Contact	AAMP European Division, UK/Sweden
Internet	www.phoenixgold-eu.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 %	★★★★★

**Top Class**



**CAR & HiFi**

INTERNATIONAL

Germany 2/24

Price/performance: excellent

„Top performance amplifier.“

Audio System Carbon-200.4 –  
four-channel entry level amplifier

# Four channels, but affordable

- ▶ Audio Systems' entry-level Carbon series is growing. The Carbon-200.4 is the most affordable way to supply four channels.

**CARBON SERIES**  
BY AUDIO SYSTEM

CARBON-200.4

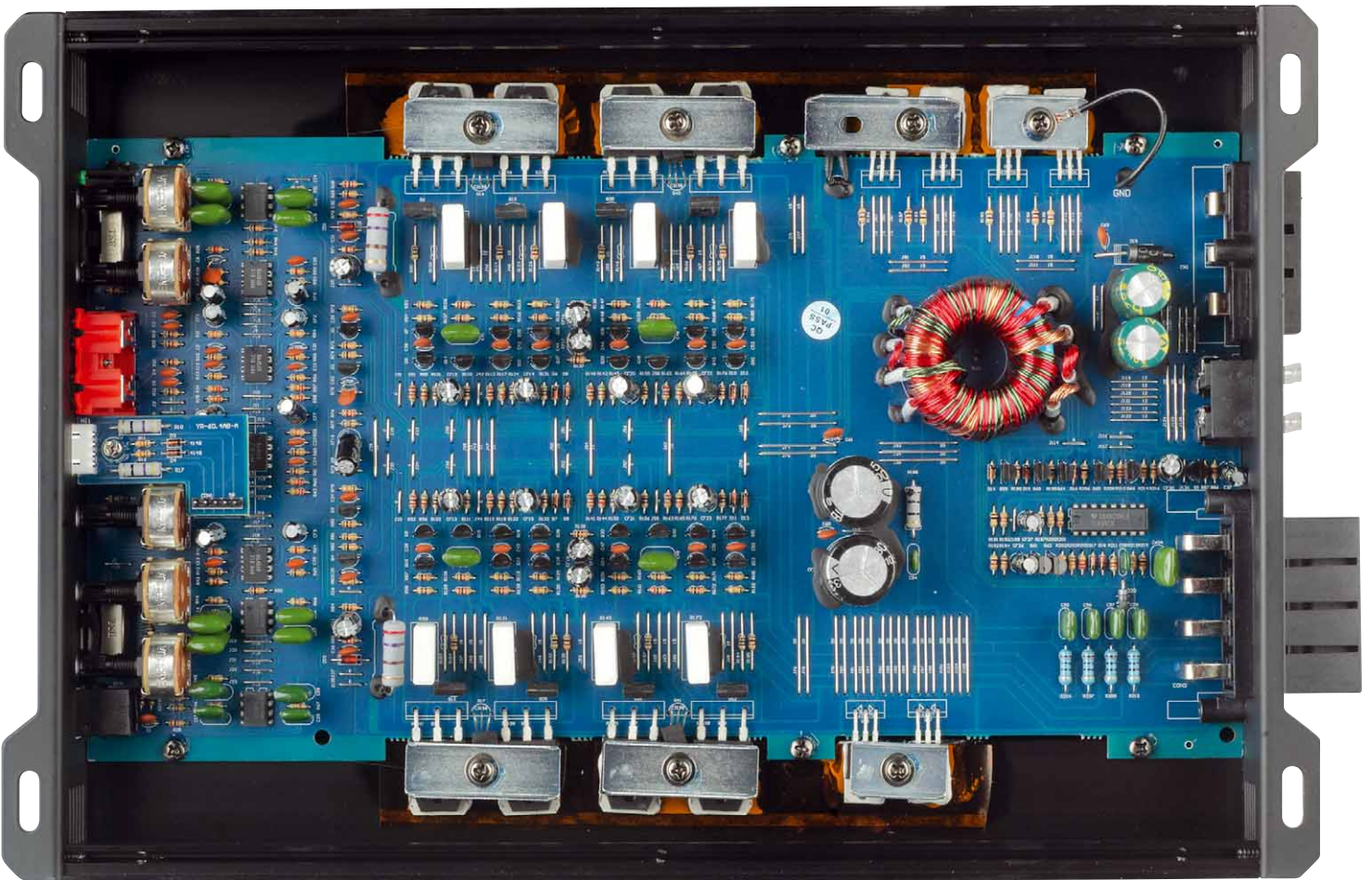
**SOUND AWARD**  
**Upper Class**  
**CAR & HiFi**  
INTERNATIONAL 2/24



The lower market segment has a very densely staggered price structure. Whether an amplifier costs EUR 150 or EUR 130 may matter little to premium customers, but in the entry-level segment, EUR 20 is considerable. Incidentally, we are talking about branded products with customer support and specialist retail outlets, which is particularly important for beginners and ultimately helps them save money. Nevertheless, we were surprised that Audio System added a smaller mo-

del to the existing Carbon-250.4. In terms of dimensions, the 200 is even slightly larger than the 250 because it has an entirely different housing with a thinner heatsink. As is usual in this price range, the terminals are not solid blocks but simple sheet metal terminals with Phillips screws. They also protrude far out of the housing, which is neither pretty nor practical, but they work. Conversely, we find a single high-pass filter for the first two channels, while channels 3 and 4 can also be wired with

a low-pass filter. Much more important are the speaker level inputs for connection to the factory radio, which also ensure that the amplifier is switched on automatically. And the Carbon-200.4 has another goodie, namely the socket for a remote control, which is not included but is available as an accessory. After unscrewing it, disillusionment sets in: the Carbon-200.4 is not a luxury model. Encapsulated pots? Nope. And you do not need space-saving SMD components either because



The Carbon has a simple design, with through-hole components and many wire jumpers. The 4 Class AB channels have a conventional design

# ULTIMATE PERFORMANCE CLASS-D AMPLIFIERS

# ZR series

## 4 & 5 CHANNEL & MONOBLOCK OPTIONS

**NEW FOR 2024**



### RANGE FEATURES

- High Level Auto Turn-On
- OEM Connection Ready
- High & Low Level Inputs
- Heavy Duty Connector Block
- 4-Way Protected Circuit
- Remote Control included
- Fanless Design

## Z12005

### 1200W 5-Channel Class-D Amplifier

**Power Ratings (RMS):**  
175W x 4 + 500W x 1 @ 2Ohm  
100W x 4 + 275W x 1 @ 4Ohm

### ALSO IN THE RANGE



**600W 4-Channel Class-D Amplifier**

**Power Ratings (RMS):**  
175W x 4 @ 2Ohm  
105W x 4 @ 4Ohm  
350W x 2 @ 4Ohm



**1000W Monoblock Class-D Amplifier**

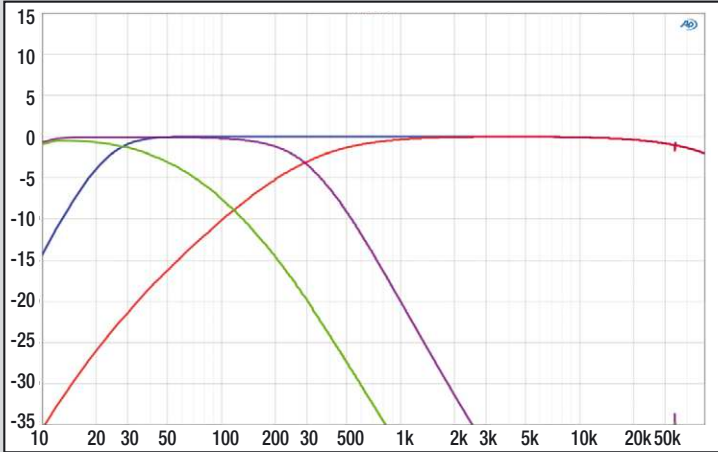
**Power Ratings (RMS):**  
1000W x 1 @ 1Ohm  
670W x 1 @ 2Ohm  
385W x 1 @ 4Ohm



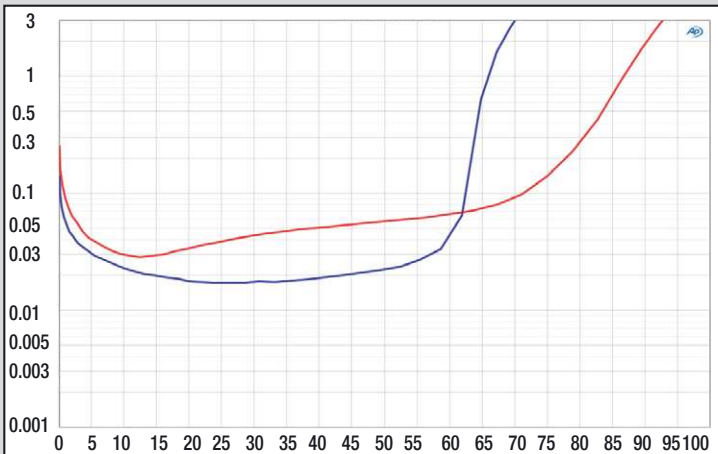
**2000W Monoblock Class-D Amplifier**

**Power Ratings (RMS):**  
2000W x 1 @ 1Ohm  
1300W x 1 @ 2Ohm  
650W x 1 @ 4Ohm

## CAR&HIFI Laboratory



There is a high-pass filter for all channels; the low-pass filter can be selected for the rear channel pair



With two loaded channels, the Carbon-200.4 performs respectably with 66 and 87 watts

the circuit board has plenty of space. After all, it is made of fiberglass, and the traditional through-hole design is not bad, as it has proven itself for decades. So, the Carbon-200.4 looks like it is from the last millennium with its traditionally constructed Class AB drivers and appropriately sized output transistors. Only the power supply transformer seems dainty; we will see what it can do when the Audio System is connected to our AP measuring station.

### Measurements and Sound

The measuring system attests to the Carbon-200.4's decent performance. Low distortion and a good SNR are very much in order. With two loaded channels, an impressive 66 watts per channel come out at 4 ohms, and even 87 watts at 2 ohms. That is more than you would expect, and the power supply only reaches its limits when fully loaded with 4 x 2 ohms, which is not something you should expect from the 200. It achieves maximum power with 2 x 2 ohms and 2 x 4 ohms, such as a compo and a small 4-ohm subwoofer in the bridge. This gives us a system output of 284 watts. Sound-wise, the Carbon-200.4 is smooth and pleasant. It is characterized by a nice, fluffy vocal reproduction and delivers sufficient high-frequency detail and spatial information. The bass is a little too soft but fun and extends deep down. Overall, the pleasant, quite mature sound is appealing and enjoyable to listen to for extended periods.



There is a high-pass filter at the front and a low-pass filter at the rear. The dedicated speaker-level inputs and the optional remote control are good features



## Conclusion

The Carbon-200.4 is not the world's best amplifier, but it is an accomplished entry-level model for savvy consumers. If you want to invest a little more, you can always go for the Carbon-250.4 or even the CO-70.4; there is plenty to choose from at Audio System.

*Elmar Michels*

### Specifications

Channels	4
Channel power 4 ohms W	66
Channel power 2 ohms W	87
Channel power 1 ohms W	0
Bridged power W	0
System power W	284
Sensitivity max. mV	160
Sensitivity min. V	4,4
THD+N (<22 kHz) 5 W	0,050
THD+N (<22 kHz) half power	0,018
Signal-to-noise ratio dB(A)	87
Damping factor 20 Hz	65
Damping factor 80 Hz	67
Damping factor 400 Hz	67
Damping factor 1 kHz	66
Damping factor 8 kHz	55
Damping factor 16 kHz	46

### Features

Low pass	50 – 250 Hz (CH34)
High pass	20 – 250 Hz
Band pass	–
Bass boost	–
Subsonic filter	via HP
Phase shift	–
High-level inputs	•
Auto turn-on	•, DC
RCA output	–
Start/stop capable	– (6,7 V)
Dimensions (L x W x H in mm)	303 x 220 x 58
Others	–

### Audio System Carbon-200.4

Price	130 Euro
Contact	Audio System, Germany
Internet	<a href="http://www.en.audio-system.de">www.en.audio-system.de</a>

### 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 %	★★★★★

**Upper Class**



**CAR & HiFi**

INTERNATIONAL

Germany 2/24

Price/performance: very good

„Entry-level amplifier with solid performance.“

Hifonics ZSPL12R + ZSPL12Dual –  
Boxed subwoofers with 12-inch drivers

# Full SPL!

- With the ZSPL, Hifonics presents new subwoofers that promise to be really loud with their robust enclosures and long-throw chassis. We grab the ear protection and get started.





**BEST PRODUCT**

**Top Class**

**CAR & HiFi**

INTERNATIONAL

2/24

**SPL AWARD**

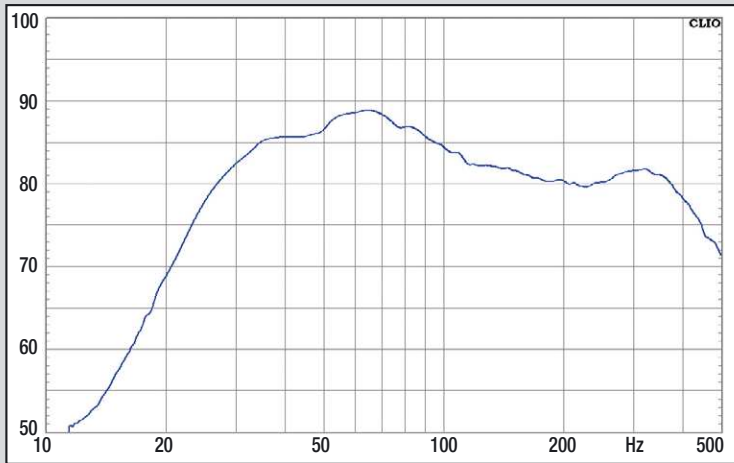
**Absolute Top Class**

**CAR & HiFi**

INTERNATIONAL

2/24

## CAR&HIFI Laboratory



With its tuning to 34 Hz, the ZSPL12R also reaches lower bass frequencies

The abbreviation ZSPL leaves hardly any questions unanswered: This is all about SPL within the Zeus series. But anyone who believes that the subwoofers are correspondingly expensive high-end competitors will be pleasantly disappointed, as Hifonics does not charge more than for the ZRX series bandpass speakers. The design as a bass reflex subwoofer is unusual for Hifonics, as the manufacturer is known for its bandpass boxes. So far, these two models are available, both equipped with the twelve-inch ZSPL12D2, which is also available separately. The ZSPL12R and ZSPL12 Dual are precisely what you think they are when you see them: The Dual is a double R: same tuning, but with two woofers. The woofer is robust and high quality; only the stamped frame is not top shelf. But with its three-dimensionally pressed spokes, the black powder-coated frame is definitely stable. The thick cone made of air-dried paper also makes a very stiff impression, especially as the ZSPL is not stingy with mounting depth and thus allows an acute cone angle. Add the rock-hard carbon dust cap to that, and you have a cone you could put a truck on. The sur-



Although „only“ a stamped frame is available at this price, the ZSPL woofer scores points with its cone and motor



### Specifications

Basket diameter	32,5 cm
Mounting diameter	28,5 cm
Mounting depth	16,4 cm
Magnet diameter	16,0 cm
Box width	52,0 cm
Box heigh	37,5 cm
Box depth	37,5/47,5 cm
Weight	24,4 kg
Nominal impedance	2 x 2 Ohm
DC resistance Rdc	3,82 Ohm
Coil inductivity Le	2,05 mH
Coil diameter	64 mm
Membrane surface	503 cm <sup>2</sup>
Resonance frequency fs	43 Hz
Mechanical Q-Factor Qms	6,58
Electrical Q-factor Qe	0,97
Overall Q-factor Qts	0,85
Equivalent volume Vas	23,5 l
Moved mass Mms	201 g
Rms	8,36 kg/s
Cms	0,07 mm/N
B x l	14,70 Tm
SPL 1 W, 1 m	89 dB
Recommended power	300 – 500 W
Test cabinet	BR 60 l
Reflex tunnel (d x l)	111 cm <sup>2</sup> x 34 cm

### Hifonics ZSPL12R

Price	300 Euro
Distributor	Audio Design, Germany
Internet	hifonics.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 %	★★★★★

Top class



**CAR & HiFi**

INTERNATIONAL

Germany 2/24

Price/performance: excellent

„Rich SPL for reasonable money.“

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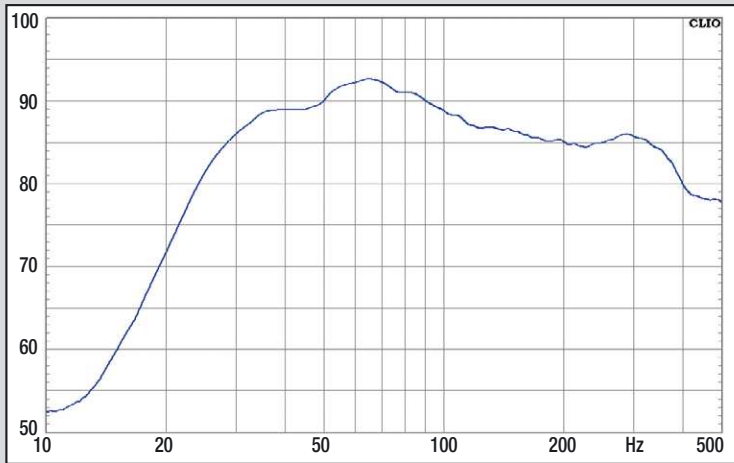
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## CAR & HIFI Laboratory



The ZSPL12Dual runs 3 dB louder than the R, achieving a full 92 dB at 1 W/m



Fully ventilated: there are rear vents in the frame, a vented pole piece and a ring of holes

round is precisely the same as is done today with a long-throw woofer, that is, high rather than broad and made of foam with supporting ribs. This surround material consumes much less energy than genuine rubber and, therefore, benefits efficiency.

The motor is of the finest quality, with both top plates finely machined and faced, with two generously dimensioned ferrite rings in between. The 2 x 2-ohm dual voice coil is wound from round wire on a very large two-and-a-half-inch aluminum former. The winding height is also impressive at 38 millimeters, which, together with the 12-millimeter thick top plate, results in a linear excursion of 13 millimeters in each direction. Cooling air is well taken care of with the ZSPL; in addition to the obligatory vented pole piece and the large rear ventilation openings under the spider, there is also a ring of holes in the back plate to ventilate the cavity under the voice coil. Both boxes are solidly constructed from 19 mm MDF; the sides are slightly offset inwards and, of course, covered in Hifonics blue. The baffle is reinforced so that the woofers can be milled in flush. The reflex ports are designed as wooden tunnels, which gives the boxes additional stability.

### Measurements and sound

The impedances are the most crucial difference in practice. In the ZSPL12R, the dual coil is simply routed to the outside so that 2 x 2 ohms are present at the terminal. The ZSPL12Dual has two individual terminals, each with 4 ohms, due to the dual coils of the two woofers being connected in series. At 60 liters, the single cabinet features plenty of volume, and the R is already a stately bass box. The Dual achieves slightly less than twice the volume, so the R's reflex tuning of 34 Hz is somewhat lower than the Dual's 35 Hz - but this makes no difference in practice. The R already produces 89 decibel per meter at one watt; the Dual produces three dB more, as it has twice the cone area (but each woofer only gets half a watt). Even the single bass kicks in powerfully, pushing vehemently in the upper bass and not neglecting the lower registers. Ultra-fast



runs are not so much its cup of tea, but it delivers an excellent thrust with sustained bass. Even short bass strikes are delivered with full power, making the inside mirror dance. When the sizeable double woofer is connected to the amplifier(s), there is no mercy for the vehicle's occupants. In short: the same sound, but a whole lot louder if required.

### Conclusion

With the ZSPL, you get a lot of woofer for your money. This applies to the cabinet volume as well as the sound. Not for the faint-hearted, but volume enthusiasts will be delighted.

*Elmar Michels*

### Specifications

Basket diameter	32,5 cm
Mounting diameter	28,5 cm
Mounting depth	16,4 cm
Magnet diameter	16,0 cm
Box width	90,5 cm
Box height	37,5 cm
Box depth	37,5/47,5 cm
Weight	41,2 kg
Nominal impedance	2 x 4 Ohm
DC resistance R <sub>dc</sub>	3,82 Ohm
Coil inductivity L <sub>e</sub>	2,05 mH
Coil diameter	64 mm
Membrane surface	503 cm <sup>2</sup>
Resonance frequency f <sub>s</sub>	43 Hz
Mechanical Q-Factor Q <sub>ms</sub>	6,58
Electrical Q-factor Q <sub>e</sub>	0,97
Overall Q-factor Q <sub>ts</sub>	0,85
Equivalent volume V <sub>as</sub>	23,5 l
Moved mass M <sub>ms</sub>	201 g
R <sub>ms</sub>	8,36 kg/s
C <sub>ms</sub>	0,07 mm/N
B x l	14,70 Tm
SPL 1 W, 1 m	92 dB
Recommended power	500 – 1000 W
Test cabinet	BR 111 l
Reflex tunnel (d x l)	220 cm <sup>2</sup> x 34 cm

### Hifonics ZSPL12Dual

Price	550 Euro
Distributor	Audio Design, Germany
Internet	<a href="http://hifonics.de/english">hifonics.de/english</a>

### 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 %	★★★★★

**Top class**



**CAR & HiFi**

INTERNATIONAL

Germany 2/24

Price/performance: excellent

„Rich SPL for reasonable money.“

Ground Zero GZPW 10SQX – Plutonium goes SQ

# Sound- Quality Subwoofer

- ▶ While the Plutonium subwoofers used to be Ground Zero's flagship products for brutal SPL power, there is now a sound-oriented Plutonium subwoofer. The GZPW 10SQX, a new edition that promises to be very interesting, is now available.

**SOUND AWARD**

**Absolute Top Class**

**CAR & HiFi**

INTERNATIONAL

2/24

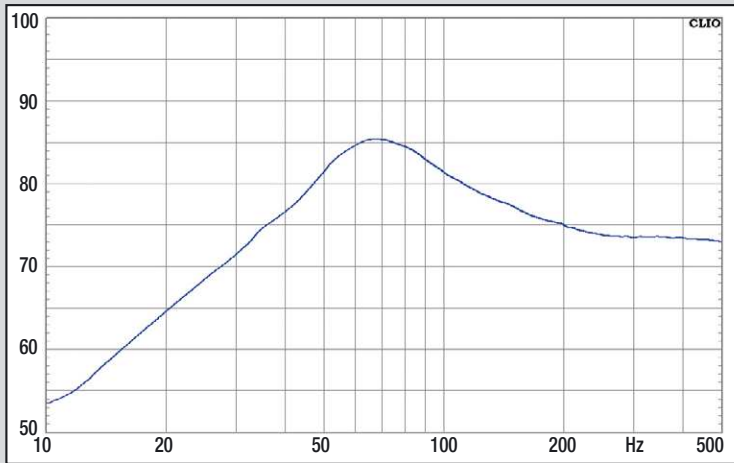


GROUND ZERO

GROUND ZERO

GROUND ZERO

## CAR & HIFI Laboratory



The GZPW 10SQX delivers 85 dB in a small, sealed box, and with -3 dB at just under 50 Hz it is tuned for practical application

As part from the Reference series, Ground Zero's Uranium components were intended primarily for the sound quality market, while Nuclear and Plutonium served the sound pressure fraction. However, Ground Zero had already decided in 2019 to develop a Plutonium woofer for sound enthusiasts, which worked quite successfully. Things are now getting exciting because the GZPW 10SQX is a new development. Ground Zero has put a lot of effort into tweaking important parameters to create the ultimate sound-quality subwoofer. The GZPW 10SQX uses the same cast frame as the Uranium 10", a filigree but stable die-cast aluminum construction that offers more than enough stroke reserves for an SQ subwoofer. The woofer is superbly ventilated, and details such as the cast mounting lugs for the stable connection terminals are very appealing. The motor works with a moderately large two-inch voice coil, which offers the best compromise between power handling and low weight.

It is no coincidence that Ground Zero's SQ woofers are often ten-inch speakers, as this represents the best compromise between cone area for significant output and low moving mass. Ground Zero makes no compromises regarding the cone; aluminum is used here, a tough yet relatively light material ideally suited for a subwoofer. Instead of a paint finish, the surface is anodized and very thoroughly so that the cone has a



The lower pole piece was prettified with an aluminum inlay and foam protection over the pole piece ventilation

rough surface of aluminum oxide, which makes it resilient to corrosion and discoloration. The cone has a flanged edge for additional stabilization, and the aluminum dust cap must also be mentioned here. The „soft parts“ of the GZPW 10SQX, namely the spider and surround, are entirely new designs. Behind this lies a concept that Ground Zero has proudly dubbed ConeGlide. In short, the influence of the spider has been maximized and that of the surround minimized, resulting in a cone movement that is as linear as possible and can also be designed for long-throw. The designer would prefer to omit the surround altogether, as it creates a significant resistance to the cone movement, which is undesirable and must be factored into the overall suspension as favorably as possible. But you can't do without the surround because it has to seal the cone against the cabinet or the rim of the basket.

Otherwise, you would have a leaky box with an acoustic short circuit and no air spring. You can well imagine this air spring in a sealed box; it is essential for the functio-



The GZPW 10SQX is a classic subwoofer with a double ferrite motor, die-cast basket, and aluminum cone

nality of the boxed subwoofer and is, of course, built into the woofer. Instead of rubber, the new surround on the GZPW 10SQX is made of Santoprene, a mixture of synthetic rubber and plastic, which has the desired properties such as much weaker damping and is durable and UV-resistant.

## Measurements and sound

We cannot directly measure the surround's influence on a loudspeaker so that we will attempt an indirect approximation here. This is done using the famous Thiele-Small parameters, which can describe the behavior of a loudspeaker in the range of its resonance frequency. What is interesting about the GZPW 10SQX are the parameters that are related to mechanical damping, i.e., the mechanical loss resistance  $R_{ms}$  and the mechanical  $Q_{ms}$ , where  $R_{ms}$  should be as low as possible and  $Q_{ms}$  as high as possible if we want a system with low mechanical losses. Indeed, the values for the GZPW 10SQX with  $R_{ms}$  3.6 and  $Q_{ms}$  10 are within the anticipated range, so we can at least estimate that the ConeGlide surround system operation has been accomplished. Typical values for a 25 cm subwoofer tend to be around 5 - 7 kg/s for  $R_{ms}$  and 4.5 - 7 for  $Q_{ms}$ . On the other hand, this means that the total  $Q_{ts}$  is mainly electrically determined and that the electrical  $Q$  must not „run away“, otherwise we will have no damping. For this reason, Ground Zero also dispenses with an electrically non-conductive voice coil former, especially as aluminum helps heat dissipation.

Let's move on to the cabinet for the GZPW 10SQX, which is small and sealed. Ground Zero has ensu-

red that the GZPW 10SQX plays very well in 18 liters, although it could use a few more liters. In 18 liters, it achieves a solid 50 Hz installation resonance, which is low enough for sufficient bass. This is also evident in the listening test, where the GZPW 10SQX produces a powerful low end. Overall, the tuning is geared towards sound quality, with precise, to-the-point onsets and thoroughly dry and impulsive bass. But as a true Ground Zero, the SQX remembers the fun factor. It can also produce fat bass that packs a punch for a 10“, and the achievable maximum level is perfectly adequate for us. Overall, the performance lives up to the motto „SQ with a fun factor“, which we are enthusiastic about.



A stable die-cast ring ensures bomb-proof mounting, optionally with or without a grille

## Conclusion

With the GZPW 10SQX, Ground Zero presents a very up-to-date woofer for small sealed boxes that impresses us with its performance.

*Elmar Michels*

### Specifications

Basket diameter	26,2 cm
Mounting diameter	23,2 cm
Mounting depth	12,6 cm
Magnet diameter	15,5 cm
Box width	0,0 cm
Box height	0,0 cm
Box depth	0,0 cm
Weight	6,3 kg
Nominal impedance	2 x 2 Ohm
DC resistance $R_{dc}$	3,84 Ohm
Coil inductivity $L_e$	2,42 mH
Coil diameter	50 mm
Membrane surface	330 cm <sup>2</sup>
Resonance frequency $f_s$	39 Hz
Mechanical Q-Factor $Q_{ms}$	9,82
Electrical Q-factor $Q_e$	0,70
Overall Q-factor $Q_{ts}$	0,65
Equivalent volume $V_{as}$	17,9 l
Moved mass $M_{ms}$	144 g
$R_{ms}$	3,56 kg/s
$C_{ms}$	0,12 mm/N
B x l	13,87 Tm
SPL 1 W, 1 m	85 dB
Recommended power	120 – 400 W
Test cabinet	g 18 l
Reflex tunnel (d x l)	-

### Ground Zero GZPW 10SQX

Price	550 Euro
Distributor Internet	Ground Zero, Germany ground-zero-audio.com

### Rating

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

**Absolute Top Class**



**CAR & HiFi**  
INTERNATIONAL Germany 2/24

Price/performance: excellent

"Perfectly accomplished SQ subwoofer."

CarMediaWorld and EMMA European final  
at Customized 2024 in Salzburg

# Sound enthusiasts turn up the heat

While the weather gave the Salzburg exhibition halls the cold shoulder, things were heating up inside: tuning and in-car electronics enthusiasts rocked the city of Mozart for an April weekend and provided the perfect setting for the CarMediaWorld and EMMA European Final event formats initiated by EMMA under the umbrella of the Customized Show.

# GROUND ZERO<sup>®</sup>

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As befits the start of the season, the CarMediaWorld exhibitors had a huge range of new products and installation inspiration ready. Not only specialist dealers, installation specialists and the car media competition community got their money's worth here, but also all tuners and fans of sporty driving who travelled to the trade fair. On 2300 square metres, the CarMediaWorld offered innovations for new sound and infotainment experiences from over 70 brands. While on Demo





Day industry specialists had the opportunity to inform themselves and exchange ideas in a relaxed atmosphere at workshops and expert discussions, the public days with live demonstrations in the show car whetted the appetite for music and entertainment on every journey. In addition to traditionally represented brands, the trade fair also welcomed newcomers such as the brands Audio Control and JBL to the CarMediaWorld exhibition area.

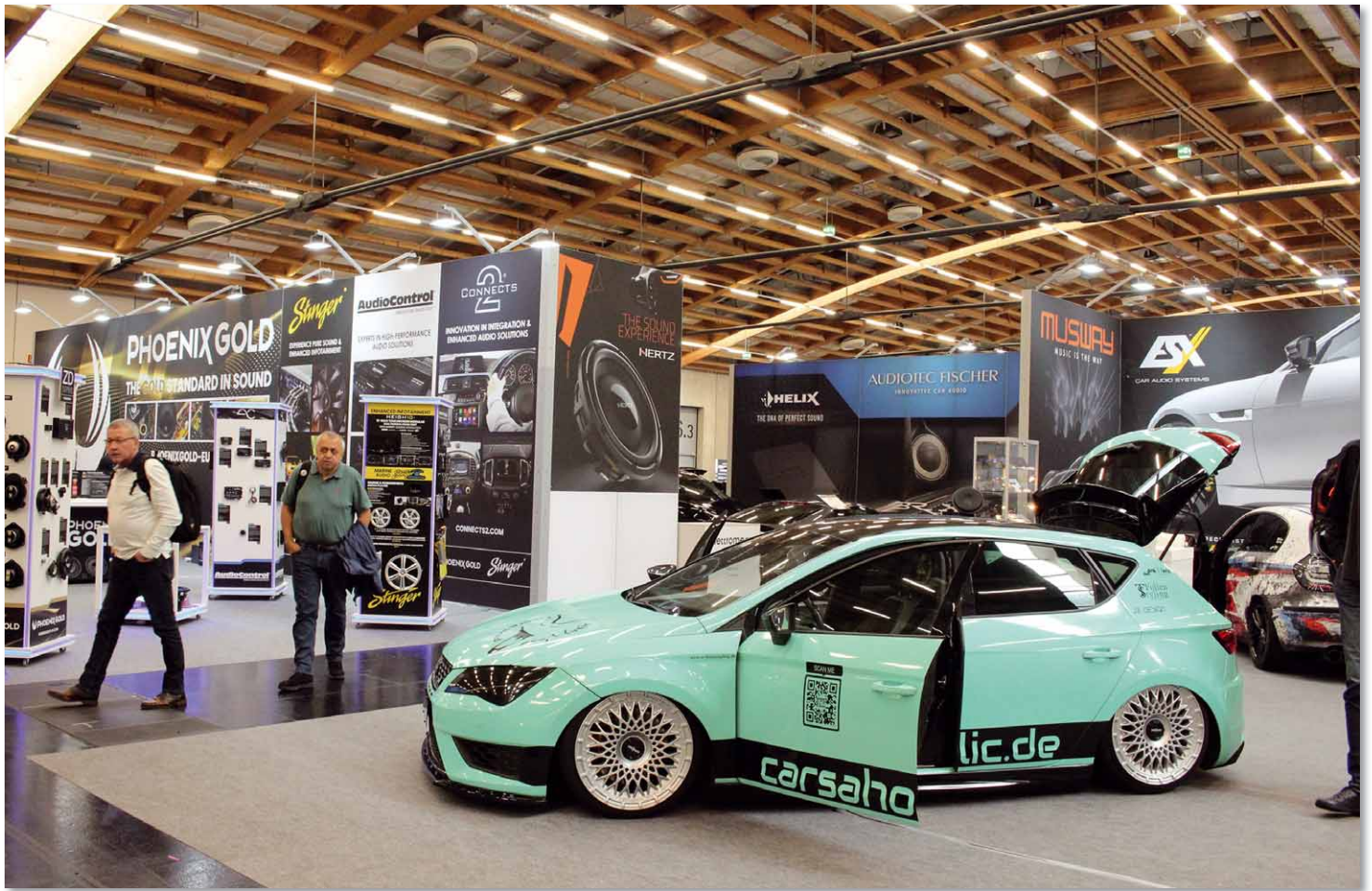




## EMMA European Final – the meeting place for sound champions

Every year, an ever-impressive number of car audio enthusiasts from all over Europe go hunting for trophies for their sound works of art on four wheels at the EMMA Sound Off. With their national championship title or runner-up title in their pockets, they are allowed to compete in the ultimate decision, the Eurofinal, in the Salzburg Exhibition Center. Goal: The European Championship trophy!

This year, the EMMA organization team welcomed over 200 starters



with 180 cars from 50 nations to Salzburg. The EMMA Head Judge training that took place beforehand with the presentation of the new high-resolution music delicacies for the vehicle evaluation and the

Friday get-together at the traditional EMMA party with live music and international cuisine rounded off the international event perfectly. As always, the award ceremony on the afternoon of April 20th was the

crowning conclusion for all visitors and participants. The newly produced music tracks in high resolution will soon be available for download in the EMMA online shop.



# The equipment classes

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

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

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

## The rating

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

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

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

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

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

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■ 2x 125 WRMS ■ 3 Ohm Impedance

### HX 130 PHASE ACTIVE **EVO 3**

■ 2x 115 WRMS ■ 3 Ohm Impedance

### HX 165 PHASE **EVO 3**

■ 2x 175 WRMS ■ 3 Ohm Impedance

### HX 165 PHASE ACTIVE **EVO 3**

■ 2x 165 WRMS ■ 3 Ohm Impedance



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# Coming soon



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