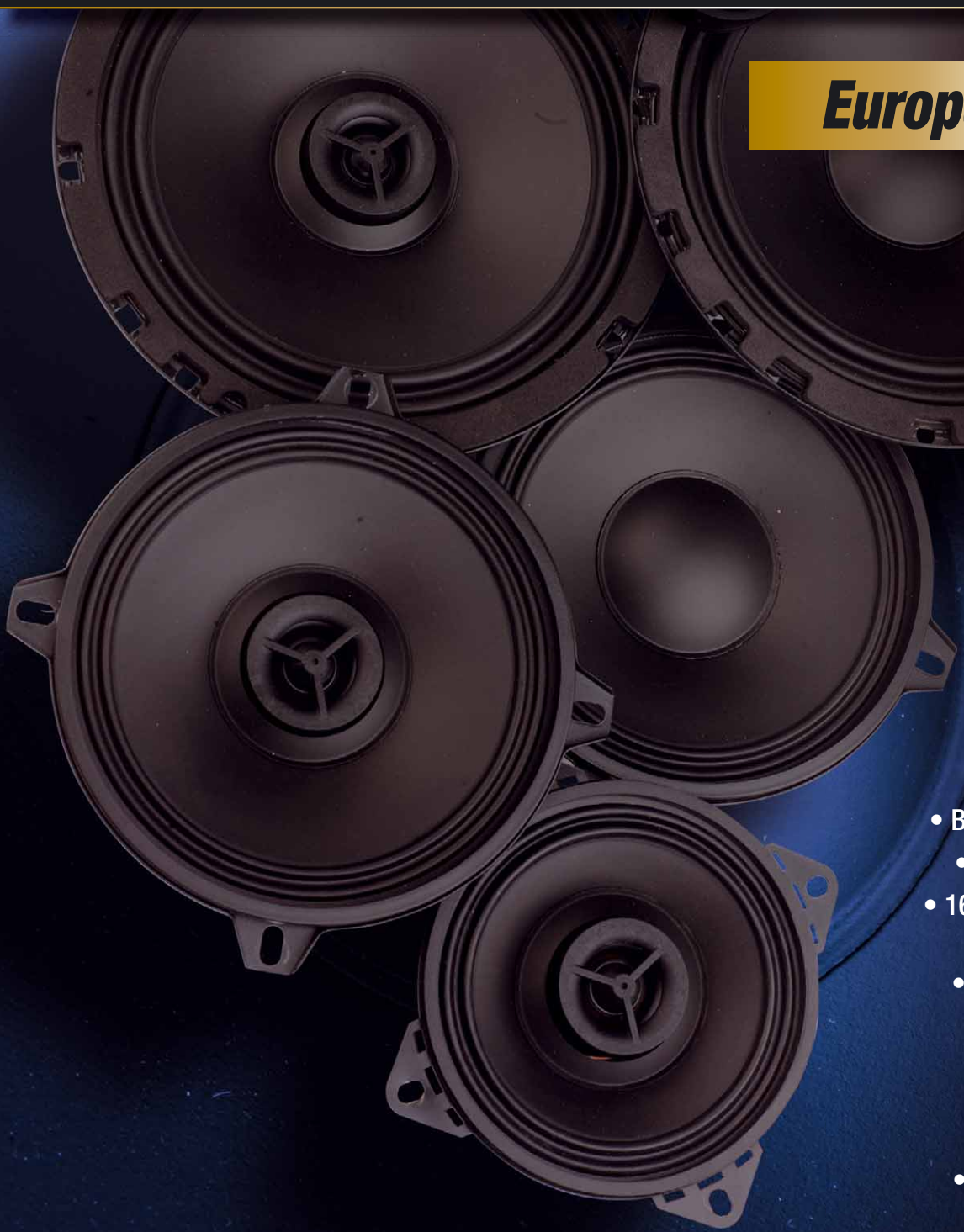
CAR & HiFi

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European Edition



Best topics

- Blaupunkt retro speakers
- 6-channel bargain DSP
- 16-channel amplifier with 24-channel DSP
- 10-inch SPL subwoofer

Featured brands

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

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Car Audio with a Future

From an in-car perspective, 2026 is proving to be a seamless continuation of 2025, and there are signs that 2027 will follow suit. In the amplifier segment, there are plenty of new models featuring modern, efficient Class D technology – this year increasingly even with fully integrated amplifier ICs that need no heat sink at all. The trend toward DSPs is also as strong as ever: we have never had so many amplifiers with a signal processor on our test bench. And finally, at least in Europe, the retro wave is in full swing. Retro car radios, accessories, and now more and more speakers, too – all of them tailored not just to well-kept used cars but specifically to modern classics. In this issue, you'll find them from the heritage brand Blaupunkt, which was already present in a great many cars 50 years ago. Bucking the trend for once, we then present a subwoofer from Ground Zero that is neither flat nor inconspicuous, but quite the opposite. Enjoy the issue!



Elmar Michels
Editor-in-chief

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- Powerful amplifier
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- Ultra-flat mounting height
- Adjustable crossover
- Low current consumption
- Wired level remote control
- Dimensions:
  260 x 194 x 71 mm / 10.24" × 7.64" × 2.80"

www.ground-zero-audio.com



Elite Class *p. 32*



The Sensation *p. 16*



Universal Solution *p. 8*





Tests

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Space-Saving Enclosure



For its popular M10 Evo2 subwoofer, Audio System now offers a matching GDF enclosure that packs the 10-incher into a compact 10.5 liters (0.37 cu ft). This makes the sealed enclosure considerably more compact than the other bass boxes in the lineup. Downfire operation is also possible, and matching rubber feet are included. In addition to the passive M10 GDF Evo2, active enclosures are available in two power levels: the M10 220 GDF Evo2 and the M10 400 GDF Evo2, with 220 W and 400 W amplifier modules, respectively.

● **www.audio-system.de**

Pioneer TS-X40SXT 3-Way Bass Reflex Speakers With a Retro Look

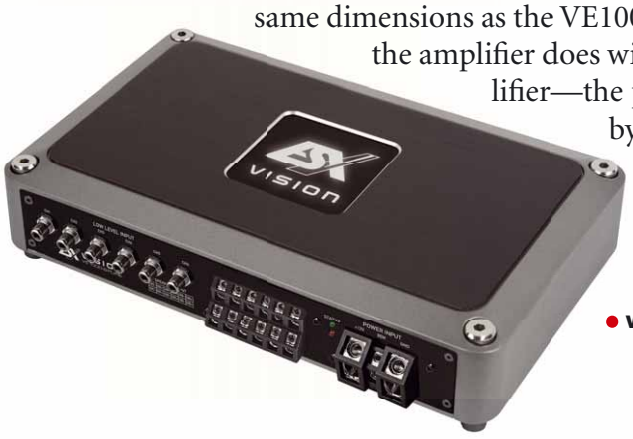
If you drive a car from the ’80s or early ’90s and want your audio system to match its retro style, you can finally give your rear deck a fitting upgrade again. With the TS-X40SXT, Pioneer revives the car audio culture of the ’80s and ’90s! The freestanding 3-way surface-mount speaker in a matte silver retro look was designed for easy installation on the rear deck, without damaging any original parts of the vehicle interior. It features a woofer in a bass reflex enclosure for rich bass reproduction.



● **www.pioneer.eu**

Pure Power

ESX introduces the new VE1000.6PURE, an expansion and add-on amplifier for ESX’s VE DSPs with exactly the same dimensions as the VE1000.6SP and VE900.7SP models. Here, the name “PURE” says it all: the amplifier does without its own filter section and works as a pure high-power amplifier—the perfect complement to sound systems that are already controlled by a digital signal processor. The signal travels via the balanced RCA inputs at top signal quality directly to the ultra-efficient Pure Class D amplifier stages. The result is clean, dynamic sound with excellent efficiency. A real highlight is its flexibility in where it can be used, thanks to its design for both 12 V and 24 V operation.



● **www.esxaudio.de**

MUSWAY

THE DSP EXPERTS

EISA AWARD Best Product 2026-2027
IN-CAR MICRO AMPLIFIER
Musway M4nano



BEST PRODUCT
Spitzenklasse
CAR&HiFi 4/2026

EMV-TIPP
Ungestörter Radioempfang
CAR&HiFi 4/2026

Musway M4nano
Spitzenklasse 1,2
CAR&HiFi 4/26

M4nano

4 amplifier channels plus 8 DSP channels

POWERFUL
4 x 55/95 W/RMS
2 x 190 W/RMS bridged

AUDIOPHILE
8 DSP channels with 512-bit technology

CONNECTIVE
6 high-level inputs with EPS (3 – 24V)

INNOVATIVE
SCS protection circuit processor-controlled

COMPATIBLE
MX-Connect Plug+Play for vehicle-specific cable sets

MOBILE
Also controllable via the Musway TUNEST app

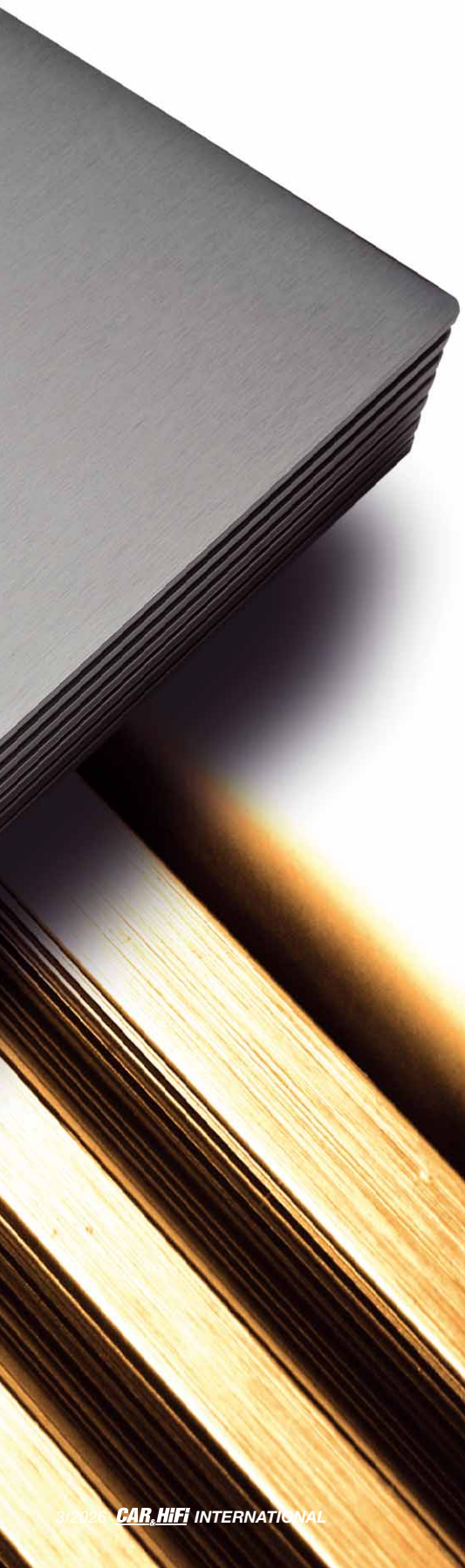
VISIONARY
Compatible with the new Musway myCON controller

COMPACT
Super compact, measuring just 150 x 45 x 95 mm

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MUSWAY
HIGH QUALITY SOUND SYSTEM



Musway M16
– 16-Channel Amplifier with 24-Channel DSP

Universal Solution

With the M16, Musway introduces a new flagship among its DSP amplifiers. More channels and more power make it possible to upgrade even the most complex OEM systems.







8 RCA outputs, one AUX input, and two digital inputs, plus connections for the remote control and Bluetooth module

Musway has been very consistent in expanding its lineup of DSP amplifiers. From the tiny M4nano to the mighty M12 with 12 amplifier channels, pretty much everything has been available, tailored to the vast majority of vehicles. But modern vehicles with their active factory multichannel systems keep growing too: multiple multi-way center speakers, speakers in the front, the rear, the far rear, and overhead – you can run out of channels very quickly unless you give up some of the original features. That's why Musway is now launching the M16, which takes the crown when it comes to channel count. The chassis houses 16 amplifier channels, and these are no puny 35-watt amps. The channels are split into 12 small and 4 large channels, with even the small ones delivering plenty of power and all of them being 2-ohm stable. All channel pairs can also be bridged, so the large channels can drive real subwoofers. If that's not enough, you also get a full 8 processed preamp outputs for additional amplifiers – whew! The input side is just as wild; Musway isn't holding back here. No fewer than 20 high-level inputs connect to the M16, and of course EPS for OEM systems with speaker diagnostics is on board. Anyone with an aftermarket head unit will find 6-channel low-level inputs, and for everyone there is also a pair of RCA jacks as an analog AUX source. Digital fans will appreciate two S/PDIF inputs, one optical Toslink and one electrical coaxial. Unfortunately, remote controls and, of course, Bluetooth are only available as add-on accessories. The latter comes in no fewer than three versions: with or without music streaming, plus the BT-HD for hi-res streaming. For analog sensitivity adjustment, there are four gain controls: outputs, AUX, small channels, and large channels. The high-level inputs handle up to 24 volts on small channels 1–12 and even 32 volts on the four large channels, which is enough even for factory amplifiers.

Software

All Musway DSPs can be programmed either with the "Tunest" PC desktop software, which was introduced with the DSPs' 512k architecture and works with all newer Musway DSPs, or alternatively with Musway's Android or iOS apps – in combination with an optional Bluetooth module, of course. Apart from routing and a few features, all the relevant settings are found in a single window. When it comes to routing, keep in mind that it is not enough to mix the inputs in the routing matrix; the correct box or boxes must also be checked in the main window. All channels get band-pass crossovers with slopes of up to 48 dB/octave in three characteristics. The EQ bands are fully parametric, and notch filters as well as first- and second-order all-pass filters are also possible. On top of that, there is time alignment in 0.02 ms or 7 mm steps. It's very convenient that the time or distance is displayed precisely and in plain language, without frills like coarse and fine adjustment. The frequency window gives a clear view of what is happening, and the EQs are easy to operate (from the keyboard, too). Channel grouping is well implemented: bridged operation can be indicated, and up to four channels can be combined into a subwoofer group, which is then recognized by the optional remote control. The high-level inputs have their own equalizers – 10 per channel, with the same functionality as on the outputs. There is also input time alignment of up to 5.2 ms. The extras are few, but important. There is a power-saving shutdown for CAN bus vehicles, a setting for passing through vehicle chimes, and an auto-mute function to prevent pops. In addition, the input Molex connector provides a reverse-gear input pin, which also feeds in the vehicle chimes. So while the Musway software isn't the most comprehensive on the market, it allows hassle-free work in most cases. And a big plus is the Musway "Tunest" app, which allows complete programming of the DSP and also provides remote-control functions such as master and sub level and source selection. As its newest feature, there is an import option for certain settings from REW, which is popular with installers.

The turn-and-click remote handles sources, setups, and volume. It also displays and controls Bluetooth streaming





Powerful power supply and 8 amplifier ICs in a row.
Bottom left: the digital signal processing with MCU, 2 DSPs, and 3 converter chips

Hardware

Everything is packed into a very rugged, high-quality aluminum housing, even with an illuminated real-glass logo, just as we've come to expect from Musway. The connections are impressive too, with solid power terminals and, of course, plenty of Molex connectors. Inside, the layout is neat, and the first thing that catches the eye is the hefty power supply. Musway relies on sheer power from a traditional push-pull transformer rather than the more modern and efficient step-up converter design. After all, the power has to come from somewhere, and Musway makes no compromises here. The 16 amplifier channels, with this much power, are implemented using amplifier ICs: neatly lined up in one long row are 6 chips with two small channels each and two chips for the four large channels. In line with the power output, the class D filter coils on channels 13–16 are also larger. For cooling, Musway relies on alu-



With 24 channels, you'd better get used to scrolling. The main screen holds the output EQs, crossovers, levels, and a well-designed overview of the active features such as delay, muting, routing, etc.

Specifications

Inputs
- 20-channel High-level
- 6-channel RCA
- 2-channel RCA (AUX)
- Sensitivity Low: 6 V, High: 24/32 V
- 1 x digital S/PDIF (optical)
- 1 x digital S/PDIF (coaxial)
- 1 x digital (accessories)

Outputs
- 8-channel RCA
- 1 x Remote-out

DSP-channels
- 24

DSP software (V 1.3.4)

Equalizer

Inputs:
- param., 10 bands per channel
- EQ, shelf, notch, allpass 1st and 2nd order

Outputs:
- param., 31 bands per channel
- EQ, shelf, notch, allpass 1st and 2nd order
- 20 – 20k Hz, 1-Hz increments
- +15 – -15 dB, Q 0,5 – 15
- Shelf 25 – 10k Hz, Q 0,2 – 16

Crossovers

Outputs:
- 20 – 20k Hz, 1-Hz increments
- Bessel, Butterworth, Linkwitz
- 6 – 48 dB

Time and level
- Samplerate 48 kHz, 7 mm increments (0.02 ms)

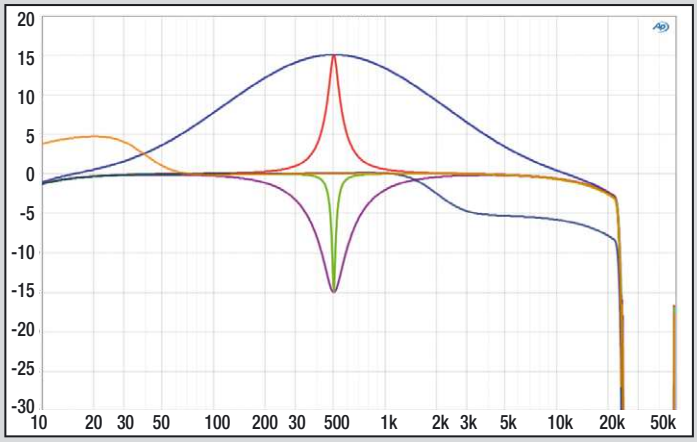
Inputs:
- 0 – 177,1 cm (20.83 ms), 256 samples

Outputs:
- 0 – 708,3 cm (20,83ms), 1024 samples
- Phase 0, 180°
- Level increments 0,1 dB

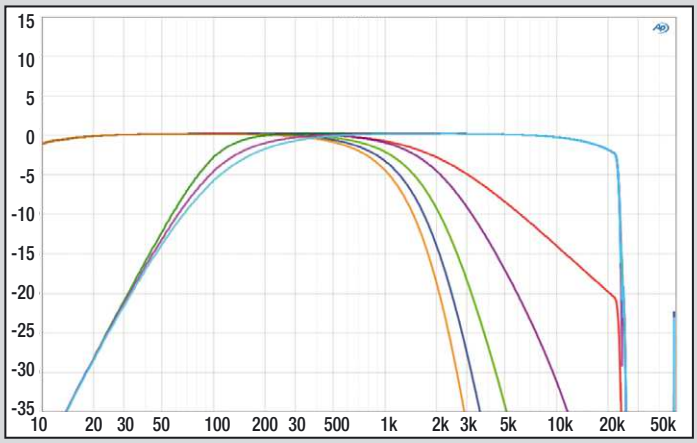
Features
- 6 presets
- EPS (Error Protection System)
- Adjustable switching to High inputs
- Adjustable mixing and noise gate
- Sub channel setup (subwoofer volume)
- Power save mode
- Export of settings via Whatsapp
- Import of settings from REW

Optional accessories
- Bluetooth dongle BTS (streaming)
- Bluetooth dongle BTA-HD (hi-res streaming and DSP control)
- Wired remote control MyCon (volume, sub level, sources, setups, BT-playback)
- Wired remote control RC1 (volume, sub level, sources, setups)
- Vehicle harnesses (Mercedes, BMW, Audi and more)

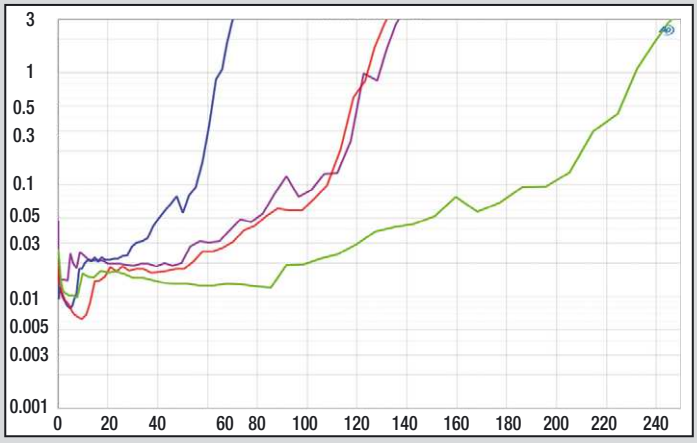
CAR&HIFI Laboratory



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



The crossovers work flawlessly. Left: 100 Hz high-pass, 12 dB, Butterworth, Bessel, Linkwitz. Right: 2 kHz low-pass, Bessel, 6 – 48 dB



Small channels into 4/2 ohms: blue, red.
Large channels into 4/2 ohms: violet, green



Master and sub level in the Android app



EQ settings in the Android app

minum in the form of a long bar through which the ICs are bolted firmly to the housing. The digital signal processing, i.e., the DSP section, features 6 large multi-pin chips. First, there is the 32-bit controller from STM, which runs the whole show as the "chief processor." Then come two ADAU1466 DSPs, which are absolutely necessary for the 24 DSP channels. As in many Musway units, the converter is the proven PCM3168 from Burr-Brown,



The analog inputs each get 10 EQ bands and time alignment



In the Input Mixer, any input can be routed to one or more outputs – and there are quite a lot of them

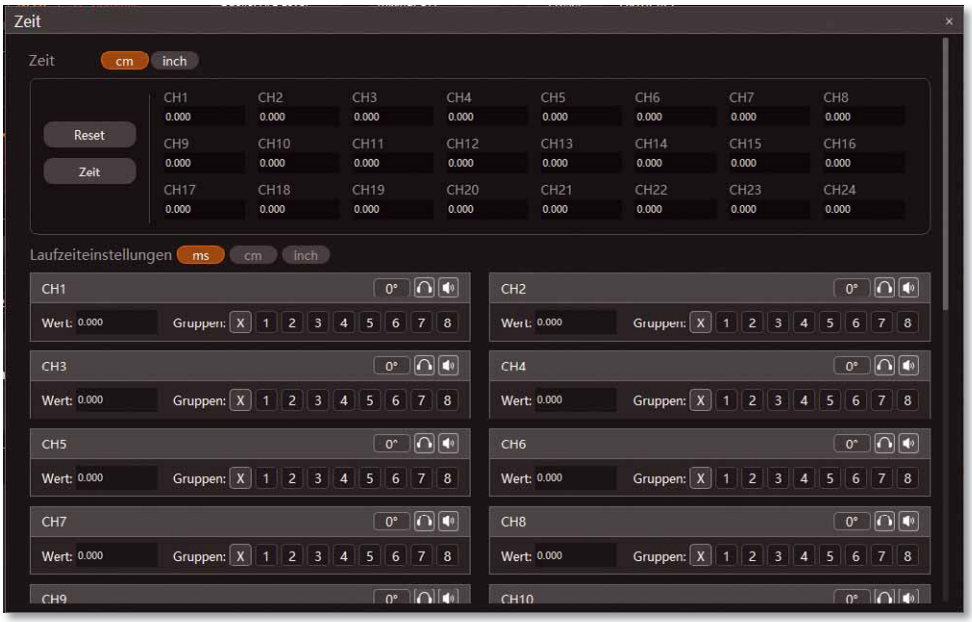


One of three Bluetooth sources: the BT-HD supports audio streaming in hi-res quality

a codec containing 6 A/D converters and 8 D/A converters, which is used three times here. That makes 24 outputs from the DSP and 18 inputs. Wait a moment – we have 20 high-level inputs, so there must be a hidden 2-channel ADC somewhere, or it's hiding inside the controller.

Measurements and Sound

An initial frequency response measurement shows the "cliff" at 22 kHz, which means the DSP runs at a 48 kHz sampling rate. That's typical for multichannel systems, and a hi-res frequency range isn't needed for this application anyway. Each of the two ADAU1466s handles 12 channels, which is already very good utilization at 48 kHz; 96 kHz would require twice the processing power. This inevitably results in 7 mm/0.02 ms steps for time alignment. Compared to the good old 1452, the ADAU1466 has more memory, so a respectable 1.77 meters at the input and 7.08 meters at the output can be corrected. On the amplification side, both the small chips on channels 1–12 and the large channels 13–16 impress. The small ones have less power but better distortion and noise figures, while the large ones are optimized for power. Even so, with a 90 dB signal-to-noise ratio and only 0.028% distortion, they are still very clean. In return, they deliver about 130 watts into 4 ohms and 230 watts into 2 ohms – incredibly strong for a multichannel amplifier. But the small channels are also powerful enough for any situation; just under 65 and 125 watts is plenty, and enough for a solid upgrade. Things get really beefy in system power,



The Time menu holds the 24 output channels, which can be divided into 8 groups. Input delays are set in the input settings



with all 16 channels running into 2 ohms. The result is our lab record for multichannel amplifiers to date – well over 1,500 watts – and this is where the massive power supply pays off. The preamp outputs also work precisely, producing little noise and only 0.002% distortion at 2 V output. They show no weaknesses across the entire frequency range – everything is excellent.

When it comes to sound, you never get the feeling of insufficient power; even with the small channels, the M16 plays with plenty of control. Tonally, it sounds pleasing – whether with vocals or acoustic instruments, you never feel that anything is missing. The overall sound is round and balanced, and the bass doesn't come up short. Even macrodynamics come across really well; none of this sounds like a multichannel chip amp. There's no doubt whatsoever that the M16 brings a great sound upgrade to any installation – it has loads of potential.

Conclusion

With the M16, Musway pulls off the feat of packing 16 channels into one housing without any real compromises in performance. 20 high-level inputs and 24 DSP channels make it the universal amplifier for complex factory systems.

Elmar Michels

Specifications

Channels amp	16
Channels DSP	24
Inputs High	20
Sensitivity High V	24/32
Inputs RCA	6 + 2
Sensitivity RCA V	6,0
Inputs digital opt./coax./USB	• / • / –
Bluetooth streaming/DSP	– / –
Outputs RCA	8
Output V	5,0
Channel power 4 ohms W	12 x 64 + 4 x 129
Channel power 2 ohms W	12 x 123 + 4 x 233
Channel power 1 ohms W	–
Bridged power W	6 x 246 + 2 x 466
System power W	1572
THD+N (<20 kHz) 5 W	0,007/0,025
THD+N (<20 kHz) half power	0,026/0,03
Signal-to-noise ratio dB(A)	95/90
Damping factor (<1 kHz)	109/56
Autosense DC/Signal	• / –
Start/stop capable V	– (7,5)
High voltage supply V	17,0
Speaker simulation	EPS
Dimensions (L x W x H mm)	225 x 140 x 44
Others	–

Musway M16

Price	1,700 Euro
Contact	Audio Design, Germany
Internet	www.musway.de/english/

Rating

Sound	40 %	★★★★★
Bass	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★★
Spatial imaging	8 %	★★★★★
Dynamics	8 %	★★★★★
Lab	35 %	★★★★★
Power	20 %	★★★★★
Signal-to-noise ratio	5 %	★★★★★
Noise	5 %	★★★½☆
Practice	25 %	★★★★★
Features	15 %	★★★★★
Build quality	5 %	★★★★★

Absolute Top Class

★★★★★

CAR&HiFi INTERNATIONAL Germany 3/26

Price/performance: very good

"A universal tool for complex factory systems, with plenty of power."

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Audio Streaming

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Input

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60s RETRO (from 1960)



BREMEN SQR 46 DAB

80s RETRO (from 1986)



FRANKFURT STEREO MB

70s RETRO (from 1970)



FRANKFURT RCM 82 DAB

90s RETRO (from 1992)



FRANKFURT STEREO

70s RETRO (from 1970)



WOLFSBURG 648

2010s RETRO (from 2008)



HAMBURG SQM 23 DAB

80s RETRO (from 1983)



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Enjoy it.

ESX SX600.6DSP
– 6-Channel Amplifier with 8-Channel DSP

The Sensation

When it comes to DSP amplifiers, everyone understands that they cost a bit more than a regular amplifier without a signal processor. But now ESX is entering the race with the new SX600.6DSP, an amplifier that has it all yet carries a very reasonable price.



SOUND AWARD
Top Class
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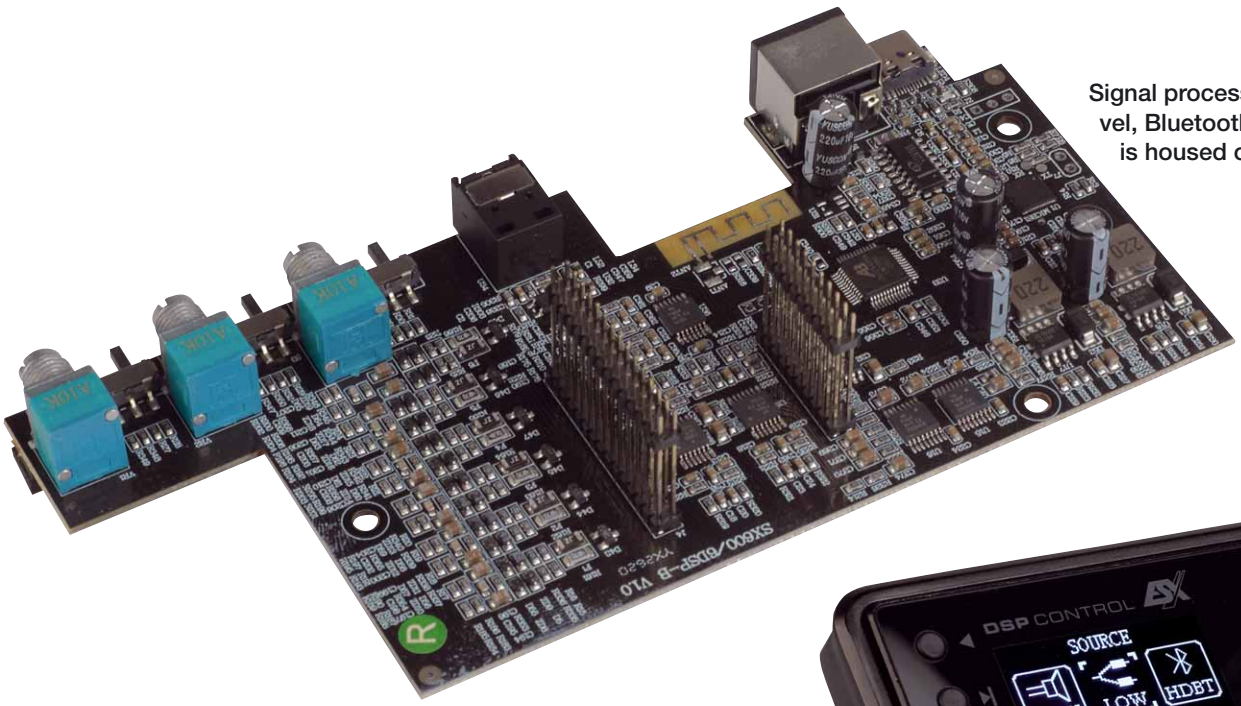
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Undisturbed FM reception
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PRESET SWITCH
PROTECT
POWER
OPTICAL INPUT
SPEAKER OUTPUT
HIGH LEVEL INPUT
REM IN
REM OUT
INPUT VOLTAGE
MIN
MAX
1-15V 15V-40V
GAIN
CH5/6
CH1/4
CH1/2
SPEAKER OUTPUT-XL
LIMITED POWER INPUT
POWER INPUT
+12V
GND



Everything on one side with ESX: the SX600.6DSP even has high-level inputs that handle up to 40 volts

DSP amplifiers are usually found in the upper price range, and it's easy to see why. After all, there's a small computer inside, complete with a microcontroller, a dedicated DSP chip (comparable to the gaming graphics card in your PC at home), and a number of specialized audio chips, such as converters from analog to digital and back. If something like this is offered at a suspiciously low price, you should be wary. Often recognizable by its many RCA outputs, the amplifier is then just a decorative extra, because the DSP has already used up the production budget. In principle, that isn't bad or objectionable at all, since you can always hook up amplifiers with more power. At ESX, DSP amplifiers were initially available only in the upper-tier Vision and Quantum lines, and it wasn't until 2025 that ESX introduced its first amplifier with DSP in the affordable Signum series. The SE800.6, with 6 amplifier channels and an 8-channel DSP, performed superbly in our test, not least because its amplifier section turned out to be full-fledged and powerful. Now ESX is going one step further and entering the SX600.6DSP at an even lower price. It offers the 6 amplifier channels and the 8-channel DSP for an unbeatable euro 450 at authorized dealers. There must be a catch, especially since the features are truly first-class, regardless of price range. The SX has everything you could wish for on board: Bluetooth comes



Signal processing for the high-level, Bluetooth, and digital inputs is housed on a separate board

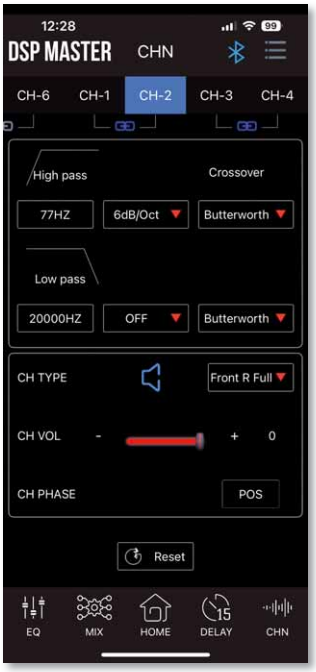


The RC-SXE also lets you select sources and setups

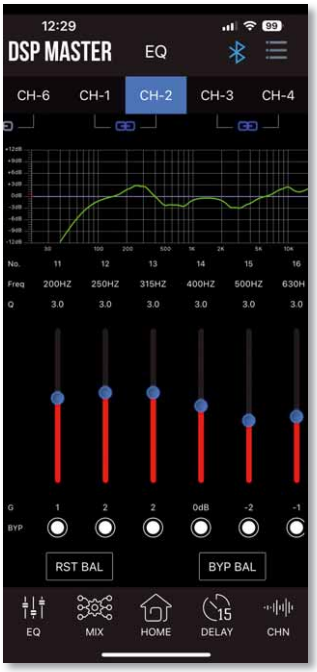
standard, complete with app programming and top-quality music streaming via Bluetooth 5.0. Then we have digital inputs for optical S/PDIF and even a streaming USB port that plays music from a smartphone via an OTG cable, in even better quality. And not just for convertible drivers, there's the preset switch pin, which changes the DSP preset when it receives a signal. As the inventor of its in-house EPS and EPS Pro, ESX doesn't skimp on the SX either. The system, which uses dummy resistors to simulate speakers for factory radios with diagnostics, comes here in a new hybrid version. Unlike the simple EPS, which has no adjustments, the SX600.6DSP has switches that set the sensitivity of the high-level inputs in two ranges. 1 – 15 volts is suitable for setups with a basic factory radio, while 14 – 40 volts can handle existing factory amplifiers as signal sources. This is provided three times, with a gain control for each channel pair, so that everything reaches the DSP perfectly even with a mixed signal from the vehicle. There is also an auto turn-on function that switches the amplifier on when the factory radio comes on, as well as a port for optional accessories. Worth mentioning here is the highly functional RC-SXE display remote, which handles volume, subwoofer level, presets, and sources. It should also be noted that ESX offers a selection of Quick Connect wiring harnesses, which make installation in the vehicle plug-and-play. We also find four RCA jacks on the front of the housing: a stereo AUX input and the two DSP channels 7 and 8 brought out as outputs, which can drive bass amplifiers or powered subwoofers, for example.



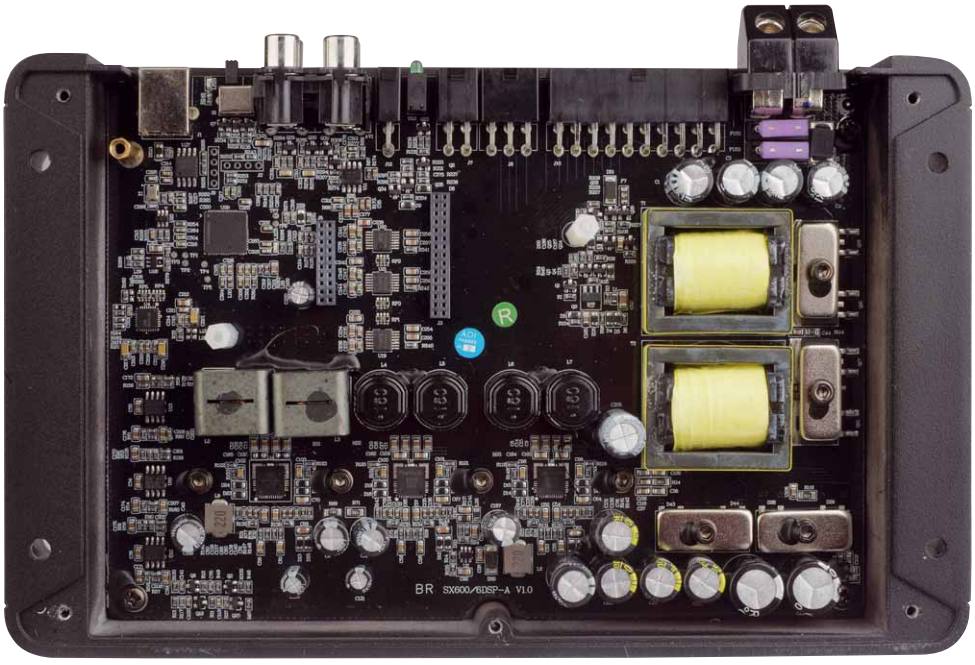
The app offers separate controls for master level and bass level



The app splits the individual sections, such as crossovers, EQ, and time alignment, into separate screens, making it easy to operate



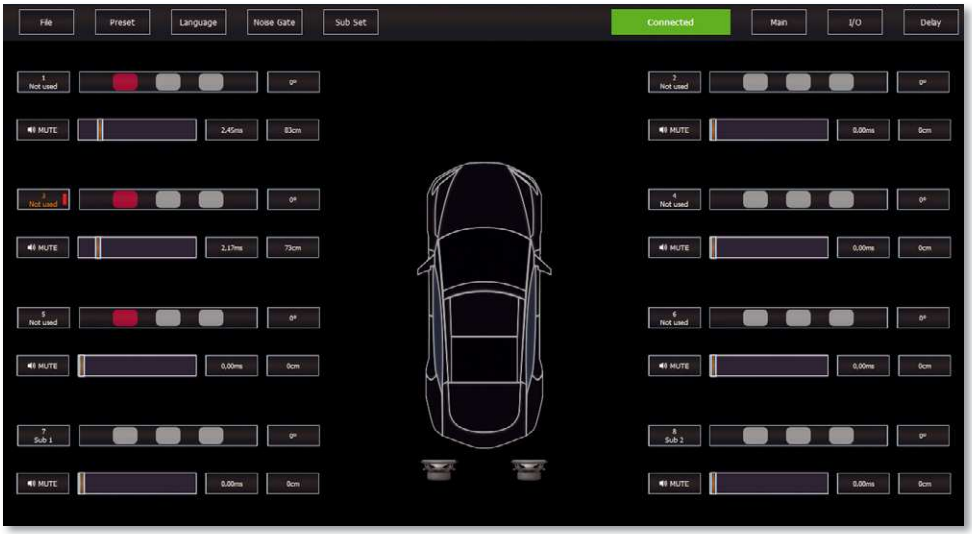
The equalizer includes a frequency response graph for checking your settings



The three square amplifier ICs sit in the lower third, without heatsinks

The housing looks almost identical to its big sister, the SE800.6DSP, but it is a little smaller in every dimension. That's remarkable, since this is a die-cast housing. It means the SX needs its own tooling, unlike an extruded body that can simply be cut

to length. All clear signs that ESX is serious about the affordable SX, so did they have to cut corners on the amplifier? Once we open it up, it quickly becomes clear that this is not the case. We find a robust dual power supply with 2 x 35 amp fusing, which, at 13.8 V x 70 A, is theoretically enough for almost a kilowatt. The layout is new and original, and the amplification stage is quickly spotted, sitting out in the open on the circuit board in the form of three two-channel chips. We're dealing with the latest technology here, which comes as amplifier ICs that contain everything. So there are no external power transistors; the chips do it all. The versions used here in the SX have only recently become available; they even manage without a heatsink on top and are cooled solely through the circuit board. The best-known manufacturer is Infineon with its Merus series, which we're finding on circuit boards more and more often. Unlike its big sister, the SE800.6, the SX600.6 doesn't have six identical channels; here we have four small and two large channels, and accordingly two „small" chips and one „large" one. All three measure 7 x 7 millimeters, of course, but the small ones are PowIRaudio, a brand of Infineon (or rather International Rectifier), with the IR hidden in the name. These are the small series, so to speak, while the third chip in the SX600.6DSP comes from the large Merus MA53x2 chip series with greater performance. That explains why the SE800.6 is the big sister, since it has three Merus chips. On the DSP side, however, the two are largely on par. Our SX600.6DSP works with the same DSP Master software as the SE (and some DSPs from sister brands Hifonics and Crunch), so it must have compatible hardware on board. On the main board, we find the same unnamed chip that combines the controller, DSP, and a number of converters. Then there are a few helpers, namely a Bluetooth chip, ICs that handle the translation work for the S/PDIF inputs and the USB, and a new, likewise anonymous many-legged chip, presumably the controller for the new USB audio or OTG streaming. Compared with its big sister, the SE800.6, our SX600.6 is only minimally stripped down: no AKM DACs and somewhat less power, as the 600 versus 800 in the name suggests.



The delay window makes it easy to set the time alignment for all channels, and it also offers mute and polarity inversion

Software

The ESX SX600.6DSP can be controlled with PC software or with an Android or iOS app. The whole package is called DSP Master and serves as a cross-brand DSP platform that also works with amplifiers from the Hifonics and Crunch brands. The PC software poses no puzzles: it combines all the important audio functions on a single main screen, which is still manageable with the SX600.6DSP's 8 DSP channels. The channels can be linked and muted, and the crossovers offer slopes of up to 48 dB per octave in Butterworth, Bessel, and Linkwitz characteristics. Unfortunately, it's not quite perfect: as is so often the case, odd orders are offered for Linkwitz, which don't actually exist. It's nice that the EQs work flawlessly and can also be repurposed as all-pass filters. The outputs get third-octave bands, which adds up to 31 per channel, and at a 48 kHz sample rate the time alignment works in 7-millimeter steps, which corresponds to 0.02 milliseconds. Routing, which is just as straightforward, and time alignment are on separate screens. In a Sub Set menu, up to 4 channels can be designated as subwoofers; this becomes interesting at the latest once you treat yourself to the optional display remote, which can then adjust the levels nicely. The Android app we tested makes no compromises compared to the desktop software. All functions are available on the phone too, neatly arranged one after another on individual screens, so operation is logical and easy. The home screen acts as a remote control, so here too the master and subwoofer levels are very easy to adjust, and selecting sources and presets is a breeze.



In the mixer, analog and digital inputs can be assigned to the channels in precise percentage steps; under Sub Set, up to 4 channels can be defined as subwoofers

Measurements and Sound

To take a closer look, we put the SX on the load resistors. First, the small channels deliver 62 watts into 4 ohms and 105 watts into 2 ohms. At 4 ohms, distortion is low; switching to 2 ohms raises it a little. The two large channels, on the other hand, are unfazed by the load. They already deliver 180 watts into 4 ohms, which rises to a hefty 177 watts into 2 ohms, both at very low distortion levels. And we're still impressed by what these chips can do. 2 x 177 watts from a 7 x 7 millimeter IC without a heatsink: that still rocks in 2026. And the good 350 watts bridged are enough for a subwoofer, too, since all of the SX's channel pairs are bridgeable. The system power of over 700 watts at 6 x 2 ohms comes to an impressive 94% of the sum of the individual channel outputs, which points to a truly generous power supply. The audio bandwidth extends to 22 kHz, followed by the typical sharp cutoff, so we're dealing with a 48 kHz sampling rate and, accordingly, 7-millimeter steps in the time alignment.



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

Specifications

Inputs
- 6-channel High-level with auto-sense
- 2-channel RCA
- Sensitivity High: 15/40 V per pair
- 1 x digital S/PDIF (optical)
- 1 x digital Bluetooth
- 1 x USB audio

Outputs
- 2-channel RCA
- 1 x Remote-out

DSP-Channels
- 8

DSP-Software (PC V 2.0.17)

Equalizer

Outputs:
- param., 31 bands per channel, allpass filters
- 20 – 20k Hz, 1-Hz increments, +12 – -12 dB, Q 0,7 – 9

Crossovers
- 20 – 20k Hz, 1-Hz increments
- Bessel, Butterworth, Linkwitz
- 6 – 48 dB/Okt.

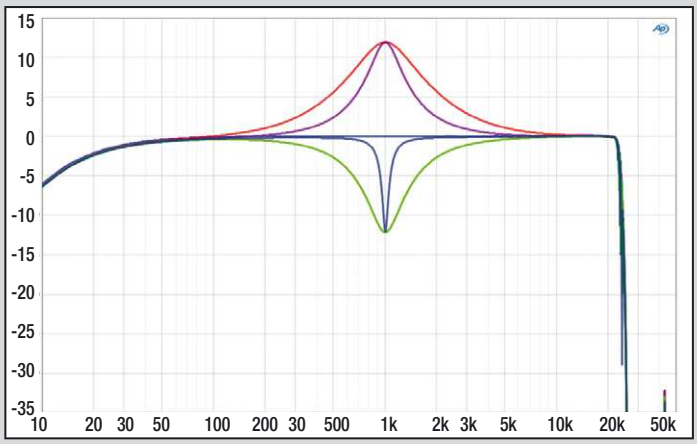
Time and level
- Samplerate 48 kHz, 7 mm increments (0.02 ms)

Outputs:
- 0 – 510 cm (15,00ms), 720 samples
- Phase 0, 180°
- Adjustable level increments 0,1 dB, Muting

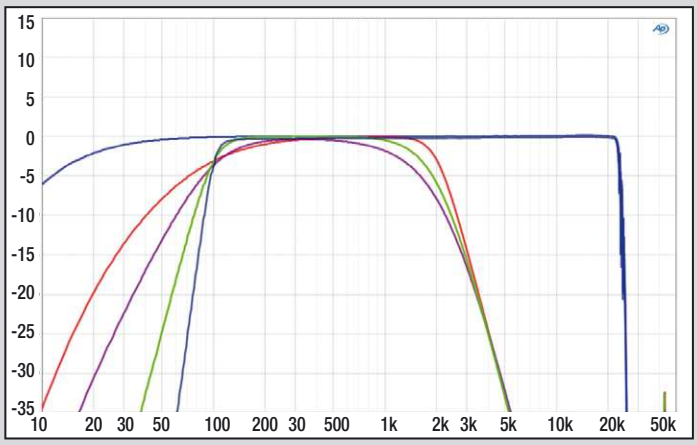
Features
- 10 presets
- Desktop PC or smartphone App (iOS und Android)
- Signal-dependent switching/mixing to digital or Aux inputs
- Bluetooth 5.0 streaming and DSP setup
- OTG USB streaming
- Mode preset switch

Optional accessories
- Wired remote control RC-SXE
- Various harnesses

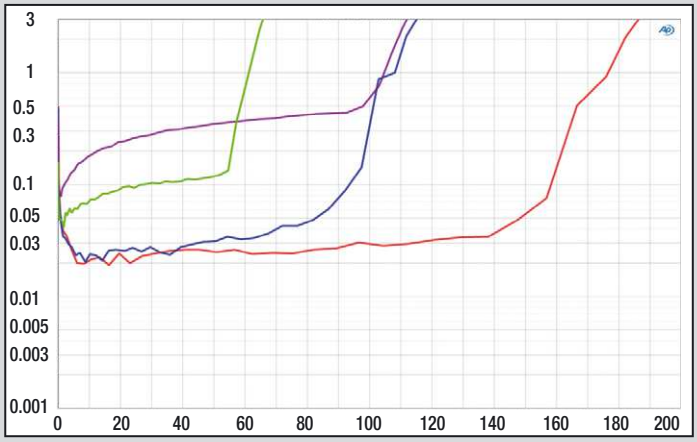
CAR&HIFI Laboratory



Flawless EQs, rolled-off amplitude below 30 Hz, and the sharp cutoff at 22 kHz due to the sampling rate



The crossovers go up to 48 dB per octave; Bessel, Butterworth, and Linkwitz work without overshoot



Impressive power of just under 100 and 180 watts on the large channels (blue, red). The small channels produce a bit more distortion, but still deliver plenty of power with a good 60 watts into 4 ohms (green) and a good 100 watts into 2 ohms (purple)

So no hi-res frequency response, but no other manufacturer offers that at this price. What we've long since come to expect from chip amplifiers is their high sound quality, and the SX600.6DSP is no exception. Whether small or large channels, nothing here sounds like Class D or artificial. The SX sounds very clean with excellent transparency, so it's no problem to follow even complex musical passages. The soundstage is nice and expansive; there's nothing to criticize here. Likewise, voices reach the ear with their familiar timbre, giving the impression of a natural tonal balance with accurate tonal colors. It gets really great with percussion: here the SX really lets loose, so hard drum hits and fierce drum attacks reach the ear unfiltered. The large channels, at least, have no trouble even with bigger or heavier woofers; no control is lost here, and everything always stays punchy and clean.

Conclusion

Our conclusion couldn't be simpler. The SX600.6DSP offers so much for the money that it hardly gets any better: 6 powerful amplifier channels with the latest technology, a superbly performing 8-channel DSP, and features including Bluetooth and all the bells and whistles that easily outshine far more expensive amplifiers. Congratulations to ESX on this genuinely excellent amplifier! If there were a best-of list for value for money, the SX600.6DSP would be right at the top.

Elmar Michels

The optional remote control comes with a sleek OLED display





Specifications

Channels	6
Channel power 4 ohms W	4 x 62 + 2 x 108
Channel power 2 ohms W	4 x 105 + 2 x 177
Channel power 1 ohms W	0,0
Bridged power W	-
System power W	724
Sensitivity max. mV	950
Sensitivity min. V	–
THD+N (<22 kHz) 5 W	0,056/0,025
THD+N (<22 kHz) half power	0,102/0,022
Signal-to-noise ratio dB(A)	81/81
Damping factor 20 Hz	11/123
Damping factor 80 Hz	13/110
Damping factor 400 Hz	17/96
Damping factor 1 kHz	19/86
Damping factor 8 kHz	10/13
Damping factor 16 kHz	3/3

Features

Low pass	20 – 20k Hz
High pass	20 – 20k Hz
Band pass	20 – 20k Hz
Bass boost	-12 – 12 dB/20 – 20k Hz
Subsonic filter	via HP
Phase shift	–
High-level inputs	• 6 CH
Auto turn-on	•, DC
RCA output	•, 2CH, processed
Start/stop capable	– (7,5 V)
Dimensions (L x W x H mm)	25 x 140 x 44
Others	8-channel DSP, EPS, Bluetooth

ESX SX600.6DSP

Price	450 Euro
Contact	Audio Design, Germany
Internet	www.esxaudio.de

Rating

Sound	40 %	★★★★★
Bass	8 %	★★★★★
Neutrality	8 %	★★★★★
Transparency	8 %	★★★★★
Spatial imaging	8 %	★★★★★
Dynamics	8 %	★★★★½
Lab	35 %	★★★★½
Power	20 %	★★★★½
Damping factor	5 %	★½☆☆☆
Signal-to-noise ratio	5 %	★★★★½
Noise	5 %	★★★★½
Practice	25 %	★★★★★
Features	15 %	★★★★★
Build quality electronics	5 %	★★★★½
Build quality mechanics	5 %	★★★★★

Top Class

★★★★½

CAR&HiFi INTERNATIONAL Germany 3/26

Price/performance: excellent

„Loaded with features and the latest tech at a bargain price.“

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Blaupunkt Classic speakers – Coaxial and component systems from 10 to 16 centimeters put to the test

Modern Vintage

In recent years, Blaupunkt has mainly made a name for itself with multimedia, but now matching speakers are hitting the market as well. We have no fewer than five systems in our office for testing and are putting them through their paces.



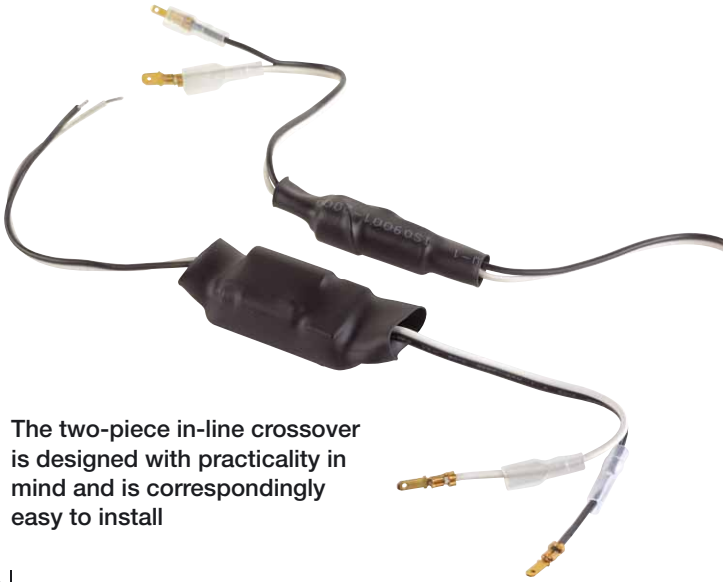






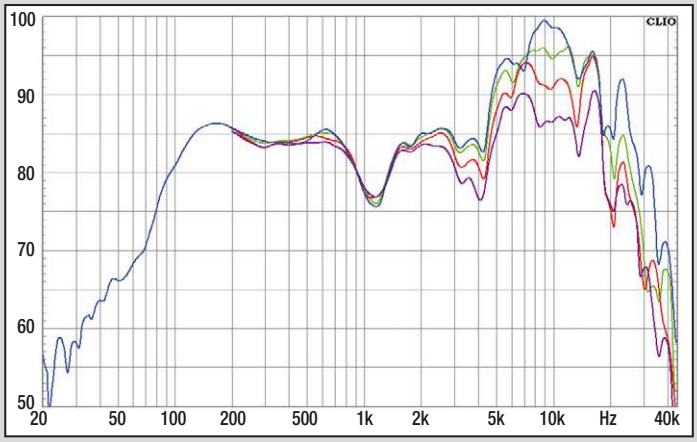
Retro touch: Choose between the vintage logo used until 1975 or the current Blaupunkt logo

Blaupunkt has lately been riding the retro wave with great success. From the retro steering-wheel remote to VW radios in 2010s style to the reissue of the Frankfurt Stereo, we find current technology in an attractive modern-classic look; that's fun, and it makes a great impression at a car meet, too. So it only seems logical that Blaupunkt is now adding matching speakers to its lineup. The older among us will surely remember the Blaupunkt ball speakers that populated the rear decks of boxy, garishly colored cars in the '70s and '80s – those are now available again as well. The rear deck of my 1985 summer car has a pair installed, too; the label only says "20 Watts," but the formerly blue dust cap in the paper cone shows that they are, of course, Blaupunkts. Mine fortunately have cloth surrounds, but of the standard-issue units with foam surrounds from that era, you can bet hardly any still work – the nasty UV radiation sees to that. So there's plenty of demand for adequate replacements, and that's exactly where Blaupunkt comes in with the Classic series. The idea is to offer modern, robust technology in an appealing retro package, so the sound is right again – but please, without clashing with the car's style. On top of that, they're designed with real-world practicality in mind, so the Classics can be used anywhere. Our test candidates are round car speakers in 100, 130, and 165 millimeter sizes (4", 5.25", 6.5"), which fit almost any modern classic but can of course also be used in newer vehicles without any problems. The five models come in the form of three coaxial systems – Classic 100 Cx, Classic 130 Cx, and Classic 165 Cx – complemented by the 130 Cs and 165 Cs component systems. The Classic series is all black, which always works. The stamped steel baskets are powder-coated and feature DIN mounting holes, so installation is no problem. In addition, all speakers are very shallow, so they're ready for tight installation spaces. This applies both to mounting depth and, on the coaxials, to the cone side. There's no bulky ferrite magnet; only the pole plate of the magnet system protrudes a few millimeters from the basket, while inside, a compact neodymium magnet drives the voice coil. On all models, the voice coil measures a hefty 36 millimeters in diameter, which also provides plenty of surface area – good for cooling and therefore for power handling. The large voice-coil diameter is needed to house the tweeters inside the coil on the coaxials. The result is tweeters that sit so deep in the cones that they don't protrude beyond the basket rim, not even on the small 100 Cx. Matching grilles are included with the Classic series, and as a special highlight, there are two different adhesive logos. You can choose between the current logo and an old logo that Blaupunkt used until the 1970s – very nicely vintage. For a seamless look, there's a kind of collar around the coaxial tweeter, shaped like a truncated cone or a dust cap with a hole in



The two-piece in-line crossover is designed with practicality in mind and is correspondingly easy to install

CAR&HIFI Laboratory



On axis, the small Mylar tweeter comes across as noticeably too loud; in the midbass range, the 100 Cx delivers a strong 85 dB



Even the 100 features a large 36 mm voice coil

the middle. On the outside, all cones are suspended by ribbed rubber surrounds, which, unlike their vintage predecessors, are UV-resistant. The bonding areas between surrounds and cones are also reassuringly generous; everything here points to a durable design. The cones themselves are made of pressed paper, which has a proven sonic track record and also fits the vintage philosophy. The front sides are also coated, making them more resistant to moisture. The 100 Cx, 130 Cx, and 165 Cx coaxials are fitted with a small tweeter that, in similar form, has been around for what feels like an eternity and fits the concept well here. What we have is the famous – or infamous – plastic dome with a 13 millimeter voice coil, radiating via a Mylar diaphragm. That's vintage enough, since polyester Mylar was already being used as a diaphragm material back in the '70s. Here, however, it's a special variant with a 20 millimeter outer diameter instead of the usual 25 millimeters. The 130 Cs and 165 Cs component sets, on the other hand, come with a full-fledged fabric dome featuring a 25 millimeter voice coil and a silk diaphragm.



The coaxial tweeter sits deep inside the woofer cone and doesn't protrude

Specifications

Basket diameter	102 mm
Mounting diameter	94 mm
Mounting depth	35 mm
Magnet diameter	58 mm
Membrane tw	13 mm
Casing tw	–
slope wf/tw	–/6 dB
Tweeter protection	–
Tweeter level adjustable	–
Grid	•
Others	–
Nominal impedance	4 Ohm
DC resistance Rdc	3,15 Ohm
Coil inductivity Le	0,04 mH
Coil diameter	36 mm
Membrane surface	53 cm²
Resonance frequency fs	139 Hz
Mechanical Q-Factor Qms	8,99
Electrical Q-factor Qes	1,10
Overall Q-factor Qts	0,98
Equivalent volume Vas	1,0 l
Moved mass Mms	5,2 g
Rms	0,50 kg/s
Cms	0,25 mm/N
B x l	3,60 Tm
SPL 2 V, 1 m	85 dB
Recommended power	20 – 80 W

Blaupunkt Classic 100 Cx

Price	100 Euro
Contact	Evo-Sales, Germany
Internet	www.bpautomotive.de

Rating

Sound	55 %	★★★★½
Bass foundation	11 %	★★★★☆
Neutrality	11 %	★★★★☆
Sound stage	11 %	★★★★☆
Spatiality	11 %	★★★★★
Dynamics	11 %	★★★★★
Lab	30 %	★★★★☆
Frequency response	10 %	★★★★☆
Max. SPL	10 %	★★★★☆
Distortion	10 %	★★★★☆
Practice	15 %	★★★★½
Crossover	10 %	★★★★☆
Build quality	5 %	★★★★★

Middle class

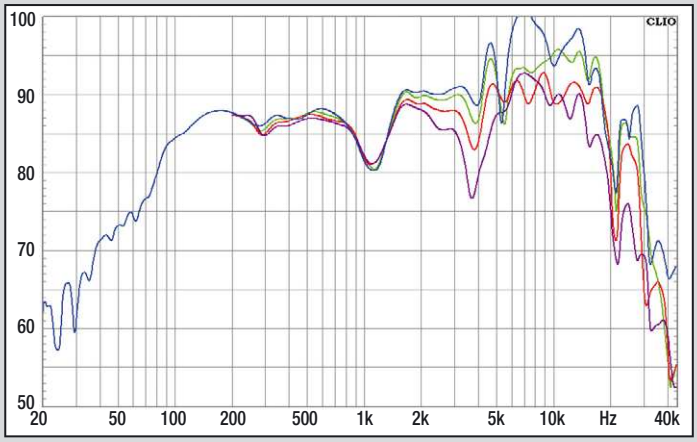
★★★★☆

CAR&HiFi INTERNATIONAL Germany 3/26

Price/performance: very good

"A well-executed retro series with fitting looks and good sound."

CAR&HIFI Laboratory



The dip around 1 kHz is more pronounced on the 130 Cx than on the 130 Cs, and harmless on both. Both deliver solid sound pressure at 87 dB



The pole piece protudes only a bit out of the basket



All woofers, right down to the 100 Cx, feature large 36 mm voice coils in the motor

The component midbass drivers are built the same way as the coaxials: they have the same shallow mounting depths and equally large voice coils, even though they wouldn't need them without a coaxial tweeter. The only difference is the dust caps on the cones. While the coaxial models get by without a separate crossover (there's only the usual small capacitor in front of the tweeter), the Cs models come with an in-line crossover. The low-frequency section consists of a transformer-core inductor that low-passes the midbass driver at 6 dB, while the tweeter gets a 12 dB crossover with a capacitor and an inductor; there's also a level-attenuation resistor on board to keep the treble from getting too forward.

Measurements and Sound

Let's stay with the component systems, both of which perform very respectably in front of the measurement microphone. The tweeter extends to 26 kHz, which is very good for a 25 mm fabric dome. The 13 cm midbass driver shows a cone resonance

Specifications

Basket diameter	130 mm
Mounting diameter	114 mm
Mounting depth	44 mm
Magnet diameter	66 mm
Membrane tw	13 mm
Casing tw	–
slope wf/tw	–/6 dB
Tweeter protection	–
Tweeter level adjustable	–
Grid	•
Others	–
Nominal impedance	4 Ohm
DC resistance Rdc	3,13 Ohm
Coil inductivity Le	0,05 mH
Coil diameter	36 mm
Membrane surface	90 cm²
Resonance frequency fs	113 Hz
Mechanical Q-Factor Qms	8,01
Electrical Q-factor Qes	0,77
Overall Q-factor Qts	0,70
Equivalent volume Vas	2,7 l
Moved mass Mms	8,5 g
Rms	0,75 kg/s
Cms	0,24 mm/N
B x l	4,95 Tm
SPL 2 V, 1 m	87 dB
Recommended power	20 – 100 W

Blaupunkt Classic 130 Cx

Price	120 Euro
Contact	Evo-Sales, Germany
Internet	www.bpautomotive.de

Rating

Sound	55 %	★★★★½
Bass foundation	11 %	★★★★★
Neutrality	11 %	★★★★☆
Sound stage	11 %	★★★★☆
Spatiality	11 %	★★★★★
Dynamics	11 %	★★★★★
Lab	30 %	★★★★☆
Frequency response	10 %	★★★★☆
Max. SPL	10 %	★★★★☆
Distortion	10 %	★★★★☆
Practice	15 %	★★★★½
Crossover	10 %	★★★★☆
Build quality	5 %	★★★★★

Middle class

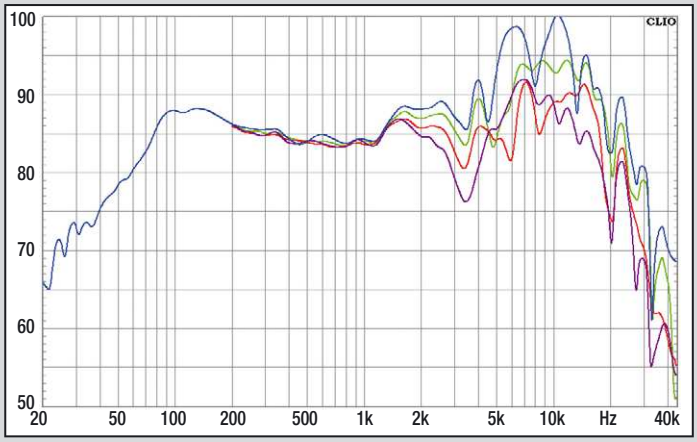
★★★★½

CAR&HIFI INTERNATIONAL Germany 3/26

Price/performance: very good

"A well-executed retro series with fitting looks and good sound."

CAR&HIFI Laboratory



The 165 Cx has the smoothest response; the off-axis frequency response looks especially good



The coaxials feature a tiny cap as crossover

at just over 4 kHz, which isn't too pronounced, though, and with paper cones can turn out to be sonically harmless. On the 16 cm driver, it's only slightly lower at just under 4 kHz – again, nothing to worry about. With resonance frequencies of 115 and 79 Hz, the woofers aren't deep-bass monsters, because Blaupunkt is taking a different approach here. The engineers traded bandwidth for sensitivity, forgoing a low resonance frequency; in return, the two play at 86–87 dB (2 V/1 m). Within its operating range, the 13 cm driver is even louder than the larger 16 cm, so this point goes to the 130 Cs. This design philosophy can also be seen in the 100 Cx coaxial, which at 85 dB is above-average loud for a 10 cm speaker. Why this is the case is easy to explain. Blaupunkt currently has no amplifiers in its lineup, so the Classic speakers are meant to work directly off a Blaupunkt head unit as well. That's why good efficiency was a priority, so the Classics don't need a lot of power. Mission accomplished: all of them show such good

Mounting accessories include a "wristwatch" for dashboard locations



Specifications

Basket diameter	166 mm
Mounting diameter	143 mm
Mounting depth	45 mm
Magnet diameter	78 mm
Membrane tw	13 mm
Casing tw	–
slope wf/tw	–/6 dB
Tweeter protection	–
Tweeter level adjustable	–
Grid	•
Others	–
Nominal impedance	4 Ohm
DC resistance Rdc	3,16 Ohm
Coil inductivity Le	0,09 mH
Coil diameter	36 mm
Membrane surface	129 cm²
Resonance frequency fs	79 Hz
Mechanical Q-Factor Qms	7,17
Electrical Q-factor Qes	1,15
Overall Q-factor Qts	0,99
Equivalent volume Vas	6,9 l
Moved mass Mms	13,7 g
Rms	0,94 kg/s
Cms	0,30 mm/N
B x l	4,32 Tm
SPL 2 V, 1 m	86 dB
Recommended power	20 – 100 W

Blaupunkt Classic 165 Cx

Price	130 Euro
Contact	Evo-Sales, Germany
Internet	www.bpautomotive.de

Rating

Sound	55 %	★★★★½
Bass foundation	11 %	★★★☆☆
Neutrality	11 %	★★★★★
Sound stage	11 %	★★★★☆
Spatiality	11 %	★★★★★
Dynamics	11 %	★★★★★
Lab	30 %	★★★★☆
Frequency response	10 %	★★★★☆
Max. SPL	10 %	★★★★☆
Distortion	10 %	★★★★☆
Practice	15 %	★★★½☆
Crossover	10 %	★★★☆☆
Build quality	5 %	★★★★☆

Upper class

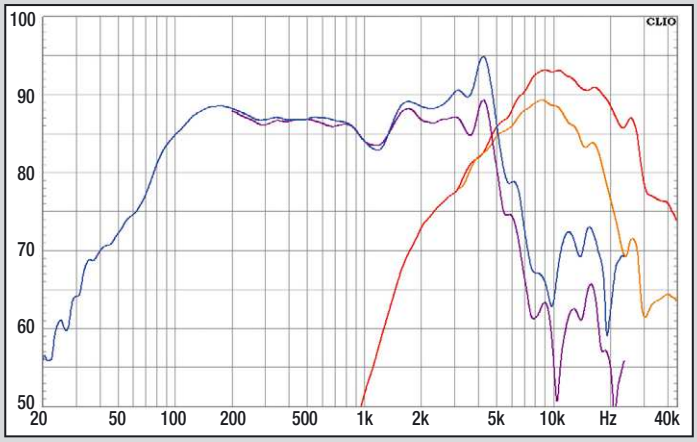
★★★★☆

CAR&HiFi INTERNATIONAL Germany 3/26

Price/performance: very good

"A well-executed retro series with fitting looks and good sound."

CAR&HIFI Laboratory



The 130 Cs offers a wide-bandwidth tweeter, while the midbass driver doesn't exactly shine with a lot of bass



The Cs midbass drivers are vented through a bore in the pole piece

efficiency that we can confidently recommend running them directly off the head unit. Continuing with our measurements, we come to the 100 Cx, 130 Cx, and 165 Cx coaxials, which naturally can't hide their coaxial design in front of the microphone either. The comb-filter-like cancellations at the top of the frequency range are caused by interference and can be found in almost all coaxials. The tweeters are also a bit forward on axis, which settles down completely at a 30° angle. The deep dips of the two smaller coaxials around 1 kHz are completely harmless; here it actually seems to be cancellation from the tweeter, since the shallow crossover slope doesn't fully take the tweeter out of play. The two component sets score very well in distortion, with the plots staying spotless. In general, all midbass cones are fine; on the three coaxials, only the tweeter prevents a better rating. Once again, the 6 dB crossover via electrolytic capacitor makes itself felt, since the tiny 13 millimeter tweeter naturally doesn't like low frequencies. But it all stays well



The component systems come with a full-fledged 25 millimeter fabric dome tweeter

Specifications

Basket diameter	130 mm
Mounting diameter	114 mm
Mounting depth	44 mm
Magnet diameter	66 mm
Membrane tw	25 mm
Casing tw	41 mm
slope wf/tw	6/12 dB
Tweeter protection	–
Tweeter level adjustable	–
Grid	•
Others	–
Nominal impedance	4 Ohm
DC resistance Rdc	3,11 Ohm
Coil inductivity Le	0,14 mH
Coil diameter	36 mm
Membrane surface	90 cm²
Resonance frequency fs	115 Hz
Mechanical Q-Factor Qms	6,33
Electrical Q-factor Qes	0,80
Overall Q-factor Qts	0,71
Equivalent volume Vas	2,4 l
Moved mass Mms	9,0 g
Rms	1,03 kg/s
Cms	0,21 mm/N
B x l	5,03 Tm
SPL 2 V, 1 m	87 dB
Recommended power	20 – 100 W

Blaupunkt Classic 130 Cs

Price	150 Euro
Contact	Evo-Sales, Germany
Internet	www.bpautomotive.de

Rating

Sound	55 %	★★★★½
Bass foundation	11 %	★★★★☆
Neutrality	11 %	★★★★☆
Sound stage	11 %	★★★★★
Spatiality	11 %	★★★★★
Dynamics	11 %	★★★★★
Lab	30 %	★★★★½
Frequency response	10 %	★★★★☆
Max. SPL	10 %	★★★★☆
Distortion	10 %	★★★★★
Practice	15 %	★★★★☆
Crossover	10 %	★★★★☆
Build quality	5 %	★★★★☆

Upper Class

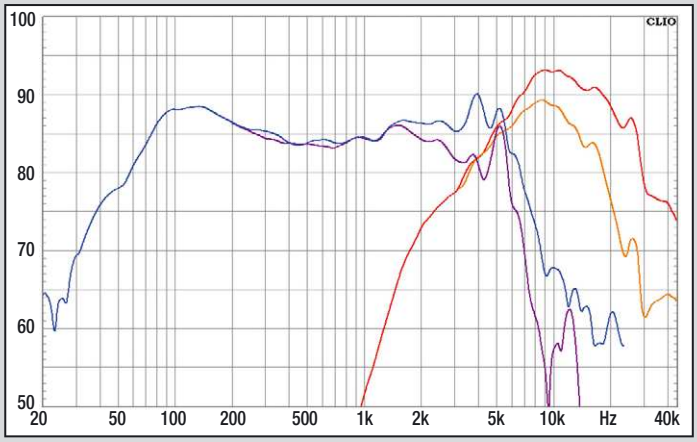
★★★★½

CAR&HiFi INTERNATIONAL Germany 3/26

Price/performance: very good

"A well-executed retro series with fitting looks and good sound."

CAR&HIFI Laboratory



There's nothing to fault with the 165 Cs; both the midbass driver and the tweeter perform flawlessly



The standard sized baskets make all Classics fit into many vehicles

within limits, as our rating reflects. Because sonically, we are more than satisfied with the Classic series. If you want to treat yourself to the best sound, go for the component systems: both the 130 Cs and the 165 Cs play cleanly and with very good resolution. The dome tweeter is really good; even fine musical details sparkle into the listening room in a relaxed, effortless way. The bass doesn't go excessively deep, but it's precise and punchy. The same goes for the coaxial speakers, of which the small 100 Cx, as expected, delivers the least bass – it plays with virtually no low end. Within its intended range, however, it also sounds clean and quite pleasant. The treble reproduction of the coaxials can't keep up with the excellent fabric domes, but at least it never gets unpleasant. As far as tonal color and vocal reproduction are concerned, we're otherwise highly satisfied.

Conclusion

With the Classic series, Blaupunkt delivers very well-performing speaker technology in an understated retro look. Thanks to the neodymium motors, they're practically slim as well. Of course, we don't expect high-end performance in this price range, but what the Classic series offers is more than enough for refined reproduction at a high sonic level – even directly off a Blaupunkt retro radio.

Elmar Michels

Specifications

Basket diameter	166 mm
Mounting diameter	143 mm
Mounting depth	45 mm
Magnet diameter	78 mm
Membrane tw	25 mm
Casing tw	41 mm
slope wf/tw	6/12 dB
Tweeter protection	–
Tweeter level adjustable	–
Grid	•
Others	–
Nominal impedance	4 Ohm
DC resistance Rdc	3,16 Ohm
Coil inductivity Le	0,19 mH
Coil diameter	36 mm
Membrane surface	129 cm²
Resonance frequency fs	79 Hz
Mechanical Q-Factor Qms	6,09
Electrical Q-factor Qes	1,23
Overall Q-factor Qts	1,02
Equivalent volume Vas	7,0 l
Moved mass Mms	13,3 g
Rms	1,09 kg/s
Cms	0,30 mm/N
B x l	4,13 Tm
SPL 2 V, 1 m	86 dB
Recommended power	20 – 100 W

Blaupunkt Classic 165 Cs

Price	170 Euro
Contact	Evo-Sales, Germany
Internet	www.bpautomotive.de

Rating

Sound	55 %	★★★★½
Bass foundation	11 %	★★★☆☆
Neutrality	11 %	★★★★★
Sound stage	11 %	★★★★★
Spatiality	11 %	★★★★★
Dynamics	11 %	★★★★★
Lab	30 %	★★★★½
Frequency response	10 %	★★★★☆
Max. SPL	10 %	★★★★☆
Distortion	10 %	★★★★★
Practice	15 %	★★★★☆
Crossover	10 %	★★★★☆
Build quality	5 %	★★★★☆

Upper Class

★★★★½

CAR&HIFI INTERNATIONAL Germany 3/26

Price/performance: very good

"A well-executed retro series with fitting looks and good sound."



Audio System H165 Evo3 – Top-Class 6.5-Inch Component System

Elite Class

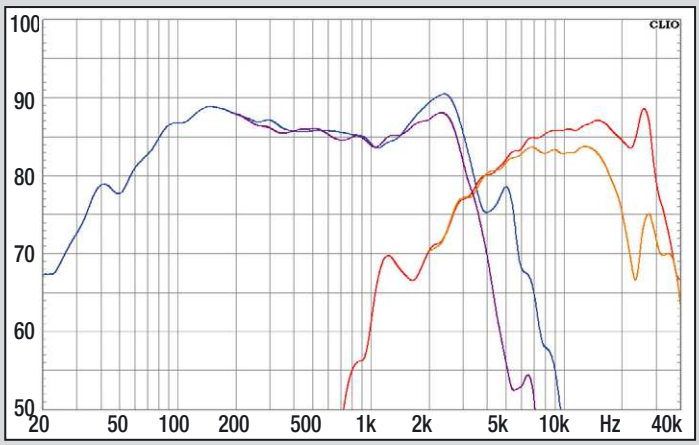
Anyone looking for car speakers that deliver both sound quality and output could quickly end up with Audio System's H series. We put the brand-new H165 Evo3 to the test.


AUDIO SYSTEM
AUDIO SYSTEM H EVO
Amplifier
Woofer1
Woofer2
Tweeter



Well-ventilated die-cast basket and genuine carbon-fiber cone on the midwoofer

The H, or Helon, series sits fairly high up in Audio System's lineup. Alongside it is the HX series, which leans more toward SQ, while the H series is more focused on output. That's underscored by the Helon PA subseries, with high-efficiency speakers that have PA DNA, such as horn tweeters. Our H165 Evo3 looks rugged and sturdy right from the first glance. The star of the ensemble is clearly the 165 mm midwoofer, which has just been newly developed. The driver, named AX165, is massive: a single unit tips the scales at 1.7 kilograms (3.7 lb). A large share of that goes to the huge ferrite magnet in the motor, and it's needed. Equally impressive is the voice coil diameter of 1.5 inches, or 38 millimeters, which would serve even a small subwoofer perfectly well. The coil is wound on a perforated aluminum former, the go-to solution for optimal cooling. Audio System rates the AX165 Evo3 at 150 watts of power handling, hence the large coil with plenty of surface area for dissipating heat. The spider has to be correspondingly robust as well; here, Nomex fabric is used, made from a polyimide fiber related to Kevlar. The visual highlight of the driver, however, is clearly the exposed carbon-fiber cone. Genuine carbon-fiber weave is embedded in a clear resin layer. Not only does it look good, it also provides stiffness at low weight. The whole thing is held together by a frame that, like the entire driver, comes across as extremely robust. Thick cast aluminum – it hardly gets sturdier than that. On top of that, the basket is superbly ventilated, thanks to slender struts and large openings beneath the spider. By comparison, the AS25 Evo2 tweeter looks rather unassuming. Through the stylish hexagonal grille, you can make out the fabric dome, as well as the 25 mm voice coil diameter. Nothing special so far, but the compact housing, with a mounting depth of just 16 millimeters, still hides a premium feature. Audio System has managed to fit in a small rear chamber without the correspondingly deep housings of the brand's HS Dust or Phase tweeters. The H system's crossover is XL-sized. No fewer than eight jumpers sit on the circuit board, allowing for a huge number of different confi-



Both drivers perform flawlessly. The woofer cone makes itself noticeable at 5 kHz, but vanishes into nirvana off-axis. On-axis, the tweeter reaches nearly 30 kHz, with a small dip above 20 kHz



The crossover offers numerous adjustment options for low-pass, high-pass, and level

gurations. The jumpers get top marks: they're solid and make secure contact – it doesn't get much better than that. The first two handle the tweeter level adjustment, switching two different resistors for a total of four possible settings. It's a similar story with the two jumpers for the two capacitors in the tweeter branch: they switch in either the small capacitor, the large one, or both, for different crossover frequencies to the midwoofer. That's where the next two jumpers come in, switching the capacitors in the low-pass section. As before, we find two values, 15 and 18 microfarads, so we can select 15, 18, 15 + 18, or neither – in the last case, we end up with a 6 dB low-pass filter. Finally, you can play the same game with the woofer inductor, which has three taps in total, since it consists of two coils wound inside each other. So there are more than enough configurations, even if it gets a bit confusing. By the time you've tested them all, you might as well have built your own crossover from scratch.

Measurements and Sound

The beefy midwoofer runs perfectly up to 4 kHz, which is pretty good for a fairly stiff cone with a large voice coil. The main resonance sits at just over 5 kHz, but it's quite well damped, although a small matching distortion spike can't be denied. Overall, though, the 6.5-inch driver produces very little distortion, even at very high SPL. The parameter set is perfectly balanced, with a free-air resonance of 60 Hz and an ideal Q of 0.53.



The large 38 mm (1.5-inch) voice coil is driven by a huge ferrite ring

The moderate 16 grams of moving mass isn't too much for the sturdy cone with its large voice coil, either. In the tweeter's impedance curve, we find a double hump that points to a complex internal design. The resonance around 1 kHz indicates that at least a small rear chamber, or something along those lines, is present. That helps the tweeter at low crossover frequencies, even though this system doesn't even take full advantage of it. From 2 kHz up, the tweeter then runs ruler-flat to just under 30 kHz – no complaints there. The same goes for distortion, which stays at an extremely low level. Then, in the listening test, something almost surprising happens. Of course, the H system doesn't hold back and really gets down to business when you turn up the volume. But that doesn't mean this system can only play loud – far from it. Playback is excellent even for discerning sound-quality ears. Vocals and instruments come across really well, and there's an abundance of detail, so you can really listen in on the little nuances. Percussion is crystal clear, as is the bass, which comes across as super clean rather than super deep. The system also handles quiet passages well; at reduced levels, the balanced tonal picture is preserved. All in all, it's a really strong performance – this system can do much more than just get loud.

Conclusion

With the H165 Evo3, Audio System delivers first-class quality, which naturally comes at a price. In return, you get a premium speaker set that can do it all, from blistering volume to high-end sound.

Elmar Michels



Looks harmless, but hides a rear chamber



Specifications	
Basket diameter	166 mm
Mounting diameter	145 mm
Mounting depth	72 mm
Magnet diameter	100 mm
Membrane tw	25 mm
Casing tw	48 mm
slope wf/tw	12/12 dB
Tweeter protection	PTC
Tweeter level adjustable	0, -3 dB
Grid	•
Others	Crossover frequency, slope, midrange, and treble level highly adjustable
Nominal impedance	3 Ohm
DC resistance Rdc	2,71 Ohm
Coil inductivity Le	0,29 mH
Coil diameter	38 mm
Membrane surface	133 cm²
Resonance frequency fs	60 Hz
Mechanical Q-Factor Qms	3,83
Electrical Q-factor Qes	0,62
Overall Q-factor Qts	0,53
Equivalent volume Vas	10,3 l
Moved mass Mms	16,8 g
Rms	1,66 kg/s
Cms	0,42 mm/N
B x l	5,28 Tm
SPL 2 V, 1 m	88 dB
Recommended power	30 – 150 W

Audio System H165 Evo3	
Price	375 Euro
Contact	Audio System, Germany
Internet	www.audio-system.de

Rating		
Sound	55 %	★★★★★
Bass foundation	11 %	★★★★★
Neutrality	11 %	★★★★★
Sound stage	11 %	★★★★★
Spatiality	11 %	★★★★★
Dynamics	11 %	★★★★☆
Lab	30 %	★★★★½
Frequency response	10 %	★★★★★
Max. SPL	10 %	★★★★★
Distortion	10 %	★★★★☆
Practice	15 %	★★★★★
Crossover	10 %	★★★★★
Build quality	5 %	★★★★★

Top Class

★★★★★

CAR&HiFi INTERNATIONAL Germany 3/26

Price/performance: very good

"Top-notch for sound and SPL."

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GZNW 25C – 10-inch subwoofer from Ground Zero

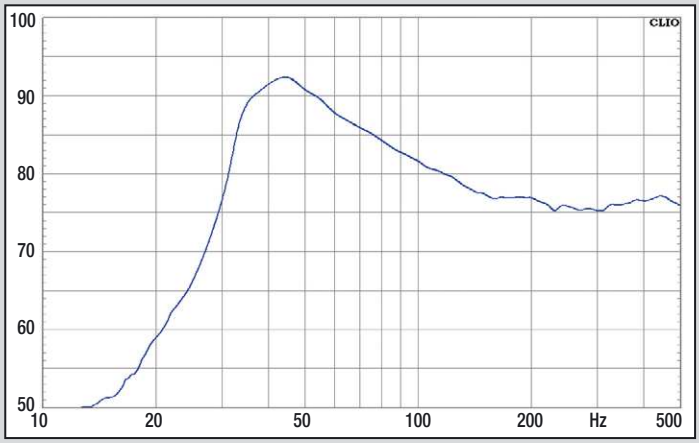
SPL Champion

With the GZNW 25C, Ground Zero introduces its “baddest” 10-inch (25 cm) subwoofer to date, which has naturally turned out to be a real heavyweight. We put it through its paces.




GROUND ZERO
GROUND ZERO
GROUND ZERO
GROUND ZERO

CAR&HIFI Laboratory



At its favorite frequency of 40 Hz, the Nuclear climbs to 92 dB; above that, 85 dB is more realistic

Anyone looking for an SPL subwoofer is sure to find one at Ground Zero, since the lineup includes a full dozen of them. From 15-inch (38 cm) monsters all the way down to a 6.5-inch (16.5 cm) basket size, there are woofers that carry SPL in their name. Just recently, Ground Zero added a brand-new design, the GZNW 38C, which comes loaded with the finest ingredients for sound pressure but doesn't go through the roof price-wise the way the almost indecent combination of SPL and a neodymium motor does. Now Ground Zero is pairing the 15-inch with the GZNW 25C, which was likewise developed from scratch based on the latest insights. As with all loudspeaker development, the work relies on software (or an entire suite) that uses the finite element method to simulate every component of a speaker, such as the basket, cone, surround, and suspension. In the course of this approach, Ground Zero's marketing has established the terms ConeGlide and ConeGrip, which tell you at a glance whether a subwoofer is geared toward sound quality or SPL. Among the 10-inch models, for example, the GZPW 10SQX SQ subwoofer features ConeGlide technology, whereas our GZNW 25C uses ConeGrip, so it's headed in the SPL direction. That brings us to the rather opposing development goals of SQ and SPL woofers. Of course, some things suit any subwoofer, but SQ is above all about linear operation, low mechanical losses, and little moving mass. With SPL, power handling, mechanical stability, and the ability to move a lot of air take center stage. Accordingly, our GZNW 25C has a carbon fiber cone that offers the optimum balance of stiffness and weight; its shape is conical with a straight profile and very deep, meaning it has an acute cone angle. All of this makes it rigid. The dual spider is as wide as possible, in this case an 8-inch spider under a 10-inch cone. In addition, the basket spokes run perpendicular to the basket rim, so the basket diameter stays just within the mounting diameter. The voice coil is also as large as possible, which creates surface area for cooling. Unfortunately, that comes with a lot of weight, but this is compensated for by the three hefty ferrite rings in the motor. The winding height, which is likely around 45 millimeters (1.8 inches), also adds to the coil's surface area. That is also roughly the maximum excursion (peak to peak), so the GZNW 25C moves large amounts of air. With this much excursion, ventilation is crucial, which is why the design of the die-cast basket follows the motto "reduce to the max." Huge basket openings both above and below the spider, along with the super-narrow basket struts they require, push the design to its limits. We already know the reinforcements on the inside of the basket rim from the GZPW 15NEO-XSPL; they serve precisely to get the most out of the material used. All this means that the massive, long voice coil former with its deep cone runs the risk of rocking at large excursions, which would be fatal for durability. This is where ConeGrip comes back into play: the goal is a surround stable enough to support the spider as much as possible, precisely in order to ensure reliable guidance of the massive moving assembly. ConeGlide would be the opposi-



Just fits the mounting cutout: close-fitting terminals and a triple magnet

te: mechanically, the surround is as close to nonexistent as possible.

Measurements and Sound

Our parameter measurements confirm that the GZNW 25C is built for sheer output. A rock-hard suspension is a must, which results in a small equivalent volume, actually good for small enclosures. At 35 Hz, the resonance frequency is ideal, but it only comes about because the moving assembly is a real heavyweight at 327 grams (11.5 oz). That goes hand in hand with an extremely strong motor despite the huge voice coil; here, more really does help more. Despite a suitable Q, the GZNW doesn't want to go into a sealed enclosure, as it would lack sound pressure down low. That output is generated by a generous volume of 66 liters (2.3 cu ft) for a 10-inch, which, just like the port, is designed for maximum sound pressure in the range around 40 Hz. There the woofer delivers a full 92 dB; with the flattest possible frequency response or in a sealed enclosure, it would be much less, perhaps around 85 dB. The tuning typical of Ground Zero then delivers the ultimate low-bass punch in the car. 40 Hz at full power means a vibrating vehicle and a crew gasping for air. Yet the GZNW keeps plenty of control: there's no soft, bloated bass here, just real bass straight to the ears. The GZNW 25C may well be just about the loudest 10-inch ever to pass through our test lab. You can use it for SQ, too; it doesn't play quite as nicely dry and precise as a sealed 10-inch, but it doesn't mind refined music listening, and it sounds nice and punchy even at more civilized levels.



Huge three-inch voice coil with an XXL winding height



A great deal of effort went into making the aluminum basket as open and airflow-friendly as possible

Conclusion

Anyone who wants the best 10-inch for SPL and brute bass force should take a closer look at the GZNW 25C. It is superbly built and, with its carbon fiber cone, a real gem. Woofer engineering at its best!

Elmar Michels

Specifications	
Basket diameter	27,4 cm
Mounting diameter	23,8 cm
Mounting depth	21,6 cm
Magnet diameter	19,4 cm
Box width	0,0 cm
Box heigh	0,0 cm
Box depth	0,0 cm
Weight	14,1 kg
Nominal impedance	2 x 2 Ohm
DC resistance Rdc	3,88 Ohm
Coil inductivity Le	3,35 mH
Coil diameter	76 mm
Membrane surface	366 cm²
Resonance frequency fs	35 Hz
Mechanical Q-Factor Qms	6,94
Electrical Q-factor Qe	0,53
Overall Q-factor Qts	0,49
Equivalent volume Vas	11,8 l
Moved mass Mms	327 g
Rms	10,38 kg/s
Cms	0,06 mm/N
B x l	22,95 Tm
SPL 1 W, 1 m	89 dB
Recommended power	>1000 W
Test cabinet	BR 66 l
Reflex tunnel (d x l)	15 x 28 cm

Ground Zero GZNW 25C	
Price	500 Euro
Contact	Ground Zero, Germany
Internet	www.ground-zero-audio.com

Rating		
Sound	50 %	★★★★★
Low frequency extension	12,5 %	★★★★★
Sound pressure	12,5 %	★★★★★
Sound purity	12,5 %	★★★★☆
Dynamics	12,5 %	★★★★★
Lab	30 %	★★★★½
Frequency response	10 %	★★★★☆
Efficiency	10 %	★★★★★
Max. SPL	10 %	★★★★★
Build quality	20 %	★★★★★

Top Class

★★★★★

CAR&HiFi INTERNATIONAL Germany 3/26

Price/performance: very good

"A 10-inch subwoofer for the toughest demands."

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

X SERIES
DSP-AMPLIFIER



KLANGTIPP
Spitzenklasse
CAR&HiFi 4/2025

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

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

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



KLANGTIPP
Absolute Spitzenklasse
CAR&HiFi 3/2025

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

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

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

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