

# B&W 802 D3

B&W's latest 802 lays convincing claim to being the most thoroughly engineered loudspeaker ever made  
 Review & Lab: **Keith Howard, Paul Miller, John Bamford**

**F**ew audiophile product launches match the significance of the arrival of a new B&W 800 series. It doesn't happen with the monotonous regularity of new iPhone generations, it always involves intriguing technical developments, and the 800 series – regardless of whether you've liked the speakers or not – is one of the audio industry's rare institutions, in the most positive sense.

Not only does it represent B&W's best effort at making the ultimate loudspeaker for everyone who seeks anything from a standmount (the 805) to a large floorstander (the 800, via the 802, 803 and 804 in descending order of size), it has been with us, through various iterations, since the original 800 appeared as long ago as 1979 [the original 802 was reviewed in *HFN* Jun '83]. For many of you reading this, the 800 series will have been an aspirational product line for as long – or almost as long – as you've been an audiophile.

## A NEW SPECIES?

Launch of the five new D3 models (the range itself is still called 800 series Diamond) is not simultaneous. The £16,500 802 D3 reviewed here is caretaker top of the range until the new 800 D3 (£22,500) arrives next Spring. Beneath it, the 803 D3 (£12,500), 804 D3 (£6750) and 805 D3 (£4500) are all available now. B&W insists that the new range is not an evolution but a revolution, citing '868 changes' in its advertising, and in the sense that only a handful of components are carried over from the old range that is unquestionably true. But some will feel that *evolution* is nonetheless a more apt description, given that the new range builds so obviously on features of the old.

The pre-diamond tweeter 800 series that appeared in the late 1990s was the

first to benefit from elements originally seen in the snail-shaped Nautilus while offering them in a less visually challenging – and considerably cheaper – form. Key features were the horseshoe-shaped cabinet wrap, manufactured using expertise first developed in the making of bent plywood furniture; the use of horn absorbers ('Nautilus tubes') to dissipate rear radiation from the tweeter and midrange driver (in the latter case with the insertion of a spherical chamber immediately behind the drive unit to act as an acoustic low-pass filter and obviate cross-modes in the horn); and the development of a novel edge surround for the FST (Fixed Suspension Transducer) midrange driver. This replaces the traditional roll surround with a foamed polymer ring that seals the swaged edge of the cone to the driver chassis beneath.

'B&W's 800 series remains an aspirational product line'

All these elements feature in the new 800 series, albeit with elaborations, but there are two obvious changes even the casual observer will note. B&W has, for the first time since it began using woven Kevlar for midrange drivers in the mid-1970s, dropped the distinctive yellow aramid fibre in a new Continuum midrange driver [see boxout, opposite] and it has performed a *volte-face* with the wraps of the new 800, 802 and 803 cabinets.

Curved cabinet walls are desirable because sound diffracts around them better and they are stiffer in bending than flat equivalents, which potentially reduces 'cabinet talk' [in combination here with B&W's Matrix internal bracing – see boxout, p36]. But a curved front baffle is awkward to attach drivers to, so previously B&W arranged the wrap with its sides

**RIGHT: Shock horror! Kevlar has been abandoned and the cabinet wrap turned through 180°. But these are just the obvious visual changes in a complete redesign that sees almost every component replaced**



## CONTINUUM CONE

When Laurence Dickie designed the Nautilus in the early 1990s he opted for a four-way design as the minimum necessary to achieve piston-like operation of the drivers throughout the audible range without unacceptably narrowed directivity. When B&W incorporated the Nautilus concepts into its 800 Series, four-way operation was considered too complex and three-way operation preferred (for all but the two-way 805). This remains the case in the new models, so it falls to the midrange driver to provide controlled cone flexure, which reduces the effective radiating area towards the top of its passband (maintaining good directivity) without allowing breakup modes to colour the sound. The warp and weft of the old woven Kevlar cone helped achieve this by making the cone anisotropic – it was stiffer along the bias axis than the fibre axes, and the velocity of bending waves varied likewise, suppressing resonance. The new Continuum midrange driver may have ditched Kevlar but it still uses a woven, albeit unidentified, fibre to which is applied a damping layer comprising multiple polymers. It took eight years and some 70 prototypes to get the design right.



pointing forwards and put a flat front baffle between them. Beveling of the wrap edges helped reduce undesirable diffraction effects caused by secondary radiation from the baffle edges, but this was an area the development team chose to improve in the new range, hence the reversal of the wrap so that it's curved portion now points forward. The twin 200mm bass drivers are mounted on cylindrical extruded aluminium 'pods' which appear to poke through the wrap, although in fact they clamp the ends of the wrap to the Matrix bracing within. To counter reflection effects (not to enhance stiffness) the inner surfaces of the pods are ridged somewhat like a scallop.

## AEROSPACE BASS

Changes have been made to the bass drivers and tweeter as well as the midrange unit. The new Aerofoil bass unit (made in diameters from 165mm to 250mm) is so-called because the thickness of the cone varies across its radius, so as to distribute stiffness optimally. This is achieved using a moulded syntactic structural foam core to which woven carbon fibre composite skins are attached, made from prepregs (fabrics pre-impregnated with a catalysed dry resin) which are formed into shape and then cured.

The result is a much stiffer cone than achieved with the previous constant-thickness Rohacell core. An overhung voice coil provides linear excursion of  $\pm 10\text{mm}$ . At the opposite end of the frequency range,

the tweeter uses the same diamond dome as previously but the surround has been improved, as has the motor system to improve linearity.

Significant changes have also been made to the teardrop-shaped midrange head, compliantly decoupled from the bass cabinet below, and to the tweeter pod that, in turn, is compliantly isolated from the midrange enclosure. In the outgoing 800 models the midrange head was cast from Marlan, a mineral-loaded resin also used for surfaces in kitchens and bathrooms, and the tweeter pod was a multi-component structure within a thin-wall zinc casting. Finite element analysis showed that both were less than optimally stiff, each exhibiting structural resonances at about 4kHz (the crossover frequency to the tweeter), exacerbated by a resonance in the midrange driver chassis at about the same frequency.

The mechanical behaviour of the midrange chassis has been significantly improved by stiffening it to raise the first resonance to about 6kHz, a peak which is subsequently suppressed by B&W's addition of a tuned mass damper (TMD). Furthermore, Marlan has been replaced by aluminium for the new Turbine midrange head, which is diecast on the exterior surface and sandcast on the interior using a collapsible core. Five internal braces →





**LEFT & BELOW:** B&W's Matrix cabinet bracing – the 802's rigid skeleton – is now both thicker and more elegant in design, and incorporates a cast alloy frontspiece to which the new 200mm Aerofoil bass units are firmly attached

heavier than its 72kg predecessor at a hefty 94.5kg. Yet despite all this extra material and the impressive engineering resources devoted to the entire new 800 series' long development, the 802 D3 remains – in high-end terms – remarkable value for money.

Available finishes are piano gloss black, rosenut and white, the last replacing the previous cherry option. Perturbed that too many 800 series owners were leaving their speakers on their castors rather than spiking to them to the floor, B&W has also adapted the plinth design so that the spikes can now be deployed without tipping the cabinet, once it has been rolled into the desired position.

## EVERYTHING AND MORE

While our key reviewers each spent time with the 802 D3 in my listening room [see [www.hifinews.co.uk/news/article/meet-the-team;-paul-miller/9952](http://www.hifinews.co.uk/news/article/meet-the-team;-paul-miller/9952)] I was lucky enough to dip in and out and sample its compelling sound over many weeks. We all used the same system – Melco N1A music storage/player feeding Devialet Le 800 monoblocks via USB – representing as direct a path from media to speaker as is possible these days. John Bamford's impressions are revealed further on, but whether we auditioned the 802 D3 for weeks or hours, the exquisite quality of its music-making was inescapable.

add stiffness, with four internal TMDs suppressing the main remaining resonance so effectively that the head, B&W says, doesn't sound metallic at all when tapped. Even so, excitation by magnet reaction force is reduced by compliantly mounting the Continuum driver.

The new tweeter pod is machined from solid aluminium. So much stiffer is it as a result that internal decoupling of the tweeter and its Nautilus tube from the remainder of the pod assembly, as was previously used, is no longer necessary.

All this beefing up of the structure means that the 802 D3 is almost a third

This floorstander is everything the 802 Diamond was, and more – it reaches down deeper and sails higher, and possesses a bell-like clarity that's so clean and insightful its forebear sounds almost grubby in comparison. What you don't get, especially through the treble, is that artificial glint, that suggestion of brightness that's so easy to mistake for leading-edge detail but is usually some form of distortion.

In this respect, the 802 D3 is in exalted company, for the far costlier Magico M-Project [*HFN* Jun '15] and the S7, heard by visitors to the Hi-Fi Show *Live* 2015, have obliged many a listener to re-evaluate their expectations in similar fashion. Like the 802 D3, they sound very smooth, almost 'dark' belying a frequency response that extends to 40kHz.

The complex percussion that illuminates Massive Attack's 'Unfinished Symphony' [*Blue Lines* 44.1kHz/16-bit CD rip] positively sparkled through the 802 D3s, every trembling nuance of those percussive, vocal and orchestral samples revealed in astonishing detail. I played the album again



## A NEW MATRIX

Matrix is the name that B&W gives to its system of interlocking internal cabinet braces, and this has changed too in the new 800 Series. In all but the baby 805 D3 the Matrix material is no longer MDF but plywood, and the 'shelves' have been reduced in number but are thicker, all in response to comprehensive finite element analysis (FEA) which identified previous sites of resonance. Metal components have also been added, most notably in the form of sections cut from a custom curved aluminium extrusion which locate behind the front of the wrap and to which the short cylindrical pods which carry the bass drivers are bolted. Another short metal section immediately behind the magnet assembly of each bass unit provides bracing of the driver chassis.

FEA was applied also to the plinths which in the top three 800 Series models provide a gap for the downwards-firing reflex port to exhaust. To reduce flexure the plinths have been significantly stiffened by reducing their size, removing the crossover, and casting them from a zinc-aluminium alloy (aluminium alloy in the forthcoming 800). The crossover network is relocated to the thin, flat vertical panel at the rear of the cabinet that links the two sides of the wrap, where it is isolated from the main internal volume and benefits from the heatsinking provided by a finned aluminium extrusion that also further braces the cabinet. The latter also contributes to the 802 D3's increased 95kg weight.



**ABOVE:** New Aerofoil bass drivers [left] feature a moulded syntactic foam core to achieve optimum cone stiffness, while [right] Marlan is replaced by cast aluminium in the Turbine midrange head

and again, revelling in the swirl of this electronic composition that picked me up and swept me along but never drowned me in confused or cloudy detail.

Frankly, regardless of where my mouse clicked on the music server screen in front of me, rock, jazz or classical selections were rendered with a combination of freshness, spontaneity, power and of subtlety, harmony and composure that I've not heard in any speaker below £30k, let alone £20k. The poignancy of Rebecca Pidgeon's voice as she sings 'Spanish Harlem' [*The Raven*, 176.4kHz/24-bit download] was astonishing, the purity of the 802 D3s' midband creating not so much a believable stereo image as a palpable presence in the room.

Here was another well-worn favourite discovered anew by the revelatory insights offered by the 802 D3. So too with 'Boisterous Bourrée' from Britten's *Simple Symphony* [192kHz/24-bit download], an elegant 2L recording seemingly reinvigorated by these speakers – the violins possessing tremendous zing and bite as the resin itself seemingly frothed from the strings while the double-bass section plumbed deep, developing a sense of mass and

*'Not just a stereo image – this was a palpable presence'*



**ABOVE:** Underneath the plinth, soft castors allow the speaker to be manoeuvred into position while adjustable spikes pin it into place

momentum that was no less disarming for its sheer realism.

I'd dearly like to write more, but space is limited and I'm rather preoccupied listening to these gems! If the 802 D3 is the loudspeaker that carries B&W's hopes and dreams aloft for another 15 years then the engineers at Steyning can rest easy. It'll take another generation for its competitors to catch up...

#### JOHN BAMFORD RELAXES

Hearing the speaker in editor PM's media room – where I've spent many hours listening to the out-going 802 Diamond, and countless hours enjoying music reproduced by the original 802 loudspeaker too – I was struck by the new model's slightly less forward and more 'relaxed' sound quality. No, it isn't soft and mellow – far from it – but it *is* a tad less matter-of-fact and clinically-clean-sounding through the upper midband and treble.

It's more inviting to listen to as a consequence, especially for prolonged auditioning sessions, and will likely score points over its predecessor among the audiophile community, thanks to its subjectively mellower tonality.

I was impressed, for example, by the way it handled the spitty and edgy high-frequency content of George Michael's 'Spinning The Wheel' from *Older* [Ægean/Virgin CDV2802], a track which has always proved problematic for any playback system. With Devialet's amplification keeping a solid and determined grip on the 802 D3s, I was able to wind the sound pressure level all the way up to 'eleven' and beyond to enable the track's deliciously indulgent bass line to massage my innards – something that's simply not possible if the recording's searing HF content is slicing the top of your head off! The speaker is rather kind in this respect: it's not so critical of less-than-audiophile recordings. ↻

## MARTIAL ROUSSEAU

We asked Dr Martial Rousseau, Head of Research at B&W's Steyning Research Establishment, what was the most difficult feature of engineering the new 800 Series. 'Development of the Continuum driver was probably the hardest aspect because finding the optimum combination of cone stiffness and damping, and achieving it in a repeatable way, was very challenging. We have simulation models that give almost the right answers but there is always a margin of error, and later in the development of the Continuum we were dealing with such low-level details we had to rely on experimental work, which is always very time-consuming.'

'It was also challenging to move away from Kevlar – for us that was a really big deal. Kevlar is a large part of our legacy so we had to be 100% sure this was the right thing to do. The first half of the project was convincing ourselves that the Continuum concept worked as intended, while the second half was ensuring that the driver could be manufactured consistently.'

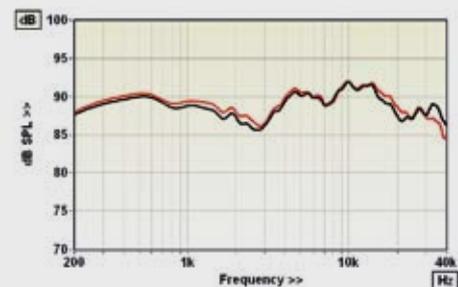
'The new 800 series is a revolution, too, in terms of our technical approach. We've tried to optimise the performance of every component in the system and I'm not sure anyone has gone that far before. The advance in computer aided design tools has made this possible but having the tools is one thing – you also need the knowledge to exploit them. You need to understand the physics, and you need to understand the materials.'



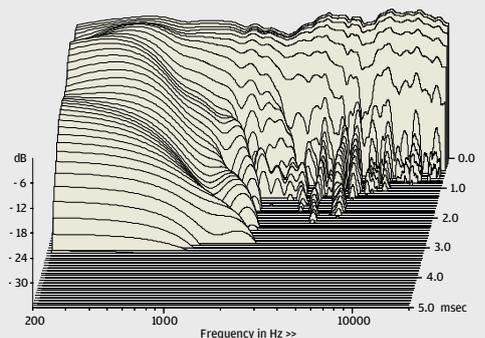
## B&W 802 D3

B&W claims 90dB sensitivity for the 802 D3 which accords well with our simple mean figure of 90.1dB but less well with that obtained using the IEC 60268-1 simulated programme spectrum (89.1dB). This suggests that the perceived sensitivity will be a little lower than B&W's spec. Impedance is quoted as 8ohm nominal, at odds with the specified minimum of 3.0ohm. We recorded precisely that minimum value at 118Hz, uncomfortably close to where the impedance phase angle reaches its highest absolute value of  $-73^\circ$  at 50Hz. Unsurprisingly, the EPDR (equivalent peak dissipation resistance) dips to its minimum between these frequencies, falling to a tough 1.1ohm at 71Hz. In combination with another dip to 1.4ohm at 890Hz this makes the new 802 an even sterner amplifier load than the 802D we measured in 2006.

Forward frequency responses, measured on the axis of the midrange driver (closest to typical seated ear height), show that any errors are modest at  $\pm 3.2$ dB and  $\pm 3.0$ dB, respectively (200Hz-20kHz). However the traces are not wholly flat in trend, a presence band dip centred on 2.8kHz being followed by a slightly raised treble [see Graph 1, below]. Pair matching over the same frequency range was good at  $\pm 0.8$ dB. Bass extension could not be measured accurately because of the impracticality of accessing the downward-firing port but the 20Hz port tuning frequency identified by nearfield measurement of the bass drivers suggests that B&W's specified 17Hz to 28kHz ( $\pm 3$ dB) is not wide of the mark. The CSD waterfall [Graph 2, below] illustrates the 802 D3's fast energy decay at treble frequencies albeit with some breakup modes above 4kHz. KH



ABOVE: Bass extension and pair matching are very good but the response has a mild presence band dip



ABOVE: Cabinet resonances are well controlled but mild bass/mid driver resonances are visible >4kHz

## HI-FI NEWS SPECIFICATIONS

<b>Sensitivity</b> (SPL/1m/2.83Vrms – Mean/IEC/Music)	90.1dB/89.5dB/89.1dB
<b>Impedance modulus min/max</b> (20Hz–20kHz)	3.0ohm @ 118Hz 35.5ohm @ 39Hz
<b>Impedance phase min/max</b> (20Hz–20kHz)	$-73^\circ$ @ 50Hz $52^\circ$ @ 1.3kHz
<b>Pair matching</b> (200Hz–20kHz)	$\pm 0.8$ dB
<b>LF/HF extension</b> ( $-6$ dB ref 200Hz/10kHz)	<30Hz / >40kHz/>40kHz
<b>THD 100Hz/1kHz/10kHz</b> (for 90dB SPL/1m)	0.5% / <0.1% / <0.1%
<b>Dimensions</b> (HWD)	1160x334x498mm



**LEFT:** The bi-wire/bi-amp terminals, and associated linking cables, are one of the few components retained from B&W's previous 802 loudspeaker. The rear heatsink is both functional and aesthetic

studio effects and treatments – again, without the production's shortcomings, its less-than-audiophile-sound-quality, being unduly exposed. The D3's silkier treble and less hectoring demeanour makes for an easier listen compared to the more 'objective' and cooler-sounding 802 Diamond.

### ALL-ENVELOPING

Choral works present a stern challenge for a hi-fi system, so I revisited the motet 'Pie Jesu' from John Rutter's *Requiem* [Naxos 8.557130]. The heavenly voice of Welsh soprano Elin Manahan Thomas was depicted divinely in the recording's broad and deep soundstage, while the textures and colours of the instruments were also delineated exquisitely, seemingly with acres of space separating each member of the ensemble.

As the intensity of the organ accompaniment began to swell, and the choir began to join in, a sense of a real musical occasion was delivered in a heavenly fashion. The tremendous clarity and pristine channel separation helped create a panoramic soundstage, the music becoming all-enveloping as the speakers served up the performers' inflections and emotions. For a majority of music lovers with 'regular' size listening rooms, the 802 D3 will be something of a dream loudspeaker. ☺

### HI-FI NEWS VERDICT

Bearing in mind that the 802 already accounts for the majority of worldwide 'high-end' loudspeaker sales, B&W's decision to embark upon a root and branch revamp was not one taken lightly or executed hurriedly. In the event, its meticulous re-engineering of this iconic floorstander has proved to be an outstanding success, redefining the sub-£30k benchmark. The king is dead. Long live the king...

Sound Quality: 90%



Playing 'Here Comes the Sun' from the album *Tides* [Afterglow AFTRCD1004] by Bristol-based dubstep producer Matt Preston (stage name Phaeleh) showed how the D3 nevertheless remained more than capable of dissecting all the elements of a composition, allowing the listener to observe fine detail with forensic precision. With nicely-balanced ambient electronica such as this, the D3 really sounded all of a piece, its potent and extended LF, subjectively warm(er) midband and less forward-sounding HF combining to a hugely satisfying whole.

That the speaker might still qualify as a worthy studio monitor for critical analysis was further reinforced when I played the title track from John Grant's 2013 album *Pale Green Ghosts* [Bella Union BELLACD377X]. The 802 D3's taut bass delivery proved immensely beneficial in allowing me to hear into this densely-packed production and observe the recording's myriad