
Bowers&Wilkins

PM1 overview The PM1 is a luxury, compact loudspeaker. It's the latest in a long line of Bowers & Wilkins audiophile mini monitors. It offers an extremely high-quality audio performance, and features several new Bowers & Wilkins technological innovations including a new tweeter design and a cabinet unlike anything previously constructed at Bowers & Wilkins. Its highly refined performance is a marked improvement over the former 805S.

Key technologies The PM1 luxury compact monitor features a number of key new innovations, as well as Bowers & Wilkins technologies developed for the 800 Series Diamond. These technologies include:

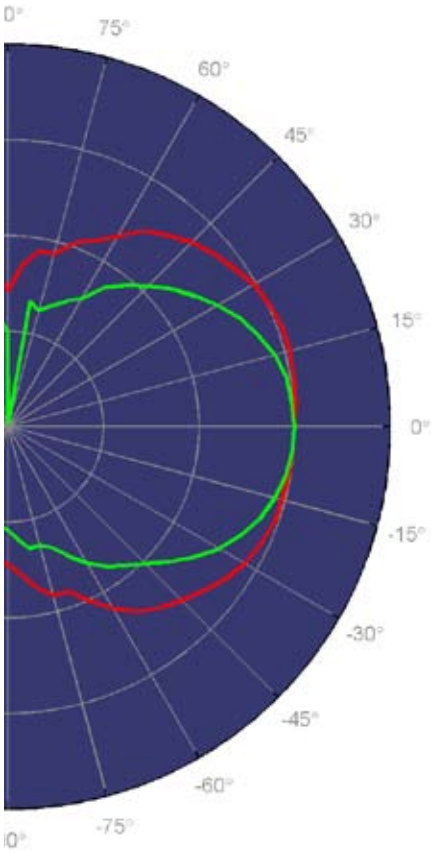
- Carbon Braced Tweeter
- Anti-Resonance Plug for bass/midrange
- Matrix reinforced cabinet
- Mineral Loaded Resin baffle
- Oxygen Free Copper Terminals
- Mundorf M-Cap Supreme Oil capacitors

Execution To achieve a higher sound quality than the 805S involved carefully engineering drive units, the enclosure, the crossover and terminals to achieve maximum synergy between all components. Some of the features are borrowed, or trickled down from the 800 Series Diamond and some are new to this model.

Carbon Braced Tweeter The PM1's tweeter looks very similar to that seen on the 805S: but it's very different. The new Carbon Braced Tweeter on the PM1 features an aluminium dome that has been strategically stiffened with a ring made of filament-wound Ultra High Modulus Pitch based carbon fibre.

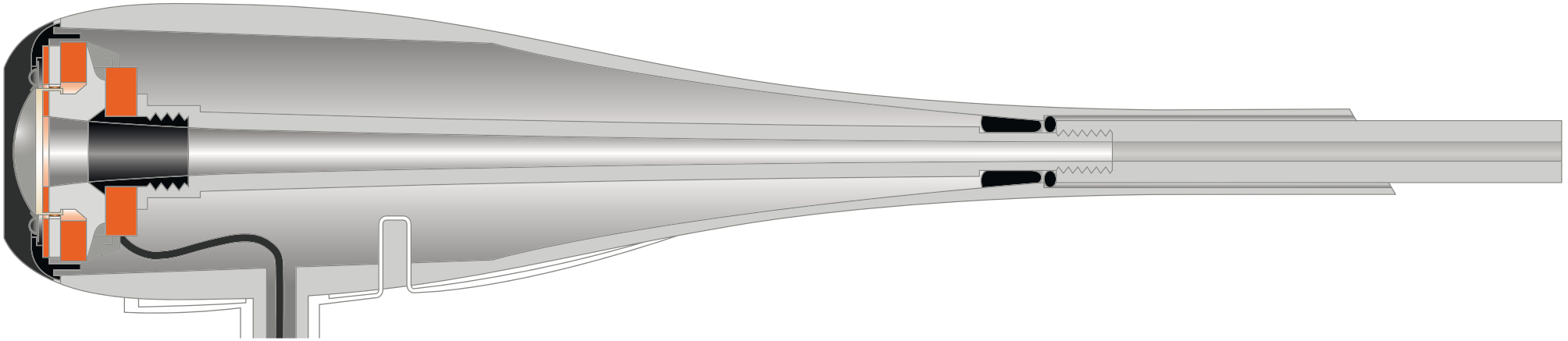
This construction pushes the breakup frequency of an aluminium dome up to 40kHz. This is above the limit of human hearing, but as with the 800 Series Diamond tweeters, it provides a marked improvement in audible frequencies below 20kHz, and results in the sweetest sounding non-Diamond tweeter we've yet developed.

805S and PM1 tweeter comparison

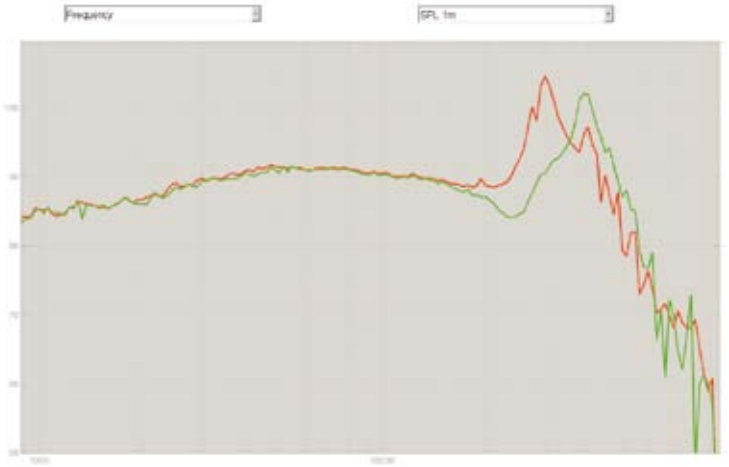


As with the 800 Series Diamond, this drive unit uses the new surround material that gives wider dispersion at higher frequencies than earlier units as shown in the 15kHz polar plot to the right where the 805S tweeter is in green and the PM1 tweeter in red.

Cross section of PM1 tweeter with magnets highlighted in orange



The wider dispersion of the tweeter affects the harmonic structure of instruments and voices and enables the listener to pinpoint the position of the performer with greater accuracy and stability. However, as with the more expensive Series' diamond dome drivers, this wider dispersion brings with it lower on-axis sensitivity. The total energy is the same, but it is re-distributed in space. To avoid the overall sound becoming dim, this loss of sensitivity has to be recovered and the answer once again lies in providing more magnetic energy in the narrow gap where the voice coil sits. However, as the overall system sensitivity is somewhat lower than the smallest model in the 800 Series, only one extra magnet is required and this is placed on the back of the magnet assembly back plate and magnetised with opposite polarity to the main magnet.



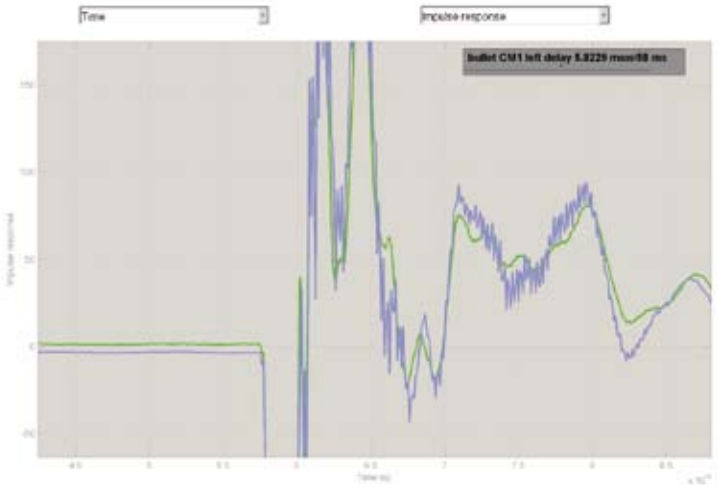
Although our diamond dome, with its 70kHz first break-up frequency, was outside the remit for this speaker, experience with the original Nautilus speaker had shown that a useful rise in the break-up frequency of an aluminium dome from 30kHz to 40kHz could be realised by using a carbon fibre ring to reinforce and stiffen the dome to voice coil former joint. The method employed on Nautilus to fit this ring is delicate, tricky and time consuming and so a sub-project to adapt the concept to mass manufacture was embarked upon. The success of the work is embodied in the new tweeter and a comparison of performance is shown in the graph to the left.

As with the diamond dome, the improvement in sound quality comes not from having a higher break-up frequency per se, but from the more coherent dome movement that results at audible frequencies below 20kHz.

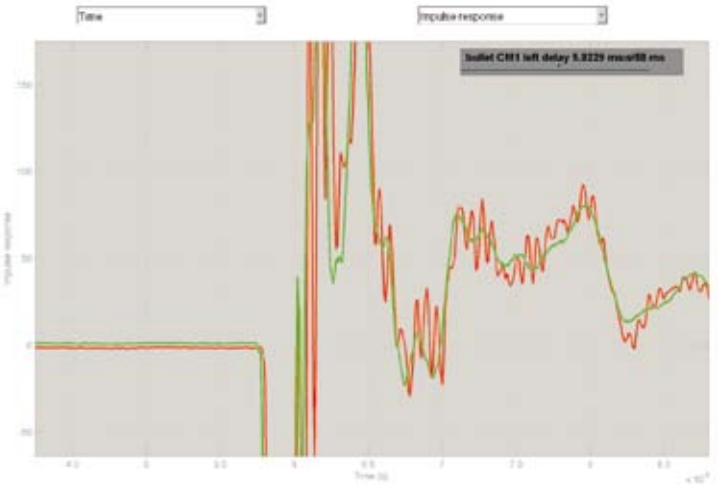
Red: 805S tweeter
Green: PM1 tweeter

Foam Damping Cap Our Kevlar® cone bass/midrange driver is renowned for its ability to deliver clarity and detail at mid frequencies. New, though, is the Anti-Resonance Plug in the centre. Unlike the majority of dust caps, this mushroom-shaped device is a tight fit inside the voice coil former. The stiffness and resistance properties of the foam are adjusted to damp down the tendency of the coil former to go out of round under the influence of cone break-up modes. Damp the motion of the former and you also reduce the cone break-up, with a commensurate reduction in sound overhang.

This is easily observed in the following impulse response traces



The reduction in cone break up is easily observed in these impulse response traces. Impulse response of a PM1 bass/midrange driver fitted with a fixed bullet (blue) and the new Anti-Resonance Plug (green). The rapid oscillations present only in the blue trace are caused by a resonance in the unrestrained cone that affects the roundness of the coil former and that is damped out by the dust plug.



This similar graph compares the driver with Anti-Resonance Plug as before in green. Here, though, the red trace shows the unit fitted with a conventional dust cap attached to the neck of the cone. The oscillations are still present.

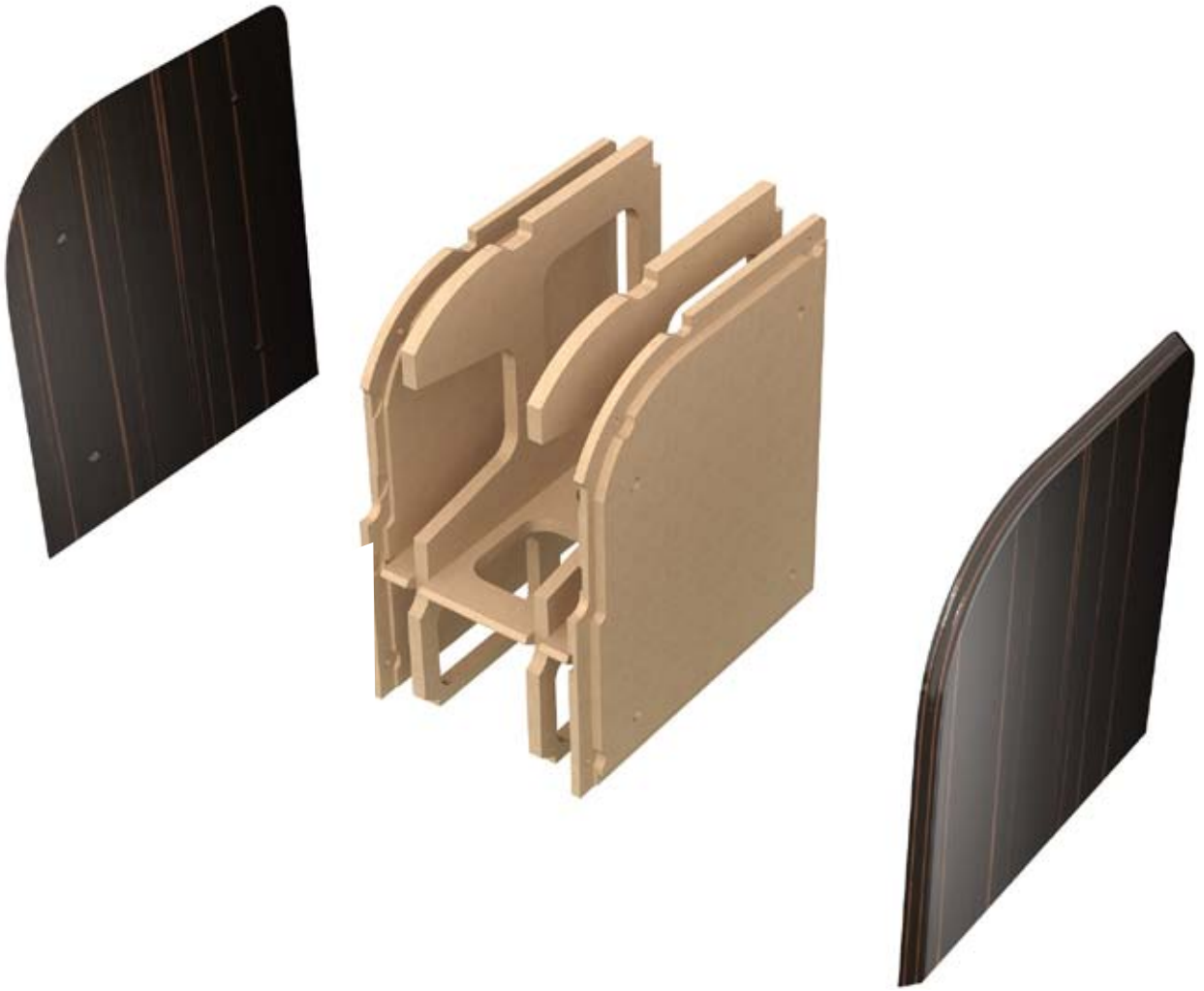
In years gone by, foam acquired a bad press from its tendency to crumble to dust with long term exposure to ultra-violet radiation from the sun. Needless to say, this modern polymer has been subjected to accelerated UV testing and no signs of deterioration were observed.

Mundorf M-Cap Supreme Oil capacitors The PM1's drive units are only as good as the signal fed to them and maintaining signal integrity as it passes from amplifier to drive units is as important as designing superior drivers.

In this respect, we have taken leaves out of the 800 Series Diamond design book by adopting oxygen-free copper (OFC) for the conducting path of the terminals and Mundorf M-Cap Supreme Oil capacitors in the minimalist crossover, both an upgrade from the outgoing 800S products. The addition of oil reduces the microphony of the capacitor – the tendency that all components have to convert small mechanical vibrations into low-level electrical signals that can reduce clarity.

Mundorf M-Cap Supreme Oil capacitor

Matrix Internally, the PM1 uses the Bowers & Wilkins Matrix bracing system, for improved rigidity. A system of interlocking panels take cabinet bracing to the ultimate level. The real-wood veneer side panels are more than simply a highly attractive finishing touch: they also increase the rigidity of what is already an incredibly solid loudspeaker.



The general construction is illustrated in this exploded diagram. Internally, a Matrix system of bracing can be clearly seen. The back, bottom and bracing panels are MDF, as are the inner skins of the sides. The outer, veneered ply side panels are attached afterwards, leading to extremely thick and strong side panels. The result is very low cabinet coloration in addition to improved imaging.

Mineral Loaded Resin baffle The PM1's curved front and top surface echoes the profile of the top of the 'head' unit used on the 800 Diamond and 802 Diamond, and to make this shape would be impractical in an all-wood construction. Our engineers investigated various moulded or cast materials to form the top and front baffle in one piece, eventually choosing a Mineral Loaded Resin baffle that is constructed from the same material as the Reference 800 head unit. The result is improved image localization, and an impressively inert construction.

Performance “The PM1 offers a compelling blend of new technologies and features that have been adopted from the flagship 800 Series Diamond. The result is a loudspeaker that is expansive, with incredibly coherent staging aided by the new Carbon Braced Tweeter. Coupled with unprecedented levels of scale and authority, the PM1 is a highly refined performer that offers a significant improvement over the 805S.” *The Steyning Research Establishment Team*

Specifications

Technical features	Nautilus™ tube loaded tweeter with carbon fibre reinforced aluminium dome Kevlar® brand fibre cone bass/midrange Flowport™	
Description	2-way vented-box system	
Drive units	1x ø25mm (1 in) reinforced aluminium dome high-frequency 1x ø130mm (5 in) woven Kevlar® cone bass/midrange	
Frequency range	-6dB at 42Hz and 60kHz	
Frequency response	48Hz - 22kHz ±3dB on reference axis	
Dispersion	Within 2dB of reference response Horizontal Vertical	 over 60º arc over 10º arc
Sensitivity	84dB spl (2.83V, 1m)	
Harmonic distortion	2nd and 3rd harmonics (90dB, 1m) <1% 110Hz - 22kHz	
Nominal impedance	8Ω (minimum 5.1Ω)	
Crossover frequency	4kHz	
Recommended amplifier power	30W–100W into 8Ω on unclipped programme	
Max. recommended cable impedance	0.1Ω	
Dimensions	Height Width Depth	331mm (13 in) 191mm (7.5 in) 250mm (9.8 in) cabinet only 293mm (11.5 in) including grilles and terminals
Net weight	9.3kg (20.5 lb)	
Finishes	Cabinet Grille Stand	Mocha Gloss Black Mocha Gloss
Price	Cabinet Stand	£1000/$1400/€1250 each £200/$275/€250 each