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Price: £15,000 (inc stands)

LOUDSPEAKER

Yamaha NS-5000

After 40 years, one of the world's most iconic speakers – the NS-1000 – has been re-imagined
Review: **Keith Howard, David Price Lab: K Howard**

Had the new NS-5000 been a quick dusting off of the legendary NS-1000 and its siblings, we might all have been left with the feeling that Yamaha was somewhat cynically cashing in on its illustrious loudspeaker history. But the NS-5000 is not an exercise in nostalgia, for all the nostalgic feelings that might well up in you – as they did me – when you clap eyes on it for the first time. Yes, the NS-5000 evokes the NS-1000 visually, particularly in its use of a midrange dome and mirror-image driver layout. But much more significantly the NS-5000 evokes the spirit of the NS-1000, in a thoroughly 21st century context.

Just as the NS-1000 excited us through its use of beryllium [see boxout, opposite], so the £15,000 NS-5000, with its matching SPS-5000 stands, introduces another unfamiliar diaphragm material and incorporates other novel technologies besides. The icing on the cake is that it also looks a million dollars: a broad-shouldered hunk in a world of skinny wimps.

Headline news about the NS-5000 is its use of a woven Zylon composite for all three of its diaphragms – a 300mm cone

bass unit, 80mm dome midrange and 30mm dome tweeter. This makes it, I think, the first audiophile domestic loudspeaker ever to use the same composite material for all its drivers.

ZYLON COMPOSITE
So why Zylon (a strong synthetic polymer)? Yamaha claims that it provides a 'high acoustic velocity comparable to that of beryllium', which is true for the raw fibre, but whether Yamaha's composite of Zylon vapour-coated with monel (nickel-copper) alloy achieves the same performance is another matter. The fact that the tweeter appears to have its first breakup mode at around 25kHz – no better than could be achieved using aluminium – suggests not, although it's notable that the resonance is unusually well damped, presumably because the Zylon/monel composite has high internal loss.

For many decades, certainly back to the 1980s, there have been those who claim that absorbent fillings in loudspeakers – typically fibrous tangles although both soft and rigid open-cell foams are other candidates – harm sound quality. Yet without them most box loudspeakers suffer unacceptable resonances within the enclosed air.

With the NS-5000, Yamaha's engineers have aligned themselves with those who consider absorbents undesirable. But internal air resonance is undesirable too, so Yamaha has developed two novel technologies to suppress it without (much) need of wadding. The first of these, which suppresses the internal height mode associated with the cabinet's



When you make some of the world's best amplifiers, you make certain they can be heard properly.

Yamaha Yes.

LEFT: Where it all began – the Yamaha NS-1000 loudspeakers with beryllium mid/treble domes, as seen in a colour ad from *HFN/RR* in 1976. The price per pair? £599.40 inc VAT at 12.5%

longest dimension, it confusingly calls its 'Acoustic Absorber' and, yes, it does contain fibrous absorbent – but much less than would otherwise be required to fill the internal void.

REDUCING RESONANCES
The Acoustic Absorber comprises two J-shaped, rectangular section tubes – looking a bit like guttering downpipes – attached to the inner face of each cabinet side wall, positioned such that the top opening is close to the inner face of the

cabinet top panel and the lower opening (on the upturn of the J) midway along the side panel. Resonance within the tubes acts to cancel the interior length mode, thereby preventing it expressing itself via pressure on the back face of the bass unit cone or on the cabinet walls. A section of the tube is visible in our cutaway shot [p39].

Radiation of this mode via the rear-firing reflex port should be suppressed too. Yes, the NS-5000, unlike the closed-box NS-1000, is reflex loaded, the port tube being unusually shaped – Yamaha calls it a

Twisted Flare Port – to encourage laminar flow at high air velocities.

Both the dome midrange unit and the dome tweeter are isolated from the interior air volume by sealed Resonance Suppression (RS) chambers that dissipate the rear radiation from the diaphragms via vents through the magnet pole pieces. Were these chambers simply tubular extensions of the vents, they would suffer resonances that would normally be damped using absorbent. To avoid this, the oddly-shaped RS chambers – which look

BIRTH OF A LEGEND

Launched in 1975, Yamaha's NS-1000 was arguably one of the most advanced loudspeakers of its time. Sporting treble and midrange domes made from the lightest, stiffest metal in the periodic table, it was decades ahead of conventional rivals. The 30mm JA-0513 beryllium dome tweeter weighed just 0.03g and was 0.03mm thick, compared to 0.1g/0.3mm for a typical soft dome tweeter of the day. The 88mm JA-0801 midrange unit was shaped identically to the tweeter for superior phase coherence. These went into a big (395x710x369mm) box with a 300mm paper-coned woofer. Transient speed was startling, as was its lack of distortion. At over £400 per pair it was expensive, but the superlative build justified it.

The NS-1000M appeared in 1978, with a slightly smaller (375x675x326mm) cabinet and uprated JA-3058A woofer. Its solid, infinite baffle design conferred superb bass grip and the NS-1000M was rapturously received around the world, its translucent character making it a hit with many recording and broadcast studios. UK sales were slower, its forensic sound having less appeal to traditionalists. Production ended in 1995, when pairs sold for £4000.

LEFT: The NS-5000's bass-reflex enclosure has a volume of 65 litres – the minimum Yamaha could employ to accommodate its 12in bass driver and 3-way configuration. Seen here on the lightweight but very rigid SPS-5000 stands

like strange pieces of plumbing – obviate resonance by means of side tubes which operate similarly to the Acoustic Absorber.

The main chamber is bottle-shaped, with a narrow neck and wider main section, to either side of which two tubes of different length provide alternative acoustic paths from the back of the driver. In the case of the tweeter the two tubes join the main chamber at either end, whereas in the midrange driver they both join at the far end. Yamaha says the RS chambers 'achieve higher-resolution audio reproduction by eliminating the need for a large quantity of sound-absorbing material inside the enclosure' which 'might degrade minute nuances of the sound.' Video simulations of both the Acoustic Absorber and Resonance Suppression chambers can be viewed via Yamaha's web site.

PIANO CABINETRY
All this effort to suppress internal air resonance would be futile if the NS-5000's cabinet were not itself free of major structural resonance. Yamaha has sought to ensure this by employing mitred-joint white birch plywood for the cabinet (29.5mm thick in the case of the front baffle) and designing the extensive internal bracing – which appears to be of fibreboard rather than plywood – with the help of finite element analysis. Even the high-gloss black lacquer finish, the same as used on Yamaha's grand pianos, is said to contribute to panel stiffness.

Melding the drivers is a crossover network that operates all three units ☞

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ABOVE: Finished in a luxurious piano black lacquer, the NS-5000's cabinet is fashioned from a laminated white birch plywood. Note 'RS' (Resonance Suppression) chambers behind mid/treble drivers and 'Acoustic Absorber'

with the same polarity and incorporates exotic components such as Mundorf MCap Supreme Evo capacitors, mounted on a double-sided PCB with 140micron-thick copper traces. Crossover frequencies are 750Hz and 4.5kHz, with only single-wire connection accommodated.

BACK TO THE FUTURE

If you're looking for a remanufactured NS-1000 or '1000M, don't buy an NS-5000, says David Price, *HFN's* long-term user and advocate of Yamaha's iconic loudspeaker. Although eerily similar in its aesthetics and an admirable piece of design, it doesn't sound like a clone of the beryllium-based 1970s classic. True, there's a distinctive Yamaha 'family sound' that it shares – dry, taut and detailed – but the new speaker is a better all-rounder.

To this day, the NS-1000M remains brilliant in some aspects (speed, incision, dynamics) but is a pig to drive and super-fussy about ancillaries. The new '5000 seems far more benevolent to the partnering source and amplification, and less prone to deconstructing the recording. Instead, it focuses more on enjoying the

music. So while unmistakably from the same gene pool as its illustrious ancestor, the NS-5000 is a great high-end loudspeaker in its own right.

Where the NS-1000M always sounded 'well lit' across the midband and treble, this new Yamaha takes a step back. It is obviously silkier in nature, and has a wonderful sense of seamlessness from bottom to top. Isaac Hayes' *Branded* [Virgin 7243 8 40335 2 1 CD] had a most satisfying 'all of a piece' feel. There's that same glorious sense of coherence that you get from single drive unit loudspeakers, but without the limited bandwidth of course.

Once you notice this aspect of the NS-5000, it becomes the cornerstone of the sound. Some types of music benefit more than others but classical is a real treat, as a recording of The Allegri String Quartet playing Beethoven's String Quartet No 4 in C minor, Op.18:4 [VIVAT103], showed. The opening *Allegro Ma Non Tanto* had a deliciously organic nature to it, with superb instrumental timbre. There's an inherently correct feel to this speaker's tonality that's hard not to love.

EASE WITH ELECTRONICA

Another highlight is soundstaging. This was never the NS-1000M's forte, truth be told, but the new Yamaha is far more at ease when asked to accurately reproduce a recorded acoustic. Other price rivals still do better here, but are invariably panels of some type. The NS-5000 does great for a box speaker, throwing out a sumptuously wide and well-ordered sound into PM's listening room on Kraftwerk's 'Computer Love' [*Computer World*, EMI EMC 3370].

'There's an architectural feel to the way it reproduces music'

This classic slice of early 80s electronica is highly immersive, and really thrived here. Just as with the old NS-1000M, turning the volume up simply expanded the musical picture, taking us deeper into the sound in a highly linear way. It has great solidity and stability whatever the listening level, and an 'architectural' feel to the way it reproduces music. Every strand of the recording is carefully put in its place, and meticulously interlinked with every other.

Indeed, the NS-5000 also shares its ancestor's ease at high sound levels. This was an admirable facet of the NS-1000M – for a non-PA speaker it goes very loud →

KOJI OKAZAKI

Koji Okazaki, Yamaha's Chief Engineer and 'Sound Tuner' for the NS-5000, says the company's iconic NS-1000M loudspeaker is still regarded as a reference design. 'As a manufacturer of both hi-fi equipment and musical instruments, the fact that the '1000M is still used today for monitoring in a number of recording studios is important.'

'We only discontinued the product because we could no longer use beryllium for environmental reasons. Now though, the new NS-5000 has become our flagship model and we have put as much technology, knowledge and experience into developing this loudspeaker as possible.'

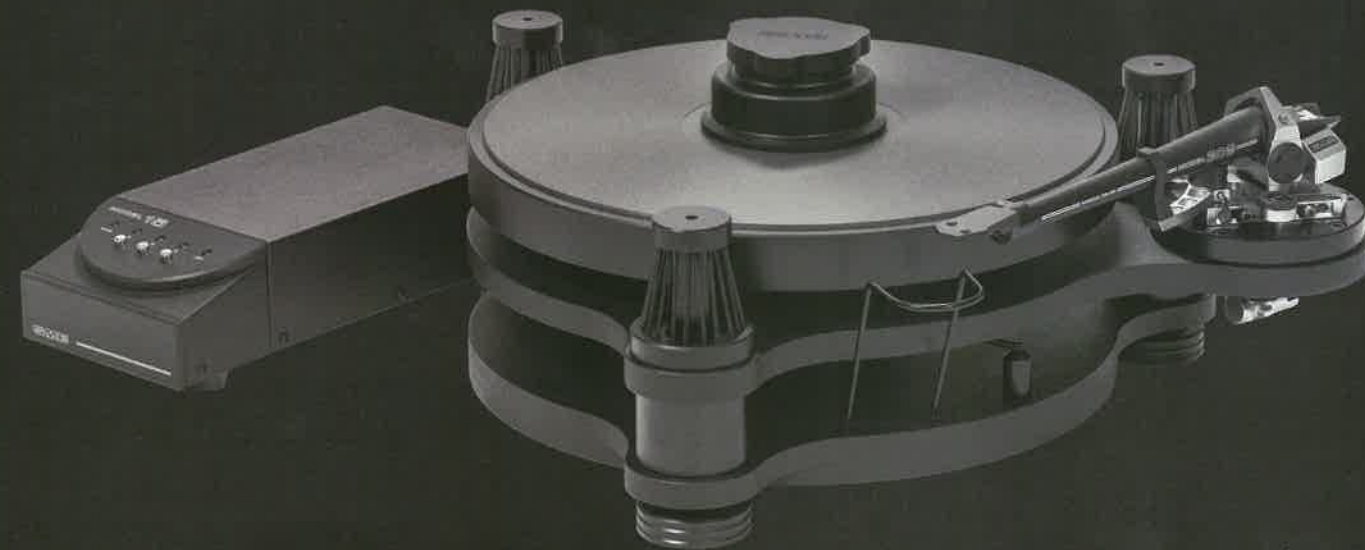
Its strong visual resemblance to the classic speaker isn't purely about retro styling, he says. 'We conceived it as a rectangular shape, because it makes the standing wave frequencies clearer. Our original technologies, like the Acoustic Absorber, control the waves in the cabinet without suppressing the original musical energy.'

The real innovation is Yamaha's use of the same material for all three drive units. Okazaki explains, 'We used the NS-1000M as a base for the NS-5000's development and replaced beryllium with Zylon when we discovered it has a similar acoustic velocity. During the design process we found the best driver configuration was a three-way bookshelf design using the same material across a single 300mm woofer, 80mm mid and 30mm tweeter. We duly followed the same design cues as the NS-1000/1000M.'



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LEFT: Rear view shows single set of 4mm speaker cable terminals with large 'Twisted Flare' port at the top of the cabinet. Two diameters of foam bung are offered by way of bass control

nature intended with its reflex port fully open promotes a more fluid, lyrical quality – as The Cure's 'Primary' [Faith, Fiction Records 827 687-2] confirmed. Deploy the bung and the bass improves slightly, but things don't get into the groove quite so well.

This reflex port makes the NS-5000 a more amplifier- and room-friendly loudspeaker than its ancestor, yet it

without blinking, refusing to compress dynamic peaks. The new Yamaha shares this unflappable nature, and is nigh-on impossible to provoke into losing the plot.

Thumping techno music from Nu Era's 'Changing Form' [Nouveau Synthetic Compositions; Omniverse OMNICDV 07] showed just how solid it can be, with crashing break beats and huge keyboard stabs ringing through the dense mix, regardless of the angle at which the volume control was pointing. It showed a delightfully natural composure at levels that would have practically any other domestic hi-fi loudspeaker out for the count.

BASS BUSINESS

The NS-5000's bass port may come as a surprise to NS-1000M fans, but Yamaha thoughtfully supplies a two-stage foam bung so you can choose whether to largely seal, partially seal, or not seal the cabinet at all. It's something that any new owner is going to have to experiment with. Sans bung and in PM's generously-sized room, this loudspeaker worked best around 80cm-1m from boundary walls, slightly toed in.

If your listening room requires you to push it closer in, then it makes sense to consider using the bung to reduce the bass output. The flip side is that – while low frequencies become usefully tighter – there's a slight sense of midband constraint. Using the speaker as

just doesn't quite have the riflebolt precision of the closed-box NS-1000M down below – there's the slightest sense you can hear the port working. So bass extension is very good for the size of cabinet, but it's perhaps not as muscular as some larger designs at this price.

While not as revolutionary as the original NS-1000M, there's no doubt the new Yamaha brings valuable things to the party. Its balanced, seamless portrayal is extremely rare, yet its powerful demeanour ensures high levels of sound are carried imperiously. Moreover, it sounds extremely detailed, but doesn't force things at the listener in the way of its ancestor. In short, Yamaha's new flagship is altogether better equipped for today's hi-fi world. ☺

HI-FI NEWS VERDICT

With its three-way design, wide baffle and similar dimensions, Yamaha's NS-5000 is evocative of the NS-1000/1000M but isn't simply a recreation of this classic. Rather, it's a technologically advanced speaker in its own right, with a wide spectrum of abilities backed by some extremely clever engineering. Sonically from the same mould as its ancestor, it's nevertheless a more balanced and versatile loudspeaker.

Sound Quality: 86%

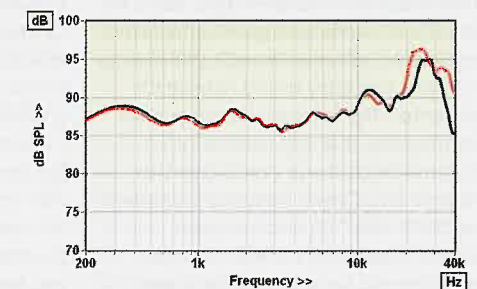


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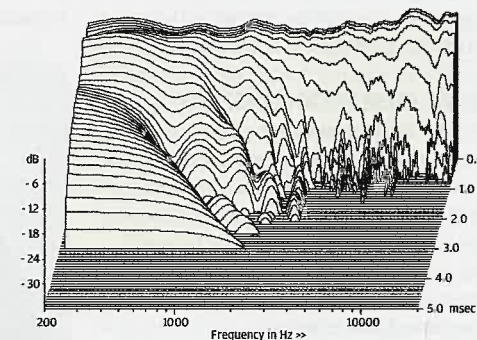
YAMAHA NS-5000

Unlike the legendary NS-1000 and its successors, the NS-5000 is not a closed box but reflex loaded in the bass. This will have given its designers the option to enhance sensitivity and/or bass extension, and it seems they opted for a bit of both. Specified sensitivity is 88dB, which corresponds well with our measured pink noise figure of 87.9dB. This could have been a little higher had Yamaha been prepared to let the NS-5000 present a more challenging load but it has preferred to make its impedance more amplifier-friendly than we often see. The nominal impedance of 6ohm is a bit high given our measured minimum modulus of 3.7ohm but the impedance phase angle is sufficiently well controlled that the minimum EPDR (equivalent peak dissipation resistance) is 2.3ohm at a relatively high 1.2kHz, or ~0.6ohm higher than many modern floorstanders.

Diffraction-corrected near-field measurement indicates a bass extension of 38Hz (-6dB re. 200Hz), about half an octave lower than many slender floorstanders achieve. This is without the optional foam bung in the port: with that in place the -6dB point rises to 49Hz – not a large transition but enough, with the concomitant change in transient response, to help tame boom if room acoustics are an issue. The forward frequency response [Graph 1], measured at 1m on the tweeter axis, is somewhat dished, with a broad tweeter peak between 20kHz and 30kHz. This worsens the frequency response errors, 300Hz-20kHz, to ±2.7dB and ±3.5dB but below 10kHz the limits are significantly tighter. So too the pair matching error, which reduces to an impressive ±0.5dB below 11kHz. The CSD waterfall [Graph 2] shows treble resonances to be very well controlled. KH



ABOVE: Response shows a mild 'dishing' through mid and presence but bass extension is impressive



ABOVE: Both cabinet and the (Zylon-coned) driver resonances are very well controlled indeed

HI-FI NEWS SPECIFICATIONS

Sensitivity (SPL/1m/2.83Vrms - Mean/IEC/Music)	88.9dB/87.9dB/87.4dB
Impedance modulus min/max (20Hz-20kHz)	3.7ohm @ 19.4kHz 23.1ohm @ 619Hz
Impedance phase min/max (20Hz-20kHz)	-57° @ 954Hz 34° @ 288Hz
Pair matching/Resp. Error (300Hz-20kHz)	±1.9dB/±2.7dB / ±3.5dB
LF/HF extension (-6dB ref 300Hz/10kHz)	38Hz / >40kHz/>40kHz
THD 100Hz/1kHz/10kHz (for 90dB SPL/1m)	0.3% / 0.1% / 0.1%
Dimensions (HxW - max envelope)	690x395x381mm