

DIGITAL AMPLIFIER

Integrated 'digital' amplifier. Rated at 400W/4ohm
Made by: SL Audio A/S, Denmark
Supplied by: Gecko Home Cinema, Berks, UK
Telephone: 0845 262 2882
Web: www.lyngdorf.com; www.geckohomecinema.com
Price: £4995 (HDMI and Analogue options +£495 each)

AUDIO
FILE

Lyngdorf TDAI-3400

The clunky designation is probably inevitable given this is much more than just an amp. But do room correction and voicing options add to its appeal, or complicate matters? Review: **Andrew Everard** Lab: **Paul Miller**

Amplifiers divide opinions. There's the valve/solid-state debate, the passive/active problem, the analogue/digital divide, and the direct signal path/flexibility tussle. And all of that's before we get anywhere near the 'two-channel or multichannel' thing, and the whole problem of high-end AV receivers and how they shape up against 'purist' designs.

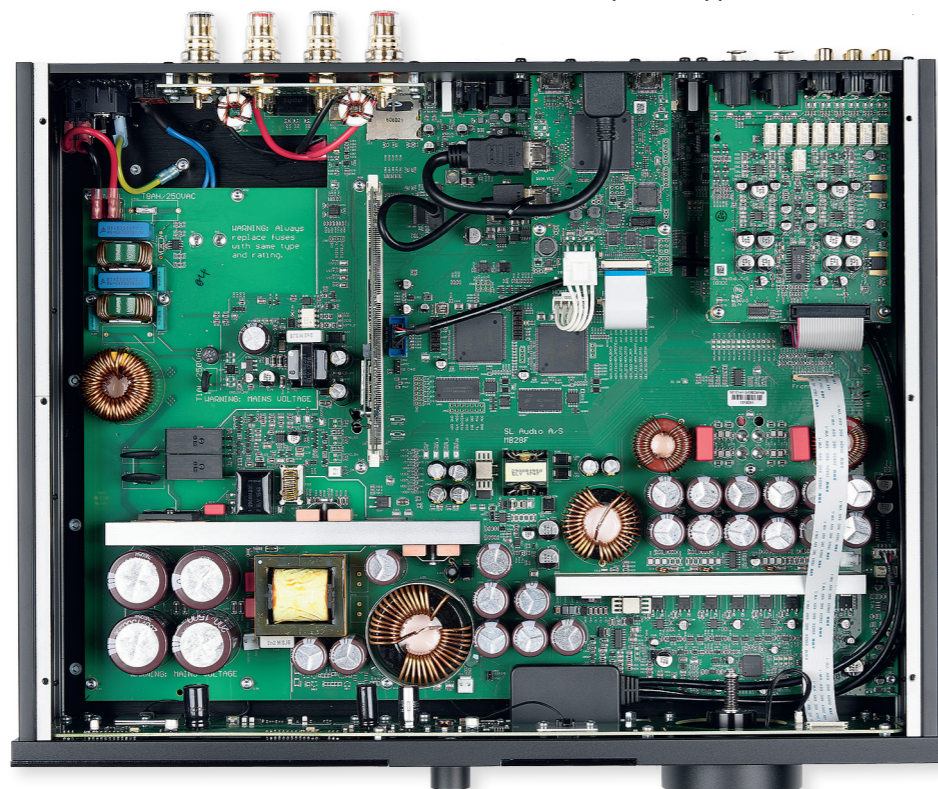
The £4995 TDAI-3400 from Denmark's Lyngdorf Audio is firmly in the 'not a simple piece of kit' camp, and is available in matt black with gloss detailing. It's described as an 'Integrated Amplifier and Audio Processor', and comes with not only a reasonably comprehensive complement of bells, but enough whistles to equip an entire restored steam railway.

CHOICES, CHOICES...

It's the most powerful product to appear from the company founded by Peter Lyngdorf, but that term isn't all about Watts and Amps, although the TDAI-3400 is rated at a full 400W/4ohm despite standing just 105mm tall and weighing a scant 8kg. No, the real power here is the processing grunt within, which allows the amp not only to carry out 'RoomPerfect' room correction using an included microphone, but also offers a digital crossover with a choice of three settings, the ability to optimise the amplifier to make the most of the speakers with which it's used, and no fewer than 32 DSP-based 'voicings', enabling the user to change the sound of the system to suit the music being played or the listening situation.

You can even set the amp up to integrate subwoofers, or use the analogue outputs to feed a separate set of speakers driven by their own amp, and with their own settings. We're a very long way from 'a straight wire with gain' here, people...

RIGHT: Our sample was fitted with the optional analogue board, featuring the 192kHz AKM AK5394 ADC [top right]. High-speed H-bridge PWM output stage and LC filter network [lower right] is fed from low-noise DC supply [left]



And that's only the start, for this is an amplifier with six digital inputs (three optical, two coaxial and one AES/EBU) plus an asynchronous USB Type B and two USB Type A ports, one on the fascia. The electrical digital inputs are good for files of up to 192kHz/24-bit, and the optical to 96kHz/24-bit, while the USBs can handle anything up to 384kHz/32-bit and DSD 128 [but see PM's Lab report, p49].

If that's still not enough, there's also an Ethernet port, through which you can play stored music using the DLNA/UPnP protocols, as well as accessing streamed content including Spotify Connect and Internet radio, and which also makes it compatible with Apple Airplay, and Roon Ready. Wi-Fi is included, as is Bluetooth, the latter usable either to receive content or to play it out – for example to a pair of headphones – and which also provides an alternative connection for the remote control, for use when not in 'line of sight'.

Two line analogue ins are also provided, along with RCA phono and balanced XLR outs as well as 4mm speaker terminals and a front panel headphone socket. And still we're not done: as extra-cost options you can add on a three-in/one-out HDMI module with 4K video pass-through (£495), and a 'High End Analogue Input' board, with three more sets of RCA line-ins and a pair of balanced XLRs, for another £495.

FIENDISH FLEXIBILITY

Take in the RS232 control socket and 12V triggering, plus a socket for the calibration microphone, and you're just about there with this fiendishly flexible amplifier – and yet the face it presents to the world is remarkably simple, having just a volume control and source selector plus a display that's resolutely unimimidating. It's an almost perfect combination, with so much going on below the surface and yet having a clean, crisp outer appearance.



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COMMENDED

Of course, all that capability means there must be some complexity somewhere, and it comes in the form of the browser interface used to set up the TDAI-3400, which is accessed using a computer on the same network. Don't get me wrong, for it's not that the browser interface is hard to use: far

from it. Rather there is so much to adjust and play with in the comprehensive menus of the amplifier – from input sensitivities and naming to variable delay and application of a passthrough mode and the disabling of unused inputs – that it's rather too easy to get it wrong. I know I did, several times.

The good news is that, once you do have it set up, the entire configuration can be saved for future reloading using an SD card in the slot to the rear, or a USB thumb drive in either the front or rear port – so if you do get 'lost' while experimenting, you

can get back to where you were, relatively easily. And of course, there's always the factory reset to start afresh.

RIFF CRUNCHING

That done, I listened to the amplifier without applying any of the corrective

wizardry, and noted several aspects to its sound. First, that it has serious clout, with that kind of effortless power well-disposed to bringing out both the weight of a recording and the smallest dynamic swings, ensuring it both musters a shedload of detail and plays music with admirable clarity and rhythmic acuity.

Playing Bo Bop Deluxe's 'Life In The Air Age' [Live! In The Air Age; Harvest CDP 7 94732 2], recorded in 1977 when the band was at its peak and only a year away from being dissolved, the amplifier not only crunched out the riffs but also the

ABOVE: Like a scale model of the original TacT volume control [see boxout, below], the weighty dial on this Lyngdorf amp governs the DC voltage of the internal PSU, and thus the final output level of the Class D power stage

tight rhythm work of drummer Simon Fox and uber-bassist Charlie Tumahai, with his attacking style especially in evidence.

Notable, though hardly surprising, is that the sound of the TDAI-3400 is more convincing when fed digitally, either from the output on my Naim NDS or directly using its Roon streaming capability, than it is when its analogue inputs are used. Perhaps it's the multiple levels of digital/analogue conversion that gives the sound a slightly glossed-over feel that's absent from the direct digital input – and this is even true when you are using the optional 'HD' audio input board.

CRISP AND CLEAN.

Yes, the HD board sounds slightly less hazed than the two 'standard fit' analogue ins, but both play second fiddle to the digital inputs, as is so often the case with amps of this type – including the NAD M32 [HFN Jul '18]. What's beyond a doubt is the ability of the onboard digital processing to clean up the sound and dial out the room to a great extent.

I've spent a lot of time playing with my set-up to get the best sound I can, so some system disruption was required to create problems for the amp to tackle. And tackle it was just what it did, compensating for my 'too close to the rear wall' speaker positioning which made the powerful bass and orchestral scale of the classic Jeff Wayne's *Musical Version Of The War Of The Worlds* concept album [Columbia CECD96000; DSD64] excessively bloomy and boomy, especially in the effects-heavy opening sequences.

After the slightly laborious process of taking measurements at various positions in the room – which takes a while but is no more onerous than the set-up with which legions of AV receiver fans will be familiar

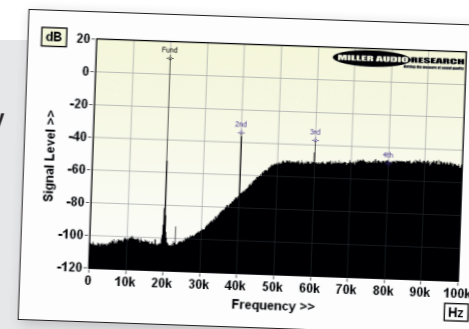
I rearranged my system to create problems for the amp to tackle'

REMEMBERING THE MILLENNIUM

Peter Lyngdorf, the man behind the brand, has backed this pure digital Class D amplifier technology for over 20 years. I first wrote about it in our sister magazine, *Hi-Fi Choice*, in 1995 and published the exclusive review (complete with in-depth measurements) of the launch product – the TacT Millennium amplifier – in the May 1998 issue. The Millennium was the brainchild of engineer Lars Risbo who was the first to crack the conundrum of stable 4th/5th-order noise-shaping modulators for digital audio (<http://dblp.uni-trier.de/db/conf/iscas/iscas1994-5.html>).

The core Class D technology within the TDAI-3400 reviewed here can be traced directly back to the Millennium. It's a rare instance of a true 'digital' Class D amp where the high-speed FET output stage switches at a rate that's synchronous with the incoming digital data. This data is truncated down from 16- or 24-bits to 8-bits (yielding a maximum 256 possible discrete pulse 'widths') and the resulting requantisation noise (the digital 'error') shifted out beyond the audio range so that an adequate dynamic range is realised from 20Hz-20kHz. The extent of this ultrasonic noise is illustrated by the graph of a 20kHz signal at 1W/8ohm [inset] and explains why the blue trace [Graph 2, Lab Report p49] is so much higher than we'd see from a conventional DAC.

Subsequently, many of Lars Risbo's patents have been acquired by Texas Instruments for use in its own range of innovative Class D chips. Lars, meanwhile, more recently started the research company Purifi with Bruno Putzeys, designer of the Kii Audio DSP/Class D-driven loudspeakers [p40]. PM



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ABOVE: The configuration of the TDAI-3400's rear panel depends on the modules fitted: an 'HD Audio' card is included here with three RCA and one balanced input alongside a three-in/one-out HDMI card. Standard inputs include two RCA (with RCA and XLR pre outs) and digital on USB-A and B, AES/EBU, two coax and three optical

– the processed sound was tighter, faster and cleaner, with no shortage of bass extension but much improved definition, along with a more layered, three-dimensional soundstage. I was sufficiently impressed even to try a play of Jeff Wayne's significantly 'thumpier' *ULLAdubULLA* remix album [Columbia 496390 2], and still the TDAI-3400 kept things crisp and clean, even at room-shaking levels.

OPENING UP THE MIX

And then there are the various voicing settings – it's with these I'd worry that a bit too much of the 'fiddle factor' could set in, as users experiment with different balances for various recordings. View this as a glorified tone control, however, and use this adjustment with restraint, and it can open up dense, thick mixes such as early period Queen – try 'Ogre Battle' from *Queen II* [Island UICY-15012; DD64] – or virtually any modern low dynamic range 'mixed for MP3' release, and the amp's 'Open' or 'Open Air' filtering can improve clarity.

Meanwhile overbright recordings can also be tamed a bit and some semblance of low-end restored with the use of the 'Relaxed' filter. It's also possible to customise the stock voicings, and even create your own if

LEFT: IR control enables source and menu selection, volume/bass/treble control and access to RoomPerfect filters



you have the time and/or inclination – not to mention applying different filters to each of the inputs.

Yet I found I kept coming back to the TDAI-3400's 'Music' setting, which gives a relatively flat response, and was well suited to all but the most challenging recordings in my collection. In this mode it gave a wonderfully clear view of Lake Street Dive's latest set, *Free Yourself Up* [Nonesuch 7559-79306-0; 96kHz/24-bit], where the soulful swagger of 'Doesn't Even Matter Now' is delivered with just the right combination of metronomic drive, closely-observed detail and perfect harmonies behind Rachael Price's powerful voice, until it finally skitters to a halt and gives way to the patter-like vocals of 'You Are Free'.

This combination of detail and drive is much in evidence with just about everything played through the TDAI-3400, right the way through the radiant *Mozart In London* set by Classical Opera And The Mozartists [Signum SIGCD534], where the tight rhythms and the intricacies of the scoring are beautifully laid bare for inspection by the amplifier's clarity and deft power. ☺

HI-FI NEWS VERDICT

When it's good – through its digital inputs – the TDAI-3400 is very good indeed, even if its analogue ins are a bit lacklustre by comparison. And provided you can set up this remarkably capable amp and then leave well alone, there's a lot of musicality inside that almost nondescript box. If you're an inveterate fiddler, however, you may find yourself spending a lot of time tweaking, and less time listening!

Sound Quality: 84%

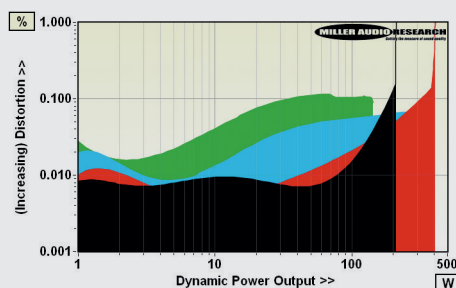
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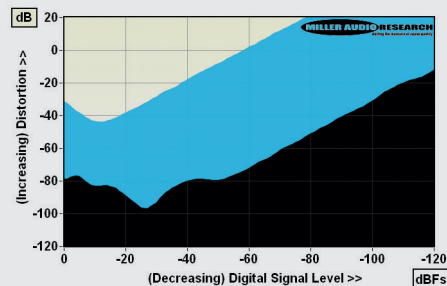
LYNGDORF TDAI-3400

Tested via its balanced analogue module, and like the NAD M32 [HFN July '18], power output is linked to volume setting because the input AKM AK5394A ADC (sampling at 96kHz) clips *before* the output. Here, with the volume at –6.0dB the maximum power output is just 2x75W/8ohm, while at (and above) 0.0dB it is 2x210W/8ohm. Distortion is far better managed in the TDAI-3400 than the M32, however. At a volume setting of –6.0dB distortion is 0.0044% (much lower than Lyngdorf's specification) and falls to 0.0035% at a volume setting of 0.0dB, with 0.0029% at +6dB (all for the same 1kHz/1W/8ohm output). HF distortion and noise is much higher at 0.05%/10kHz, 0.35%/20kHz and 9%/40kHz thanks to the swell of ultrasonic requantisation noise [see boxout, p47], reflected here in the difference between black (1kHz) and blue (20kHz) traces in Graph 2.

Meanwhile, and in keeping with a true digital amp design, there is no dynamic headroom, so the TDAI-3400's transient output remains at 210W/410W into 8/4ohm and 383W/143W (protected) into 2/1ohm loads [see Graph 1, below]. All incoming data is up/downsampled to 96kHz and, perhaps as a result, jitter is lowest (though not especially low) at 945psec with 96kHz/24-bit files, increasing to a slightly disappointing 2140psec (±147Hz, ±294Hz, etc, sidebands) with 48kHz/24-bit data. Noise is determined by the ripple-rejection of the switchmode PSU – a very refined implementation – and so the TDAI-3400 offers a wide 98.4dB A-wtd S/N ratio via its digital inputs. The final LC filter brings a reactive component to the amp's output impedance so the amp/speaker response is load-dependent at +1.2dB/20kHz/8ohm and –0.25dB/20kHz/4ohm. PM



ABOVE: Dynamic power output versus distortion into 8ohm (black trace), 4ohm (red), 2ohm (blue) and 1ohm (green) speaker loads. Max. current is 13.8A



ABOVE: THD+N vs. digital level over a 120dB range at 1kHz (black) and 20kHz (blue). 0dBFS = 210W/8ohm

HI-FI NEWS SPECIFICATIONS

Continuous power (<1% THD, 8/4ohm)	210W / 410W
Dynamic power (<1% THD, 8/4/2/1ohm)	210W / 410W / 383W / 143W
Output impedance (20Hz–20kHz)	0.14–1.27ohm
Freq. resp. (20Hz–20kHz/45kHz)	–0.2 to +1.2dB / –1.2dB
Digital jitter (48kHz/96kHz, 0dBW)	2140psec / 945psec
A-wtd S/N ratio (re. 0dBW/0dBFS)	74.3dB (Analogue) / 98.4dB (Dig)
Dist. (20Hz–20kHz, 0dBW, An/Dig)	0.0065–0.5% / 0.0025–1.6%
Power consumption (idle/rated o/p)	36W / 260W (1W standby)
Dimensions (WHD) / Weight	450x105x360mm / 8kg