Photo-electric pick-up cartridge and equaliser
Made by: Digital Stream Corporation, Kanagawa, Japan
Supplied by: Soundfowndations Ltd, Berks
Telephone: 0118 9814238
Web: www.ds-audio-w.biz; www.soundfowndations.co.uk
Prices: £18,995/£42,200 (cartridge/PSU & equaliser)

AUDIO FILE

hi-fi news OUTSTANDING PRODUCT

DS Audio Grand Master EX

How to upgrade the 'ultimate' optical pick-up? By fitting the Grand Master with a single-piece diamond cantilever and stylus. We take the GM Extreme for a drive...
Review: **Ken Kessler** & **Paul Miller** Lab: **Paul Miller**

It's too easy to presume, just because only one change separates a new model from an earlier one, that assessing it will be a breeze. DS Audio's £18,995 Grand Master Extreme optical cartridge differs from its stablemate solely in its cantilever/stylus assembly. Aside from a different body colour for easier identification, I wrongly imagined that a side-by-side shoot-out with the earlier Grand Master [*HFN* Feb '21] would suffice, and that a couple of LPs' worth of listening would reveal all. Silly me.

Actually, 'assembly' is the wrong word because the whole point of the Grand Master Extreme – pun intended – is that the 'Micro-Ridge' stylus and diamond cantilever are formed as a single piece, manufactured by Orbray (formerly Namiki Seimitsu). This is a new trend in the high-end, with Audio-Technica and others offering similar alternatives to the traditional stylus-glued-in-place construction that has been the sole methodology for decades. Its goal is to minimise even further any spurious vibrations between the LP and the pick-up tracking it. If this seems like a rather picayune detail about which to concern one's design team, bear in mind that the activity in an LP's groove is at a truly microscopic level [see PM's boxout, below].

LEFT: The solid alloy packaging and wrap-around stylus guard ensure your precious purchase is safe *until* you mount it into an arm!

LIVING THE DREAM

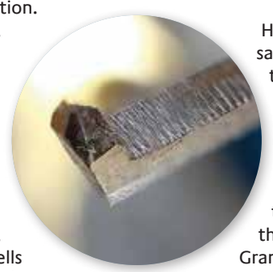
For those not familiar with DS Audio cartridges, they are the realisation of a dream first manifested in Toshiba, Kenwood and other optical cartridges of a half-century ago. The difference is that in the 2020s we have LEDs that free cartridge designers from the problems of heat and weight, thus enabling the creation of a true optical cartridge without the burden of a 'hot' lamp. Those original bulbs generated enough heat to warm the damping rubber of a cartridge, softening it over time and changing its compliance. While the makers of early optical cartridges tried various solutions, the technology was abandoned before suitably tiny LEDs were readily available, not least because digital was on the horizon. As DS Audio states, however, the optical principle is the same.

LIGHTING UP

How it departs from the dozen or so other types of cartridge – moving-magnet, moving-coil, moving-iron, moving-flux, *etc* (but not counting electret, strain gauge or other exceptions) – is in eliminating coils and magnets in their entirety. The two most widely-accepted types (MM and MC) generate electrical signals via manipulation of a magnetic field, a current being induced when a magnet or coil moves. By the same token, these designs are necessarily more susceptible to stray electrical noise – compared to optical transducers, they're a swarm of bumblebees.

Of course, an optical cartridge still has to trace the wiggles in the groove, but, in the words of DS Audio, 'it detects music signals by capturing shadow changes (brightness changes) using LEDs and photocells'. Here the cantilever is moving neither coils nor magnets but a 'light shading plate', a square of beryllium foil with a thickness of only 100 microns, in response to the stylus's motion.

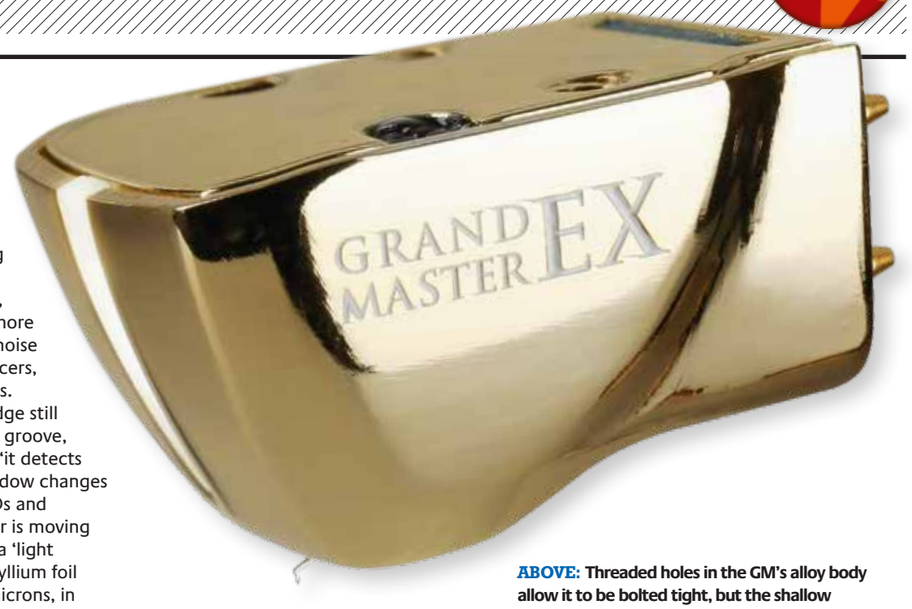
In DS Audio's cartridges, this foil plate vibrates in front of the infrared LED, modulating the light level that falls on the photocells behind and, thus, the voltage flowing across them. The company's top-flight pick-ups use separate LEDs, shading plates and photocells for the left and right channels, improving both output, S/N ratio and left/right stereo separation.



Because DS Audio's photo-electric conversion is sensitive only to the *amplitude* of the movement of the stylus, unlike velocity-sensitive MCs/MMs whose output increases with both groove excursion and frequency, the Grand Master EX requires only a relatively subtle HF boost to realise a 'flat' response with all RIAA pre-equalised LPs [see PM's Lab Report, p55]. So while DS Audio's various optical pick-ups can be mixed-and-matched with its range of PSU/eq boxes, none are compatible with traditional phono preamps (and vice-versa).

COUNTING THE COST

Now we arrive at what must represent the current state-of-the-art for optical cartridges. The Grand Master Extreme can be purchased in a package with the two-box Grand Master Equaliser for £55,075, a saving of around £5000, as the equaliser is sold separately for £42,200. The Grand Master cartridge remains in the catalogue at £12,550, and existing owners wanting to upgrade to the EX model can benefit from a 20% discount.



ABOVE: Threaded holes in the GM's alloy body allow it to be bolted tight, but the shallow profile requires care in adjusting the rear arm height. The EX model is distinguished by its gold body and one-piece diamond stylus/cantilever

LEFT: Micrograph reveals the laser-trimmed diamond cantilever with right-angled tip cut into a 'Micro-Ridge' profile

Here's where you can also save money, if it matters at this level. It has been my experience with six different DS Audio optical cartridges and four energisers that the latter, while offering audible differences, contribute less to the performance than do the cartridges. I even tried the Grand Master Extreme with the entry-level DS-E1 energiser [*HFN* May '19] at £1270 and you could still hear how it bettered the Grand Master.

AHEAD OF THE CURVE

This brings us to the only question this review begs: does the Grand Master Extreme improve on the Grand Master? So vivid were the gains, despite nearly identical measurements and my initial disbelief that something as seemingly minor as a single-piece stylus/cantilever could up the performance over a glued-in stylus, that I spent disproportionately more time assessing the Extreme than I had initially expected to allocate to a mere change in diamond fitting. Or the removal thereof.

> 'It adapted like a Lotus moving from road to track'

It required a varied mix of genres because it wasn't just a case of smoother behaviour, as PM pointed out upon revealing that the curves were nearly identical. The original Grand Master cartridge is already a 'smooth' operator and I found nothing in its behaviour that I thought might need taming, polishing or refining. Opening with Albert King's *Born Under A Bad Sign* [Craft/Stax CR00513], I was struck not so much by the timbre of the guitar and its fluidity, the veracity in the reproduction of his rich, deep voice, nor the absolutely mesmerising punch of the Memphis Horns. Instead, I was bowled over by even more taut bass – with no increase in aggression – and a soundstage so cavernous as to challenge my all-time reference, the Denon DL-103 [*HFN* Jul '09].

MASSIVE ATTACK

I should add here that, even with the Grand Master Extreme's supremacy exhibited at such an early stage in the sessions, part of me stayed grounded enough to acknowledge that its hyper-precision and the nakedness of the sound might not suit every listener nor every system. But can a cartridge be *too* revealing? Purists, transparency addicts and those who dream of master tapes might say 'No!', but I am reminded of Peter Lederman's guidance when advising his customers as to which SoundSmith strain-gauge cartridge [*HFN* May '21] will suit their system.

At a certain level, you need a system that can handle the information: attack bandwidth, dynamics, what-have-you. It is the reason why I have not abandoned ⇨

FULL DIAMOND

While both 'Grand Masters' share the same dual-mono LED/photocell, and decorative white LED at the front, it is their stiffer diamond cantilevers and reduced moving mass that most clearly benefit their performance over DS Audio's boron [*HFN* Dec '22] and alloy-cantilever [*HFN* Oct '21] models. Although these optical designs are free of coils and magnets the precise communication of information between groove and – in this instance – beryllium shading plates [just visible in the inset picture, right] faces the same challenges as a regular MM or MC.

Ideally the pick-up's cantilever/stylus would be both infinitely stiff and of vanishingly low mass. In practice this is unlikely, but at least the EX's one-piece diamond avoids the extra mass of adhesive, and potential compliance, of a joint between the cantilever and stylus. All cantilever/stylus combinations exhibit a series of bending and twisting modes that interfere, or at least modulate, the motion of the shading plate (or coils, or magnets) relative to the stylus in the groove. In-band resonances with lower-cost alloy cantilevers are even employed to strategically *boost* the top-end response of some MMs! But DS Audio is on a quest to achieve the opposite here and banish all unwanted movement to far higher frequencies. Our response plots, while following the same trend as the Grand Master, certainly look *smoother* [see Lab Report, p55].

The source of DS Audio's one-piece wonder is revealed in our review, but Audio-Technica has also recently unveiled a similar 0.22mm-square unified stylus/cantilever in its limited-edition AT-MC2022. While a natural diamond cannot be cleaved along faults into a 90° shape, A-T's solution involves a CVD (chemical vapour deposition) lab-grown 'diamond' that's trimmed into shape with a powerful laser. PM

SoundSmith's Hyperion, the various Koetsus and Londons/Deccas, which I use as the mood strikes. And because King's album is one I have owned for over a half-century and have played at least 200 times, I was stunned by the Grand Master Extreme's ability to extract even more from the grooves. As with the changes in the curves, the gains were minuscule but inescapable, the precise sorts of nuances which separate two vintages of the same wine (or even two bottles from the same case).

How much of this was due to what my tiny earth brain attributes to the Extreme's quietness, and thus its refusal to mask low-level information, I cannot say. But when I moved on to Son House's far leaner, utterly minimalist *Father Of The Folk Blues* [Analogue Productions/Columbia CS9217], which features only voice and guitar for the bulk of the album, I was able to focus on his metal slide's contact with the strings and the textures in his vocals, with no other distractions.

ABOVE: Machined, bead-blasted and anodised casework hosts the over-sized Grand Master PSU [bottom] and energiser/equaliser [top]. They are chunkier than many high-end power amps!

READY TO ROCK

If one's yardstick for system performance is the sensation of placing the artist in the space in front of the listener, the Extreme has very few peers. While I always seem to make reference to Denon MCs when this aspect of playback is discussed, a well-tuned Decca or Urushi-lacquered Koetsu [*HFN* Jun '13 & Nov '19] is also 'up there'. What the EX showed, even with this uncrowded session, was both width and depth, but that only meant the sense of air. For scale, I needed majesty.

Whitesnake's remastered *Slip Of The Tongue* [Rhino 0190295409784] is one of those joyous contradictions in which an eardrum-bursting band actually cares about sound quality. While my go-to heavy metal/hard rock artists are Mountain, Cream and Blue Cheer, this band's time with ⇢

LEFT: Gold-anodised plates inside the GM equaliser connect the six huge electrolytics feeding each side of the fully discrete, fully balanced filter and output stage [far right]

TETSUAKI AOYAGI

Allegiance to LP playback is something of a mission for that indefatigable champion of optical cartridges, DS Audio's President, Tetsuaki 'Aki' Aoyagi. 'I intend to pursue the reproduction of analogue records as can only be done with optical cartridges', he promises. Of course, this latest twist in the DS Audio saga – the Extreme's single-piece diamond stylus/cantilever – is an 'on trend' approach in high-end cartridge design [see boxout, p50].

'I have learned', says Aki, 'that the sound changes so much depending on whether the stylus is glued or a single-piece. I would also like to make the vibration system lighter to retrieve the stylus tip information more directly'. Research continues beyond the stylus/cantilever but some aspects of the cartridges' basic optical topology seem settled.

Regarding immunity from stray light, Aki says, 'The photodiodes are only sensitive to infra-red (850µm) rays, so interference from outside light is basically not a problem. Also, the cartridge's body shell prevents light from coming in from the side or top'. There is, however, in-depth research being conducted into the optimisation of the light path.

'We are now experimenting with alternative light sources and photo-detectors for possible future use. We will probably not change the wavelength, but there are various options, such as using a lens to focus the light to a more stable intensity. We are also looking at using photo-detectors that offer faster response times and lower [thermal and shot] noise.' Watch this space!

ABOVE: Rear view of the PSU [bottom] and equaliser [top]. The pick-up's internal LEDs are powered via the R– and L– pins while the output is returned via R+ and L+, all via the 'Input' RCAs. Three eq'd line outs, on RCAs and balanced XLRs, offer three bass roll-offs from two different – 30Hz and 50Hz – turnover freqs. [see Graph 1, opposite]

guitarist Steve Vai provides ample opportunity to assess the sheer mass of a recording. Vai's pyrotechnics are also ideal for gauging the attack of transients, while the vocals are out of the stadium filler's handbook.

EXTREME EPIPHANY

This album offers the kind of contrast that fastidious listeners and audio veterans relish: as far removed from Son House as possible, Whitesnake's massed instruments, with so much going on, enabled the Extreme to demonstrate its prowess with a different sort of challenge. I am not suggesting for a second that House's one instrument and voice is easier to reproduce than an onslaught from a big hair band, but the Extreme adapted to it as easily as a Lotus moves from road to track.

There's usually a moment of epiphany when one track tells you all you need to know. Even after going from electric blues to acoustic, followed by hard rock and with a number of genres inbetween, it was a 34-year-old country LP that made me fall in love with the Extreme: Dwight Yoakam's *Just Lookin' For A Hit* compilation [Reprise 7599-25989-1], an exemplar of a genre which was out of fashion when he arrived in the 1980s.

What it does for assessing hi-fi systems is deliver a ton of 'redneck bass'; that deep, snapping, funky lower register, underlining slightly nasal vocals, as if ol' DY was doing an impression of ol' Buck Owens. Now this music might seem more at home via an 8-track player in a pick-up truck but, *hot damn*, it made me forget all about the system and spoke directly to my inner cowpoke.

DS Audio's Grand Master Extreme is that kind of cartridge. It should come with a warning: you need to bring plenty of food and drink into your listening room because you will not want to leave.

ABOVE: The GM EX's pins are clearly marked and separated. Just visible are the shading plates, diamond cantilever and Micro-Ridge stylus [see also p51]

HI-FI NEWS VERDICT

Despite my adoration of Decca, Soundsmith and Koetsu pick-ups, *HFN* Feb '21 saw me write, 'The Grand Master is so truly supreme in resolution, transparency, spatial recreation, neutrality and any other parameter I can name that it's impossible for me to not say what I usually try to avoid: "This may be the best cartridge I've ever heard"'. This time, I cannot deny: the Grand Master Extreme is even better.

Sound Quality: 92%

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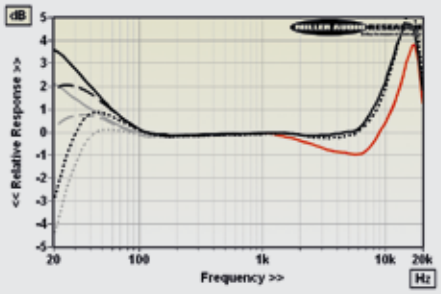
LAB REPORT

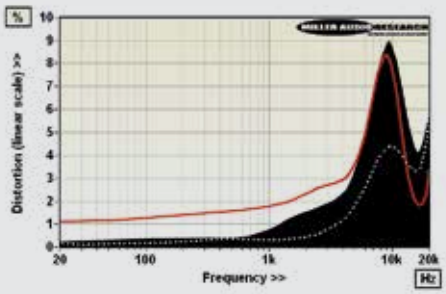
DS AUDIO GRAND MASTER EX

Bearing in mind that this 'Extreme' version of the Grand Master flagship [*HFN* Feb '21] is distinguished *only* by its one-piece diamond stylus/cantilever [see boxout, p50] then the measurable differences depend as much on the sample-to-sample production variation of the shared photo-electric mechanism. In practice the precise matching of its 22° VTA and 11/15cu compliance is remarkable in itself, the latter playing a significant role in determining the tracking prowess of these pick-ups. Both Grand Masters will hold onto the maximum +18dB test track (re. 0dB at 315Hz/5cm/sec) at a 2.0g downforce, albeit at ~1.5% THD.

Once again, the 2.05V output (re. 1kHz/5cm/sec) is a function of the GM equaliser as are the six 'bass contours', three rolling off from a notional 50Hz and three from a lower 30Hz. Output 1 [see pic, left] provides a +3.6dB/+1.9dB boost at 20Hz in 30Hz/50Hz settings [black/grey traces, Graph 1], while Output 3/50Hz (–4.4dB/20Hz) is arguably the 'safest' with big, reflex-loaded speakers. Channel balance, incidentally, was a far tighter 0.1dB with our sample of the EX. Otherwise the boosted and extended HF response of +5.5dB/20kHz [–8dB re. 5cm/sec; dashed HF trace Graph 1] marks out the GM and GM EX as the most advanced in DS Audio's stable, but note how the EX's response is visibly 'smoother' than the GM's. The extended bandwidth is also reflected in the 4-5% stereo THD peak being pushed out from ~7kHz to 9kHz here [see Graph 2, below] while the excellent lateral/vertical symmetry is clear from both the response and THD plots [solid black and red traces/infills]. **PM**



ABOVE: Freq. resp. (–8dB re. 5cm/sec) lateral (L+R, black) vs. vertical (L–R, red) vs. stereo (dashed). Bass only: Output 1/30Hz, solid; 2, dashed; 3, dotted; Output 1/50Hz, grey solid; 2, dotted; 3 dashed)



ABOVE: Lateral (L+R, black), vertical (L–R, red), stereo (dotted) tracing and generator distortion (2nd-4th harms) vs. freq. from 20Hz-20kHz (–8dB re. 5cm/sec)

HI-FI NEWS SPECIFICATIONS

Generator type/weight	Photo-optical / 7.7g
Recommended tracking force	20-22mN (21mN)
Sensitivity/balance (re. 5cm/sec)	2050mV / 0.1dB (from Eq unit)
Compliance (vertical/lateral)	11cu / 15cu
Vertical tracking angle	22 degrees
L/R Tracking ability	80µm / 65µm
L/R Distortion (–8dB, 20Hz-20kHz)	1.2-6.7% / 0.3-5.8%
L/R Frequency resp. (20Hz-20kHz)	+3.6 to –1.1dB / +3.6 to +2.1dB
Stereo separation (1kHz / 20kHz)	34dB / 25dB