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MONO POWER AMPLIFIER

Monoblock power amplifier. Rated at 1500W/8ohm
Made by: D'Agostino LLC, Connecticut, USA
Supplied by: Absolute Sounds Ltd
Telephone: 0208 971 3909
Web: www.dagostinoinc.com; www.absolutesounds.com
Price: £125,000 (each)

AUDIO FILE

hi-finews
OUTSTANDING
PRODUCT

D'Agostino Relentless

The culmination of one man's 'relentless' quest to develop his 'dream amplifier – an amplifier without any limits' is revealed in this special six-page, in-depth review...

Review: Paul Miller with Ken Kessler & Andrew Everard Lab: Paul Miller

It is not unusual for products featured in *Hi-Fi News* to rival a family car for cost. But a pair of monoblocks that weigh as much as a car and cost as much as a house? While that is surely breaking new territory for us all, the prospect of 'stretching the envelope' in power output, industrial design and sheer audio performance was clearly uppermost in CEO Dan D'Agostino's mind as he contemplated the next step on from his 400W/8ohm Momentum monoblocks [*HFN* Oct '16].

Enter the Relentless, a battleship to sink all other flagships, and a statement of intent rivalled only by Wilson's WAMM Master Chronosonic or Magico's Q7 MkII loudspeakers in the elusive quest to inch us that little bit closer to the 'real thing'. We saw the Relentless displayed at Munich's High End 2018, and 2019, but we only heard it for the first time in Europe at our Hi-Fi Show *Live* in Ascot last October. So this is the first – and possibly the only – full and independent technical test you will read of the hi-fi world's most luxurious, most powerful, heaviest and costliest amplifier... ever. Time to assemble the *HFN* crew!

BETTER BY THE TON

Pictures alone cannot convey the sheer scale of this amplifier, so here's the Relentless by numbers: each chassis is over a half metre in width (572x280x826mm, whd), weighs over a quarter ton (258kg) and is composed of interlocking slabs of precision-milled copper and aluminium alloy. The latter is a very costly 'aircraft-grade' alloy that guarantees the quality of the

RIGHT: The main 5kVA toroidal PSU transformer and bank of six [blue] 100V reservoir electrolytics dominate the interior, powering the input [far right] and output stages [top and bottom]. High current relays afford protection [silver, on floor of amp]

1µm-deep diamond cut finish, gloss black and silver (natural) anodising and hard, synthetic enamel coating. The price, if you need to ask, is an astonishing £125,000 per mono chassis, in either colour. As I say, best not to ask...

Power output is rated at 1.5kW/8ohm, with a theoretically 'perfect' doubling to 3kW/4ohm and 6kW/2ohm [see Lab Report, p41]. This is at least partially reflected in the 0-1.6kW scale embedded into the eye-catching meter that glares from its fascia. By now a hallmark of the D'Agostino brand, the design resembles watch dials from the 19th century, while the needle is a facsimile of the hour hand created by Abraham Louis Breguet – the greatest watchmaker of all time.

In use you'll regularly see that needle flicking up beyond 300W, but this is 'fake news' – the meters are made to move

all the time so that 'users are confident something is going on', admitted Dan, 'fun to look at, but please don't take the numbers too seriously'.

DECORATIVE BY DESIGN

Why? Simply put, the early Momentum amplifiers had accurate meters and, with typical real-world outputs being just a

few watts for much of the time, the needles were barely moving. I think D'Agostino just got fed up with customers complaining that their amplifiers were faulty! I tested the meter calibration here and

'It is over half a metre wide and weighs a quarter of a ton'

can report that with just 1W/8ohm at the output the scale reads 400W, while 20W/8ohm is indicated as a full 1kW. During the real power tests [see p41], those needles were slammed into their end stops and all but bending under the strain.



Under the bonnet, D'Agostino has specified a suitably robust power supply, with a fully-screened 5kVA toroidal mains transformer that weighs some 35kg in its own right. The 'standby' and control circuitry transformer, adjacent, looks small but is still bigger than those fitted to some modest integrated amplifiers!

This custom PSU is supported by a bank of six huge 100,000µF electrolytics that are clamped firmly into place by a Delrin 'Coke can holder' designed to mitigate any potential microphony [see Investigation, *HFN* Jul '18]. The transformer has a split secondary winding that feeds two sets of rectifiers – these are not destined for each half of the amplifier but are combined to feed both sides of the amplifier in tandem. This is a mono chassis, but the amplifier is a story of two perfectly balanced sides.

In order to achieve a very high power, typically beyond about 500W/8ohm, most high-end amplifiers employ a bridged output, doubling the available voltage by combining two amplifiers, one out of phase with the other. The Relentless is a true balanced design that uses a single differential input amplifier, a current mirror circuit, to derive the mirrored (plus and minus) audio rails.

TRANSISTOR FARM

Even-order distortions are suppressed, if not entirely cancelled by this technique, which is just one reason why D'Agostino has reduced the overall feedback, or compensation, employed in the design [see boxout, below]. Also key is the 'super rail'

ABOVE: Unmistakably 'D'Agostino', albeit on a very grand scale, the black livery is offered as an alternative to silver. Illumination for the 200mm diameter display is dimmable/defeatable but the meter calibration is deliberately inaccurate!

PSU that offers a headroom of some 20% for this input stage. The following current gain stage runs on the same rails as the output stage, the latter employing purely complementary drivers and output devices, all from ON Semiconductor.

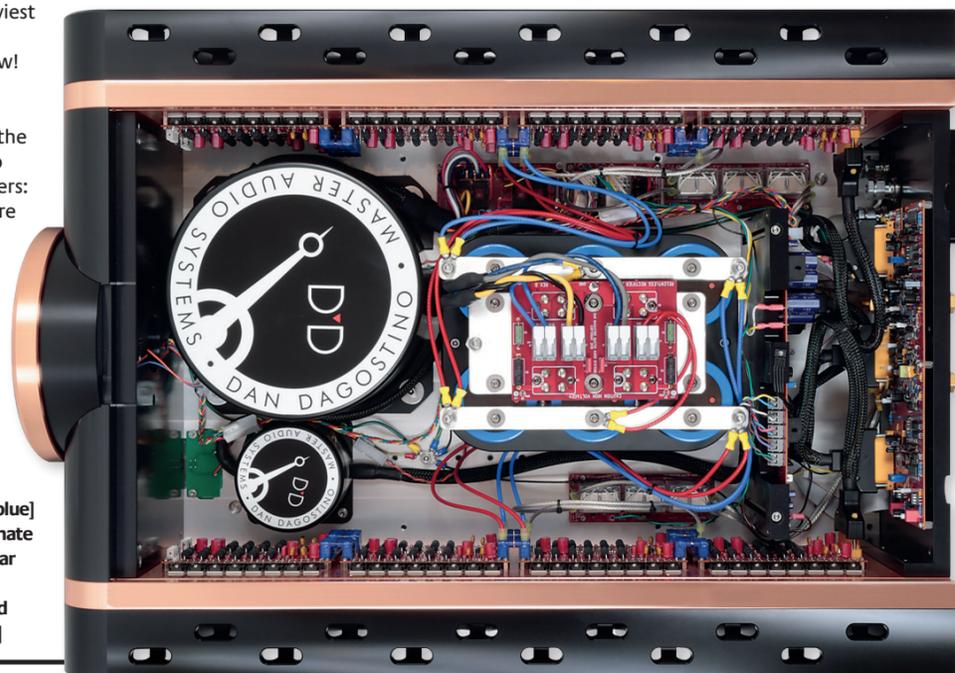
This output stage is a huge 'transistor farm' staged over eight separate parallel amplifier modules – it is simply impractical to fabricate a single PCB to host this many devices. Each module [see picture, p38] has eight complementary pairs of bipolar power transistors, adding up to 128 devices per mono chassis.

Moreover, every power transistor is hand-matched to create the ideal complementary pair and each pair grouped to ensure optimum symmetry. So, with as many drivers as output devices, the Relentless functions as 32 smaller, fast power amps in parallel per balanced side.

There's no Zobel or other stabilising network on the output as the Relentless is specified as unconditionally stable into any likely load.

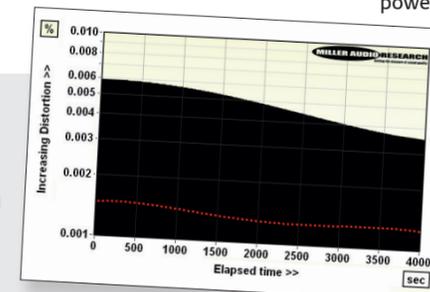
TURNING UP THE HEAT

Unsurprisingly, this many richly-biased devices generates a good deal of heat that requires dissipation. The amplifier modules are bolted to two 23kg copper slabs that are clamped to its custom external heatsinking – a variation on the passive Venturi cooling system first seen on the



ARE YOU WARM YET?

With 1000s of watts on tap, and a fully floating output that cannot be permitted to see a sniff of ground, the Relentless presents some special challenges for anyone intending to work up a full lab test. This is not a task for the inexperienced! But there are more subtle factors that need to be considered, in particular the impact of D'Agostino's low feedback scheme on performance as this mass of copper and aluminium very slowly heats up. When first taken out of standby, a 'cold' Relentless incurs some 0.006% distortion (1kHz/10W/8ohm) but over the first hour or so this reduces to 0.0035% [black trace, inset Graph] as the heatsinks gradually adapt to the 512W of idle power consumption. Just leaving a pair of these amps powered-up draws as much from the wall as a one-bar electric heater, the chassis typically rising to 25°C over ambient (so about 45°C in a 20°C living space). After 24hrs the Relentless's thermal latency is almost entirely resolved, the linearity of its output stage maintained by sheer mass at a low 0.0015% distortion [red dotted trace, inset Graph]. For more exclusive performance figures, see Lab Report, p41.



MONO POWER AMPLIFIER

THE HD PREAMP

The perfect partner for D'Agostino's flagship monoblocks? The Momentum HD Preamp, seen here in silver/copper livery, is certainly an aesthetic match for the Relentless but it was designed primarily to service the Momentum M400 [HFN Oct '16] and S250 power amplifiers. We learned during our interview with designer/CEO Dan D'Agostino [see opposite page] that the HD Preamp already benefits from a lot of the thinking that has informed the soon-to-be-released Relentless Preamplifier, including the use of a fully discrete differential FET input stage, comprehensive PSU filtering and isolation, plus over-voltage rails (+36%) for the output stage. Convenience features are enhanced too, including the remote control which is now a Bluetooth device offering out-of-sight, long-range operation. Owners of the existing Momentum Preamplifier [HFN Nov '13] are able to upgrade to the new Momentum HD model. A separate in-depth review of the £48,000 HD Preamplifier is scheduled for next month's *Hi-Fi News*, and I used one during the course of my extended sessions with the Relentless, typically partnered with dCS's Vivaldi One digital hub [HFN Feb '18].



Momentum, machined here into two 22kg alloy blocks [see pic, p39]. So the Relentless is also an effective, albeit costly, storage heater, raising the temperature in my listening room by 5°C over a 48hr period.

While dancing around the subject of safety, I should also make mention of D'Agostino's AC inlet solution. Not for the Relentless a standard 13/15A IEC mains socket, instead the rear of the amp

bare-wire/spade cable terminations into position. The line input is achieved by less violent means – a simple balanced XLR connection suffices here.

COUNTDOWN TO LIFTOFF

Once you have the Relentless(s) positioned – adjacent to your loudspeakers seems *de rigueur* – and securely clamped to the AC mains, a breaker switch is accessed on the rear panel. This puts the amp into standby and that 200mm watchface meter is illuminated in red. The main power button is hidden just underneath the front face, near the stainless steel foot on the right hand side. Turn-on is absolutely silent, and aside from the faint ticking of relays as the PSU 'boots up', there are no pops or other extraneous noises. Output protection too, is 100% 'analogue' for DC, over-temperature and over-current. If you run it into a short it will shut off. Or your speaker wires may melt, whichever occurs first.

THE ULTIMATE JOURNEY

Let's cut to the chase: this past month the rumour mill was working overtime and just about every audiophile I know was asking 'so just how *good* are these amplifiers?'. Certainly, I had the luxury of living with these behemoths for longer than is decent, but to merely describe their sound in the hi-fi vernacular is perilously close to missing the point. It would be like defining a McLaren Speedtail by its top speed or the top notes of that 2003 Sassicaia I have tucked away in the cellar by the DNA of its Cabernet Sauvignon grapes.

Yes, the Relentless paints an astonishing musical picture – one bursting with ripe detail, with unprecedented grip and slam, and with a seemingly limitless palette of colours that depict every twist and turn in harmonic accent. And that sense of latent power that hangs over every piece of music is so palpable that I'd hesitate to define its dynamic envelope, its untapped reserve, as merely 'unburstable'.

The Relentless represents a crushing force deployed with exquisite delicacy – a 15lb hammer wielded with the precision

LEFT: Each balanced side of the Relentless (positive and negative-going) comprises four modules. Each of these has eight complementary pairs of bipolar power transistors from ON Semiconductor. This adds up to 128 devices per mono amplifier!



of a micrometer. *HFN* readers will surely grasp this idea, but only when you *hear* the Relentless in action does the penny truly drop. For the Relentless amplifier is a game-changer and proof-positive that (almost) limitless power brings with it limitless musical possibilities.

The Relentless is the culmination of Dan's life work, a 40-year drive to build an amplifier without compromise – a period during which I've also been lucky enough to audition and lab test amplifiers from every corner of the globe. So when I was finally face-to-face with the green glow from a pair of these toasty-warm monoblocks it was impossible not to hear the man's life-long voyage, his ambition and his personality expressed in every note played.

There's a little of Dan in every one of these hand-assembled amplifiers. So you are not just invited to audition a *sound* – rather, you are treated to an experience where once-familiar albums are transformed as you are chaperoned along their musical journey.

DARK DESERT HIGHWAY

And by familiar, I mean *very* familiar. I dialled up the 2001 remix of The Eagles' *Hotel California* [192kHz rip from DVD-A] and with only the slightest hesitation from Melco's music library, that iconic opening chord progression rang into the room, heard countless times before but somehow fresher now, more vibrant, intense and beguiling. This is music taking form, achieving a physicality that is not just reaching out to touch you (or pound you in the case of Massive Attack or Yello) but take you by the arm, embrace you and gently draw you from the audience to the stage. So there I was, admiring the layered sound of Walsh and Felder's guitar solos while the faint draft from Henley's cymbals raised the hairs on the back of my neck.

ABOVE: Seen in silver, D'Agostino's 'Venturi effect' sidecheeks not only wick thermal waste away from the copper heatsinks but also contribute to its distinctive industrial design

Channel Classics' DSD release of Stravinsky's *Rite of Spring* [Iván Fischer/BFO; CCS SA32112, DSD64] provided another, entirely separate journey as, once again, the orchestra crafted sound shapes of breathtaking earthly beauty, with fresh timbres and structures of unlikely physicality. As befits the work of this composer, the musicians interlocked

to create a single, huge percussion instrument, from the resonant might of the tympani to the shrill interjection of the piccolo. And the silence! Breathtaking – as the vital, rhythmic contortions of brass, winds and strings

lapsed into moments of reflection, so the ambience of Budapest's Millennium City Palace of Arts was revealed. Caught in the moment, the urge to lift my head towards the invisible ceiling was irresistible. By now the Relentless was straining at the leash, urging me to order up some fireworks from the Melco's menu. The 2014 remaster of Deep Purple's 1972 *Made In Japan* [Universal 0602537719365; 96kHz FLAC] features the band's legendary 'mkII' lineup recorded live in Osaka with, famously, 'everything louder than everything else'. The Relentless thrusts you perilously close to the action as 'Machine Head', 'Highway Star' and 'Space Truckin' are all thrashed out with casual disregard to both hearing and syncopation.

HEAVY METAL AMP

Blackmore is gunning his Stratocaster like a man possessed while Jon Lord's organ is a frenzy of feedback – the perfect backdrop to Ian Gillan's barely-controlled screaming. They don't make 'em like this any more, ☞

DAN D'AGOSTINO

'Once the decision was made, it took about a year to design and then get a working sample up and running', confirmed founder and CEO Dan D'Agostino. Few would argue with Dan's contribution to the art and engineering of cutting-edge amplification, and the Relentless not only incorporates lessons learned from the development of the Momentum series but also the entirety of his 40 years at the forefront of high-end design.

But what of digital – will there be a network-connected front-end to partner the Relentless? 'The people doing digital are doing such a fine job – dCS for example – that we feel we have little to add here', Dan acknowledged, 'but we will be introducing a Relentless phono stage – extending the Relentless marque across the analogue scene'. And a partnering preamp? 'In practice, the current HD preamp [see p38] is the result of early research on the Relentless preamp which, itself, is an ongoing project, due for release at this year's Munich High End in May.'

The Relentless is clearly Dan's most determined amplifier to date, including the MRA model that he developed while at Krell Industries. Dan agreed as much during our conversation, but as a man known to all as an innovator and breaker of boundaries, it is tempting to think that something even bigger, more powerful, more outrageous... might still be a possibility.

'We have no plans for anything more ambitious just yet', said Dan, 'But never say never!'

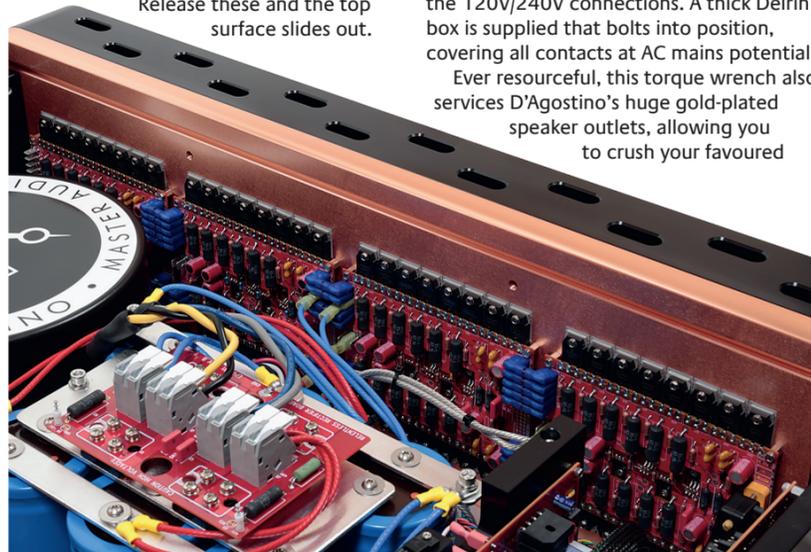


'A crushing force deployed with exquisite delicacy'

DO NOT TOUCH

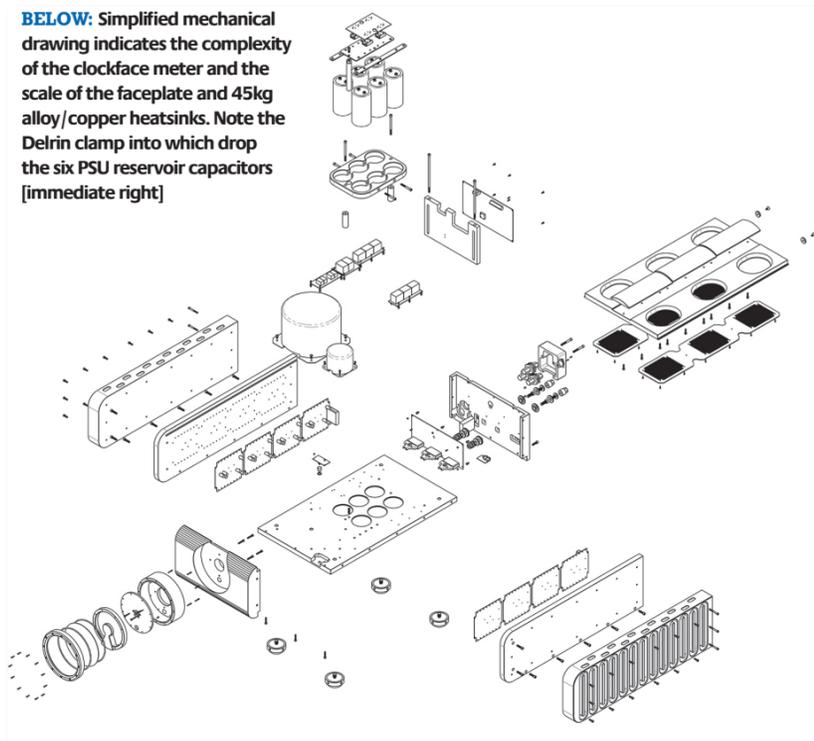
Much of what I have described is readily identifiable from our 'lid off' shot [p36]. While I absolutely do not recommend lifting the lid, neither is this an inelegant pressed metal top plate. It's another milled-from-solid interlocking section, complete with six decorative vents, and secured in place by just two large Allen bolts at the rear.

Release these and the top surface slides out.



MONO POWER AMPLIFIER

BELOW: Simplified mechanical drawing indicates the complexity of the clockface meter and the scale of the faceplate and 45kg alloy/copper heatsinks. Note the Delrin clamp into which drop the six PSU reservoir capacitors [immediate right]



but with the Relentless in tow and my trusty B&W 800 D3s [HFN Oct '16] being warmed to within an inch of their voice coils, I was back to my youth, with denim, hair – lots of hair – inhaling the heady atmosphere of the Hammy Odeon. Over to you, Ken...

KEN ON RELENTLESS

In any field, writes Ken Kessler, on rare and therefore memorable occasions, we get to experience what are close-to-once-in-a-lifetime events. For a golfer, it's that first hole-in-one. A fisherman? Landing a massive swordfish. Mine have included driving the Bugatti Veyron and seeing The Kinks play live. They may be superseded some day – I await the Bugatti Chiron with as much hope as expectation – but the D'Agostino Relentless amplifier will be a tough act to follow.

For me, the Relentless also represents a sort of continuity if not closure, as the very first time I ever heard what Dan D'Agostino could do was another memorable event: listening to the original Apogee Full Range Loudspeaker System, driven by his massive Krells [HFN Sept '85].

Nothing, however, prepared me for one specific element of the Relentless, which may come to define both the amplifier's signature sound and what it represents in the evolution of high-end audio. And it has everything to do with unbridled power.

Manufacturers, marketing types and, yes, reviewers, bandy about terms like 'cost-no-object' and 'zero-compromise' with abandon. We should leave that to the likes of Ferrari and Lamborghini, as rarely has it ever been realised in audio. Aside from some unfeasible, never-to-be produced designs with €1m price tags that turn up at shows, I can think of no other amplifier in my half-century-plus in audio which even approaches the sheer chutzpah demonstrated by Dan's Relentless monoblocks.

NO COMPROMISE

Dan has been threatening to produce a true, no-limits amplifier for as long as I have known him. This is it. What I heard the Relentless amps do was – without any notion of hyperbole – demonstrate what sound without power limitations can be. This is not to suggest for a moment that one cannot live with less; neither is it to insinuate that there are no other systems so blissfully free of constraint. That said, they are few in number, and must be built around the most sensitive of speakers. The Relentless needs no such accommodation.

From the first notes, the liberation of the sound through these behemoths is something I had never heard before in

my life – and I have been blessed with exposure to some of the finest privately-owned installations on the planet. It is not restricted to one aspect of the sound, such as bass slam or dynamic contrasts. Rather, it affects everything, and those who have lived with either Krell or D'Agostino electronics will recognise the sound's character – only more of it.

Massive soundstage, super-fast transients, punch where needed, finesse as required. What's different is the notion of unbridled possibility. It's as if a whole stage of intrusion between source and ears has been eliminated. It needs to be heard, before anyone – like the idiot trolls I've seen online – condemns it as an irrelevance whether for price, size, weight or other trait. Rather, the Relentless needs to be appreciated for doing one thing without any display of restraint: it is showing us what is possible, and for that I salute it.

ANDREW AUDITIONS

As one might hope, given their price, mass, sheer size and prodigious power output, writes Andrew Everard, the Relentless amps have the wherewithal to make almost any electronics we've had through editor PM's listening room sound somewhat limited if not lacklustre. Driving the B&W 800 D3 speakers – careful with that volume control! – it's clear from the first notes of Foy Vance's 'She Burns' from his *The Wild Swan* set [Gingerbread Man Records/Atlantic 554739], that we're on to something special.

It's not just the wide-open, crisply-focused soundstage, and the jaw-dropping levels of detail and timbral texture: when that deep, deep bassline kicks in, it does so with both solidity and definition. There's not a hint of cartoonish bloom masquerading as extension – instead we get sheer, effortless power.

With another favourite tester, the Espen Eriksen Trio's 'In The Mountains', from *Never Ending January* [Rune Grammofon RCD 2173; 96kHz/24-bit], what the Relentless monoblocks deliver is about as close as you're ever going to get to a live experience, with that real 'listen around the trio' sense of performance.

Andreas Bye's drums, opening the track, are big and sonorous, but oh so tight, Lars Tormod Jensen's bass is rich and resonant with fine snap, and the weight and presence of Eriksen's piano is remarkable. What can sound overblown and a little forced elsewhere is here just a trio of musicians locked together and anticipating



ABOVE: Custom loudspeaker terminals are supplied with a special tool to crank them tight against spade or bare wire terminations [the same tool is used to bolt-down the AC mains cable – see left]. A single balanced XLR input is fitted

levels (ever cautious of the 800 D3's 1kW maximum unclipped power handling), the amps handle it with aplomb. Brass and percussion are delivered with a gorgeous edge, then again that inexhaustible power and total control as the music whirls and swirls to its conclusion.

SUBTLETY AND SLAM

Yet these massive monoblocks can apply the most delicate of touches to Britten's 'Moonlight' [Four Sea Interludes Op. 33a, Bernstein/New York Phil; Sony Classical SS 87981, DSD64], with its rich, velvety string textures, before unleashing the power with no less control for the 'Storm' interlude. With beautifully ripe brass, the layers of the orchestra raging with each other, and skittering strings and woodwinds, the piece builds to an explosive, literally sofa-shaking conclusion.

HI-FI NEWS VERDICT

I am typically wary of 'great expectations' because they may just as easily resolve into dismay. Not so here, for the anticipation and auto-suggestion planted into the minds of eager audiophiles the world over by the astonishing scale and price of these amplifiers is realised in every facet of their performance. Just as their sound is forever etched in my memory, their 11kW will be permanently scorched into the record books!

Sound Quality: 95%
0 - - - - - 100

each other's moves, and it's all presented with so little effort from the electronics, making other amps sound like they're trying too hard.

OUT OF THE GATES

These amps really do that 'from the first note' thing, the opening of the second movement of Elgar's Symphony No 1 [Barenboim/Staatskapelle Berlin; Decca 478 9353], has that immediate sense of the presence of the orchestra and the venue even before the music starts. From there on the sound just builds, with percussion especially vivid, such as in the way cymbals clash and then are instantly muted.

That same magical suggestion of the scale and acoustic is readily apparent in Masaaki Suzuki's recordings of Bach for the organ [BIS 2241], as is the delicious sense of the air being moved through the pipes, not to mention the sheer size of the sound of the Garnier instrument in the chapel of Kobe's Shoin University.

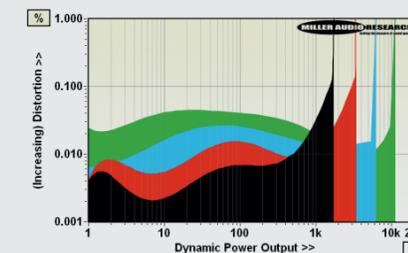
There's never any shortage of musicality or expression here: witness the slow build of 'The Carousel Waltz' from The John Wilson Orchestra's *Rodgers & Hammerstein At The Movies* [EMI Classics 50999 3 19301 2 3]. There's a real sense of expectation as the piece spins into motion, and if you advance the volume to thrilling

LAB REPORT

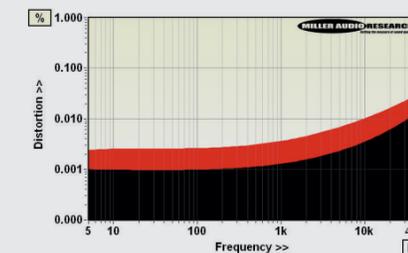
D'AGOSTINO RELENTLESS

One thing is for certain: this amplifier is the most powerful – more accurately, the most load-tolerant – in current hi-fi memory, besting the last-most-powerful amplifier, Musical Fidelity's Tri-Vista kW [HFN Aug '03]. D'Agostino quotes 1.5kW/80hm doubling to 3kW/40hm and 6kW/20hm although we obtained a slightly higher 1.605kW/80hm and a slightly lower 2.73kW/40hm. Not that 2.7kW can realistically be described as 'low' for, under dynamic conditions, the Relentless's massive power supply serves up 1.74kW, 3.35kW, 6.36kW and 11.325kW into 8, 4, 2 and 1ohm loads, respectively, the latter equivalent to 106.4A for 10msec at <1% THD [see Graph 1, below]. Yes, over 100A! (D'Agostino quotes '400A peak' but no period, frequency or THD limit is specified). However you look at it, the Relentless will surely drive any high-end loudspeaker without pause (figuratively and literally – neither DC, over-current or thermal protection was tripped during these in-depth lab tests).

Output impedance is close to the specified 0.03ohm at 0.04ohm from 20Hz-10kHz, rising thereafter to 0.06ohm/100kHz and 0.335ohm/100kHz. The frequency response follows suit with a very gentle treble roll-off amounting to -0.5dB/10kHz, -1.1dB/20kHz down to -7.6dB/100kHz (identical in both units) just as distortion hovers at a minimum of 0.0009% at 1W from 5Hz-200Hz, rising very gently to 0.0013%/1kHz, then 0.0035%/10kHz and 0.006%/20kHz [see Graph 2, below]. Versus output, distortion rises very gently indeed, reaching 0.005% through bass and midrange at 100W/80hm and 0.03% at 1kW/80hm. Bearing in mind the size of the PSU, noise is low at just -75dBV and the A-wtd S/N wide at 91dB (re. 0dBV). PM



ABOVE: Dynamic power output versus distortion into 80hm (black trace), 40hm (red), 20hm (blue) and 10hm (green) speaker loads. Max. current is 106A (!)



ABOVE: Distortion versus extended frequency (1W/80hm, black; 100W/80hm, red)

HI-FI NEWS SPECIFICATIONS

Power output (<1% THD, 8/4ohm)	1605W / 2730W
Dynamic power (<1% THD, 8/4/2/1ohm)	1740W/3350W/6360W/11325W
Output impedance (20Hz-20kHz)	0.039-0.060ohm
Freq. response (20Hz-20kHz/100kHz)	+0.0dB to -1.1dB/-7.6dB
Input sensitivity (for 0dBW/1.5kW)	139mV / 5335mV (balanced)
A-wtd S/N ratio (re. 0dBW/1.5kW)	90.7dB / 122.5dB
Distortion (20Hz-20kHz, 10W/80hm)	0.0025-0.016%
Power consumption (Standby/Idle)	35W / 512W
Dimensions (WHD) / Weight (each)	572x280x826mm / 258kg