

Krell Illusion II/KSA-i400

Developed to celebrate Krell's 40th anniversary, the KSA-i400 combines all the brand's proprietary circuit ideas in one very powerful amplifier. We partner it with the Illusion II
 Review: **Andrew Everard & Paul Miller** Lab: **Paul Miller**

Over time, most hi-fi brands develop an image: ask any audiophile and you'll be told this one is warm, that one is all about rhythm and timing, and another is 'bright and detailed, but I could never live with it'. Of such generalisations, myths are born, and I'd say it's a pretty safe bet that most enthusiasts 'know' what Krell is all about – big, heavy, and massively powerful American amps, with the ability to drive just about any speaker to any level you want, or could imagine.

Of course, the name helps. Derived from the extinct race of highly advanced beings at the heart of the 1956 sci-fi classic *Forbidden Planet*, it gave the brand instant mystique when it made its debut at the beginning of the 1980s. Well, that and the company's trademarked slogan 'The Leader in Audio Engineering'. Myth becomes legend, and those with a stereotyped view of Krell's place in the hi-fi firmament will find plenty of confirmation in its latest power amplifier, the £40,998 KSA-i400.

POWER OF THE ID

It is massively powerful – rated at 400W/8ohm – and exceptionally heavy at 73kg. Developed to mark the company's 40th anniversary a couple of years back, it's one for use on the floor, or a dedicated platform. For the purposes of this review we have added the company's £13,500 Illusion II preamplifier, a design that's been around for a while despite largely escaping the attention of the quality hi-fi press.

Offering both digital and analogue inputs, this preamplifier is served by an ESS Sabre DAC giving it limited 192kHz/24-bit capability. Even when the unit appeared – getting on for a decade back – the company acknowledged it had been too late in the development process to include a USB digital audio input, and now

RIGHT: Inside the Illusion II with large toroidal transformer and multiple PSUs [far right] supplying three stacked 'digital' PCBs [centre] and the two stacked L/R balanced 'analogue' preamp PCBs [left]. There is no USB hub included

that looks like even more of an omission. Third-party S/PDIF-to-USB converters are available, of course [HFN Feb '17].

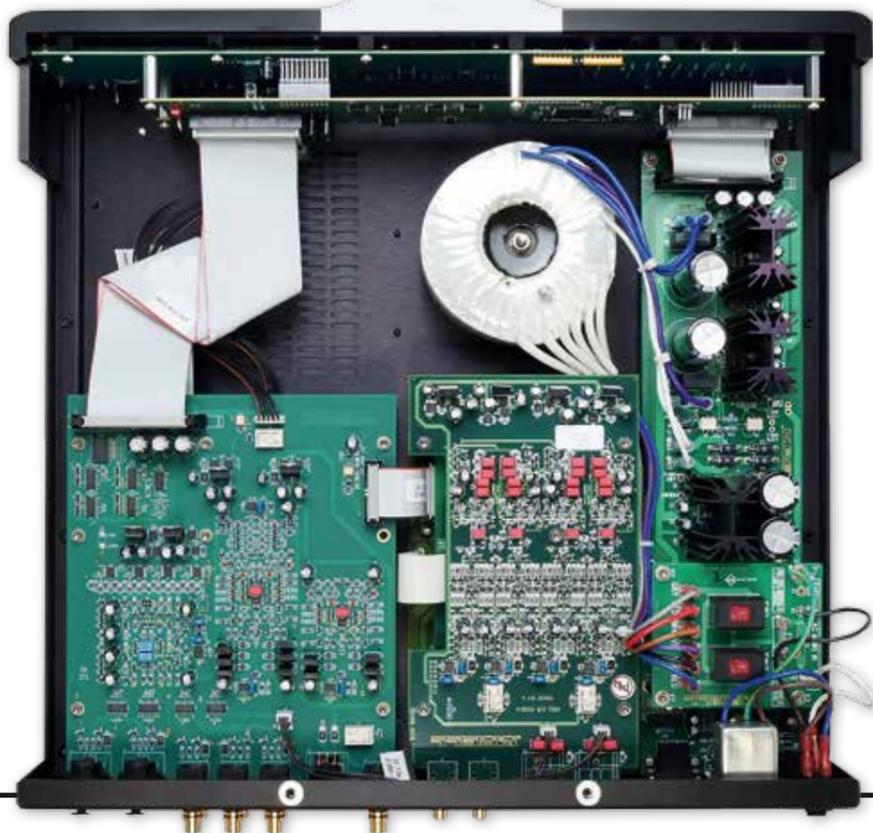
There's nothing whatsoever backward with the Illusion II as a purist preamp, as we'll discover, but the digital audio game has moved on apace, and the provision here accords with the legacy white on blue dot matrix display. There's no indication yet, but Krell will surely have a preamp in the works with extended digital provision, perhaps with streaming onboard, and, on my wishlist, a crisp colour OLED display.

The latest in a long line of Krell power amps, the new KSA-i400 draws heavily on the company's in-house technology, developed over many years, as Dave Goodman, Krell's Product Director, describes in his interview with PM [see sidebar, p45]. The headline claim is that

the KSA-i400 delivers its entire output, all the way up to the specified 400W/8ohm, in non-switching Class A, thanks to the company's iBias circuitry, and does so 'with absolute accuracy but without the heat produced by a traditional Class A design'.

COOL RUNNING

As Krell explains it, this is achieved by maintaining a 'low preset current level. It doesn't matter what the signal is doing or how the speaker impedance changes with frequency, by maintaining that preset current level the amplifier is always operating in Class A'. As PM notes in his boxout [p44], this iBias technology has been at the heart of Krell's power amps for the better part of a decade, and the KSA-i400 adds to it with a slew of other proprietary elements, including 'XD' ↪





and 'Sym-Max' which aim to tackle any asymmetry in the amplifier's balanced, differential, and direct-coupled circuitry. Running to 16 pairs of high-power audio transistors and 8 pairs of driver transistors, correcting for any slight differences in their characteristics is not trivial. Thermal equilibrium is maintained by mounting all these devices on a continuous run of alloy heatsinking [see pic, p45].

Two huge 2700VA transformers are stacked under a total 188,000µF of filter capacitance in the amp's power supply, while gold-plated PCB tracks and silver-plated copper bus-bars keep all subsequent losses to a minimum. This massive supply underpins Krell's claim that power keeps doubling, to 1600W into 2ohm, with the ability to drive 1ohm loads, and with peak current at 62A [see PM's Lab Report, p49].

ABOVE: Nothing if not purposeful, the hulking KSA-i400 retains Krell's curved fascia motive but with two vertical LED strips that denote standby/power and L/R channel status

For all that, the operation of the amplifier is simple: it has just RCA and balanced inputs, plus a single set of substantial winged combination terminals, for banana plugs or spades, for each channel. The two LED light bars, one each side of the radiused centre portion of the fascia, glow green when the amp is powered up by the rear mains switch, turning blue when the front-panel switch is used to bring it out of standby. These bars either light or flash red in case of a fault, with one bar 'reporting' on each channel.

USE YOUR ILLUSION

An Ethernet port is provided on the power amp for software updates, but the only means of control from the preamp is via 12V triggers for on/standby. The Illusion II itself has two sets of balanced analogue inputs and three on RCAs, plus two coaxial, optical and one AES/EBU digital input. Outputs are also on XLRs and RCAs, alongside 12V trigger in/out, and a socket for an external IR receiver should you want to hide the preamp away [see p47].

Front panel controls are via traditional 'pin-head' pushbuttons, duplicated on the

RIGHT: Inside the massive KSA-i400 with two (dual mono) Noratel toroidal transformers sited under two banks of 20x4700µF reservoir caps [left]. For the L/R power amps, 16 pairs of 15A bipolar transistors from ON Semiconductor are bolted to long, lateral heatsinks [top/bottom]



chunky metal remote handset. There's no volume knob, but the balanced resistor-ladder adjustment has a rather a large number of very fine steps controlled by up/down buttons [see PM's Lab Report, p47]. This makes for precise if rather slow adjustment, but at least the blue light-bar on the preamp, which initially glows red in standby, flashes to show you that commands are being received and acted upon. There's a mute button on the remote should you wish for a swifter pause or restoration of output level.

Otherwise, a menu option lets the user configure details such as balance, input trims and labelling, and bypass (for use with a surround processor), although this isn't helped by the narrow vertical viewing angle of that display. Otherwise this is a very simple, if solidly engineered preamp, designed and built in typical Krell style. It uses the company's balanced Current Mode circuit design, and has a massive power supply for a preamp, employing a 95VA transformer and

ABOVE: Launched a decade before the new power amp, the Illusion II preamp's two-tone fascia combines input and menu buttons with and 'old-school' back-lit display

40,000µF of capacitance. The headphone output is fed directly from the line stage for high-quality personal listening.

POWER OF THE KRELL

The Illusion II and KSA-i400 were slotted into PM's reference system between the usual Aurender W20SE/dCS Vivaldi ONE APEX front-end [HFN Mar '23], the latter running with a fixed output purely as a DAC, and Bowers & Wilkins' 801 D4 Signature speakers [HFN Sep '23]. The power amp was set on the floor between the speakers and connected with long balanced cable runs of transparent cable to the preamp, much as I suspect most users will use this hefty lump of electronics – it's the classic 'long interconnect/short speaker cables' US audiophile set-up. ↪

'Maximum detail, maximal drive – it's what they do best'



DAVE GOODMAN

Dave Goodman, Director of Product Development, explains how Krell's amplifiers have evolved from the very earliest Class A amps [HFN Aug '83] with their basic single-ended voltage-mode circuit and manually adjusted DC offset and output stage biasing. 'Our Current Mode circuitry made its debut in the FPB series of amplifiers', says Dave. 'By operating in current-rather than traditional voltage-mode the circuitry is less affected by capacitance and its bandwidth is opened up. A key circuit element, the current mirror, has been improved in each generation of Krell amplifiers, resulting in lower distortion and better sound quality. Sym-Max, our latest technology, also suppresses even-order harmonic distortions by adjusting out gain differences in the positive and negative halves of the complementary circuitry.'

Krell's Class A biasing remains the foundation of its amps. 'In the KSA-150/250 series we replaced manual with auto biasing but only with Sustained Plateau Bias, introduced in the KAS amplifier, did we address the efficiency/waste heat problem by stepping the bias up or down in discrete levels based on the signal level and load.'

Sliding bias schemes 'peaked' in the '80s, but Krell has pushed the tech further. 'Digitally calibrated bias levels were introduced in the FPB series while iBias – a fundamentally different and more accurate method of Class A biasing – was first used in the Chorus/Duo/Solo series', confirms Dave. 'Since iBias is a continuously variable system it is also more efficient than Sustained Plateau Bias [see boxout, p44].' PM



CLASS A ALL THE WAY?

Over 40 years since Krell's iconic Class A power amps [HFN Nov '21 & May '11] hit the high-end, and over the last two decades of the brand's steady evolution [see interview sidebar, p45], the company is now offering very refined, sophisticated amplifiers, packed with proprietary thinking but still underpinned by prodigious power. The fully balanced, direct-coupled 'current mode' amplification has been the backbone of its amplifiers for some time but the 'XD technology' [not to be confused with Cambridge Audio's XD 'crossover displacement' output stage technology – HFN Jun '14] is more recent. Here the amplifier's output impedance is reduced as far as possible, without impacting on stability, to improve its resilience to low and variable impedance speaker loads. The KSA-i400's input and driver stages have all been optimised for the wide open-loop bandwidth and enhanced transient performance of this revised output stage.

Krell's iBias (intelligent Bias) output stage technology has been a staple for some ten years [HFN Oct '14], claiming to offer the 'sonic benefits of Class A operation without the heat and power consumption of traditional designs'. In practical terms, rather than maintain a constant, high standing current (or bias) in the output stage – the effective, but inefficient, Class A approach to eliminating NPN/PNP transistor crossover distortion – iBias dynamically adjusts the output stage idle current to suit the music signal. 'Sliding bias' technologies have been with us since Technics' 'New Class A' and JVC's 'Super-A' regimes of the 1980s but iBias claims a better correlation with the music signal. Instead of 'guesstimating' the optimum bias from the input signal voltage and presumed 8ohm load, iBias tracks the real output stage current and moderates the bias within the closed-loop of the feedback network. Thus the multiple output devices in the KSA-i400 are always maintained in their 'on' state regardless of the music signal level or content, or variation in the loudspeaker load. PM

PRE/POWER AMPLIFIERS



ABOVE: Three single-ended (RCA) and two balanced (XLR) inputs are joined by AES, two coax and two optical digital inputs. Outputs are on RCAs and balanced XLRs

In use, two things are striking about the Illusion II/KSA-i400 combination: one is that it seems to have almost limitless power, which suits the somewhat demanding Bowers & Wilkins flagship speakers exceptionally well. The other is that the amps need to be cranked a bit to come to life, sounding less animated at very low levels. This isn't unusual, as most systems sound better when they're shifting some air, but PM's Lab Report [p49] does show a change in distortion 'fingerprint' until the power amp is flexing its muscles with a double-digit watt output. Coincidence?

SNAP AND PUNCH

However, in practice it doesn't take much to get into this 'sweet spot'. With the jangly sound of Ali Farka Touré's *Voyageur* set [World Circuit WCD097], the Krell pairing delivers excellent snap on the guitar strings, plenty of vocal character, and percussion that's crisp and, where appropriate, weighty. Maybe a little more warmth and intimacy wouldn't go amiss, but there's no problem with the focus on the performances here and in the high levels of



detail revealed with Penguin Café's latest set, *Rain Before Seven* [Erased Tapes Records ERATP159CD].

From the repeating patterns of 'Might Be Something', with real

LEFT: Substantial metal system remote caters for input, volume, mute, balance and menu navigation

conviction in the double bass, to the more mystical 'Galahad', there's fine insight into the scoring and performances. Soundstaging is excellent too, giving a real 'listen in' effect with the 801 D4 Signatures. The sound is also fast and driving with the dance rhythms of the concluding track, 'Goldfinch Yodel'.

The KSA-i400 does scale with almost disdainful ease, for example with Rush's live 'The Spirit Of Radio' from the remastered *Moving Pictures* [Mercury Records download], where the amplifier unleashes serious punch. Bring things down to the studio-recorded 'Red Barchetta' from the same set and there's no shortage of detail, particularly in Neil Peart's precision drumming. It almost goes without saying that the KSA-i400 will go as loud as anyone could sensibly want without any suggestion of stress.

ROCK THE ROOM

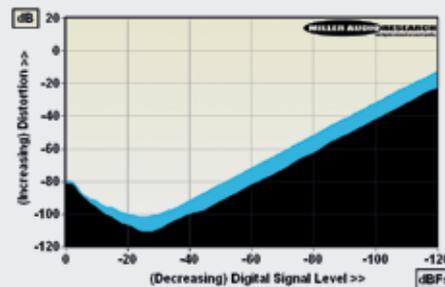
Those characteristics also suit well Nicolas Kynaston's recording of Liszt's 'Prelude and Fugue on B.A.C.H.' on the Royal Albert Hall 'Father Willis' organ [from Base 2 Music 012; www.nativesdsd.com]. Encoded from an original 1968 analogue tape, this release has monumental power, and that real sense of the massive instrument shaking the entire venue comes through the big Bowers & Wilkins speakers driven by the Krell KSA-i400. From the subtle intricacies of the higher manuals through to the great growling low frequencies, it was all delivered with an almost palpable sense of the size of the venue being driven by the organ.

Go poppy with the recent remaster of the dance mix of Human League's 'Don't You Want Me', from *Dare Singles & Remixes* [UMC download], and while this seven-plus minute version is a definite period piece, it's still anthemic. ➔

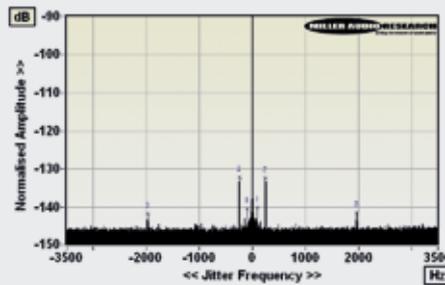
KRELL ILLUSION II

There's no ALPS pot in the Illusion II preamplifier but a digitally-governed, 12-bit R-2R ladder volume control that operates over a phenomenal 151-steps, equivalent to a useable range of 65dB. The top 50 steps (101-151) represent a 10.8dB range (~0.2dB per step), the next 50 steps (051-101) operate over 17.5dB (~0.35dB per step), becoming slightly coarser over the remaining 37dB. The maximum (balanced) gain is +12.0dB, facilitating a maximum output of 18.2V from a 150ohm source impedance (max input is 8.4V). Distortion is lowest at 1-2V output at 0.00018-0.001% (re. 20Hz-20kHz), increasing to 0.0018-0.0025 at 6V. The S/N is a wide 97.3dB (A-wtd, re. 0dBV) while the analogue in/out frequency response is flat to within ±0.03dB from 2Hz-1kHz before extending up to 100kHz within ±0.005dB! Importantly, and in contrast with many amps/preamps, the volume circuit is correctly buffered and so the Illusion II's HF response does not change with volume position.

Used as a DAC/preamp, the Illusion II delivers a 16.2V balanced output for a 0dBfs digital input. Distortion is ~0.02% at this full scale input and falls to a minimum of 0.00018%/1kHz and 0.001%/20kHz over the top 40dB of its range [see Graph 1, below]. The A-wtd S/N is a very useable 110.0dB, linearity good to ±0.5dB over a 110dB range and channel separation a very fine 135dB. The ES9018 DAC has excellent built-in jitter rejection and this is not squandered in the Illusion II where the mere ~18psec is primarily linked to the onboard PSU [see Graph 2]. Krell's choice of linear phase/fast roll-off digital filter defines the 83dB stopband rejection and 'digital' response of -0.2dB/20kHz, -0.8dB/45kHz and -2.2dB/90kHz with 48kHz, 96kHz and 192kHz media, respectively. **PM**



ABOVE: Distortion versus 24-bit digital signal level over a 120dB range at 1kHz (black) and 20kHz (blue)



ABOVE: High resolution jitter spectrum via S/PDIF input with 48kHz/24-bit data (mkr's show PSU jitter)

HI-FI NEWS SPECIFICATIONS

Maximum output / Impedance	18.2V / 149-150ohm (balanced)
Input sensitivity (re. 0dBV)	250mV (balanced)
Freq. resp. (20Hz-20kHz/100kHz)	+0.02 to -0.00dB/-0.005dB (pre)
Freq. resp. (20Hz-20k/45k/90kHz)	+0.0 to -0.2dB/-0.8dB/-2.2dB (DAC)
Digital jitter (USB at 48kHz/96kHz)	18psec / 7psec
A-wtd S/N ratio (re. 0dBV/0dBfs)	97.3dB (Analogue) / 107.1dB (Dig)
Distortion (20Hz-20kHz; 0dBV/0dBfs)	0.0004-0.001% / 0.008-0.0085%
Power consumption	56W (21W standby)
Dimensions (WHD) / Weight	438x97x464mm / 10.4kg

PRE/POWER AMPLIFIERS



ABOVE: Large winged 4mm binding posts allow speaker cables and spades to be clamped firmly in place. Unswitched inputs are on RCAs and balanced XLRs. The 12V trigger facilitates system integration, but Ethernet port is for software updates only

The KSA-i400 powers through the lengthy stripped-down drums and bass intro, basically laying out the whole backing track before the more familiar aspects of the song swing in with those big bass chords. Crank it up, and even if it really is a guilty pleasure, above all else it's huge fun.

The same could be said for Bonobo's take on London Grammar's 'Hey Now', from the recent *The Remixes* compilation [Ministry of Sound download]. As one might expect given the remixer's own releases, such as those on *Fragments* [Ninja Tune ZENDNL 279], this one is infused with some serious electro/drum and bass. The KSA-i400 really gets the 801 D4's big bass drivers moving, albeit under strict control, delivering maximum low-end impact without detracting from all the interesting stuff going on above. Maximum information, maximal drive – it's what these Krell amps do best.

A TOUCH OF ROMANCE

That's not to say this big, powerful amplification can't do subtle. Fed with an atmospheric solo piano recital such as Sergei Kivitko's *Schubert By Candlelight* [Fresh! FR753; 96kHz/24-bit], recorded live in front of an audience in Madrid, the Krell combo not only brings out the scale of the piano in a finely delineated acoustic, with wonderful dynamics, but also does an excellent job with the intimate, romantic atmosphere of the entire performance. All told, this was a rather fine relaxing evening listen, emphasising the all-round ability of these pre/power amplifiers.

The combination of power and finesse is also deployed to great effect in Michala Petri's recording of Ma Shuilong's 'Bamboo Flute Concerto' on her *Chinese Recorder Concertos* [OUR Recordings 6220603], bringing out the album's fine balance between the delicate solo instrument and the power of the Copenhagen Philharmonic. Altogether, the performance sounds as thrilling as it is exotic.

But then that's the story with this Krell preamp and mighty power amp – there's the insight to elevate the quality of recordings and performances alike, with colossal reserves not just to drive speakers convincingly, but also control them as they deliver with speed, definition and focus. It's a classic 'iron fist/velvet glove' amplifier pairing, well suited to an extremely wide range of musical genres, loudspeakers and listening tastes. ☺

HI-FI NEWS VERDICT

OK, so it takes a bit of level before this Krell power amp gets into its stride, and at late night background levels it can even sound a shade passive, but give it its head and it combines with the relatively simple Illusion II preamp to deliver a compelling, satisfying sound that's as informative as it is hard-charging. Behind all that high-level swagger is a design as much about micro-dynamics and detail as it is a wall-shaker.

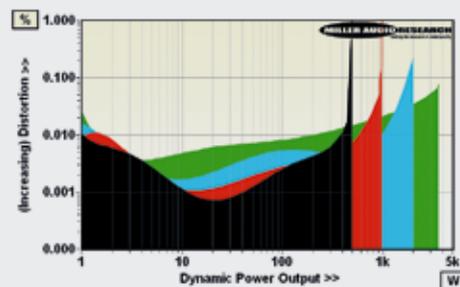
Sound Quality: 88%



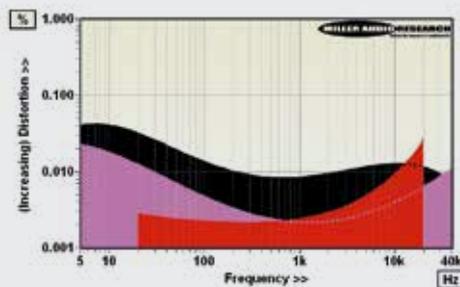
KRELL KSA-I400

Historically, Krell has set the standard for packing maximum power into as compact a chassis as possible, and all without going down the switchmode PSU/Class D route – its S-550i integrated [HFN Jul '13, and p61] being a classic case in point. Of course, the KSA-i400's 73kg, 660mm-deep enclosure is far from 'compact' but then neither is its rated 400W/8ohm the stuff of small boxes. In practice this behemoth delivered 2x483W and 2x845W into 8/4ohm loads, respectively, with a further uplift under dynamic conditions to 500W, 990W, 1.95kW and 3.61kW into 8, 4, 2 and 1ohm loads. Note the incredible 'stiffness' of the PSU regulation to deliver a near doubling of power into each halving of load impedance [see Graph 1] and where the 60A output into 1ohm is 'limited' only by Krell's electronic protection. As Krell claims, the amp's output impedance is both low and remarkably 'flat' at 0.015-0.018ohm (20Hz-20kHz), maintaining a response that's also flat to within ±0.1dB from 2Hz-20kHz across 8, 4, 2 and 1ohm loads. Gain is a sensible +26.4dB (balanced input) and noise is low too, given the total 5400VA PSU, promoting an above-average 89.5dB A-wtd S/N ratio.

The KSA-i400's distortion profile is arguably more interesting and is undoubtedly informed by Krell's various 'Current-Mode', iBias and XD circuit regimes [see boxout, p44]. Versus frequency, distortion is typically lowest through the midrange (down to 0.002%/1kHz) but higher at the audio frequency extremes – 0.013%/20Hz and 0.0065%/20kHz at 10W/8ohm [see Graph 2]. Versus level, there's a more marked trend with distortion starting 'high' at 0.007%/1W, falling to a minimum of 0.00009% at 20-30W, then rising to 0.005%/200W and 0.0075%/400W. PM



ABOVE: Dynamic power output versus distortion into 8ohm (black trace), 4ohm (red), 2ohm (blue) and 1ohm (green) speaker loads. Max. current is 60.1A



ABOVE: Distortion versus frequency versus power output (1W/8ohm, black; 10W, pink; 100W, red)

HI-FI NEWS SPECIFICATIONS

Power output (<1% THD, 8/4ohm)	483W / 845W
Dynamic power (<1% THD, 8/4/2/1ohm)	500W/990W/1.95kW/3.61kW
Output imp. (20Hz-20kHz/100kHz)	0.015-0.018ohm / 0.105ohm
Freq. resp. (20Hz-20kHz/100kHz)	+0.0dB to -0.08dB/-1.0dB
Input sensitivity (for 0dBW/400W)	135mV / 2750mV
A-wtd S/N ratio (re. 0dBW/400W)	89.5dB / 115.5dB
Distortion (20Hz-20kHz, 10W/8ohm)	0.0022-0.013%
Power consumption (Idle/Rated o/p)	225W / 1.91kW (1W standby)
Dimensions (WHD) / Weight (total)	438x239x610mm / 73kg