
# Musical Fidelity

## Supercharger 550k

**What the hell is a 'Supercharger?'** More importantly, what the hell does it do? Perhaps, even more importantly: 'Do I need one?' I will answer the first two questions in the next few paragraphs. As for that last question, you'll have to read quite a bit further to discover the answer to that one!

### What The Hell Is It?

Quite simply, Musical Fidelity's Supercharger 550k is a device that's designed to 'supercharge' your hi-fi system by increasing its output power to more than 550-watts continuous per channel. It's called a 'supercharger' because the concept is that it doesn't make any part of your existing system redundant: you just wire it in between your existing amplifier and speakers. It's also not supposed to affect sound quality in any way. Musical Fidelity claims that the design of the 550k is such that after you've inserted a pair in your system you will continue to hear exactly the same quality of sound—or, if you prefer, tonal character—but that the sound will be improved, because for probably the first time in your life, you won't be hearing the effects of amplifier clipping, protection circuit misbehaviour, or quashed dynamics.

After writing that paragraph, I can almost hear readers complaining right now: 'Clipping, protection circuit misbehaviour, quashed dynamics? My system doesn't have any of that!' Well I am sorry to be the bearer of bad news, but the simple (and highly provable!) fact is that unless you listen to music at levels that are so low they can't even approach realism, or your amplifier has an output of more than 500-watts continuous per channel, the bad news is that your system will be exhibiting at least two of these problems, whether you like it or not. And, since these problems will have been affecting the sound right from the very start, you won't be hearing them simply because you've become accustomed to them.

First, let's all assume that rock concerts are, on average, louder than classical concerts. If you sit in a 'good' position (that is, in the middle, midway up the hall) at a classical concert, listening to a symphony orchestra, you will experience peak sound pressure levels of 109dBSPL. It stands to reason, therefore, that you'd expect to be able to do the same in your own home. Whether you in fact *can* depends on the sensitivity of your speakers, how far you sit from them, and the power output of your amplifier. The average speaker efficiency is 87dBSPL, which means that if you put one watt of amplifier power into one of your speakers, the sound pressure level one metre away from it will be 87dBSPL. However, for the sake of argument, let's say your speakers are twice as efficient as the average, or 90dBSPL. Sound pressure drops off by 6dB every time distance is doubled, so the sound pressure level at two metres will be 84dBSPL, and it will have dropped to 78dBSPL at four metres. But because there are two speakers, we can add 3dB which means that the level at the listening position will be 81dBSPL when your amplifier is delivering one watt of power to both speakers. Double the power to both speakers (to 2-watts) and you'll get back to 84dBSPL at the listening position. Double it again (to 4-watts) and you'll get to 87dBSPL. Double it again, (to 8-watts) and you'll hit 90dBSPL. And so on until you finally reach the target level of 109dBSPL. So how much power will you need to hit the target level? If you just continue this simple 'double amp power to increase speaker SPL by 3dB' example, you may be astonished to find that you'd need an amplifier rated at 512-watts per channel to reach 108dB, which is close enough to our 109dB target that I'm not about to quibble, or make the math any more difficult.

So does this mean you'll need an amplifier with a power rating of around 500-watts per channel? If your speakers have a sensitivity rating of 90dBSPL or less, and you plan to be able to achieve long-term peak sound pressure levels of 108dBSPL at the listening position without clipping you certainly will. There is a bit of 'wriggle room' in all these figures, because true orchestral peaks (fff) are not particularly common and the 'average' volume level of a performance will, by definition, be much lower, so even if your amplifier was clipping on the peaks, it would still have sufficient output power to be able to cope for the greater majority of the musical performance. And, of course, the power rating of amplifiers is always (well… almost always!) stated on a 'continuous' basis, so that an amplifier rated at 100-watts continuous is very likely to be able to deliver—at

least for a few milliseconds—a peak output of at least 200-watts (which is the reason for the 'dynamic power' specification you'll often see accompanying 'continuous' ratings). And if your room is smaller, and your listening position is closer to your speakers, you reduce the need for amplifier power and/or speaker efficiency. However, my experience is that in an ideal acoustic situation (windows closed, not too much soft furnishing, single listener…), in a typically-sized Australian lounge-room, the absolute minimum power output (when driving speakers rated at 90dBSPL) required to achieve true 'high-fidelity' sound is 100-watts per channel. This combination won't deliver truly clean peaks, but it will come close.

But 'close enough' isn't good enough for Antony Michaelson (the man behind Musical Fidelity), who's long made high-output power amplifiers a crusade (witness Musical Fidelity's monster kW750, as just one example). Hence this 550k 'super-charger'…

## What Does It Do?

As you've probably guessed, the supercharger is basically just a very high-power power amplifier whose input impedance and overload characteristics have been optimised for connection to the speaker outputs of an integrated amplifier or stereo receiver. This is the reason you can see two sets of speaker terminals on the rear of the unit. The uppermost set is the 'input' and the set at the bottom the output. If you look carefully at the photograph accompanying this review, you'll see that above the speaker input terminals there's a solitary RCA input. Yes, this means you can use the Supercharger 550k as an 'ordinary' power amplifier, but because it doesn't have a volume control, whatever you connect it to would need to have one. (And, just in case it isn't clear from the lead photograph, or what I've written so far, I should now make it quite clear that the Supercharger 550k is a mono amplifier, so you'll need TWO of them!)

That said, the 550k is actually two 'low-power' mono amplifiers wired in bridged mode for increased power output. What happens in bridged mode is that one of the two amplifiers inside the 550k is wired 180° out of phase, which effectively doubles the voltage at the speaker terminals as 'seen' by the speaker. However, you get more than double the power because output power is derived by squaring the voltage, not just multiplying it by two. The problem is that as with most things in life—and most especially in electronics!—you never get something for nothing, and there are two significant problems with operating amplifiers in bridged mode. The first is that even though you may connect an 8Ω speaker to the 550k, the amplifier will react as if you have connected a 4Ω speaker, so twice the current will flow, which means you need output devices with double their normal current rating, and a far higher-capacity power supply to provide the current. The second problem is that both the (+) and (–) speaker terminals will be 'hot': that is, the (–) terminal will not be at the usual 'ground' potential. This means that you cannot connect the (–) terminal of the 550k to any device whose (–) terminal is grounded. This essentially means you can't connect it to the speaker level terminals of a powered subwoofer, or even to some electrostatic loudspeakers. However, connecting it to any passive loudspeakers will be fine, except that if you're bi-amping, you MUST remember to remove the buss-bars linking the bass and treble terminals on the speaker.

## Listening Sessions

It seemed to me to be obvious from the design of the 550ks that they are intended to be located as close to your loudspeakers as possible. Why 'obvious'? First, because they're monoblocs. Second, because their columnar design doesn't exactly lend itself to rack-mounting. Third, because they have built-in 'auto-switching' circuitry that turns the amplifiers on and off automatically, depending on whether they sense an audio signal at their input. Fourth, because the 'high-level' nature of the input signal means that you can run pretty-much any kind of budget cable you like between your primary amplifier and the 550ks, which then leaves you plenty of cable budget for the most important part of the run, which is the metre or less of speaker cable required between each 550k and its loudspeaker. How come you can use almost any cable? It's all to do with voltages, matching impedances and the maximum power transfer theorem. Basically, with a normal amplifier set-up, you have a very low-impedance source (the amplifier, at around 0.01Ω) and a relatively low-impedance load (the speaker, at around 2–10Ω) and a very high-voltage audio signal running down the cable (up to 30 or 40 volts). This all makes cable choice quite important. However, when you connect your amplifier's output to the speaker input of the Musical Fidelity amplifier, you're looking at a much higher-impedance load (50Ω) and at voltages that are an order of magnitude lower than usual. This means cable quality isn't nearly so important—in fact I'd venture to suggest that any half-way decent cable will do.

Anyway, so that's how I set the amplifiers up in my system—though I have to say that my other half wasn't over-enamoured about the two amps sitting alongside the speakers. She suggested I put them on top of the speakers, but I wasn't about to risk the amps scratching my speakers… or the possibility of the amps falling off! In the end I put them behind the speakers, where they were all but invisible from most points in the room, but if I had paid $8k for a pair of 550ks, I think I'd want to see them—if only until the thrill wore off.

Before starting my listening sessions proper, I spent some little while experimenting with the automatic power switching, because I've had some issues in the past with

- Power Output
- Styling
- Low Noise

- Bi-wiring facilities
- Auto-on circuitry
- Price

## Musical Fidelity Supercharger 550k

**Brand:** Musical Fidelity
**Model:** 550k
**Category:** Power Amplifier
**RRP:** $3,999 (Each)
**Warranty**: Five Years
**Distributor:** Audio Marketing Pty Ltd
**Address:** Unit 14L,
175 Lower Gibbes Street
Chatswood
NSW 2067
**T:** (02) 9882 3877
**F:** (02) 9882 3944
**E:** info@audiomarketing.com.au
**W:** www.audiomarketing.com.au

the settings of the time-constant circuits that control switching. This proved somewhat tedious, because the 550k switched on instantly, and took ages to switch off, but in the end I was satisfied that you won't have to worry about 'nuisance' power switching. However, if the 550k is powered down and you start a CD cleanly (without touching any control at all), you may miss the first few milliseconds of music. In practise, this isn't a bother, since the unit won't power down in normal everyday use, so it will never occur. When it did happen, it generally didn't bother me particularly, since missing the first few milliseconds usually didn't matter to me. On the odd occasion when it did, I simply hit the skip backwards key and started over. There are some who'd argue that Musical Fidelity should provide a manual override of the auto-switching circuitry (as is found on many active subwoofers) but I'm not one of them. The added inconvenience of having to switch both amps on and off manually (particularly since they'll likely be located some distance not only from each other, but also from your main equipment rack, and also likely as not on the floor, which would require bending down) means I preferred the convenience of automatic switching, despite the occasional minor inconvenience. As for leaving the amplifiers on all the time (the other option), that's not only not environmentally friendly, but would also have serious implications for the size of your household power bills.

As for the performance, I can only say that I was not expecting to hear the amount of difference the extra few hundred extra watts of power made to my system. Since I previously extolled the advantages of high power in a system, I should point out that I've had used very high-powered amplifiers in my system before, and although I've loved the effortlessness of the sound they delivered, and their wonderful dynamic capabilities, I have never been overly enamoured of the way these high-powered amps handled micro-detailing, or of their lack of transparency at very low volume levels. So my system has been permanently wedged between a rock and a hard place—not so much power that I lost the micro-detailing I love, but not quite enough power to provide me with the clean unclipped peaks I desire when I'm pushing the limits (and, I should add, *nowhere* near enough power to get me great sound when I'm partying with a room full of people!).

So what I wasn't expecting is that with the Musical Fidelity 550k, I finally had the best of both worlds—the micro-detailing at low volume levels, yet with all the power on tap I required. The sound was stunningly good. The most important thing I can tell you about having all this power is that it doesn't mean the music *sounds* loud. Indeed, quite the contrary. You'll find that you can actually play your system louder, without the sense of it *seeming* loud. If that sounds contradictory, you have to realise that when a hi-fi system appears as if it's 'sounding' loud, what you are hearing is most usually not 'loudness' *per se*, but just 'congestion'—or just plain distortion—because you've plain run out of watts. The way these Superchargers elasticised the soundstage was just phenomenal, seeming to stretch every aspect of performance beyond previous limits, so that it was not only the effortless way it delivered the peaks, but also the sheer quietness of the silences in between. Likewise, the front-stage images appeared higher and wider than before. The only thing that remained identical was the rock-solid position of performers within the stage, so that I could still work out exactly where each microphone was positioned when listening to live performances. (And, unfortunately, hear the mixing engineers moving the image around on multi-tracked studio performances, but such is life). The improvements delivered by the Superchargers are most evident with large orchestral forces (or orchestra and massed choir) so if you have limited auditioning time, and you don't mind a bit of Mahler, that's what I'd suggest you use as auditioning fare. But if orchestral works aren't your bag, try any music where large forces have been amassed, because all musicians fall prey to the monster of excess at one or more time in their career, from Paul Simon to the Beatles, to Powderfinger to… well, name your own, it isn't hard!

There is one thing Musical Fidelity's Supercharger is not, which is a magical panacea for all your system's ills. Basically, the Supercharger's elixir will cure a lack of power, but that's all. If you are unhappy with the tonal quality of your system, the Supercharger is not going to fix it, indeed it's more than likely that it may even make whatever tonal fault you perceive even more evident! In fact, Antony Michaelson trumpets this as a virtue. He says that the Supercharger will 'preserve the sonic flavour of the amplifier that precedes it.' Most famously, he told UK reviewer Ken Kessler, who uses Quad II monoblocs (maximum output of 20-watts continuous on a good day) to drive a pair of Sonus Faber Guarneris (efficiency 86dBSPL… with a tailwind): 'If you insert the 550ks between the Quad and the Guarneris, you'll hear the sound of Quads driving Guarneris… only with power.' [Reported in HiFi News Sept 07]. Kessler subsequently discovered that this was indeed the case, with 'a near-total preservation of the Quads' tonal character'—though he added that he did note 'a tiny hardening of the treble' that he put down to the inclusion of the Supercharger in the audio chain. But although Kessler goes on to say that the 550k is 'if you adore the sound of a particular, low-powered classic, a miracle upgrade', this rather ignores the fact that in the case of valve amplifiers (such as the Quad IIs) in particular, my opinion is that at least a part of the 'sonic signature' of such amplifiers is an artefact of the interaction of the impedance of their output transformer windings with the impedance of the loudspeaker itself and by inserting the Supercharger between the two you remove this interaction entirely, and therefore any sonic effect it might have! That said, I have absolutely no doubt that the Superchargers will preserve the tonal quality introduced by the relatively high levels of second and third harmonic distortion present in the output of a typical valve amplifier (and of many low-powered solid-state amplifiers built with an eye to tonal quality). I have no doubt about this because I tried it myself, by connecting the Superchargers to the output of an Altitude 3500SS (32-watts per channel). This is a lovely-sounding valve amplifier—but in my view too low-powered to be useful with anything but the most highly efficient loudspeakers—absolutely bloomed into usefulness with the addition of the 550ks, turning into the valve amplifier from hell… tubes with 'roid rage! Certainly no shortage of power, and still that beautiful valve sound.

I'd just about got around to finishing this review when I discovered that Musical Fidelity's even larger Superchargers, the 750ks, were about to be released in Australia (we still seem to lag on release dates down-under, despite the fact that I understand that most high-ticket audiophile items are now air-freighted) and I put my hand up to be the reviewer, but editor Greg Borrowman informed me that he was pulling rank, and that I'd already had my fun. Such is life.

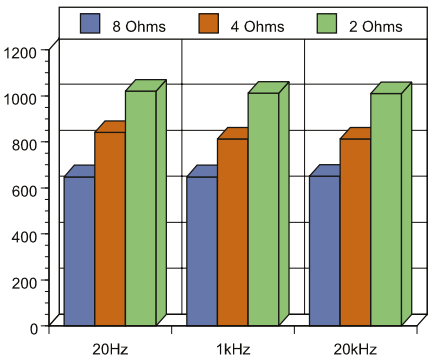
## Conclusion

If you've reached this point and are still wondering whether I've answered the question I promised to answer in the introduction: 'Do I need one?', you obviously haven't been paying attention. Of course you do!

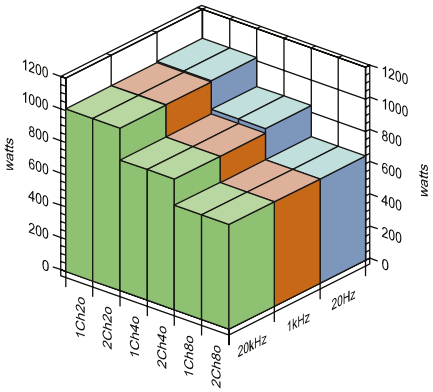
*Jutta Dziwnik*

## LAB REPORT

Readers interested in a full technical appraisal of the performance of the Musical Fidelity Supercharger 550k should continue on and read the LABORATORY REPORT published on the following pages. Readers should note that the results mentioned in the report, tabulated in performance charts and/or displayed using graphs and/or photographs should be construed as applying only to the specific sample tested.




Power Output: Musical Fidelity MF550k Supercharger driven into 8-ohm, 4-ohm and 2-ohm non-inductive loads at 20Hz, 1kHz and 20kHz.




Power Output: Single and both channels driven into 8-ohm, 4-ohm and 2-ohm non-inductive loads at 20Hz, 1kHz and 20kHz. (See copy). [Musical Fidelity 550k Pair.]


## Test Results

Due to the monobloc nature of the Musical Fidelity Supercharger 550k, *Newport Test Labs* tested only one of the two Supercharger 550ks that were used in the auditioning sessions. This is reflected in the abbreviated tabulated charts, which don't show channel separation, channel balance, interchannel phase and other 'two-channel' results, for obvious reasons. One exception is the three-dimensional power output bar graph, where the lab has 'doubled up' the figures it measured, so that power output results gained for the amplifier tested have been replicated as the 'other channel' to ensure the integrity of the graph.

As you can see, *Newport Test Labs*' test results for power output show that the 550k exceeded its rated output at all frequencies, and at all load impedances, by a healthy margin. Driven into 8Ω loads, it produced 648-watts (28.1dBw) at 20Hz and 1kHz and 650-watts (28.1dBw) at 20kHz. The asterisk alongside the 20kHz result (650-watts) result indicates that rather than clipping being the limiting factor at this frequency, the 550k's electronic protection circuit triggered. This circuit powers down the amplifier, requiring it to be switched off manually using the power switch, then turned on again. The electronic protection triggered only when the amplifier was delivering high-frequency, high-power outputs into 8Ω loads. It did not trigger when the amplifier was driving 4Ω or 2Ω loads. This indicated to me that the 'trigger' for the protection circuit is likely voltage rather than current. Driving 4Ω loads, the Musical Fidelity 550k delivered 841-watts (29.2dBw) at 20Hz, 812-watts (29.0dBw) at 1kHz and 20kHz. Driving 2Ω loads, the amplifier delivered just over one thousand watts right across the audio band. You'll note from the power output table that the figure in the dBw column is sometimes the same for different wattages. For example, in the 2Ω row, the three different 'watts' output levels are all shown as 30.0dBw. This is because the dBw figures are 'rounded' to one decimal place, which is insufficient to show the tiny differences recorded in the 'watts' columns. In fact, you should really ignore any difference in power output of 1dB or less, since it would be completely inaudible.

The harmonic distortion of the Musical Fidelity 550k at an output level of one watt, is shown into 8Ω (*Graph 1*) and 4Ω (*Graph 2*) loads. The first thing to note about these graphs is that the 'spike' at the extreme right-hand end of the graph was caused by the presence of a near-by TV monitor (it's the line-scanning frequency). It's so far down (–100dB) that it contributes less than 0.001% to the overall THD+N, so it could be ignored anyway, and in any event, it would not be present in a typical domestic installation at all!

As for the two small spikes at the left of the graph (not counting the first and tallest one, which is the test signal!), they're second and third harmonic distortion components (sometimes written at $HDL^2$ and $HDL^3$). In *Graph 1*, they're both around 100dB down. These would be completely inaudible but, even if they were, would tend to make the sound 'richer' rather than being audible as distortion *per se*. In *Graph 2* the first two components are slightly higher, but still both below –90dB (0.003%) and so the same 'inaudible' comment applies. You can see they've been joined by two additional harmonic distortion components, the $4^{th}$ (at –110dB) and $5^{th}$ (–100dB). Again, these are two low in level to be audible, and still low enough in 'order', that they, too, would make the sound seem 'richer-sounding'… if they were audible.

At very high output levels (and remember that we're talking 550-watts in the case of *Graph 3*, and 750-watts for *Graph 4*!), there's a lot more distortion in the output of the 550k, and also quite a bit of high-order harmonic distortion (both graphs show harmonics out to the $17^{th}$. In both graphs, the higher-order harmonics are 'odd' (seventh-order, ninth-order, eleventh-order), however, even though these would sound harsh if they were audible, the fact that they're so low down in level means they would be inaudible. The overall THD+N figures were measured at 0.01% at one watt and 0.004% at rated output. Both are better than specification.

The Musical Fidelity 550k's frequency response across the audio band was measured into both a standard non-inductive laboratory resistor and into a load simulating that of a 'typical' two-way bookshelf loudspeaker. Both traces are shown in *Graph 5*. You can see the response into the 8Ω resistor is for the most part ruler-flat across the audio band: note that the divisions on the graph are spaced at 0.2dB intervals, so from the very top of the graph to the very bottom is only 2dB. The low-frequency response starts rolling off at about 50Hz to be 0.06dB down at 20Hz, 0.2dB down at 9Hz and 0.7dB down at 5Hz. At high frequencies, the response starts rolling off at 5kHz, to be 0.18dB down at 20kHz. I can't emphasise enough that these tiny 'roll-offs' are visible only because of the enormously expanded vertical scale of this graph. If these traces were shown on a more conventionally-scaled graph, with 1dB or 5dB intervals, the roll-offs would not be visible. As it is, the 'normalised' frequency response measured by *Newport Test Labs* is 20Hz to 20kHz ±0.09dB, which is not only excellent, but also better than Musical Fidelity's own specification for the 550k. (The second (red) trace on this graph shows the amp's response into a typical loudspeaker and you can see that there's a little more variation in level, but the overall

response in numerical terms, is identical: 20Hz to 20kHz ±0.09dB.) As well as being extraordinarily flat, the 550k's frequency response is also extended, with the overall bandwidth of the 550k extending from 4Hz to 75kHz –1dB and from 3Hz to 150kHz –3dB.

Signal-to-noise measurements revealed excellent performance, though *Newport Test Labs'* measurements fell a little short of MF's specification, with the lab reporting a figure of 115dB A-weighted referred to rated output for the line input, for example, compared to Musical Fidelity's specification of 120dB under the same conditions. (Musical Fidelity's specification for the speaker input is 115dB.) The line input also proved a little more sensitive than specification, requiring just 90mV for an output of 1-watt and 2.1-volts for an output of 550-watts. Speaker input sensitivity for rated output was 31-volts, so you'll need to connect an amplifier rated at more than 20-watts per channel before the 550k will deliver its rated output.

The output impedance of the 550k was measured at 0.039Ω at 1kHz, which means the damping factor is a very high 576, so the 550k should have excellent control over even the largest and heaviest bass drivers. The square wave performance is excellent. On the 100Hz wave there's a slight tilting that shows the response does not extend to d.c. and the slight roll-off tabulated in the performance tables, but there is no evidence of low-frequency phase shift. The 1kHz result is perfect: like it came direct from the signal generator that created it. Look at the 'flatness' of the horizontals and the right-angles created where the verticals join. Wonderful. The 10kHz square wave shows slight rounding on the leading edges, and you can see the rise-time limitations, but overall, it's a very good-looking waveform, and beautifully symmetrical. The amplifier is obviously unconditionally stable, as you can see from its performance into a highly reactive load. There is a substantial initial overshoot (about half wave height) but it's damped to just half this within the first cycle and is completely damped within three cycles.

The Musical Fidelity 550k is powerful, but it's also power-hungry, consuming nearly 1,000-watts from the mains when it's operating at full power, so a pair would be consuming just shy of 2,000! Things are much more sedate when the amplifier is idling, but the power consumption is still high enough that it's a good thing that Musical Fidelity has included automatic power switching: it'll keep your power bills down. My take on its performance? This is a very well-designed amplifier that is well-protected against potential fault conditions and has excellent measured performance.

*Steve Holding*

| Musical Fidelity Supercharger 550k Monobloc Power Amplifier - Power Output | | | | | | | |
|---|---|---|---|---|---|---|---|
| Channel | Load (Ω) | 20Hz (watts) | 20Hz (dBW) | 1kHz (watts) | 1kHz (dBW) | 20kHz (watts) | 20kHz (dBW) |
| 1 | 8Ω | 648 | 28.1 | 648 | 28.1 | 650* | 28.1* |
| 1 | 4Ω | 841 | 29.2 | 812 | 29.0 | 812 | 29.0 |
| 1 | 2Ω | 1,020 | 30.0 | 1,012 | 30.0 | 1,010 | 30.0 |
| Note: Figures in the dBW column represent the output level, in decibels, referred to one watt output. *Fuse Protection | | | | | | | |

| Musical Fidelity Supercharger 550k Monobloc Power Amplifier | | |
|---|---|---|
| Test | Measured Result | Units/Comment |
| Frequency Response @ 1 watt | 4.0Hz–75kHz | –1dB |
| Frequency Response @ 1 watt | 3.0Hz–150kHz | –3dB |
| THD+N | 0.01% / 0.004% | 1 watt/rated o/p |
| S/N Ratio (unweighted/weighted) | 80.0dB/87.0dB | dB re 1 watt output |
| S/N Ratio (unweighted/weighted) | 107.0dB/115.0dB | dB re rated output |
| Input Sensitivity (CD input) | 90.0mV/2.1V | (1 watt/rated o/p) |
| Output Impedance | 0.039Ω | OC = 2.8535V |
| Damping Factor | 576 | @ 1kHz |
| Power Consumption | N/A/48 watts | Standby/On |
| Power Consumption | 68 watts /992 watts | 1-watt/Rated op |
| Mains Voltage Variation | 238–252 volts | Min–Max |

"This is a very well-designed amplifier that is well-protected against fault potential conditions and has excellent measured performance."