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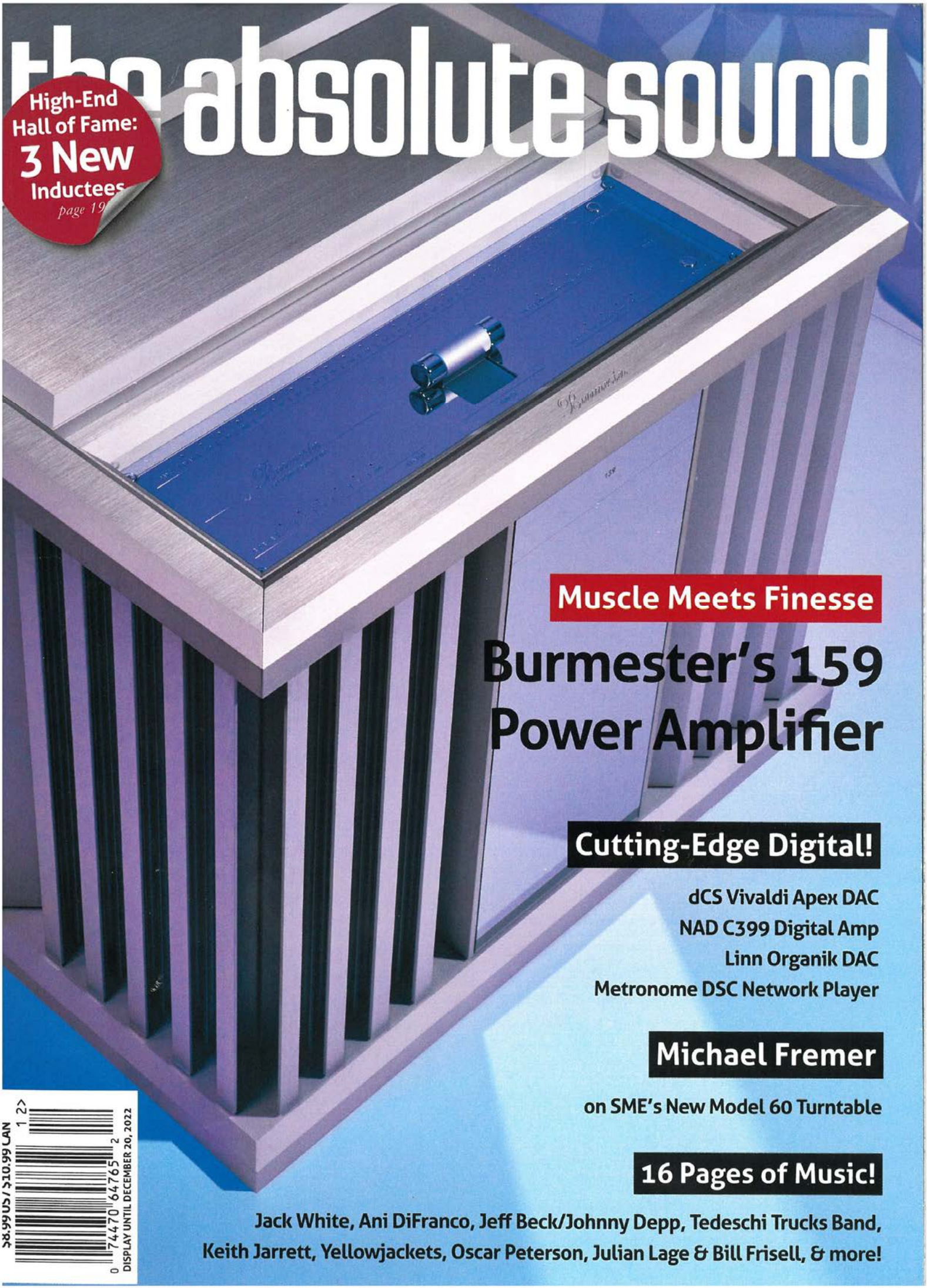

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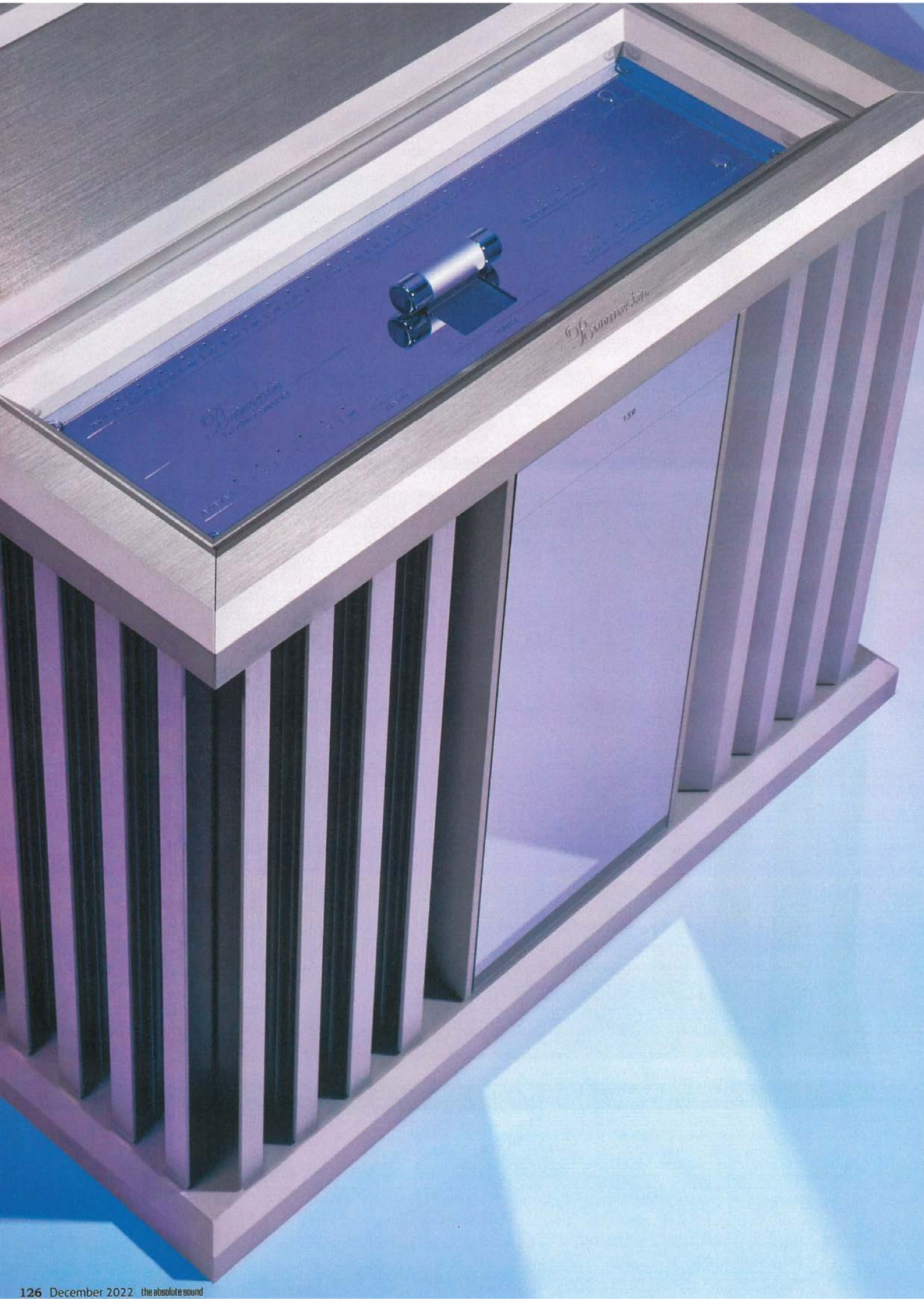
MORE THAN MEETS THE EYE

Burmester 159 Monaural Power Amplifier

by Robert Harley

photography by Matt Wright-Steel


159



EVERYTHING ABOUT BURMESTER'S

flagship 159 monaural power amplifier is extreme. First is the amplifier's sheer size, weight, and appearance. Measuring roughly 21" x 26" and 16" high, the 159's massive form factor defies convention. The stunning industrial design is adorned with beyond-lavish casework. Then there's the weight of 396 pounds per amplifier. Don't forget the massive output power of 1400W into 4 ohms, with the ability to deliver a whopping 17A of continuous current with 72A peaks. Finally, there's the amplifier's breathtaking price of $350,000 per pair, making the 159 the most expensive amplifier I'm aware of. The 159 is something you have to see firsthand to appreciate. It is visually awe-inspiring.

The 159's proportions and vertical heatsink columns are reminiscent of the Parthenon. A massive top panel, nearly the width and depth of the amplifier, slides back to reveal the amplifier's power switch and controls, along with a long row of LEDs set in chrome that display the setting of the amplifier's variable damping factor. This unusual feature, described in detail in the technical sidebar, allows the user, via a rear-panel knob, to change the damping factor from 102 to 3895 in 23 discrete steps (these damping factor values are specified with a 4-ohm loudspeaker; double them for an 8-ohm speaker). With the top panel in its fully forward position, you'd never know that the panel isn't simply the amplifier's top plate. As befitting a product of this price and sophistication, the heavy aluminum panel glides smoothly in its track, like closing a bank-vault door. The power on/off switch, located beneath the panel, is in keeping with the amplifier's mega-luxury vibe; the switch is a large round bar whose size and shape would be at home as the master switch on an electrical breaker panel—except that this power switch is custom machined from aluminum and adorned with chrome accents. Throwing the switch takes a bit of effort, but the switch's feel and solid "thunk" when thrown are rewarding—it's like no other power switch in high-end audio. A second row of LEDs beneath the top panel indicates the amplifier's status—on, standby, start-up, error, etc. The 159 features the German company's characteristic chrome finish but only as accent; most of the casework is finished in a more subtle matte aluminum. Astonishingly, there isn't a single fastener, bolt, or screw visible anywhere on the chassis.

Around back, the 159 has a balanced input jack along with a balanced pass-through output. This pass-through output provides an easy way of connecting a second 159 for bi-amping. The speaker binding posts are massive custom devices that operate differently from any other posts I've seen. You remove the post's cover, insert the spade through a slot in the cover, and then put the cover back on the post and tighten the outer clamp. This makes for a very secure connection that can't come loose the way spades on other posts can. The large rear-panel knob mentioned earlier allows the user to adjust the damping factor in 23 steps. A pair of jacks provides connection to other Burmester components via the BurSync link for one-button system turn on and off, as well as for synchronizing the amplifiers' output impedances. If you have other Burmester components with a remote control, you can turn the 159 on and off from the remote as well as adjust the auto-shut-off delay time, switch between variable and fixed damping factor, and other functions. Burmester claims that the 159 can reach its optimum operating temperature just 90 seconds after turn-on. A patented thermal monitoring system, along with an analog computer, maintains the output transistors at the ideal temperature regardless of the load or operating level. My experience suggests that solid-state amplifiers sound better and better as they get hot, leading to my habit of turning on power amplifiers a couple of hours before a listening session. The claimed 90-second warmup time is amazing, if accurate.

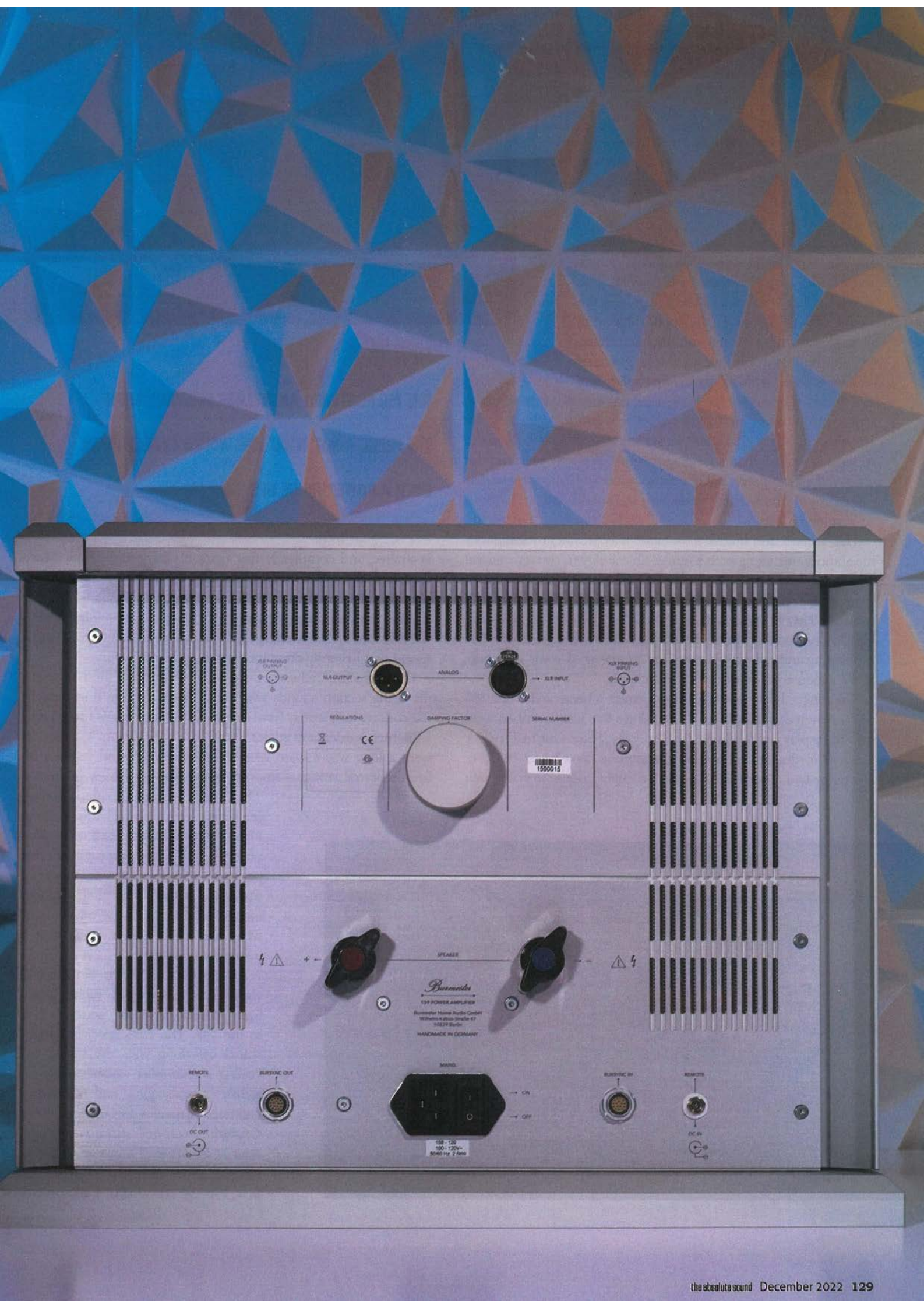
Burmester Audiosysteme was officially founded in 1978, less than a year after Dieter Burmester began building a preamplifier in his garage and selling it through word of mouth. The company steadily grew into one of Germany's largest high-end manufacturers. Burmester has had a long partnership developing automotive audio for Mercedes and Porsche, and just announced that they will be designing and supplying the audio systems for Ferrari. Burmester has 100 employees in its 44,000-square-foot Berlin headquarters and factory.

AS MUCH AS ONE TRIES NOT TO PREJUDGE A PRODUCT BASED ON ITS DESIGN VISUAL APPEARANCE OR BRAND REPUTATION ONE CAN'T HELP HOLDING A CERTAIN SET OF EXPECTATIONS OF HOW A PRODUCT WILL SOUND.

LISTENING

Given the 159's size, weight, price, and exclusivity, I was invited to audition the amplifier at the Scottsdale, Arizona, showroom of retailer LMC Home Entertainment (Legendary Music and Cinema). At LMC, I listened to the 159 in two different systems, one of them featuring my familiar long-time reference loudspeaker, the Wilson Audio Chronosonic XVX with a pair of Wilson SubSonic subwoofers. In the second system, the 159s drove Burmester's flagship BC350 loudspeaker. I'll cover the BC350 ($375k per pair) in a subsequent issue. Both systems were sourced by a familiar digital front-end, the Linn Klimax DSM server with the Organik DAC. I happen to have a DSM in my home system at the moment (see my review elsewhere in this issue) and am familiar with its sound. Both systems included Burmester preamplifiers. Although I had many fewer hours with the 159 than I normally would with an amplifier under review, I felt that I had sufficient time with the product, and with familiar associated components (particularly the XVX), that I could take the 159's measure. I spent one day with the 159 driving the Wilson XVX, and a second day with the 159 partnered with the Burmester BC350 loudspeaker.

There's a general belief in the high end, not entirely unfounded, that massive dreadnought power amplifiers are good at bombast but lack subtlety, delicacy, and the ability to express musical intimacy. It's the small, featherweight amplifiers that best reproduce small-scale music, the conventional wisdom holds. That assumption was immediately turned on its head when listening to the 159. Right from the first track, the 159 surprised me. As much as one tries not to prejudge a product based on its design, visual appearance, or brand reputation, one can't help holding a certain set of expectations of how a product will sound. The 159 not only defied those expectations, but the amplifier's sonic character was the antithesis of my sonic expectations from such a massive dreadnought de-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The 159s driving the Wilson Audio Chronosonic XVX at LMC Home Entertainment. (Photo courtesy of LMC Home Entertainment.)

sign. The very first words in my extensive listening notes, written at the conclusion of the first track, are "liquid, lush, warm, completely grain-free, gentle, musical, not hi-fi-ish. Subtle and refined."

On this first track, from Melody Gardot's *Sunset in the Blue*, her voice had an ethereal beauty and warmth that was relaxed and inviting. The texture of her vocal, the subtle strings, and the solo trumpet set back in the soundstage were all rendered with a natural and organic timbre, with no hint of solid-state hardness, grain, or stridency. That "whitish" patina that solid-state amplifiers often superimpose on tonal colors was completely absent, contributing to the 159's seductive warmth. Moreover, the 159 had a laid-back character that set her voice slightly back in the soundstage rather than sounding forward or overly present. Her voice was still palpable, but in a more subtle and intimate way that caused me to immediately relax into the sound. We were off to an auspicious start.

This relaxed and intimate character was prevalent throughout the auditioning, along with a remarkable ability to convey musical expression and intent. The delicate phrasing of Pat Metheny's spare guitar work on the beautiful piece "September Fifteenth" from *As Falls Wichita, So Falls Wichita Falls* was full of emotion. The 159 presented the music with a gentleness and grace that was captivating and involving. It was the antithesis of sonic fireworks at the expense of musical communication.

The longer I listened the more apparent it became that the 159 was a very special amplifier. The qualities I've just described were on full display on "I Guess I'll Hang My Tears Out to Dry" by Dexter Gordon from his 1962 masterpiece *Go* (Qobuz 192/24). His tenor had a warm and burnished quality, dense in color, rich in timbre, and completely free from mechanical artifacts. More than that, the 159 conveyed the expressiveness of his sensitive phrasing combined with his robust tone. Billy Higgins' delicate cymbal work on this track was finely textured and natural, with a full measure of treble energy but without a whitish edge. It was a sound that instantly drew me into the performance.

THE 159 FOSTERED AN INTENSE INTIMACY WITH THE MUSIC—NOT WHAT ONE WOULD EXPECT FROM SUCH A POWERHOUSE DESIGN.

Hearing a live orchestra throws into sharp relief how different the string section sounds when reproduced by a hi-fi system. In the concert hall, strings have an ethereal beauty that is turned into a brighter, harder, and edgier sound by a hi-fi system. Yet the 159 went a long way toward recreating the delicacy and warmth of live orchestral strings—smooth, liquid, and absolutely gorgeous. The metallic sheen that often overlays the string section simply wasn't there. Here was an absolute beast of an amplifier—1400W and nearly 800 pounds per pair—with a delicacy and liquidity that belied its heft. The 159 fostered an intense intimacy with the music—not what one would expect from such a powerhouse design.

Moving on to more dynamically challenging music and higher playback volume revealed another side to the 159. The 159's special qualities scaled up along with the music, revealing an amplifier capable of spectacular soundstaging and seemingly unlimited dynamics. On the track "*The Cowboy's* Overture" from *John Williams at the Movies* (Qobuz 96/24, also available from Reference Recordings as a 176/24 download), I discovered

Specs & Pricing

Type: Class A/B solid-state amplifier
Output power: 1400W into 4 ohms
Pulse power: 2600W into 4 ohms (CEA)
Continuous/peak current: 17A/72A
Power bandwidth: 410kHz (–3dB)
Slew rate: 160V/µs
Harmonic distortion: 0.00039%, 50W output, 4 ohms, 22kHz
Signal-to-noise ratio: >120dB
Input sensitivity: 750mV
Damping factor: 102–3895 (4 ohms), variable in 23 steps
Dimensions: 523mm x 415mm x 660mm (20.6" x 16.34" x 26")
Weight: 180kg (396 lbs.) each
Price: $350,000 per pair

BURMESTER AUDIOSYSTEME GMBH
Wilhelm-Kabus-Straße 47
10829 Berlin Germany
49 30 787 968 0
burmester.de

RUTHERFORD AUDIO (U.S. Distributor)
14 Inverness Drive East, Unit G-108
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that the upper midrange to lower treble region sounded less forward and prominent than I'm used to from this track. The brass and woodwinds were just a little less upfront, but this laid-back character didn't rob the instruments of their presence and palpability. Rather, it reflected the complete absence of the glare and hardness that so often overlays these instruments and gives them a forward and aggressive character. I was able to listen at higher volume without the big brass tuttis offending my ears. The 159 was the antithesis of a hyped hi-fi sound; instead, it was gorgeous in its timbral liquidity and utterly realistic tone colors. The track also showcased the 159's stunning spatial presentation. Not only was the soundstage immense, but the amplifier clearly delineated individual instruments and the space between them, all within the halo of the surrounding acoustic.

Another track that revealed the 159's superb spatial presentation was from Rutter's Requiem on Reference Recordings—a piece I've played on just about every product I've reviewed in the last 25 years. Through the 159, the soprano was perfectly placed within the acoustic, and when the chorus came in, the soundstage opened up with an enveloping panorama.

The 159's bass exhibited tremendous grip and authority, reproducing the most challenging music with effortless authority. Kick drum had visceral impact and "center-of-the-earth" solidity. Bass textures were beautifully resolved, as well (listen to the superbly recorded solo acoustic bass of Brian Bromberg on his album *Wood*). The 159 revealed all the nuances, textures, and dynamic shadings that contributed to the impression of hearing a live instrument. On the powerful rhythmic drive of Talking Head's *Speaking in Tongues*, the 159 was as hard driving and rhythmically upbeat as I've ever heard this recording sound.

This was true even with the damping factor set below the maximum value. I first listened to the 159 with the damping factor in the position set by LMC Home Entertainment when they initially set up the system with the Wilson XVX. After a couple of hours listening in this setting (about midway in its range), I experimented by listening to different damping factors. It was a unique opportunity to hear exactly the effect of damping factor on specific sonic qualities. The very lowest settings were non-starters for me; the bass sounded slow and the rhythms plodding. Yet the highest settings sounded a bit too "tight" and restrained. The highest damping factors lacked ultimate body and warmth and didn't have quite the same level of whole-body involvement as the lower settings. The higher damping factors appealed more to the intellect, the lower settings to the more primal parts of the brain. After much listening to different settings, I ended up preferring a setting about two-thirds of the way up toward maximum—right about where the store's personnel had set it when installing the Wilson XVX loudspeakers.

DESPITE THE 159'S GREAT REFINEMENT IT CAN DELIVER THE MOST BOMBASTIC OF MUSIC OR HARD-DRIVING RHYTHMS WITH ABSOLUTE AUTHORITY AND EASE.

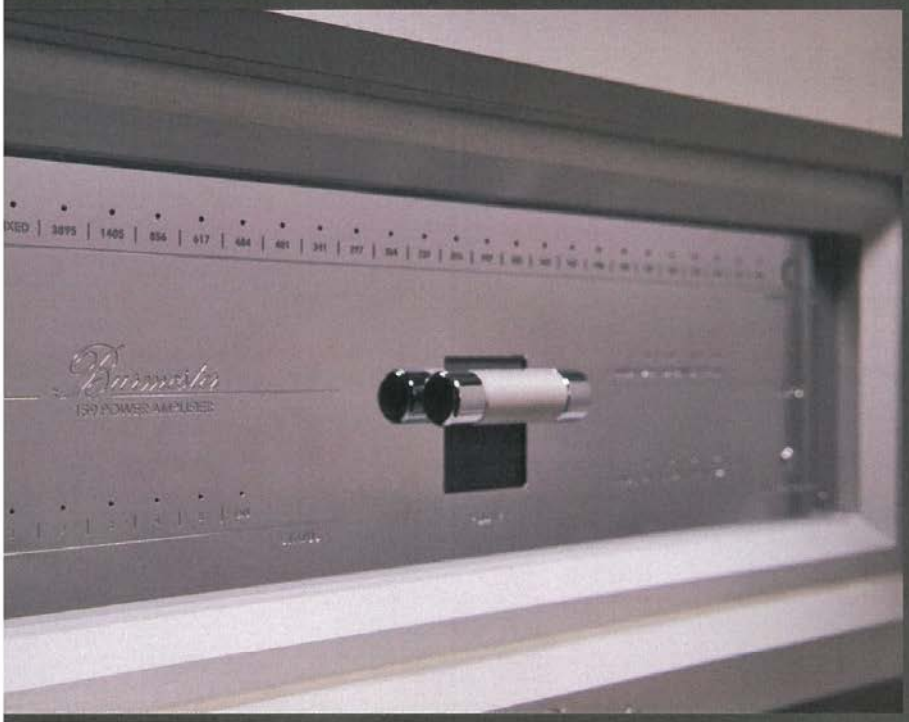
CONCLUSION

The Burmester 159 belongs in the pantheon of the world's greatest power amplifiers. The industrial design, build-quality, and fit 'n' finish are stunning. But those qualities alone don't make a great amplifier. What distinguishes the 159 is its utterly realistic presentation, particularly in its smoothness and liquidity of timbre. At first listen, the 159 has a somewhat darkish balance compared with most amplifiers, with a midband and treble that favor ease over the last measure of palpability. But to my ears, this character is the result of a lack of hardness and grain, not a deviation from neutrality. This is an amplifier that conveys musical expression with a warmth and intimacy rather than hi-fi flash. The 159 draws you into the musical performance, not into the sound. The palpability and believability of images results not from a forward or aggressive sound, but rather from its subtlety. It's also an amplifier that allows you to listen at high levels for long periods without fatigue.

Despite the 159's great refinement, it can deliver the most bombastic of music, or hard-driving rhythms, with absolute authority and ease.

Components that try too hard for immediacy or "impressive" sound may be superficially appealing during a brief listen, but over the long run they lack the ability to foster a feeling of intimacy with the music. The Burmester 159 doesn't fall into that trap. The 159 has a delicious refinement and delicacy yet is an absolutely unflappable powerhouse that is unchallenged by any music at any playback level. It's an addicting combination that only a few fortunate music lovers will experience.

Technology



THE 159'S DIRECT-COUPLED CIRCUIT is fully balanced throughout. The output stage is two separate amplifier channels that are bridged to create a monoblock. In this operation, each output-stage channel is driven by half the balanced signal, with the speaker connected between the two channels (the "bridge") so that the amplifier operates as a single channel. This is a very different way to connect an amplifier than is typical, where the speaker's negative terminal is connected to the amplifier's ground reference.

The output stage consists of 24 output transistors per "channel," for a total of 48 per amplifier. The transistors are mounted on a pair of massive solid-copper heatsink blocks that run vertically on each side of the amplifier. I was shown one of these output-stage modules that had not been installed in a chassis—it's an impressive piece of engineering. Burmester chose copper for the heatsink because copper conducts heat much faster and more efficiently than aluminum. (Copper's thermal conductivity is 60% higher than that of aluminum.) This characteristic isn't useful only for sinking and dissipating heat from the output transistors; the higher thermal conductivity also helps keep each transistor at the same operating temperature—there's less temperature variation over the heatsink. Maintaining all the output transistors at the same temperature is vital to the goal of having each transistor perform identically so that they "speak with one voice." In addition to the usual convection cooling, the 159 employs heat pipes to cool the output transistors.

As you can imagine in an amplifier of this power rating (not to mention the 48 high-current output transistors per chassis), thermal management is an important aspect of the design. Indeed, the 159's thermal-management system is the subject of two Burmester pending patents. According to Burmester: "The quiescent current [*the output-stage bias current—RH*] is regulated on the basis of a very precise temperature measurement during the heating phase (by means of a circuit arrangement for which a patent is pending), which results in a 'sonically settled' state after only a few minutes. To stabilize the operating points, these control processes must intervene in the circuit in a galvanically isolated and potential-free manner, which happens via a circuit with a high-frequency transmission, also patent-pending, which in turn works without feedback on the audio range."

Safe operating control of the output stage is handled by what Burmester calls an "analog computer." Burmester wanted to keep the chassis free from any digital circuitry and from the noise that circuitry inevitably creates, thus the analog nature of this sub-system. I'm not sure how it works, but it involves monitoring the temperature of each of the 48 output transistors via an extra pair of leads on each of the transistors (the output transistors have five leads rather than three) that send temperature information to the "analog computer."

The power supply is built to handle the absolute maximum power that can be drawn from a domestic wall outlet, with a power transformer rated at 1.5kVA, filtered with 200,000µF of reservoir capacitance.

Finally, there's the 159's variable damping factor—a feature I've never seen on an amplifier. Damping factor is a unit-less number that refers to the amplifier's ability to control woofer motion once the drive signal has stopped. Damping factor is directly related to the amplifier's output impedance. In fact, damping factor is another way of specifying an amplifier's output impedance (provided you also specify the loudspeaker's load impedance). The higher the damping factor, the lower the amplifier's output impedance.

More precisely, damping factor is the ratio of

the amplifier's output impedance to the loudspeaker's load impedance. Technically, the speaker cable's resistance should be added to the equation. But ignoring the speaker cable's resistance for now, if we have a power amplifier with an output impedance of 0.1 ohms driving a loudspeaker with a nominal impedance of 8 ohms, the damping factor is 80 (8 divided by 0.1).

A high damping factor (800, say) is associated with tight and punchy bass, minimal bass overhang, and superior bottom-end transient fidelity. (Damping factor primarily affects frequencies below 150Hz.) Such an amplifier would have a very low output impedance—in this case, 0.01 ohms with the amplifier driving an 8-ohm loudspeaker. This amplifier would exert an iron-fisted control over the woofer's motion, conceptually "applying the brakes" to the woofer cone's motion after the drive signal has stopped, counteracting the woofer cone's inertia and the resonance of the air within the speaker enclosure.

By contrast, an amplifier with a high output impedance has very little ability to control such woofer motion. For example, tube amplifiers typically have an output impedance of at least 1 ohm, and sometimes as high as 4 ohms. Single-ended triode amplifiers may have even higher output impedances. Let's calculate the damping factor of an amplifier with a 4-ohm output impedance driving an 8-ohm speaker. Dividing 8 (speaker impedance) by 4 (amplifier output impedance) we get a damping factor of just 2.

A high damping factor explains why solid-state amplifiers generally have tighter and more controlled bass than tube amplifiers. The bass from tube amplifiers is typically warmer, softer, and less incisive than that of transistor amplifiers. The tube amplifiers' higher output impedance is the primary reason (along with the need for an output transformer).

Class D (switching) amplifiers can have vanishingly low output impedances—0.002 ohms for example. These amplifiers are known for their extremely powerful, punchy, and tight bass performances. An amplifier with this low an output impedance has a damping factor of a whopping 4000 when driving an 8-ohm speaker.

Returning to the Burmester 159, the amplifier provides an adjustment for the listener to choose one of 23 damping factors, ranging from 102 to 3895. These damping factors are specified with a 4-ohm speaker; double these damping factors for an 8-ohm load.

Note that changing the amplifier's output impedance does more than just affect the amplifier's ability to control woofer motion. An amplifier with a high output impedance driving a loudspeaker whose impedance varies with frequency (as they all do) will result in a deviation from flat frequency response if the amplifier's output impedance is high enough. The higher the amplifier's output impedance, and the greater the variation in the loudspeaker's impedance over the audio bandwidth, the greater the frequency-response deviation from flat. This is why the tonal balance of some tube amplifiers varies so dramatically when driving different loudspeakers; the amplifier's output impedance interacts with the speaker's varying impedance to create frequency-response shifts.

Upon learning that the 159 offers variable damping factor (variable output impedance), my first question was "Why?" Isn't a higher damping factor always preferable? Burmester had this to say about its approach: "The tonal influence of a damping factor and the interaction of the power amplifier with the respective connected loudspeaker has been known for a long time and is also often a tried and tested 'tuning tool' in the high-end scene. Therefore, more than ten years ago our engineers made an attempt to find an ideal damping factor for different loudspeakers, with the result that the influence of interactions was too great to settle on one value. So, the conclusion was the idea of an adjustable damping factor, and here the results of listening tests were overwhelmingly positive. Now, it was necessary to implement this idea in a way suitable for series production and to stabilize it under all operating conditions. Especially with linearity, phase reserve, and changing load situations, as well as with very complex impedances this can be a big challenge."

In other words, Burmester has found that some listeners prefer a sound that has a bit more warmth and body in the bass, even at the expense of ultimate transient fidelity. The variable damping factor allows the listener to fine-tune the system specifically to the speaker and taste. As you can read in my listening description, Burmester is on to something by providing this feature; I found that a damping factor lower than the maximum had its virtues. tas