Brinkmann Nyquist

STATE-OF-THE-ART DAC WITH FIELD-UPGRADABLE ARCHITECTURE

Digital so good... only an analog expert could make it

Elegance. Precision. Heirloom Build Quality and State-of-the-Art Performance. These are the hallmarks of Brinkmann Audio. Now, thirty years after the introduction of their first Digital-to-Analog Converter, Brinkmann Audio proudly introduces "Nyquist", the world's most advanced DAC. Authored by the newly expanded Brinkmann design team, "Nyquist" sets new standards in convenience, sonic excellence and lasting value.

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1986: Brinkmann's first DAC - The Zenith

Although Brinkmann is justly renowned as a designer and manufacturer of State-of-the-Art analog components, the company's first DAC, "Zenith", debuted in 1986 and still enjoys a devoted cult following. For Helmut Brinkmann, the development of "Zenith" demonstrated the importance of analog circuitry and passive filter implementation in the design of high end digital components. Everything Brinkmann learned with "Zenith" - combined with three decades of subsequent engineering experience - has resulted in "Nyquist": the culmination of Brinkmann's vast audio design expertise.

When Brinkmann Audio started exploring digital audio again after more than 25 years, they wanted to address three key basic requirements:

- Longevity
- Ease of use
- Quality

1. Longevity

Product longevity is a particular challenge in digital audio because of the ever-changing formats, standards and interfaces. Fortunately, there is also a relatively simple and straightforward solution.

FIELD-UPGRADEABLE MODULE

Besides the capability to perform Software updates, Brinkmann designed the digital section of the Nyquist as a field-upgradeable Module that may be user exchanged. When a new hardware standard launches or a new DAC chip or DSP technology offers a significant leap in performance, Brinkmann will be able to offer these state-of-the art improvements to all of their customers. The digital module includes the digital connections, the processors and DAC chips, including their bespoke power regulators.

2. Ease of use

With digital audio there are myriad possibilities which can influence the signal. Using different filters is just one of them.

FILTERS

Brinkmann have decided to keep it simple, so customers can focus on the musical experience rather than fumbling with different properties of the product. That's why Brinkmann chose to pre-select one filter per format. The much bigger question in digital audio is the playback transport. If you are not using a CD transport or a purpose-made music server, there are many possibilities, with few of them being user friendly.

ROON-READY

Besides the possibility to stream to the DAC (via the mConnect App, for example), Brinkmann decided to support 'Roon music player' because it offers some of the excitement that we experience when browsing our vinyl or CD collection. Together with its user-friendly remote control, Roon is starting to become a de-facto standard supported by many digital audio companies. The Nyquist is a roon-ready endpoint (certified) and hence can stream directly from any roon core server on the network.

3. Quality

AT BRINKMANN AUDIO, "QUALITY" REFERS TO BOTH SOUND QUALITY AND BUILD QUALITY

The Nyquist is manufactured to the same high standards as other Brinkmann products, namely, turntables and electronics. Meticulously hand-assembled in Germany from the finest parts available, every product runs through a series of rigorous quality assurance processes. Since some of the components, like the Telefunken tubes, are NOS (New Old Stock), they are tested individually and pair-matched to ensure that every Nyquist lives up to Brinkmann Audio's ultimate quality standards.

UNIQUELY NATURAL AND ORGANIC ANALOG SOUND

During the research and development period, Brinkmann's main reference for Nyquist's Sound Quality were Brinkmann turntables, as they feel their 'tables achieve a uniquely natural and organic analog sound.

BRINKMANN DNA

Brinkmann designed Nyquist to share its "Brinkmann DNA" . Their approach to audio quality is at once simple and rigorous: they want their products to serve as tools for customers, to deliver as much of the musical experience to them as possible.

BRINKMANN CALL THE NYQUIST THEIR "ANALOGUE D/A CONVERTER" BECAUSE THEY EMPLOYED A HOLISTIC APPROACH IN ITS DEVELOPMENT

They do not distinguish between the digital and analogue parts of the circuit, but look at the whole product as one analogue circuit with all the consequences. For example, Brinkmann's spend the same, if not more, effort on the power supply for the digital parts of the circuit as they do for the analogue parts. Brinkmann scrutinize every single component and its influence upon the sound.

BRINKMANN'S BELIEF IS THAT HUMAN HEARING COMBINES THE LISTENERS' MEMORIES WITH THE ACTUAL SOUND

If, for example, one hears a violin through an old tube radio, it still might

transport a lot of emotion, because our memories complement the sound we hear.

Any kind of distortion interferes with that experience. Assuming a circuit design that fulfils all the basic technical requirements, those distortions often come from resonances in the various components (especially capacitors) and via the signal processing in the DSP.

HELMUT BRINKMANN'S VAST EXPERIENCE WITH RESONANCE TUNING IS AS IMPORTANT FOR THE NYQUIST DAC AS IT IS FOR THEIR STATE-OF-THE-ART TURNTABLES

In the Nyquist, the careful selection of materials for the chassis and the Black Granite base offer superb resonance control and are chosen for their positive influence upon the sound. The chassis is also optimized for heat dissipation, which greatly extends the life of Brinkmann's Class A circuitry and tubes as well as maintaining ideal operating temperature.

The analog signal that comes out of the digital module passes through a pair of Lundahl transformers to filter high frequency distortion; in order to prevent sonic coloration, this is the only filter used in the analog circuit.

DEDICATED HEADPHONE OUTPUT

The Nyquist also features a headphone output. The analog signal for the headphone follows the same signal path, with all the benefits described above, including the tube output stage. The gain control is being switched to maximum, 10dB, and feeds the signal through a chip for the headphone volume control and from there into the headphone driver.

ON THE SIGNAL PROCESSING AND D/A CONVERSION SIDE, BRINKMANN HAVE PUT EMPHASIS ON THE FOLLOWING THREE ITEMS:

- Optimal signal path for every format (DSD vs. PCM vs. MQA)
- Timing accuracy
- Ultra-low phase noise clocks for low jitter

Since PCM and DSD are two very different formats, Brinkmann have decided to engineer individually optimized signal paths for every format.

DSD FORMAT

In the Nyquist, DSD is not converted to PCM, rather, after a very precise re-clocking, it is sent directly to a discrete (i.e., non-IC) DSD DAC followed by a soft analog filter in order to reduce the high frequency noise inherent in a DSD signal. This analog filter has been carefully optimized: it is steep enough to reduce the noise energy to a level that will not impact the audio components which are "Downstream" in the playback chain, but not too steep, as Brinkmann take great pains to preserve the air and openness of sound for which DSD is famous. Brinkmann employs relays to switch between the PCM and DSD signal path because relays work without loss.

Brinkmann have been testing several DSD DAC-Chips, but once you have heard the ease of the sound of a discrete DSD DAC, no chipset can compare!

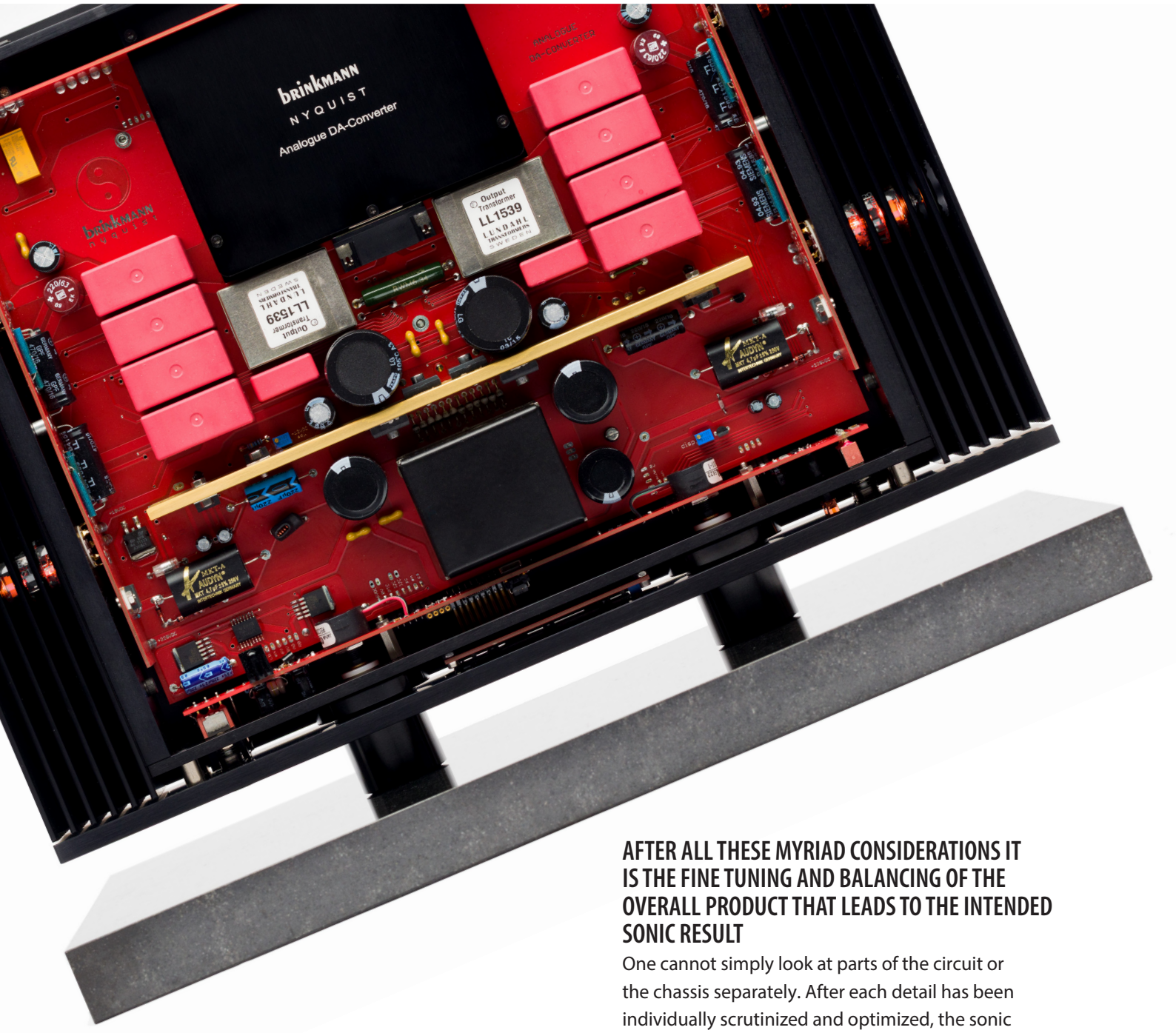
PCM & MQA FORMATS

The PCM and MQA signal paths differ only in signal processing that is being applied, as MQA is essentially PCM, with special reconstruction algorithms being applied. All PCM and MQA signals are up-sampled to 8x (i.e. 352.8kHz or 384kHz). This is being done in a powerful Processor with 16 processor cores, which also handles the MQA decoding. The up-sampled signal is then being re-clocked and sent to two ES9018S Sabre DACs: one for each channel. The ES9018S consists of 8 DACs each, which are combined for each channel to achieve the best possible result. The ES9018S is a very powerful chip, which has been designed to build systems with a minimum need for additional components. So it includes a digital PLL, various up-sampling filters and many more features. Brinkmann are using the ES9018S purely as a DA converter and hence have switched off all the additional features. The filtering, i.e. up-sampling, is being done in a separate processor, which is much more powerful. The jitter is being taken care of by Brinkmann's re-clocking circuit. Brinkmann took special care in designing power supplies for each of the various circuit parts inside the ES9018S. Even the clock-frequency of the ES9018S, which is variable, has been optimized for the best sound. The clocks are ultra-low phase noise units, specifically designed for High Definition audio and placed in extremely close proximity to the DAC Chips in order to reduce jitter to a minimum.

The signal processing, i.e. up-sampling and rendering, is accomplished with special emphasis on timing accuracy. The up-sampling filters that are used for PCM cancel pre-ringing and are optimized for a short impulse response. Both are important parameters to avoid typical digital effects and listening fatigue. MQA finally provides the possibility to reduce time smear, i.e. distortion of the timing of the signal, to a minimum. The MQA algorithm parameters have been optimized for the Nyquist with hours of test material in order to achieve the best results.

THE CLOSER BRINKMANN COME TO THE SOURCE COMPONENT IN AN AUDIO SYSTEM, THE MORE IMPORTANT IS ATTENTION TO EVERY DETAIL. WHY ELSE WOULD THE QUALITY OF THE USB CABLE MATTER?

The circuit design in the digital module has been optimized for short signal paths, low resonance and optimal power regulation from the signal processor to the DA Converters. The digital module alone has 11 dedicated power supplies. This module also includes a streamer with Ethernet input. The streamer functionality comes with several advantages compared to the USB input. Since Brinkmann have the full streamer circuit under control, they were able



to optimise it sonically even more than the USB input, which always has to cope with the imponderables of the cabling and the server or computer connected to it. So with the streamer, Brinkmann has been able to remove one more unknown variable from the equation.

We must also mention that the Nyquist has a special high voltage power supply for all analog circuits including the DAC output.

AFTER ALL THESE MYRIAD CONSIDERATIONS IT IS THE FINE TUNING AND BALANCING OF THE OVERALL PRODUCT THAT LEADS TO THE INTENDED SONIC RESULT

One cannot simply look at parts of the circuit or the chassis separately. After each detail has been individually scrutinized and optimized, the sonic signature of the whole must achieve a lofty level of realism and listening pleasure.

RELENTLESS FINE TUNING

At Brinkmann Audio, it is through relentless fine tuning of the product that this performance is achieved. This fine tuning demands years of experience in creating audio products and is, in the final analysis, what sets Brinkmann Audio products above the rest.

Additional Reading:
Products Designed for Music, Not Measurements

TECHNICAL MEASUREMENTS ARE INDISPENSABLE IN THE DEVELOPMENT OF ANY AUDIO PRODUCT

They enable a designer to determine if a circuit is evolving in the right direction and ensure no gross errors are committed during the prototyping phase. Like other credible High End Audio manufacturers, Brinkmann employ state-of-the-art measurement equipment (AudioPrecision APx525, Agilent 500Mhz scopes, Wavetek signal generator, etc.) as part of the methodology by which they assess the progress of their designs.

Although technical measurements are helpful in avoiding glaring mistakes and uncovering manufacturing defects, they neither dictate Brinkman's circuit design nor are they a substitute for the meticulous fine-tuning they feel is necessary to achieve optimal sound quality.

BRINKMANN HAVE TWO FUNDAMENTAL REASONS FOR THESE BELIEFS:

1. Compared to the complexity of our auditory system, the very few parameters that are measurable only represent a small part of what we hear and are therefore a poor predictor of sound quality.

2. Better measured specifications do not necessarily yield better sound quality. In fact, it is often quite the opposite.

There are even products currently available which have facilities (switches or multiple outputs) which enable the user to choose between “Measure” and “Listen” mode (iFiAudio’s nano-iOne, for example).

The reason for these “Multiple Modes” is that the circuit or signal path which offers the best measurements often sacrifices sound quality. Better measurements are an effective marketing tool as they suggest that it’s possible to quantify sound quality. Unfortunately, measured specifications still cannot predict musical realism. Today, listeners still need to trust their ears—and not measurements—to judge sound quality. And that’s what they do at Brinkmann.

BRINKMANN USE MEASUREMENTS AS A TOOL DURING DEVELOPMENT TO ENSURE THAT NOTHING FUNDAMENTAL GOES WRONG

To achieve the sound quality for which Brinkmann products are renowned, they use highest quality playback equipment (Vandersteen 7s, Vivid B1s, Revel Salon 2s) in hundreds of listening sessions to optimise and fine tune the sound of their components.

INCREASED DISTORTION AT LOW FREQUENCIES

Brinkmann use a tube output stage with low feedback which, as tubes have non-linear bias curves, naturally causes a certain amount of distortion. Any competent circuit designer has the means to lower distortion by adding feedback, but Brinkmann achieve audibly superior performance by keeping feedback to a minimum. By lowering feedback, the bandwidth of the tube output circuit is in the region of 5Mhz with low output resistance, which yielded better sonic performance than could be obtained by adding feedback.

One special feature of their circuitry is that Brinkmann don’t use any kind of filtering; rather, they borrow a technique from pro-audio (mixing consoles, etc.) and employ a coupling transformer which works as a filter because of its limited bandwidth. With a bandwidth of more than 100kHz, however, this transformer imposes no limitation of the audible frequency range.

An additional benefit, this transformer decouples the differential outputs of the DAC Chips without the need to use capacitors. The only coupling capacitor is in the tube output stage. The rising distortion figures at low frequencies are aspects of this transformer and the coupling caps, but these values do no influence performance in the audio bandwidth, nor do they affect sound quality.

NOISE LEVEL AND DYNAMICS

Brinkmann employ vacuum tubes in the Nyquist's output stage, as they find them to be sonically superior to transistor output stages. Vacuum tubes naturally produce a slightly increased noise level. The Nyquist noise level measures in the range of -110dB to -120 dB. Attempting to push noise below -120 dB by using transistor output stages instead of tubes would degrade sound quality and nothing would be gained except better measurements. Even from a purely technical standpoint, a Signal-to-Noise figure above 120dB has no benefit whatsoever. The ear has a dynamic range of around 120 dB from absolute silence to the threshold of discomfort, but recorded music never reaches a dynamic range of 120 dB (extreme recordings probably reach 80-90 db max.).

SIDEBANDS IN THE JITTER SPECTRUM

Brinkmann have devoted considerable attention to the power supplies employed in both their analogue and most especially their digital circuitry. Over damping (i.e., filtering) the incoming power might result in better measured values, but often kills the life in the music. Hence each and every power regulator (there are 11 in the DAC-module alone!) is optimized for best sonic results. The sidebands visible in the jitter spectrum are not related to jitter. They are also visible with a jitter-free signal and are well below -110 dB. They are a result of power supplies designed for best sound quality by avoiding over-damping of the power lines.

In Brinkmann's opinion, music reproducing machines such as Nyquist are created to maximize musical satisfaction: music, not measurements, is their ultimate purpose.

Brinkmann call their Nyquist DAC an "analogue DAC" because they favour sonic advantages, such as those provided by their turntables, over measurement data.

Brinkmann encourage serious aficionados of both music and fine audio componentry to experience Nyquist and determine the validity of their design approach for yourself.

BRINKMANN NYQUIST SPECIFICATIONS

Inputs
USB 2.0, SPDIF, AES-EBU, TOSLINK
RJ45 ETHERNET for Streaming

Formats
MQA and PCM up to 384 kHz (DXD)
DSD 64 and 128 via DoP (DSD over PCM)
DSD 256 natively
Digital module upgradable

THD/IM distortion
<0.01%

S/N ratio
>100 dBA

Gain adjustment
0...+10 dB

Output voltage
maximum 3,5 V eff.

Output impedance
10 ohms balanced

Headphone output
30-600 ohms

Dimensions (WxHxD)
420 x 95 x 310 mm (with granite base)
Power supply
120 x 80 x 160 mm

Weight
Dac: 12 kg
Granite Base: 12 kg
Power Supply: 3.2 kg