Mola-Mola embodies the idea that once you've removed everything that isn't the music, what remains is the music.

This is radical. Today's high-end audio has become all about mixing circuit topologies and parts to make a sonic blend that the designer thinks "sounds about right". You'd almost forget that getting closer to the sound as crafted by the artist really means keeping the replay system from changing it.

Turning this simple insight into hardware is probably the toughest way to do audio. All simple circuits change the signal audibly, so one has to get to grips with more complicated ones that don't. I analyse every subcircuit mathematically and look for ways to eliminate every error term. When the practical circuit measures as predicted, I listen to search for unexpected sources of colouration. These are then included into the maths and the whole process repeats.

After every stage has proven immaculate performance, the same is done with the whole product and so problem spots get methodically rooted out before they hide themselves and become "audible but not measurable".

The result is something never before heard of in high end audio: amplifiers and converters whose output signal cannot be distinguished, by ear, from the input signal. So what does that sound like? In a few words: natural, nimble, rich and musically enthralling.

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Technical Data

Makua

I/O
- 5 balanced and 5 unbalanced inputs, all routable through optional processor boards like the phono stage.
- 2 parallel outputs for bi-amping.
- 4 programmable trigger outputs.

Processing
- Balance and input gain offset.
- Phase invert and mono sum.
- Optional tone control.
- Full software control of routing and processing

Performance
- Maximum input/output level: 20 dBu (7.75 Vrms)
- Unweighted noise voltage at unity gain: 1.9 µV
- Input impedance: 100 kΩ
- Output impedance: 44 Ω
- Distortion at maximum signal level (THD, IMD): not measurable, estimated around -150dB.
- Bandwidth >200 kHz
- Gain range: -70 dB to +15 dB.
- Gain resolution: <1 dB, better than 0.2 dB over normal listening range.

Phono Stage Option

Performance
- Input noise (MC): 0.35 nV/rtHz
- Input noise (MM): 2.8 pA/rtHz
- Sensitivity: variable from 30 µV to 5 mV
- THD, IMD: not measurable
- RIAA conformance: +/-0.1 dB.

Available time constants
- τ1: 200, 250, 318, 400, 450 µs
- τ2: 50, 64, 75, 100 µs
- bass shelf: 14, 18, 20dB

Kaluga

Performance
- Output power: 400 W/8 Ω
- 700W/4 Ω
- 1200W/2 Ω
- Gain: 28 dB
- Unweighted Signal/Noise Ratio: 128 dB
- Distortion (THD, IMD): <0.003 % (all frequencies and power levels)
- Input Impedance: 100 kΩ
- Output Impedance: <0.002 Ω (DF>4000), all frequencies.
- Bandwidth: >50 kHz

I/O
- Balanced and unbalanced input.
- 2 pairs of Furutech binding posts, biwired directly to the amplifier PCB using Kubala·Sosna cable.

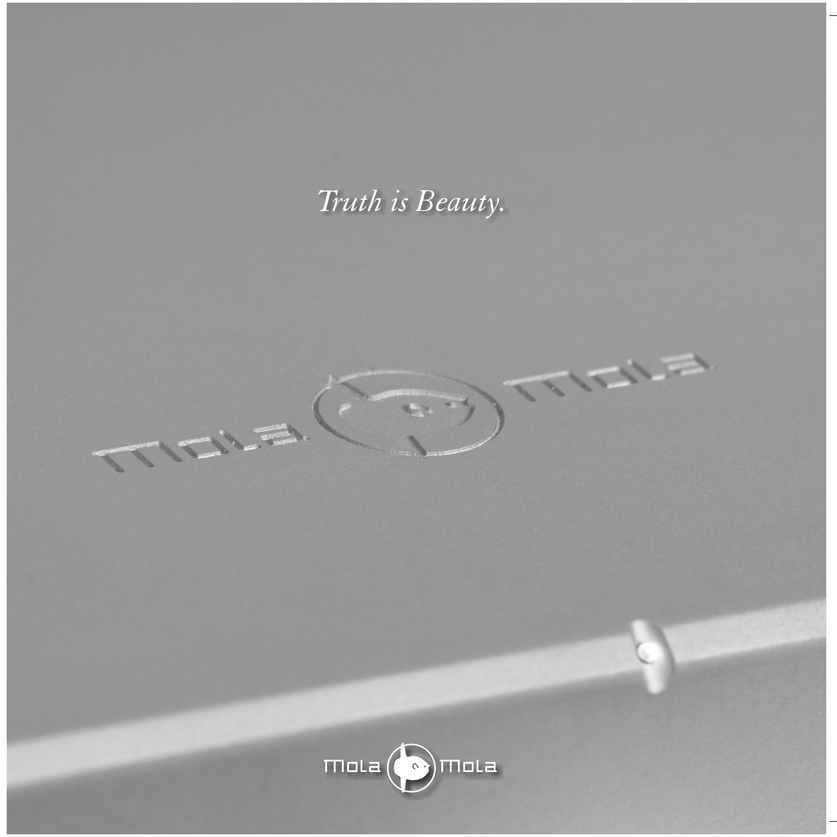
DAC Option

Inputs
- XLR (AES3), Optical, USB, Bluetooth (A2DP, APTX) and Ethernet.

Supported formats
- PCM up to 384 kHz / 32 bits (>192 kHz and >24 bits only via USB)
- DSD up to quad speed.

Performance
- Full-Scale Output Level: 20 dBu
- Signal to Noise Ratio: 130 dB
- THD, IMD: not measurable (estimated -140 dB).
- Bandwidth: Up to 80 kHz (apodising response).
- Integrated jitter: <1 ps from 10 Hz upwards, <300 fs from 1 kHz upwards.
- Jitter rejection: >80 dB at 1 Hz after 20 seconds of lock.

Notes 1, 2: Supporting data available on request.



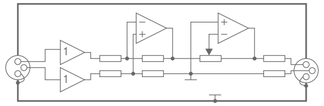
***Makua**, the Preamplifier*

With the knowledge in hand to design minimally invasive electronics without needing to be minimalist, we decided that our preamp should be complete. *Very* complete.

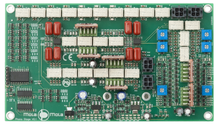
The basic Makua is an extremely transparent gain stage and a programmable routing matrix. The chassis has ample room to fit optional extras, most notably a DAC and a phono stage. The 6 preset buttons are programmable via USB or Bluetooth to access any combination of channel, processing and routing. In a system with mainly digital sources, the preset buttons would be programmed to select between them. Vinyl lovers on the other hand might want to use several buttons to select the same turntable but with different EQ settings to suit their large collection of historic LP's. All five inputs are switchable between XLR and floating RCA connections, and all can be assigned as either phono or line.

Analogue Design for a Digital Age

All stages in the Makua use discrete amplifier modules in a little known topology called "single-ended driven differential". Unlike fully symmetrical signal paths, this structure prevents noise from propagating all the way through. The Makua is amazingly immune to influences like mains quality and choice of interlinks. The relay-based volume control directly controls the gain of the output stage. Dynamic range and linearity of this arrangement are much greater than those of stepped attenuators. Operation is smooth and entirely glitch free.



***Phono and DAC** Options*

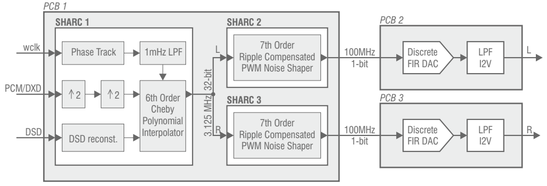


Fall in love with your record collection again with the quietest, most transparent and probably most versatile **phono stage** ever built.

The fully independent MC/MM input stages are optimized for voltage and current noise respectively. Input gain is variable over a 40dB range. Termination resistance and capacitance are individually switchable. Available EQ settings cover practically all known cutting curves ever used, including most 78RPM. Since the preamp can route any input through the phono stage, only one is needed even if you have multiple turntables and elements connected.

Future-Proof by Being Far Ahead

Some things just can't be done with off-the-shelf chips. Let's face it: today's best DAC chip claims no better than 22 bits' worth of dynamic range and *only 20 bits' worth of linearity*[1]. High resolution music deserves better than that. Mola-Mola's **DAC** is designed from the ground up using circuits and digital algorithms that were entirely developed in house.

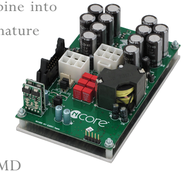


The result: performance that historical and current trends in chip performance predict won't be equalled in at least a decade[2]. That's what we call future-proof design!

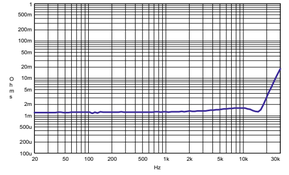
***Kaluga**, the Power Amplifier*

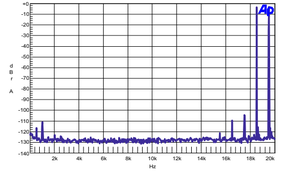
Class D has never been so good. Come to think of it, neither has class A...

Kaluga is based on world's most sought after class D technology: Ncore. Also designed by Bruno Putzeys, this circuit packs 20 years of research and experience into non-linear control theory. Unprecedentedly low distortion, noise and output impedance combine into what scores of enthusiastic users unanimously describe as "no sonic signature at all". Just music, glorious music.



For instance, the two supposedly unassailable strongholds of class A amplifiers are linearity and output impedance, at high frequencies. Plotted below are the output impedance as a function of frequency and the output spectrum in a high power (400W), high frequency IMD test. In both cases Kaluga outperforms any power amplifier, regardless of technology, operating class or asking price, of which such test results are available.





For Kaluga, Bruno substantially streamlined the NC1200 platform, optimized parts choice and eliminated board-to-board connectors, instead hardwiring the speaker outputs to the circuit board.