# Clarity, Transparency and Rich Detail



Ime



TEST

### High-grade HiRes in PCM and DSD

Limetree USB-DAC

Lindemann Limetree USB-DAC

and a

COMPACT COMPETENCE AS A CONVERTER, PREAMPLIFIER AND HEADPHONE AMP

OSD USB D1



### Lindemann Limetree USB-DAC

# Compact competence as a converter, preamplifier and headphone amp

Attractive solutions with small components - this is grooves and finished off by a plate fixed with screws, both the directive of the Limetree series by Lindemann Audio. The company expanded the portfolio of this series of smart devices: the Limetree USB DAC upgrades the computer to a compact audiophile system and elevates every analogue sound chain to a top digital level. It converts HiRes files up to PCM 768 kHz/24 bit and DSD512 works as a headphone amplifier. The USB DAC plays music on active speakers and drives analogue or power amplifiers, thanks to the built-in preamplifier.

Limetree - in 2018, just in time for the 25th anniversary of the company, Lindemann Audio initiated this series. Since then, the prestigious hi-fi manufacturer has developed highly compact audio solutions within this series, which follow the "small but mighty" idea. The USB DAC now joins the phono preamp, the network player and the streaming bridge. However, the idea for the tiniest cube format of this series goes back to 2007, when Lindemann decided to focus on computer audio as an additional area of its product development. That also gave birth to the no-frills, compact design: The body of the components since then consisted of an extruded aluminium profile, refined by decorative

at the front and the back. In launching the Limetree series, Lindemann significantly refined and updated this design: The surfaces feature a noble and coherent satin finish, the slightly rounded but squiggle-free lettering underlines the refreshingly modern look, and the stylised lemon tree leaf on the top complements the appearance.

#### Information illumination for inputs and formats

The consistent feature of all Limetree components is the on/off section on the left front: In contrast to the silver of the devices, we find a red-framed toggle switch in black with an indicator LED. The LED in the USB DAC tells us in various colours which file format it is currently converting. The colours range from green to red, indicating a conversion bandwidth from PCM 44.1 to DSD512. The operating manual explains which colour corresponds to which sampling rate and audio format. A second LED indicates when a DSD file is currently playing. The following three LEDs provide information about the selected input. You can choose



Rounded design, satin surfaces and straight-lined typography, the USB DAC presents a clean, modern, discrete look.



The multifunctional knob changes the volume by turning it, activates muting with a firm press, and selects the input by turning and pressing simultaneously.

between USB, D1 and D2, whereby D1 indicates the coaxial and D2 the optical digital input. You pick the input channel by turning and pressing the control knob on the right side of the front panel. Due to the extremely compact dimensions of the converter, the rotary control appears quite dominant, but: this is misleading.

#### **Direct and Remote Control**

The design of the control knob makes it easy to handle. That is good because it serves as a multifunctional control element in three ways: Turn it to change the volume, press it to mute the USB DAC, and turn and press it simultaneously to select between the different inputs. However, the metal knob has clearance on all sides. When turning it, we feel a well-defined, pleasant detent, but at the same time, we notice a wobble during rotation. Turning and pressing the knob simultaneously for input selection causes





795.00 Euro

08153 9533390

3 years

Silver

Category:

Digital-analogue converter / Pre-amplifier/ Headphone amplifier

Lindemann Audiotechnik, Wörthsee

www.lindemann-audio.com

Price: Warranty: Versions:

Distribution:

Dimensions  $(H \times W \times D)$ : Weight: Inputs (digital):

40 x 107 x 107 mm 0.29 kg 1 x S/PDIF optical (TOSLink) 1 x S/PDIF coaxial (Cinch) 1 x USB (USB Type B, USB Audio Class II) Outputs (analogue):1 x Headphone (jack, 3,5 mm) 1 x Line unbalanced (Cinch) Maximum

sampling rate / resolution:

#### Recommended

Headphone impedance: 16 -300 Ω Power consumption: - Standby: 0.1 W - Operation: 3 W

- DSD: DSD512

- PCM: 768 kHz/24 Bit

### Contents

- Lindemann Limetree USB-DAC
- Power supply unit (length of cable: 1.0 m)
- Remote Control
- 1 battery for remote control (CR 2032)
- 4 self-adhesive rubber feet
- User manuals for DAC (German, English) and power supply unit (International)

Score

Total: Class: Price/performance: appropriate

90/90

Upper class



The included remote control with its matt, rubberised shell feels pleasant in hand. Its rubberised buttons are also easy to handle and offer a well-defined tactile response.

the knob to bump and scrape. That encourages us to use the infrared remote control supplied with the unit. It takes handling into a more convenient, more precise - and more functional feature: you can now change the brightness of the LED via remote control. Selecting an input is now only a push of a button away. Furthermore, you can pause and restart the current music track. It is also possible to skip to the previous or next music track. Excellent!

#### High-grade HiRes in PCM and DSD

In the first place, these music files reach the USB DAC via USB port. After all, it should work as an audiophile partner for laptops, PCs and Macs. USB also offers a widespread format diversity and capability: It supports PCM up to 768 kilohertz/24 bit and DSD up to DSD 512 - that means HiRes in the highest possible degree. As alternatives, there are coaxial and optical S/PDIF inputs - e.g. for the connection of a CD drive or a TV flatscreen. The fundamental limit of these two digital interfaces is 192 kilohertz/24 bit. The ES 9038, an excellent D/A converter from the specialist ESS Technology, handles the music data. An ultra-precise Femto clock processes precise and accurate signals to minimise jitter. This term refers to inaccuracies and asynchronies when reading data, leading to errors in reconstructing the analogue music signal - resulting in a distortion of the information and a deterioration of the sound.

# USB-DAC is also suitable for "crooked" formats

This precision is all the more important because, with PCM, the DAC is not only capable of reproducing the "smooth" HiRes sampling rates (48, 96, 192, 384, 768 kilohertz), but also those files with a sampling rate that is a multiple of the "crooked" CD standard 44.1 kilohertz/24 bit - i.e. 88.2, 176.4, 352.8 and 705.6 kilohertz. After the conversion from digital to analogue, a filter section filters any artefacts that may arise during this procedure. It then reconstructs the signal in a smooth and step-less manner. There are different filters for this purpose having advantages and disadvantages. In the USB DAC, Lindemann opted for the "minimum phase slow roll-off filter". The filter is gentle and operates slightly at the edge of the audible range. This "slow rolloff" avoids the formation of pre-ringing artefacts, i.e. preechoes of a signal impulse affecting the sound.

#### Including Preamplifier and Headphone Amplifier

But the USB DAC is more than just a converter. The small cabinet also contains a high-quality amplifier module. The recalculated analogue signal runs through an amplifier providing it in two ways. First hand, at the RCA sockets on the rear, we receive a music signal. This way, you can feed it to a power amplifier or connect the USB DAC to a pair of active speakers. Secondly, you can process the signal for playback via headphones. For this purpose, the USB DAC comes with a mini-jack socket on the front. Lindemann recommends headphones with an impedance between 16 and 300 ohms. The powerful headphone amplifier can drive the majority of available headphone models. Anyway, volume control is necessary for operation. In the USB DAC, this is purely analogue and realised as an integrated network of resistors. Lindemann attests to this rather unusual and complex analogue solution as a sonic advantage for details and richness, especially at medium and low volumes.



In terms of input, the USB DAC offers a USB-B port and two S/PDIF interfaces: D1 is coaxial, D2 is the optical digital input. That allows you to connect a laptop or a desktop computer, a CD player or any other digital source. That is also the way to playback TV sound. An unbalanced line out is available on the output side of the USB DAC.



The USB DAC also scores points as a headphone amplifier but is discreet in promoting this competence: the mini-jack for the headphone connection is left unlabelled.

#### External Power Supply to Prevent Interference

These dynamic high-end headphones, rated at an impedance of 80 ohms, with their slightly angled beryllium There is one thing not included in the small box - and that drivers, avoid total in-the-head localisation and, in comis the perfectly right decision: the power supply of the USB bination with their open design, deliver a more brilliant, DAC is external. An external power supply prevents expoimmensely detailed reproduction. So you naturally hear sure of sensitive audio electronics to electromagnetic inthe strengths and weaknesses of the upstream electronics terference that could worsen the sonic performance and - and with the USB DAC, these are strengths. The output is lead to humming and buzzing. Lindemann also uses a "mepleasantly calm and relaxed, while the recording is wondical grade" plug-in power supply. It guarantees excellent derfully clear and transparent. That is why we notice the decoupling from the mains interference. Moreover, further slight murmur of the guests right at the beginning. The filtering takes place in the USB DAC. This low-interference four Feenbrothers played the famous "Take Five" during power supply also has a positive effect on the noise perforan exclusive live concert in the Hilversum Studio. Thanks mance of the electronics. Mitigating mechanical influences, to the USB DAC, we are now part of the privileged circle. the USB-DAC includes four self-adhesive rubber feet for vi-The discernible spatial impressions reinforce this beautiful bration-absorbing. However, their most important purpose illusion: While Marc van der Feen introduces "Take Five" is to protect the underlying surface, e.g. the sideboard, bewith the ingenious rhythmic theme in 5/4 time, we get to cause otherwise, the front and back of the metal enclosure know the studio room acoustically via the reflections of the could harm the standing surface. So: stick the feet underpiano sound and the ambient background noises. neath, plug in the mains plug, connect the USB DAC to the computer via USB cable - and there you go.



By placing the power supply outside, the sensitive converter and Practical use of Lindemann Limetree USB-DAC

#### Practical use of Lindemann Limetree USB-DAC

The musical events are a pleasure on top: the four fairy For the test, we plugged in our laptop using the audiophibrothers spread out and stagger nicely in front of us. We le player software Audirvana. It enables the playback of Hilisten to every detail of their performance: the changing Res files and DSD tracks in particular - in combination with timbres of the piano, the dry, growling tone of the plucked a converter capable of this, i.e. our USB DAC. To start our double bass, the crisp drum set, where the continuously test, we explore its format capability with all possible Hiplayed ride cymbal, in particular, is fascinating: although Res files until we finally arrive at DSD512. Initially, the play-Matthijs van der Feen strikes it extremely gently, this denback was not successful. It only worked after changing the ted metal disc has an imposing presence! The only thing USB cable, and from then on, the data went via the Supra that is even more fascinating is the saxophone, which Cables USB Excalibur to the converter. You always have to plays a sophisticated role in this song: even the blowing look at the cable as a potential weak point; this is whesounds are so realistic that we can practically see Paul van re quality products pay off. The current test file is " Take der Feen playing in front of us. The reproduction is fresh, Five Reprise" from the album "Feenbrothers Play Dave agile and vivid while unfolding a very comfortable open Brubeck", recorded in PCM format DXD 352.8 kilohertz/24 sound. All this contributes to a relaxed and electrifying bit, converted and available for purchase in DSD512. Auperformance. That also holds up at low volumes: The entidirvana recognises the original format, the USB DAC does re event retains its presence, the USB DAC remains stable its conversion work - and we enjoy the recording via the even in the bass range and avoids the thinning otherwise headphone output first using the Focal Utopia. often experienced. Thanks to its compact dimensions, the USB DAC always finds its place in the ambience.



#### **Clarity, Transparency and Rich Detail**

Thanks to its compact dimensions, the USB DAC always finds its place in the ambience.

## Both Relaxing and Exciting at the Same Time





For HiRes playback via computer, audiophile player software is recommended. In our test, Audirvana comes into play. In addition to your music library, a music service such as Qobuz is also available.

### **High Fidelity to the Limit**

Using the Focal Beryllium, we hear a minimal change in character. Therefore, we switch to the HEDD HEDDphone - with a compelling result: the sound is now soberer, more balanced, more linear. Here the different transducer principle comes into play: the HEDDphone uses an Air Motion Transformer (AMT) as a full-range chassis. On the other hand, even with changes in level, the sound now remains perfectly constant. Chapeau! However, the HEDDphone, which has a rated impedance of 42 ohms, is quite demanding because its AMT is not very efficient. Accordingly, it requires a powerful drive. The amplifier of the USB DAC can cope with this, but we already reach its maximum power when we want to listen at the topmost level. That is also what happens when we switch to the Beyerdynamic DT 1990 Pro, whose specified impedance is 250 ohms. It proves to be more robust and bass-emphasising in sound. Nevertheless, the USB DAC also delivers refined resolution, transparency and presence using these headphones.

# USB DAC as a Digital Upgrade for Analogue Equipment

Now we pull out the headphone cable. That reactivates the line out on the back of the USB DAC. In this configuration, it delivers music to the Supravox Vouvray. That is a super tube/transistor hybrid amplifier. However, it is purely analogue. With the USB DAC, we bring it up to a modern digital level. That is a further possible application of the USB-DAC. Its output delivers a maximum of two volts as a line out, and the volume is adjustable. Therefore, we can connect it to a line input of the Vouvray. This time, the Oppo UDP-203 CD player serves as the source instead of the laptop; the music now goes via S/PDIF coaxial cable to the D1 input of the USB DAC. The PMC twenty5.24i serve as speakers. The sound performance of this chain is excellent: We listen to a colourful CD with Kari Bremnes' epicdramatic "Kanskje", Tokunbo's melancholic "Headlights", and the jazzy "All In" by Joachim Neuffler and the Tobias Becker Big Band -...

#### Small Combination for Powerful Sound Reproduction

But the sound qualities we already enjoyed via headphones remain constant: We again experience this successful symbiosis of clarity and transparency, vitality and relaxation, the richness of detail and accuracy. For comparison, our CD player did the conversion for us, and we connected it directly to the amplifier: The sound is now a little more busy and dull. Finally, we put the USB DAC to use in a small setup: it plays in conjunction with a pair of active speakers, namely the exceptionally compact Kanto YU4. Here, as before, we would have liked to see a marker on the USB DAC's level knob - which, admittedly, can be turned endlessly and therefore makes it difficult to mark. That would make it easier to find the right volume setting. Apart from that: Listening to music becomes a lot of fun even with this space-saving combination! That's all it takes for an impressive sound system.

### Conclusion

Attractive solutions using small components - the Lindemann Limetree USB DAC fulfils this directive of the Limetree series: it acts as a converter, headphone amplifier and preamplifier in one and thus offers a wealth of possible applications. The DAC allows listening to high-grade HiRes up to PCM 768 kHz/24 bit and DSD512. Its volume-controlled amplifier module then prepares the signal for the line out on the one hand and for the headphone output on the other. Here, it delivers a rich sound volume with demanding or high-impedance models, but it is not a candidate for volume orchestrations. In terms of sound, the USB DAC shines in all disciplines. It impresses with clarity, transparency, the richness of detail. It delivers accuracy along with a vital and also relaxed, natural reproduction. Thanks to its multitude of options, the remote-controllable USB DAC refines the computer into a compact audiophile system, brings conventional-analogue sound chains to a modern-digital level, forms a dense sound chain in combination with active speakers, but is also capable of driving a pure power amplifier. Thus, the USB DAC proves to be an impressive all-rounder.



In combination with active loudspeakers - here, the ultra-compact Kanto YU4 - and a laptop or any other digital player, you can create incredibly small fully-fledged sound chains.

Test and text: Volker Frech Photos: Philipp Thielen

