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elysia xfilter 500

Surface-Mount Magic in a Small Format

By
Miguel Marques
(Portugal)

elysia established itself in 2006 with the launch of the alpha compressor, an all discrete hand-built stereo compressor. Made for mastering, it is one of the most expensive outboard compressors ever built. The German-based elysia quickly became known for its “no compromise” designs and build quality. It is also known for creating innovative solutions that fit the modern sound engineer’s needs due to their high versatility, creative functions, and overall excellent sound quality.

Since the launch of its flagship models—which also include a creative compressor called mpressor and a program equalizer called museq—elysia surprised the market with more affordable products by using surface-mounted technologies and machine construction instead of hand-built manufacturing. Among them are the xpressor (a versatile true stereo compressor) and the nvelope (a stereo transient design with some clever bonus features). These two products still feature discrete components on the audio path and always run in Class A. This is in fact part of the elysia DNA. Using the company’s own words, “In Class-A amplifiers, the transistors are conductive all of the time, so there is no crossover distortion at all. This is the perfect technological basis for an open sound with massive punch and no degradation of your original source.” Also, using discrete components makes it “possible to design every single stage in signal processing to do exactly what you want it to do—physics becomes the only limit.”

Features

The xfilter 500 is an active true stereo equalizer in a 500-series module format (VPR Alliance certified). Like the xpressor 500 and nvelope 500, it fills two slots on an API lunchbox or 500-series compatible rack. As of publication, the xfilter is also available as a stand-alone 19” rack unit with the same features and functions so this review is valid for both xfilter 500 versions.

The xfilter 500 is a four-band semiparametric equalizer with the spectrum’s outer bands working as low- and high-shelf filters. Its two mid-bands are peak/dip filters with different switchable 0.5- and 0.1-Q factors. The equalizer’s outer bands can also work individually as high- and low-pass second-order filters. In this mode, the gain knob controls each filter’s resonance. Because the xfilter 500 is a true stereo equalizer, it only has one set of knobs to address the processing on both channels. This is beneficial for users but can create manufacturing issues, as it is

The German-made xfilter 500 uses top-quality components, gold-plated PCBs, a rugged aluminum front panel, and solid aluminum knobs.



difficult to find reliable low-tolerance potentiometers for this task.

The xfilter 500 uses dual- and quad-layer potentiometers. The company's production department obtained an Audio Precision device to build custom computer routines so only the best components were used. To ensure the best tolerance for true stereo operation, the xfilter 500 uses FKS film capacitors with a 5% maximum tolerance. The tolerance is half the 10% most MKS capacitors have and is the industry standard for audio equipment. In all, this unit has the typical mismatch of less than 0.4 dB between left and right channels. This is a good value for any true stereo equalizer, especially one that costs just under \$975.

While the museq, elysia's flagship equalizer, uses all discrete components, including the actual filters, the xfilter 500 has ICs for the filter sections. elysia also chose the Burr-Brown OPA amp series, which was designed especially for applications in which pristine audio is a requirement. The mixing stage between the filters and the main signal path and the input and output stages uses discrete components running in constant Class-A operation.

The xfilter 500 has proportional Q behavior in its curves (i.e., there is some interaction between each filter's Q factor and the gain applied). This should make the equalizer adjustments more intuitive and immediate. The xfilter 500 also has a built-in passive filter that can be activated by a creatively named function called "Passive Massage," which is a fixed LC filter with a capacitor and a coil per channel. This filter's response results in a small boost/peak around 12 kHz that gently starts to roll off audio at 17 kHz. This passive filter was added to create a different effect for audio processing, as the coil's selected curve and saturation produces a characteristic high-frequency response that should improve the program's detail and texture in most scenarios.

Other notable features include true bypass of all processing, custom-made aluminum knobs (CNCed through a solid aluminum block), a four-layer PCB design with one dedicated ground shield layer close to the filter networks for minimum electric interferences and maximum hum reduction.

Measurements and Technical Specifications

All the measurements I took are on par with the manufacturer's published specifications. The first specification that stands out is the equalizer's bandwidth. I measured the xfilter 500 to be almost linear up to 200 kHz (± 1 dB), which is an impressive value in any price range. According to elysia, the xfilter 500's usable bandwidth goes up to 400 kHz



After exploring the unit's layout, this equalizer quickly becomes a comfortable and functional unit.

with a 3-dB loss, though I really couldn't measure that high. The xfilter 500 is not only a high-bandwidth unit; it is also a high-headroom equalizer with a low noise floor and good maximum I/O levels that provide a total of 120 dB of dynamic range. THD+N levels are also low, typically in the 0.001% to 0.005% range, depending on input levels, which is also a good value for professional audio equipment. Stereo tracking in this equalizer works pretty well. Even though elysia didn't publish this specification, I measured the stereo mismatch and found it to

Manufacturer Specifications

Frequency Response: less than 10 Hz–400 kHz (3 dB)
THD+N at 0 dBu (20 Hz–22 kHz): 0.0018%
THD+N at 10 dBu (20 Hz–22 kHz): 0.005%
Noise floor (20 Hz–20 kHz A-weighted): -98 dBu
Dynamic range (20 Hz–22 kHz): 120 dB
Maximum I/O level: 21 dBu
Impedance (I/O): 10 k Ω /68 Ω
Power consumption (total/per slot): 210/105 mA

About the Author

Miguel Marques, a full-time mastering engineer, works in his own mastering studio in the north of Portugal. After earning a bachelor's degree in Music Production and Technologies, Miguel worked in commercial recording studios as a recording engineer.

Miguel has also written technical reviews and articles for pro audio magazines. Miguel recently finished his first book on audio engineering, which is to be released soon in Portuguese-speaking countries.



The xfilter 500 is a 100% Class-A signal path, resulting in an exceptionally open boutique sound with flawless transient projection and solid punch, ideal for processing single signals, creative sound shaping, mix bus duties, or even helping handle demanding mastering scenarios.

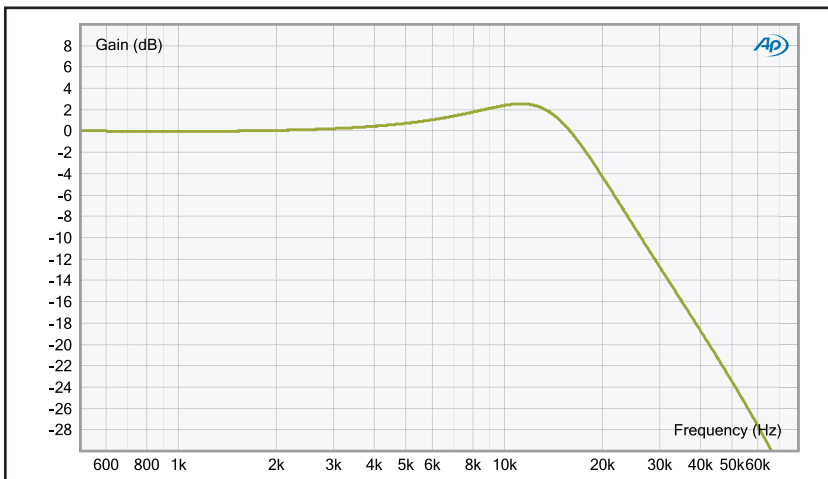


Figure 1: The “Passive Massage” function activates a fixed LC filter with a capacitor and a coil per channel. The response created by this filter results in a small boost/peak around 12 kHz that gently starts to roll off audio at 17 kHz.

be typically under 0.4 dB, which, considering it is a potentiometer-based stereo equalizer, is an impressive value. On paper the xfilter 500 is as good as it gets for most professional audio gear, rivaling most high-end gear’s specifications, yet it sells for a relatively affordable price and is a compact unit.

Operation and Sound Quality

The xfilter 500 is a complete equalizer with some knobs used for multiple functions, depending on the processing they’re addressing. Because there are so many functions and options (and so few knobs!) it can be difficult at first to operate the unit. Following a few tests with this equalizer, I felt more comfortable with the xfilter 500’s layout and operation. It takes some time to get used to it, but after that initial reaction and remembering what each knob does in each mode, the xfilter 500 is actually fairly easy to use.

The only operational issue I found with the xfilter 500 happens when the filter gains need to be set at zero. There isn’t a detented zero position for the filter gain, as all 47 steps of each knob are equally detented to help recall. Each filter’s zero-gain position can be easily found by looking at the unit and aligning the knob mark to 12:00. It isn’t really a big issue, but it requires the user to look directly at the unit. Apart from that, everything feels very solid when operating the xfilter 500. Every knob and switch is clearly labeled.

Even though the xfilter 500 is a stereo equalizer, it can also work on mono sources by feeding one of the unit’s inputs. In my tests, I used this unit to process single tracks, buses or groups, and complete mixes. In all the tests, one characteristic prevailed—the open and clean sound—even when doing large amounts of boost and cutting. In almost every situation, the filter range will be more than adequate to accomplish even the most drastic changes to a source.

However, I found that in the majority of cases I wasn’t even using half of the ± 13 -dB range on the mid filters and even less than that on the ± 16 -dB range of the shelf filters. Because this is a relatively broad equalizer with proportional Q behavior, most adjustments sound immediate, which makes the equalizer a pleasure to use.

If you mostly use digital plug-in equalizers, you’ll notice how—with even with the smallest gain, boosts, and cuts—the xfilter 500 will sound instantly effective. Each filter’s available frequency ranges provide a decent selection for most duties. At no point in the testing did I feel the need for different or more frequency points.

One curiosity is this equalizer's extended frequency range. For instance, the high-frequency shelf can be set up as high as 28 kHz. Even though 28 kHz is a frequency point already above the hearing spectrum, it creates a gentle curve behind it on the audible range.

The xfilter 500 is broad enough to be used as a program equalizer. It also works on individual instruments with narrower frequency content (e.g., individual drum snares, kicks, or other percussion elements). The xfilter 500 isn't narrow enough to do the most surgical or notch type of filtering because elysia preferred to turn its attention to other functionality types. (The xfilter 500's manual states that most users prefer using digital equalization for these type of corrections.)

One example is the "Passive Massage" function (see **Figure 1**). Even though the function provides a relatively clean saturation and curve change on the program, it creates a noticeable improvement on most sources. Obviously it won't work on everything, but when it does, the "Passive Massage" adds a sheen and sparkle to the source without brightening it excessively. It enhances the top-end response and improves the overall detail and clarity. Finally, the low- and high-pass filters with resonance are a useful addition to any equalizer. The ability to change its resonance makes it more versatile and enables a user to further modify the sound.

From polishing groups and full mixes to changing a single instrument's balance and even to creatively changing a source's balance, the xfilter does it all without ever sounding harsh, uneasy, or over equalized. In terms of function and versatility, the xfilter 500 can only be rivaled by digital plug-in equalizers. I've never seen so much functionality in an analog equalizer of this size.

Surpasses Expectations

The xfilter 500 excelled with almost every source I tried with it. Apart from notching, the xfilter 500 should be able to accomplish whatever you want to achieve with equalization. And, it can be achieved without damaging the source while producing clean-sounding results. Most of the time, you don't even hear the equalizer itself, which I found to be a great thing! Considering the specifications, functions, versatility, and cost, this is one of the most complete and best-engineered pieces of gear I've seen lately.

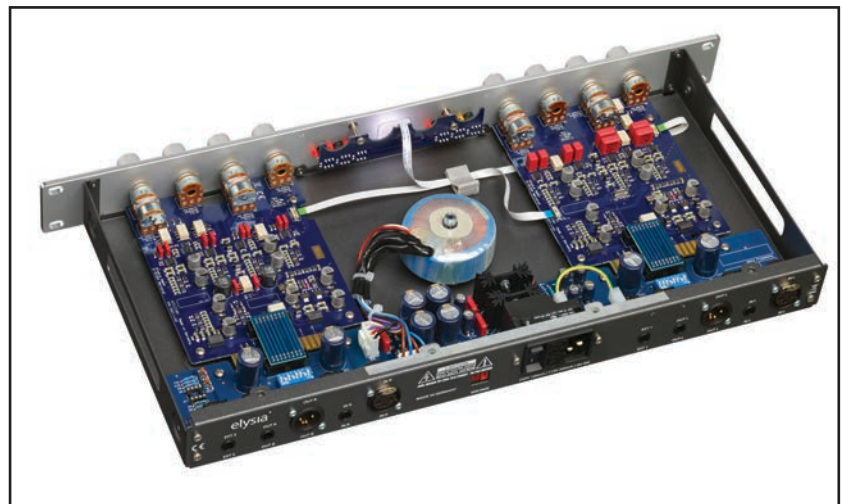
While testing the xfilter 500, I felt elysia created one of the finest equalizers I've ever heard. It has everything necessary to become an industry reference. All in all, this is definitely the type of gear that serious professionals will want to have as it will pay for itself, due to its excellent sound



The xfilter 500 is shown on the API Lunchbox rack for which it was designed, side by side with elysia's other 500-series products, the xpressor 500 universal compressor and the nvelope 500 impulse shaper.




After the xfilter 500, elysia expanded its rack series with the xfilter true stereo equalizer in a 19" format. Both XLR and balanced 0.25" inputs and outputs are provided.



Showing the two exact circuit boards found on the 500 series unit, the new xfilter rack sports a high-grade linear power supply with shielded toroidal transformer. It is housed in a super-lightweight yet sturdy full-aluminum chassis.

quality, adaptability, and build quality. And if you already own an xpressor, pairing the xfilter 500 with it creates one of the most impressive channel strips available.

For more information, visit www.elysia.com. The xfilter 500 can also be seen and heard on YouTube (www.youtube.com/elysiaTV). 

Tech Talk with elysia's Ruben Tilgner and Dominik Klaßen

By Miguel Marques

audioXpress: elysia has a history of designing hand-built discrete gear. Was it difficult to create products by using surface-mount designs (SMDs) and still maintain the quality and audio integrity for which the brand is known?

elysia: Using SMD technology in production has been a new process for us with the introduction of the xpressor 500. As with every new process, you need to learn a couple of things and gain some experience to get things right from the start. All SMD components are placed by a robot, one after the other, in a single production step, so we also needed to organize ourselves better in terms of purchasing components and scheduling production.

In our opinion, audio quality is not so much a question of through-hole technology (THT) vs. SMD. What really makes the difference is if you have a good circuit design or not, and if you have chosen the best components for it or not. In terms of reliability, we can now say we have very good experiences with SMD technology, as our products based on it are even more reliable than the THT ones had already been.

audioXpress: What were the biggest technical challenges you encountered when designing the xfilter 500?

elysia: The biggest challenge in this regard was to match both channels of this equalizer as well as possible. There is a good reason that not many stereo-linked equalizers occupy the market. Some stages in the filter need four resistance layers and this means you need a rotary switch with four layers and enough positions. These are rare and very expensive. The other option is a four-layer potentiometer.

The problem with four-layer potentiometers is that each individual layer comes with its own component tolerance. This means while layer one could be at the minimum tolerance end, layer two could be at the maximum of the tolerance range, or anything in between. It is a nightmare in terms of stereo matching.

For this reason, we built a little machine that uses a micro-controller running our software to read and evaluate every single two- and four-layer potentiometer we buy. As a result, only 65% of the dual-layer potentiometers and only 50% of the quad potentiometers we buy go into production. On a side note, we are also using special low-tolerance film capacitors for even better stereo accuracy.



elysia was founded in Nettetal (Germany) in 2005 by Ruben Tilgner and Dominik Klaßen to make their personal sound philosophy come true. Pictured are Ruben and Dominik with Tom Van Den Heuvel from elysia France.

audioXpress: Is designing gear for a 500 series harder than building standard 19" rack products? Apart from the space available—which is obviously a lot less on the 500 series—is it difficult to create high-bandwidth and high-headroom gear like yours for the 500 series?

elysia: Space is certainly a consideration when building a 500-series product. But we have another advantage using an SMD. When you look at the nvelope 500, it's definitely the most technologically complex analog processor we have ever built. So many stages, so many functions, so many components—and a complete channel still fits on a single 500-series board.

Bandwidth is really not a problem. Take the xfilter 500 for example, which has a frequency response of less than 10 Hz to 400 kHz at -3 dB. Headroom is lower than with our "bigger" units running at ±30 V, but only those who are running their DACs at very hot levels are really affected by this. You might have to be a little bit more careful, but once your levels are adequate, it works well.

audioXpress: elysia has a long history designing compressors. In your experience, are equalizers more or less difficult to design and build than compressors?

elysia: You can't really say that a compressor is more difficult to build than an equalizer, or the other way around, because both types of processors have their individual challenges to master. The audio path needs to be pristine in both, and that's why we have every single one of our amplifier stages operate in constant Class-A mode.

When you design a compressor, the two most important parts are the detector circuit and the gain reduction element. If you look at the many different topologies in the market, you can already tell what a broad and interesting field this is.

The focus in development when it comes to equalizers is the amplifier stages for the individual filter bands and the tuning

of the individual filter curves in combination with the overall voicing of the equalizer.

audioXpress: How does being a German company affect your builds and gear designs? Can you manage to source parts and components in Germany or do you have to go abroad for most of it?

elysia: Our products are entirely developed, built, and tested in Germany, and we do a good part of it. Speaking of parts and components, the majority of our metalwork and all the transformers are made in Germany, while most electronic components are obviously produced in the East. We have a good industrial infrastructure here, so finding the right partners to help us during the production process takes some time and patience. In the end, we have a chance to work with some experienced companies. There are also many electronic component distributors, so we only need to buy abroad in a few cases.

The well-known seal of quality, "Made in Germany," actually does mean a lot to us. Our home country has a great history for quality engineering. If you look at our PCBs or the design and accuracy of our housings, you will certainly spot some traces of our heritage here and there.

audioXpress: Is the industry and the manufacturing different now compared to 10 years ago when elysia started? What major technological achievements in audio and/or manufacturing have you witnessed during this time?

elysia: elysia was founded in 2006, and at this point in time, analog audio technology was already well developed. All the real classics had already established themselves when we hit the market. Today, the pro audio market is certainly in a different situation than in former decades, but does that necessarily mean manufacturing quality has decreased? We don't really think so. Looking at all the great (and sometimes not so great) analog products the past has given us, the true challenge in our book is something else: Trying to come up with something new.

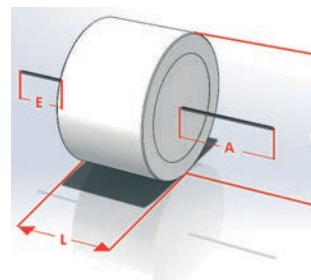
A more dynamic development can be found in the digital segment of our market, but of course, we have to consider that this one is much younger than good old analog, so it seems to have more room for further evolution.

audioXpress: Is there any new technology you want to try or are interested in that can be applied to pro audio or general manufacturing? Where do you see the industry going in the next few years?

elysia: Streaming audio via IP/network is still relatively new, and we are interested in seeing how this technology will develop. This is something so extremely useful and powerful that it is likely to have a great future. As always, there is the question of a possible common standard, and reality often makes it more than one instead... still it looks promising.

As for the future of the industry? (laughter) We really wish we knew... the only thing we can take for granted is that we have some amazing stuff in the pipeline.

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