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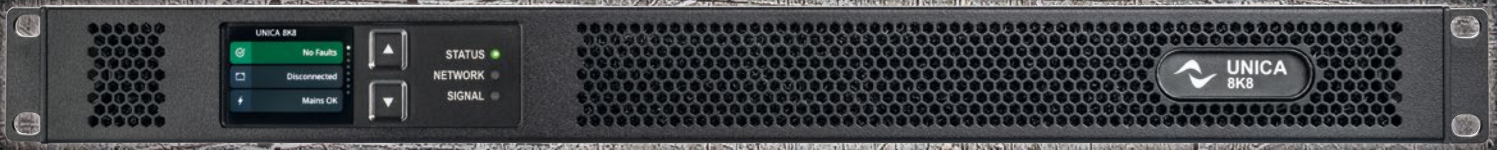


8-CHANNEL CLOUD BASED AMPLIFIER PLATFORM

Powersoft Unica 8K8

8-CHANNEL POWER AMPLIFIER WITH DSP

Unica 8K8

With the Unica series, Powersoft presents a new generation of eight-channel power amplifiers with total output ranging from 2 to 16 kW. The product family features Powersoft's latest and most powerful DSP platform and is configured and controlled via the manufacturer's ArmoniaPlus software. Alongside Unica, Powersoft is also introducing the "Universo" cloud platform that enables remote access via the Internet.

Copy and measurements: Anselm Goertz | Images: Anselm Goertz, Powersoft (1)

Eight-channel amplifiers are becoming the new standard for both fixed installations and for mobile use: Relying on modern Class-D power amplifiers, clever power distribution and integrated DSP systems, current technology allows users to achieve a very high power density. Powersoft is certainly one of the pioneers when it comes to compact high-power amplifiers. Since the company's foundation in Florence, Italy, in 1995, it has remarkably developed into one of few independent manufacturers of professional power amplifiers. With only a few exceptions, enclosures with a height of only 1 RU are certainly Powersoft's flagship products. In addition to a whole range of amplifier modules for the integration in loudspeakers, the company's current portfolio includes two series of touring power amplifiers and five for the installation market. With the Unica models, Powersoft is now introducing three new eight-channel power amplifiers primarily intended for the fixed installation market at this year's ISE at the end of January 2023. With 2 kW, 4 kW and 8 kW respectively, the type designations 2K8, 4K8 and 8k8 correspond to the total output these offer.

Additionally to eight channels versions, three four-channel models with even higher power ratings (9K, 12K and 16K) are also available. For our review, we received one of the very first samples of the 8k8 directly from the development department located at the company's headquarters near Florence.

More than just eight channels: cloud & swap

Now if you think that this is "just another eight-channel power amplifier", you are definitely missing the hidden features included in these inconspicuous devices.

A power amplifier's task in a sound system has undergone a significant change during the last three decades: from a big, heavy box that was defined primarily by its performance values (and often also by its weight) to a sound system's smart control centre. Integrated into a network, a power amplifier controls, optimizes and protects everything that has to do with the speakers. While the best thing users could find in the past regarding operation was a gain setting and possibly a slot for filter cards, extensive software

With four- and eight-channel models, the series offers a large selection of models

packages come into play today. These include all functions one can think of and allow users to easily operate and control even large installations.

With the Unica models, Powersoft is also introducing two further innovations which expand the ArmoniaPlus software's well-known functions: Powersoft's "Universo" cloud and an Easy Swap function. With a Universo cloud connection, users can operate, monitor and analyse errors from any location simply via an internet connection – a great advantage especially when it comes to fixed installations. If an error occurs, users can simply make a quick change or take a look inside the system without having to be on site.

Easy Swap

The Easy Swap function assists users should a power amplifier actually experience a fault. As soon as a USB stick is connected to the rear USB port, the power amplifier continuously secures a backup of its configuration onto it – including the firmware it currently uses. If the power amplifier has to be replaced due to a fault, the complete backup can be easily transferred from the USB stick to the replacing unit via the USB port. If necessary, the firmware is also updated to the correct version. This process is so easy to perform that it can be carried out even by laypersons, thereby noticeably reducing possible downtime.

Low-Z and 100 V

The power amplifier provides a maximum output voltage of 160 V_{pk}, regardless of the model; the maximum output current is 30, 40 or 48 A_{pk}. With its maximum output voltage, the power amplifier qualifies for direct operation (direct drive) in a 100-volt system without a transformer.

Additionally, the high output currents also allow low-impedance operation (Low-Z) down 2 Ω.

The 8k8's maximum output power per channel is 2000 W. However, this power is only available as long as all channels are not loaded simultaneously. In addition to the amp's maximum current and the maximum output voltage, the maximum output is limited primarily by the power supply unit, which can only deliver a certain amount of total power over a defined period of time. Further limiting factors are the power semiconductors' SOA (Save Operation Area) and the power grid's maximum load. For example, several power amplifiers share a 16-amp phase or the power amplifier operates in a 110-volt network. Regardless of this, the amp can be operated with mains voltages of 80 to 265 V and a mains frequency of 50 to 60 Hz. For more details on the performance, please see the corresponding paragraph.

Features: Display, In/Out, Amping, PoE

Viewed from the outside, the Unica power amplifiers come in a simple 1 RU / 19" design. A novelty for a Powersoft installation power amplifier is the small colour display on the front of the enclosure. Using two buttons, users can navigate through eight info displays that provide information on the network, the power supply, the level, the loaded setups and also the hours of operation. The remaining front consists of a perforated grille with foam behind it, through which air is drawn in for cooling. The grille, which is fastened using magnetic catches, can be easily removed for cleaning.

The mains connection is located on the rear as an IEC cold appliance socket (20 A). In the middle of the rear pan-

The Unica power amplifier's display, where the most important information is also displayed directly on the unit

el, users will also find the speaker outputs in the form of large Phoenix connectors PC 5/8, followed on the right by analogue inputs with Phoenix MC 1.5/6. Three RJ45 / 1 Gb network connections for a Dante/AES67 network are located on the very outside. These can be operated in switched mode or redundantly.

The ETH1 network socket also states "PoE" (Class 4), which – in the case of a power amplifier – might initially cause an odd puzzled look: the connector can supply power to the internal DSP, which means that all DSP functions can be maintained in the event of a main power failure. With less than 0.5 s, the following restart is very quick in comparison to a complete restart, which takes 10 seconds. In addition, a PoE++ supply (Class 8, 90 W) also enables monitoring of the connected speakers even when the main power supply is switched off.

Below the network socket, one also finds a USB3 port and a USB type A socket for the Easy Swap USB stick.

A look inside the Unica power amplifier reveals densely packed electronics. The front third of the enclosure is occupied by the power supply unit, followed by a partition that is completely occupied by eight small fans. The air that is drawn in from the front through the power supply unit is forced through a cooling profile occupying the entire width of the enclosure as part of a new thermal design. The air then flows past the output filters and power amplifiers as well as the mains filter and the DSP system and then back outside through the rear panel.

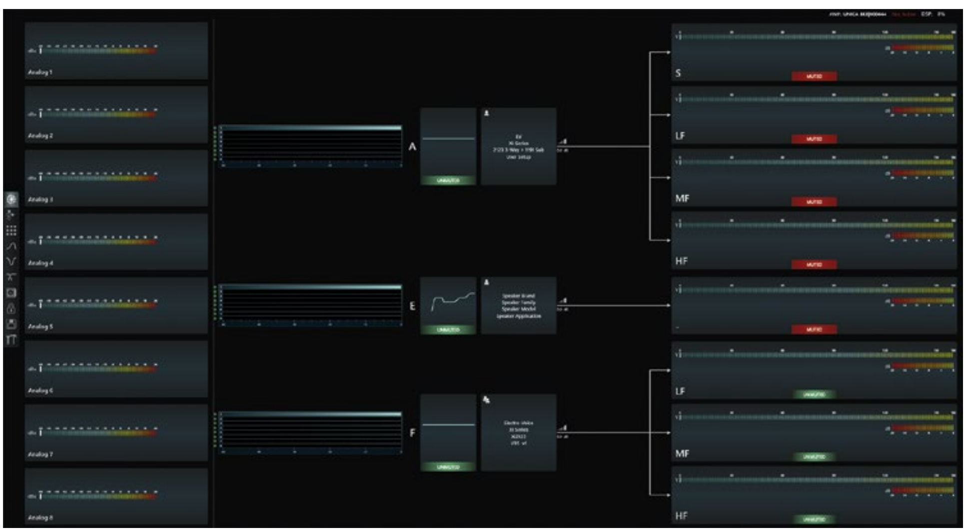
The direction of air flow is important for the amplifier's durability: the cool outside air flows around the power supply unit capacitors first and only then heats up in the cooling profiles. This way, the capacitors are protected from premature ageing caused by high temperatures.

The DSP system is hidden under a cooling profile in the rear corner of the enclosure. Next to it, one finds the analogue input board with two four-channel AKM5534 ADCs and several Ti OPA1679 low-distortion operational amplifiers.

All in all, the design results in a very low weight in relation to the number of channels / the power density achieved.

ArmoniaPlus: matrix and filter

The Powersoft power amplifiers' complete functions can be accessed via the ArmoniaPlus System Manager software. Here, users can configure and manage complete systems as well as create or edit setups for loudspeakers. We will not go into detail here regarding the extensive functions ArmoniaPlus offers to developers and loudspeaker manufacturers. However, in brief, these are: raised-cosine filters in several levels, all kinds of X-Over filters with a slope of up to 48 dB/Oct, phase-linear FIR high and low passes, peak and



Block diagram ArmoniaPlus 8-channel Unica power amplifier in the software (Fig. 1)

RMS limiters for the output voltage, current and power limiters as well as extensive protection and control functions including measurement of the load impedances with reference value comparison.

If one opens a power amplifier in ArmoniaPlus's design mode, the entire signal processing is shown as a block diagram (Fig. 1). The eight input channels can receive their signal in an analogue way or via the Dante/AES67 network. Users can create a backup strategy with three fallback levels, which are controlled either via the signal level or via pilot tone detection. The analogue and digital inputs can be adjusted to in relation to each other using delay and gain, so that a transition without a jump is possible.

The next block contains a complete 8 × 8 matrix. With this, users can mix the eight inputs to the eight outputs as desired. In Fig. 1, only three of the eight inputs continue to be used. The reason for this is that the speaker settings loaded in the outputs include a 4-way and a 3-way setup, each requiring only one input.

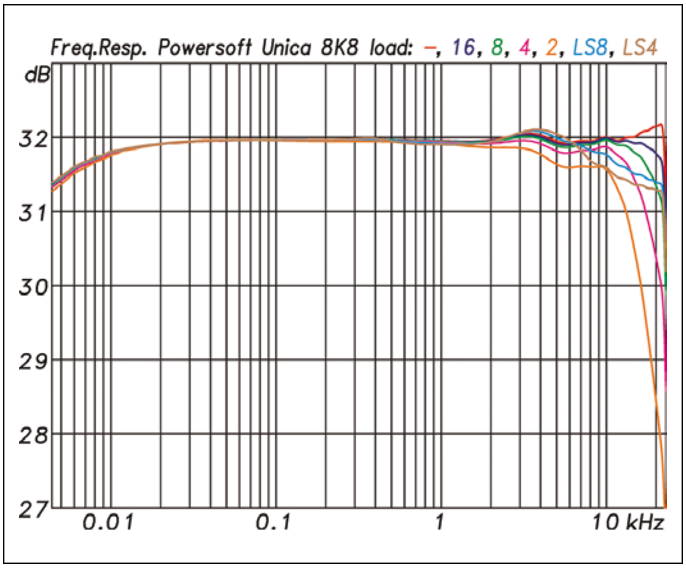
The next step in the inputs is a filter bank with raised-cosine EQs (Fig. 2) with three levels. This kind of filter offers maximum flexibility as well as clear graphical adjustment possibilities. The three levels also allow a differentiation of accessibility according to different user levels. For example, one level could be for manufacturer setup, one for calibration and one for daily use.

For the actual loudspeaker setups, users can either rely on predefined settings that are available for numerous models from well-known manufacturers. Alternatively, users can create their own setups using the numerous functions available with IIR and FIR filters (Fig. 3). At a sampling rate of 48 kHz, the custom FIR filters can process a maximum of 2048 coefficients per channel, which means that almost all wishes can be fulfilled. At the end of the signal chain, users will find the limiters (Fig. 4). Each of these has separately configurable functions for RMS, peak and clip voltage, RMS current, true power and now a newly added level-controlled dynamic EQ. All this is topped off with the diagnostic module that includes impedance measurement and pilot tone monitoring.

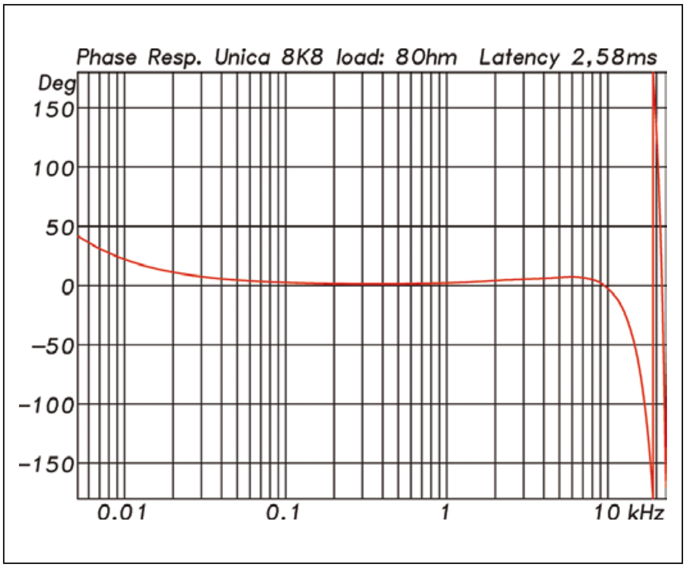
ArmoniaPlus User EQ with raised-cosine filters; three independent layers are available per channel (Fig. 2)

Speaker EQ with 16 IIR filters, X-Over functions and optional FIR filters that users can load with a maximum of 2048 taps at a sample rate of 48 kHz (Fig. 3)

Detailed limiter functions with RMS, peak and clip limiters as well as a current and true power limiter. In addition, a dynamic EQ is also included; the filter's gain is controlled by the signal level (Fig. 4)



Frequency responses measured with loads of 2, 4, 8 and 16 Ω, without load and with typical loudspeaker impedances for 4 Ω and 8 Ω nominal impedance (Fig. 5)



Phase response measured with a load of 8-Ω. The base latency is 2.58 ms (Fig. 6)

Measurements: frequency / phase response

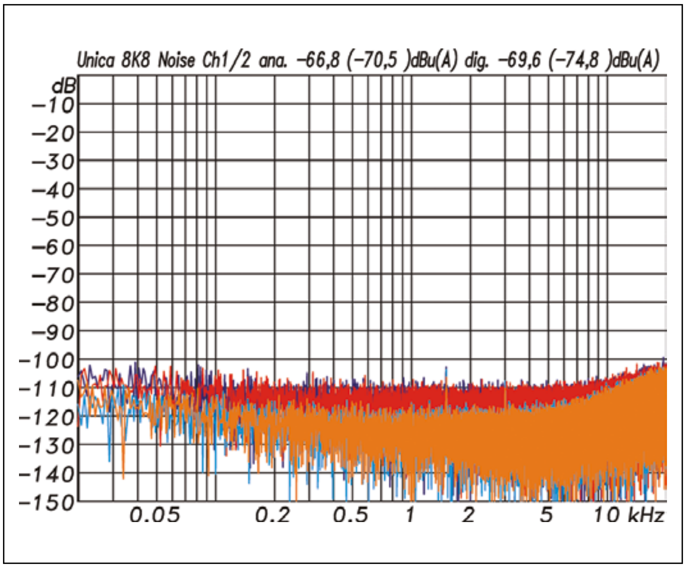
Let us begin with the Unica 8k8's frequency response measurement, which is displayed in Fig. 5 using several curves depending on the load. The gain when using the analogue inputs with very good CMRR is 32 dB. Due to the Class-D power amplifier's circuit design with passive low-pass filters in the outputs, fluctuations that are more or less strong occur at the upper end of the transmission range in the frequency response, depending on the load.

The lower the load's impedance, the more the curve drops towards high frequencies. However, as the curves in Fig. 5 show, this only becomes relevant with a 2- or 4-Ω load. Real speakers, however, usually have an impedance that increases towards the high frequencies, which in turn weakens the abovementioned effect. Measurements with real 4- and 8-ohm speaker impedances show a level loss of only 0.6 dB at 20 kHz, a loss that can confidently be considered negligible. The output filters are slightly more noticeable in the phase response (Fig. 6), where the response turns by 180° up to 20 kHz due to the brick-wall filter at 24 kHz. For the display of the phase response in Fig. 6, the amplifier's basic latency of 2.58 ms was subtracted.

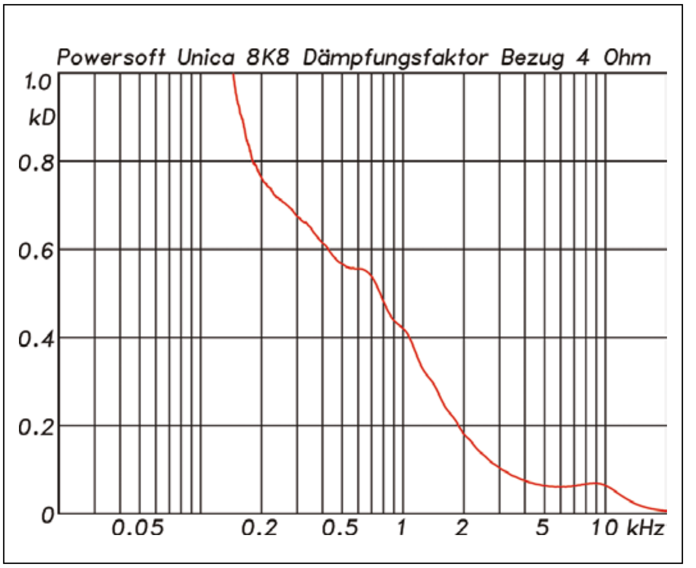
Dynamic range

To calculate the dynamic range, one first has to determine the maximum output voltage. This is 160 V_{pk} for the 2K8, 4K8, and 8K8 models and thus approximately 43.3 dBu (four channel models each have different peak voltages). This is contrasted with the noise level measured at the outputs, which was measured once for analogue inputs and once for digital inputs. For this purpose, the analogue inputs were terminated with a 200-Ω resistor. The noise level measured in this way was 66.8 dBu unweighted and 70.5 dBu with A-weighting. After switching from the analogue to the digital signal feed, the values improved to a very good 69.6 dBu and -74.8 dBu(A). If the A-weighted noise level is taken as a starting point, a very good signal-to-noise ratio of just un-

Phoenix connectors for the inputs and outputs, three network connections incl. Dante/AES67 interface as well as GPIO contacts and status request



Noise level at the output measured exemplarily for channels 1 and 2. When using the analogue inputs, the noise level is -66.8 dBu and 70.5 dBu(A). With a digital input, the results are 69.6 dBu and -74.8 dBu. The maximum signal level is 43.3 dBu (Fig. 7)



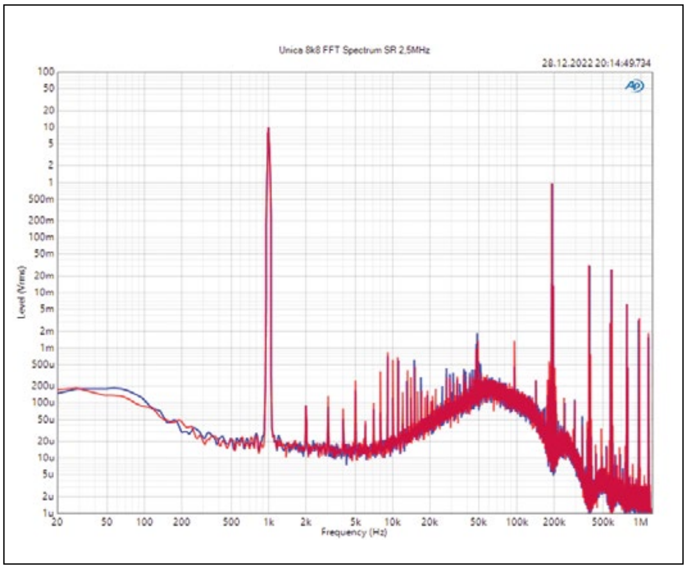
Damping factor related to 4 Ω measured exemplarily for channel 1 (Fig. 8)

der 114 dB is achieved with an analogue, while 118 dB are achieved with a digital signal feed. Fig. 7's corresponding interference spectra shows the measurement with analogue and digital inputs. Mono-frequency components that can be particularly disturbing do not exist here.

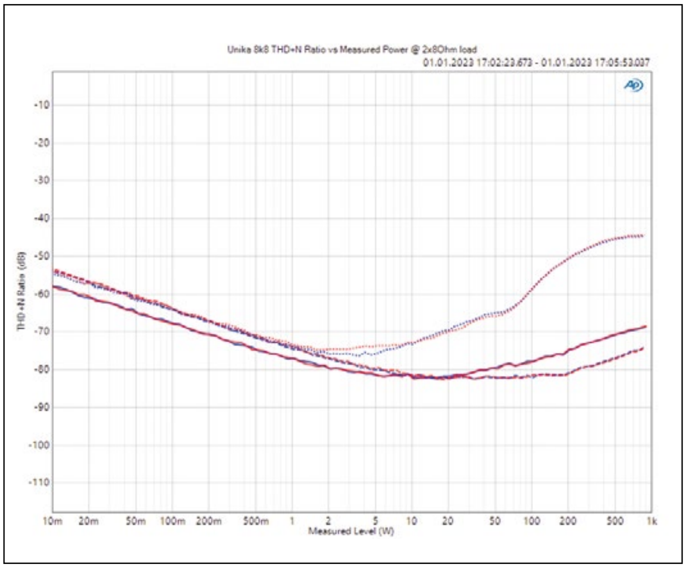
The measurement of the damping factor in Fig. 8 shows the curve typical for modern Class-D power amplifiers, which are somewhat overcompensated at low frequencies and therefore already have a negative internal resistance in some cases. The curve then drops towards the higher frequencies. Nonetheless, a value of 70 is still achieved at 10 kHz. The curve only collapses at even higher frequencies, as the output filter becomes noticeable here.

However, a high damping factor is especially important at low frequencies, as it is here where the loudspeaker needs good control by the amplifier to prevent too long oscillation. In practice, for the power amplifier, values of 100 are more than sufficient as cable and contact resistances usually create even greater resistances on the signal path anyway.

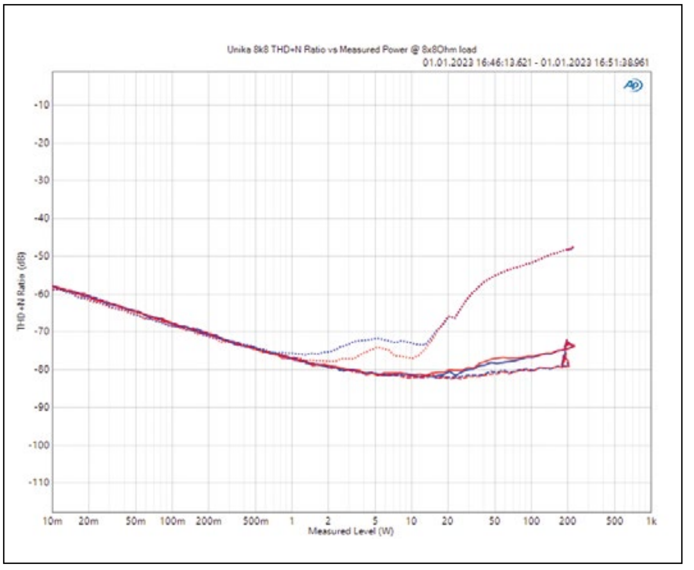
A further measurement for Class-D amplifiers is the FFT analysis of the output signal using a very high sampling rate. Fig. 8 shows a measurement of this kind for the Unica 8k8 using a sampling rate of 2.5 MHz, the highest value possible for an APx555 audio precision analyser. With this type of measurement, both the Class-D switching frequency and possible interference within and also outside the audio frequency range become visible. For the measurement in Fig. 8, a 1 kHz useful signal was also added. The useful signal's amplitude at the output was 10 V for this type of measurement. The PWM switching frequency at 192 kHz with a voltage of 1 V and its integer multiples up to just below the measurement limit at 1 MHz can be clearly identified.



FFT spectrum for the output signal measured with 2.5 MHz sample rate. At 1 kHz, the useful signal with a voltage of 10 V can be identified. Remnants of the PWM switching frequency in the order of 1 V are found at 192 kHz and its integer multiples (Fig. 9)



Distortions (THD+N) as a function of the output power (x-axis in W) at a load of 2 × 8 Ω. Measurements at 100 Hz (- - -), 1 kHz (——) and 6.3 kHz (···). The distortion values increase significantly from 6.3 kHz onwards (Fig. 10)

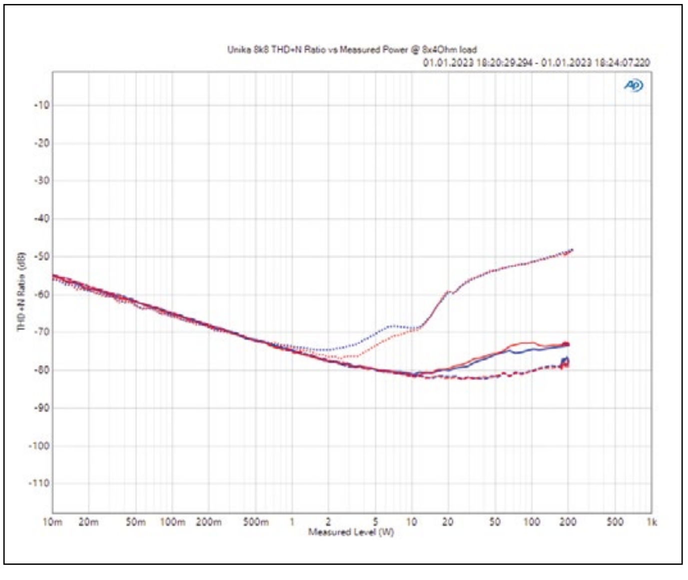


Distortions (THD+N) as a function of the output power (x-axis in W) at a load of 8 × 8 Ω. Measurements at 100 Hz (- - -), 1 kHz (——) and 6.3 kHz (···). Measurement for channels 1 and 2 (Fig. 11)

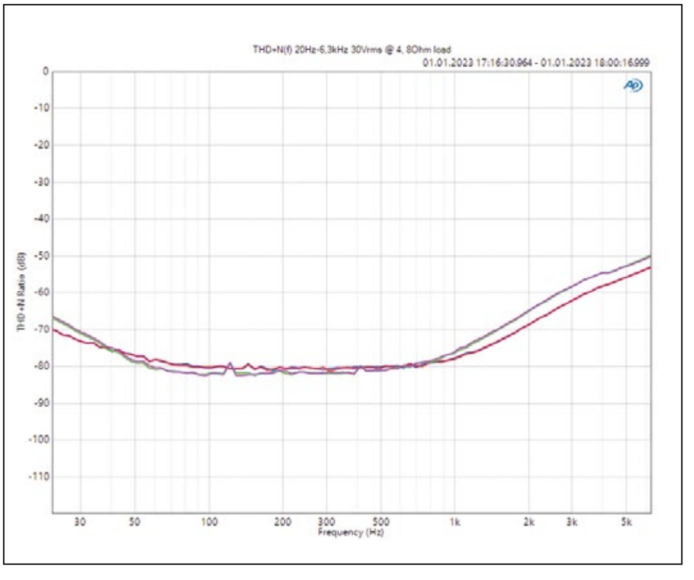
Distortion

Three further measurements allow us to analyse the amplifier's distortion behaviour. Figs. 10-12 show the THD+N results as a function of the output power, measured at frequencies of 100 Hz, 1 kHz and 6.3 kHz for a load of 2 × 8 Ω, 8 × 8 Ω and 8 × 4 Ω with simultaneous operation of the amp's eight channels. At 100 Hz and 1 kHz, the curves can be found between -80 dB and -70 dB (=0.03%). At 6.3 kHz, however, the THD+N values are significantly higher at -50 dB to -45 dB. Here, somewhat less distortion would be desirable.

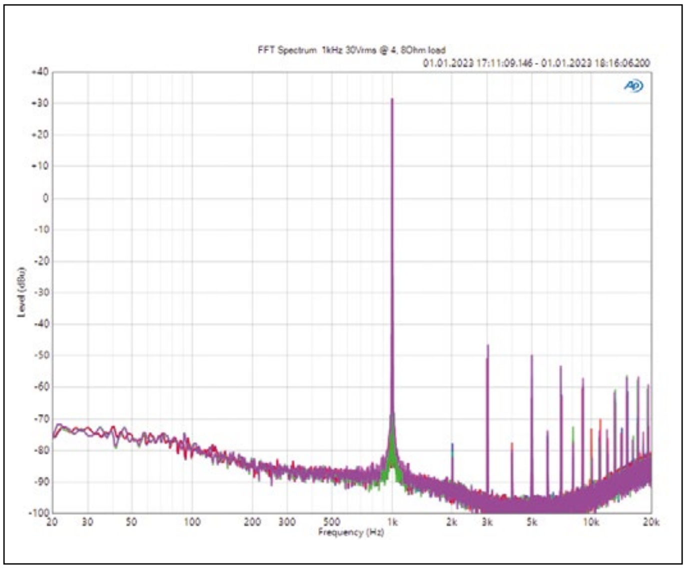
Further THD curves from Fig. 13 were measured at a constant level and an output voltage of 30 V_{rms} as a function of the frequency. The four curves in total display two exempla-



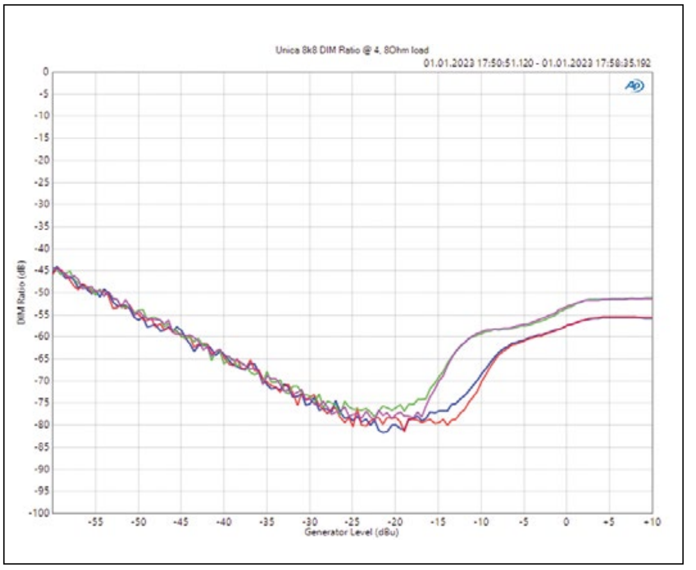
Distortions (THD+N) as a function of the output power (x-axis in W) at a load of 8 × 4 Ω. Measurements at 100 Hz (- - -), 1 kHz (——) and 6.3 kHz (···). Measurement for channels 1 and 2 (Fig. 12)



Distortions (THD+N) depending on the frequency exemplary for channels 1 and 2 at an output voltage of 30 V_{rms} with a load of 4 Ω (red, blue) and of 8 Ω (green, purple) (Fig. 13)



Exemplary distortion spectrum for channels 1 and 2 at an output voltage of 30 V_{rms} with a load of 4 Ω (red, blue) and of 8 Ω (green, purple). All distortion components are located below -80 dB (0.01%) and therefore completely uncritical (Fig. 14)



Transient intermodulation distortions (DIM100) as a function of the input level measured exemplarily for channels 1 and 2 with a load of 4 Ω (blue, red) and of 4 × 8 Ω (green, magenta) (Fig. 15)

ry channels with 4- and with 8-Ω-loads. At 1 kHz, the results we are already familiar with from Fig. 11 and Fig. 12 can again be identified. Beyond that, the distortions increase evenly with approximately 12 dB/oct towards higher frequencies.

The distortion spectrum at 1 kHz from Fig. 14 was also measured for loads of 4 Ω and for 8 Ω. Again, the output voltage was 30 V_{rms}, which corresponds to 112 W at 8 Ω or 225 W at 4 Ω. The dominant distortion components are of odd order (k3, k5, ...) and fall off evenly towards the higher orders. There are no anormal features in this measurement.

The final distortion measurement is the DIM measurement (Dynamic Intermodulation Distortion, Fig. 15), in which a 15 kHz sine wave is superimposed with a steep-sided 3.15 kHz square wave. The resulting intermodulation products are analysed. This measurement reveals weaknesses especially regarding fast transient signals. The steep edges of the square-wave component are much more demanding on the power amplifier than the THD measurement's steady sine wave. The DIM measurement is therefore relatively important when it comes to a power amplifier's sonic qualities: as soon as high currents are called for, the transient distortions often rise sharply – which is not the case here. At the clip limit, which is reached at an input level (x-axis) of around +3 dBu, the results are -55 dB for a load of 8 Ω and -52 dB for a load of 4 Ω.

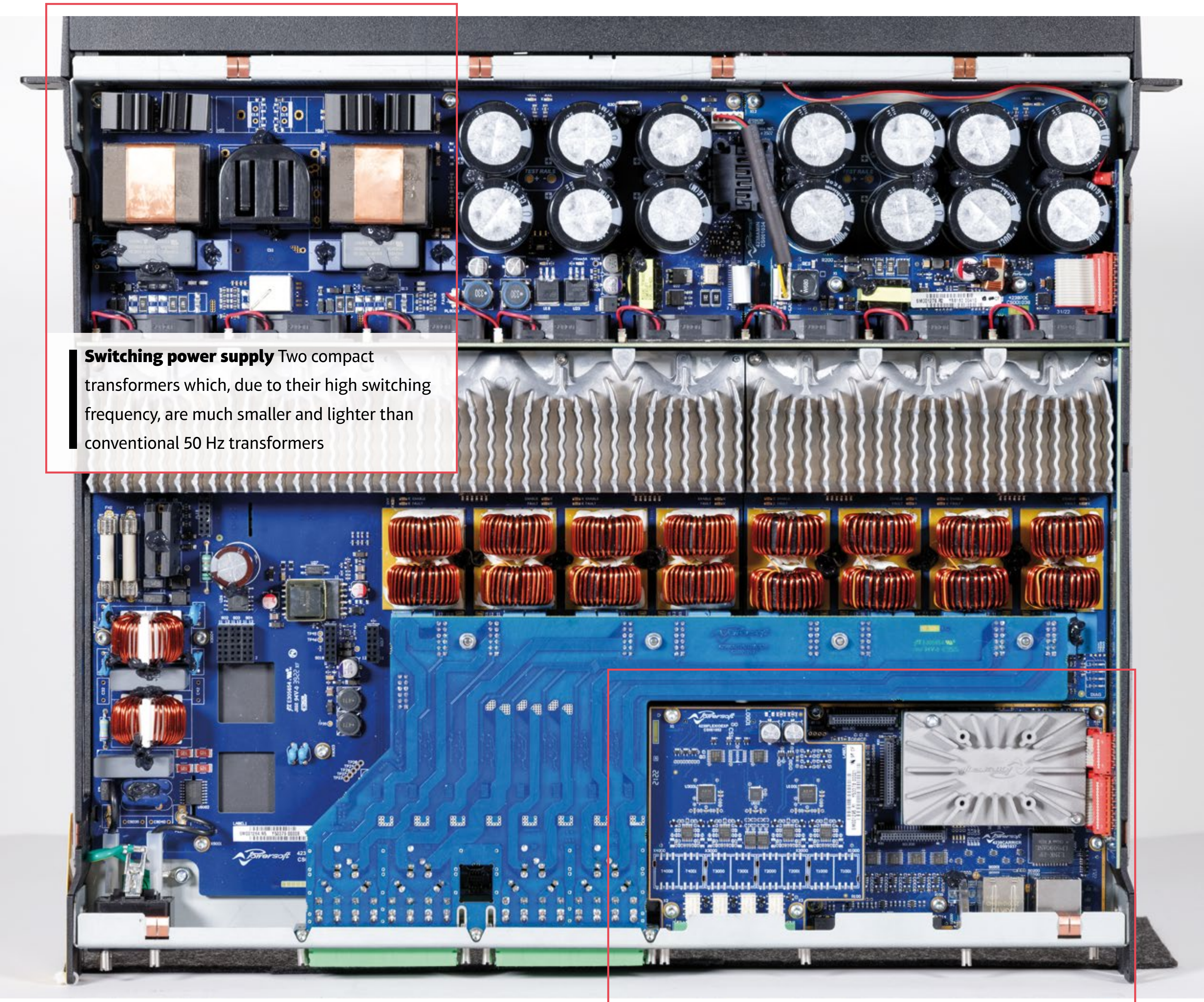
Performance

Discussions always arise – especially when it comes to modern power amplifiers – about whether manufacturers' values are comparable, which standard was used for the measurement and what is ultimately relevant. What type of signal is used clearly has the greatest influence on the performance. In extreme cases, this can be a permanently applied sine signal, a sine burst that varies in length or even a noise signal.

An important characteristic for the signal used is the crest factor, which describes a signal's ratio of peak value to effective value. This value is 3 dB for a sine signal and 12 dB for an uncompressed pink noise. Music and speech signals usually have a crest factor between 9 and 20 dB. When assessing the measured results, this precisely is an important aspect, as a power amplifier primarily has to transmit speech or music signals, not constant sine signals.

One can therefore distinguish between two types of performance measurements: sine signals are suitable for measuring the permanently possible power, while burst or noise signals are suitable for measuring the possible short-term peak power. When evaluating or comparing amplifiers, if possible, one should therefore consider both values.

In the case of multi-channel power amplifiers that are powered using one power supply unit, there is the additional aspect of load distribution. If only two of eight channels



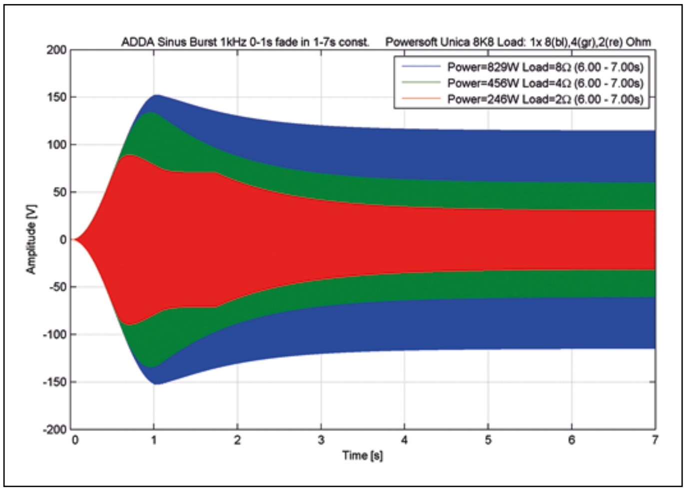
Switching power supply Two compact transformers which, due to their high switching frequency, are much smaller and lighter than conventional 50 Hz transformers

The Unica 8k8's power supply unit (top), below the cooling profiles with eight small fans, followed by the output filters. Below left, the mains filter for suppressing interference into the mains

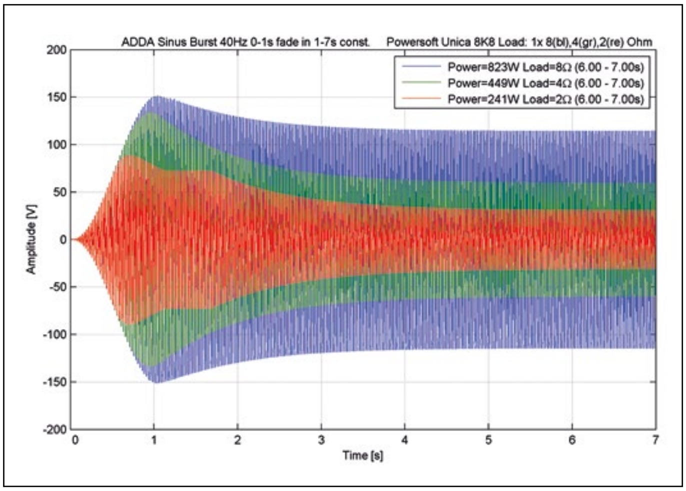
Analogue input board with two four-channel AKM5534 ADCs, on the right below the Powersoft DSP's cooling profile

are fully loaded while the others operate at a lower load, then higher performance values are possible than if all channels are fully loaded.

In the case of the Unica 8k8, the first step was therefore to carry out measurements with sine signals that also allow the identification of temporal. Fig. 16 shows the output signal with a single-channel load of 2, 4 or 8 Ω. The single-channel measurement does not cause the power supply unit to run at full capacity, so that the amplifier's limit can be identified as such. With the 8-Ω load, the maximum output voltage of 152 V_{pk} is reached for approximately for a burst of some ms. The maximum output voltage at 4 Ω was approximately 134 V_{pk} and approximately 89 V_{pk} at 2 Ω. This corresponds to power values of 1440 W at 8 Ω, 2240 W at 4 Ω and 1980 W at 2 Ω. After some ms, a limit is reached that reduces the continuous power to 829, 465 or 246 W. If



Burst measurement with a single-channel 1 kHz sine signal for loads of 2 Ω, 4 Ω or 8 Ω. The burst signal is faded in within the first second, which prevents overshooting of the limiter (Fig. 16)

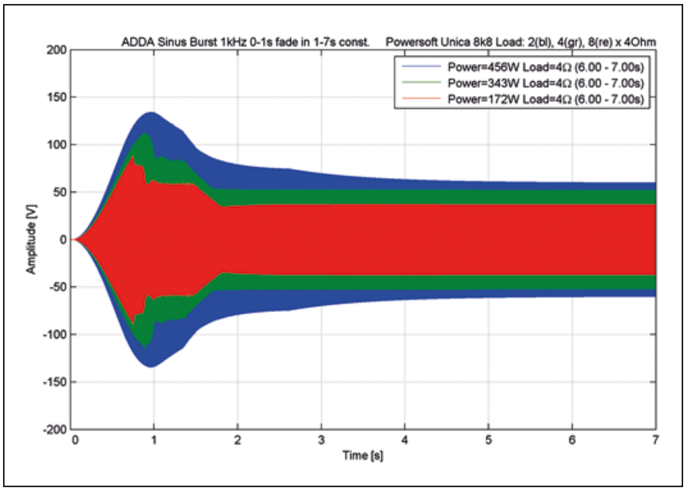


Burst measurement with a single-channel 40 Hz sine signal for loads of 2 Ω, 4 Ω or 8 Ω (Fig. 17)

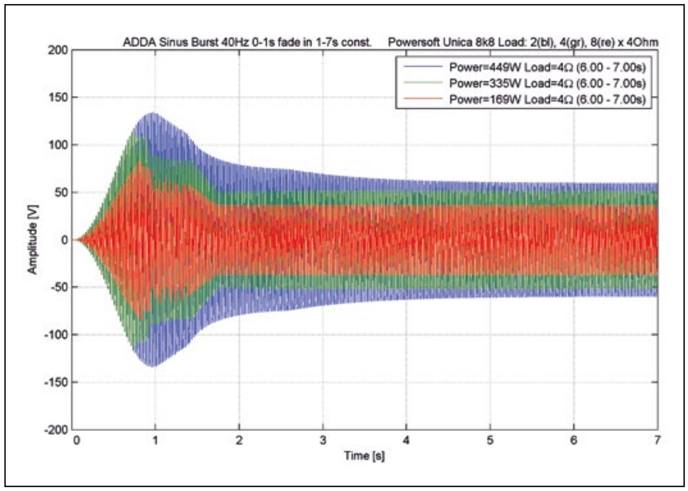
the measurement is carried out with a 40 Hz instead of the 1 kHz sine signal, the results remain largely unchanged.

For a further sine signal measurement, two, four or all eight channels were now fully loaded with the same signal. The load was 4 Ω for all channels. This measurement is mainly used to test the power supply unit's limits. The results with two loaded channels are exactly the same as those with only one channel. For 1 s, 695 W were reached at 4 Ω. With four channels, the result was 417 W, while 215 W were achieved with all eight channels. The measurements with loads of 8 Ω and 2 Ω, which are not shown here, delivered similar power values. A prolonged load (60 s or more) reduced the values to 135 W per channel, regardless of the load.

Front cover with magnets for easy cleaning of the dust filters. As is typical for Powersoft, the amp's interior is tightly packed, yet very tidy and shows only little visible wiring



Burst measurement with a sine signal of 1 kHz for a one-, two-, four- or eight-channel load of 4 Ω. The measured curve is identical for a one- or two-channel load (Fig. 18



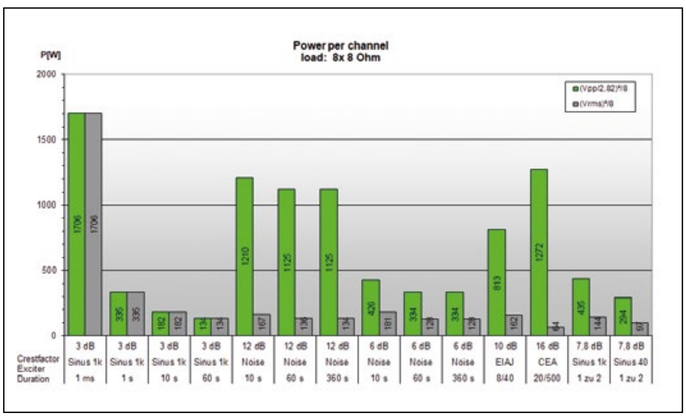
Burst measurement with a sine signal of 40 Hz for a one-, two-, four- or eight-channel load of 4 Ω. The measured curve is identical for a one- or two-channel load (Fig. 19)

Power for different signal types

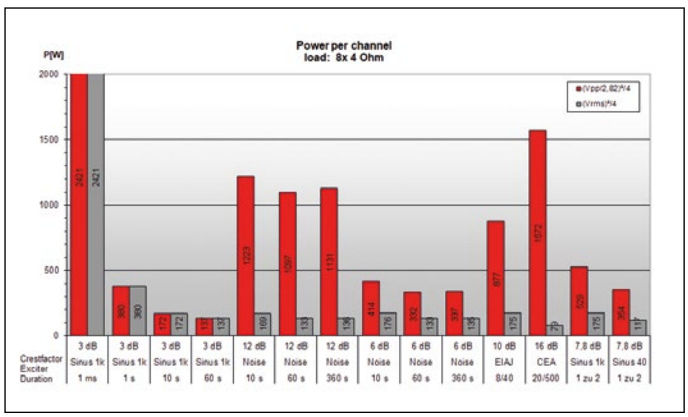
Inevitably, the question now arises: how do these results match the 1000 W per channel with simultaneous load of all channels that are specified in the data sheet? The answer is provided by the next measurements series that was carried out with various burst and noise signals with crest factors of 6 to 16 dB.

Let us begin with a brief explanation. The following values are measured (Fig. 20/21):

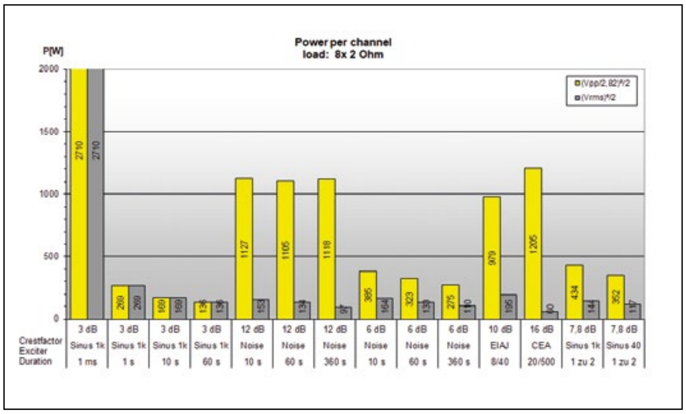
- the pulse power for a 1 kHz sine signal's single 1 ms period
- the sine power for a constantly applied 1 kHz sine signal after one second, after ten seconds and after one minute
- the power for a constantly applied noise with a crest factor of 12 dB after ten seconds, after one minute and after six minutes
- the power for a constantly applied noise with a crest factor of 6 dB after ten seconds, after one minute and after six minutes
- the power according to EIAJ measured with a pulsed 1 kHz sine signal with a duration of 8 ms and measured every 40 ms. The signal has a crest factor of 10 dB.
- the performance according to CEA 2006 with a 1 kHz sine signal whose level increases by +20 dB every 500 ms for 20 ms. The signal has a crest factor of 16 dB.
- the power for a periodically repeating 1 kHz burst with a length of 33 ms followed by a rest phase of 66 ms. This signal's crest factor is 7.8 dB.
- the power for a periodically repeating 40 Hz burst with a length of 825 ms followed by a rest phase of 1650 ms. This signal's crest factor is also 7.8 dB.



Power for different signal types Unica 8k8 with 8 Ω per channel with simultaneous load of all channels (Fig. 20)



Power for different signal types Unica 8k8 with 4 Ω per channel with simultaneous load of all channels (Fig. 21)



Power for different signal types Unica 8k8 with 2 Ω per channel with simultaneous load of all channels (Fig. 22)

Evaluating sine measurement signals is easy. One simply records the effective value and uses it to calculate the power. The sine wave should not yet be visibly distorted. Two values can be determined for the sine burst signals according to EIAJ or CEA: the short-term RMS for the duration of the burst and the overall RMS that also includes the signal pauses. The ratio of the two values is 7 dB for the EIAJ signal and 13 dB for the CEA signal. The crest factor is 3 dB greater, it is therefore 10 dB and 16 dB respectively. For the burst measurements, the overview shows the power calculated from the burst's short-term effective value and the overall effective value. A further burst measurement method uses 33 ms long 1 kHz bursts followed by rest phases with a length of 66 ms. Here, the crest factor is 7.8 dB. Based on this measurement, the frequency of the burst was reduced by a factor of 25 to 40 Hz while the time span was extended by a factor of 25. This was done with a special focus on the power amplifier's bass reproduction capabilities, where sounds are often present for longer periods.

The measurement with the noise signals with a crest factor of 12 or 6 dB is somewhat different. With these signals, the amplifier is driven to its clip limit and then permanently loaded. The signal's peak-to-peak (V_{pp}) and effective value (V_{rms}) are measured after ten seconds, after one minute and after six minutes. From this – comparable to the burst measurement – one calculates one power value from the voltage's effective value and one from the peak-to-peak value divided by 2.82. The results are therefore comparable to those of the burst measurements. These measurements resolve the only apparent contradiction between the measured results and the data sheet. Regardless of the load, when all eight channels are operated simultaneously with a load of 2, 4 or 8 Ω and a signal with a crest factor of 12 dB, this results in a power of approximately 1100 W – calculated from the peak-to-peak voltage divided by 2.82. In all cases, the average power is the familiar 135 W. In other words, everything fits together.

Mains load and smart rail management

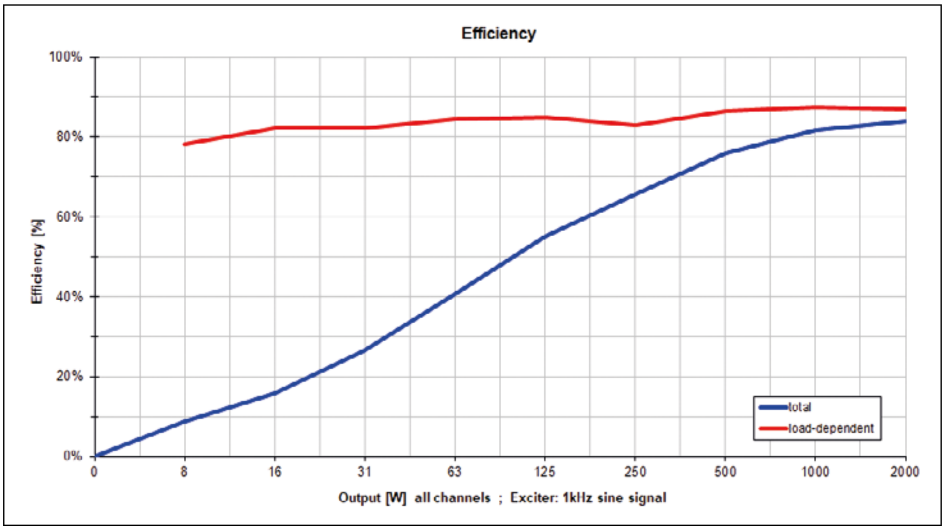
When it comes to high power amplifiers, mains load is an important issue. Important aspects to consider are efficiency, mains load (power factor) and – especially when continuous operation in fixed installations is called for – also power consumption in standby mode.

Fig. 23 shows the power amplifier's efficiency using two curves. The blue curve sets the output power in relation to the total power drawn from the mains grid. Along with the base load, this results in rather low values for efficiency at low output power. For the red curve, on the other hand, the output power is only related to the power consumed in addition to the base load.

The Unica 8k8 shows very good efficiency results of 80 to 88%. These were so good that the measurement was repeated as a precaution to avoid measurement errors. For the second measurement, a Hameg power meter was used in addition to the Fluke power analyser, however both confirmed the first measurement's results.

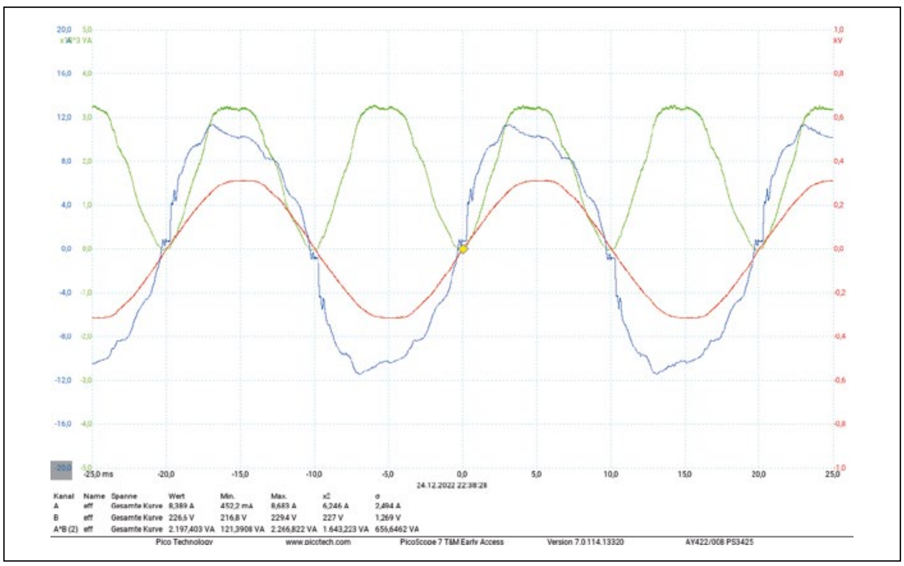
Added to this is the base load, which can be between 44 and 79 W depending on the time period before the measurement. Powersoft's Smart Rails Management (SRM) ensures that the power supply voltage driving the amplifiers is not always constantly high, but that it is adjusted as required. If there is no or only a small signal, the power supply unit delivers a lower voltage. If demand increases – a fact that is detected early in the signal chain thanks to a short delay – the power supply voltage is ramped up very quickly. The SRM function is always active. The fact that individual channels can also go into standby mode is activated in ArmoniaPlus via the Eco Mode function.

The current drawn from the mains should follow the voltage as closely as possible. Comparable to a real resistor, the amplifier should behave like a load for the mains. Deviations are caused by displacement reactive currents (capacitive or inductive) and by distortion reactive currents (harmonic component). Metrologically, the power factor (PF) shows how well the current curve approximates



Efficiency as a function of output power The blue curve refers to the total power, the red curve refers to the load-dependent share without base load (Fig. 23)

the voltage curve. Fig. 24 shows the measurement of the Unica 8k8 at full load. Apart from a slight offset and a little distortion of the curve's shape, the blue current curve follows the red voltage curve's progression very well. The power factor is 0.95 – or 5.5% when expressed as distortion. This very good result is the work of an active PFC (Power Factor Correction) circuit.



Power Factor Correction Course of mains voltage (red), mains current (blue) and calculated power consumption (green). The PFC performs very well (Fig. 24)

The key results for the Unica 8k8's power consumption are as follows

- Standby: 21 W
- Idle Eco: 44 W
- Idle: 79 W
- Max. with 12 dB CF noise: 1360 W
- Max. with sine signal: 1300 W

The results measured here are snapshots and may deviate slightly depending on the outside temperature, the time interval before the measurement and the type of signal.

Summary

With its eight- and four-channel Unica models, Powersoft is launching a new power amplifier series that can be deployed flexibly both for low-impedance operation as well as for use with 100- or 70-volt applications. The channels are always available regardless of the operating mode.

Depending on the total load and the type of signal, the maximum power of our test model per channel is 1000 to 2000 W. The Unica power amplifiers are configured and operated using Powersoft's proven ArmoniaPlus software. With its high-performance DSP system, the Dante/AES67 interface and many other features, the power amplifiers leave hardly anything to be desired.

New and particularly noteworthy are Powersoft's "Universo" cloud and the Easy Swap function that provide real advantages especially for the operation and maintenance of the power amplifiers in fixed installations. Phoenix connectors also underline the preferred deployment in fixed installations. However, this formality should not be a n obstacle to also using Unica amplifiers as mobile units in a rack with a connection panel. ■