



DAC 8 High End D/A-Converter

Over the last few years we have exploited our long experience and profound knowledge of digital signal processing in the development of fully-featured disc and multi-source players. However, the DAC 8 is another device designed to operate purely as a converter, and achieves its fantastic performance through the use of the very finest technologies and uncompromising design. After protracted reflection we decided to go far beyond the aim of just building a sound card for the high-quality transfer of computer music, and our DAC 8 can accomplish so much more. In fundamental form it contains everything required to convert any form of digital source into analogue signals to the very highest standards. It is a complete high-end device of the most elevated quality, from the case right through to the mains power supplies.

The case is of all-aluminium construction: the base plate and top cover are machined from solid aluminium plates 6 mm thick, and we make the side and front panels from aluminium profiles which are extruded using special complex tools. The heavy case rests on vibration-damped absorber feet.

The seriousness of our claim that the DAC 8 is one of the world's finest high-end converters can be judged by the fact that we employ two separate, sophisticated mains power supplies for the analogue and digital sections. A volume control is another unusual feature in a DAC, but it makes good sense if the user wishes to install active loudspeakers, or employ the DAC 8 as a pre-amplifier in conjunction with external power amplifiers. The volume control is of highly refined design, and exploits analogue control elements down to low volumes, as they avoid any loss of dynamic quality even at low listening levels. Two gold-contact relays are provided to bypass the volume control, i.e. it can be removed entirely from the signal path when not required. A high-quality headphone output is also present.

The array of sockets on the back panel reflects the impressive facilities offered by the DAC 8: it features two high-quality analogue outputs, 1 x symmetrical (XLR) and 1 x asymmetrical (RCA), whose output resistance is very low at just 22 Ohms. This means that it is possible to drive active speakers for professional use, or with very long cables, without loss of quality. A slide-switch is used to determine whether the volume control is active or not. The CTRL socket below the mains socket is intended for updates and for external control of the DAC 8. Eight digital inputs are available: 4 x SP/DIF, 1 x optical (TOS-Link), 1 x BNC, 1 x AES/EBU, 1 x USB. All inputs support data rates of 32 kHz to 192 kHz at 16 ... 24-bit (TOS-Link 96/24). The USB input supports USB Audio Class 1 (USB Full Speed) at up to 96/24 and USB Audio Class 2 (USB High Speed) at a maximum of 192/24. For USB Audio Class 2 it is possible to select either synchronous or asynchronous transmission; a special driver is required for this.

One of the biggest problems in converting different digital sources is jitter (fluctuations in the transmission rate, or "clock"). The more pronounced the jitter, the worse the sound quality. That's why T+A has invested tremendous effort right from the outset in developing measures to eliminate jitter, and for the DAC 8 we have taken a unique new approach. Jitter arises in the source device – especially in computers – and in the transfer of data between source and converter. For top-quality reproduction the jitter must be eliminated before the DAC converts the digital data into analogue signals. The jitter problem is a huge one, especially when computers are involved, as these machines were never designed with high audio quality in mind. Our investigations have shown that the "jitterbugs" used by many high-quality DACs to reduce jitter are not sufficient on their own, so we have developed a unique and even more sophisticated system for clock generation: in the first stage the received data are processed and decoded. At this early stage a raw clock is derived from the received data stream, and a PLL circuit is used in an initial cleaning stage to remove coarse jitter from the source device and the transfer path. This clock is now analysed very closely by the DAC 8's micro-processor: if it fulfils certain minimum criteria in terms of frequency and stability, the DAC 8's D/A converters are switched to an extremely accurate master-clock generated internally in the DAC 8, with extremely low phase noise. This clock is completely de-coupled from the source device, and therefore eliminates all trace of jitter interference from the source and the transfer. For the purpose of generating the local master-clock the DAC 8 is equipped with two separate quartz oscillators which are extremely accurately matched – one for the clock families 44.1 / 88.2 / 176.4 kHz and one for 48 / 96 / 192 kHz. This sophistication ensures that perfect converter clocks are available for all clock frequencies from 44.1 kHz upwards. If the incoming signal does not fulfil the requirements for switching to the local clock oscillators, a second PLL stage (2nd jitterbug) is employed instead of the quartz oscillators. This greatly improves the result from the first jitterbug stage, and reduces the residual jitter remaining after the first stage by a factor of 4.

The core of the DAC 8 is the converter. As in our high-end players this device also employs the superior quadruple arrangement with eight 32-bit converters from Burr-Brown in a double symmetrical circuit. This circuit provides perfect compensation for non-linearities, and the residual background noise – which is excellent in any case with the 32-bit converters we employ – is reduced by approximately a further 6 dB. The result is a dynamic performance which is hardly capable of improvement, with a perfect "black level", extreme linearity and freedom from distortion, even in critical passages and the most minute musical details. Oversampling is carried

out by a modern 56-bit signal processor, for which T+A has developed algorithms specific to our equipment, offering perfect timing characteristics. They are based on Bezier polynomials: Bezier interpolation and Bezier / IIR combination. A standard FIR filter and a short FIR filter are also provided. These options make it possible to select the optimum sound quality to suit the individual piece of music. The DAC 8 can even invert the absolute phase of the audio signal at the digital level, and thereby correct material recorded with incorrect absolute phase.

Ten long years ago we developed a means of galvanically separating the converter from the analogue section for use in our high-end players: this provides complete galvanic isolation of the digital section from the analogue section using magnetic “i-couplers” made by Analog Devices. The result is to prevent any interference from the source devices finding its way into the analogue section. Computers, in particular, generate enormous levels of interference which would ruin the superior sound qualities of the audiophile output stage without this measure. The “State of the Art” analogue stages are of fully discrete and symmetrical construction, and do not employ OP-AMPS. Their linearity is not a function of “hard” negative feedback, as is typical of OP-AMPS, but rather of the quality of the circuit design and the components employed, which are selected and matched to very fine tolerances. A further unique feature of the DAC 8 is its switchable analogue bandwidth, which has already proved so effective in our high-end players. The limit frequency of the DAC 8’s analogue reconstruction filter can be switched between 60 kHz and 120 kHz; the “ultra-wide” 120 kHz setting is the key to perfect frequency response and phase characteristics when used with power amplifiers with a broad-band output – such as those in the T+A range, naturally. The phase linearity and signal fidelity of the “ultra-wide” circuit also has a perceptible effect in the audible range, and allows an open sound image with phenomenally clear positioning and ultra-lively dynamics.



Specifications

<i>D/A converter</i>	32-Bit, 384 kHz Sigma Delta, 8-times oversampling, double-mono-quadruple
<i>Analogue filter</i>	3rd order phase linear Besselfilter, switchable 60 kHz or 120 kHz
<i>Frequency response</i>	2 Hz – 20 / 22 kHz (44.1 / 48.0 kSps) 2 Hz – 40 kHz (88.2 / 96.0 kSps) 2 Hz – 80 kHz (176.4 / 192.0 kSps)
<i>Total harmonic distortion</i>	< 0,001 %
<i>Signal noise (A)</i>	116 dB

<i>Channel separation</i>	110 dB
<i>Analogue outputs</i>	
<i>coaxial (Cinch)</i>	2,5 Veff / 22 Ohm fixed. 0 ... 2,5 Veff variable
<i>Symetrical (XLR)</i>	5,0 Veff / 22 Ohm fixed. 0 ... 5,0 Veff variable
<i>Digital output</i>	1 x coax, IEC 60958 (CDDA/LPCM)
<i>Digital inputs</i>	SP/DIF (16 – 24 Bit): 4 x co-ax, 1 x BNC, 1 x AES/EBU up to 192/24, 1 x TOS-Link up to 96/24 1 x USB with USB Audio Class 1 (USB full Speed) up to 96/24, adaptive mode and USB Audio Class 2 (USB high Speed) up to 192/24 asynchronous mode*
<i>Accessories</i>	F8 remote control handset included, asynchronous drivers for Windows 10, 8.1, 8, 7, XP and MAC OS X 10.6.4 or higher until OS X 10.9
<i>Mains connection</i>	110–120 V or 220–240 V, 50 – 60 Hz
<i>Dimensions (HxWxD)</i>	9,5 x 27 x 27 cm
<i>Weight</i>	4 kg
<i>Ausführungen</i>	Case black aluminium 42, cover silver aluminium 43

* Driver for Microsoft Windows 10, 8.1, 8, 7 and Windows XP and MAC OS 10.6.4 or higher until OS X 10.9 free of charge on T+A website for download. OS X 10.10 is supported with disabled signature interrogation. For details please refer the support area. MAC operating systems higher than OS X 10.10 no longer support the asynchronous USB 2 Mode of the USB audio chip used in the DAC 8. A suitable media player is necessary.

Technical modifications reserved!