

Series 8



Series 8

The concept

For more than twenty five years T+A has been developing and manufacturing digital and analogue devices of absolute top quality. At a very early stage we decided to concentrate on digital signal processing, because it was clear to us that the natural, uncoloured reproduction of digitally stored music depended crucially on the quality of conversion of the digital data into analogue data. Back in the mid-nineties we introduced the PreDA 3000 AC: a totally unique pre-amplifier / DAC with a superb performance. Our high-end disc players were far ahead of their time - not to mention the competition - due in no small measure to their sophisticated D/A converters and the natural sound generated by the excellent analogue output stages which were always an important feature. 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 was our first device designed to operate purely as a converter, and achieved its fantastic performance through the use of the very finest technologies and uncompromising design. Its successor is the DAC 8 DSD, which is the result of substantial further development work. It is now capable of processing even DSD formats at ultra-high resolution using a dedicated T+A True One Bit Converter. This means that it features the very latest leading technologies to convert any digital source into perfect analogue signals at ultra-high quality and genuinely audiophile sound. The result is that the DAC 8 DSD is the perfect unit for use with digital sources in a classic High-End system which is not capable of processing digital sources directly, or not at sufficiently high quality. With its superb pre-amplifier and sophisticated volume control the DAC 8 DSD can also drive very high-quality output stages or active speakers, enabling it to take its place as the High-End command centre of a complete system. It was exactly for this purpose that we developed our high-performance AMP 8 power amplifier. This unit is based on the circuit technology of our HV- and R-series amplifiers, which simply means that it offers superb sound characteristics and very high power reserves in spite of its small physical size.

The AMP 8 sounds sensational: vigorous, dynamic, high-resolution yet delicate, subtle and audiophile.

The new MP 8 Multi Source Player completes the Series 8 range. The MP 8 is based on our R-series MP 2000 R MKII, and is best described as a digital multi-talent. It incorporates a wide range of digital sources, from CD mechanism via high-res streaming client to Bluetooth module, and processes all of them to the highest standard of audiophile quality. Viewed overall, the Series 8 constitutes a comprehensive High-End system offering extremely high performance, despite being amazingly small and compact.

The cases are intentionally small and 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. All sockets and connections are made from gold-plated pure brass, eliminating all traces of ferro-magnetic materials which could generate interference. The heavy case rests on vibration-damped absorber feet.

The High-End system consisting of DAC 8 DSD, AMP 8 and MP 8 has been developed with the aim of satisfying the purist audiophile music lover who is uncompromising when it comes to quality of reproduction from a vast range of digital music sources. It sets new standards far beyond its price class.



DAC 8 DSD

High End D/A Converter-Preamplifier

D/A-Converter
Double-Differential-Quadruple-Converter for PCM with 32 Bit/384 kHz
T+A True One Bit Converter for DSD up to DSD 512
Total harmonic distortion
< 0,001 %
Signal to noise ratio
116 dB
Channel separation
110 dB
High-End headphone amplifier

The DAC 8 DSD is a cutting edge and uncompromising converter - pre-amplifier. Fundamentally he is capable of doing everything necessary to convert every form of digital source into analogue signals at the very highest quality, including DSD right up to the highest possible resolution. The unit has an outstanding pre-amplifier, and incorporated a volume control of fully analogue construction based on High-End Melf resistors. The "State of the Art" output stage is of fully symmetrical design and discrete construction. Its impedance is very low, and it is equipped with symmetrical (XLR) and asymmetrical (RCA) outputs. These features make the DAC 8 DSD more than just a High-End converter: it is also a High-End preamp of supreme quality.

The seriousness of our claim that the DAC 8 DSD 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 DSD 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 by-pass the volume control, i.e. it can be removed entirely from the signal path when not required.

We placed particular emphasis on the development of a very good headphone amplifier with the ability to handle high currents. This further widens the practical applications of the DAC 8 DSD.





High performance USB-Device Mode interface equipped with the newest generation of ultra fast processors.

Unique by T+A: the True One Bit Converter for DSD and the Quadruple Converter for PCM with highest resolution.

Sophisticated mains filtering to block RF interference and DC voltage.

High-End „State of the Art“ analogue output stage with high performance volume control. Fully discrete and symmetrical design.

Separate, sophisticated mains power supplies for the analogue and digital sections.

High precision quartz crystal controlled oscillators generate absolute jitter-free master clocks.

Freely programmable signal-processor creating T+A over-sampling algorithms with perfect time domains.

Front control PCB with processor and dimmable OLED-screen display

Complete galvanic isolation of the digital section from the analogue section.

AMP 8

High End Power Amplifier

Nominal output per channel

2 x 110 Watts into 4 Ohms

Signal to noise ratio

> 103 / 110 dB

Frequency response

1 Hz - 200 kHz

Power Supply

400 Watts peak power

The AMP 8 forms the ideal complement to the DAC 8 DSD converter / pre-amplifier. During the development of this power amplifier our top priority was no-compromise audiophile sound characteristics, rather than ultra-high output power. Even so, with an extremely stable output of more than 100 Watt per channel its reserves are more than sufficient to drive and control even critical loudspeakers. This level of performance is nothing short of sensational in a machine of this size, and is due to the sophisticated overall circuit design and the over-sized and extremely robust mains power supply.

This small, incredibly potent powerhouse not only boasts an incredible performance, but also delivers superb sound quality thanks to High-Voltage technology - adopted from our HV- series - and is more than a match even for larger and much more expensive amplifiers. The unique circuit topology of the AMP 8 endows it with tremendous speed and extreme bandwidth, and its performance is also not dependent on the load presented by the loudspeakers connected to it. The AMP 8 simply sounds fabulous: powerful, dynamic, high in resolution and detail rendition, subtle and totally natural. It is perfect for the music delivered by the DAC 8 DSD.

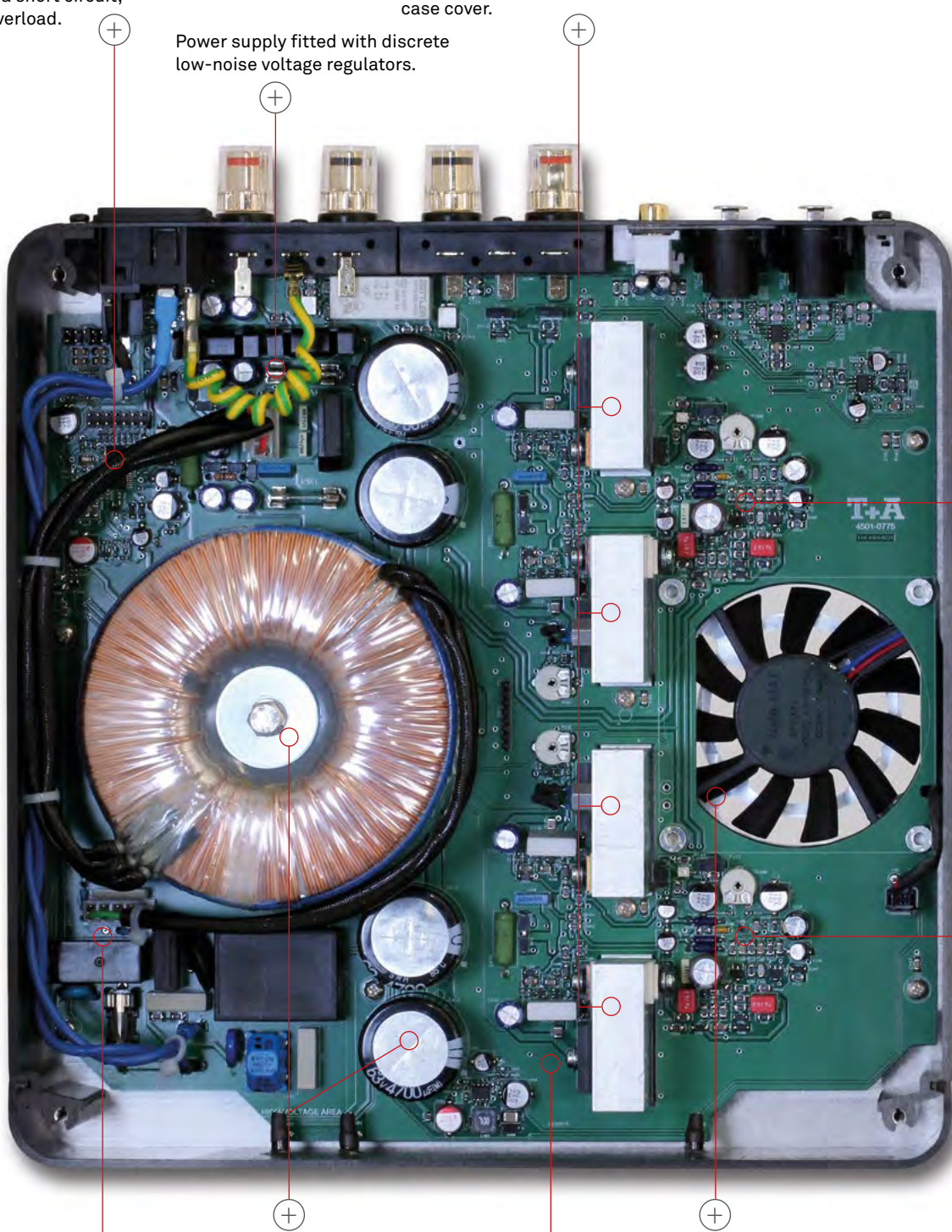


A cleverly programmed mikro-processor monitors the AMP 8 and controls the protection circuit, which switches off the output relay in case of a short circuit, overheat and overload.

High-performance output stages with *ThermalTrak™* audio transistors and a special heat-sink for rapid dissipation of heat into the case cover.

Pre-amplifier and output stages of fully symmetrical construction with cross-coupled J-FET cascode differential amplifiers as the input stage, and single-ended Class-A Hawksford FET cascode as the voltage amplifier stage.

Power supply fitted with discrete low-noise voltage regulators.



Sophisticated mains filtering to block RF interference and DC voltage.

Rock-solid mains power section based on a toroidal transformer which is stable under load and generates low leakage fields; combined with high-quality, low-induction electrolytic reservoir capacitors.

Single-board overall design with short audio signal paths, devoid of plug-in connections between the input sockets and the loudspeaker terminals.

The slow-running cooling fan is silent, and is controlled by a mikro-processor according to load and temperature.

MP 8

High End Multi Source Player

CD-Linear mechanism

FM, FM HD, DAB+ Tuner

High-Res Streaming Client

Tidal, Deezer, qobuz

Bluetooth streaming (aptX®)

Digital IN + OUT

The MP 8 looks small and inconspicuous. At first glance the casual observer may think it is just a classic CD player, but its true capabilities extend far beyond this. Our multi-source player houses a first-class CD mechanism; a high-performance digital tuner offering FM, FM-HD and DAB+ reproduction; a high-quality Bluetooth streaming module for receiving music from mobile devices, a streaming client with Internet radio and music services for connection to the home network via LAN and WLAN, USB Master Mode and HD streaming plus a digital connecting board with inputs for external sources (two USB device mode and three HD-S/P-DIF). The wide range of connections allows external equipment to exploit the machine's superb signal processing to the full.

Please note: the MP 8 is not a computer; it is a high-end audio device incorporating many supplementary functions designed to ensure that all modern digital sources can be used, reproduced and processed to a D/A converter in the highest possible quality. The MP 8 can provide any converter with high-quality audio data (up to 192 kHz) via its S/P-DIF output, but the perfect match is our DAC 8 DSD. The SYS OUT and DAC 8 LINK outputs are used to exchange control data and transmit audio signals with optimal routing to the DAC 8 DSD. When using the T + A App, the entire Series-8 system is controlled via the MP 8.

The MP 8 delivers a stunning experience in sound reproduction, and finally exploits the full potential of digital music sources.



„State of the Art“. The processor and memory board of the new streaming client: an in-house T+A development, extremely powerful and future-proof. (Below the power supply)

The central control processor, responsible for all the control and operating functions of the entire device, including CD, tuner, front panel screen and App control. (Below the CD Mechanism).

Stabilized high performance power supply with filtering and shielding

The Digital Connecting Board for connecting external digital sources.

The sophisticated digital tuner offers excellent sound quality, high sensitivity, good overload margin and reception of FM, FM-HD and DAB+ signals.

Our Bluetooth module is of very high quality, and works with the aptX® transmission protocol.

Front Control board with dimmable OLED display and Bluetooth aerial.

High quality CD mechanism incorporating modern decoder technology, offering very fast access times and excellent error correction.

The four-layer Digital Processing Board is of extremely complex construction. It accommodates all the digital components for the sources; this is where they are routed and switched.



Technology

DAC 8 DSD Decoder technology

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 DSD 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 DSD’s micro-processor: if it fulfils certain minimum criteria in terms of frequency and stability, the D/A converters are switched to an extremely accurate master-clock generated internally in the DAC 8 DSD, 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 DSD is equipped with two separate quartz oscillators which are extremely accurately matched - one for the clock families 44.1/88.2/176.4/352.8 kHz and one for 48/96/192/ 384 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.



A new system remote control handset is now available for the Series 8: the FM8 infrared remote control set is capable of controlling all the devices in the range. If the system includes the MP 8, we recommend the use of our apps to provide convenient control of all functions and features.

High quality symmetrical (XLR) and asymmetrical (RCA) outputs with very low output impedance. Slide switch activates the volume control.

1 x digital output S/P-DIF.
Digital inputs: 4 x S/P-DIF, 1 x TOS-Link
1 x BNC, 1 x AES/EBU, 1 x USB (Device Mode).

SYS IN socket connects MP 8 source device. CTRL-socket for updates and external control (RS 232).



The core of the DAC 8 DSD 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 DSD can even invert the absolute phase of the audio signal at the digital level, and thereby correct material recorded with incorrect absolute phase.

For the purpose of handling DSD data which can be supplied via the PC-USB input we have developed a unique, dedicated converter: the T+A True One Bit DSD Converter. This is of fully analogue construction and constitutes a genuine one-bit converter, since - unlike other manufacturers - we did not want to use the DSD mode of a PCM converter. This development ensures that DSD data are processed in a genuine one-bit stream process as in our PDP 3000 HV High-End DSD / PCM player, uncoloured and without detrimental additional conversion.

Twenty 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 extremely fast Digital Isolators made by Silicon Labs in the DAC 8 DSD. 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 DSD is its switchable analogue bandwidth, which has already proved so effective in our high-end players. The frequency limit of the DAC 8 DSD’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 broadband output - such as those in the T+A range. 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.

Symmetrical (XLR) and asymmetrical (RCA) inputs with high-quality audiophile Burr-Brown "SoundPlus" FET operational amplifiers. The AMP 8 automatically switches itself on when a signal is present.

High-quality gold-plated loudspeaker terminals made of pure amagnetic brass.

The AMP 8 is switched on and off by a trigger voltage if the DAC 8 DSD is connected via the CTRL socket.



AMP 8 Amplifier technology

The overall circuit design of the AMP 8 is that of our sensational HV-Series power amplifiers, which is why the input stage and the voltage amplifier stage operate at much higher voltage potentials (HV - High Voltage concept). The input stage is a cross-coupled J-FET cascode amplifier, while the voltage amplifier stage is a single-ended Class-A Hawksford FET cascode. The output stage is responsible for current amplification, and is equipped with *ThermalTrak™* high-performance audio transistors to ensure that the bias point is totally stable and free of inertia effects. The voltage amplifier stage and the current amplifier stage are completely separate from each other, and each has its own power supply. This prevents any feedback effects from the loudspeakers influencing the voltage amplifiers, which are crucial to sound quality. We call this circuit concept ICA (Isolated Current Amplifier), and developed it years ago for our R-series of equipment. The individual stages are of extremely linear, broad-band design, with the result that the AMP 8 requires very low levels of "overall" negative feedback; the bandwidth is more than 200 kHz! Our engineers have invested tremendous effort in creating a circuit track layout with absolutely minimal inductivity, thereby helping to achieve superb transient and dynamic

response.

At those points in the circuit which are crucial to sound quality we employ carefully selected audiophile components such as amagnetic Vishay resistors and special WIMA and ELNA audio capacitors!

The mains power supply is designed to cope with extremely severe and difficult loads. Its toroidal transformer generates up to 400 Watts whilst maintaining low leakage fields, and is capable of driving even very demanding loudspeakers effortlessly. The power supplies for the amplifier stages are completely separate for each channel, and feature their own reservoir capacity and buffering. In consequence there is no trace of interaction of any kind between the channels.

The aerial socket is dedicated for FM, FM HD and DAB+ radio. We strongly recommend a quality outdoor aerial. A jitter-free digital output and three digital inputs are present.

The WLAN aerial, the LAN socket and the USB Input (HDD) are directly connected to the Streaming Client Board.

The MP 8 is connected to the DAC 8 DSD via the SYS OUT and DAC 8 LINK sockets. The USB INPUT is looped through to the DAC 8 DSD.



MP 8 Multi Source technology

T+A was one of the first High-End manufacturers to install additional digital sources in its CD players. This was an unusual idea, but can now be seen to be a consistent and logical approach. We call these devices Multi Source Players, and all our High-End series now include them. Our design engineers were asked to integrate five high-quality digital sources in the very small case of the Series 8 range, and this represented a particular challenge to them.

The first source is a high-quality CD mechanism boasting very fast access times, and its error correction is outstandingly good. Although the CD has been very largely superseded by streamed content, it is very clear that our customers still harbour the wish to be able to play CDs. We have developed a disc mechanism featuring refined mechanical design and a floating suspension. It just barely finds space in the small cabinet of the MP 8. The machine's second digital source is the streaming client (SCL), which takes the form of a network-enabled processor board designed with audiophile sound performance in mind. It features USB Master mode ports as well as WLAN and LAN ports. The board creates a high-quality connection to networks and the Internet, and is capable of streaming audio data using UPnP at

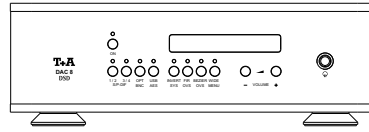
up to HD quality (192/24). We deliberately eschewed a standard computer solution, as its high-frequency interference signals would have had an adverse effect on sound quality. The SCL is a T+A development and supports high-resolution formats, music services and media servers, and includes the convenient airable Internet radio service at no charge.

The digital tuner is the third of the MP 8's digital sources. Fully digital intermediate frequency (IF), demodulation and stereo decoder stages ensure that the tuner provides outstanding sound quality. It has excellent sensitivity, high crosstalk attenuation and overload margins, and sounds excellent when using cable and aerial systems. The tuner delivers FM, FM-HD and DAB+ radio services, and offers Radiotext, presets and various supplementary functions depending on the service selected. A high-quality Bluetooth receiver module forms the fourth digital source. Its purpose is to transfer music files from mobile devices at very high quality using aptX® technology. This process makes it possible to transfer data – such as uncompressed FLAC files – even using the limited bandwidth available with a Bluetooth radio link.

The fifth digital source is the digital connecting board featuring three digital inputs. This is used to connect any external sources – such as set-top boxes, drives, digital recorders and players – at HD quality. The jitter-free S/P DIF digital output allows the connection of any external D/A converter.

DAC 8 DSD

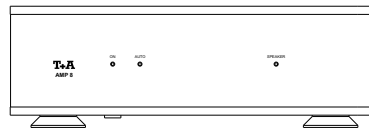
D/A Converter-Preamp



D/A-Converter	PCM	Double-Differential-Quadruple-Converter with 4 D/A-Converters per channel, 32-Bit Sigma Delta, 352,8 kSps/384 kSps. Eight times oversampling. Upsampling: free programmable signal processor with four selectable oversampling algorithms. FIR kurz, FIR lang, Bezier/IIR, Bezier
	DSD	Direct DSD Signal Path via T+A True 1 Bit Converter
Analogue filter		Phaselinear filter with bandwidth switching 60 kHz or 120 kHz
Frequency response		PCM 44,1 kSps: 2 Hz - 20 kHz
		PCM 48 kSps: 2 Hz - 22 kHz DSD 64: 2 Hz - 44 kHz
		PCM 96 kSps: 2 Hz - 40 kHz DSD 128: 2 Hz - 60 kHz
		PCM 192 kSps: 2 Hz - 80 kHz DSD 256: 2 Hz - 80 kHz
		PCM 384 kSps: 2 Hz - 100 kHz DSD 512: 2 Hz - 100 kHz
Total harmonic distortion		< 0,001 %
Signal to noise ratio		116 dB
Channel separation		110 dB
Analogue outputs	high level (RCA)	2,5 V _{eff} / 22 Ohms fixed. 0...2,5 V _{eff} variable
	symmetrical (XLR)	5,0 V _{eff} / 22 Ohms fixed. 0...5,0 V _{eff} variable
Digital output		1 x coax, IEC 60958 (CDDA/LPCM)
Digital inputs	S/P-DIF	4 x high quality Coax und 1 x opt. TOS-Link, 1 x BNC, 1 x AES/EBU; 32 kSps; 44,1 kSps; 48 kSps; 88,2 kSps; 96 kSps; 176,4 kSps; 192 kSps; 16/24 Bit
	USB (Device mode)	USB Class 2 Mode; support for asynchronous data transfer PCM-Mode: 44,1 kSps; 48 kSps; 88,2 kSps; 96 kSps; 176,4 kSps; 192 kSps; 352,8 kSps; 384 kSps; 16/24/32 Bit DSD-Mode: DSD64; DSD128; DSD256; DSD 512; (MAC OS up to DSD 128)
Accessories		infrared remote control FM8, included asynchronous drivers for Windows are available on T+A homepage for download
Mains		110-120 V or 220-240 V, 50 - 60 Hz
Standby		< 0,2 W

AMP 8

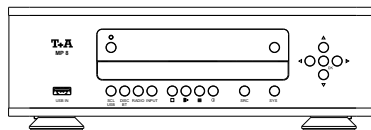
Power Amplifier



Nominal input sensitivity	High-level (RCA)	0,7 V / 10 kOhms
	Balanced (XLR)	1,4 V / 5 kOhms
Output Stage		
Nominal output per channel	into 8 Ohm / an 4 Ohm	80 Watts / 110 Watts
Peak output per channel	into 8 Ohm / an 4 Ohm	100 Watts / 130 Watts
Frequency response + 0 / - 3 dB		1 Hz - 200 kHz
Slew rate		60 V/μs
Damping factor		> 170
Signal to noise ratio		> 103 / 110 dB
Channel separation		81 / 65 dB
Total harmonic distortion		< 0,009 %
Reservoir capacity		33.000 μF
Mains		110-120 V or 220-240 V, 50-60 Hz. 400 Watts
Standby		< 0,2 W
Additional features		Triggerinput +5 ... 20V for external switching on Automatic signal-controlled power on

MP 8

Multi Source Player



CD drive unit	High precision linear tracking drive CD: 785 nm
Formats	CD, CD-R, CD-RW, CD Text
Frequency range and dynamics	CD: 2 Hz - 20 kHz / 100 dB
Streaming Client	
Formats / Standards	MP3, WMA, AAC, OGG Vorbis, FLAC, WAV, AIFF, ALAC / UPnP AV, T+A Control
Data rates	PCM 32...192 kHz, 16/24 Bit; MP3 to 320 kBit, variable and constant bit rate
Music services	Tidal, Deezer, qobuz. (Subscription required)
Features	Gapless Playback für MP3 (Lame), WAV, FLAC. T+A Control App for iOS and Android
Interfaces	LAN: Fast Ethernet 10/100 Base-T, WLAN: 802.11 b/g/n with WPS
Tuners	
Internet Radio	Airable Internet Radio Service (> 11000 stations)
FM, FM-HD	87,5 - 108 MHz; sensitivity 1 µV; S/N > 65 dBA
DAB, DAB+	168 -240 MHz (Band III); sensitivity 2,0 µV, S/N > 96 dBA
Features	RDS/RDBS, Stationname (PS), Programm type (PTY), Radiotext (RT)
Bluetooth Standard / Codes	A2DP (Audio), AVRCP 1.4 (Control) / aptX®, MP3, SBC
Connections	
Digital output	1 x coax, IEC 60958 S/P-DIF (LPCM)
Digital inputs (digital connecting board)	3 x S/P-DIF: 2 x standard coax 192 kHz / 24 Bit, 1 x optical TOS-Link 96 kSps /24 bit. 2 x USB Master-Mode for USB-mass storage (Stick oder HDD) 1x USB: Device-Mode is passed through to DAC 8 DSD
Remote Control	infrared remote control FM8, included
Accessories	USB interconnect cabel from USB A to USB B, SYS Link Cable
Mains	110-120 V or 220-240 V, 50-60 Hz. 50 Watts
Standby	< 0,2 Watts
Dimensions DAC 8 DSD, AMP 8, MP 8 (H x W x D)	9,5 x 27 x 27 cm, 3.7 x 10.6 x 10.6 inch
Finishes	Case black aluminium 42, cover silver aluminium 43
Weight	DAC 8 DSD 4 kg, 8.8 lb
	AMP 8 7 kg, 15.0 lb
	MP 8 5 Kg, 11.0 lb



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