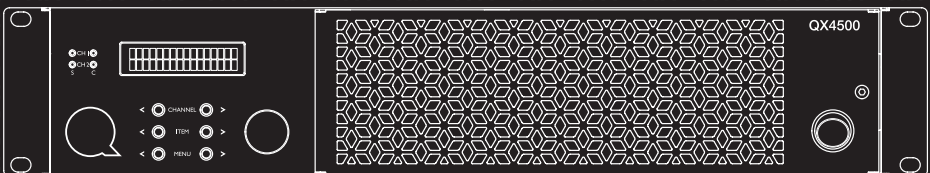


QX4500 User Manual



quest[™]
engineering

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Safety Precautions

Please read the instructions in this section carefully before use.

Ensure all instructions in this manual are observed as all information contained within is very important.

It is also highly recommended that this manual is retained for future reference.

Safety Symbol and Message Conventions

The safety symbols described below are used in this manual to prevent bodily injury and property damage which could result from mishandling. Before operating this product, please read this manual first, in full so you that you are thoroughly aware of any risks.



WARNING

Indicates a potentially hazardous situation which, if mishandled, could result in serious personal injury or death.





General Caution

- Do not expose the unit to any moisture whether rain, water or other liquids. Exposure to moisture could result in damage to the internal components, corrosion of the steel protective grill or electrocution\circuit failure.
- Do not cut, kink, otherwise damage or modify the speaker cable. Ensure a speaker cable with a core diameter of at least 1.5mm is used for correct performance.
- Do not install or place speaker cables or devices near heaters, high traffic areas or any area where the cables or devices can be damaged.
- Avoid installing or mounting speaker boxes, amplifiers, electronics or cabling in unstable locations.
- When flying or installing speakers only use the hardware specifically designed for this product and install to a secure wall.
- When installing amplifiers and\or other electronics only use the hardware specifically designed for this product and install to a secure wall.
- In the event of storms and\or lightning, ensure all devices are disconnected from power supplies in order to prevent damage to any of the units in the system.
- When cleaning the unit, ensure it has been disconnected from any power source and that only a dry cloth is used. Do not use any aerosol or liquid based cleaners.
- Ensure all electronics are electronically grounded (earthed) to a safety ground terminal in order to avoid electric shock. Do not ground any device to a gas pipe as this may result in disaster.
- Never hang a speaker from only one rigging point. Always use multiple points and attach a safety line to a point rated highly enough to support the weight of the speaker box.
- Ensure all installation, flying and\or rigging is carried out by licensed professionals and adheres to your countries safety standards.
- Servicing of all electronics should only be carried out by a certified Quest technician. Please consult your original place of purchase to find the location of your nearest Quest service centre.

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When the Unit is in Operation

- Ensure all amplifiers and mixers are turned down before switching the system on.
- If there is no sound, ensure all cabling in the signal path is correct and where applicable, the speaker connectors are locked into place correctly.

Should any of the following irregularities be found during use, immediately switch off all electronics, disconnect all power supplies and contact your original place of purchase:

- If you detect smoke or a burning smell coming from any device
- If the unit is physically damaged in any way
- If the unit is malfunctioning (eg: no HF or LF output, failing switches or intermittent operation etc.)

Make no further attempt to operate the unit if it is found to be in any of the above conditions as this may result in fire or electric shock.

NOTE: Quest Engineering is not responsible for any incorrectly flown, installed or poorly positioned devices.





1. Product Overview

The suite of technologies employed in this amplifier represent the state of the art in digital processing and high current amplifier design. Very sophisticated DSP control and networking/communication capability make the QX4500 an authentic concert grade product without compromise.

Suited to both permanent installation or touring concert sound, the QX4500 is a powerful asset that will take any speaker system to its full sonic potential.

The high speed 64 bit DSP processing and broad range of system control parameters are just the start of a long list of capabilities offered by this amplifier. Please make yourself familiar with this user manual to get the full benefit and performance from the QX4500.

UNPACKING

Please unpack and inspect your new amplifier for any damage that may have occurred during transit. If damage is found, notify the transportation company and your product supplier immediately. Only you the consignee may initiate a claim for shipping damage. Please save the shipping carton as evidence of damage for the shipper's inspection.

Even if the amplifier has arrived in perfect condition, save all packing materials so you will have them if you ever need to transport the unit.

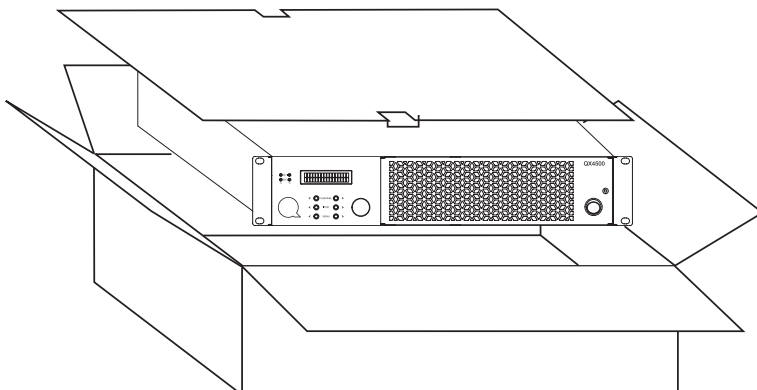
NOTE

Never ship the amplifier without the original packing materials.

When shipping the QX4500 amplifier, always use the original shipping carton and packing materials. For maximum protection, repack the unit as it was originally packed at the factory.

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The Quest Engineering manufacturer's warranty is our commitment to you that every Quest product is ready to give you many years of faultless service.





2. The Amplifier

The QX4500 is a Class-H power amplifier with a power output of:

Power output	Operating mode
1 × 4 500 W	mono bridge @ 8 Ω peak
1 × 3 800 W	mono bridge @ 8 Ω
1 × 3 000 W	mono bridge @ 4 Ω
2 × 2 250 W	dual channel @ 4 Ω peak
2 × 2 000 W	dual channel @ 2,7 Ω peak
2 × 1 900 W	dual channel @ 4 Ω
2 × 1 500 W	dual channel @ 2 Ω

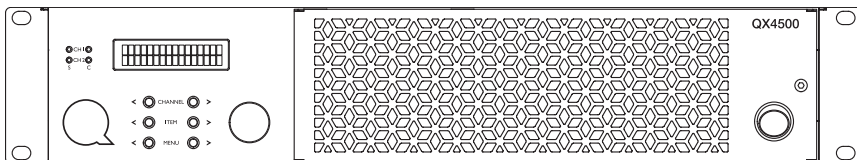
QX4500 amplifiers are fitted with highly developed switch-mode power supplies (SMPS), which significantly reduces the weight and size (only 2U) of the amplifier. Using SMPS, the 2 symmetrical supply voltages of the power amplifier are more stable than the power supplies used in conventional amplifiers.

The QX4500 has been designed as a powerful two channel amplifier with on-board 64 bit DSP processing. Both amplifier settings and DSP settings can be user adjusted to match a speaker systems specifications. With up to 100 on-board speaker pre-set storage capability, fine tuning of a system or differing systems is fast, easy and straight forward. The user interface is designed to be intuitive and allow for quick familiarisation.

The combination of both power amplifier and on-board DSP technologies used in the QX4500, provide the level of control and audio quality previously unavailable in all but the most costly and complex professional applications. The QX4500, a very powerful and complete speaker management system, with optimum flexibility and maximum control and security.

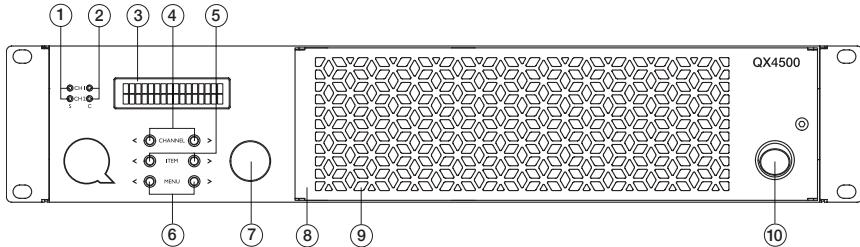
Since some of the externally mounted controls have multiple functions, it is important that users should familiarise themselves thoroughly with the entire range of controls.

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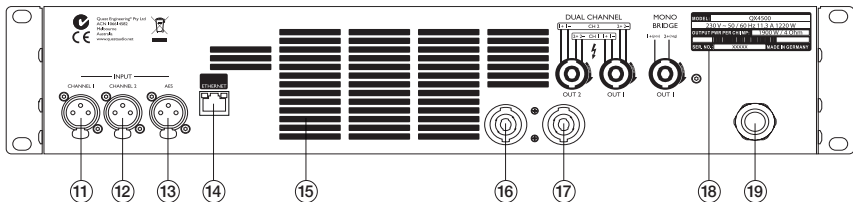
2.1 FRONT PANEL LAYOUT



- | | |
|--------------------|------------------------------------|
| 1. Signal-LEDs | 6. Menu buttons |
| 2. Clip-LEDs | 7. Rotary encoder with push button |
| 3. Character LCD | 8. Removable air filter system |
| 4. Channel buttons | 9. Cooling air inlet vents |
| 5. Item buttons | 10. On/Off switch |

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2.2 REAR PANEL LAYOUT



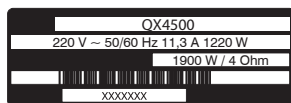
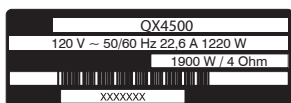
- | | |
|------------------------------|-----------------------|
| 11. XLR – line input 1 | 16. SPEAKON® output 2 |
| 12. XLR – line input 2 | 17. SPEAKON® output 1 |
| 13. AES input | 18. Rating plate |
| 14. Ethernet network input | 19. AC power cable |
| 15. Cooling air outlet vents | |



3. Installation

3.1 MAINS SUPPLY

When mounting or connecting the amp always disconnect it from mains. Only connect the QX4500 amplifier to an appropriate AC circuit and outlet, according to the requirements indicated in the second line on the rating plate.



Exemplary rating plates for the three available amplifier variants

Power supply data of all available variants:

Operating Condition	Mains current (4Ω / 2Ω)	Power consumption (4Ω / 2Ω)	Output power
Amp. standby (power off)	< 0,5 A	8 W	0 W
Idle (amp. powered on)	1,3 A	70 W	0 W
250 W per channel	8,5 / 10 A	1220W/ 1500 W	500 W

Mains current draw and power consumption @ 230V, 50 Hz measured with pink noise with crest factor of 12 dB to represent typical music signal. For 120V mains operation, the current values can be multiplied by 2.

3.2 ON / OFF SWITCH

The On / Off Switch is a rocker-type switch. It is located on the right side of the front panel. To turn the amplifier on, press on the upper part of the switch. During power up the Clip- and Signal-LEDs from both channels will light up in red for a few seconds. To turn the amplifier off, press on the lower part of the switch.



Amplifier is switched on



Amplifier is switched off

NOTE

This switch does **NOT** disconnect the amplifier from mains.

Disconnecting the amplifier from the main power supply can only be achieved by disconnecting the mains plug or by an external all-pole disconnection (e.g. a mains / circuit breaker). The mains plug or circuit breaker therefore has to be freely accessible at all times. Disconnect the mains plug from the mains during a lightning storm or when the amplifier remains unused or unsupervised for a prolonged period of time.

The switch initiates start-up by activating the inrush current limiter. As soon as the power amplifier is connected to the mains power supply, a voltage is supplied to both the line-filter and the fused input of the controllable rectifier.

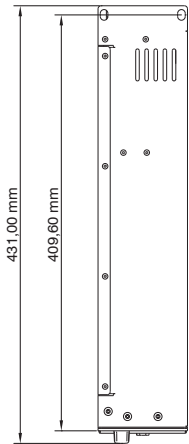
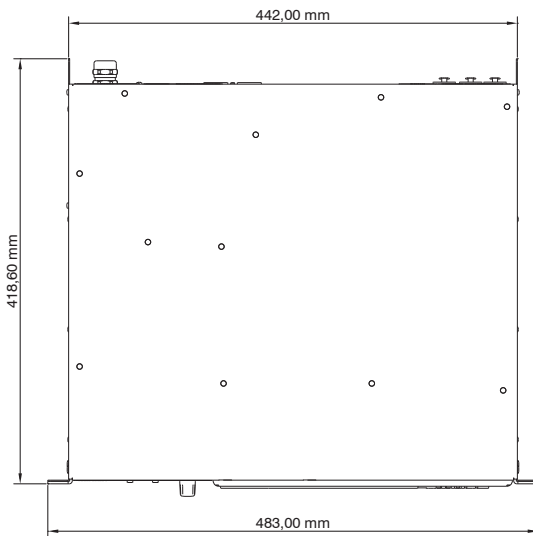
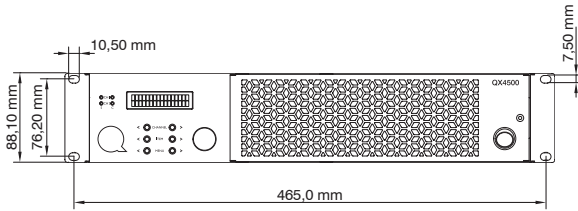
If a power cut occurs while the amplifier is switched on, it will restart automatically once the power supply has been restored. All amplifier settings prior to the loss of power will be maintained.





3.3 MOUNTING

Use four screws and washers when mounting the amplifier to the front rack rails. For mobile use, the amplifier should also be secured using the 19" mounting elements on the rear panel.



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3.4 COOLING

The air is taken in from the front and out through the back. It is essential that while the amplifier is running the air is able to circulate around it freely. The efficiency of the cooling will depend on the immediate environment (e.g. an enclosed rack, direct sunlight). If the amp is installed in a case, the open area at the back of the case must be at least 140 cm². This area should be in line with the amplifier.

If this cannot be achieved a forced ventilation system has to be used.

Note that continuous high power draw at low load impedance (equal or less than approx. 2,7 Ω) can drive the amplifier into thermal limitation. So please check the amplifier temperatures on the display or in the DSP control application and reduce the input levels if necessary.

3.5 SIGNAL INPUTS

3.5.1 Analog Input XLR:

- Pin 1 = Ground
- Pin 2 = Hot (inphase)
- Pin 3 = Cold (out of phase)

Always use symmetrical (balanced) shielded cable to connect the amplifier.

3.5.2 AES Input

The digital AES XLR input accepts any AES / EBU signals (pro or consumer format) in 16 to 24 bit resolution and 44,1, 48, 88,2, or 96 kHz sampling frequency. This wide input frequency range of is guaranteed by an integrated sample rate converter (SRC) chip.

3.6 REMOTE CONTROL / NETWORK INPUT

The Ethernet Link network connector allows you to access the QX4500 from a host computer for remote control, firmware update and downloading DSP presets.

The QX4500 is configured by default to use DHCP for automatic IP address assignment in the network. If not desired, this feature can be set through the DSP Control application.

3.7 POWER OUTPUTS

3.7.1 SPEAKON® Connection

Both SPEAKON® connectors are connected to channel 1 and channel 2 outputs. The pin configuration of the SPEAKON connectors is as follows:

SPEAKON® right (View at the back):

Pin 1 +	Channel 1	signal
Pin 1 -	Channel 1	ground
Pin 2 +	Channel 2	signal
Pin 2 -	Channel 2	ground

SPEAKON® left (View at the back):

Pin 1 +	Channel 2	signal
Pin 1 -	Channel 2	ground
Pin 2 +	Channel 1	signal
Pin 2 -	Channel 1	ground



! WARNING!

SPEAKON® connectors marked with the lightning flash indicate high voltages that are potentially life threatening.

Wiring to these terminals requires installation by an instructed person or the use of ready-made leads or cords.





Custom wiring should only be made by qualified personnel.

To prevent electric shock, do not operate the amplifier with any of the conductor portion of the speaker wire exposed.

NOTE

For reasons of safety and performance, use only high-quality fully insulated speaker cables of stranded copper wire. Use the largest wire size that is economically and physically practical, and make sure the cables are no longer than necessary.

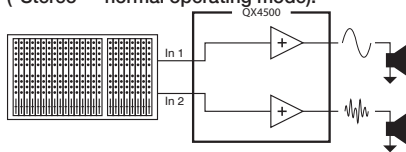
NOTE

When connecting speaker cabinets in parallel, always use all the contacts in both SPEAKON® connectors. If not, this may cause permanent damage to the connectors and considerably reduce performance

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3.7.2 Dual Channel Operation

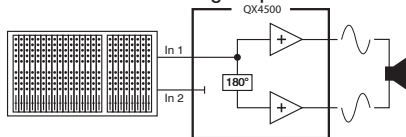
Two fully independent amplifier channels ("Stereo" – normal operating mode).



$Z_{min} = 2 \Omega$ for Dual Channel operation

3.7.3 Mono Bridge Operation

One-channel mono bridged operation.



$Z_{min} = 4 \Omega$ for Mono Bridge operation

In this mode the channel 2 amplifier stage processes the identical input signal than channel 1, but with reversed phase. The channel 2 input signal is not used / ignored.

The loudspeaker load must then be connected between the two positive channel outputs (pin 1+ and pin 2+) using a specially configured SPEAKON® connector / cable. This effectively doubles the maximum output voltage. But please note that this also doubles the minimum allowed loudspeaker impedance Z_{min} .



! WARNING!

In Mono Bridge Operation RMS output voltages can be as high as 200 VAC.

Wiring to the speaker loads must conform to NEC class 3 safety standards or its equivalent that meets all national and local electric codes. All customer specific cables may only be manufactured by qualified suppliers/ personnel. All cabling or rewiring work must be carried out by qualified personnel



4. Operation

4.1 USER INTERFACE ELEMENTS

NOTE

This chapter only describes the basic user interface operation and functions. Please refer to the separate DSP Control manual for an explanation of the extensive Digital Signal Processing (DSP) options and advanced features offered by the remote application.

4.1.1 Signal- / Protect-LEDs (multifunctional)



The Signal-LEDs are illuminated in green when the voltage level at the output reaches approx. 4V; this corresponds to a power of 4 W into a 4 Ω load. The channel Signal-LEDs are illuminated red when the amplifier is in Protect Mode (Mute), for example because of persistent DC-voltage at the outputs or overheating.

When switching the amplifier on, the Signal-LEDs will also light red for a few seconds while the DSP is starting up (along with the Clip-LEDs). In case the FuseProtect limiter is activated, it is possible that the (green) Signal-LED's will glow in orange or red colour for short periods of time while the amplifier is playing music.

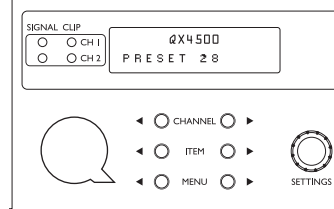
See also chapter 4.5.5 Fuse Protection

4.1.2 Clip-LEDs (multifunctional)



The colour of the bi-coloured LED changes between orange and red, depending on the clip intensity. Orange indicates light clipping, red indicates heavy clipping.

These LED's exclusively indicate hardware clipping of the power amplifier stage. Possible internal DSP limitation and compression is not indicated here.



4.1.3 CHANNEL Buttons

The CHANNEL buttons allow to select the channels to make adjustments on. Selectable items are In 1 to In 4 and Out 1 and Out 2 (depending on user and access rights). Note that if channels are linked the settings will always affect both linked channels. In this case the channel selection will display *In 12*, *In 34* or *Out 12*.



4.1.4 ITEM Buttons

The ITEM buttons allow you to navigate through all parameters which can be set from the front panel. Note that not all parameters can be set from the amplifier user interface. For full and easier access to all settings and parameters please use the DSP Control remote control application. The available parameters are:

Gain	Gain settings in 0,25 dB steps <i>Smaller steps (0,01 dB) can be set via the DSP Control remote application.</i>
Source	Selects the source of the chosen input channel <i>Setting only available for the Inputs 1 to 4</i>
Delay	Set the signal delay



Low Pass	Configure the low pass filter section
High Pass	Configure the high pass filter section
PEQ 1 to 10	Configure the 10 parametric EQ bands
Phase	Set the Output channel phase (normal or inverted) <i>Setting only available for Output 1 and 2</i>
Limiter	Configure the peak limiter
Compressor	Configure the compressor
Link	Selects if Input 1 & 2, Input 3 & 4 or Output 1 & 2 shall be linked

All settings and selections are done through the rotary encoder. Changes will take effect immediately.

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4.1.5 MENU Buttons

The left (◀) MENU button will always act as an ESCAPE / EXIT button.

The right (▶) MENU button offers following sub-menus, accessible through repeated pressing on the right MENU button:

- **Load** preset
- **Save** preset
- **Access Level** control
- Auxiliary information:
 - » **Version Info** Serial Number (**SN**)
 - » **Version Info** FW Version (**SW**)
 - » **Version Info** Hardware Version (**HW**)
 - » **IP Address**
 - » **MAC Address**
 - » **Temperature** of both amplifier stages

Inside the *Auxiliary information* menu you can navigate through the sub menus with the encoder wheel. Note that in this menu the encoder will only work in a round-robin fashion, regardless of the direction you turn it.

NOTE

The left (◀) MENU button always acts as an ESCAPE / EXIT button in all menus.

4.1.6 Rotary Encoder with Push Button

The rotary encoder allows to make swift adjustments of parameters (like for example the Gain settings) by simply turning it in the desired direction. In some menus the push-function of the encoder will act as an ENTER button (for example when loading or saving presets) or will allow you to access the parameter's sub-settings for the Low Pass, High Pass, PEQ, Limiter and Compressor.

4.2 HOT KEY FUNCTIONS – STANDBY

To set the QX4500 to standby mode simply press both (34) MENU buttons simultaneously for more than three seconds. You will then be asked if you want to switch to Standby Mode. Pressing the encoder knob (without rotating it) will then power down the main power supply of the QX4500.

The standby function can of course also be controlled by the DSP Control remote application.

4.3 STANDBY FUNCTION

The QX4500 offers the possibility to set the amplifier into standby mode either from the user interface or by the DSP Control remote application. In standby mode the QX4500 will power down it's main SMPS, thus saving energy while at the same time staying accessible via network connection.

From the amplifier's user interface this function is accessible through a Hot Key function as described above.

Inside the DSP Control remote application you can access this function through the Unit menu.



An additional feature is the automatic standby function which will set the QX4500 in standby mode if no input signal (analogue and / or AES) is applied for a certain period of time. This delay time can be set individually (or switched off) inside the DSP Control remote application through the Unit -> Configure -> Auto Standby menu.

NOTE

If the amplifier has been set into standby through the Auto Standby function, automatic wake-up will only work if digital AES input signal is applied again.

Applying analogue signal again will not wake-up the amplifier again. When using analogue input signal, exiting the automatic standby mode must be done manually through the user interface or the DSP Control remote application. So please consider this carefully before using the Auto Standby function with analogue input signal.

4.4 POWER AMP PROTECTION SYSTEMS

4.4.1 Clip Limiter / Under impedance Limiter

The DSP section of the QX4500 offers various limiter and compressor settings, both on the signal inputs and on the signal outputs. Those limiters and compressors can be adjusted and even switched off completely if desired. Disabling the limiters is done by setting the thresholds to their highest values.

But in case the amplifier is driven into hardware clip (i.e. when the Clip-LED is glowing orange or red) for longer periods of time, the threshold setting of the output limiter will automatically be reduced temporarily. Note that this is automatically done inside the amplifier and cannot be seen in the DSP control application.

This automatic threshold reduction will especially take place at low output impedances (smaller 4 Ω) and high output powers and shall prevent the amplifier from being operated in continuous hard amplifier clipping.

4.4.2 SOA Protection

Whenever the power transistors leave their Safe Operation Area (SOA), the SOA-protection switches back the rail of the respective channel.

4.4.3 DC Protection

Each output of the power amp is constantly monitored for persistent DC voltage levels. If the 3V thresholds are exceeded at any of the outputs, the corresponding channel will be muted. If DC was only detected for a short moment, the amplifier will release mute and work as normal. If DC is detected for longer periods or repeatedly, the amplifier will switch to standby mode and disable the main power supply. If this happens the display will indicate "Error – amp switched off".

In this case, switch off the amplifier for at least 4 minutes and switch the amplifier on again.

4.4.4 Over Current Protection

Over current is permanently controlled in the output stage. There are two limiting levels of over current depending on output voltage. These limits will be set automatically. This improves reliability without degrading sound quality when driving complex loads.

4.4.5 Thermal Protection

There are several sensors inside the amplifier in order to ascertain temperature data. If a temperature of more than 85 °C is detected at the heat sinks, the input signal on that channel is reduced.

4.5 MAINS PROTECTIONS

4.5.1 Inrush Current Limitation

Within 2 seconds of the amplifier being switched on, the inrush current limiter will increase mains current from nearly zero to nominal value. This value depends on program material, output level and speaker loads.



4.5.2 Mains Over Voltage Detection

Mains over voltage detection is always operative. When the mains voltage exceeds approx. 263V (220 / 230V operation) or 134V (110 / 120V operation), the amplifier will be switched off. The system will try to restart in intervals and will return with a soft start when the regular mains voltage returns.

4.5.3 Mains Surge Over-voltage Protection

The QX4500 is fitted with a varistor unit, protecting the SMPS from sporadic surge over-voltages coming from the mains distribution.

4.5.4 Mains Failure Detection

Mains failure detection is always operative. When the mains supply is interrupted for about 2 mains cycles, the amplifier will be switched off. When the mains voltage returns to a normal value, a soft start occurs.

4.5.5 Fuse Protection

When driving the QX4500 at very high output levels over a longer period of time (i.e. several seconds and minutes) the average mains current draw can become very high. In such situations, the FuseProtect limiter will reduce the output signal in order to prevent the external mains breaker from tripping. But this limiter in turn will not affect the output signal on dynamic music signal and short current peaks, thus guaranteeing the full available peak output power.

Please note that the FuseProtect limiter only controls the average mains input current, not the short term peak input current. This means that with very dynamic music signals the (short term) input current can still reach very high levels, which can be very demanding for a mains distribution. If active, the operation of the FuseProtect limiter can be seen by short orange or red glowing of the Signal-LED's.

4.6 MAIN SMPS PROTECTIONS

4.6.1 Over Current Protection

Main SMPS (Switched Mode Power Supply) transformer current is continuously monitored. If over current occurs, the main SMPS immediately stops working. Should there be an internal failure, this feature prevents other parts being damaged.

4.7 FANS

The fans mounted in the QX4500 operate permanently, but as long as the temperature remains below 40 °C they run at their slowest speed and can hardly be heard. The highest detected temperature from either channel controls the speed of the fans: above 40 °C the speed is increased until it reaches its maximum value.

4.8 FILTER CLEANING

The air intake on the front of your QX4500 amplifier is fitted with a removable filter system. If the filter becomes clogged, the unit will not cool as efficiently as it should and may result in reduced output levels.

QX4500 Filter Assembly

1. Foam filter
2. Front frame
3. Screw



! WARNING!

Turn off and disconnect the amplifier from the mains before removing the front frame.

To clean or replace the filter just slightly unscrew the fixing screw with the help of a 3mm Allen key. The screw will be held back by a small plastic spacer on the back of the frame to avoid losing it. Then shift the front frame slightly to the right. Then you should be able to remove the frame from the amplifier completely (pull gently to avoid any bending of the front frame).



5. Troubleshooting

5.1 PROBLEM: NO REACTION WHEN SWITCHING THE AMPLIFIER ON

If nothing happens when switching the amplifier on (i.e. the display stays totally dark, no message inside the display), please check following points:

- Check mains cable and plug
- Confirm that the AC outlet works by plugging in any other device

5.2 PROBLEM: NO SOUND

If no sound can be heard on the outputs please check following DSP settings (through the DSP control application):

- Input source selection
- Input and output gain settings
- Input and output limiter settings
- If digital (AES) input signal is used, please check AES signal source (sampling frequency, bit resolution and signal quality (long cables))

5.3 PROBLEM: ERROR MESSAGE: “ERROR – AMP SWITCHED OFF”

This error message indicates an internal error which forced the main power supply (SMPS) to be switched off. This can be caused by:

- Detection of permanent DC on the outputs
- Detection of amplifier stage malfunction (protect)
- Detection of main SMPS error

You can try to power-cycle the amplifier to reset all amplifier stage detection circuits. This might help in case the DC or amplifier fault was caused by an invalid input signal (e.g. an extremely high frequent or extremely distorted input signal).

For this please switch off the amplifier for at least 4 minutes and switch the amplifier on again. If the message still appears after this procedure the fault is permanent and the amplifier requires servicing.





6. Specifications

We reserve the right to make technical alterations without prior notice.

Output power 1 kHz, THD = 1%, in dual channel operation typical values @ 230V / 50 Hz duration limited by fuse / thermal protection for $RL = 8 \Omega$	2 × 600 W @ 16 Ω 2 × 1 100 W @ 8 Ω 2 × 1 900 W @ 4 Ω 2 × 1 950 W @ 2,7 Ω 2 × 1 500 W @ 2 Ω
Peak output power 1 kHz, single sine wave in dual channel operation typical values @ 230V / 50 Hz, may be subjected to component tolerances	2 × 630 W @ 16 Ω 2 × 1 240 W @ 8 Ω 2 × 2 250 W @ 4 Ω 2 × 2 000 W @ 2,7 Ω 2 × 1 500 W @ 2 Ω
Mono bridge operation output power 1 kHz, THD $\leq 1\%$, in mono bridge operation typical values @ 230V / 50 Hz duration limited by fuse / thermal protection for $RL \leq 16$	1 × 2 200 W @ 16 Ω 1 × 3 800 W @ 8 Ω 1 × 3 000 W @ 4 Ω
1 kHz, single sine wave in mono bridge operation typical values @ 230V / 50 Hz, may be subjected to component tolerances	× 2 480 W @ 16 Ω peak* 1 × 4 500 W @ 8 Ω peak* 1 × 3 000 W @ 4 Ω peak*
70 / 100V line operation output power 1 kHz, THD $\leq 1\%$ * only possible in mono bridge operation (single channel)	2 × 1 800 W @ 70V line 1 × 2 500 W* @ 100V line
Circuitry	Bipolar, Class H 2 step high efficiency circuit
Signal to noise-ratio 10 Hz – 20 kHz, 8 Ω load	> 102 dB (unweighted) > 105 dB (A-weighted)
Power consumption @ 230V * both channels driven at 250 W output power (approx. of max. THD limited output power with pink noise to represent typical music signal)	Amplifier standby (power off): 8 W Idle (Amp powered on): 70 W 4 Ω : 1 220 W* 2 Ω : 1 500 W*
Maximum output voltage in dual channel operation; typical values @ 230V / 50 Hz	$\pm 142V$ peak
Maximum output current in dual channel operation; typical values, may be subjected to component tolerances	$\pm 39 A$ peak

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Frequency response @ 4 Ω load with 120 W output power	10 Hz – 20 kHz: ± 0,175 dB
THD+N over frequency @ 4 Ω load with 120 W output power	20 Hz – 10 kHz: < 0,02 %
Damping factor 8 Ω load, 1 kHz and below	> 400
Input impedance	29 kΩ balanced
Amplifier gain	32 dB default (adjustable through DSP)
Maximum analogue differential input level	+20,5 dBu / 8,2V _{RMS} / 11,6V _{Peak}
Level attenuation	Done through DSP in 0,25-dB-steps
Minimum loudspeaker load impedance Lower values are safe, but out of specification. No performance guarantees can be given when driving lower impedances than specified	Z _{min} = 2 Ω for Dual-Channel operation Z _{min} = 4 Ω for Mono Bridge operation
Protection circuits	Inrush-current limitation, mains surge overvoltage protection, temperature monitoring of heatsinks, output DC protection, temperature dependent SOA protection, mains fuse protection, output current limitation, thermal limitation
Analogue limiters (HW)	Clip / Underimpedance Limiter, FuseProtect Limiter
Cooling	Two temperature dependent speed-controlled axial fans
LED indicators	LEDs for signal / protect and clip
Input connectors	Two 3-pin XLR female analogue input connectors, pin 2 = hot (inphase) Two 3-pin XLR male passive loop through connectors One 3-pin XLR female AES (digital) input connector One Ethernet connector RJ45
Power output connectors	One 4-pole SPEAKON® connector for each output channel (bi-amping possible)
Modes of operation	Dual channel (Stereo), mono bridge
Input sources	Analogue, AES
A/D – D/A converters	24 bit / 96 kHz
Latency	Min. 0,58 ms
Digital inputs	AES / EBU, 16 to 24 bit, 44,1, 48, 88,2, or 96 kHz



AC mains * Approximative mains voltage range where the amplifier can be used. Amplifier output power performance will decrease with lower mains voltages than the rated 230V / 220V / 120V and slightly increase with higher mains voltages.	230V AC, 50 / 60 Hz (for Europe), 190 – 263V* 220V AC, 50 / 60 Hz (for China), 190 – 263V* 120V AC, 50 / 60 Hz (for US), 95 – 134V*
Operating temperature	+5 °C to +55 °C / +41 °F to +131 °F
Dimensions (W x H x D)	483 x 88,1 x 419 mm / 19 x 3,5 x 16,5 inches (19", 2U)
Net weight	9,4 kg / 20,7 lbs
Shipping dimensions (W x H x D)	600 x 105 x 527 mm / 23,3 x 4,1 x 20,7 inches
Shipping weight	11 kg / 24,3 lbs

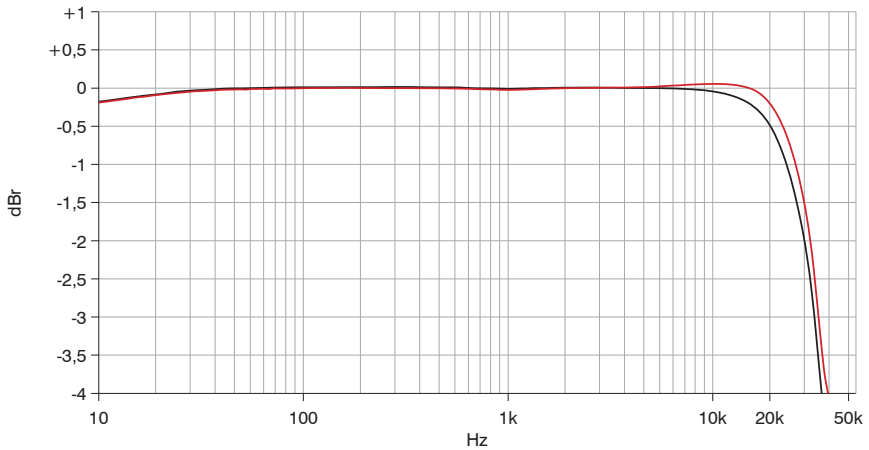
We reserve the right to make technical alterations without prior notice.



7. Typical Performance Diagrams

FIGURE 7.1

Gain vs. frequency, 120 W output power
(Measurement of a typical performance @ 2 Ω & 4 Ω)



19

FIGURE 7.2

THD @ 1 kHz vs. input level @ 4 Ω load (32 dB amplifier gain)
(Measurement of a typical performance of Ch 1 & Ch 2)

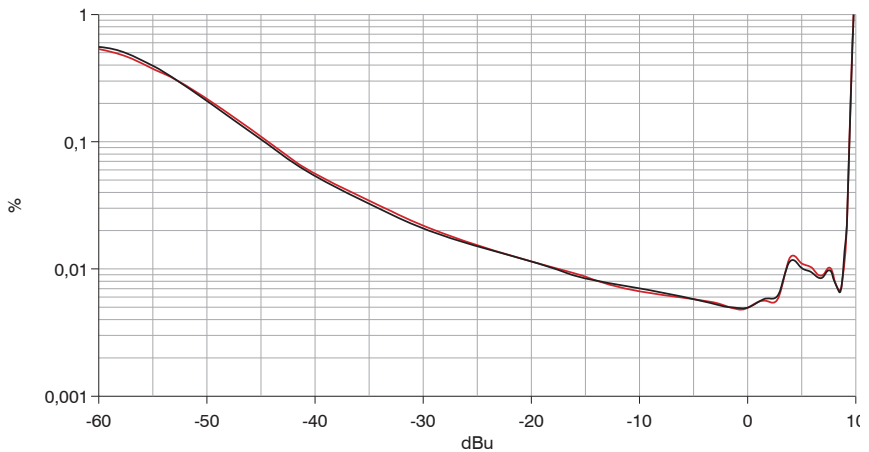
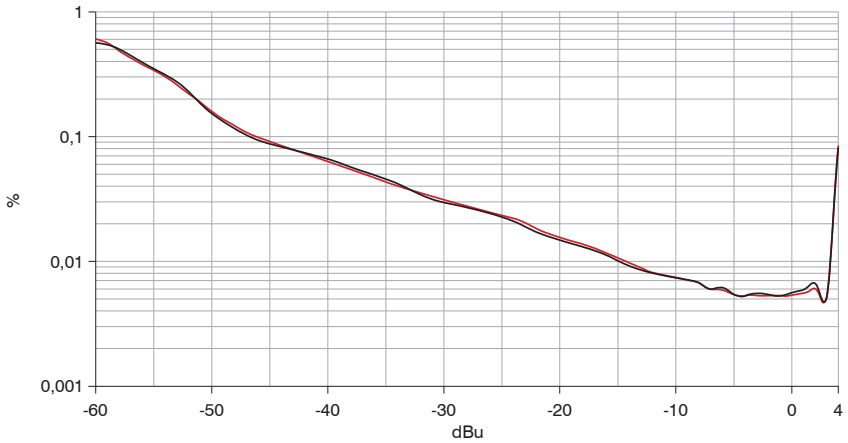




FIGURE 7.3

THD @ 1 kHz vs. input level @ 2 Ω load (32 dB amplifier gain)
(Measurement of a typical performance of Ch 1 & Ch 2)



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FIGURE 7.4

THD vs. frequency, 120 W output power
(Measurement of a typical performance @ 2Ω & 4Ω)

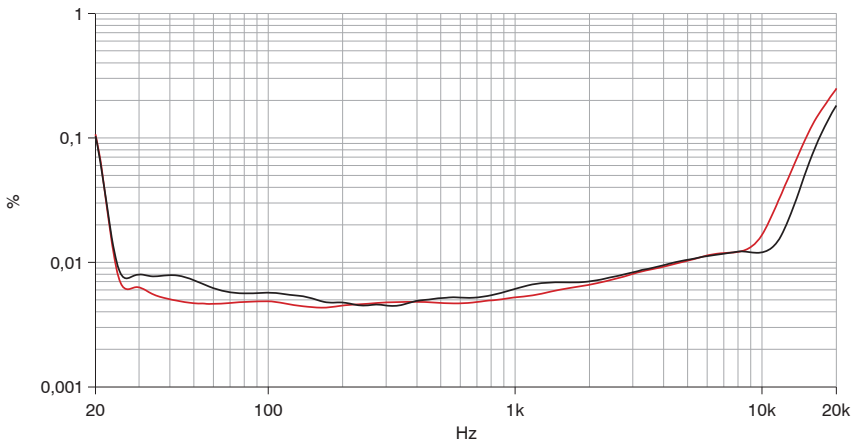




FIGURE 7.5

Channel separation vs. frequency @ 120 W / 4 Ω
(Measurement of a typical performance of Ch 1 \rightarrow Ch 2 & Ch 2 \rightarrow Ch 1)

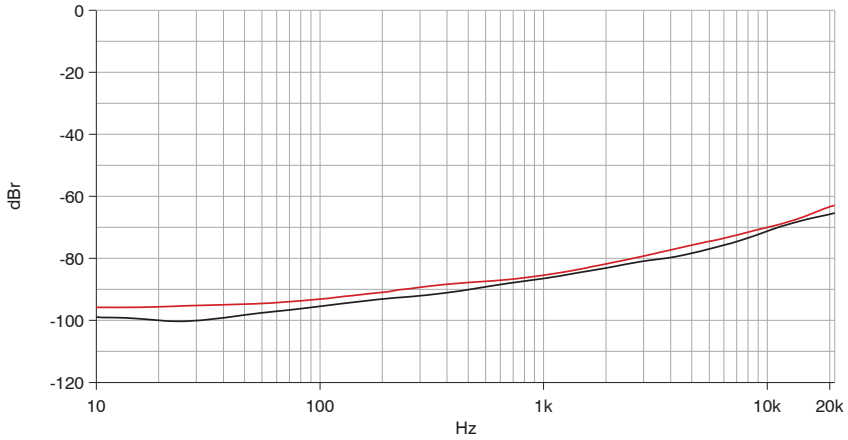


FIGURE 7.6

DIM100 vs. input level (32 dB amplifier gain)
(Measurement of a typical performance of Ch 1 & Ch 2)

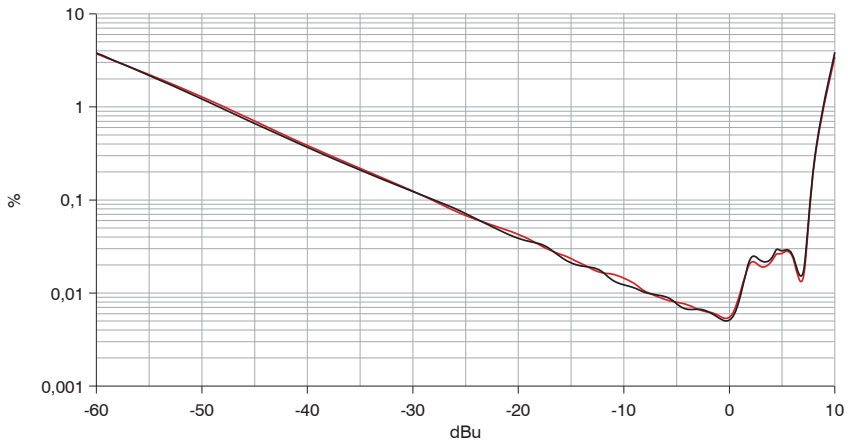
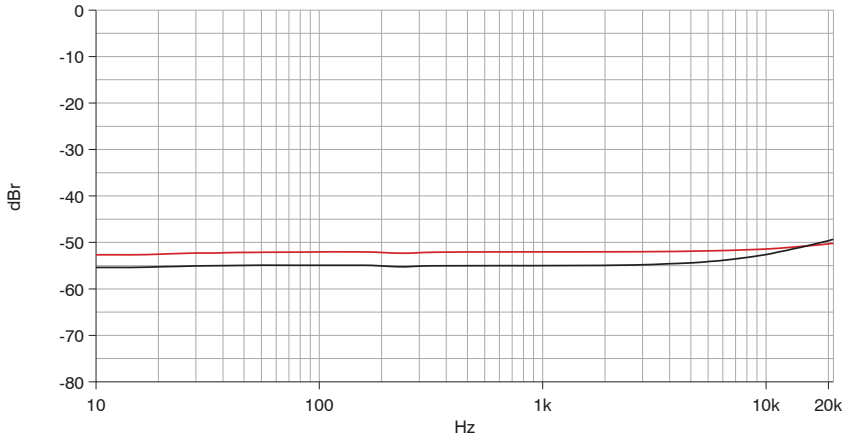




FIGURE 7.7

Common mode rejection ratio vs. frequency
(Measurement of a typical performance of Ch 1 & Ch 2)



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FIGURE 7.8

FFT of noise level (no input signal applied, analog input, 32 dB amplifier gain)
(Measurement of a typical performance of Ch 1 & Ch 2)

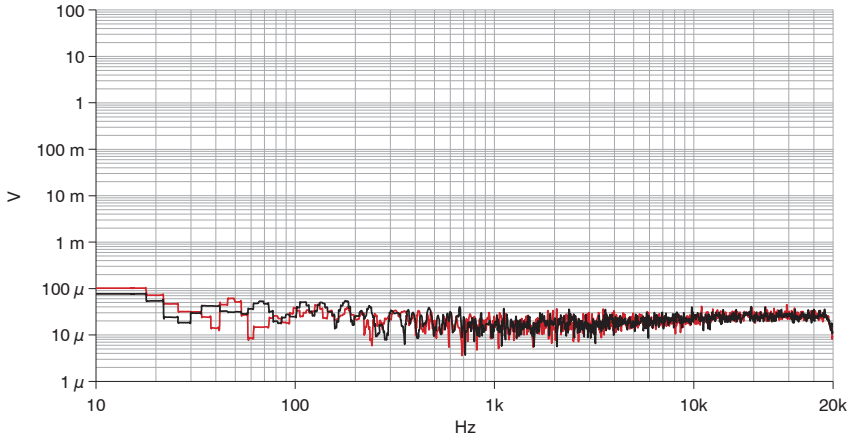




FIGURE 7.9

Output impedance vs. frequency
@1 Amp RMS injected current equivalent $11\text{ m}\Omega + 2,1\text{ }\mu\text{H}$
(Measurement of a typical performance of Ch 1 & Ch 2)

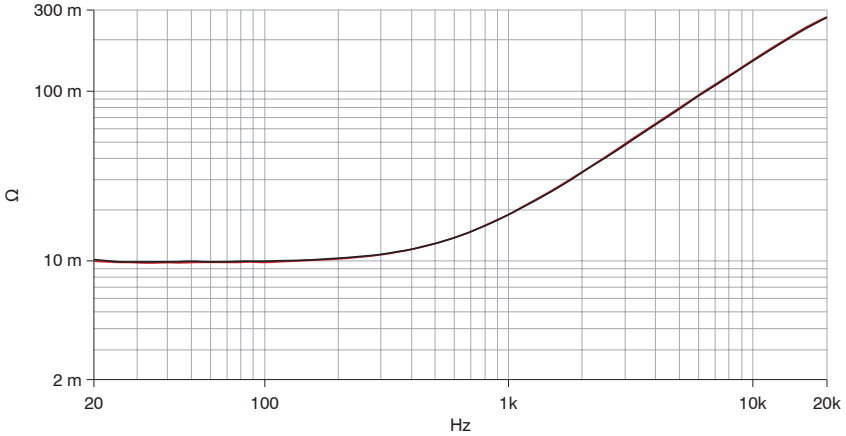
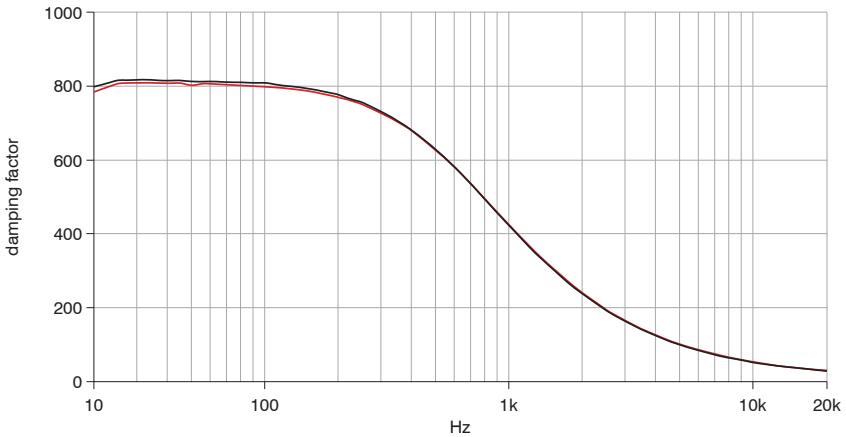


FIGURE 7.10

Damping factor into 8Ω
(equation: $\text{damping factor} = \text{loaded impedance} / \text{amplifier output impedance}$)
(Measurement of a typical performance of Ch 1 & Ch 2)





8. Unit Conversion Equations and Conversion Table

8.1 UNIT CONVERSION EQUATIONS

Unit conversion	Equation
$V_{RMS} \rightarrow \text{dBu}$	$Level\ in\ \text{dBu} = 20 * \log \left(\frac{Value\ in\ V_{RMS}}{0,7746} \right)$
$V_{RMS} \rightarrow \text{dBV}$	$Level\ in\ \text{dBV} = 20 * \log \left(\frac{Value\ in\ V_{RMS}}{1,0000} \right)$
$\text{dBu} \rightarrow V_{RMS}$	$Voltage\ in\ V_{RMS} = 0,7746 * 10^{\left(\frac{Level\ in\ \text{dBu}}{20} \right)}$
$\text{dBV} \rightarrow V_{RMS}$	$Voltage\ in\ V_{RMS} = 10^{\left(\frac{Level\ in\ \text{dBV}}{20} \right)}$
$V_{RMS} \rightarrow V_{Peak}$	$Voltage\ in\ V_{Peak} = 1,414 * (Voltage\ in\ V_{RMS})$
$V_{RMS} \rightarrow \text{Output power}$	$8\ \Omega$ $Output\ power\ in\ W = \frac{(Voltage\ in\ V_{RMS})^2}{8\ \Omega}$
	$4\ \Omega$ $Output\ power\ in\ W = \frac{(Voltage\ in\ V_{RMS})^2}{4\ \Omega}$
	$2\ \Omega$ $Output\ power\ in\ W = \frac{(Voltage\ in\ V_{RMS})^2}{2\ \Omega}$

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8.2 CONVERSION TABLE

V_{RMS}	V_{Peak}	dBu	dBV	Output power in W (8 Ω)	Output power in W (4 Ω)	Output power in W (2 Ω)
1	2,83	2,22	0,00	0,13	0,25	0,50
2	5,66	8,24	6,02	0,50	1,00	2,00
3	8,49	11,76	9,54	1,13	2,25	4,50
4	11,32	14,26	12,04	2,00	4,00	8,00
5	14,14	16,20	13,98	3,13	6,25	12,5
6	16,97	17,78	15,56	4,50	9,00	18,0
7	19,80	19,12	16,90	6,13	12,3	24,5
8	22,63	20,28	18,06	8,00	16,0	32,0
9	25,46	21,30	19,08	10,1	20,3	40,5
10	28,29	22,22	20,00	12,5	25,0	50,0
12	33,95	23,80	21,58	18,0	36,0	72,0
15	42,43	25,74	23,52	28,1	56,3	112,5
20	56,58	28,24	26,02	50,0	100,0	200,0
30	84,87	31,76	29,54	112,5	225,0	450,0
40	113,15	34,26	32,04	200,0	400,0	800,0
50	141,44	36,20	33,98	312,5	625,0	1 250,0
60	169,73	37,78	35,56	450,0	900,0	1 800,0
70	198,02	39,12	36,90	612,5	1 225,0	2 450,0
80	226,31	40,28	38,06	800,0	1 600,0	3 200,0
90	254,60	41,30	39,08	1 012,5	2 025,0	4 050,0
100	282,89	42,22	40,00	1 250,0	2 500,0	5 000,0
120	339,46	43,80	41,58	1 800,0	3 600,0	7 200,0
150	424,33	45,74	43,52	2 812,5	5 625,0	11 250,0



Values in grey are calculated only. The QX4500 is not able to deliver these output powers.

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