

VIOLECTRIC

HEADPHONE AMPLIFIER

Violectric HPA V101



USER'S MANUAL

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CAUTION !!

**THE HIGH OUTPUT LEVELS ACHIEVABLE
WITH THIS UNIT MAY
DAMAGE YOUR HEARING OR THE
HEADPHONES**

Cordial thanks for your decision in favour of a **VIOLECTRIC product !**

VIOLECTRIC is a trademark and product line of Lake People electronic GmbH. Lake People electronic GmbH develops, manufactures and distributes products in the professional range, for broadcast, television, airports, exhibition halls, festival venues, theatres, large-scale installations, private studios and more. In the private sector as well, Lake People products become increasingly popular due to their outstanding quality.

The trademark and product line **VIOLECTRIC** is specially intended to supply the Hi-Fi and High-End market with its specific requirements.

Who develops **VIOLECTRIC equipment ?**

The devices are exclusively developed in Germany by the engineers of Lake People electronic GmbH. In doing so, the team of developers can draw on over thirty years of experience and countless products for the pro-audio domain.

Among others, the first German-made 20-Bit A/D and D/A converters were developed by Lake People in the early nineties of the past century.

Who manufactures **VIOLECTRIC equipment ?**

The devices are exclusively manufactured in Germany by Lake People electronic GmbH or contractors in the company's vicinity.

Lake People - and by association **VIOLECTRIC** - put high emphasis on domestic manufacturing. As well, all component suppliers are chosen in order to achieve the main part of added value inland.

How do **VIOLECTRIC** devices get to the customer ?

The devices can be obtained from respective specialist suppliers. If there is none such accessible regionally, the customer is supported by transregional distribution partners (google may help...) and, of course, by **VIOLECTRIC** on-line shop.

... and if it doesn't work like it should ?

VIOLECTRIC devices are covered by a 5-years warranty. In case of any malfunction during this period, they can be shipped to the manufacturer directly. Of course, the client will benefit from the full technical support even when warranty has expired. Any technical questions or need for advice is welcome.

VIOLECTRIC

is a subsidiary of



LAKE PEOPLE

LAKE PEOPLE electronic GmbH

Max Stromeyer Str. 116

D-78467 Konstanz

Tel: +49 (0) 7531 73678

Web: www.lake-people.de

Mail: info@lake-people.de

www.vioelectric.de **www.vioelectric.com**

www.lake-people.de **www.lake-people.com**

WARNING

For your protection, please read the following:

Water, Liquids, Moisture:

This appliance should not be used near water or other sources of liquids. Care should be taken so that objects do not fall and liquids are not spilled into the enclosure through openings.

Power Sources:

The appliance should be connected to a power supply only of the type described in the operating instructions or as marked on the appliance.

Grounding:

Care should be taken that this appliance is operated with proper grounding only.


Power Cord:

Power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them, paying particular attention to cords at plugs, convenience receptacles, and the point where they exit from the appliance.

This unit is equipped with a 3-pole mains cable with German 3-pin mains plug.

In some countries this unit must be operated with a mains adaptor, supplied by the owner.

Please refer to the table below to connect a mains plug:

| OVERVIEW: POWER CORD FUNCTION AND COLORS | | | |
|---|------------------|--------------|------------|
| CONDUCTOR | | COLOR | Alternativ |
| L | LIVE | BROWN | BLACK |
| N | NEUTRAL | BLUE | WHITE |
| E  | PROTECTIVE EARTH | GREEN+YELLOW | GREEN |

U.K. Mains Plug Warning:

A moulded mains plug that has been cut off from the cord is unsafe.

Discard the mains plug at a suitable disposal facility.

Mains Fuse:

The mains fuse of this appliance is soldered in place and accessible from the inside only!!

A blown fuse may indicate an internal problem and should be replaced during qualified servicing or repair work!

**Switchable Power Supply:**

Connect this unit to the power source indicated on the equipment rear panel only to ensure safe operation!

This unit is provided with an internally settable mains supply for 230 or 115 V AC.

Service / Repair:

To reduce the risk of fire or electric shock, the user should not attempt to service the appliance beyond the measures described in the operating manual. All other servicing or repair should be referred to qualified personnel!

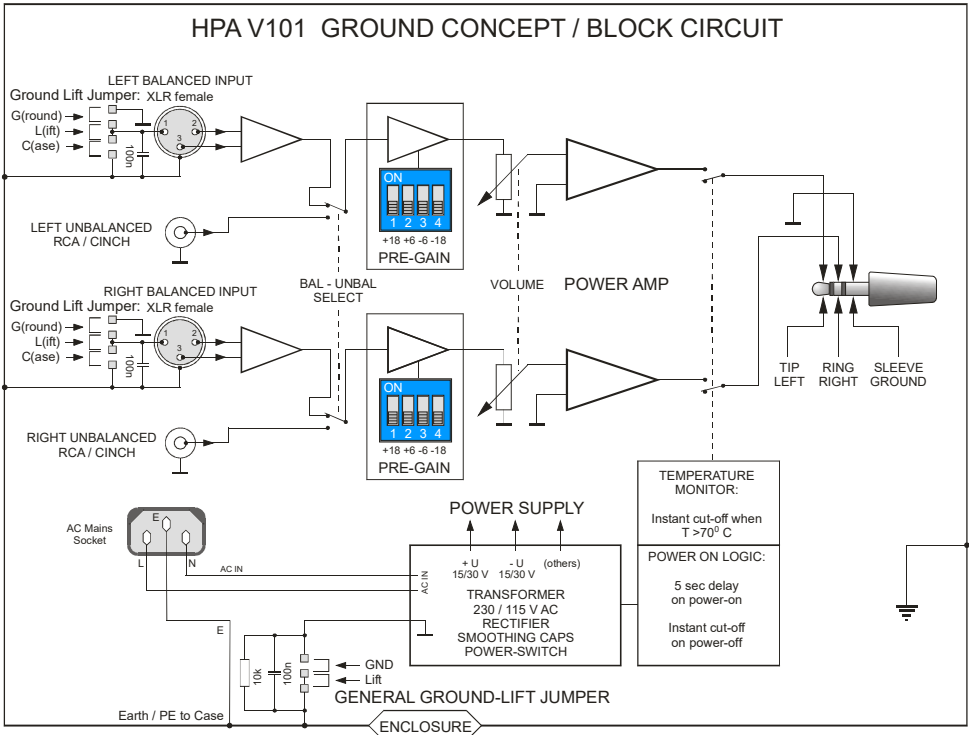
Electromagnetic Compatibility

This unit conforms to the Product Specifications noted as

Declaration of Conformity at the end of this manual. Operation is subject to the following conditions:

- this device may not cause harmful interferences
- this device must accept any interference received, including interference that may cause undesired operation
- this device must not be operated within significant electromagnetic field

The Earth / Grounding Concept



General GROUND-LIFT Jumper - accessible from the inside.

Mind the SECURITY INSTRUCTIONS !!

Ex-works this jumper is set to the **LIFT** position.

The internal ground potential is "lifted" by means of this jumper.

As a result, the interconnection for DC voltages and lower frequencies (< 150 Hz) will be cut. Higher frequencies will be bled off to earth potential through the RC filter. The LIFT position is helpful in case of hum or jitter caused by different ground/earth potentials.

Of course full electrical protection is granted as the case is always connected to ground/earth potential !

See more on page 23.

Ex works the GENERAL GROND LIFT JUMPER is set to **LIFT** position.

XLR GROUD-LIFT Jumper (Page 23)

(accessible from the inside. Mind the SECURITY INSTRUCTIONS !!):

G(ROUND): Ex-works all jumpers are set to "G" (ground) position. Pin 1 is connected to the internal ground reference. High frequency interference is deflected to the case via a 100 nF capacitor.

L(IFT): The interconnection between Pin 1 and ground is open. High frequency interference is deflected to the case via a 100 nF capacitor. This jumper position is specifically useful if the unit is equipped with transformers !!

C(ASE): Pin 1 is connected to the case, the 100 nF capacitor is bridged. This jumper position may be varied together with the **General GROUND-LIFT jumper**.

**Please note that with jumpers not in the ex-works position
EMC emission might occur,
for which the user is responsible only !**

Connection / Connectors for Analog Signals



LAKE PEOPLE

GENERAL INFORMATION

VIOLECTRIC HPA V101 contains a high-grade stereo **Headphone Amplifier** designed to drive low-, medium- and high-Z loads (16...600 ohms) as usually represented by high-quality headphones. Due to its specific, highly variable, low-noise and low distortion circuit design especially optimised for dynamic and orthodynamic headphones, HPA V101 fulfils even highest demands.

Features:

- **2 analogue Stereo Inputs**,
unbalanced via RCA sockets, gold plated
balanced via XLR connectors, gold plated
- **PRE-GAIN** = 7-fold switchable gain/attenuation
-18 / -12 / -6 / 0 / +6 / +12 / +18 dBr
- Headphone amp with **discret-design power amps**
- 4 transistors per channel
- extremely low output impedance
- headphone connectors 2 x 6,3 mm (1/4") phone jack
- RK 27 volume attenuator
- delayed relay-based headphone output during power on
- instant cut-off for power off
- **Protective circuit** for thermal overload
- toroidal transformer 10 W
- Rugged Aluminum case, black anodized
- massive Aluminum front panel

With its compact dimensions, the VIOLECTRIC HPA V101 ensures optimum flexibility combined with high output power. During design, high emphasis was put on operational safety even when the unit is operated inappropriately.

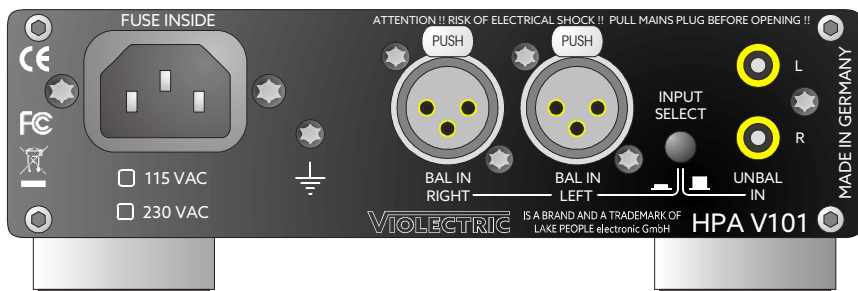
HPA V101 is equipped with safety circuitry and internal filters to prevent damage to the connected headphones due to high-frequency overload beyond the audible range.

THE CASE

of VIOLECTRIC HPA V101 is made of 3-4 mm Aluminum and a thick aluminum front panel. This choice of material ensures high mechanical stability and resistance whilst maintaining a high optical and haptic quality.

GROUND AND PROTECTIVE EARTH

The case of VIOLECTRIC HPA V101 is connected to protective earth.



POWER SUPPLY

Mains power is provided via a three-pin IEC/CEE socket and mating "cold-appliance" mains cord with Schuko-type plug for units purchased in middle Europe.

The device is set to 230V mains, whereas the actual voltage may vary between 190 and 240 volts for flawless operation.

The mains voltage may be altered to 115 V AC supply inside the unit with the aid of a mains voltage selector. In this case stable operation is granted in a range of 85 to 120 V (see page 23).

A toroidal transformer with 10 Watt is providing the internal operating voltages of +/-25 V. Out of these voltages some more operating voltages are generated.

MAINS FUSE

The internal 0,25 AT fuse is soldered in place on the PCB.

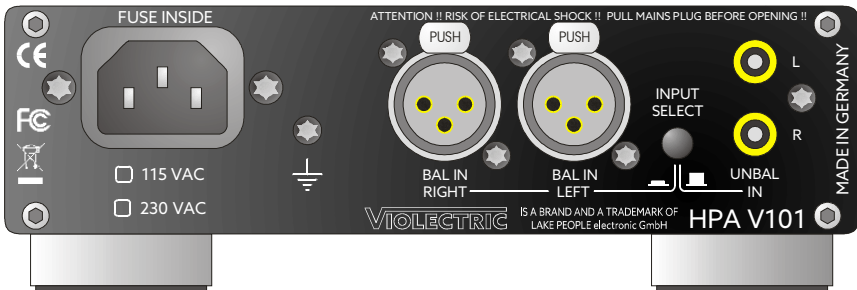
IMPORTANT !!

FOLLOW THE SAFETY INSTRUCTIONS:

A blown fuse may indicate internal problems and should be replaced during qualified servicing work only !!

THE INPUTS

The signal inputs on the rear are equipped with XLR female-type sockets, allowing balanced signal injection. They are marked "BAL IN LEFT" and "BAL IN RIGHT" respectively.



| Balanced Signals XLR Input Wiring: | |
|------------------------------------|-----------|
| PIN 1 | GND |
| PIN 2 | (+) PHASE |
| PIN 3 | (-) PHASE |

For unbalanced signals, two RCA connectors are provided. With the "INPUT SELECT" switch on the back panel either the unbalanced or balanced inputs are activated.



POWER SWITCH

This switch activates the unit. Power-on status is indicated by the blue "ON"-LED under the switch.

THE VOLUME ATTENUATOR

is to set the desired volume for the left and right channel simultaneously. The attenuator features a mechanical 41-steps detent which may be helpful for precise (re) adjusting the position.

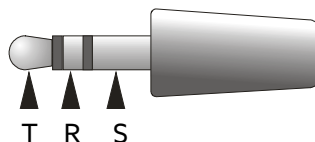
THE AMPLIFIERS

The input signals are fed to a stereo amplifier specially designed for this purpose. Its operating range covers nearly DC to 150 kHz (-0,5 dB) in order to ensure optimum linearity within the audible frequency spectrum. Overall gain is set to +8 dB to enable the unit to drive high-Z headphones at sufficient volume.

HEADPHONES OUTPUTS

The VIOLECTRIC HPA V101 offers two stereo headphone outputs, each equipped with a standard 1/4" phone jack.

| 1/4" Phone Jack: | |
|------------------|---------------|
| TIP | Left Channel |
| RING | Right Channel |
| SLEEVE | GND |



PROTECTIVE MEASURES:

To ensure error-free operation and not to harm your valuable headphones in a comprehensive way your VIOLECTRIC HPA V101 is equipped with some protective circuits:

- During powering on there is a five second delay to protect your headphones from possibly unwholesome noises. After the time the headphone outputs are switched to the amp. Also, the instant cut-off after powering off is intended to protect your headphones.
- Due to the thermal overload protection the outputs are also cut from the electronics when the power section reaches 70° degrees Celsius or more. After cooling down the unit will start proper work again automatically.

Too loud ? Too soft ? The PRE-GAIN method

The VIOLECTRIC HPA V101 is specially designed to drive headphones. To do so it is placed between up to two analogue sources and the headphones.

Headphones however can present load impedances from 8 to 2000 ohms and efficiency ratios from 85 to 115 dB per Milliwatt.

The sources may have output levels between 0.5 Volt up to 10 Volt. Thus, it can be quite tricky to fulfil all demands, since...

... owners of high-efficiency headphones will rarely set the volume control higher than 9 o'clock in order to exclude hearing damage, while

... the maximum setting may still be too soft for low-efficiency headphones, but

... all users expect highest quality at lowest noise and distortion.

Thus, the *circuitry* must adapt itself - as the headphones won't do and the sources will seldom do!

WE CALL THE SOLUTION TO THIS PROBLEM **PRE-GAIN**

A single amp of HPA V101 has a gain of +8 dB (factor 2,5).

By this measure the amps will produce an extremely low self-generated noise which can hardly be heard even with highest sensitive in-ear-monitors (IEM).

On the other hand, the amps of HPA V101 with very powerful transformers and with their high operating voltage are able to drive low efficiency or high impedance headphones to the full with ease. You will hardly find a headphone driving HPA V101 to its limits. This effortless action will save your precious headphones as they will never see a distorted signal from the amp.

The alignment between amplifier and headphone is provided by the preamp stage, which can boost or attenuate the input signal in seven steps of -18 / -12 / -6 / 0 / +6 / +12 / +18 dB. (Factor 64 !!)

These DIP-switches are situated internally on the PCB.

Settings are made for the left and right channel - they shall not be different from each other.

With these switches an additional gain or attenuation may be set. It is dependent on the output level of the input source and the sensitivity of the headphones connected. By this measure it is maintained to achieve lowest possible noise and maximum travel of the volume attenuator.

The high gain/attenuation range of +/-18 dB (factor 64) ensures a perfect match to any source with any headphone in the market.

HOW TO OPTIMIZE THE PRE-GAIN SETTING:

Connect your source to VIOLECTRIC HPA V101 and plug in your headphones.

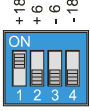
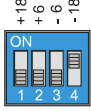
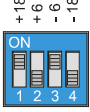
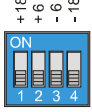
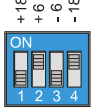
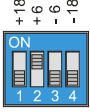
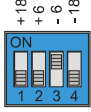
Listen !!

Your amp is adjusted best by the individual PRE-GAIN setting when the volume control for "normal" listening is positioned around 12 o'clock. So it is provided, that there is enough attenuator travel to boost the signal through lower level passages or to listen with higher

volume. On the other hand, the attenuator travel is optimized to reduce the self-generated noise from the amp.

THE HEADPHONE AMP PRE-GAIN SETTING

Ex works all switches are in the lower position: 0 dB gain.

| | | |
|---|--|---|
|  <p>PRE-GAIN +18 dB 1 = ON</p> | <p>EX WORKS SETTING</p> |  <p>PRE-GAIN -18 dB 4 = ON</p> |
|  <p>PRE-GAIN +12 dB 1 + 3 = ON</p> |  <p>PRE-GAIN +/- 0 dB All OFF</p> |  <p>PRE-GAIN -12 dB 2 + 4 = ON</p> |
|  <p>PRE-GAIN +6 dB 2 = ON</p> | <p>EINSTELLUNG AB WERK</p> |  <p>PRE-GAIN -6 dB 3 = ON</p> |

In case you cannot reach the 12 o'clock position because the input signal is too loud, feel free to reduce the signal with the PRE-GAIN steps -6 / -12 / -18 dB (factor 0,5 / 0,25 / 0,125).

In case the signal is too soft even with volume settings above 12 o'clock please use the PRE-GAIN settings +6 / +12 / +18 dB to achieve more gain (factor 2 / 4 / 8).

Other than the above settings are not useful but harmless.

CAUTION

To avoid unwanted level leaps the settings should be altered under the following conditions only:

- The "VOLUME" control should be set to minimum.
- Left and right channel settings should be the same unless you want to settle the amp for different hearing abilities.

Ex-factory, all switches are set to their lowest position - i. e. 0 dB PRE-GAIN - which should be sufficient for most applications.

Things to know ...

Why makes it sense to make such huge efforts?

A headphone amplifier is a device designed to condition audio signals with regards to the very specific requirements of headphones. This doesn't sound too spectacular at the first glance and can be achieved relatively easy. As with many things however, the devil is in the details and much more effort is required to design **one** amplifier for **all** current headphone models.

Headphones per se are quite diverse, and there are two essential parameters: Impedance and Sensitivity.

In general, headphones with higher impedance can be regarded as less sensitive than headphones with low impedance (which is not generally true, but in the majority of cases). The sensitivity of headphones is usually stated in dB SPL (sound pressure level) per Milliwatt.

Extremes in this sense are the AKG K1000 with 74dB/mW on the one hand, and the Sennheiser HD25 with 108 dB/mW on the other hand: The K1000 requires 2500 times the power to achieve the same sound pressure as the HD25.

There is also the fact that headphones with high impedance usually require much higher voltage to achieve high loudness. Thus, the amplifier *must* be designed with high internal supply voltages.

Why are op-amps ideal for low-level signal processing?

Discrete amplifiers (designed with transistors) are very popular in high-end audio design also for preamplifier stages. This is often marketed as an optimization measure, but the partially exorbitant extra expenses are of course to be paid by the customer.

But an op-amp consists of transistors as well ... moreover, its structure has the advantage of thermal coupling between its internal components. Also ageing issues play a much less important role. Due to the large number of op-amp types offered, it is possible to pick an optimum type for any specific application.

Why does frequency bandwidth limiting make sense ?

In signal processing, sound is represented by AC voltages. Sound is audible - for young people - from about 20 to 20000 Hz. The elder the listener, the less he will hear high frequencies in particular.

In order to transmit these frequencies at optimum quality, the frequency response of an amplifier should be as wide and as "flat" as possible. At the low end of the scale, this limit is represented by DC, as there is no frequency lower than zero. In upward direction, the limit can be set to practically any frequency, but the higher, the more susceptible the device becomes concerning electro-magnetic interference. This is not audible in the first place but, may interfere with the useful signal and then become evident. Therefore, unrestricted frequency response attests thoughtlessness rather than remarkable engineering skill.

Why is a low output impedance essential ?

When actuated, electro-dynamic systems respond with a counterforce. When the voice coil of a headphone has been displaced by the signal, an (error-) current will be induced when it swings back to its initial position. This current must be suppressed as far as possible, which is effected best if the amplifier's output

impedance is the lowest possible. The damping factor describes nothing but the ratio between output impedance of an amplifier and a given load.

Since there is no known technical specification, we define the load (voice coil impedance) as 50 ohms. With VIOLECTRIC HPA V101 having an output impedance of <0.125 Ohm this results in a damping factor 400.

Why are high supply voltages essential ?

A headphone doesn't really require high power, but from the equation $P = U^2 / R$ we can see that the square of the supply voltage determines the power into a given load resistance. The higher the headphone's impedance, the more voltage will be needed. But this deals with the achievable loudness to a limited extent only:

Technically spoken, music lives on fast transients which put high demands on signal processing. And thus, a fast transient can easily push an average amplifier with +/-15 volts supply to its limits (90 % of all headphone amps in the market are operated with these or even lower supply voltages). Due to the high supply voltage of VIOLECTRIC HPA V101 you will benefit from more than doubled output voltage swing capability.

Why does PRE-GAIN make sense?

Two extreme examples (with the VIOLECTRIC HPA V101 with +8 dB gain = factor 2,5, volume control set to full):

1st example:

The (pre-) amplifier provides 8 V output voltage, whereas the headphone requires only 4 V for 100 dB sound pressure level.

With the volume control fully turned up, the amp would deliver 20 V output at +8 dB gain. Therefore, the volume control would have to be operated very carefully to avoid hearing damage. Moreover, any interference at the input should be avoided since it would be

"unforgivingly" amplified as well.

With PRE-GAIN, the input level can be reduced by 12 dB (a fourth), with 2 V instead of 8 V input level as the result. This 2 V is again amplified by +8 dB, then equalling around 5 V. Now the volume control can be turned over almost the entire range.

2nd example:

The source provides 1 V, whereas the headphone requires 10 V to release 100 dB of sound pressure.

With the volume control fully clockwise, the amp would provide around 2,5 V at +8 dB gain only – too low for the headphone. By means of PRE-GAIN, input level can be boosted by 12 dB (four-fold), resulting in effective 4 V input voltage instead of 1 V. These are again multiplied by +8 dB or factor 2,5, now equalling 10 V. This is exactly what the headphones demand.

Why a good volume attenuator is essential?

"Normal" devices do have a volume potentiometer which is a mechanical control element, it can be obtained on the market at any low price. Meanwhile it is often replaced by electronic circuitry, often exhibiting essential disadvantages concerning dynamic range, noise and distortion.

Conductive-plastic resistive tracks, high-quality multi-tap wipers and separated chambers for the individual sections are highly desirable for sophisticated applications, and high quality is inevitable to ensure trouble-free operation for years. Since the market for really good pots is a small one, manufacturers like Noble or Panasonic don't offer these anymore. A current sample of top-of-the-line pots is the RK27 by ALPS, which is used inside VIOLECTRIC HPA V101.

Why we are making our amps in such a way.

They are made with transistors and operated with +/- 25 V supply voltage because it is senseful to do so. But a headphone amp must

not be as powerful as a speaker amp.

Our "power" stage consists of four transistors, two small ones, two bigger ones, all of them very fast. They are driven by an op-amp in non-inverting mode, the gain is set to +8 dB (factor 2,5).

For high impedance headphones a very high output voltage of nearly 19 V RMS is achieved - while low impedance headphones will profit from a power over 2050 mW into 50 Ohms per channel.

Under all operating conditions noise, distortion and dynamic range is on the edges of physics.

Why does a output relay make sense when switching power?

Amplifiers generate unwanted output signals when applying or removing power, which can damage the connected headphones.

The relay breaks the connection between amplifier and headphone for some seconds after power-on and thus protects the latter until electrical conditions have stabilized.

DISPOSAL

Disposal of Old **E**lectrical & **E**lectronic **E**quipment - WEEE Regulation
(Applicable in the European Union and other European countries with separate collection systems)



DE 26076388

This symbol on the product or on its packaging indicates that this product shall not be treated as household waste. Instead it shall be handed over to the applicable collection point for the recycling of electrical and electronic equipment.

By ensuring this product is disposed of correctly, you will help prevent potential negative consequences for the environment and human health, which could

otherwise be caused by inappropriate waste handling of this product.

The recycling of materials will help to conserve natural resources.

For more detailed information about recycling of this product, please contact your local Civic Office, your household waste disposal service or the shop where you purchased the product.

INTERNAL SETTINGS

Please note:

The following chapters refer to internal settings of the HPA V101.

To alter these settings, a TORX screwdriver T10 or 2,5 mm Allen Key is required. The more, you should by all means

PULL THE MAINS CORD !!!




after which all settings can be performed without any hazard.

Dismantling


1. Screw out two upper screws from the front panel
2. Screw out to upper screws on the back panel
3. Now lift the lid to make your settings
4. Afterwards re-assemble the unit

ADJUSTMENTS HPA V101

XLR GROUND-LIFT JUMPERS (siehe Seite 6/7)

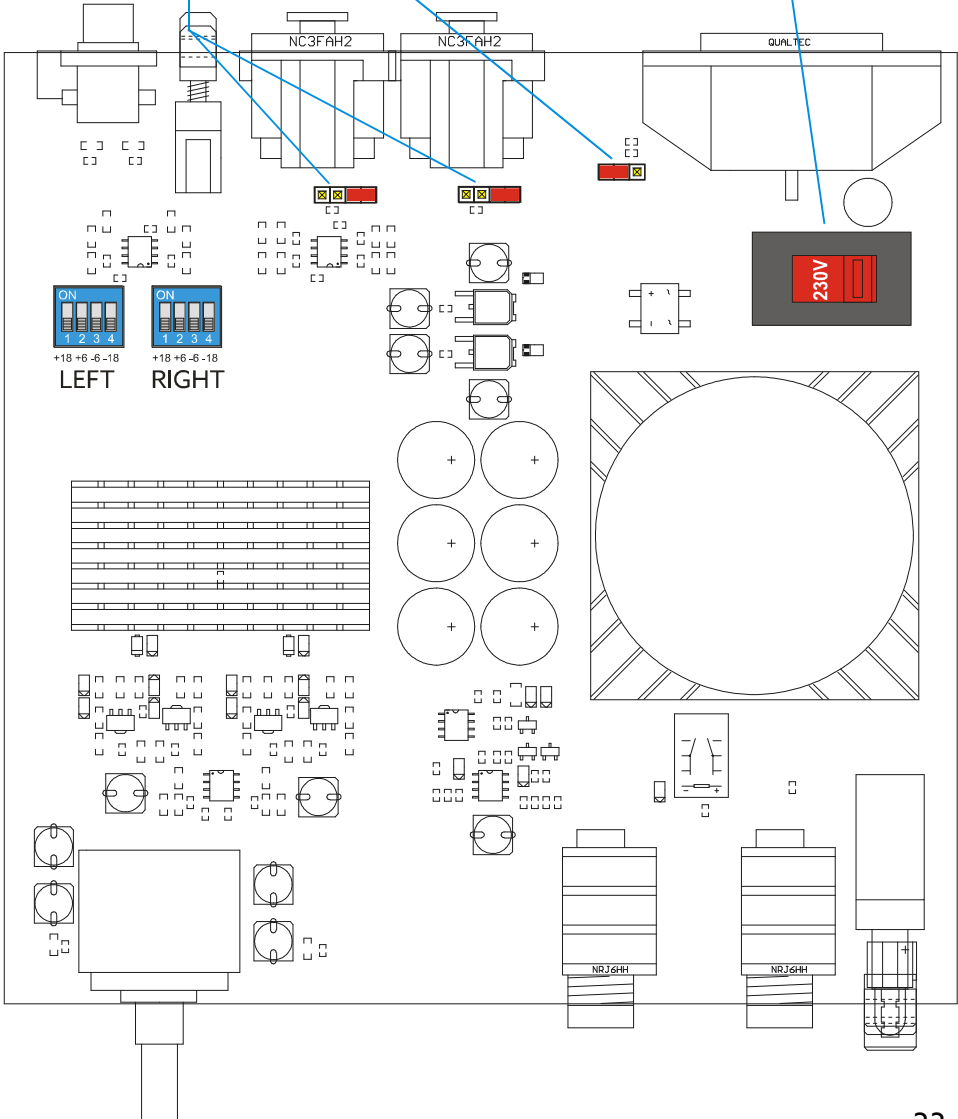
| | | |
|---|---|--|
|  GROUND POSITION (ab Werk) |  LIFT POSITION |  CHASSIS POSITION |
|---|---|--|

GEHÄUSE GROUND-LIFT JUMPER (siehe Seite 6/7)

| | |
|---|---|
|  LIFT POSITION (ab Werk) |  GROUND POSITION |
|---|---|

Spannungseinstellung (siehe Seite 11)

| | |
|--|--|
|  Das Gerät ist auf 230 V eingestellt. |  Das Gerät ist auf 115 V eingestellt. |
|--|--|



TECHNICAL DATA HPA V101

All measurement RMS unwt'd., 20 Hz - 20 kHz, Pre-Gain set to 0 dB

| | |
|------------------------------------|---|
| Inputs: | 2 x XLR female bal, 2 x RCA, unbal |
| Max. Input Voltage: | + 21 dBu, Impedanz 10 kOhms |
| Input Impedance: | 10 kohms |
| Nom. Input Sensitivity: | +6 dBu |
| Amplifier Gain: | +8 dB |
| PRE-GAIN: | -18 / -12 / -6 / 0 / +6 / +12 / +18 dB |
| Overall gain with PRE-GAIN: | -10 / -4 / +2 / +8 / +14 / +20 / +26 dB |
| Frequency Range: | 0 Hz - 150 kHz (- 0,5 dB) |
| Slew Rate: | 8 V / usec |
| Dynamic Range 2x 600 R: | > 126 dB / 129 dB (A-wtd) |
| Dynamic Range 2x 100 R: | > 123 dB / 126 dB (A-wtd) |
| Noise: | < -98 dBu / -101 dBu (A-wtd) |
| THD+N (1kHz/2x10V/100R = 1W) | < -100 dB / < 0.001 % |
| THD+N (1kHz/2x18V/600R = 0,5W) | < -102 dB / < 0.0008 % |
| Output Impedance : | < 0,125 Ohm |
| Damping Factor : | > 400 |
| Crosstalk: | < -110 dB (1 kHz) / -98 dB (15 kHz) |

Max. Output Level:
(1kHz / < 0.1% THD+N)

| R _L (x 2) | U _a (dBu) | U _a (V) | P _a (mW) |
|-----------------------|----------------------|--------------------|---------------------|
| 600 | 27,8 | 18,9 | 600 |
| 300 | 27,3 | 17,8 | 1050 |
| 100 | 24,6 | 13,2 | 1750 |
| 50 | 21,5 | 9,2 | 2050 |
| 32 | 18,7 | 6,7 | 1450 |
| 16 | 13,1 | 3,5 | 770 |

| | |
|--|-------------------------------|
| Mains Supply Voltage: | 230 V AC / 115 VAC max. 10 VA |
| Case, Front, Back: | Aluminium |
| Dimensions (Case with front and back): | 168 x 47 x 125 mm (W x H x D) |