

Stereo High-Power Amplifier

PRO A 2000

Installation and Operation

058-E0021

Version 01-20-2004



KLEIN + HUMMEL GmbH
Zeppelinstr. 12 73760 Ostfildern/Germany

Tel.: + 49 - (0)711 - 45893 - 0
Fax: + 49 - (0)711 - 45893 - 35
e-Mail: info@klein-hummel.de
Internet: www.klein-hummel.de

Safety Instructions

It is absolutely essential that you read these safety instructions carefully before connecting and using this K+H product. Your safety depends on it. Furthermore, failure to follow these instructions voids the warranty. To ensure safe operation for years to come, keep these instructions in a safe place for future reference. K+H has manufactured this product in accordance with IEC 1992 (SEC) 39 standards, then tested and delivered it in safe operating condition. To maintain it in this condition, you must:

- observe all safety instructions,
- use the product only as described herein,
- have any maintenance, repairs, or modifications performed only by K+H or other authorized personnel, and
- ensure that the room in which you use this product is wired in accordance with the local electrical code.

Warning!

- When the interior of the cabinet is exposed, touching some parts can lead to an electric shock.
- If you need to gain access to the interior electronics of the unit, always disconnect the unit from any and all power sources first.
- Any repairs, maintenance, or other service of the unit when its interior compartment is exposed may only be performed safely (in accordance with VBG 4) by authorized technicians familiar with all the risks involved. Even in an unplugged state, a fully charged capacitor in the unit can zap the unsuspecting.
- Loudspeaker output jacks labeled with the IEC 417/5036 emblem (Fig. A, right) may be carrying dangerously high voltages. If your unit has this emblem, ensure that any connections to be made between these jacks and the speakers themselves are made before powering up the unit, and are done so only with manufacturer-approved interconnecting cables.
- If you need to replace any fuses, ensure that the replacements are of exactly the same type, value and voltage as the originals, as spelled out in the technical specifications at the rear of this manual.
- Do not use "repaired" fuses.
- If you do not have any fuses on hand of the specified size, type, and value, do not hot-wire the contacts in the holder by short-circuiting them.
- Certain areas of the cabinet, cover, and rear panel can achieve extreme temperatures and are therefore marked with a "HOT" label (Fig. B). Refrain from touching any heat sink or ventilation grille.
- High volume levels are known to cause permanent - i.e. irreversible - hearing damage, especially when listened to without sufficient breaks. The higher the levels, the more frequent and extended must be the breaks. Avoid standing too close to loudspeakers that are being driven at high levels. If you must be exposed to high sound pressure levels over an extended period of time, use hearing protection.



Fig. A



Fig. B

Mains Connection:

- This unit is designed for continuous operation.
- Ensure that the operating voltage of the unit matches that of the local mains current (AC line voltage).
- Always check before connecting the power cable to the mains socket that the power switch on the unit itself is set to off ("O").
- Use the power cable or power supply that came with the unit to connect to the mains socket (wall outlet).
- Power supply: a damaged power cable may not be repaired. Use a new cable.
- Avoid plugging the mains cable into a power strip that already has several other power-consuming devices connected to it.
- Avoid using extension cables. The unit must be connected to a mains socket close to it, and that socket should be freely accessible.

Installation:

- This product may only be placed on a stable, clean, horizontal surface.
- Do not expose this product to vibration.
- Do not operate this product anywhere near water or other liquids. Do not use it near a sink, swimming pool, bathtub, or in any damp room or area. Electrical shocks carried through water can kill. Do not place any beverages whatsoever on or near this product, as liquids can kill electronic components.
- Ensure sufficient ventilation around the product to allow for adequate heat dissipation, especially near the rear panel and the sides of the cabinet (minimum of 8 inches from the nearest wall). The unit may only be installed in a rack if measures are taken to ensure sufficient ventilation and if the mounting instructions of the manufacturer are followed. Do not block or cover any heat sink, fan, or vent.
- Do not place the product where it will be in the path of direct sunlight, and keep it a safe distance away from radiators and other heaters of any kind.
- If you bring this product from a cold environment into a warm one (such as from a vehicle into a studio), it is quite possible that condensation will form inside the cabinet. Please allow the unit sufficient time for acclimatisation to room temperature (minimum thirty minutes) before connecting and powering up.
- To avoid accidents, do not use any accessory equipment with this product which is not approved by the manufacturer, particularly mounting accessories. Do not place this unit on any unstable platform, cart, stand or table. Should the unit fall, it can cause bodily injury to persons, or can be damaged itself.
- To protect this product from lightning damage during a thunderstorm or from power surges during an extended absence, disconnect the power cable from the wall outlet.

High Power Amplifier PRO A 2000

Precision Audio Line



Fig. 1 Front view



Fig. 2 Rear view

Table of Contents:

Safety Instructions	2	3. Operation	6
Illustrations, table of contents	3	3.1 Front panel	6
1. Basic Information	4	3.2 Indicators and level control	6
2. Installation	4	3.3 Diagnosis indicators	6
2.1 Read this first.	4	3.4 Determining modes and signal inputs	7
2.2 Operating conditions	4	3.5 Digital Audio input (optional)	8
2.3 Rack Installation	4	3.6 Protection circuit and limiter functions	8
2.4 Cooling	4	3.6.1 Overcurrent limiter	8
2.5 Mains connection	4	3.6.2 Temperature rise limiter	8
2.6 Mains switch (POWER)	4	3.6.3 RMS limiter	8
2.7 Mains fuse	5	3.6.4 Distortion limiter	8
2.8 Output Power	5	3.6.5 Peak limiter	8
2.9 Connecting to audio-sources	5	3.6.6 Dynamic overcurrent limiter	8
2.10 Output connectors	5	3.6.7 High frequency and DC protection	8
2.11 Expansion module slots	6	3.6.8 Temperature protect	9
2.11.1 Controls and jumpers in the slots	6	4. In case of a problem	9
		5. Technical specification	10

1. Basic Information

The K+H PRO A 2000 is a highest performance class AB high power amplifier. Most sophisticated protection functions and high power reserves make this amplifier the first choice for all applications. Special features are: built in versatile limiter, which can be disabled in part, 3 slots for expansion modules such as controller for switching over to a redundant power amplifier in case of failure (HAVARIE), remote control, remote diagnosis, audio controller, parametric 2-band EQ, add on digital audio input interface and high performance balancing input transformers. 100/70 V output transformers are available as separate units.

Basically the PRO A 2000 is designed for 4 Ohms load impedance under hard conditions too, but dependant on environmental effects and audio material, it can drive loads down to 1.8 Ohms without loss in performance. Safe operation of the amplifier itself and the connected speakers under all conditions and faults is secured by costly protection circuits. Before switching off the amplifier or the speakers, these circuits try to go back to a safe operation condition in reducing the output power by means of the thermal and current limiters. This is very smoothly done and without increasing THD. Not before these steps will not do there will be a switch off. If any high frequency (e. g. feedback to preamplifier) or DC-signals are detected at the power output, the protection circuit switches off both amplifier and speaker outputs immediately.

2. Installation

2.1 It is absolutely essential that you read and observe the Safety Instructions on page 2 before connecting or using this device.

2.2 Operating conditions

The K+H model PRO A 2000 high power amplifier is intended for use over a range of ambient temperatures from +10° C to +40° C (+50° F to +104° F). During transport or storage, temperatures from -25° C to +70° C (-13° F to 158° F) are permissible.

2.3 Rack Installation

When installing the PRO A 2000 to a rack it is recommended to use sidewise bearings. In any case the rear fastening angles have to be fixed to the rack too.

Warning! 

Because of the heavy weight the front panel alone cannot carry the PRO A 2000!

Please take care of sufficient ventilation at both sides of the amplifier see figure 3:

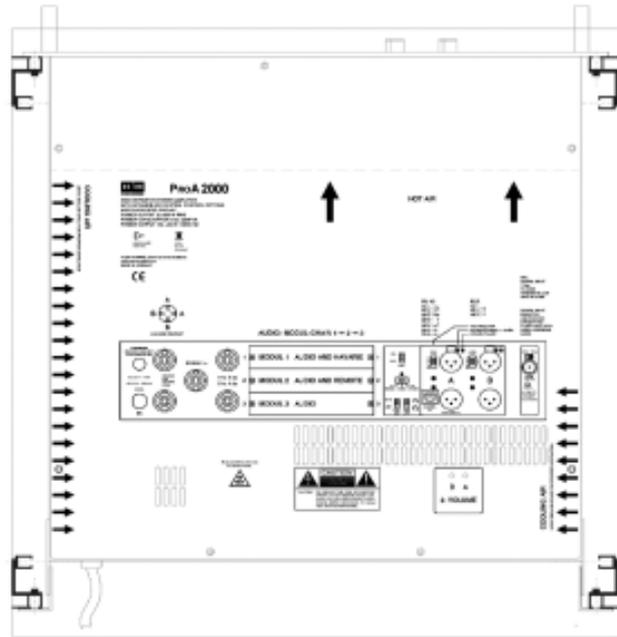


Fig. 3 PRO A 2000 airflow

2.4 Cooling

The PRO A 2000 is equipped with a most efficient push-pull cooling system, which allows for sustained continuous operation at a 4 Ohms load. So the PRO A 2000 can be operated under hard conditions without any air conditioning. Of course the ventilation in the rack has to be sufficient.

The cooling air is drawn in at both sides and the cover plates on top and bottom of the cabinet. For even better cooling you can leave one unit above and one under the amplifier blank.

The outlet air is blown out on the front panel.

2.5 MAINS Connection

The amplifier electronics of the standard European model are set up for an AC line voltage of 230 volts, 50 or 60 Hz. Export versions with other voltages are also available. If the power plug of the mains cable should ever need to be replaced, ensure that the connection to the protective earth is maintained.

2.6 MAINS Switch (POWER)

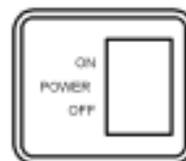


Fig. 4 Mains switch

The mains switch is a 3-position rocker type. Shortly pushing the upper end (ON) will power up the PRO A 2000. After a 5 second on delay it will be ready and the mains LED will light up. Pushing the lower end (OFF) will interrupt mains power. If a remote control module is present and set in function, all amplifiers in a set can be powered on

and off with the mains switch of the first one. To avoid excessive on currents the units are powered on one after the other with a 3 second delay each.

Caution: Do not push the rocket switch for a too long time if there are remote control modules present in the system. Some components inside the amplifier could overheat!

2.7 Mains FUSE

When replacing the fuse, *first disconnect the mains cable* and ensure that the new fuse is of the following type only:

for 230 volts AC **16 A** Slo-Blo (6.3 x 32 mm)

2.8 Output Power

The PRO A 2000 is stable without any restrictions as to thermal and load specifications at a load impedance of **4 Ohms** and at any program material. The power stage is able to generate a temporal limited RMS output power of 650 watts and up to 850 watts peak power. The ambient temperature should not exceed 40° C (104° F).

At a **2.6 Ohms** (= 3 x 8 ohms in parallel) load the PRO A 2000 can provide temporarily 850 watts of sine and 1050 watts of peak power. Stability is warranted in respect to the impedance but not always to the thermal aspects. Do not apply too compressed program material and pay attention to the ambient temperature. At **2 Ohms** load impedance the PRO A 2000 will be capable to deliver 1000 watts of sine power and 1200 watts of peak power. In some cases the protection circuit will reduce output power due to excessive temperature or load current. Do not compress the audio signal and pay more and more attention to the ambient temperature.

Caution: The PRO A 2000 is able to easily destroy speaker systems! For safe operation please be sure to apply only the permissible power to each driver. The limiter inside the amplifier has to be adjusted suitable to speaker power capability or use a special audio controller.

2.9 Connecting to audio-sources

Use only screened professional audio cable to connect the amplifier to your mixer or preamp. The balanced input XLR connectors are wired in the standard manner:

- Pin 1 = GND
- Pin 2 = + (hot)
- Pin 3 = - (cold)

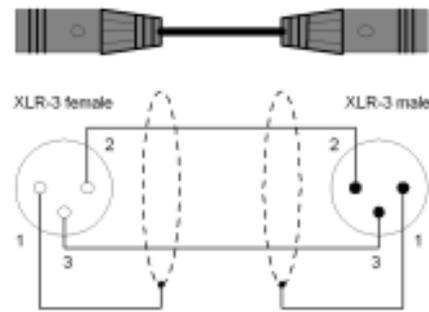


Fig. 5 XLR connector wiring

2.10 Output connectors

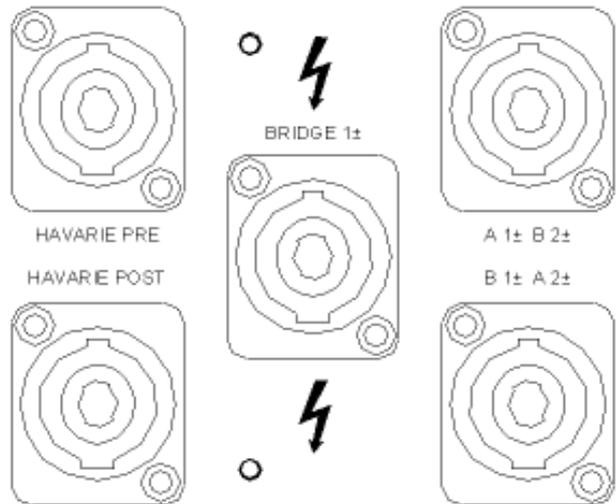


Fig. 6 Speakon outputs

- Havarie Pre** insertion of HAVARIE post signal of the preceding amplifier (if present), 4 wires! (optional)
- Havarie Post** insertion of HAVARIE pre signal of the following amplifier (if present), 4 wires! (optional)
- Bridge 1±** speaker connector for bridge mode
- A 1±, B 2±** speaker A connector for mono or stereo mode, also connector for K+H active top speakers
- B 1±, A 2±** speaker B connector for mono or stereo mode, also connector for non K+H active top

Caution: Avoid shortcuts between ground and the 1+ or 2+ terminals respectively 1+ and 1- as well as 2+ and 2-. It is true, the PRO A 2000 is absolutely shortcut proof, but shorting the outputs will strongly heat up the power stage.

2.11 Expansion module slots

○ Module 1 Audio and HAVARIE ○
○ Module 2 Audio and Remote ○
○ Module 3 Audio ○

Fig. 7 Module slots

- Module 1** slot for the first audio module in a chain of 3, also for the optional HAVARIE card
- Module 2** slot for the second audio module in a chain of 3, also for the optional remote control card
- Module 3** slot for the third audio module in a chain of 3

Caution: Make sure to have the amplifier switched off before installing or removing modules. Only the K+H PRO A 2000 modules may be inserted in the proper slots. If you plug in non K+H products you can destroy both modules and amplifier! In this case product warranty will not be extended!

2.11.1 Controls and jumpers in the slots

On the bottom of the slots you will find trim-pots for adjusting the maximum permissible RMS-power, which the limiter allows for. It can be tuned from 20 watts to maximum. By means of the jumpers two limiter time constants can be selected: a short one for high frequency drivers and a long one for midrange and subwoofers.

Caution: When leaving the factory the amplifier is set to maximum output power and long time constant. Changing these settings makes only sense, if the amplifier is always used together with the same speaker system. Only skilled personnel with professional test equipment can modify these settings. Inexpert altering results in bad performance.

3. Operation

3.1 Front panel

The whole heated air of the power stage is blown out over the front panel. Do not close the front side of the amplifier rack for not to constrain the cooling otherwise maximum power output cannot be guaranteed.

3.2 Indicators and level control

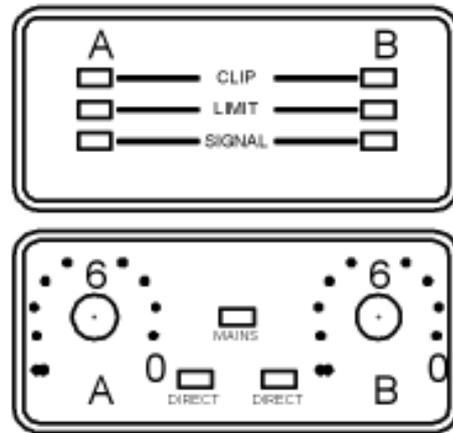
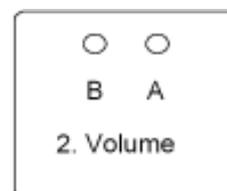


Fig. 8 Indicators and level controls

- Signal A/B** input level is - 20 dBu or more
- Limit A/B** peak-, RMS- or distortion limiter is active
- Clip A/B** input signal level is too high or amplifier in the LIMIT OFF mode is overdriven
- Mains** amplifier is ready
- A/B Direkt** the front level controls are not functional. This can be activated by the HAVARIE module.



The trim-pots 2nd Volume on the top-side can only be set in function by the optional remote control card.

Fig. 9 Trim-pots 2nd Volume

3.3 Diagnosis indicators

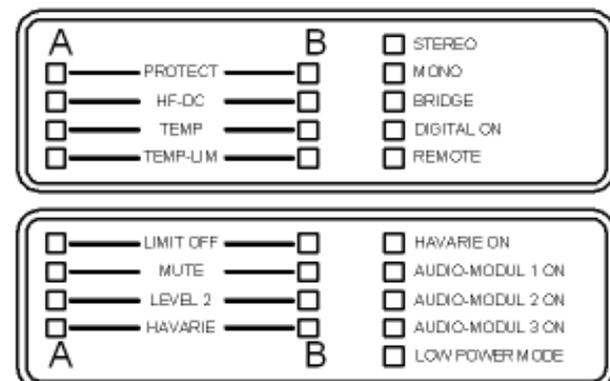


Fig. 10 Diagnosis indicators

Protect A/B a protection function is active, A/B-speaker outputs are switched off, the input of the power-stage is muted (Mute)

HF-DC A/B At the amplifiers output a non audible signal such as HF or DC is present, speaker outputs are switched off and the power stage is muted (Protect and Mute)

Temp A/B the power stage A/B is overheated (>90°C [>194°F])

Temp-Limit A/B the temperature in the power electronics has come up to 85°C (185°F), the limiter reduces the output level by 10 dB

Limit off A/B the internal distortion-, RMS- and peak-limiters are disabled when using an audio-controller, the thermal limiter is always active

Mute A/B channel A/B is muted

Level 2 A/B the intern 2nd volume trim-pots on top are enabled, the front side volume controls are out of order

Havarie A/B one or both channels are defective, inputs and outputs are switched over to a redundant amplifier. This function is only available with the optional HAVARIE-unit.

Stereo normal stereo operation

Mono mono operation, both channels are fed by the A-input signal

Bridge the two channels are working in bridge mode and are fed via the A-input connector. Please use only the bridge marked speakon output connector - see figure 5.

Digital on the optional analog to digital converter is in operation. Only the digital inputs (AES/EBU and SPDIF) are active.

Remote an optional remote control card has been plugged in and is active

Havarie on an optional HAVARIE-card has been plugged in and switched on

Audio-Modul 1 on an optional audio-module has been activated in slot 1

Audio-Modul 2 on an optional audio-module has been activated in slot 2

Audio-Modul 3 on an optional audio-module has been activated in slot 3

Low Power Mode the power stage is in standby mode, because there is no input signal present. In the automatic standby-mode the power stages idle current is put to zero to reduce energy consumption and not to heat up the rack needlessly.

3.4 Determining modes and signal inputs

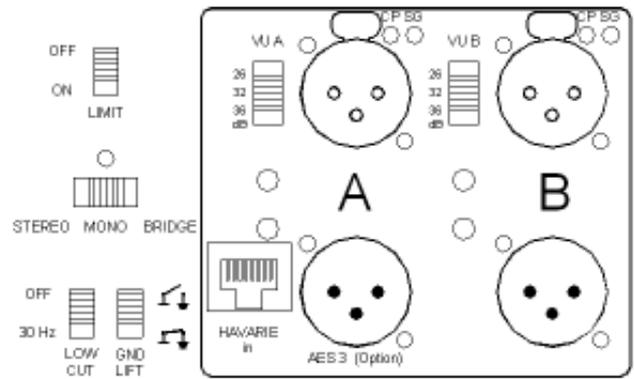


Fig. 11 Inputs and mode switches

Limit on/off deactivates all limiters except for the thermal limiter, which is always in function. Plugged in modules can possibly disable this setting.

Stereo/Mono/Bridge

slide switch to control the operating mode:

stereo via the A and B-inputs, mono and bridge mode via the A-channel input connector only. Upside the switch you will find a LED, which indicates the switch is operating. Possibly inserted modules can disable this switch too. If so the LED will extinguish.

Low cut in the 30Hz position the switch activates a subsonic filter with a cut-off frequency of 30 Hz and a 12 dB/octave slope.

Ground lift slide switch for separating signal ground from chassis ground. In any case the chassis ground remains connected to the protective earth (PE) connector of the power cord.

Warning!

The protective earth conductor must never be interrupted even for test purposes! This may be dangerous to life!

Havarie in

When using the amplifier as a redundant unit to replace a defective amplifier in a HAVARIE system, the input signal coming from the HAVARIE cards of the faulty amplifier(s) will be send to this western connector. You can use the western input instead of the XLR-inputs too.

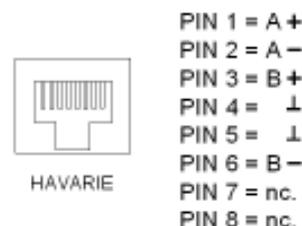


Fig. 12 Havarie in connector

- VU A, VU B** select total gain:
26, 32 or 36 dB.
- A (AES3)** input channel A when in stereo mode or input when in mono and bridge mode or input for AES/EBU digital audio when using the optional digital to analog converter module
- B** input channel B when in stereo mode. In mono or bridge mode the B-inputs are not functional.
- CP** clip-LED indicates input A/B overload
- SG** signal-LED will light as the input signal exceeds - 20 dBu

3.5 Digital Audio Input (optional)



When present the digital audio interface is located at the utmost right side on the back of your PRO A 2000 amplifier.

S/PDIF

BNC-connector 75 Ohms to feed the digital interface. Via the XLR channel A input a AES/EBU digital audio source can be connected too.

A/R/L/S

rotary switch for selecting analog or digital operation and for establishing how the amplifiers inputs are assigned to the left and right channels within a digital stereo signal:

Fig. 13
Digital interface

- A** Analog
the digital interface is switched off. The PRO A 2000 behaves as if the interface would not exist.
- R** Digital right
the interfaces right output is sent to the amplifiers A-channel (mono and bridge mode). That is why the B-channel is not connected.
- L** Digital left
the interfaces left output is sent to the amplifiers A-channel (mono and bridge mode). That is why the B-channel is not connected too.
- S** Digital stereo
the interfaces stereo output is sent to the amplifiers A- and B-channels for normal stereo operation.

Open/Term(inated)

- switch** for internal terminating resistor
- Term** input is terminated. The input has to be terminated when the interface is the only one connected to a digital source or if it is the very last one in a chain of several amplifiers.

Open input is not terminated. The input may not be terminated, if several amplifiers are connected in a chain to one digital audio source by means of BNC T-connectors. However the coaxial cable has to be terminated at both the very ends, so the last amplifier in such a chain has to terminate it.

3.6 Protection circuit and limiter functions

3.6.1 Overcurrent limiter

This limiter takes effect as the total speaker impedance is lower than 1.8 Ohms. If the current rises up too high, the audio level is reduced in such a way, that no overcurrent can occur. At the limit off position of the limiter switch (see figure 11) this function is disabled.

3.6.2 Temperature rise limiter

If the heat sinks temperature inside the PRO A 2000 rises up to 85°C (185°F) and more this thermal limiter reduces the audio level very smoothly by 10 dB to counteract an excessive rise in temperature. The temperature rise protection circuit is always in function.

3.6.3 RMS limiter

Designates the maximum RMS - power as adjusted with the trim-pots in the expansion module slots - see chapter 2.11.1. When setting the LIMIT-switch (figure 11) to the OFF position, the RMS limiting function is disabled.

3.6.4 Distortion limiter

This limiter function counteracts every kind of distortion by reducing smoothly the operating level. When setting the LIMIT-switch (figure 11) to the OFF position, the distortion limiting function is disabled too.

3.6.5 Peak limiter

In contrast to the distortion limiter the peak limiter prevents from temporary clipping in reducing peaks very rapidly. When setting the LIMIT-switch (figure 11) to the OFF position, the peak limiting function is disabled.

3.6.6 Dynamic overcurrent limiter

In addition to the overcurrent limiter this function admits peak currents for transients.

3.6.7 High frequency and DC protection

The HF- and DC- protection functions keep away dangerous signals for speakers such as excessive non audible high frequencies and DC voltages. In

case of trouble the amplifiers power stages are muted and the speaker outputs are switched off by relay contacts.

3.6.8 Temperature protect

If the power electronics heat up in spite of the active temperature rise limiter, power stages are muted and the speaker outputs switched off by relay contacts too.

4. In case of a problem

Problem:	Possible cause:
No sound	Input or output cables defective or not plugged
	Volume controls turned fully counter-clockwise
	2nd Volume is active, trim-pots turned fully counter-clockwise
	Mains power switched off
	Amplifier is muted by the remote control unit
	HAVARIE controller detects a fault, but no redundant amplifier is present
	Power transformer overheated
	Fuse blown out
	HF or DC detected at the output
	Temperature protect function is active
	Digital audio interface set up wrong
	Digital audio cable too long
Sound is not clear and distorted	Limiter switched off, see figure 11
	Input is overloaded and so the CP- (= clip) LED is lighting
	Wrong expansion module plugged in or not activated
Sound is too low	Limiter setting not correct
	Gain low
	Wrong expansion module plugged in
	Volume control turned low
HF/DC protect is in action	Strong non audible signals at the input
	Distorted input signal
	Excessive overload in the LIMIT OFF mode, CP-LED is lighting
	PRO A 2000 is defective
Temperature rise limiter is in action in spite of low load	Bad ventilation in the rack
	Cooler defective
	PRO A 2000 is very dirty inside
	Very high ambient temperature
	Shortcut in speaker or in speaker cable
	PRO A 2000 is defective
Temperature protect function is in action	PRO A 2000 is overloaded by compressed audio material at high load
	Bad ventilation in the rack
	Cooler defective
	PRO A 2000 is very dirty inside
	Very high ambient temperature
	PRO A 2000 is defective
PRO A 2000 cannot be switched on	Mains fuse blown out
	Power transformer overheated
	PRO A 2000 is defective
Clip (CP) LED is lighting in spite of switched on Limiter	Input level too high

5. Technical specifications **PRO A 2000**

Power output 20 Hz...20 kHz, 0.1 % THD+N

Operation	RMS	Peak
8 Ohms mono or stereo	2 x 395 watts	2x 420 watts
4 Ohms mono or stereo	2 x 650 watts	2 x 850 watts
2 Ohms mono or stereo	2 x 1,000 watts	2 x 1,200 watts
8 Ohms bridge	1 x 1,300 watts	1 x 1,650 watts
4 Ohms bridge	1 x 2,100 watts	1 x 2,500 watts

The RMS power output is time-limited by protection circuits in both the power transformer and the amplifiers electronics

Audio data

Frequency response	< 20 Hz...> 20 kHz \pm 0.5 dB at rated output power
THD+N	< -95 dB / 0.002 % at 1 kHz and rated output power into 4 Ohms < -85 dB / 0.006 % at 20 Hz...20 kHz and rated output power into 4 Ohms
DIM 100	< -85 dB / 0.006 % at rated output power into 4 Ohms
Noise	< -120 dB unweighted at 26 dB gain and rated output power
Damping	> 400:1 at 1 kHz and 4 Ohms
Crosstalk	< -60 dB at rated output power into 4 Ohms, 20 Hz...20 kHz
CMRR	> 70 dB at 20 Hz...20 kHz

Features

Gain	26 / 32 / 36 db switchable per channel
Low-cut	30 Hz / 12 dB per octave slope
Limiters	peak, RMS, overcurrent and temperature all switchable except for the temperature limiter
Ground lift	
Low power mode	active as no input signal is present, level and time controlled

Power supply

Mains voltage	180...250 V AC, 50...60 Hz
Power consumption	idle 50 VA in energy saving mode about 2,500 VA RMS power
Mains fuse	16 A slow blow, 6.3 x 32 mm

Dimensions, weight, design

Dimensions (H x W x D)	88 mm (2 units) x 483 mm (19") x 470 mm over all
Weight	21 kg without options, packed up
Design	2 mm steel frame with an aluminium front panel and screwed on 19-inch fastening angles