

PA-LV124/148

Trendsetting Power Amplifier System

L124 + LV148 + associated standards

for advanced test procedures

Linear Power Amplifiers

as a modular **Master-Slave-System**

- **DC – 400 kHz @ rated load**

up to 200 kHz –0,1db on your DUT

using **HFL (High Frequency Linear) in V-Mode**

Designs: Symmetrical / asymmetrical / unipolar

Power [kW]: 2 / 4 / 6 up to **12 kW each rack**

Expandable by paralleling eg. 2 systems

- **Integrated PC (Windows 10)**

- **7" Touchdisplay (front side)**

for control, monitoring, V-/C-limiting and generator surface

- rear side: **HDMI interface** for an external monitor

- **Integrated computing board** for

Voltage, Current, Temperature, Power dissipation

- **2 x USB Interfaces** (1x front-, 1x rearside)

for e.g. Mouse, Keyboard, USB-Memory,

- **LAN-Interface**

for network connection or a function generator

(using crossover-adapter),

- **WLAN-functionality** - **Interlock interface**

2 - 24 kVA



Example: Power ratings of a symmetrical unit (master and each slave)

Range	V _{OUT} – Operation	C _{OUT} – Operation
1	±70V / ±30A (42Arms) / ±60A inrush	±30 A (42Arms) / ±70V
2	±35V / ±40A (56Arms) / ±120A inrush	±40 A (56Arms) / ±35V
Scaling:	V-Mode	C-Mode
Input–Output:	1V _{IN} = 10V _{OUT}	1V _{IN} = 10A _{OUT}
Output–Monitors	10V _{OUT} = 1V _{MON}	10A _{OUT} = 1V _{MON}
Dynamic:	V-Mode	C-Mode
	AC–200kHz –0.1dB @ rated load and 40% modulation DC–400kHz –6dB @ rated load	DC–200kHz –6dB @ rated load

PA-LV124/148 Trendsetting Power Amplifier System

NEW!! linear regulated HERO®Power Amplifier System

The latest Exclusive Modular System for automotive tests according **LV124/148** and associated standards defines **new benchmarks** and **vital advantages**.

Examples:

PA-LV124/148– 12 kVA

Constructed as a linear regulated 4-Quadrant amplifier for Source / Sink operation. Selectable versions are:

symmetrical (same **swing** for positiv and negative **drive**)

asymmetrical (negative swing may be required just for polarity testing) or

unipolar for battery simulation or testing

(for just replacing the battery or charging / discharging the battery)

multiple power ranges: e.g. 2 power ranges are standard, which you may switch local or remote from LV124 to LV148

Control quantity may also be switched, local or remote, from V-regulation to C-regulation within msec by digital command.

For instance:

Powerrating range: LV124-AS (asymmetrical)

Continuous: 300 A; Inrush Current 500 A

Dynamic: AC...>200 kHz –0.1 dB sin @ rated load,

DC...>100 kHz –6 dB arb @ rated load

Powerrating range: LV148-AS (asymmetrical)

Continuous: 150 A; Inrush Current 300 A

Dynamic: AC...>200 kHz –0.1 dB sin @ rated load,

DC...>100 kHz –6 dB arb @ rated load.

PA-LV124/148

Trendsetting Power Amplifier System

Advantages:

7" Touchdisplay—Integrated computer: Windows 10

Frontside: Controls, Analog Panels for voltage and current-control as well as V and C Limit adjustments, bargraphs for temperature and power dissipation.

Rearside: HDMI Interface to connect an external Monitor

Integrated Measuring Card: for voltage, current, temperature, power dissipation

USB Interfaces: 1 at front, 1 at rearside to connect e.g. mouse, keyboard, USB memory

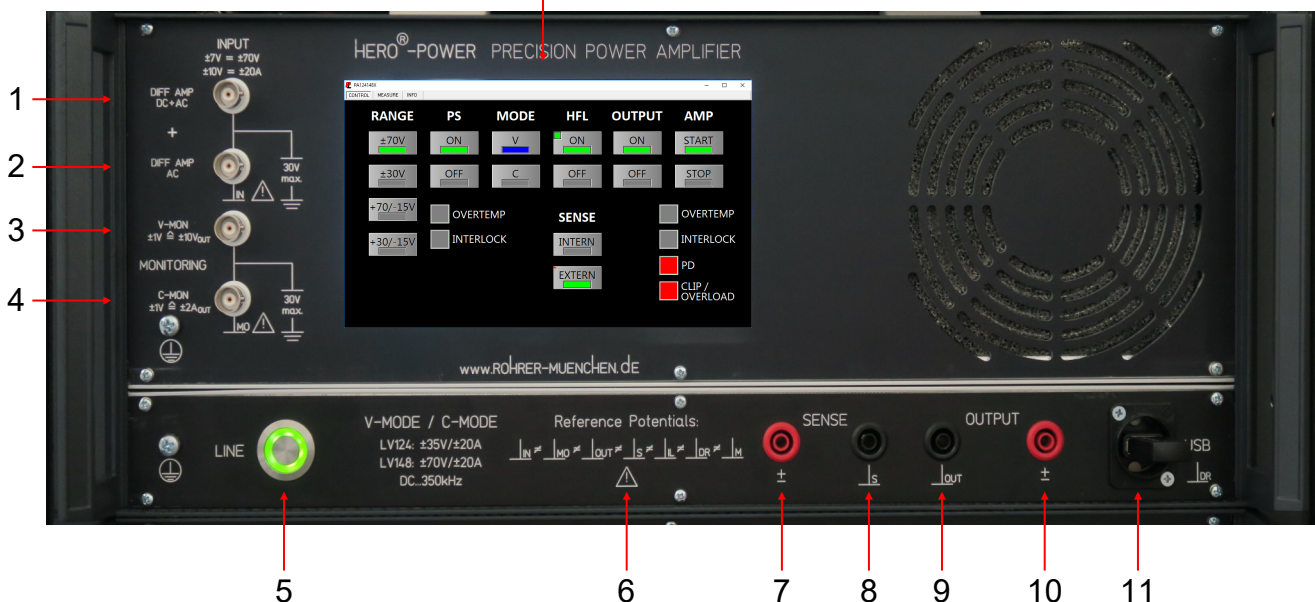
LAN-Interface: to a network, function generator via a crossover-adapter, WLAN

2 Interlock Interface

Master - Frontpanel

12

Control View



Legend

1 + 2: Two adding differential analog inputs; No 1 is DC coupled for DC+AC signals; No. 2 is AC-coupled for AC signals—other configurations are possible

Remark A: Input 2 is mainly for magnetic application in voltage mode to avoid any DC voltage which could cause undesired pre-magnetisation. Mostly the function generators are responsible for this. Almost all of them have a DC offset.

Remark B: You may drive both of them simultaneously to create very easily arbitrary function without time-consuming programming.

3 + 4: Analog monitoring for V_{OUT} and C_{OUT} . Scaling from the inputs and monitors are corresponding, so it is easy to compare the values.

5: Line: When shining, the amplifier is ready to operate

6: Reference Potentials: Each stage has its own reference potential which is different to the others. They are isolated with 30V each. That means you have a maximum on flexibility to set up your assembly.

7 / 8: SENSE for controlling the voltage at your DUT, or just for measurements.

9 / 10: Output high and low

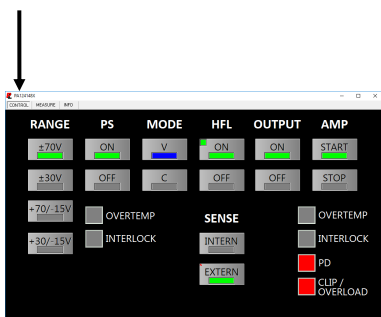
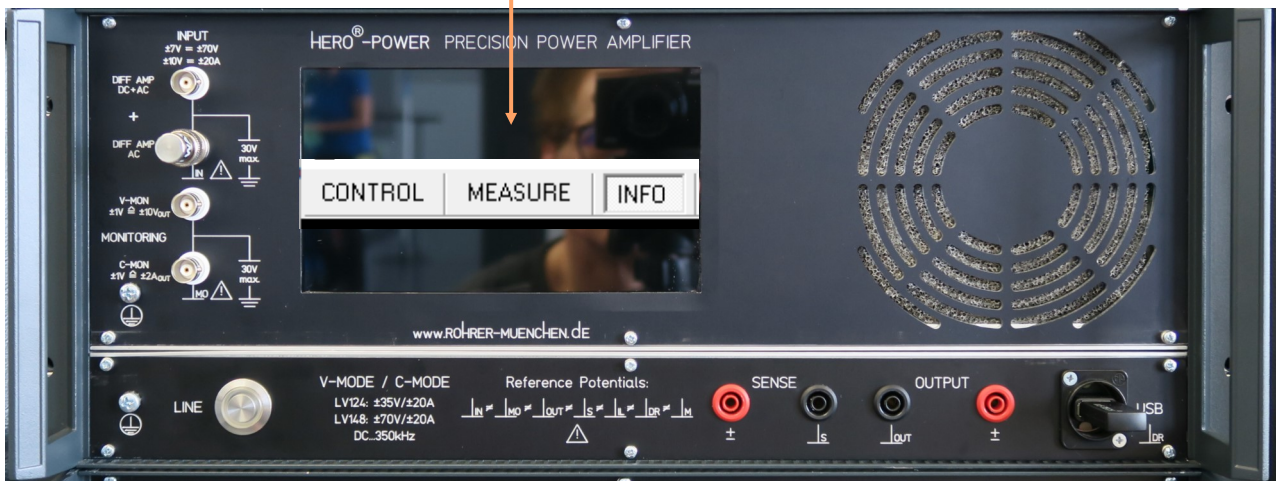
11: USB stick

12: Information Center switchable to: CONTROL — MEASURE — INFO

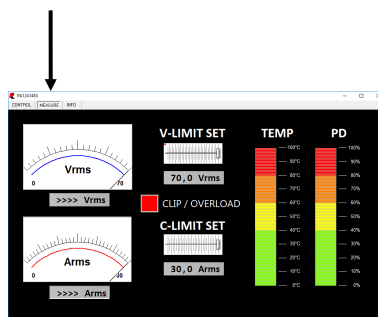
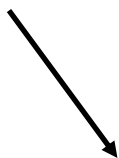
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Master — Frontpanel

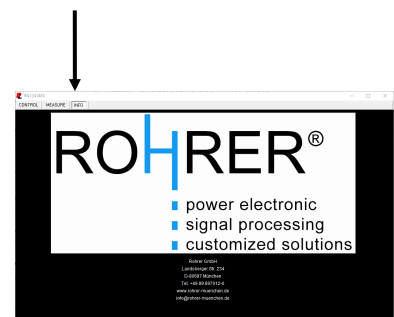
Information Center



Click here



Click here



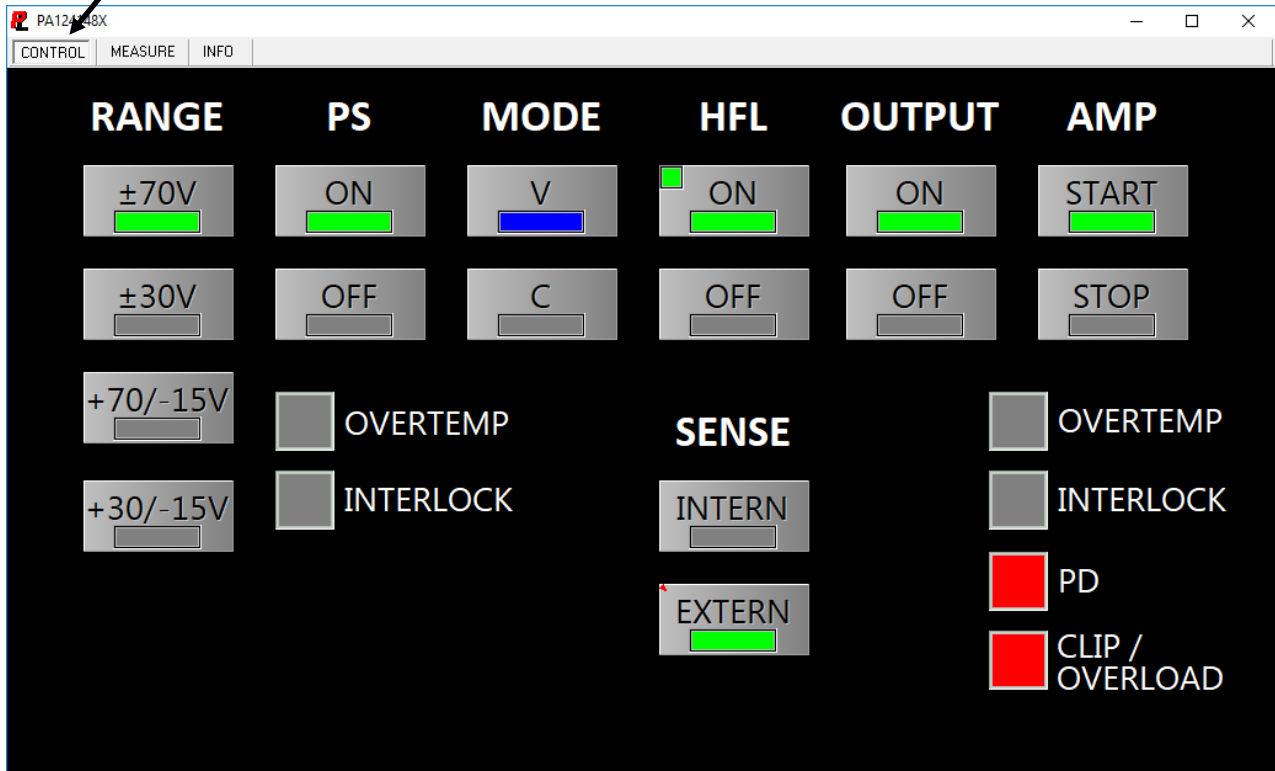
Click here



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 Trendsetting Power Amplifier System

MASTER: Control – Operation State

Click here



Explanation for the above settings:

RANGE ±70V: Symmetrical output range from ±0 to ±70V for rated current and the whole frequency range.

RANGE ±35V is also symmetrical

RANGE +70/-15V and **+35/-15V** are asymmetrical ones

Option: unipolar ranges (according to your requirements)

PS ON: PS is the power supply for the amplifier. Pushing ON puts the power contactors to the line; with OFF you disconnect them from the power line. These contactors are isolating the power input from the line supply.

MODE V: V is the voltage mode. The output voltage results from the drive and is independent from the load, as long as the amplifier operates within its specification. The output current depends on the load.

MODE C: C is the current mode. The output current results from the drive and is independent from the load, as long as the amplifier operates within its specification. The output voltage depends on the load.

PA-LV124/148 Trendsetting Power Amplifier System

MASTER: Control – Operating State

Explanation

SENSE (INT / EXT): <INTERN> means that they are connected inside the amplifier to the load cable. <EXTERN> means you may use them for your DUT. You need only one pair of sense lines to the DUT to select or switch over from measuring to arbitrary sense or HFL (only V-mode).

HFL: High Frequency Linear (ON / OFF):

This feature is reserved **only for V-mode** operation. When using the sense line in HFL-mode (time constant appr. 10msec), then you avoid any oscillation which might occur in arbitrary operation. To control the voltage at your DUT you just use the external sense lines in <HFL ON> state.

When you select HFL, it just prepares the automatically connections when pushing <**AMP START**>. This state will be indicated by a green square in the upper left corner of the button. The green strip shines when HFL is active (green strip on both <AMP > and <OUTPUT>).

OUTPUT (ON / OFF): With this function you may disconnect or connect the output galvanically from or to the amplifier, but the **AMP is still on <STOP>**.

AMP (START / STOP): To stop the amplifier means, that the output is regulated wether to 0 Volt or to 0 Amps depending on drive mode, respectively to the predefined controlled variable for this situation. **The output is blocked but not disconnected.** The advantage of this <**START**> <**STOP**> is that you **may control an automated process within msec.**

Malfunctions are shown by red lighting of the assigned pad.

INTERLOCK: Control and safety installation

There are two circuits,

- one for the Power Supply, to switch it <ON> and <OFF> to connect or separat it galvanically from line.
- another one to start and **stop** the Amplifier — **it will be not disconnected** .

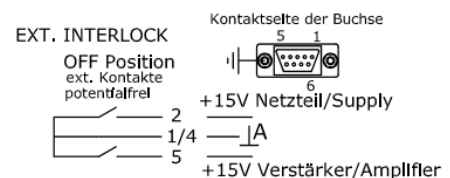
OVERTEMPERATURE for both PS or AMP:

Amplifier will be on <STOP> and Power Supply will be <OFF>.

EXTERNAL INTERLOCK: Power Supply Interlock and Amplifier Interlock may also be controlled externally.

PS INTERLOCK: Amplifier will be set on <STOP> and Power Supply will be set on <OFF>

AMP INTERLOCK: Amplifier will be on <STOP>.



PA-LV124/148
Trendsetting Power Amplifier System

MASTER: Control – Operating State

Explanation

PD: If the allowed power dissipation is exceeded, there are the following possibilities depending on your order request:

1. Power Supply will shut down
2. Outputpower will be reduced

CLIP / OVERLOAD: Depending on your order request:

1. Amplification will be reduced to avoid overshooting.
2. The overshooting part will be cut.

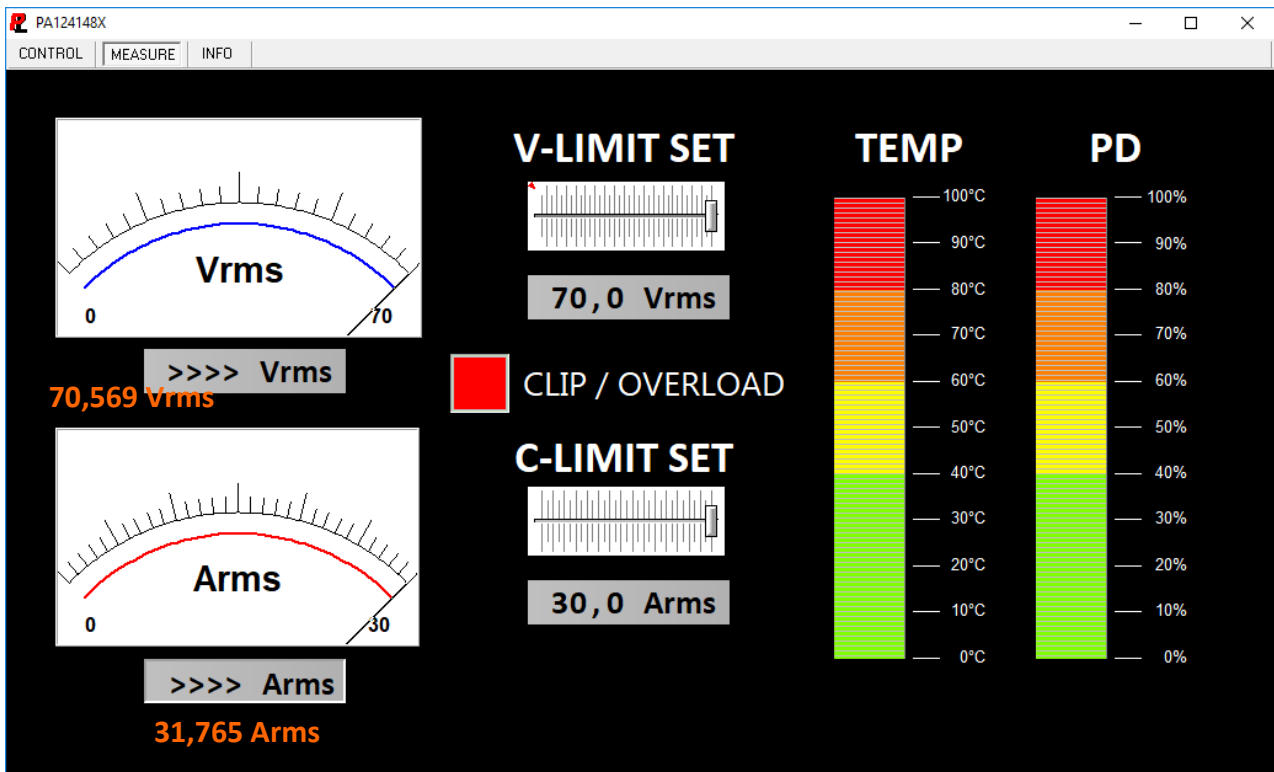
Restart:

If the amplifier shuts down in spite of a failure, you have to repair the failure, or in spite of OVERTEMP you may restart as soon as it has cooled down.

PA-LV124/148
 Trendsetting Power Amplifier System

MASTER – Measure

- Needle indicator for quick capture of state even from larger distance.
- Digital meter for precise value.



V-LIMIT SET / C-LIMIT SET: Setting via touch screen or remote

TEMP: Analog visual indicator

PD: Power-dissipation — analog visual indicator

CLIP / OVERLOAD: Visual indicator : red = active—clip or overload takes place
 green: normal operation

PA-LV124/148

Trendsetting Power Amplifier System

LOAD CONNECTION at REAR SIDE

MAIN OUTPUT



TEST SUPPLY: Amplifier Output for testing your DUT or other application

SENSE: To control the output voltage in Vmode either arbitrary or HFL:

- You may shorten the sense lines direct at the output with a bracket 19mm width and 4mm contacts or
- connect them anywhere else, e.g. on your DUT

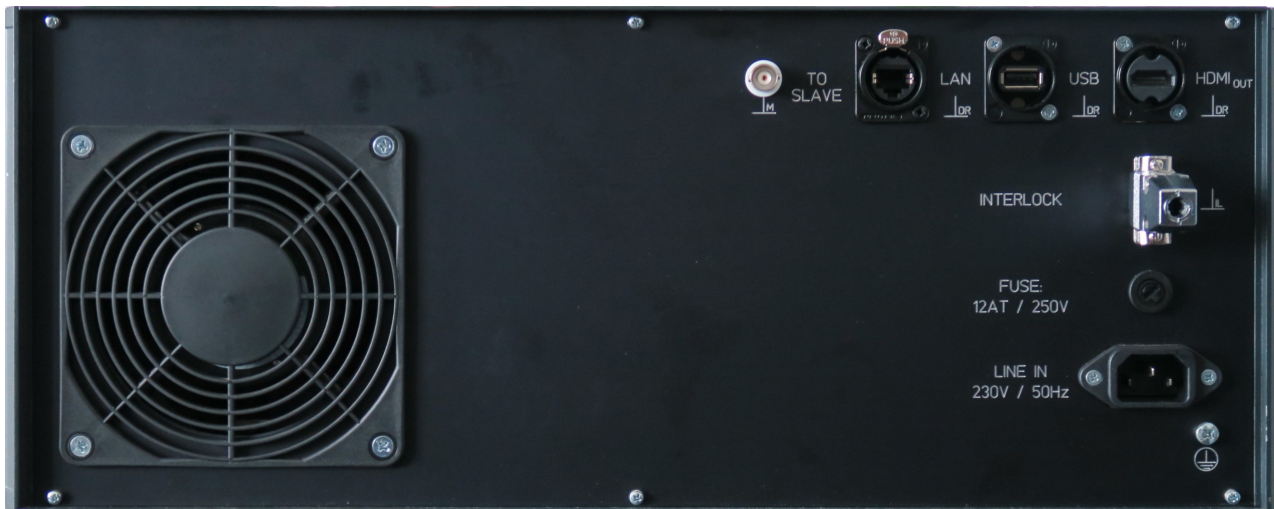
LINE CONNECTION at REAR SIDE for larger systems e.g. 6 / 12 kVA



PA-LV124/148

Trendsetting Power Amplifier System

INTERFACES at REAR SIDE



HDMI Interface

You may connect an external monitor.

2 USB Interfaces (one frontside, one rear side)

To connect e.g. mouse, keys, USB-Memory.

LAN-Interface

To connect to a network **or** directly to a function generator (using a Crossover-Adaption) -WLAN-



INTERLOCK Interface

For start / stop function of the amplifier and <ON> <OFF> for the power supply

LINE IN / FUSE

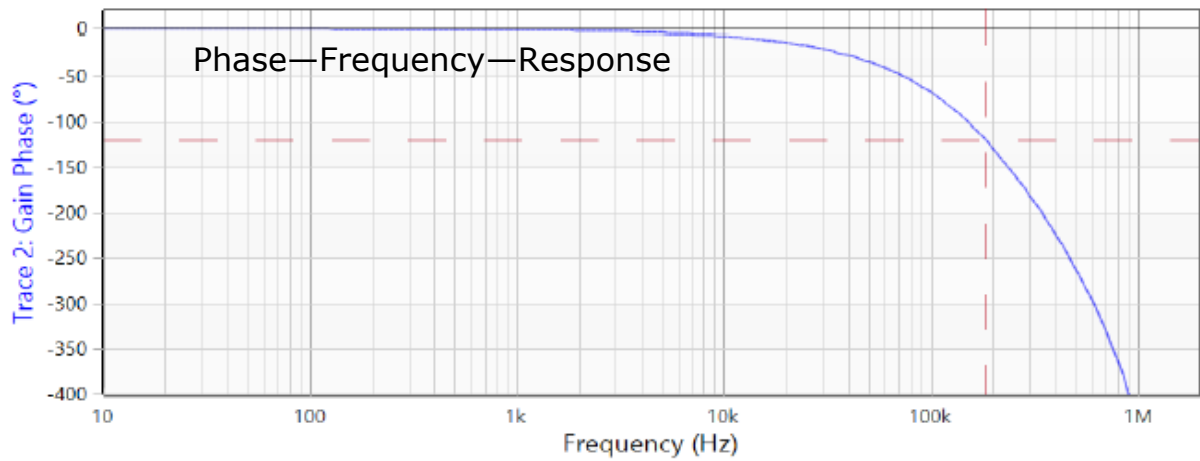
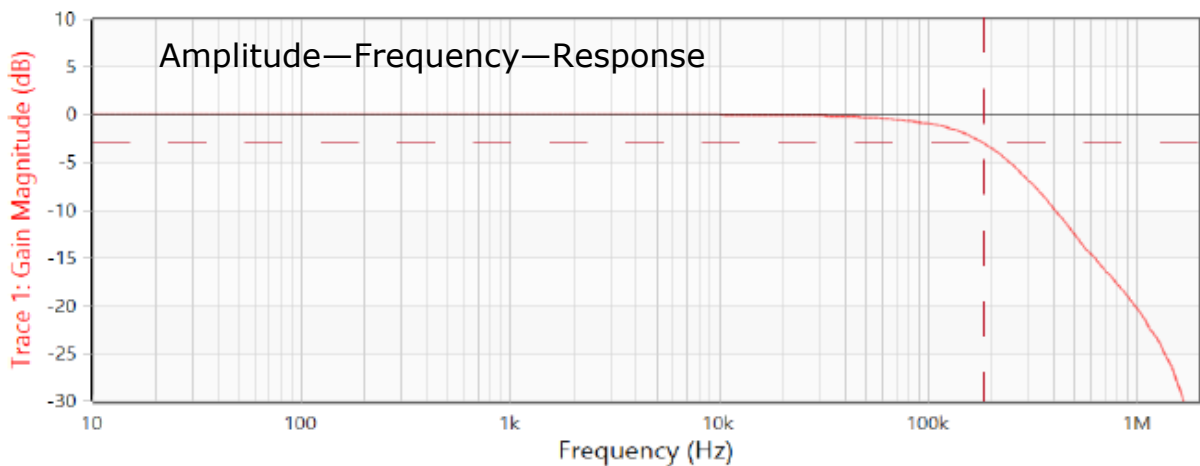
Supply according to your line.

PA-LV124/148
Trendsetting Power Amplifier System

PA124-148A: C-mode; Load app. 5 Ohms; range: 70V-4App; without HFL

Frequency—Characteristic

Measurement: Transmission / Reflection



	Cursor 1	Cursor 2	delta C2-C1
Frequency	186,229 kHz	450,001 kHz	67,008 kHz
Trace 1	-3 dB	-11,152 dB	
Trace 2	-121,277 °	-241,937 °	

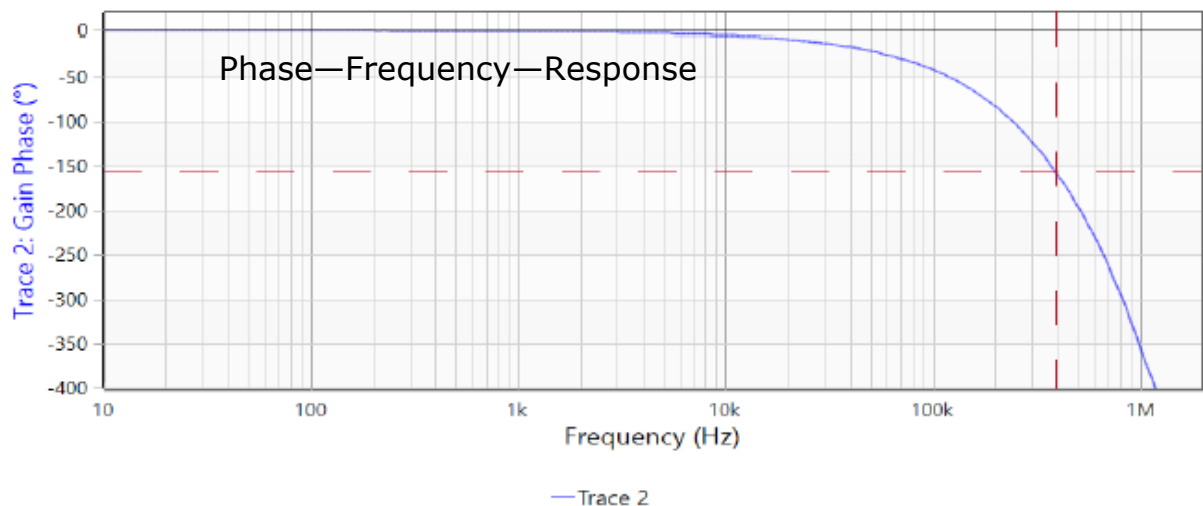
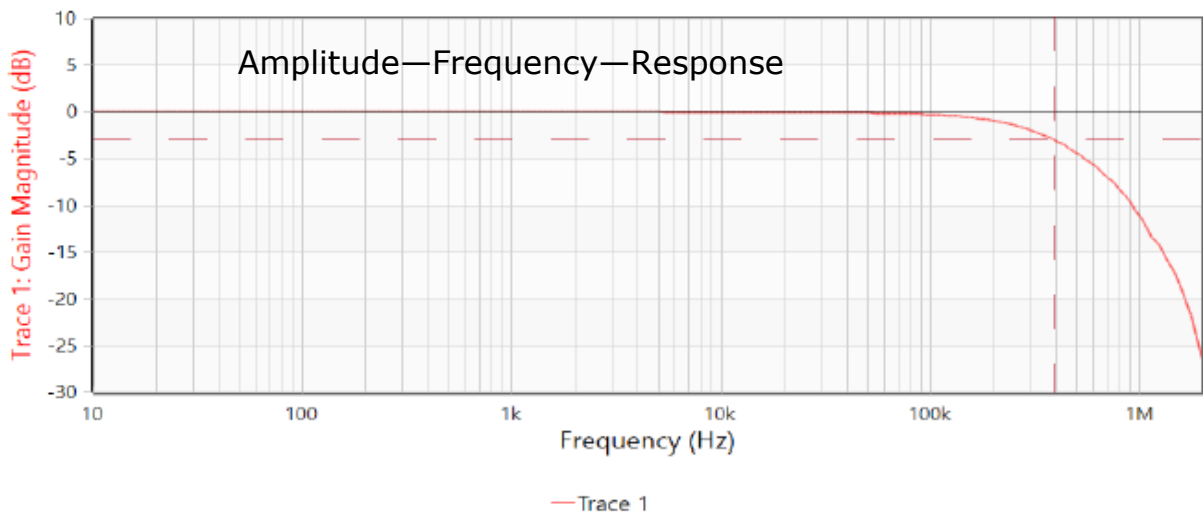
PA-LV124/148

Trendsetting Power Amplifier System

PA124-148A: V-mode; Load app. 5 Ohms; range: 70V-20Vpp; without HFL
Output — relais excluded

Frequency—Characteristic

Measurement: Transmission / Reflection



	Cursor 1	Cursor 2	delta C2-C1
Frequency	393,941 kHz	450,001 kHz	58,347 kHz
Trace 1	-3 dB	-3,701 dB	
Trace 2	-157,101 °	-177,119 °	

HFL

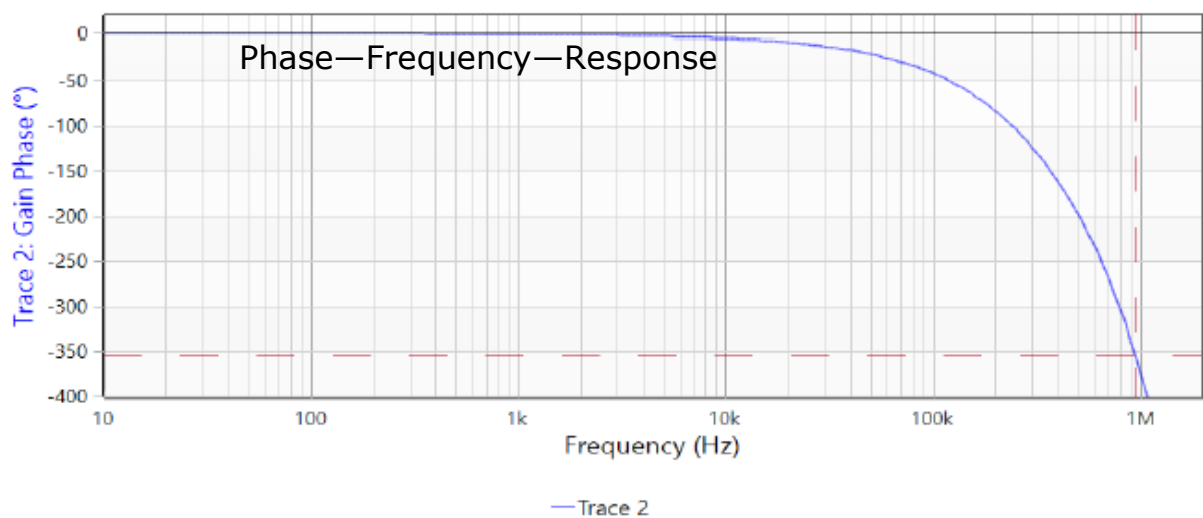
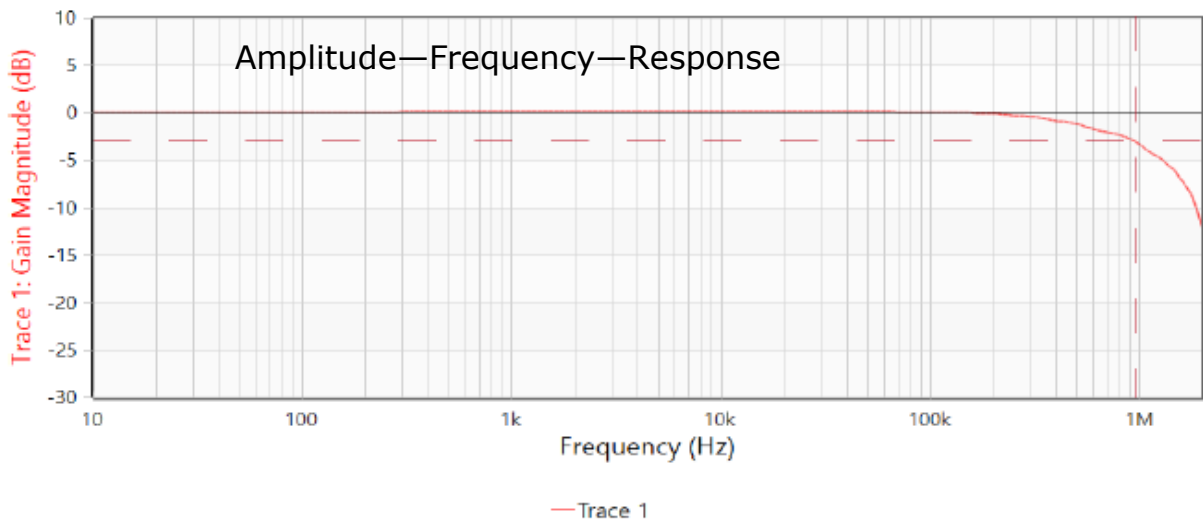
PA-LV124/148

Trendsetting Power Amplifier System

PA124-148A: V-mode; Load app. 5 Ohms; range: 70V-20Vpp; **with HFL**
Output — relais excluded

Frequency—Characteristic

Measurement: Transmission / Reflection



	Cursor 1	Cursor 2	delta C2-C1
Frequency	953,603 kHz	450,001 kHz	58,347 kHz
Trace 1	-3 dB	-1,002 dB	
Trace 2	-354,723 °	-178,814 °	HFL

PA-LV124/148

Trendsetting Power Amplifier System

Applications**HERO[®] Precision Power Amplifiers**

are true linear voltage and current regulated, bipolar Power Supplies from DC to MHz. A wide range of high sophisticated models are designed to cover extreme requirements.

Such as: (see image catalogue for Power Amplifiers—36 pages)

- Rotor craft: development of piezoelectric actuators for trailing edge flap control of full scale rotor blades
- Large magnets like quadrupols for accelerators
- simulation of batteries in automotive and avionic power systems
- Load simulation for batteries as well as for generators
- Simulation of subsystems in automotive and avionic power systems
- Simulation of interrupts and discontinuance in automotive, avionic and public-lines power systems
- Excitation of piezoelectric actuators for rotor blades and airframes
- Calibration of current transformers, voltage transformers and power meters for power transformers up to MVA
- Test of magnetic materials for switching applications
- Test of capacitors
- Research on fuel cells
- X- / Y-deflection for precise coating and plating
- Testing of solar cell arrays for space application
- Powering of electro-chemical reactions
- Research on piezoelectric motors and motion
- Test of power line filters
- Polymer research
- ... and many more

Their main features are:

- Linear regulated without switching devices to avoid ripple and noise
- Up to over 90 dB signal to noise ratio, including line frequency
- True 4-quadrant \pm voltage and \pm current regulated as source and sink
- Precise and smooth operation at zero and transition through zero, without any switching
- Direct linear regulated output voltages up to ± 1000 V
- Direct linear regulated output current up to over ± 400 A
- Direct linear regulated output power up to over 40 kW per channel
- Frequency ranges from DC to 2 MHz
- Rise time less than 1 μ s (0.4 μ s) for ± 40 V / ± 60 A
- Rise time 1000 V / μ s for 100 Vrms / 0.5 A
- True arbitrary regulation
- Transient recovery to 0.3 μ s max
- Temperature stability to 5 ppm (0.0005% / °C)
- Protection against overtemperature, short circuit, reverse current
- Local and/or remote control