



# LPA400 Series.

## Laboratory Power amplifiers

### USER GUIDE



# LPA400 series

High frequency, high voltage, dc accurate, power amplifier for laboratory and industrial applications.

## Description

LPA400 is a high frequency amplifier with up to  $\pm 400\text{V}$  peak voltage output capability from dc to greater than 100 kHz. At lower output levels, the gain extends beyond 1MHz. It uses an integrated power driver with regulated high voltage supplies to give dc accuracy and excellent high frequency performance, with high reliability.

The gain is switch selectable as x50, x200, or x500 and uses 0.1% low temperature coefficient resistors for accuracy and thermal stability.

LPA400 is unconditionally stable driving resistive, capacitive (**See note**) or inductive loads and can deliver up to 100mA rms continuously into any load. An indicator on the front panel indicates that the output is on and there is a switch to reset the protection circuitry in the event that it has been triggered by excessive output current.

As well as ac and ac+dc coupling there is a special coupling mode, ac+(dc), where the dc component is not eliminated entirely but is reduced by a factor of about 10. This is particularly useful for testing wound components with a controlled dc bias current where the dc resistance of the component is considerably lower than the ac resistance. The high frequency bandwidth can also be reduced with a low pass filter.

The LPA400 is housed in a robust steel cabinet and includes a current overload reset switch.



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## Warranty

This product is guaranteed to be free from defects in materials and workmanship for a period of 36 months from the date of purchase.

In the unlikely event of any problem within this guarantee period, first contact Newton's4th Ltd. or your local representative, to give a description of the problem. If the problem cannot be resolved directly then you will be given an RMA number and asked to return the unit. The unit will be repaired or replaced at the sole discretion of Newton's4th Ltd.

This guarantee is limited to the cost of the LPA400 itself and does not extend to any consequential damage or losses whatsoever including, but not limited to, any loss of earnings arising from a failure of the product.

In the event of any problem with the equipment outside of the guarantee period, Newton's4th Ltd. offers a full repair service – contact your local representative.

The LPA400 does not require any calibration.

## Declaration of Conformity

We, Newton's4th Ltd, declare that the product LPA400, conforms to the requirements of Council Directives:

89/336/EEC relating to electromagnetic compatibility:

EN 55022 Class A

73/23/EEC relating to safety of laboratory equipment:

EN 61010-1

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Eur Ing Allan Winsor BSc CEng MIEE

(Director of Newton's4th Ltd)

## IMPORTANT SAFETY INSTRUCTIONS

**This product can generate lethal voltages. Observe all safety instructions.**

This equipment is designed to comply with BSEN 61010-1 (Safety requirements for electrical equipment for measurement, control, and laboratory use) – observe the following precautions:

- Ensure that the supply voltage agrees with the rating of the instrument printed on the back panel *before* connecting the mains cord to the supply.
- This appliance *must* be earthed. Ensure that the instrument is powered from a properly grounded supply outlet.
- Use only safety connection leads approved to BSEN 61010-1.
- The input and output connectors, and the internal circuitry are isolated from earth - do not exceed  $\pm 40V$  peak common mode.
- Keep all the ventilation holes on the underneath, rear, top, and sides free from obstruction.
- Do not operate or store under conditions where condensation may occur or where conducting debris may enter the case.
- There are no user serviceable parts inside the amplifier – *do not attempt to open the case*, refer service to the manufacturer or his appointed agent. Potentially lethal voltages are present inside the instrument even when no input signal is present.
- In the event of a failure of the mains fuse, disconnect the mains cord and replace the fuse with the same type and rating, as shown on the rear of the amplifier.
- Switch off the amplifier and ensure that the output current has fallen to zero before disconnecting an inductive load from the output.

**Note: Newtons4th Ltd. shall not be liable for any consequential damages, losses, costs or expenses arising from the use or misuse of this product however caused.**

## Specification

Parameter	LPA 400A	LPA 400B	Units
Input connector	isolated BNC		
Input impedance	10k		$\Omega$
Peak operational input voltage	$\pm 8$	$\pm 3.6$	V
Maximum safe input voltage	$\pm 15$		V
Input common mode range	$\pm 40$		V
Input offset voltage	1.5		mV (typ)
	5		mV(max)
Input coupling (switch)	ac, ac+dc, ac+ (dc)		
AC coupling filter –3dB	16		Hz
(DC) gain factor	0.1		
Full power bandwidth	100K@800Vpk-pk 1M@80Vpk-pk	200K@360Vpk-pk 1M@80Vpk-pk	Hz (min)
Low bandwidth –3dB (switch)	80k		Hz
Low bandwidth filter attenuation	40		dB/decade
Low bandwidth filter type	linear phase		
Gain options (switch)	x50, x200, x500		
Low frequency gain accuracy	0.1		%
Output connector	isolated BNC		
Peak output voltage	$\pm 400$	$\pm 180$	V
Peak output current	75	150	mApk
Continuous output current	50	100	mA rms
Maximum dc output current	70 @ >250Vdc		mA dc
	25 @ 0V		
Slew rate (Typical)	350		V/us
Output impedance	50		$\Omega$
Temperature range	0 - 40		$^{\circ}C$
Size	8.5 x 15 x 25		cm
Weight	2.5		kg
Power source (UK (USA)	230V $\pm 10\%$ , 50Hz		
	115V $\pm 10\%$ , 60Hz		
Power consumption	45		VA (max)

### Notes:

All specifications at 230V, 50Hz, 23 $^{\circ}C$  unless otherwise stated.

All specifications are typical values unless otherwise stated.

Derate output current linearly for output voltages between those stated.

*Note: The amplifier contains an output rms current protection circuit, and when driving some capacitive loads this circuit may be activated. Due to capacitor construction, at high current the amount of energy transfer distorts the current waveform resulting in excessive peak current (Fig 1 below), whilst the rms value remains within specification. To ensure correct functionality and prevent false triggering of the protection circuit, ideally the current waveform should be a sinewave as pictured in (Fig.2 below).*

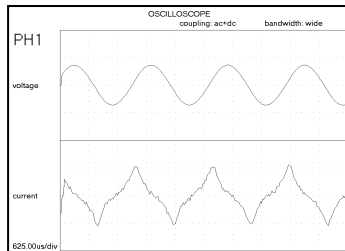


Fig 1 (Distorted current waveform)

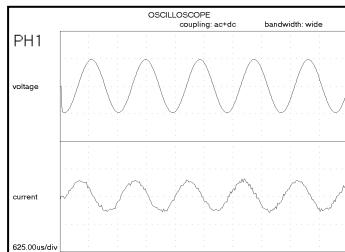


Fig 2 (Correct current waveform)

## Total Harmonic Distortion:

For frequencies up to 50KHz, Total Harmonic Distortion is typically less than 0.5%. Between 50KHz and 1MHz THD is typically less than 5%.

This graph demonstrates the effect of Total Harmonic Distortion on the Maximum Output Voltage of the LPA400 amplifier at higher frequency levels up to 1MHz.

