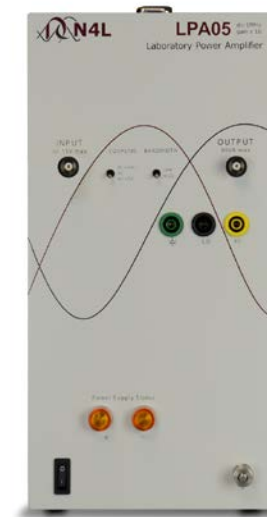




# LPA05

## Laboratory Power amplifier

### USER GUIDE



# LPA05

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

## Description

LPA05 is a wideband power amplifier with  $\pm 40V$  peak voltage output at 3A rms from dc to 500kHz. At lower output levels, the gain extends beyond 1MHz. It uses an innovative balanced high frequency design to give a slew rate of greater than 120V/us, while maintaining dc accuracy and high reliability.

LPA05B is a higher current, lower voltage version capable of delivering 5A rms from dc to 1MHz at  $\pm 16V$  peak.

LPA05 is generally stable driving any load - resistive, capacitive (**see note**) or inductive – but as with all high frequency amplifiers, care must be taken when connecting to pure capacitive loads. An appropriate resistor or inductor may be needed in series with the capacitive load to minimise peaking in the frequency response or to prevent spurious oscillation.

LPA05 is powered by a universal input power supply monitored by a pair of indicators on the front panel. Internally the LPA05 is floating from ground to minimise earth loops, but can be grounded by linking the output 0V to earth via the 4mm connectors.

LPA05 is housed in a robust steel cabinet.

**Do not obstruct the ventilation holes on the sides, underneath or rear of the amplifier.**



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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 Newtons4th 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 Newtons4th Ltd.

This guarantee is limited to the cost of the LPA05 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, Newtons4th Ltd. offers a full repair service – contact your local representative.

The LPA05 does not require any calibration.

**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.**

## Declaration of Conformity

We, Newtons4th Ltd, declare that the product LPA05 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

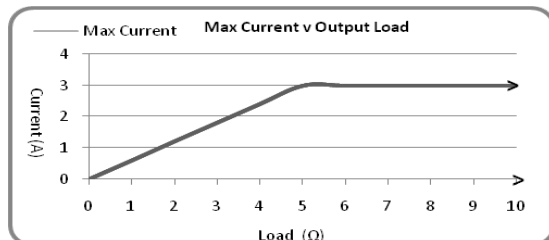
November 2005

Eur Ing Allan Winsor BSc CEng MIEE  
(Director of Newtons4th Ltd)

**IMPORTANT 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:

- When continually running the **LPA05A** into a  $<5\Omega$  impedance load refer to Current v Load De-rating graph below. However, it is allowable to run the unit at full current into  $<5\Omega$  for a period not exceeding 30 seconds, otherwise overload damage may occur.



- 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.
- 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, 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.
- 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 the output current has fallen to zero before disconnecting an inductive load from the output.
- We recommend that after running the amplifier at high power for a period of time disconnect the load, letting the fan run for 10 minutes to remove any latent heat build up within the unit.

**Specification**

| Parameter                         | LPA05A                       | LPA05B     | Units              |
|-----------------------------------|------------------------------|------------|--------------------|
| Input connector                   | isolated BNC                 |            |                    |
| Input impedance                   | 10k                          |            | $\Omega$           |
| Peak operational input voltage    | $\pm 4$                      | $\pm 1.6$  | V                  |
| Maximum safe input voltage        | $\pm 15$                     |            | V                  |
| Peak withstand input voltage      | $\pm 30$                     |            | V                  |
| Input common mode range           | $\pm 40$                     |            | V                  |
| Input offset voltage              | 1                            |            | mV (typ)           |
|                                   | 5                            |            | mV (max)           |
| Full power bandwidth              | 1M                           | 1M         | Hz                 |
|                                   | @40V pk-pk                   | @36V pk-pk |                    |
|                                   | 250k                         |            | Hz                 |
|                                   | @80V pk-pk                   |            |                    |
| Small signal bandwidth (-3dB)     | 3M @2V pk-pk                 |            | Hz                 |
| Coupling                          | Ac, ac+dc, ac+ (dc)          |            |                    |
| Gain                              | X10                          |            |                    |
| Output connectors                 | isolated BNC<br>isolated 4mm |            |                    |
| Peak output voltage               | $\pm 40$                     | $\pm 16$   | V                  |
| Maximum safe output level         | 90                           |            | VA                 |
| Slew rate                         | 120                          |            | V/us               |
| Maximum ac output current (>10Hz) | 3                            | 5          | A rms              |
|                                   | 5                            | 8          | A pk               |
| Maximum dc output current         | 2                            | 4          | A dc               |
| Temperature range                 | 0 - 40                       |            | $^{\circ}\text{C}$ |
| Size                              | 30 x 15 x 25                 |            | cm                 |
| Weight (approx)                   | 6                            |            | Kg                 |
| Power source                      | 90-265                       |            | V                  |
|                                   | 45-63                        |            | Hz                 |
| Power consumption (max)           | 150                          |            | VA (max)           |

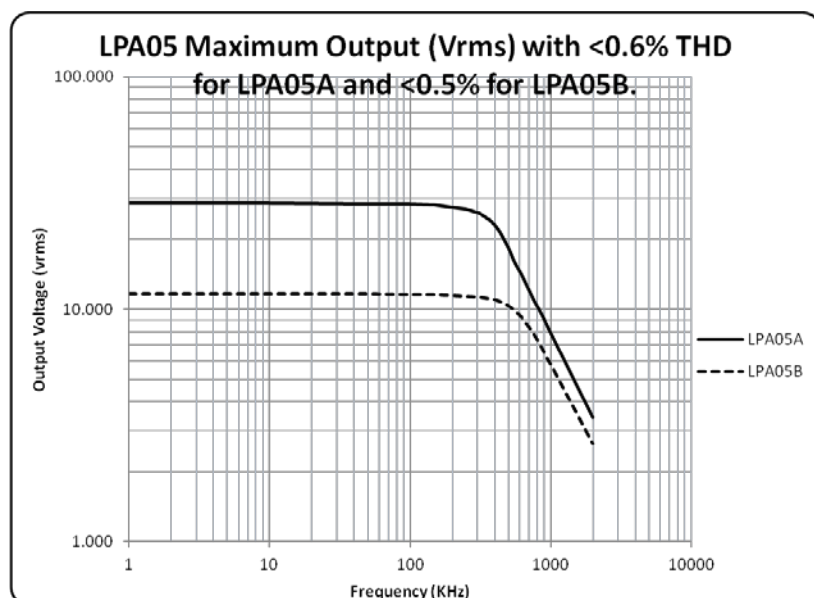
**Notes:**

All specifications are typical values unless otherwise stated.  
Specifications are valid after 30 minutes warm up.

## Total Harmonic Distortion:

For frequencies up to 1MHz, Total Harmonic Distortion is typically less than 0.6% for the LPA05A and 0.5% for the LPA05B.

This graph demonstrates the effect of Total Harmonic Distortion on the Maximum Output Voltage of the LPA05 amplifier at higher frequency levels up to 1MHz.



**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 on next page), 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 on next page).

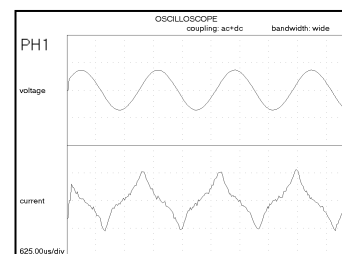


Fig 1 (Distorted current waveform)

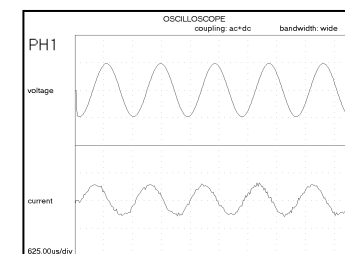


Fig 2 (Correct current waveform)

### Quick User Guide

In the following text we describe the use of the LPA05, including details on the Coupling and bandwidth settings.

**Input:** The LPA05A features an input impedance of 10kOhms; this should be considered when using function generators designed for 50Ohm load impedance.

**Nominal Gain:** The nominal gain of the amplifier is x10

### **Coupling:**

**AC + (DC)** – This coupling setting will amplify the AC signal at the input of the amplifier by x10 and simply pass (x1 gain) any DC input signal.

Example:

Input signal: 1V AC @ 10 kHz + 500mV DC offset

Output Signal: from amplifier: 10V AC @ 10 kHz + 500mV DC offset

**AC** – This coupling setting will amplify the AC signal at the input of the amplifier by x10 and attenuate the DC.

**AC + DC** – AC+DC coupling will amplify both the AC and the DC components of the input signal.

Example:

Input signal: 500mV AC @ 10 kHz + 500mV DC offset

Output Signal: from amplifier: 5V AC @ 10 kHz + 5V DC offset

### **Bandwidth:**

There are two options for the bandwidth on the LPA05

Low: -3dB @ 85 kHz

High: -3dB @ 1MHz