Newtons4th Ltd

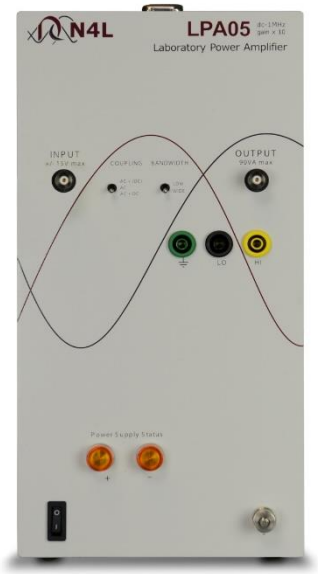
ENS LYON P47.15

LPA05

Laboratory

Power amplifier

User Guide



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Safety

Important safety Information

This manual contains important information that must be followed to ensure the safety of all operatives and both this instrument and any accessories attached.

General Safety Information

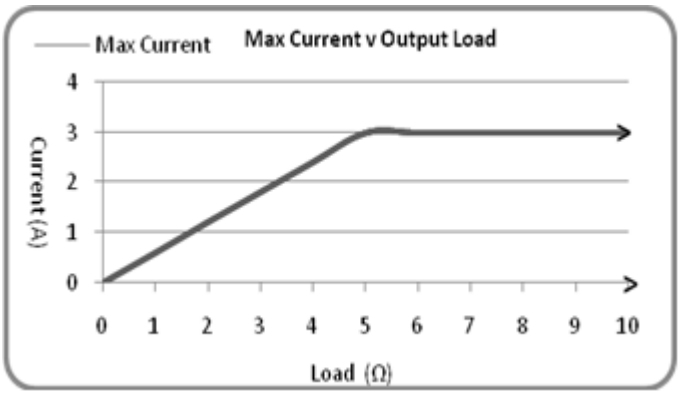
Use the product only as detailed in this manual. Review the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. Carefully read all instructions. Retain these instructions for future reference.

For correct and safe operation of this instrument, it is essential that you follow generally accepted safety procedures in addition to the safety precautions specified in this manual.

The product is designed to be used by trained personnel only it is designed to comply with BSEN 61010-1 (Safety requirements for electrical equipment for measurement, control, and laboratory use)

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.

When continually running the LPA05A into a <5Ω impedance load refer to Current v Load De-rating graph below. However, it is allowable to run the unit at full current into <5Ω 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 ±40V peak common mode.

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.

This unit is fitted with safety BNC input and output connections, appropriate safety BNC cables must be used, standard metal BNC cables will damage these connectors.

The cover(s) should not be removed to attempt repair, maintenance, or adjustment, as this instrument contains no user serviceable parts. All repairs, maintenance or adjustment should only be caried out by Newtons4th Ltd or our official distributor.

While using this product, you may need to access other parts of a larger system. Read the safety sections of the other component manuals for warnings and cautions related to operating the system.

When incorporating this equipment into a system, the safety of that system is the responsibility of the assembler of the system.

There are no user serviceable parts inside the instrument – do not attempt to open the instrument, refer service to the manufacturer or his appointed agent.

To avoid fire or personal injury

Use the correct mains lead. Use only the mains lead supplied with this product and certified for the country of use.

Ground the instrument. This instrument is grounded through the grounding conductor of the mains lead. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the instrument, ensure that the instrument is properly grounded.

Power disconnect. Do not position the instrument so that it is difficult to disconnect the mains lead; it must always remain accessible to the user to allow for quick disconnection if needed in an emergency.

Connect and disconnect properly. Switch off the amplifier and ensure the output current has fallen to zero before disconnecting an inductive load from the output.

Observe all terminal ratings. To avoid fire or shock hazard, observe all rating and markings on the instrument. Consult the specifications in this user manual for further ratings information before making connections to the product. Do not exceed the Measurement Category (CAT) rating and voltage or current rating of the lowest rated individual component of a product, probe, or accessory.

Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Do not operate with suspected failures. If you suspect that there is damage to this instrument, have it inspected by Newtons4th Ltd or our official distributor. Do not use the instrument if it is damaged or operates incorrectly. If in doubt about safety of the instrument, turn it off and disconnect the mains lead. Clearly mark the instrument to prevent its further operation. Before use, inspect test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged.

Use proper fuse. Use only the fuse type and rating specified for this product.

Do not operate in wet/damp conditions. Be aware that condensation may occur if a unit is moved from a cold to a warm environment.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry. Remove the input signals before you clean the product, only use a dry cloth for cleaning. Do not use chemicals or cleaning products on this instrument.

Provide proper ventilation. Installation into a system integration requires that the instrument has proper ventilation. Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings.

Provide a safe working environment. Always place the instrument in a location convenient for viewing and operation. Use care when lifting and carrying the product. This product is provided with handles for lifting and carrying.

Terms in the manual

These terms may appear in this manual:



WARNING. Warning statements identify conditions or practices that could result in injury or loss of life.



CAUTION. Caution statements identify conditions or practices that could result in damage to this product or other property.



INFORMATION. Information statements identify instructions or commands that may save time or provide extra functionality

Terms on the product

These terms may appear on the product:
- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

Symbols on the product



When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which must be taken to avoid them.

The following symbol(s) may appear on the instrument.



Instrument GND

Environmental compliance

This section provides information about the environmental impact of the product.

Product end-of-life handling
Observe the following guidelines when recycling an instrument or component:

Equipment recycling. Production of this equipment required the extraction and use of natural resources.

The equipment may contain substances that could be harmful to the environment or human health if improperly handled at the product's end of life. To avoid release of such substances into the environment and to reduce the use of natural resources, we encourage you to recycle this product in an appropriate system that will ensure that most of the materials are reused or recycled appropriately.



This symbol indicates that this product complies with the applicable European Union requirements according to
Directives 2012/19/EU and 2006/66/EC on waste electrical and electronic equipment (WEEE) and batteries. For information about recycling options, check with your local authorities.

Declaration of Conformity

Manufacturer: Newtons4th Ltd.
Address: 1 Bede Island Road
Leicester
LE2 7EA

We declare that the product:

Description: Laboratory Amplifier
Model: LPA05

Conforms to the EEC Directives:

2014/30/EU relating to electromagnetic compatibility:
EN 61326-1:2013

2014/35/EU relating to Low Voltage Directive:
EN 61010-2-030:2010:

July 2021

Jigar Patel
(Senior Engineer Newtons4th Ltd.)

Preface

This manual covers the Newtons4th Ltd Laboratory Amplifier LPA05A & LPA05B models

LPA05 is a wideband power amplifier with ±40V peak voltage output at 3A rms from 100Hz to 250kHz. 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/µs while maintaining DC accuracy and high reliability.

LPA05B is a higher current, lower voltage version capable of delivering 5A rms from 100Hz to 200kHz at ±16V peak.

LPA05 is generally stable driving any load - resistive, capacitive (see note on page 12) 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.

Key Features

- DC and AC wide bandwidth
- Switch selectable coupling options:
  AC, AC+DC or AC with reduced DC
- Fixed x10 Gain
- Switch selectable bandwidth
- High slew rate
- Isolated BNC or 4mm output sockets
  ± 40V peak
  3A rms / 5A peak
  (LPA05A resistive load)
- ± 16V peak
  5A rms / 8A peak
  (LPA05B resistive load)
- Isolated from ground to prevent earth loops
- Robust metal enclosure

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. Please have as much relevant information to hand as possible – particularly the serial number which is on a label adhered to the rear panel.

If the problem cannot be resolved directly then you will need to request an RMA number from the support section of our website. https://resources.newtons4th.com/ and 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 or software.

In the event of any problem with the instrument outside of the guarantee period, Newtons4th Ltd. offers a full repair service.

Please contact your local Distributor or the N4L office for further details of N4L's instrument repair service.



INFORMATION. The LPA05 does not require any calibration.

Specification

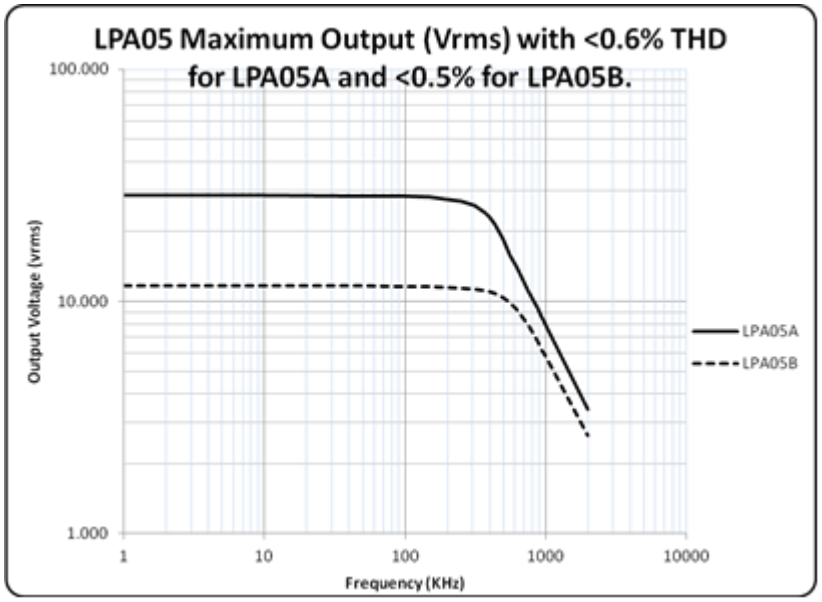
Parameter	LPA05A	LPA05B	Units
Input connector	isolated BNC		
Input impedance	10k		Ω
Peak operational input voltage[1]	±4	±2	V
Maximum safe input voltage	±15		V
Peak withstand input voltage	±30		V
Input common mode range	±40		V
Input offset voltage	1		mV (typ)
	5		mV (max)
Full power bandwidth	80V pk-pk 28Vrms @ 250kHz 14Vrms @ 1MHz	32V pk-pk 11Vrms @ 1MHz	Hz
Small signal bandwidth (-3dB)	3M @2V pk-pk		Hz
Coupling	AC, AC+DC, AC+(DC)		
Gain	X10		
Output connectors	isolated BNC isolated 4mm		
Peak output voltage	±40	±16	V
Maximum safe output level	90	60	VA
Slew rate	120		V/µs
Maximum ac output current	3	5	A rms
(>100Hz)	5	8	A pk
Maximum dc output current	2	4	A dc
Temperature range	0 - 40		°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.
[1] The input voltages should be limited to ensure that the output does not exceed the permitted limits.

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 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).

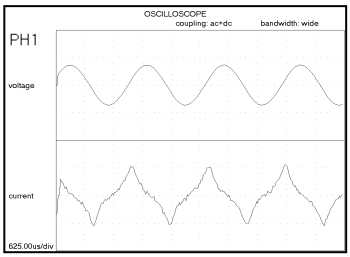


Fig 1 (Distorted current waveform)

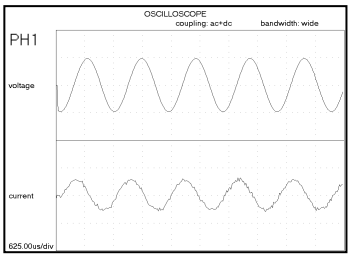


Fig 2 (Correct current waveform

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

Contact details

Please direct all queries or comments regarding the LPA05 instrument or manual to:

Newtons4th Ltd.

1 Bede Island Road

Leicester

LE2 7EA

United Kingdom

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web site: www.newtons4th.com

At Newtons4th Ltd. we have a policy of continuous product improvement and are always keen to hear comments, whether favourable or unfavourable, from users of our products.

An example comment form can be found at the end of this manual – if you have any comments or observations on the product, please fill a copy of this form with as much detail as possible then fax or post it to us.

Alternatively send an e-mail with your comments.

LPA05 comments		
serial number:		date:
your contact details:		
comments:		
detailed description of application or circumstances:		
Please post or fax to Newtons4th Ltd.		