



# N4A Series

## Programmable AC Power Sources

# USER MANUAL

Document Title: N4A Series User Manual v6.0  
Document Release Date: 01<sup>st</sup> September 2026  
Software version on release date: v1.34

**Document Ref: D000196 issue 06**

# Contents

|                                                                                 |    |
|---------------------------------------------------------------------------------|----|
| Terms in the manual .....                                                       | 7  |
| Terms on the product .....                                                      | 7  |
| Symbols on the product .....                                                    | 7  |
| Environmental compliance .....                                                  | 8  |
| Warnings .....                                                                  | 9  |
| General Safety Information .....                                                | 10 |
| To avoid fire or personal injury .....                                          | 10 |
| DECLARATION OF CONFORMITY .....                                                 | 12 |
| WARRANTY .....                                                                  | 13 |
| About this manual .....                                                         | 14 |
| Introduction – general principles of operation .....                            | 15 |
| Getting started .....                                                           | 16 |
| Unpacking .....                                                                 | 16 |
| Connecting the input supply to the N4A unit .....                               | 17 |
| Wiring .....                                                                    | 17 |
| Connection configurations .....                                                 | 19 |
| Single phase output-mains supply N4A03 .....                                    | 19 |
| Single phase output-3 phase supply N4A06 .....                                  | 19 |
| 3 phase output - 3 phase supply with or without neutral N4A18/N4A30/N4A67 ..... | 20 |
| Supply configurations No's 1-12 .....                                           | 21 |
| N4A power up sequence .....                                                     | 23 |
| Amplifier output .....                                                          | 23 |
| Output warnings .....                                                           | 23 |
| Protection .....                                                                | 24 |
| Using the menus .....                                                           | 25 |
| Selection from a list .....                                                     | 26 |
| Numeric data entry .....                                                        | 27 |
| Text entry .....                                                                | 28 |
| Table entry .....                                                               | 28 |
| Using remote control .....                                                      | 29 |
| Standard event status register .....                                            | 31 |
| Serial Poll status byte .....                                                   | 31 |
| RS232 connections .....                                                         | 33 |

---

|                                     |    |
|-------------------------------------|----|
| Null-Modem cable pin out .....      | 34 |
| Keyboard functions.....             | 34 |
| Pre-set waveform keys .....         | 35 |
| Menu control (cursor) keys.....     | 35 |
| ENTER/NEXT.....                     | 35 |
| HOME/ESC .....                      | 35 |
| DELETE/BACK.....                    | 36 |
| ARROW KEYS .....                    | 36 |
| Display control keys .....          | 36 |
| ZOOM+ and ZOOM-.....                | 36 |
| WIRING.....                         | 36 |
| VOLTAGE .....                       | 36 |
| FREQ.....                           | 36 |
| Setup keys and numeric keypad ..... | 37 |
| Setup keys .....                    | 37 |
| PH1.....                            | 37 |
| PH3.....                            | 38 |
| SWEEP.....                          | 38 |
| CONFIG.....                         | 38 |
| MAINT.....                          | 38 |
| HARM.....                           | 38 |
| ALARM.....                          | 39 |
| SEQ.....                            | 39 |
| SYS.....                            | 39 |
| COMMS.....                          | 39 |
| PROG.....                           | 39 |
| Numeric entry .....                 | 40 |
| Control keys .....                  | 40 |
| WAVEFORM LIBRARY .....              | 40 |
| START.....                          | 40 |
| STOP.....                           | 40 |
| OUTPUT ON/OFF.....                  | 40 |
| Program settings .....              | 41 |
| Store/recall .....                  | 41 |

|                                              |    |
|----------------------------------------------|----|
| Power on program.....                        | 42 |
| <i>Program 1</i> .....                       | 42 |
| <i>Factory default</i> .....                 | 42 |
| <i>As last used</i> .....                    | 42 |
| Display Layout and Parameter adjustment..... | 43 |
| Layout Breakdown .....                       | 43 |
| Generator settings ① .....                   | 43 |
| Mode and Waveform ② .....                    | 43 |
| Output Monitor ③.....                        | 43 |
| Help and Information ④ .....                 | 43 |
| Further Settings .....                       | 44 |
| Direct Parameter Adjustment .....            | 44 |
| Step Adjustment.....                         | 44 |
| Direct Adjustment.....                       | 44 |
| Modes of operation.....                      | 45 |
| Single component .....                       | 46 |
| Voltage setting.....                         | 46 |
| DC offset.....                               | 46 |
| Frequency setting.....                       | 47 |
| Range setting .....                          | 47 |
| Phase 1 turn on angle.....                   | 47 |
| Setting a DC Offset Voltage .....            | 47 |
| Instrument Setup details: .....              | 48 |
| Harmonic series.....                         | 50 |
| Dual component.....                          | 51 |
| DC only.....                                 | 52 |
| IEC61000 .....                               | 53 |
| IEC61000-4-13 - Flat curve .....             | 53 |
| IEC61000-4-17 – D.C. ripple .....            | 54 |
| UL2231 .....                                 | 55 |
| Using Harmonic Series.....                   | 56 |
| Using Sequence.....                          | 58 |
| A simple example of an AC sequence.....      | 59 |
| Checking the operation of the sequence.....  | 62 |

---

|                                                             |    |
|-------------------------------------------------------------|----|
| Three-phase settings.....                                   | 63 |
| Output settings.....                                        | 63 |
| Wiring menu .....                                           | 63 |
| Parallel option .....                                       | 64 |
| High voltage transformer options .....                      | 65 |
| N4A18/30 .....                                              | 65 |
| System settings .....                                       | 67 |
| System Options (SYS).....                                   | 67 |
| Language .....                                              | 67 |
| Initial settings.....                                       | 67 |
| Keypad Beep .....                                           | 68 |
| Sync Output.....                                            | 68 |
| User Data.....                                              | 68 |
| System Information .....                                    | 69 |
| Programs .....                                              | 70 |
| Store /recall (PROG) .....                                  | 70 |
| Preset keys .....                                           | 71 |
| Specifications .....                                        | 73 |
| Nominal Output Power.....                                   | 73 |
| Output Voltage.....                                         | 73 |
| Maximum Inrush (3 Second) Output Power .....                | 73 |
| Maximum Output Current (Continuous) .....                   | 74 |
| Parallel output option .....                                | 74 |
| Maximum Output Current (Inrush).....                        | 74 |
| Parallel output option .....                                | 74 |
| Output Frequency .....                                      | 74 |
| Min Slew Rate .....                                         | 74 |
| Output Voltage Stability .....                              | 74 |
| Output Voltage Accuracy .....                               | 74 |
| THD.....                                                    | 74 |
| Output Noise .....                                          | 74 |
| Recovery Time of Output Waveform .....                      | 74 |
| Max Compensated drop on wires (w.r.t voltage setting) ..... | 75 |
| Recovery Time of Drop on Wires .....                        | 75 |

---

---

|                                                                 |     |
|-----------------------------------------------------------------|-----|
| Maximum Crest Factor Output (Current).....                      | 75  |
| General .....                                                   | 75  |
| Dimensions .....                                                | 75  |
| Weight .....                                                    | 75  |
| Input Voltage .....                                             | 76  |
| Input Frequency .....                                           | 76  |
| Operating Temperature.....                                      | 76  |
| Input Current .....                                             | 76  |
| Efficiency.....                                                 | 76  |
| Resetting the N4A to factory default mode.....                  | 77  |
| Firmware Programming .....                                      | 77  |
| Repair / Recalibration & Servicing.....                         | 78  |
| Servicing .....                                                 | 78  |
| Repair / Recalibration .....                                    | 78  |
| Appendix A – Accessories .....                                  | 79  |
| Appendix B – Connection Diagrams.....                           | 80  |
| IMP161 Connections .....                                        | 80  |
| IMP163 Connections .....                                        | 82  |
| IMP323 Connections .....                                        | 83  |
| IMP753 Connections .....                                        | 84  |
| Appendix B.6 N4A18 Connection Details.....                      | 85  |
| Rear Connection Terminal Blocks associated with the N4A18 ..... | 85  |
| Appendix B.7 N4A30 Connection Details.....                      | 87  |
| Rear Connection Terminal Blocks associated with the N4A30 ..... | 87  |
| Appendix B.8 N4A67 & N4A67-HV Connection Details .....          | 88  |
| Rear Connection Terminal Blocks associated with the N4A67 ..... | 89  |
| Input connections:.....                                         | 89  |
| Output connections: .....                                       | 90  |
| N4A67 & N4A67-HV Connection Diagram .....                       | 91  |
| Appendix C – CommView2 PC Software .....                        | 92  |
| Appendix D – N4AXX Communications Commands .....                | 93  |
| Appendix E – Available character set.....                       | 117 |
| Appendix F – Contact details.....                               | 117 |

This manual is copyright © 2006-2026 Newtons4th Ltd. and all rights are reserved. No part may be copied or reproduced in any form without prior written consent.

Document release date August 2026

## 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

Conventions used to signify control keys, screen menu options and remote control commands are differentiated as shown below.

|                 |                  |                                                     |
|-----------------|------------------|-----------------------------------------------------|
| control keys    | ACQU             | denoted by <i>italicised font</i>                   |
| menu options    | <b>bandwidth</b> | denoted by <b><i>bold italicised font</i></b>       |
| script commands | *CLS             | denoted by <b><i>grey, bold italicised font</i></b> |

## 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 waste recycling facility.

## Warnings

---

**WARNING. Important Safety Information**

**This product can generate lethal voltages that could result in injury or loss of life. Observe all safety instructions.**

---

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

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:

- The 3-phase inputs need to be wired into the connector on the rear of the unit. Use caution and ensure that the 3-phase supply is not live when connecting or disconnecting from the unit.
- For mains powered instruments 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.
- **The two main output terminals are NOT grounded and should not be grounded under any circumstance.**
- **The maximum output from the unit is 300V AC<sup>1</sup>. Switch off the amplifier and ensure that the output current has fallen to zero before connecting or disconnecting anything to/from the outputs of the unit.**
- Keep the ventilation holes on the front and rear 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 instrument – do not attempt to open the instrument, refer service to the manufacturer or his appointed agent.

**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.**

---

<sup>1</sup> 360V AC for the N4A67-HV version

## 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.

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 carried 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

**Ground the instrument.** This instrument is grounded through the grounding terminal. 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.

**Connect and disconnect properly.** Do not connect or disconnect probes or test leads while they are connected to a voltage source. Use only insulated voltage probes, test leads, and accessories supplied with the product, or indicated by Newtons4th Ltd. to be suitable for the product.

**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 voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged.

**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 a safe working environment.** Always place the instrument in a location convenient for viewing and operating the switches.

## DECLARATION OF CONFORMITY



Manufacturer: Newtons4th Ltd.

Address 1 Bede Island Road  
Leicester  
LE2 7EA

We declare that the product:

|               |                              |
|---------------|------------------------------|
| Description:  | Programmable AC Power Source |
| Product name: | N4A                          |
| Model:        | N4Axx Family                 |

Conforms to the EEC Directives:

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

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

May 2025

Callum Spiby  
(Senior Engineer Newtons4th Ltd.)

## WARRANTY

This product is guaranteed to be free from defects in materials and workmanship for a period of 12 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 and release numbers (press SYSTEM then LEFT).

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 instrument 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 and re-calibration service – contact your local representative. It is recommended that the instrument is re-calibrated annually. Users can perform re-calibration of the N4A if they have access to an N4L Precision Power Analyzer. Alternatively, the instrument can be returned to us for re-calibration.

## About this manual

This manual describes the general features, usage, and specifications of the N4A range of Programmable AC power sources.

The N4A power source range comprises:

|          |                                                |
|----------|------------------------------------------------|
| N4A03    | -240V ac mains input, 3KVA Single Phase Output |
| N4A06    | -Three phase input, 6KVA Single Phase Output   |
| N4A18    | -Three phase input, 18KVA Three Phase Output   |
| N4A30    | -Three phase input, 30KVA Three Phase Output   |
| N4A67    | -Three phase input, 67KVA Three Phase Output   |
| N4A67-HV | -High voltage version of N4A67                 |

Optional hardware (N4A18/30/67 units only):

### Parallel

- PH1+PH2+PH3 current on a single-phase connector

### HV Transformer

- External transformer for 440Vrms Line to Neutral

## Introduction – general principles of operation

The N4A range of self-contained Programmable AC power sources have a number of modes and functions that share common resources such as the keyboard and display.

The instruments are normally supplied with 3-phase inputs with a choice of models that have a single phase or 3-phase outputs.

There is also a single phase “mains” input, single phase output version.

On single phase units, output and sense are accessed via four 4mm safety terminal. 3-phase units are provided with screw terminals.

The frequency range of the generator is from 1Hz to 10KHz. The output voltage range is 0V to 300Vrms\*\* at a frequency up to 1KHz. Above 1KHz the maximum voltage available reduces with the increase in frequency.

The output waveform type is also selectable and can be set to Sinewave, Squarewave and Triangular waveform.

Software commands are available to control the generator output from a PC using N4L software programs such as CommView2, and IECSoft.

Harmonic, Sequence and Sweep modes are also available. The settings for these modes are user selectable.

Accordingly, this manual first describes the general features and specification of the instrument as a whole; and then describes the individual functions in detail.

Each function is described in turn, in its own chapter, with details of the principles on which it is based, how to use it, the options available, display options, specifications etc.

\*\* 360Vrms for the N4A67-HV version

## Getting started

The N4A is supplied calibrated and requires no further action by the user before operating the unit.

## Unpacking

Please remove all contents from the packaging and check each item against the packing list.

Please retain the delivery packaging sent with the unit to ensure safe return of the equipment for re-calibration etc using the RMA return procedure.

Having verified that the entire list of contents is present, it is recommended to verify that your N4A has not been damaged in transit and operates correctly.

## Connecting the input supply to the N4A unit

Except for the mains powered N4A03 & N4A06, the unit requires a 3-phase supply of either 380VAC $\pm$ 10%, 400VAC $\pm$ 10% or 415VAC $\pm$ 10%.

Power is supplied to the N4A03 and N4A06 units through the black input connector on the rear of the unit. All units with 3-phase outputs are powered via screw terminals located on the rear.

A flat head screwdriver or similar tool must be inserted into the two tabs at the bottom of the black input connector lid to gain access. The small 'bridge' piece can then be removed to allow the supply cable to be inserted.



**CAUTION.** Ensure the supply cable is removed from its socket at the inlet end and can be seen to avoid the possibility of an electric shock.

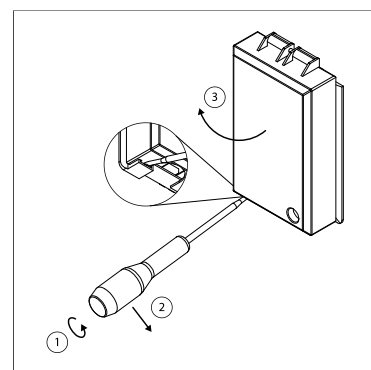
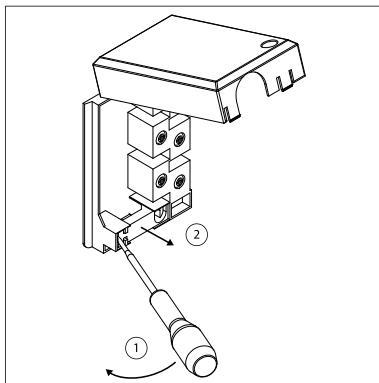
The connector should be wired as:

1. Live 1
2. Live 2
3. Live 3
4. Neutral
5. Neutral
6. Safety Earth

Once these wires have been securely fastened, replace the bridge piece, and close the lid.

### Wiring

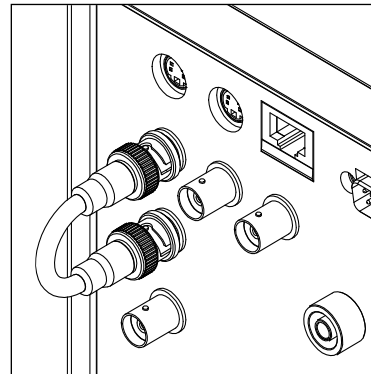
To open the input connector cover, insert a flathead screwdriver into the **two** square slots located on its underside. Rotate and pivot the screwdriver as shown.



Before securing the inlet wiring in place, the cable clip should be removed. To do this, use a flathead screwdriver and a pivoting

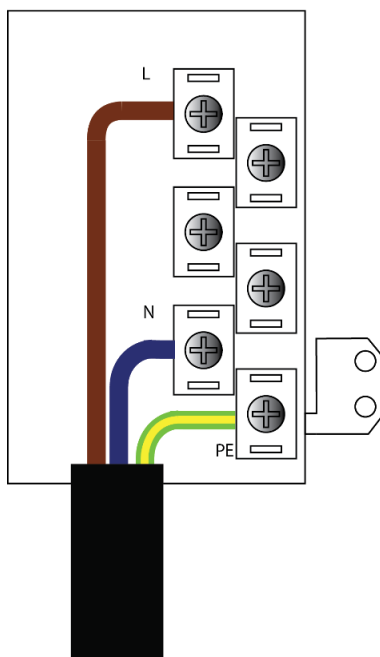
motion to slide the clip out. Wire the connector up with reference to the diagram on the rear panel.

Ensure that the supplied BNC link cable is connected between PH1 GENERATOR OUTPUT and PH1 IN.



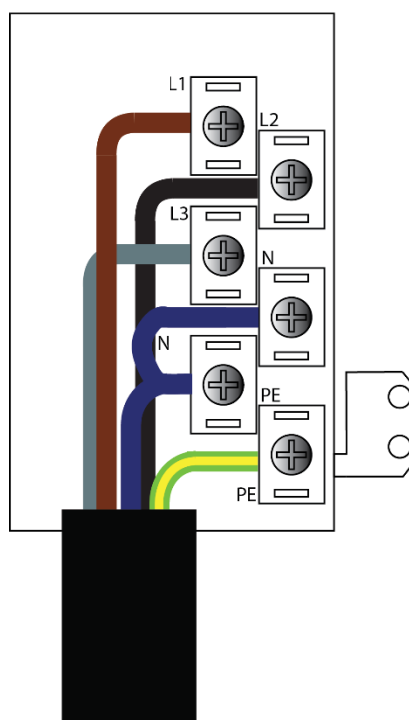
N4A03

Mains input wiring diagram



N4A06

Mains input wiring diagram



Note, for clarity the cable securing clip shown on the previous page, has been omitted in both diagrams.

## Connection configurations

Depending on the region, supply configuration and the voltage the following tables must be consulted prior to wiring up the source.

### Single phase output-mains supply N4A03

| Option No. | Voltage                          | Current |         | Configuration | Notes |
|------------|----------------------------------|---------|---------|---------------|-------|
|            |                                  | Phase   | Neutral |               |       |
| 1          | 220V $\pm$ 10%<br>Europe & Korea | 24A     | 24A     | 6,12          |       |
| 2          | 230V $\pm$ 10%<br>Europe & Korea | 23A     | 23A     | 6,12          |       |
| 3          | 240V $\pm$ 10%<br>Europe & Korea | 22A     | 22A     | 6,12          |       |

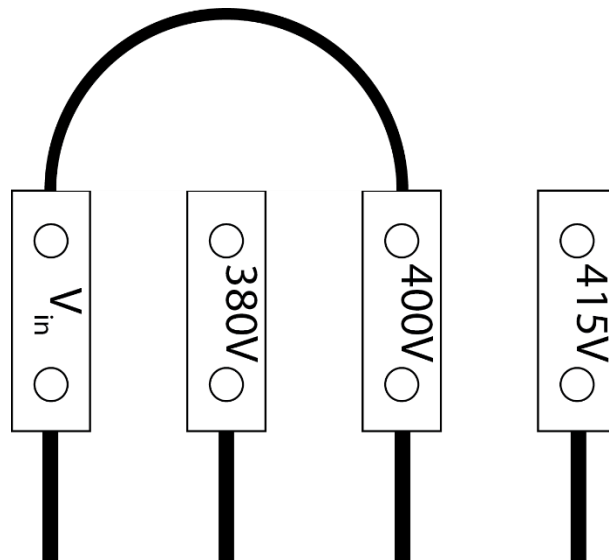
### Single phase output-3 phase supply N4A06

| Option No. | Voltage                          | Current |         | Configuration |            |
|------------|----------------------------------|---------|---------|---------------|------------|
|            |                                  | Phase   | Neutral |               |            |
| 4          | 380V $\pm$ 10%<br>Europe         | 17A     | 34A     | 1,2,9         | See note 1 |
| 5          | 400V $\pm$ 10%<br>Europe         | 16A     | 32A     | 1,2,9         |            |
| 6          | 415V $\pm$ 10%<br>Europe & Korea | 15.5A   | 31A     | 1,2,9         | See note 1 |

**3 phase output - 3 phase supply with or without neutral N4A18/N4A30/N4A67**

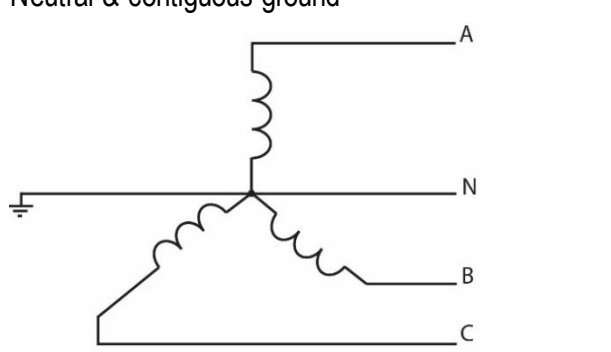
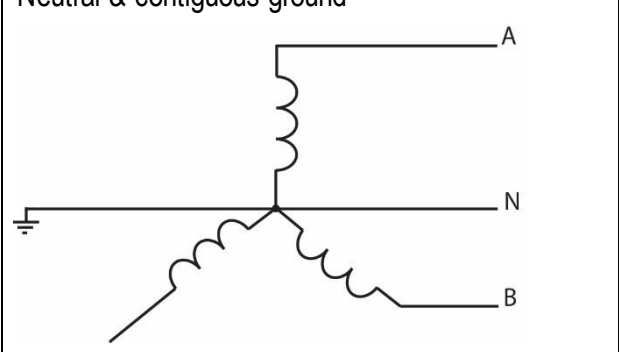
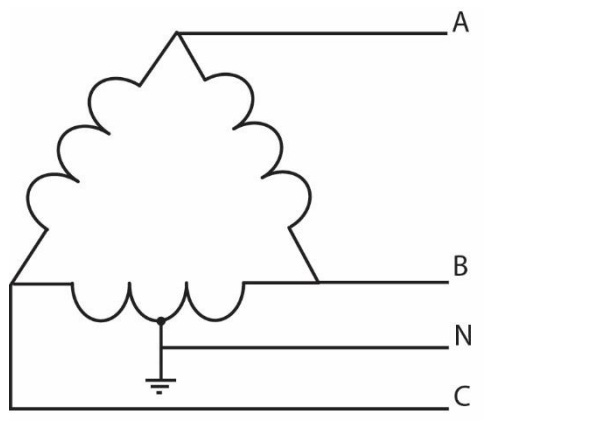
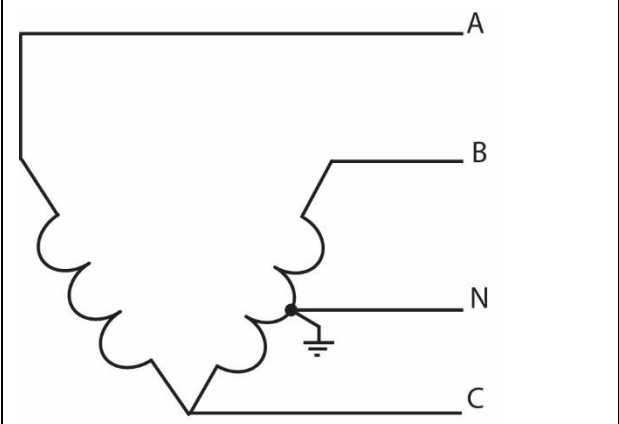
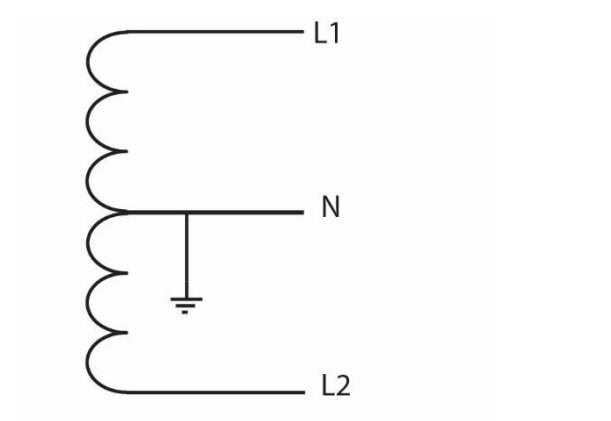
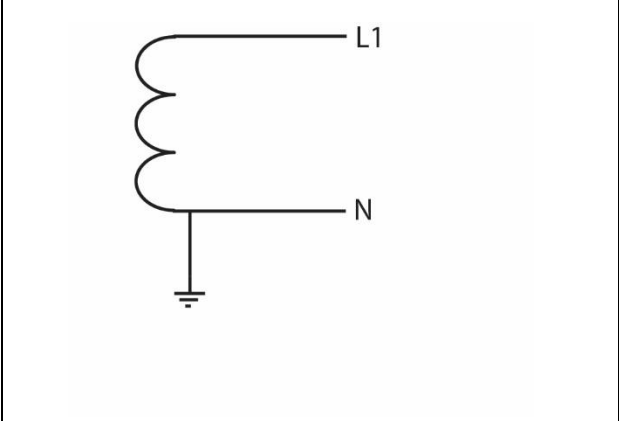
| Option No. | Voltage                          | Configuration          |            |
|------------|----------------------------------|------------------------|------------|
| 7          | 380V $\pm$ 10%<br>Europe         | 1,2,3,4,7,8,9,10,11,12 | See note 1 |
| 8          | 400V $\pm$ 10%<br>Europe         |                        |            |
| 9          | 415V $\pm$ 10%<br>Europe & Korea |                        | See note 1 |

Note 1

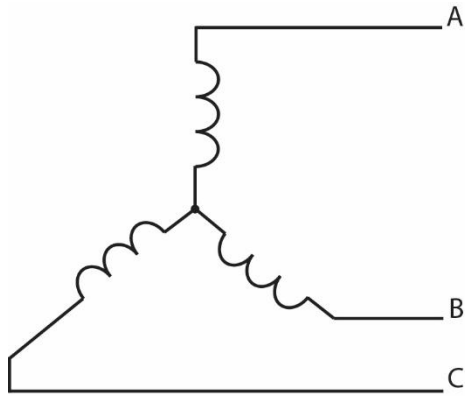


Connect between  $V_{in}$  and selected voltage terminal according to tables above.

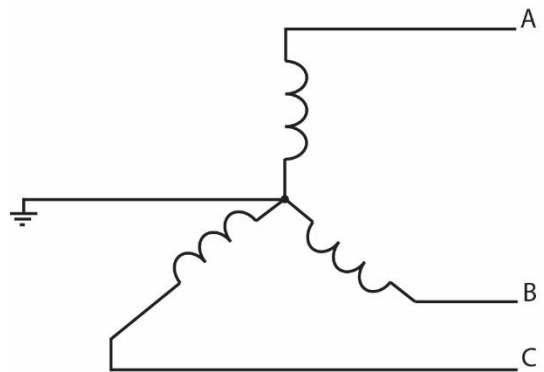
Supply configurations No's 1-12

|                                                                                                                                                      |                                                                                                                                                       |
|------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>① 3ph Y 4-wire grounded<br/>Neutral &amp; contiguous ground</p>  | <p>② 2ph Y 3-wire grounded<br/>Neutral &amp; contiguous ground</p>  |
| <p>③ 3ph Delta 4-wire grounded at midpoint of phase</p>            | <p>④ 3ph Open Delta 4-wire grounded at midpoint of phase</p>       |
| <p>⑤ Single ph 3-wires grounded neutral</p>                       | <p>⑥ Single ph 2-wires grounded neutral</p>                       |

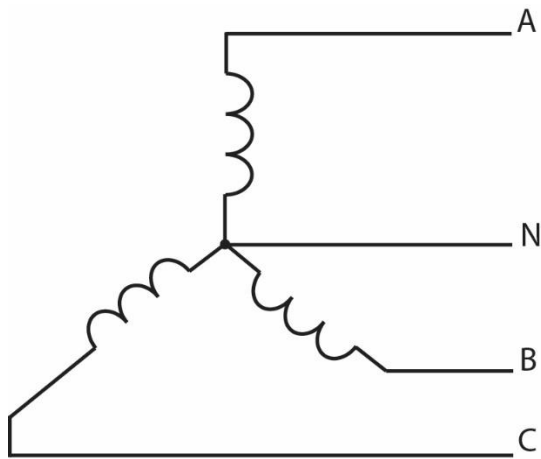
⑦ 3ph Y 3-wire



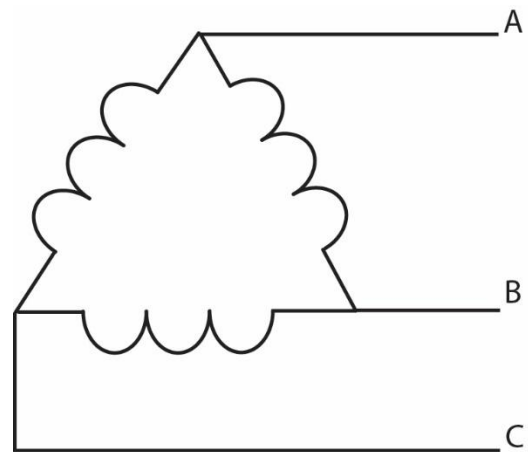
⑧ 3ph Y 3-wire grounded neutral



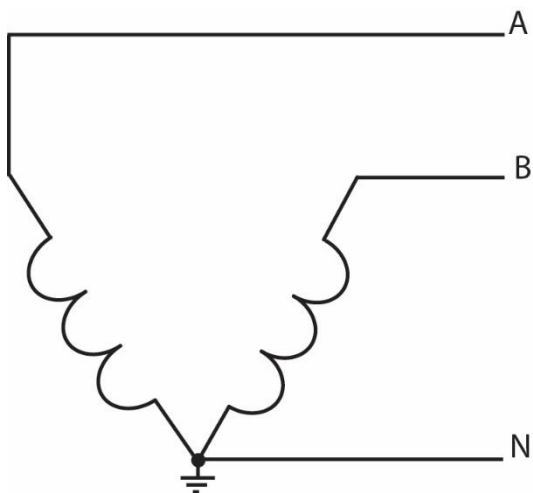
⑨ 3ph Y 4-wire grounded neutral



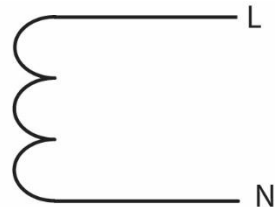
⑩ 3ph Delta 3-wire



⑪ 3ph Open Delta 3-wires grounded junction of phases



⑫ Single phase 2-wire non-grounded neutral



## N4A power up sequence.

Ensure the rocker switch on the front of the unit is set to position 0. Switch on the 3-Phase input to the N4A by setting the rotary "Power" switch on the rear of the unit to position 1.

Power to the instrument is now controlled by the rocker switch on the front panel. Switch on the N4A.

The instrument will begin by displaying the initial "splash screen". The firmware and model numbers are displayed, as well as a number of user-definable strings ([See here](#)). The display will then default to the output summary screen and after a few seconds amplifier status data will start being received and displayed.

The N4Axx-M contains a 3-phase waveform generator unit. Outputs of the generator are located at the back of the instrument and are labelled "Generator Output – PH1, PH2, PH3". The reference input to the power amplifier is located below the outputs and is labelled "PH1 IN". The 6 inch BNC cable must be connected between the PH1 output and PH1 input for any signal to be present at the main amplifier output.

The generator is off by default, but the **OUTPUT MONITOR** may show a small voltage reading (100mV) due to the tolerance of the measurement device.

## Amplifier output

Although the output terminals are not the conventional high and low, for clarity the left hand (BLACK) terminal can be considered as the positive and the right hand (BLUE) as the negative terminal.

## Output warnings

---



**CAUTION.** It should be noted that the two main output terminals on the amplifier are **NOT** grounded and should not be grounded under any circumstances.

**The three HI output terminals on a 3-Phase unit MUST NOT be connected to the same point under any circumstances.**

---

In the event of any problem with this procedure, please contact customer services at Newtons4th Ltd. or your local authorised representative: contact addresses and telephone numbers are given in the appendix at the back of this manual.

## Protection

| Model                        | Input Protection Recommendation |             |
|------------------------------|---------------------------------|-------------|
|                              | Magneto-thermic                 | RCD         |
| N4A03                        | Type C                          | Type B 30mA |
| N4A03 Isolated               | Type C                          | Type F 30mA |
| N4A06                        | Type C                          | Type B 30mA |
| N4A06 Isolated               | Type C                          | Type F 30mA |
| N4A18                        | Type C                          | Type F 30mA |
| N4A30                        | Type C                          | Type F 30mA |
| N4A67 / HV                   | Type C                          | Type F 30mA |
| 3Ph with Step up transformer | Type C                          | Type F 30mA |

| Model                        | Output Protection Recommendation |               |
|------------------------------|----------------------------------|---------------|
|                              | Magneto-thermic                  | RCD           |
| N4A03                        | Type C                           | Not necessary |
| N4A03 Isolated               | Type C                           | Type B 30mA   |
| N4A06                        | Type C                           | Not necessary |
| N4A06 Isolated               | Type C                           | Type B 30mA   |
| N4A18                        | Type C                           | Type B 30mA   |
| N4A30                        | Type C                           | Type B 30mA   |
| N4A67 / HV                   | Type C                           | Type B 30mA   |
| 3Ph with Step up transformer | Type C                           | Type B 30mA   |

## Using the menus

The N4A is a versatile instrument with many configurable parameters. These parameters are accessed from the front panel via a number of menus.

Each of the main menus may be accessed directly from a specific key.

| KEY           | FUNCTION                                                                                    |
|---------------|---------------------------------------------------------------------------------------------|
| <i>PH1</i>    | PH1 generator output settings                                                               |
| <i>PH2</i>    | See PH1, Available on 3-phase versions only.                                                |
| <i>PH3</i>    | See PH1, Available on 3-phase versions only.                                                |
| <i>SWEEP</i>  | This option is not presently available                                                      |
| <i>CONFIG</i> | Amplifier settings such as sense and coupling                                               |
| <i>MAINT</i>  | Time since last maintenance of each phase                                                   |
| <i>HARM</i>   | Adding harmonics to a waveform                                                              |
| <i>ALARM</i>  | This option is not presently available                                                      |
| <i>SEQ</i>    | Creating a sequence of amplitudes and frequencies                                           |
| <i>SYS</i>    | General system options such as communications recall, display brightness and keyboard beep. |
| <i>COMMS</i>  | Communications options (USB / LAN / Serial)                                                 |
| <i>PROG</i>   | Recall, store and delete non-volatile programs.                                             |

Each menu starts with the currently set parameters visible but no cursor. In this condition, pressing the menu key again or the *HOME* key aborts the menu operation and reverts back to normal operation.

To scroll through parameters, press the ▲ or ▼ keys to move the cursor through the menu. Pressing *ENTER* or using the numerical keypad allows the user to edit the parameter highlighted by the cursor. In this condition, the keys take on their secondary function such as numbers 0-9 or +/-.

Pressing the *HOME* key once removes the cursor from the display. Pressing the *HOME* key, a second time exits the current menu and reverts back to the summary display.

Parameters can also be altered from the main summary display screen. To change a parameter, first press the *HOME* key to bring up the cursor. Scroll through parameters by using the ▲ and ▼ arrow keys and edit by pressing *ENTER* or a numerical key. Remove the cursor with the *HOME* key, at this point a voltage or frequency step can be performed by using the arrow keys. The ▲ and ▼ arrow keys step the output voltage up or down by the multiplier parameter displayed. Frequency can also be stepped up or down by using the ◀ and ▶ arrow keys.

*To abort the menu sequence, press the HOME key twice*

There are three types of data entry:

selection from a list

numeric

text

In addition, there is a special entry mode for table creation.

## Selection from a list

This data type is used where there are only specific options available such as the coupling may be '2-wire' or '4-wire'.

Use the ▲ and ▼ arrow keys to move the cursor through the menu items, Either *ENTER* or ▶ can be used to open the drop-down list for a highlighted item.

The number keys 0-9 step directly to that point in the list, which provides a quick way to jump through long lists. The *ENTER* key should then be pressed to confirm a selection.

## Numeric data entry

Frequency and Voltage parameters are entered as real numbers.

Real numbers are entered using the number keys, decimal point key, or +/- key (if signed value is permitted). When the character string has been entered, pressing the *ENTER* key sets the parameter to the new value. Until the *ENTER* key is pressed, pressing the *HOME* key aborts the data entry and restores the original number.

If a data value is entered that is beyond the valid limits for that parameter, then a warning is issued, and the parameter set as close to the requested value as possible. For example, the maximum frequency of the N4A source is 10 KHz; if a value of 15 KHz is entered, a warning will be given and the frequency set to the maximum of 10 KHz.

When the parameter is first selected there is no character cursor visible – in this condition, a new number may be entered directly and will overwrite the existing number.

To edit a data value rather than overwrite it, press the ► key and a cursor will appear. The cursor can be moved using the ◀ and ▶ keys. New characters are inserted at the cursor position as the keys are pressed, or the character before the cursor position can be deleted with the *DELETE* key.

Data values are always shown in engineering notation to at most 5 digits (1.0000-999.99 and a multiplier).

## Text entry

There are occasions where it is useful to enter a text string; for example, a non-volatile program may have some text as a title.

Text is entered by selecting one of 9 starting characters using the Setup keys / Numeric keypad ([see here](#)), then stepping forwards or backwards through the alphabet with the ▲ and ▼ keys.

Keys 2 to 9 and +/- provide starting letters A,D,G,J,M,P,T,W and space. For example, the letter C is entered by pressing the 2 / PH2 key three times.

The ▲ and ▼ keys step forward and backwards using the ASCII character definitions – other printable characters such as # or ! can be obtained by stepping on from the space. The available character set is given in the [Appendix](#)

When entering alphabetic characters, the PROG key selects upper and lower case respectively for the character preceding the cursor and the next characters to be entered.

The editing keys, RIGHT, LEFT, DELETE and ENTER operate in the same way as for numeric entry.

## Table entry

For the SWEEP, HARM and SEQ menus, data is entered into a table. As some of these tables can have up to 100 entries, the whole table is not always visible on the display.

By pressing the ▼ arrow, the cursor can be used to highlight each value in a table. To bring up the parameters held in a highlighted cell, press *ENTER*. Values within that cell are then edited in the same way as in any other menu. Once new values have been chosen, highlight the **SAVE** option within the box and press *ENTER*. You will now see the new values stored within the table.

## Using remote control

The N4A is fitted with RS232, USB serial and LAN communication ports as standard. All the interfaces use the same ASCII protocol.

|       | Rx expects                             | Tx sends                      |
|-------|----------------------------------------|-------------------------------|
| RS232 | carriage return<br>(line feed ignored) | carriage return and line feed |
| USB   | carriage return<br>(line feed ignored) | carriage return and line feed |
| LAN   | carriage return<br>(line feed ignored) | carriage return and line feed |

All three communications ports offer the same functionality i.e., firmware upgrades, reading and writing parameters.

The commands are not case sensitive and white space characters are ignored (e.g., tabs and spaces). Replies from the N4A are always upper case, delimited by commas, without spaces.

Only the first six characters of any command are important – any further characters will be ignored. For example, the command to set the generator frequency is FREQUE but the full word FREQUENCY may be sent as the redundant NCY at the end will be ignored.

Fields within a command are delimited by a comma, multiple commands can be sent on one line delimited with a semi-colon e.g.

*MODE,DC; AMPLIFIER,SENSE,WIRE2*

Mandatory commands specified in the IEEE488.2 protocol have been implemented, (e.g., *\*IDN? \*RST*) and all commands that expect a reply are terminated with a question mark.

The N4A maintains an error status byte consistent with the requirements of the IEEE488.2 protocol (called the standard event status register) that can be read by the mandatory command *\*ESR?*

The N4A also maintains a status byte consistent with the requirements of the IEEE488.2 protocol, that can be read by the mandatory command *\*STB?* Over RS232 or LAN

The RS232 data format is: a start bit, 8 data bits (no parity), 1 stop bit. Flow control is RTS/CTS baud rate is selectable via the **COMMS** menu. When connecting to a PC use the supplied null modem cable.

Full details of the available commands are given in the Appendix D.

Commands are executed in sequence except for two special characters that are immediately obeyed:

*Control T (20)* – reset interface (device clear)

*Control U (21)* – warm restart

**Standard event status register**

|     |  |     |     |     |  |  |     |
|-----|--|-----|-----|-----|--|--|-----|
| PON |  | CME | EXE | DDE |  |  | OPC |
|-----|--|-----|-----|-----|--|--|-----|

bit 0 OPC (operation complete)

cleared by most commands

set when data available or sweep complete

bit 3 DDE (device dependent error)

set when the instrument has an error

bit 4 EXE (execution error)

set when the command cannot be executed

bit 5 CME (command interpretation error)

set when a command has not been recognised

bit 7 PON (power on event)

set when power first applied or unit has reset

The bits in the standard event status register except for OPC are set by the relevant event and cleared by specific command (*\*ESR?* *\*CLS*, *\*RST*). OPC is also cleared by most commands that change any part of the configuration of the instrument (such as **MODE** or **START**).

**Serial Poll status byte**

|  |  |     |     |  |     |     |     |
|--|--|-----|-----|--|-----|-----|-----|
|  |  | ESB | MAV |  | FDV | SDV | RDV |
|--|--|-----|-----|--|-----|-----|-----|

bit 0 RDV (result data available)

set when results are available to be read as enabled by *DAVER*

bit 1 SDV (sweep data available)

set when sweep results are available to be read as enabled by *DAVER*

bit 2 FDV (fast data available (streaming))

set when data streaming results are available to be read as enabled by *DAVER*

bit 4 MAV (message available)

set when a message reply is waiting to be read

bit 5 ESB (standard event summary bit)

set if any bit in the standard event status register is set as well as the corresponding bit in the standard event status enable register (set by \*ESE).

## RS232 connections

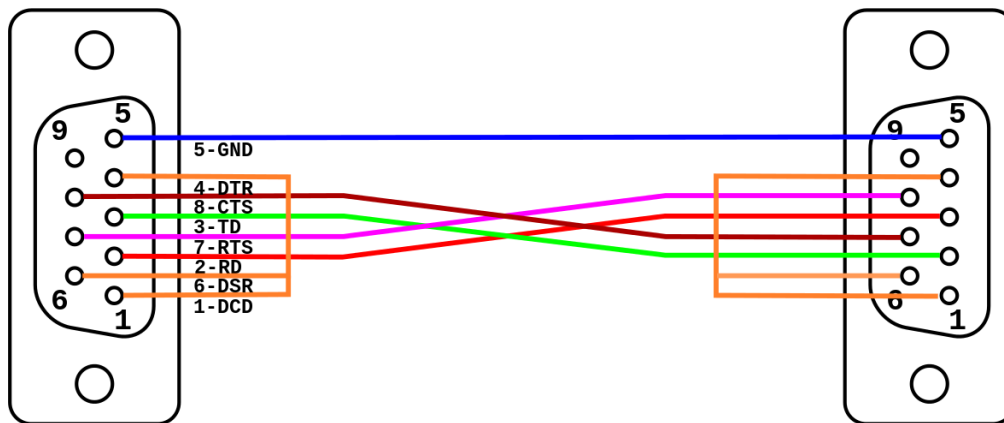
The RS232 port on the N4A uses the same pinout as a standard 9 pin serial port on a PC or laptop (9-pin male 'D' type).

| Pin | Function | Direction           |
|-----|----------|---------------------|
| 1   | DCD      | in (+ weak pull up) |
| 2   | RX data  | in                  |
| 3   | TX data  | out                 |
| 4   | DTR      | out                 |
| 5   | GND      |                     |
| 6   | DSR      | not used            |
| 7   | RTS      | out                 |
| 8   | CTS      | in                  |
| 9   | RI       | not used            |

The N4A will only transmit when CTS (pin 8) is asserted and can only receive if DCD (pin 1) is asserted. The N4A constantly asserts (+12V) DTR (pin 4) so this pin can be connected to any unwanted modem control inputs to force operation without handshaking. The N4A has a weak pull up on pin 1 as many null modem cables leave it open circuit. In electrically noisy environments, this pin should be driven or connected to pin 4.

To connect the N4A to a PC, use a 9 pin female to 9 pin female null modem cable:

|       |   |       |
|-------|---|-------|
| 1 & 6 | - | 4     |
| 2     | - | 3     |
| 3     | - | 2     |
| 4     | - | 1 & 6 |
| 5     | - | 5     |
| 7     | - | 8     |
| 8     | - | 7     |



**Null-Modem cable pin out**

## Keyboard functions

The keyboard is divided into 5 blocks of keys:

Pre-set waveform keys (six keys top right)

Menu control (cursor) keys (seven centre keys)

Display control keys (five keys top left)

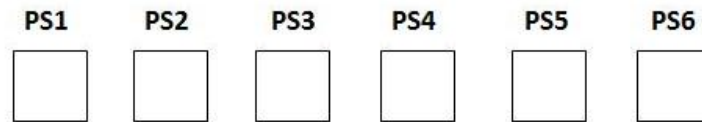
Setup keys and numeric keypad (twelve keys lower left)

Control keys (four keys lower right)

In normal operation, the cursor keys give one-touch adjustment of the frequency and voltage parameters without having to access the menu system. The ◀/▶ cursor keys adjust the frequency whilst the ▲/▼ cursor keys adjust the voltage levels.

The Setup keys and numeric keypad provide access to the menus and are used for numeric data entry.

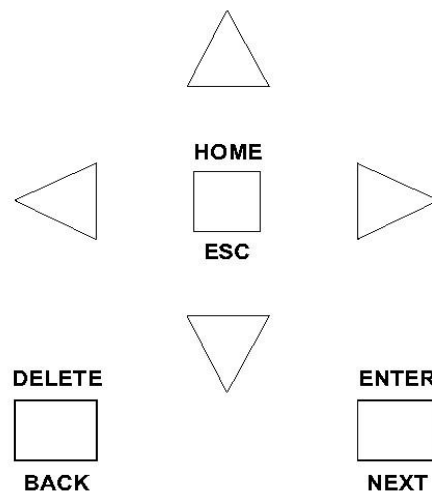
## Pre-set waveform keys



This row of pre-set keys is used to recall saved programs from internal non-volatile memory. For the keys to perform this operation, the user must first assign a saved program to a key. To assign a program to a key, by entering **the pre-set key** menu, press the *PROG* key and then ► arrow.

Further details of assigning these keys can be found [here](#).

## Menu control (cursor) keys



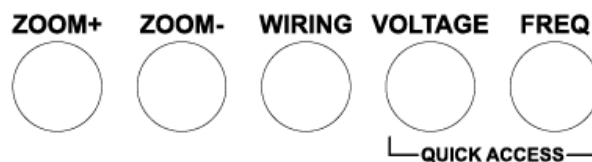
ENTER/NEXT confirms a selection or parameter value/data entry. Also allows the user to move between home screens for each phase.

HOME/ESC returns to the original entry or to a previous action.

DELETE/BACK removes a previous selection or value,  
or returns to your previous action.

ARROW KEYS (▲, ▼, ◀, ▶) to move around menu  
options, make incremental/decremental changes etc.

## Display control keys



*ZOOM+ and ZOOM-*

*These keys are currently non-operational.*

### **WIRING**

1-phase is displayed on a single phase instrument.

On a 3-phase instrument, 1-phase or 3-phase options will be available.

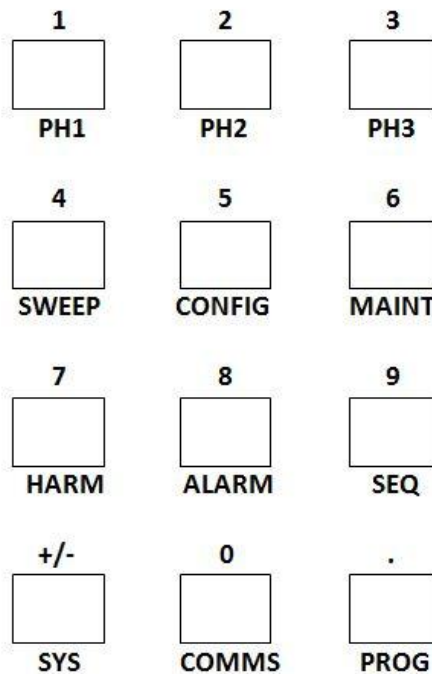
### **VOLTAGE**

This shortcut key highlights the cursor over the voltage parameter on the **HOME** screen, allowing the user to update the output voltage.

### **FREQ**

This shortcut key highlights the cursor over the fundamental frequency parameter on the **HOME** screen, allowing the user to update the output voltage. This key has no function when the N4A is in DC mode.

## Setup keys and numeric keypad

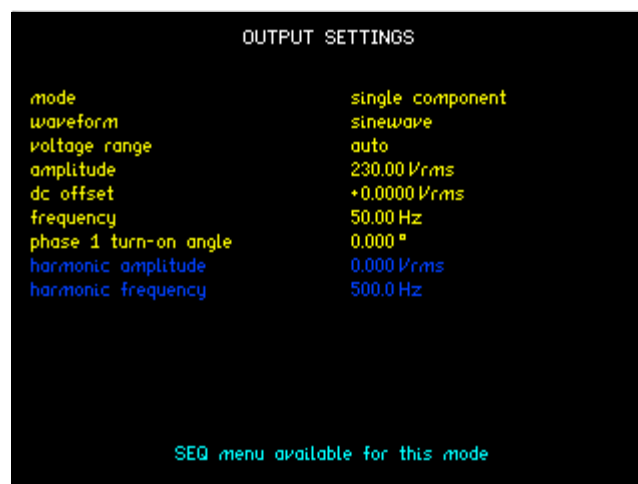


### Setup keys

These keys provide access to various N4A parameters.

#### PH1

This key is used to set the main output voltage and frequency of the PH1 amplifier. The **MODE** of operation is also set within this menu. Other mode specific settings will be displayed.



### PH2

This key is used to set the output voltage and frequency of the PH2 amplifier; in addition, the PH2 phase offset can be set in relation to PH1.

### PH3

This key is used to set the output voltage and frequency of the PH3 amplifier; in addition, the PH3 phase offset can be set in relation to PH1.

### SWEEP

*This key is currently non-operational. This function will be added at a later date.*

### CONFIG

This key is used to access amplifier specific settings, such as coupling and sense.

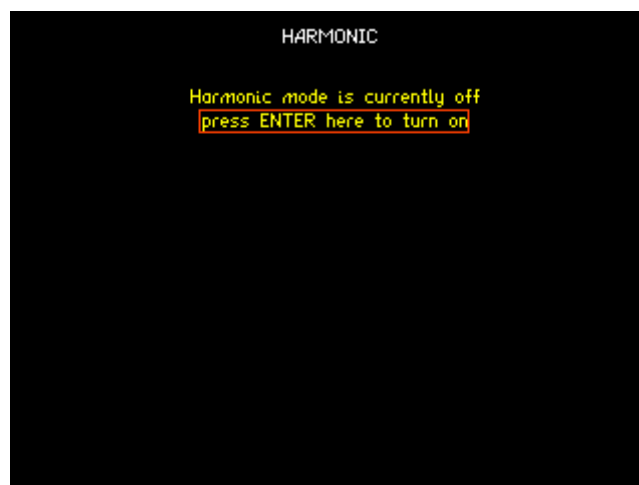
### MAINT

This key will display the time since the last service. For 3-phase instruments, the time for each phase will be displayed.

### HARM

This key allows access to the harmonic series creator and is currently only available in HARMONIC SERIES mode. This mode allows the addition of up to 99 harmonics, of independent magnitude and phase, to a sinewave.

As this menu is not available in all modes, the following message may be displayed when the *HARM* key is pressed:



This reminds the user that the N4A mode has to be updated to use the **HARM** menu. Use the ▼ arrow to highlight the text shown above, press *ENTER* to update the MODE and show the menu.

#### **ALARM**

*This key is currently non-operational. This function will be added at a later date.*

#### **SEQ**

Sequence mode enables the user to generate a table of the output voltage and frequency values and to specify the time each entry is present at the output. This table of entries can be executed once or cycled through continuously. See [Using Sequence](#) for a detailed view of this menu.

#### **SYS**

This key displays various system parameters such as display brightness and keyboard beep. Use the ◀ and ▶ arrow keys to access user data and system information from this menu.

#### **COMMS**

Use this key to change communication port.

#### **PROG**

Use this key to store and recall N4A parameters, as a single block of data.

## Numeric entry

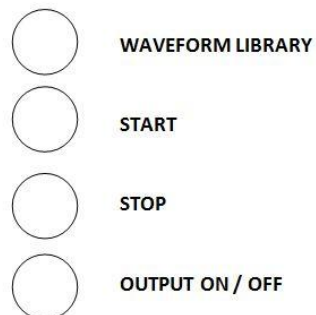
Use NUMERIC KEYS for number, multiplier, decimal point, or +/- to enter parameter value.

Press *ENTER* (MENU CONTROL KEYS) to set value.

Press *HOME* (MENU CONTROL KEYS) to abort data entry, & restore original.

(Values may be overwritten, or edited by use of the **▶**, **◀** and *DELETE* keys)

## Control keys



### *WAVEFORM LIBRARY*

This key is currently non-operational and will be added at a later date.

### *START*

Press this key to start a sequence or to update the output waveform in harmonic series mode.

### *STOP*

Press this key to stop a sequence.

### *OUTPUT ON/OFF*

To turn on the generator output press and hold this button until the output switches on. Press and release this key to turn off the amplifier. This should be done from the **HOME** screen.

## Program settings

The PROG menu allows the user to save all instrument settings to a non-volatile memory location. Any sequence data entered into a table is also saved within the program.

### Store/recall

The steps for saving or recalling a program are shown below:



1. Press the *PROG* button to open up program store/recall mode.
2. Select the action to be taken – store, recall or delete.
3. Select the location that is to be recalled from, stored to or deleted from, there are 50 locations available.

**Location 0** = FACTORY DEFAULT *and cannot be changed.*

**Location 1** = Programs stored within program location 1 can be automatically recalled when the instrument is switched on.

4. Enter a name within this parameter to aid the user in relation to storing/recalling a program to/from memory for future reference. To enter a name, use the Alpha / Numerical keypad on the instruments front panel.
5. Remember to scroll down to **EXECUTE** and press *ENTER* to validate your selection/action.

## Power on program

The instrument will power up with program settings in one of three states:

- Program 1
- Factory default
- As last used

The power on program option is set in the **SYS** menu under initial settings.

### ***Program 1***

The instrument first looks for a valid program saved in memory location 1 and then if able to, loads it as the active configuration.

If program 1 is empty, the factory default program is loaded.

### ***Factory default***

This is the default set up of the N4A and cannot be changed by the user.

### ***As last used***

The instrument saves the active instrument configuration in non-volatile memory. This means the instrument settings will not be affected by cycling the power.

## Display Layout and Parameter adjustment

The default display or **HOME** screen provides a quick reference view of the fundamental N4A settings. There is a dedicated view for each output phase, which can be accessed using the **NEXT** and **BACK** keys.

### Layout Breakdown

#### Generator settings ①

The box on the top left of the screen displays the amplitude, frequency, and step size for the indicated phase.

#### Mode and Waveform ②

The central window displays the selected mode along with a corresponding waveform.

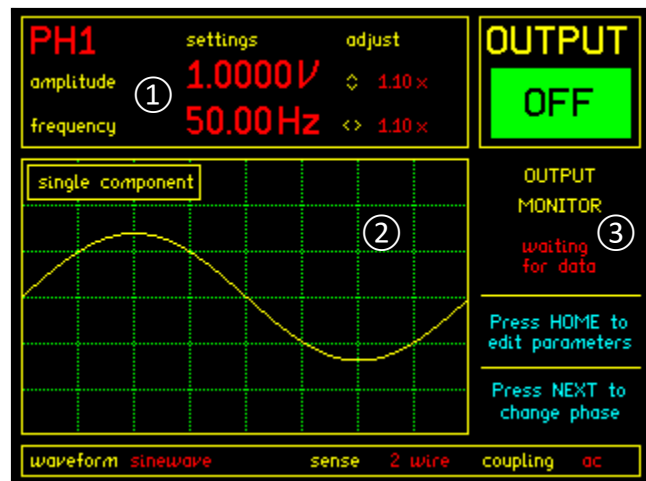
Note: The waveform display is not an accurate representation of the output; it is simply a quick reference.

#### Output Monitor ③

The top right hand corner of the display indicates the state of the amplifier output relay. On 3-phase units, there is a separate relay for each output and a corresponding OUTPUT display. Voltage and current readings taken at the output terminals are displayed below this indicator. If an amplifier alarm becomes active, such as overvoltage, the readings are replaced by a warning message.

#### Help and Information ④

The Help and information text displayed in light blue gives mode-dependant warnings, which may flash to remind the user that they have not completed a particular operation.



## Further Settings

The box at the bottom of the display allows the user to update the waveform (mode permitting), sense and coupling can also be updated for each phase.

## Direct Parameter Adjustment

From the **HOME** screen, it is possible to edit the parameters displayed, allowing quick access to fundamental N4A settings. There are two ways this can be done.

### Step Adjustment

The arrow keys are used to change the amplitude and frequency parameters, without entering a menu. The step size is set by the two ADJUST values shown to the right of these parameters. For example, 230V x 1.1 becomes 253V when the ▲ arrow is pressed.

### Direct Adjustment

Pressing the **HOME / ESC** key brings up the cursor and allows the user to scroll through editable parameters with the ▲ keys. Changing settings is performed in the same way as in a menu.

Press the **HOME / ESCAPE** key to exit the adjustment screen.

## Modes of operation

The N4A currently has five modes of operation:

Single component

Harmonic series

Dual component

DC only

IEC61000-4-13

UL2231

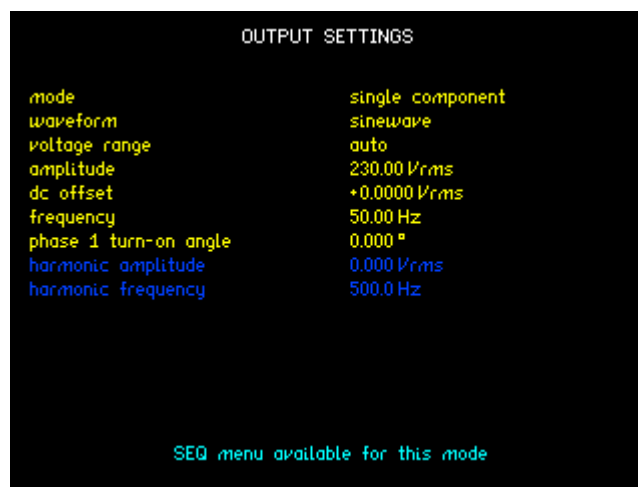
In each mode, certain features, such as sequence, may or may not be available.

| Mode             | Available feature |     |       |
|------------------|-------------------|-----|-------|
|                  | Harm              | Seq | Sweep |
| Single component | ✗                 | ✓   | ✗     |
| Harmonic series  | ✓                 | ✗   | ✗     |
| Dual component   | ✗                 | ✗   | ✗     |
| DC only          | ✗                 | ✓   | ✗     |
| IEC61000-4-13    | ✗                 | ✗   | ✗     |
| UL2231           | ✗                 | ✗   | ✗     |

## Single component

This mode can be used to generate simple waveforms, such as sine, triangle and square with no harmonics. For single-phase units, the *PH1* key should be used to edit fundamental voltage and frequency. For 3-phase units *PH1*, *PH2* and *PH3* keys give access to settings for their corresponding phase outputs.

To enter the output settings menu, press the *PH1* key.



### Voltage setting

To change the value of the RMS output voltage, select **amplitude** using the arrow keys, enter the desired value with the keypad and then press *ENTER*. Values between 0 and 300Vrms can be entered.

### DC offset

A DC offset can be applied to the AC output of the N4A by using the **DC offset** parameter. A range of +400V to -400V is available.

## Frequency setting

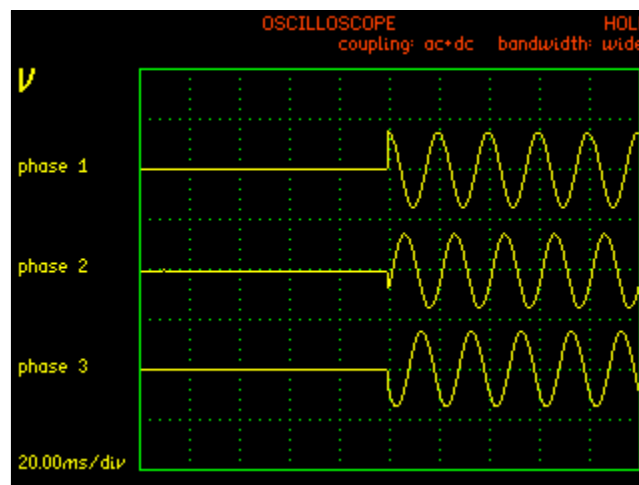
The frequency setting is accessed in the same way as voltage, through the **PH1** menu. A frequency range of 1Hz to 10 KHz is available.

## Range setting

The instrument has two voltage ranges of 30V and 300V. The output can be fixed to either of these ranges by selecting them from the **voltage range** menu item. Alternatively, the instrument can automatically select the most appropriate range when the **voltage range** is set to **auto**.

## Phase 1 turn on angle

This parameter allows the user to set the phase angle at which the N4A output turns on. The PPA oscilloscope image below shows a 3-phase N4A starting up at  $+90^\circ$ . Values between  $0^\circ$  and  $+360^\circ$  are valid for this option.



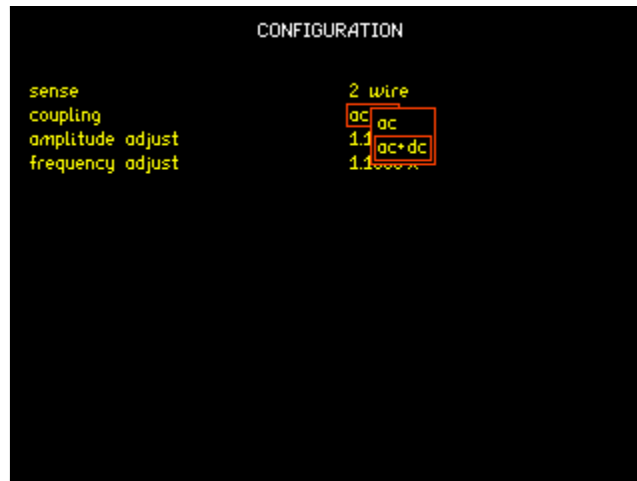
N4A18 with  $+90^\circ$  turn on angle

## Setting a DC Offset Voltage

It is possible to apply a DC offset to the AC sinewave output of the N4A source. The nominal accuracy of the applied DC level is  $\pm 500\text{mV}$  so where necessary slight adjustments to the DC output of the Source will need to be made to obtain the required offset. The DC level can be monitored using the True RMS Voltmeter mode on a PPA connected to the Output terminals of the Source.

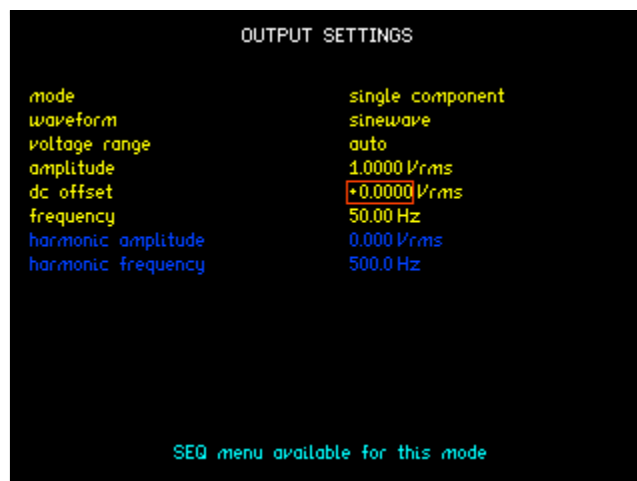
## Instrument Setup details:

Press the *Config* button on the Source to display the Configuration menu.



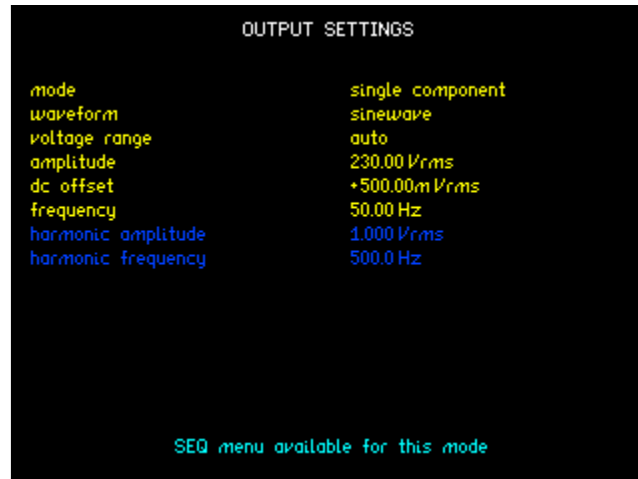
Using the arrow keys highlight the coupling option and then select **ac+dc** from the drop down menu. Press the *ENTER* button twice to return to the default display.

Press the *PH1* key to display the **Output Settings** Menu.

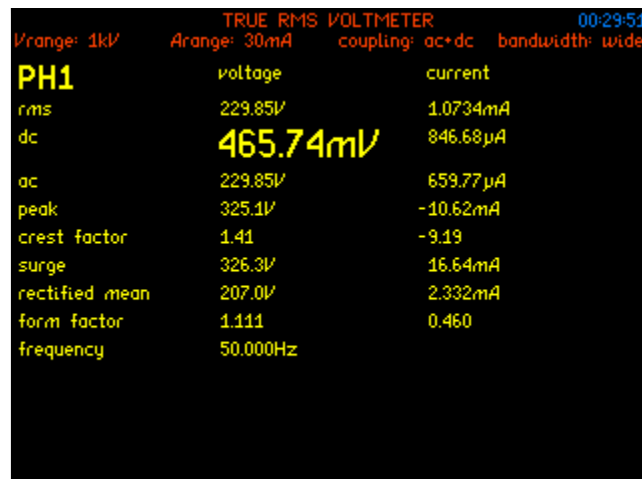


Check that the **mode** is set to **Single component**.

Use the arrow keys to highlight the required parameter in the menu to be set. Type in the required value and press **ENTER**. Use the arrow keys to select the next parameter and repeat the process. The required **Amplitude**, **Frequency** and **DC offset** need to be entered:



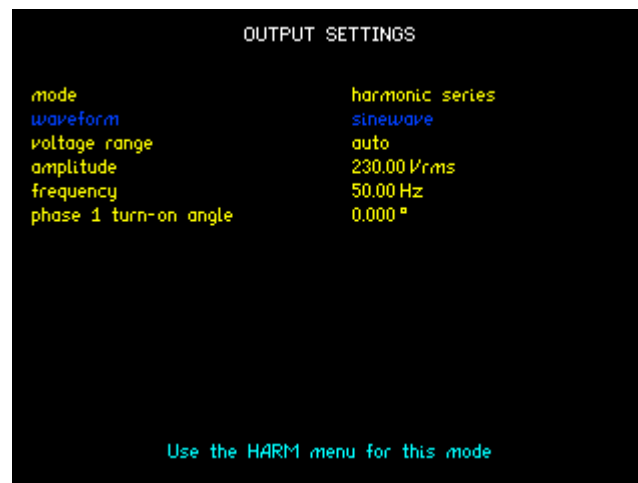
Press the **ENTER** button to return to the default screen. Check that the PPA is connected and set to **RMS Voltmeter** mode. Hold down the **Output On/Off** key for a second until the Output turns on.



Observe the DC level displayed on the PPA. If necessary, press the **PH1** key on the Source to return to the **Output Settings** menu. Use the process above to make slight adjustments to the **DC Offset** value until the required DC level is displayed on the PPA.

## Harmonic series

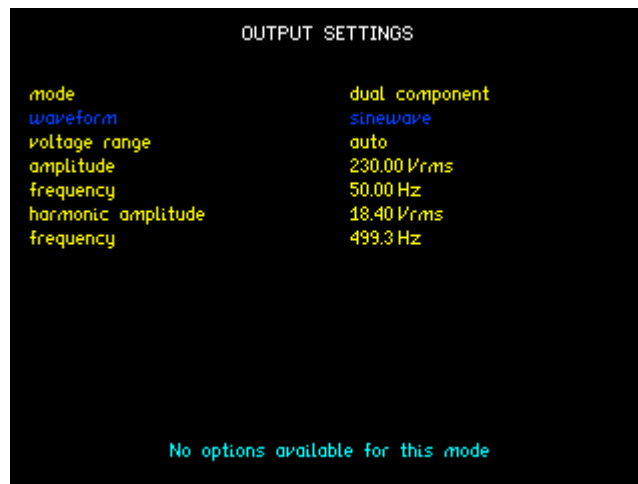
Harmonic series mode allows the addition of multiple harmonic components to a sine wave. This is achieved through the **HARM** menu by creating a table of magnitudes and phases for individual harmonic components.



For further details about using the [HARM](#) menu.

## Dual component

This mode allows the generation of two independent frequency components. Voltage and frequency, for each component, are set in the same way as *single component* mode.



Note that in 3-phase mode, the voltage parameters displayed in PH2 and PH3 are independent, but the frequency applies to all three phases.

For example:

Primary settings

PH1 Voltage = 230 Vrms, Frequency = **50** Hz

PH2 Voltage = 210 Vrms, Frequency = **50** Hz

PH3 Voltage = 235 Vrms, Frequency = **50** Hz

Secondary (harmonic) settings

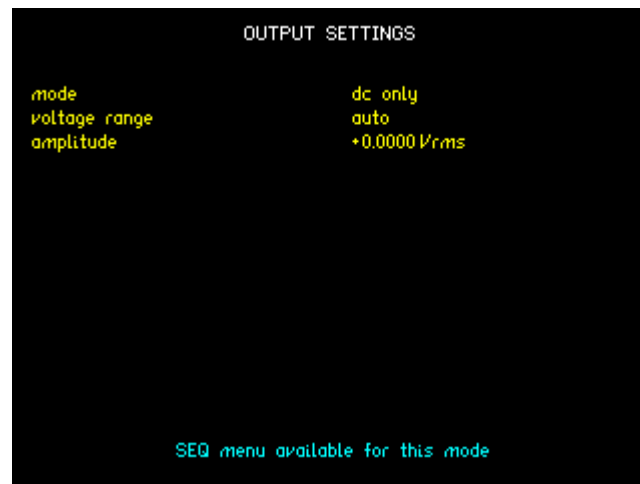
PH1 Voltage = 15 Vrms, Frequency = **480** Hz

PH2 Voltage = 23 Vrms, Frequency = **480** Hz

PH3 Voltage = 12 Vrms, Frequency = **480** Hz

## DC only

This mode provides a DC only output voltage when in use make sure that *coupling* is set to **ac+dc**.



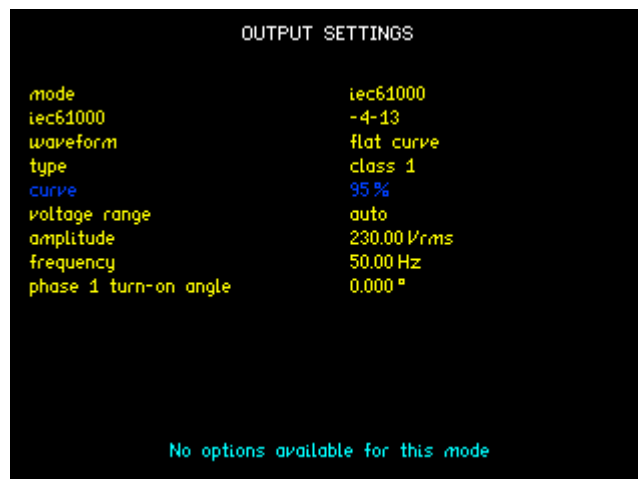
The **Sequence** menu is available in this mode, see [using sequence](#) for further details.

## IEC61000

This mode provides IEC61000-4-13 and IEC61000-4-17 standard specific waveforms. Use the *iec61000* menu parameter to change between standards.

### IEC61000-4-13 - Flat curve

The instrument can provide a flat curve waveform for class 1, 2 and 3 tests. By selecting **type > class x** the user can set a flat curve to any value between 70% and 99%. The amplitude and frequency are set in the same way as in other modes.

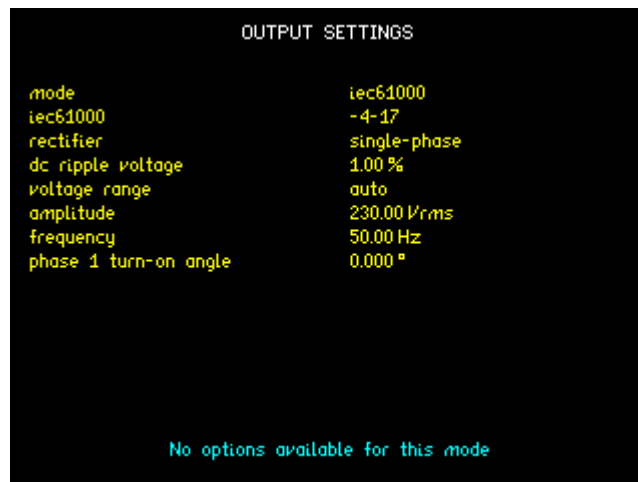


In accordance with the standard, the flat part of the sine wave is calculated as a percentage of the peak. The output is then multiplied by a scale factor  $K_y$  so that the resulting RMS voltage equals that of a normal sine wave of equivalent amplitude.

The harmonic over swing test is not currently available from the menus but can be performed through IECSoft.

## IEC61000-4-17 – D.C. ripple

In accordance with the IEC61000-4-17 standard, the N4A can superimpose an AC rectifier like ripple onto a DC voltage. Both single and 3-phase rectifiers options are available. Use the **rectifier** menu parameter to change between the two options.



The AC and DC components are calculated from the **dc ripple voltage** and **amplitude** parameters:

$$amplitude = U_{dc} = U_{max} - 0.5 * (U_{max} - U_{min})$$

Where

$$U_{max} = U_{dc} + U_{dc} * \frac{ripple\ voltage}{2} (\%)$$

For 230V amplitude with 10% ripple

$$U_{max} = 230 + (230 * 5\%) = 241.5V$$

$$U_{min} = 230 - (230 * 5\%) = 218.5V$$

## UL2231

This mode allows the injection of a high frequency ringing waveform on to a 60Hz fundamental sinusoid, in accordance with UL2231-2: 24.9.

The ring decays exponentially with a time constant of 1.6ms and has a magnitude equal to 40% of the fundamental amplitude.

The ringing frequency is user selectable within the range of 1,2,3,4 and 5 kHz and lasts for 8ms as required by the standard.

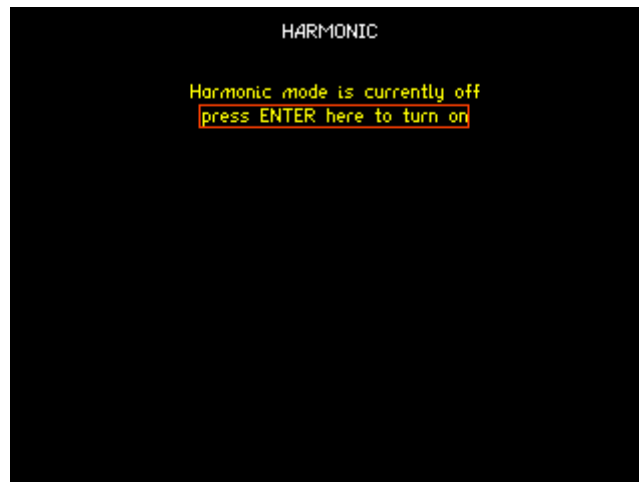
The waveform is applied by pressing the *START* key. Each press of the key applies the ringing only once so that it can be applied 5 times randomly.



If using a 3-phase instrument the ringing waveform can be injected on to any of the three output phases.

## Using Harmonic Series

The Harmonic settings menu can be accessed through the *HARM* key. If not already in **harmonic series** mode, use the ▼ arrow key to highlight “press ENTER here to turn on”.



Press the *Enter/Next* key to activate Harmonics mode and display the harmonic series table.

A screenshot of a device's menu interface showing a table titled 'HARMONIC SERIES'. The table has five columns: Order, Magnitude, Phase, Vrms, and Frequency. The data is as follows:

| Order | Magnitude | Phase  | Vrms   | Frequency |
|-------|-----------|--------|--------|-----------|
| Fund. | -         | -      | 1.000V | 50.00Hz   |
| 2     | 0.00%     | 000.0° | 0.000V | 100.0Hz   |
| 3     | 0.00%     | 000.0° | 0.000V | 150.0Hz   |
| 4     | 0.00%     | 000.0° | 0.000V | 200.0Hz   |
| 5     | 0.00%     | 000.0° | 0.000V | 250.0Hz   |
| 6     | 0.00%     | 000.0° | 0.000V | 300.0Hz   |
| 7     | 0.00%     | 000.0° | 0.000V | 350.0Hz   |
| 8     | 0.00%     | 000.0° | 0.000V | 400.0Hz   |
| 9     | 0.00%     | 000.0° | 0.000V | 450.0Hz   |
| 10    | 0.00%     | 000.0° | 0.000V | 500.0Hz   |

Below the table, the text 'Press START to update output' is displayed.

To begin editing the table use the ▼ arrow key to bring up the cursor.

HARMONIC SERIES

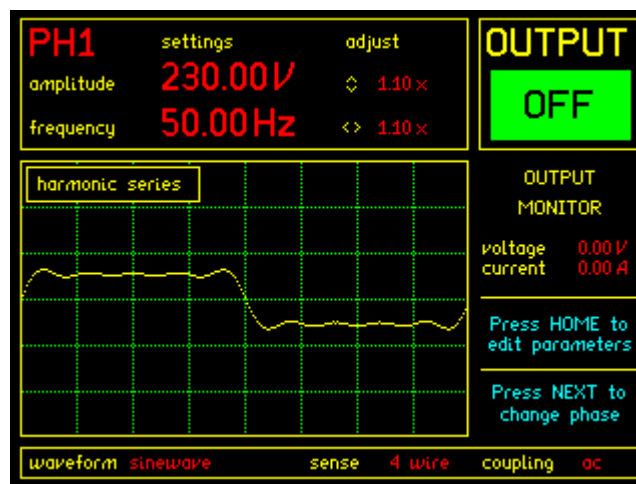
| Order | Magnitude | Phase  | Vrms   | Frequency |
|-------|-----------|--------|--------|-----------|
| Fund. | -         | -      | 230.0V | 50.00Hz   |
| 2     | 0.00%     | 000.0° | 0.000V | 100.0Hz   |
| 3     | 33.3%     | 000.0° | 76.59V | 150.0Hz   |
| 4     | 0.00%     | 000.0° | 0.000V | 200.0Hz   |
| 5     | 20.0%     | 000.0° | 46.00V | 250.0Hz   |
| 6     | 0.00%     | 000.0° | 0.000V | 300.0Hz   |
| 7     | 14.3%     | 000.0° | 32.89V | 350.0Hz   |
| 8     | 0.00%     | 000.0° | 0.000V | 400.0Hz   |
| 9     | 11.1%     | 000.0° | 25.53V | 450.0Hz   |
| 10    |           |        |        |           |

|                                  |         |
|----------------------------------|---------|
| order                            | 9       |
| magnitude                        | 11.1 %  |
| phase                            | 000.0 ° |
| press ENTER to save clear cancel |         |

First, set the fundamental voltage and frequency by highlighting **Fund** and pressing **ENTER**. Use the arrow keys to navigate between parameters and update as required.

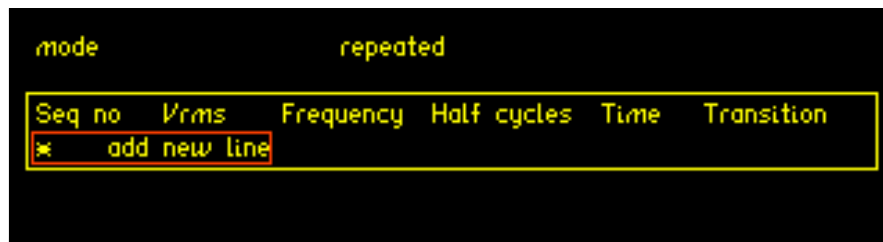
Before pressing **HOME**, highlight **Save** and press **ENTER** to add the new values to the table. Use the same process to add harmonics of order 2 to 100. Magnitude is limited to values between 0 - 50%. Once all values have been entered, press the **START** key to update the output waveform.



Although only 10 table entries are displayed at once, the ▲ and ▼ arrows provide access to all 99. Entering a number when the **order** parameter is highlighted, will also jump to that point in the table.

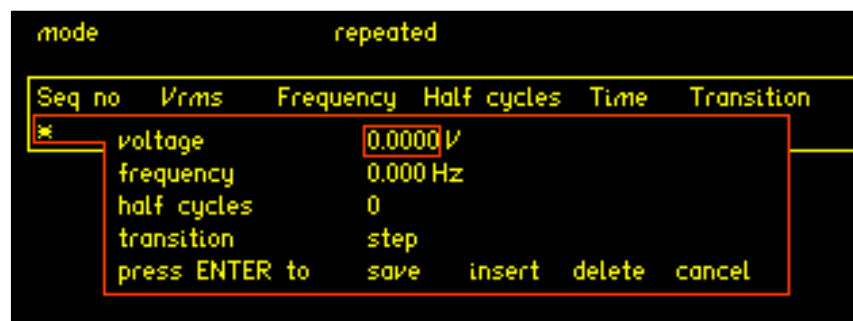
## Using Sequence

Sequence mode enables the user to generate a series of voltages (and frequencies in **generator mode**), each for a specified period. When the **START** key is pressed the N4A will automatically run through the points. This table of entries can be executed once or cycled through continuously. An overview of the parameters associated with sequence, are given below:



| Seq no | Vrms         | Frequency | Half cycles | Time | Transition |
|--------|--------------|-----------|-------------|------|------------|
| *      | add new line |           |             |      |            |

- **Mode:** Set the sequence to run through once (single shot) or run continuously (Repeated) until the stop button is pressed.
- **Add new line:** Select **add new line** and press **ENTER** to open the table entry box.



| Seq no | Vrms    | Frequency | Half cycles | Time | Transition |
|--------|---------|-----------|-------------|------|------------|
| *      | voltage | 0.0000 V  | 0.000 Hz    | 0    | step       |

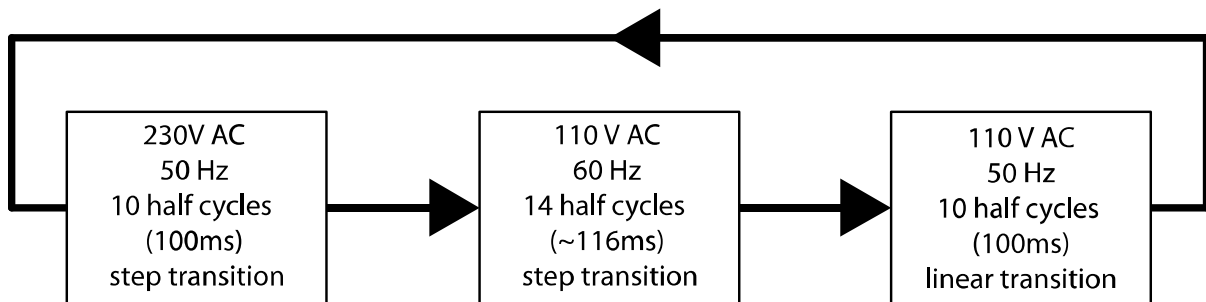
press ENTER to    save    insert    delete    cancel

- **Voltage:** Set the starting amplitude for the specified sequence number in the table. Selectable from 0.00Vrms to 300.00Vrms in generator mode and 0Vdc – 430Vdc in DC only mode.
- **Frequency:** Set the frequency for the specified step number in the table. Selectable from 1.0Hz to 10.000KHz.
- **Half cycles:** Select the required number of half cycles. Selectable from 1 to 20000. For example, at 50Hz the time period of each half cycle is 10ms. Therefore, if a time period of 30ms is required at a frequency of 50Hz then 3 half cycles would need to be selected.
- **Transition:** Can be set to either **step** or **linear**. Sets the type of transition between voltage points.

- **Save:** Once the parameters have been set for a sequence entry, highlight **Save** with the cursor and press *ENTER*.
- **Insert:** To insert a new table entry between entry[n] and entry[n+1], select entry[n] with the cursor and press *ENTER*. Add the parameters for the new entry, highlight **Insert** and then press *ENTER*.

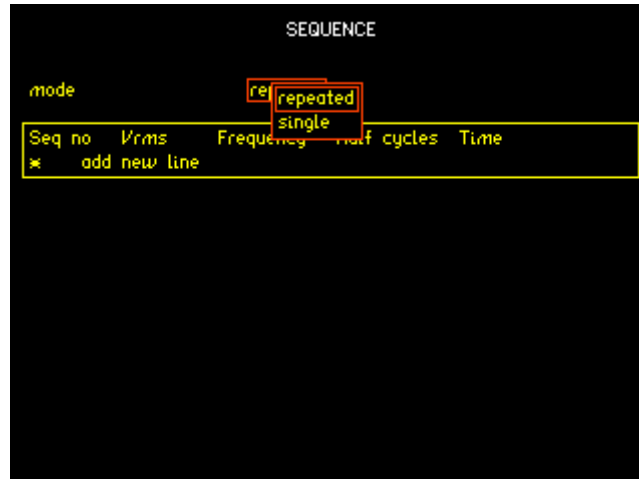
Once each line of the sequence is entered, it can be saved by moving the cursor to **Save** and pressing the *Enter* key. By reselecting **add new line**, another line in the sequence can be added. It is also possible to insert a new line in the middle of the sequence and to delete lines within the sequence, by using the **insert** and **delete** functions.

### A simple example of an AC sequence

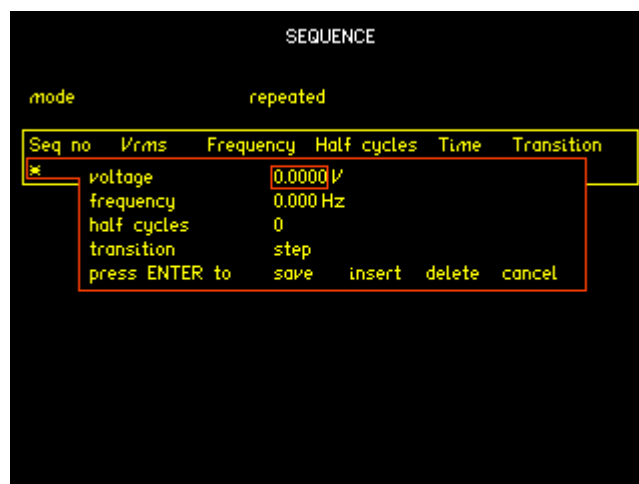


This example will run through the process of creating a simple 3 step repeating sequence:

- Enter the sequence menu by pressing the SEQ key.

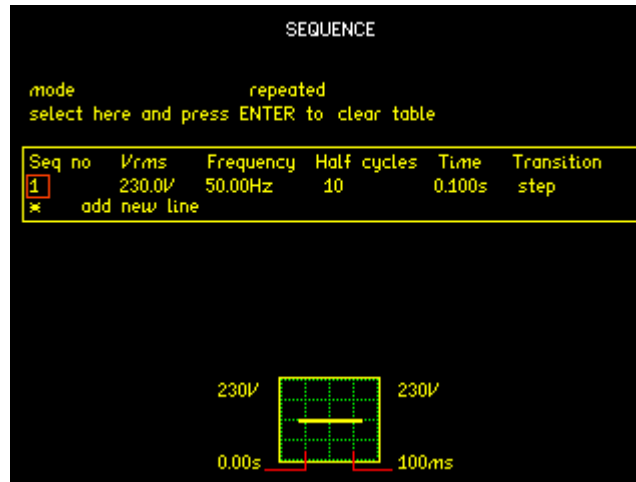


- Ensure that the sequence **mode** is set to **repeated**, as shown above.
- Use the ▼ arrow key to move the cursor to highlight **Add new line**.
- Press the **ENTER** or ► arrow key.

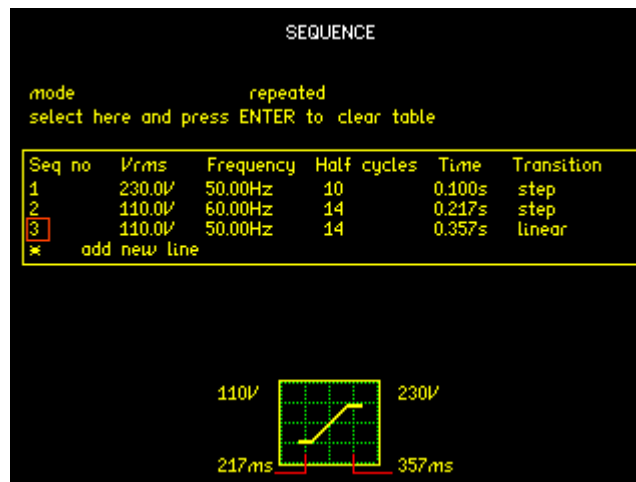


- The cursor will highlight the **voltage** parameter, enter 230 using the keypad and press **ENTER**.
- Use the ▼ arrow key to highlight frequency, enter 50 and press **ENTER** as per the previous step.
- Enter 10 half cycles and ensure transition is set to **step**.
- Use the ▼ arrow to highlight **save** and press **ENTER**. This step must be completed for the entry to be saved.

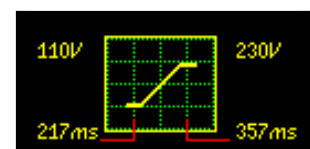
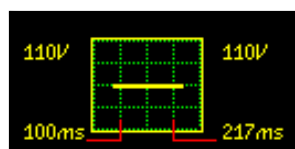
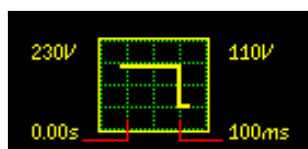
The first line of the sequence should now be complete as shown in the following screenshot:



Use the above procedure to enter the next two lines in the sequence. The completed sequence will then look like this:



As the cursor is moved over each entry, a help box will appear at the bottom of the display indicating what the RMS voltage transition will look like:



Note that in the third help box, the transition shown is a linear ramp from 110V (Seq no[3]) to 230V (Seq no[1]), this will only occur when the sequence *mode* is set to *repeated*.

To run the sequence:

- Remove the cursor by pressing the *HOME* button.
- Hold down *OUTPUT* until the amplifier turns on.
- Press the *START* key to start the sequence.
- Press the *STOP* key to abort the sequence.

### Checking the operation of the sequence

It is possible to check if the sequence is still running or has been completed.

Sending the Command *SEQUEN?* will return a value of 0 or 1.

If the returned value is 0, the Sequence has completed.

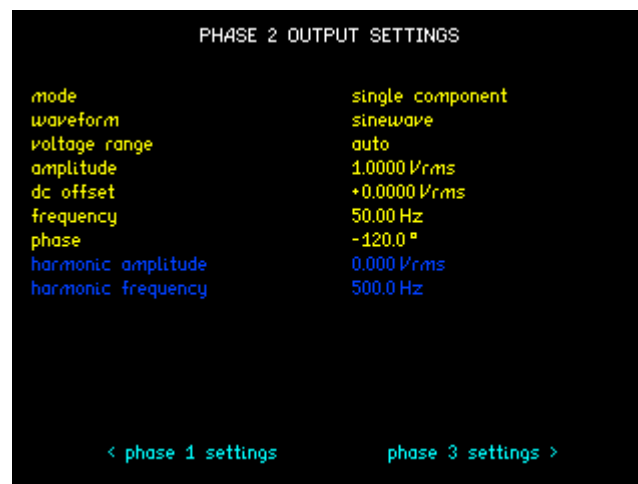
If the returned value is 1, the Sequence is still running.

## Three-phase settings

There are a number of menus and parameters only available for 3-phase N4As. This section applies to the N4A18, N4A30, N4A67 and N4A67-HV

## Output settings

Modifying the amplitude, DC offset and phase angle for phase-2 is performed through the *PH2* key. The same is true for phase-3 through the *PH3* key.

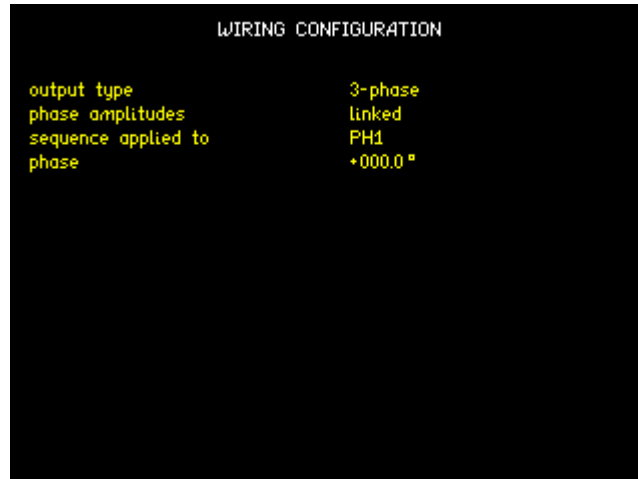


The **mode**, **waveform** and **voltage range** options are displayed in the PH1-3 menus but are **not** independent. Changing **waveform** in the PH1 menu will update the waveform on all three phases.

## Wiring menu

A 3-phase N4A can be configured to output on all 3 phases or just phase 1. This is controlled by the **output type** option in the **WIRING** menu.

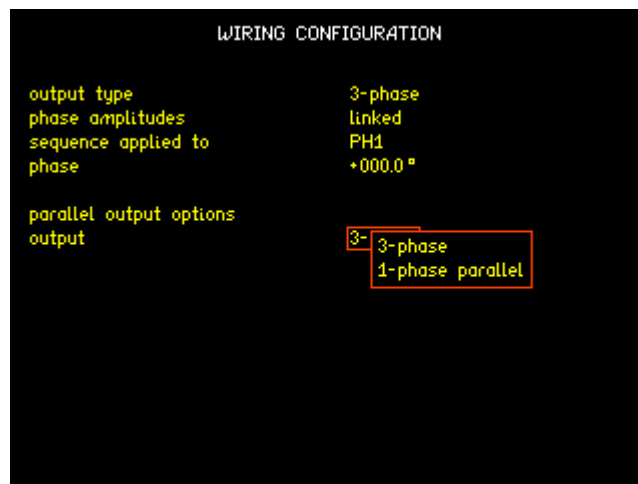
By default, both the amplitude and DC offset values for phase 1-3 are linked between phases. For example, setting **amplitude** to 250V in the PH2 menu will update the output **amplitude** for PH1 and PH3 to 250V. The same applies to the DC offset values, i.e. if DC offset on PH1 is 10V, then both phases 2 & 3 are also set to 10V. If independent amplitudes are required, set the **phase amplitudes** option to **independent**.



By default, when a sequence is run, it is applied to the phase 1 output, while phase's 2 and 3 remain unchanged. The option to apply the sequence to phase 2 or 3 is available through the **sequence applied to** option. Selecting **ALL** from the menu will apply the sequence table to all three phases, but at the point in time where phase 1 is at its minimum value.

## Parallel option

If an N4A is supplied with the optional parallel output, this is enabled and disabled through the **WIRING** menu.

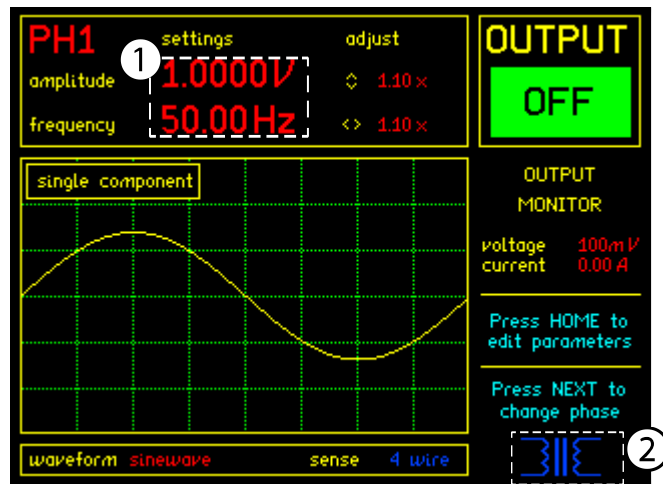


When changing this option, allow ~10s for set-up completion. A relay click should be heard as the outputs turn off and on.

## High voltage transformer options

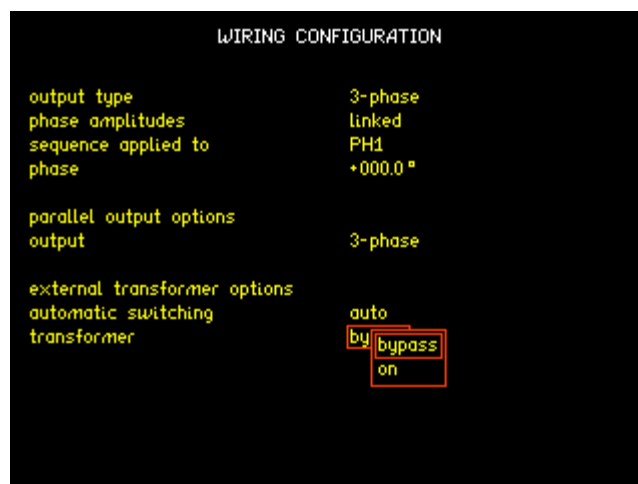
### N4A18/30

The N4A18 3-phase transformer allows line-to-neutral voltages of up to 440Vrms to be achieved. To preserve the accuracy of the standard 300Vrms output range, the transformer unit can be switched out of circuit with a bypass switch. The bypass switch state is displayed on the N4A HOME screen (2):

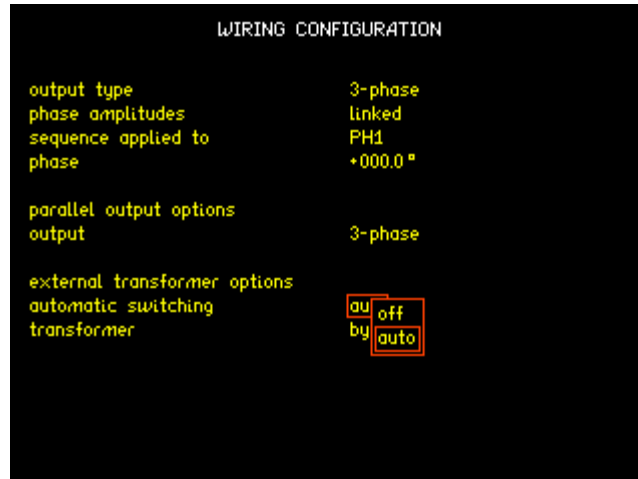


Symbol 2 is blue when the transformer is not in-circuit and flashes red and white when it is. Whenever a voltage greater than 300Vrms is requested (1), the transformer will automatically switch in.

The transformer can be manually switched in and out through the WIRING menu. By default, the transformer is bypassed and will switch in when the output voltage is set higher than 300Vrms.



To force the transformer into a particular state, it is advisable to set *automatic switching* to *off* and then use the *transformer* menu item.



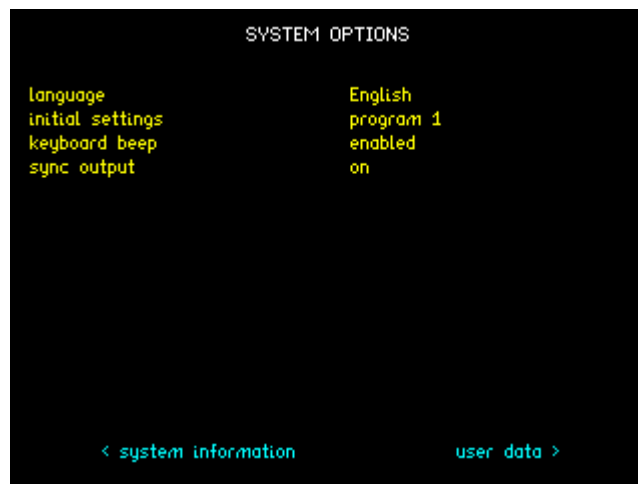
**CAUTION.** The N4A18/30 with transformer is calibrated as a system; under no circumstances should the transformer unit be disconnected from the N4A18/30 while power is applied.

---

## System settings

The **system** menu provides general N4A settings and information. The ◀ and ▶ arrows are used to access **system information** and **user data**.

### System Options (SYS)



### Language

By default, the N4A menu strings are displayed in English. A single additional language can also be loaded into the instrument, with a choice of Italian, French and Russian currently available. When an additional language is loaded into the N4A, select it from the **language** drop-down.

### Initial settings

This option determines what settings (e.g., waveform, AC coupling) are recalled from memory on power-up.

**Factory default** will recall the default program.

**Program 1** will recall the settings saved in location 1, providing a valid program is available. If no such program exists, the default program is recalled.

The N4A saves a copy of all user-definable parameters in non-volatile memory. **As last used** recalls these parameter settings, the next time the instrument is powered up.

## Keypad Beep

Each key press is normally accompanied by an audible 'beep' as well as the tactile 'click'. The 'beep' can be disabled for quiet environments if the feel of the key is sufficient feedback.

## Sync Output

The sync output on the rear of the N4A provides a logic-level active high pulse for triggering scopes and other devices. Providing a valid sequence is available, pressing the *START* key or sending the *START* command will trigger a sync pulse. The pulse will remain high for  $0.5/f$  seconds, where  $f$  is the frequency of the first sequence step. This also applies in the UL2231 mode when pressing start.

## User Data

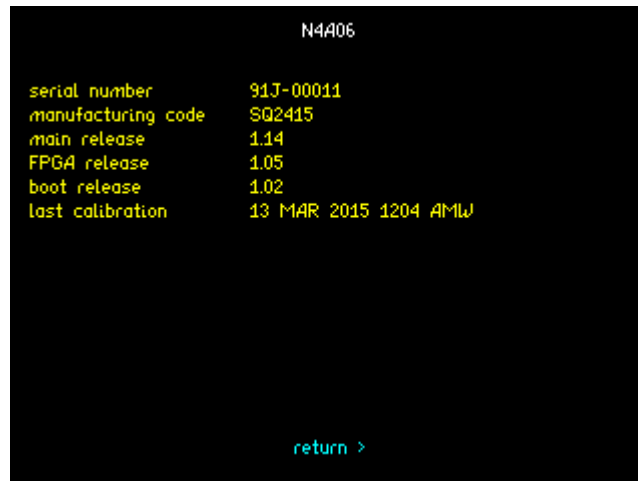
The N4A can be personalised by entering up to three strings of up to 32 characters in length. The strings can be read out, via any of the available communications methods, by sending the command "*USER?*".

A typical arrangement of the user data might be:

- line 1      company name
- line 2      department or individual name
- line 3      unique identifying number (e.g., asset number)

## System Information

Pressing the *SYSTEM* key displays information about the instrument, it cannot be changed by the user.



|                     |                                                       |
|---------------------|-------------------------------------------------------|
| Serial Number:      | Instruments unique serial number.                     |
| Manufacturing Code: | Code attributed to build date of the instrument.      |
| Main release:       | Current firmware release installed in the instrument. |
| FPGA Release:       | Field Programmable Gate Array release version.        |
| Boot Release:       | Release version of instruments boot up firmware.      |
| Last Calibration:   | Instruments last calibration date.                    |

## Programs

### Store /recall (PROG)



1. Press the *PROG* button to open up **program store/recall** menu.
2. Select the action to be taken – **store/recall** or **delete**.
3. Select the location that the associated action is to be recalled from, stored to, or deleted, from the 50 locations available.
4. Enter a name within this parameter to aid the user in relation to storing/recalling a program to/from memory for future reference. To enter a name, use the Alpha / Numerical keypad on the instruments front panel.
5. Upon implementing any of the above actions, remember to scroll down to *EXECUTE* and press *ENTER* to validate your selection/action.
6. *Single component* and *DC only* modes have a sequence table associated with them; this table will be updated when a program is recalled and saved when a program is stored.



#### INFORMATION.

Location 0 = FACTORY DEFAULT and cannot be changed.

Location 1 = A program stored in program location 1 is automatically recalled when the instrument is switched on (provided *system options* > *initial settings* = program 1).

## Preset keys

The top right row of keys is used to quickly recall saved programs. To do this they must first be assigned in the PRESET KEYS menu.

In this example, a program has already been saved to location 2, with the name “**230Vac 50Hz**”



From the **PROG** menu screen, press the ► arrow key to enter the **PRESET KEYS** menu.

You should be presented with a list of menu options as shown below:



The first line (**assign preset key**) is used to select the key you wish a program to be assigned to. If the key has already been assigned, the text on the right hand side will turn green and display the program name.

The second line (**to program location**) is used to search through the program locations (0-50) to find a valid program to assign. The blue text will display the program name, if available.



Once a valid program has been selected, the bottom line will become selectable. Highlight **ASSIGN** with the cursor and press *ENTER* to save your selection. Pressing the *PS1* key will now load program 2.

## Specifications

| Nominal Output Power |         |
|----------------------|---------|
| N4A03 (1-phase)      | 3000VA  |
| N4A06 (1-phase)      | 6000VA  |
| N4A18 (3-phase)      | 18000VA |
| N4A30 (3-phase)      | 30000VA |
| N4A67 (3-phase)      | 67500VA |

| Output Voltage                  |                                                |                   |        |
|---------------------------------|------------------------------------------------|-------------------|--------|
| Output Voltage (AC)             | Line to Neutral Vrms                           | Line to Line Vrms | DC     |
| N4A03 (1-phase)                 | 0-300V                                         | 0-520V            | 0-425V |
| N4A06 (1-phase)                 | 0-300V                                         | 0-520V            | 0-425V |
| N4A18 (3-phase)                 | 0-300V                                         | 0-520V            | 0-425V |
| N4A30 (3-phase)                 | 0-300V                                         | 0-520V            | 0-425V |
| N4A67 (3-phase)                 | 0-300V                                         | 0-520V            | 0-425V |
| N4A67-HV (3-phase)              | 0-360V                                         | 0-625V            | 0-500V |
| High Voltage Transformer option | Available option for N4A18, N4A30 & N4A67 only |                   |        |
|                                 | 0 – 440V                                       | 0-762V            |        |

| Maximum Inrush (3 Second) Output Power |         |
|----------------------------------------|---------|
| N4A03 (1-phase)                        | 6000VA  |
| N4A06 (1-phase)                        | 12000VA |
| N4A18 (3-phase)                        | 36000VA |
| N4A30 (3-phase)                        | 60000VA |
| N4A67 (3-phase)                        | 90000VA |

|                                                      |                     |                               |
|------------------------------------------------------|---------------------|-------------------------------|
| <b>Maximum Output Current (Continuous)</b>           |                     |                               |
| N4A03 (1-phase)                                      | 10Arms              |                               |
| N4A06 (1-phase)                                      | 20Arms              |                               |
|                                                      |                     | <b>Parallel output option</b> |
| N4A18 (3-phase)                                      | 20Arms (Per Phase)  | 60Arms                        |
| N4A30 (3-phase)                                      | 33Arms (Per Phase)  | 99Arms                        |
| N4A67 (3-phase)                                      | 75Arms (Per Phase)  | N/A                           |
| <b>Maximum Output Current (Inrush)</b>               |                     |                               |
| N4A03 (1-phase)                                      | 20Arms              |                               |
| N4A06 (1-phase)                                      | 40Arms              |                               |
|                                                      |                     | <b>Parallel output option</b> |
| N4A18 (3-phase)                                      | 40Arms (Per Phase)  | 120Arms                       |
| N4A30 (3-phase)                                      | 64Arms (Per Phase)  | 200Arms                       |
| N4A67 (3-phase)                                      | 100Arms (Per Phase) | N/A                           |
| <b>Output Frequency</b>                              |                     |                               |
| Single Phase N4A03 & N4A06                           |                     | DC - 1kHz                     |
| 3 Phase N4A18, N4A30, N4A67, & N4A67-HV              |                     | DC - 1kHz                     |
| High Voltage Transformer option only for N4A18/30/67 |                     | 45Hz – 1kHz                   |
| <b>Min Slew Rate</b>                                 |                     |                               |
| All models single & 3 phase including 67-HV model    |                     | 3V/μs                         |
| <b>Output Voltage Stability</b>                      |                     |                               |
| All models single & 3 phase including 67-HV model    |                     | Better than 0.1%              |
| <b>Output Voltage Accuracy</b>                       |                     |                               |
| All models single & 3 phase including 67-HV model    |                     | Better than 0.5%              |
| <b>THD</b>                                           |                     |                               |
| All models single & 3 phase including 67-HV model    |                     | Better than 0.3%*             |
| <b>Output Noise</b>                                  |                     |                               |
| All models single & 3 phase including 67-HV model    |                     | <500mVrms                     |
| <b>Recovery Time of Output Waveform</b>              |                     |                               |
| All models single & 3 phase including 67-HV model    |                     | Better than 50μs              |

|                                                              |                                                  |
|--------------------------------------------------------------|--------------------------------------------------|
| <b>Max Compensated drop on wires (w.r.t voltage setting)</b> |                                                  |
| All models single & 3 phase including 67-HV model            | 5%                                               |
| <b>Recovery Time of Drop on Wires</b>                        |                                                  |
| All models single & 3 phase including 67-HV model            | Less than 200ms                                  |
| <b>Maximum Crest Factor Output (Current)</b>                 |                                                  |
| All models single & 3 phase including 67-HV model            | [Inrush I <sub>max</sub> *1.41]/RMS Load Current |

|                    |                         |
|--------------------|-------------------------|
| <b>General</b>     |                         |
| <b>Dimensions</b>  |                         |
| N4A03 (1-phase)    | 281mm x 471mm x 513mm   |
| N4A06 (3-phase)    | 281mm x 471mm x 513mm   |
| N4A18 (3-phase)    | 1785mm x 930mm x 755mm  |
| N4A30 (3-phase)    | 1785mm x 930mm x 755mm  |
| N4A67 (3-phase)    | 1800mm x 1200mm x 800mm |
| N4A67-HV (3-phase) | 1800mm x 1200mm x 800mm |
| <b>Weight</b>      |                         |
| N4A03 (1-phase)    | 30kg                    |
| N4A06 (3-phase)    | 45kg                    |
| N4A18 (3-phase)    | 740kg                   |
| N4A30 (3-phase)    | 740kg                   |
| N4A67 (3-phase)    | 1300kg                  |
| N4A67-HV (3-phase) | 1300kg                  |

| Input Voltage                               |                                     | Input Frequency                                                                                 |
|---------------------------------------------|-------------------------------------|-------------------------------------------------------------------------------------------------|
| N4A03 (1-phase)                             | 220V AC +/- 10% 1PH                 | All models single & 3 phase including 67-HV                                                     |
|                                             | 230V AC +/- 10% 1PH                 | 45-65Hz                                                                                         |
| All 3 phase models                          | 380V AC +/- 10% 3PH                 | <b>Operating Temperature</b><br><br>All models single & 3 phase including 67-HV<br><br>0-35degC |
|                                             | 400V AC +/- 10% 3PH                 |                                                                                                 |
|                                             | 415V AC +/- 10% 3PH                 |                                                                                                 |
| Input Current                               |                                     |                                                                                                 |
| N4A03 (1-phase)                             | 25Arms                              |                                                                                                 |
| N4A06 (3-phase)                             | 16Arms Phase / 27A Neutral          |                                                                                                 |
| N4A18 (3-phase)                             | 60A continuous 120A inrush / Phase  |                                                                                                 |
| N4A30 (3-phase)                             | 80A continuous 160A inrush / Phase  |                                                                                                 |
| N4A67 (3-phase)                             | 160A continuous 220A inrush / Phase |                                                                                                 |
| N4A67-HV (3-phase)                          | 160A continuous 220A inrush / Phase |                                                                                                 |
| Efficiency                                  |                                     |                                                                                                 |
| All models single & 3 phase including 67-HV |                                     | Better than 80%                                                                                 |

\*At Nominal Voltage with Linear Load

Note: The N4A06 features a 3-phase Input with a 1-phase Output.

## Resetting the N4A to factory default mode

This will clear any user defined programs that might be stored in the N4A and recalled when the instrument is switched on.



To access Program Store / Recall mode:

Press "PROG" button

Press the ▼ Key until

Red Box surrounds the number adjacent to  
**"Location"**

Enter "0"

Press the ▼ Key until the red Box surrounds  
**"Execute"**

Press "ENTER" - This will now reset the instrument to  
factory default mode.

## Firmware Programming

The N4L CommView2 software is used to program the N4A with updated firmware. LAN, Serial and USB interfaces can be used. This is available to download from our website.

<https://resources.newtons4th.com/>

## Repair / Recalibration & Servicing

### **Servicing**

This instrument requires servicing after the following periods:

20,000 hours – Ventilator replacement

40,000 hours – DC bus capacitor replacement

### **Repair / Recalibration**

Please refer to the N4L for calibration and repair services

Website: [www.newtons4th.com](http://www.newtons4th.com)

## Appendix A – Accessories

### Supplied Standard Accessories

#### Single Phase Units:

- one N4A unit
- one 6" BNC to BNC cable
- one null modem cable
- one USB cable

#### 3-Phase Units:

- one N4A unit
- one null modem cable
- one USB cable

#### Documentation:

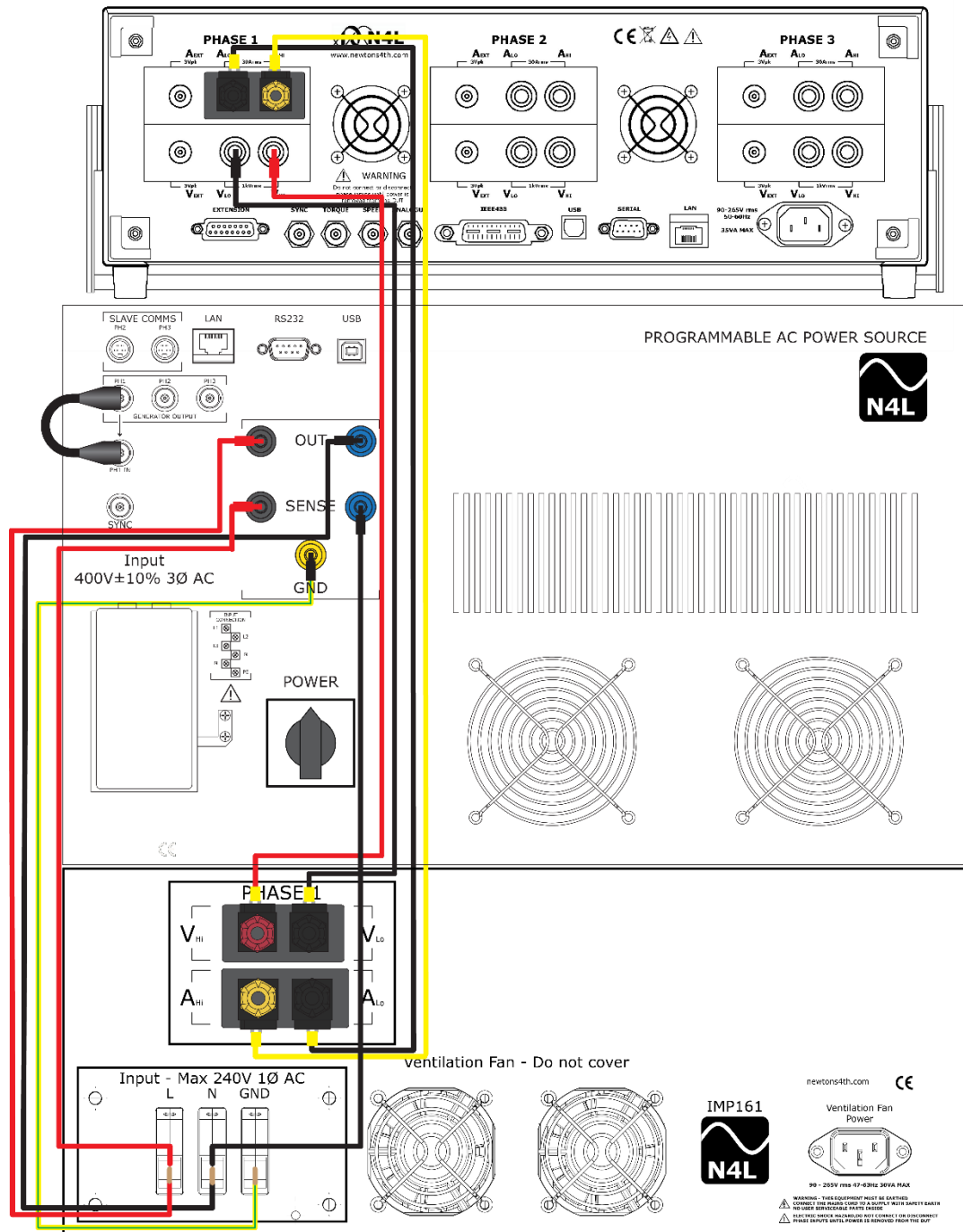
- Calibration Certificate
- Combined User Manual & Communications manual \*

\* This manual is available as a free download from the support section of our website  
<https://resources.newtons4th.com/manuals/>

## Appendix B – Connection Diagrams

### IMP161 Connections

The diagram below shows the connections required to connect the AC Source, IMP161 Impedance Network, and PPA5511 Power Analyzer.



PPA - IMP161 Connections - All leads supplied are 36A rated 4mm shrouded / stackable test leads 1.5mtrs. N4L Part Number: 517-009  
AC Source - IMP161 Connections - Single Phase 4mm test leads, Red (L), Black (N) & Green / Yellow (GND). N4L Part Number 517-010

Make connections as shown:

AC Source – Impedance Network

L – L

N – N

GND - GND

Impedance Network – PPA5511 Power Analyzer

4mm Yellow Lead – A Hi – A Hi

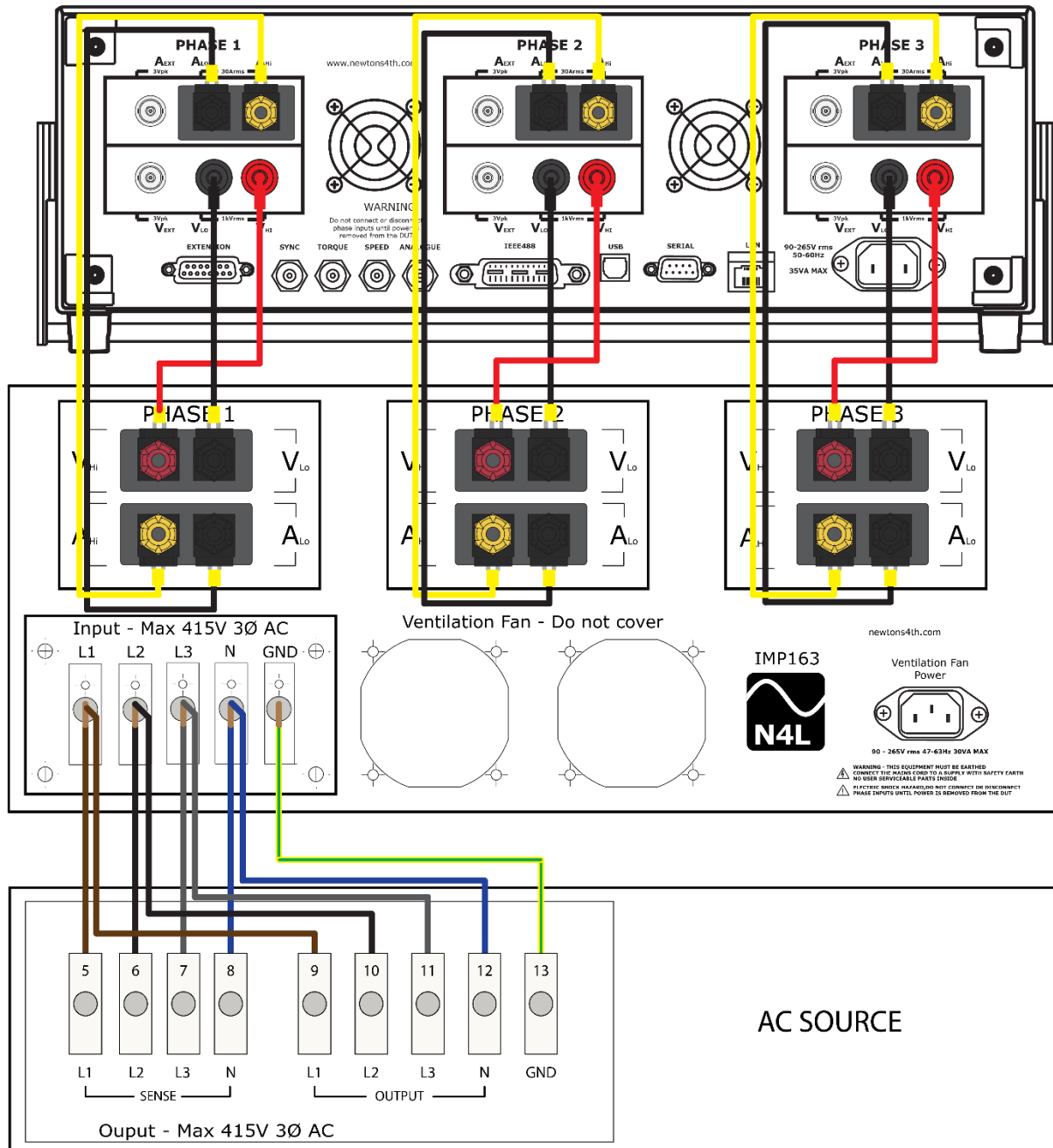
4mm Black Lead – A Lo – A Lo

4mm Red Lead – V Hi – V Hi

4mm Black Lead – V Lo – V Lo

## IMP163 Connections

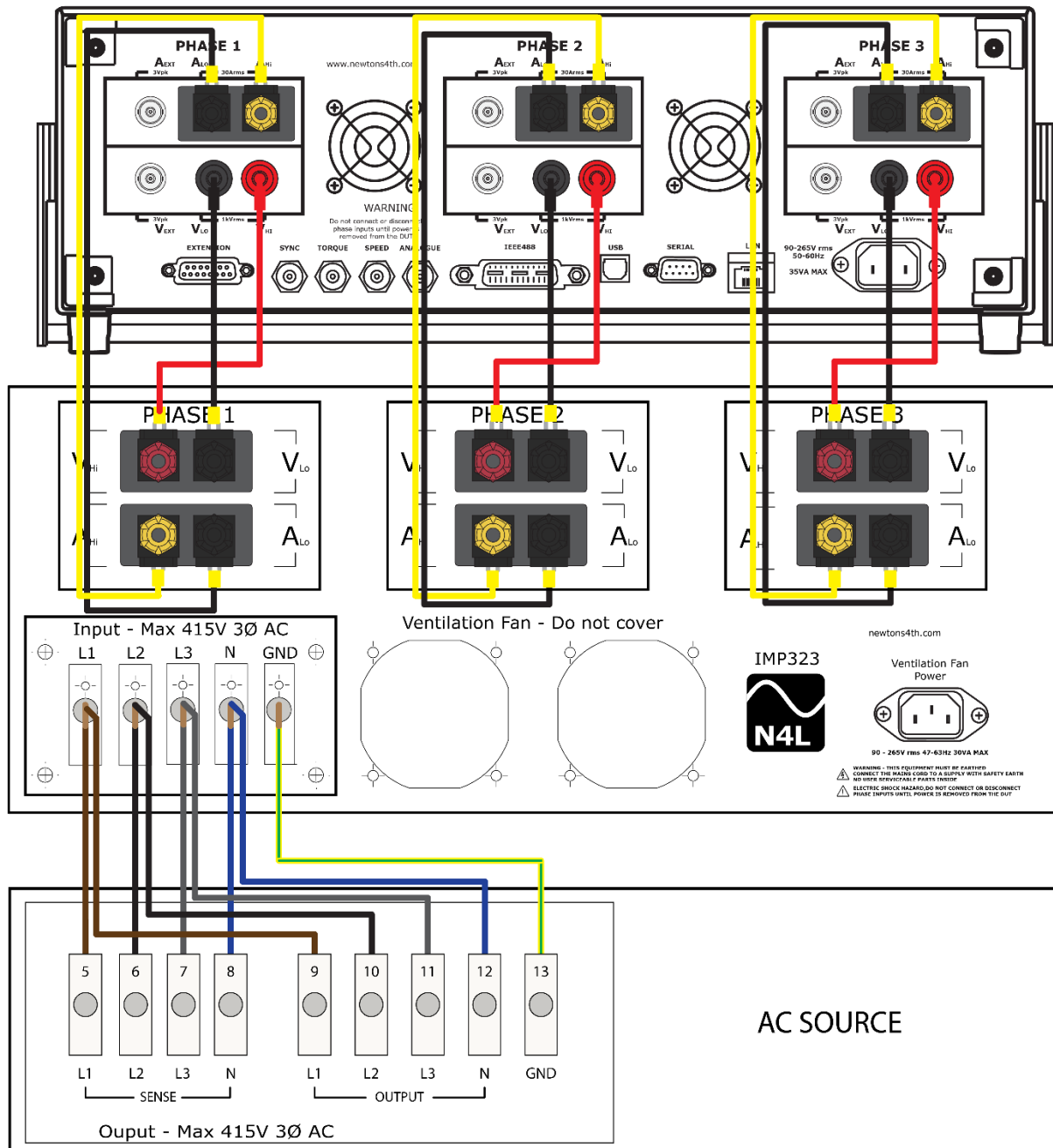
The diagram below shows the connections required to connect the AC Source, IMP163 Impedance Network, and PPA5531 Power Analyzer.



PPA - IMP163 Connections - All leads supplied are 36A rated 4mm shrouded / stackable test leads 1.5mtrs. N4L Part Number 517-009  
 IMP - AC Source Connections - 25mm tri-rated, 3 Phase + N + E Lead Set. N4L Part Number 517-012

## IMP323 Connections

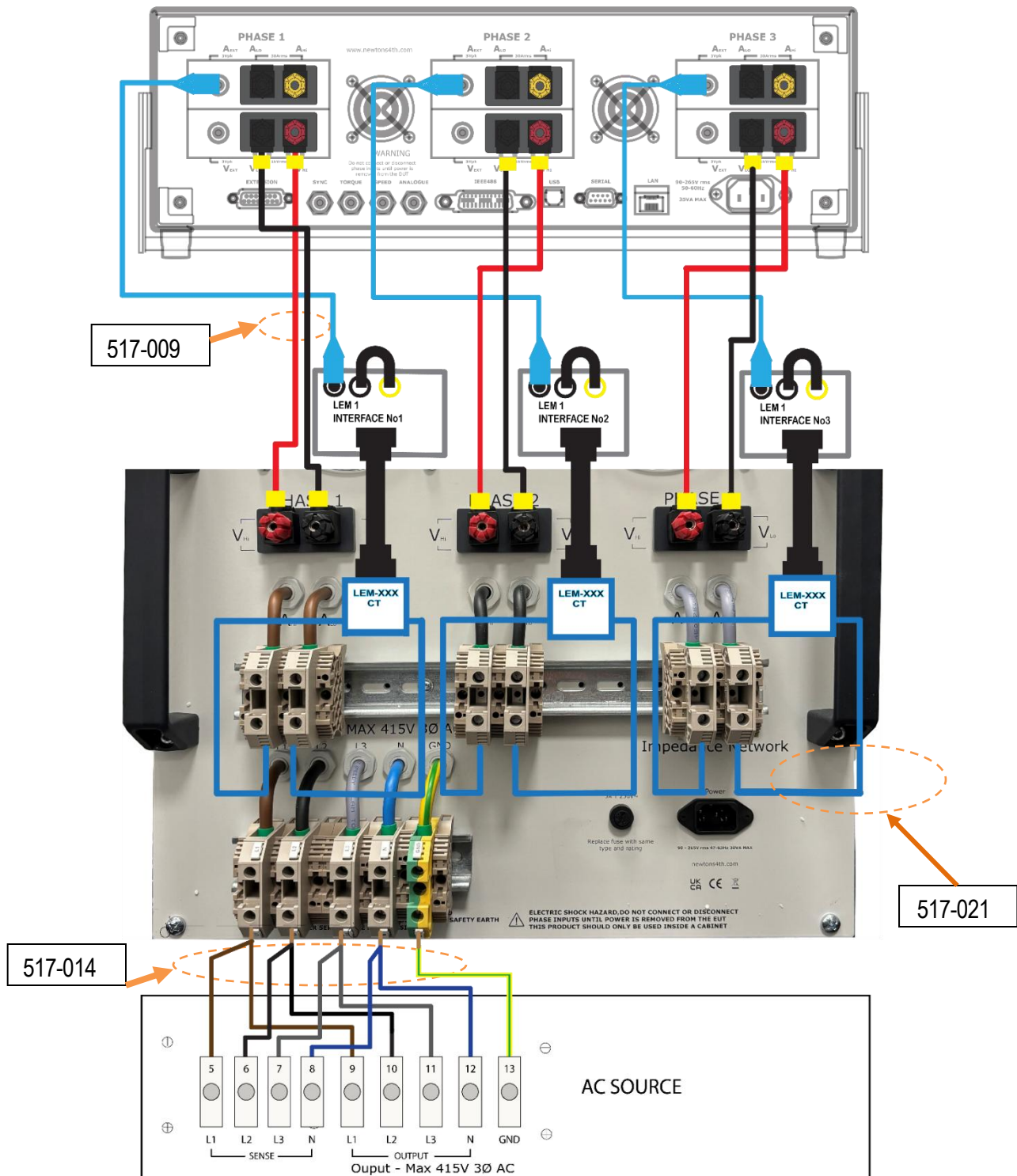
The diagram below shows the connections required to connect the AC Source, IMP323 Impedance Network, and PPA5531 Power Analyzer.



PPA - IMP323 Connections - All leads supplied are 36A rated 4mm shrouded / stackable test leads 1.5mtrs. N4L Part Number 517-009  
 IMP - AC Source Connections - 25mm tri-rated, 3 Phase + N + E Lead Set. N4L Part Number 517-012

### IMP753 Connections

The diagram below shows the connections required to connect the AC Source, IMP753 Impedance Network, and PPA5531 Power Analyzer.

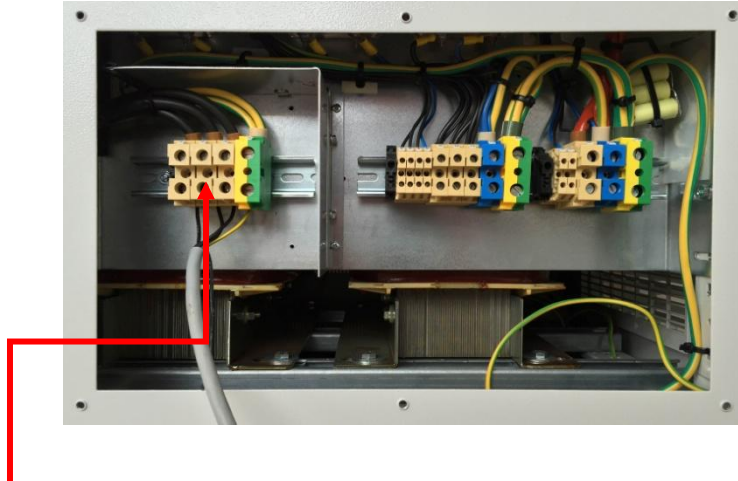


The IMP is supplied with the following cables:- 517-009 Phase connection lead set, 517-014 Source connection lead set, & 517-021 CT current connection lead set

## Appendix B.6 N4A18 Connection Details

This section identifies the terminals that can be found on the rear of the N4A18

**Rear Connection Terminal Blocks associated with the N4A18**

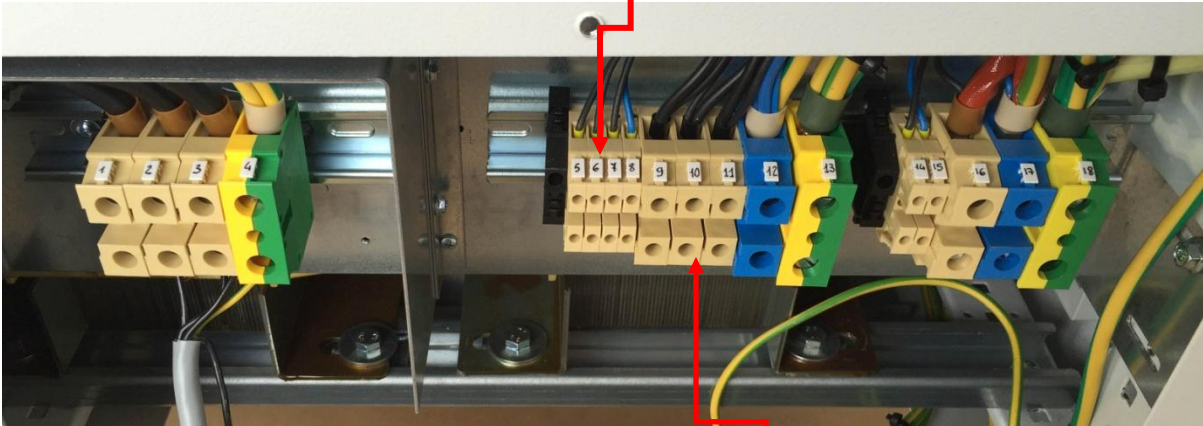


3 phase input and earth

|             |    |    |    |                    |
|-------------|----|----|----|--------------------|
| Terminal No | 1  | 2  | 3  | 4                  |
| Name        | L1 | L2 | L3 | Earth (No neutral) |

|             |    |    |    |         |
|-------------|----|----|----|---------|
| Terminal No | 5  | 6  | 7  | 8       |
| Name        | L1 | L2 | L3 | Neutral |

3 phase and Neutral sense terminals

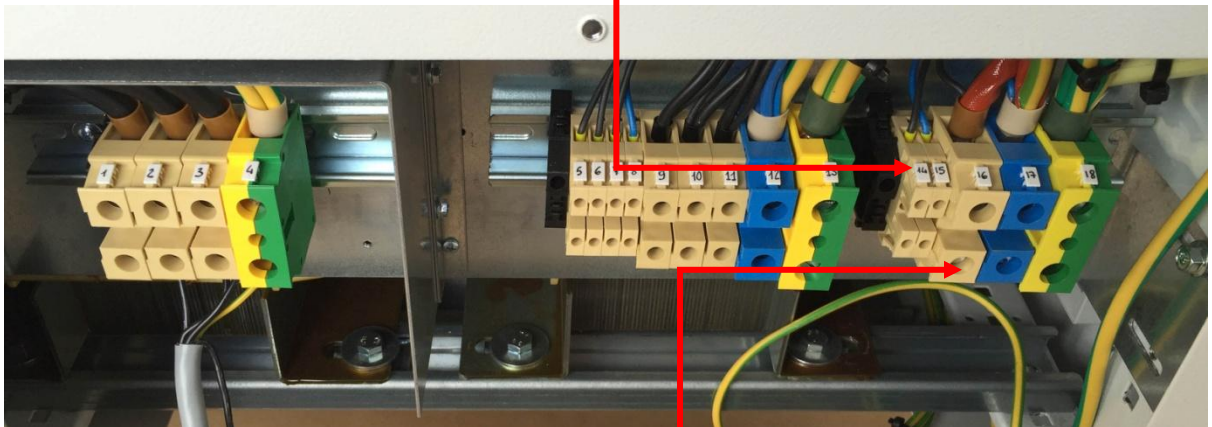


3 phase and Neutral / Earth output terminals

|             |    |    |    |         |       |
|-------------|----|----|----|---------|-------|
| Terminal No | 9  | 10 | 11 | 12      | 13    |
| Name        | L1 | L2 | L3 | Neutral | Earth |

|             |    |    |
|-------------|----|----|
| Terminal No | 14 | 15 |
| Name        | L  | N  |

Single phase (parallel) sense terminals



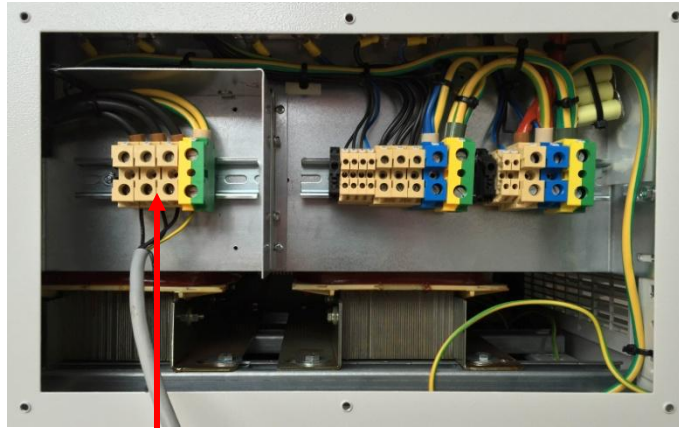
Single phase high current (parallel) output with Low / Earth

|             |    |    |       |
|-------------|----|----|-------|
| Terminal No | 16 | 17 | 18    |
| Name        | L  | N  | Earth |

## Appendix B.7 N4A30 Connection Details

This section identifies the terminals that can be found on the rear of the N4A30

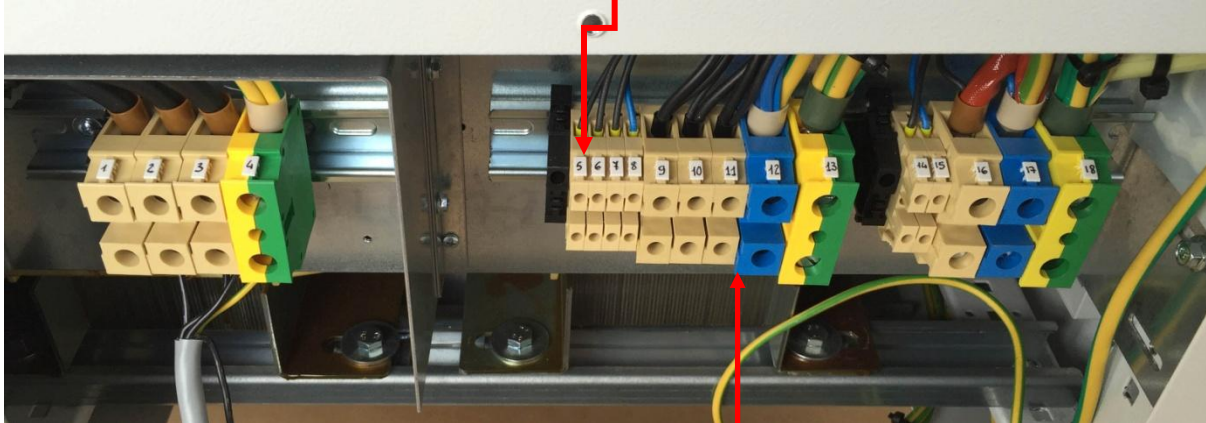
**Rear Connection Terminal Blocks associated with the N4A30**



| Terminal No | 1  | 2  | 3  | 4                  |
|-------------|----|----|----|--------------------|
| Name        | L1 | L2 | L3 | Earth (No neutral) |

### 3 phase and Neutral and sense terminals

| Terminal No | 5  | 6  | 7  | 8       |
|-------------|----|----|----|---------|
| Name        | L1 | L2 | L3 | Neutral |

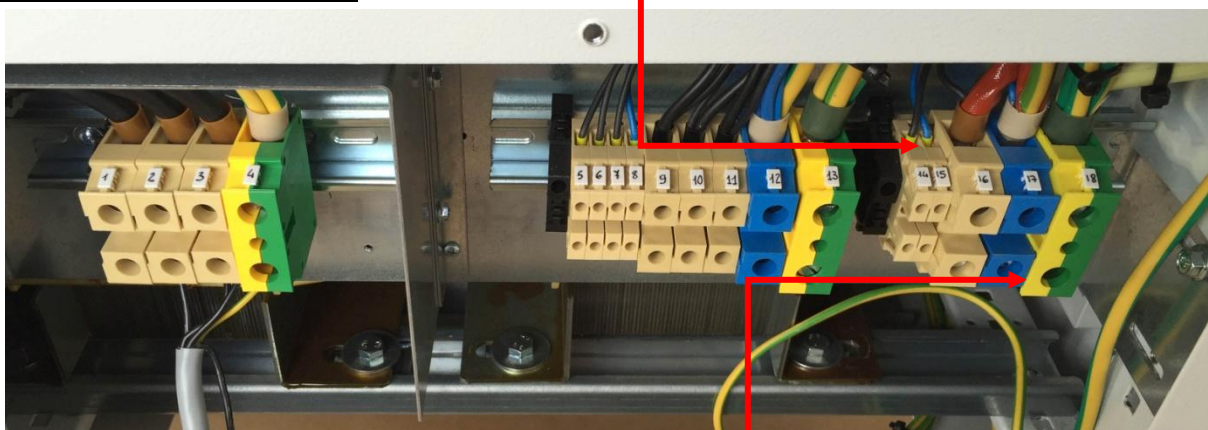


### 3 phase and Neutral / Earth output terminals

| Terminal No | 9  | 10 | 11 | 12      | 13    |
|-------------|----|----|----|---------|-------|
| Name        | L1 | L2 | L3 | Neutral | Earth |

| Terminal No | 14 | 15 |
|-------------|----|----|
| Name        | L  | N  |

Single phase (parallel) sense terminals



| Terminal No | 16 | 17 | 18    |
|-------------|----|----|-------|
| Name        | L  | N  | Earth |

Single phase high current (parallel) output with Low / Earth

### Appendix B.8 N4A67 &

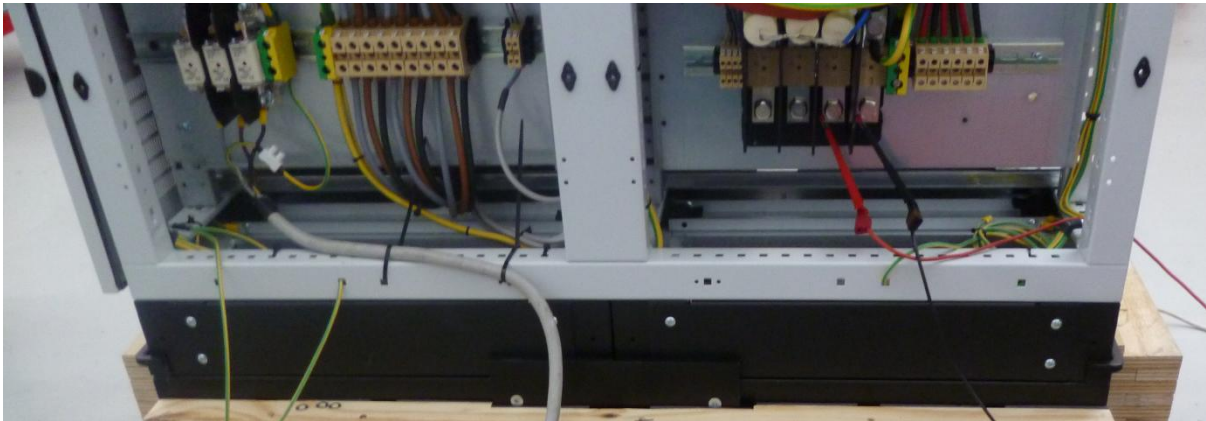
## N4A67-HV Connection Details

This section identifies the terminals that can be found on the rear of the N4A67.

### Rear Connection Terminal Blocks associated with the N4A67

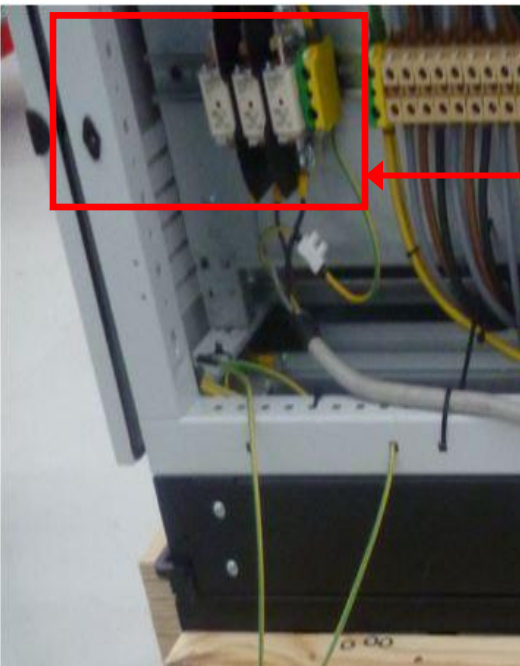
Input connections:

Output connections:



Input connections:

3 phase input and earth

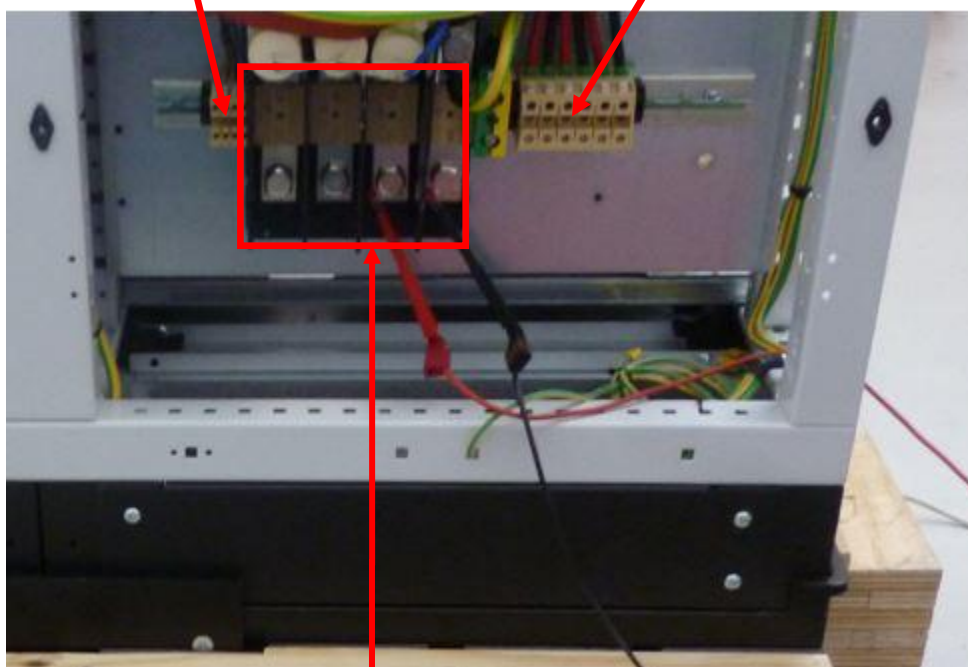


| Terminal No | 1  | 2  | 3  | 4                  |
|-------------|----|----|----|--------------------|
| Name        | L1 | L2 | L3 | Earth (No neutral) |

**Output connections:**

Sense Terminals

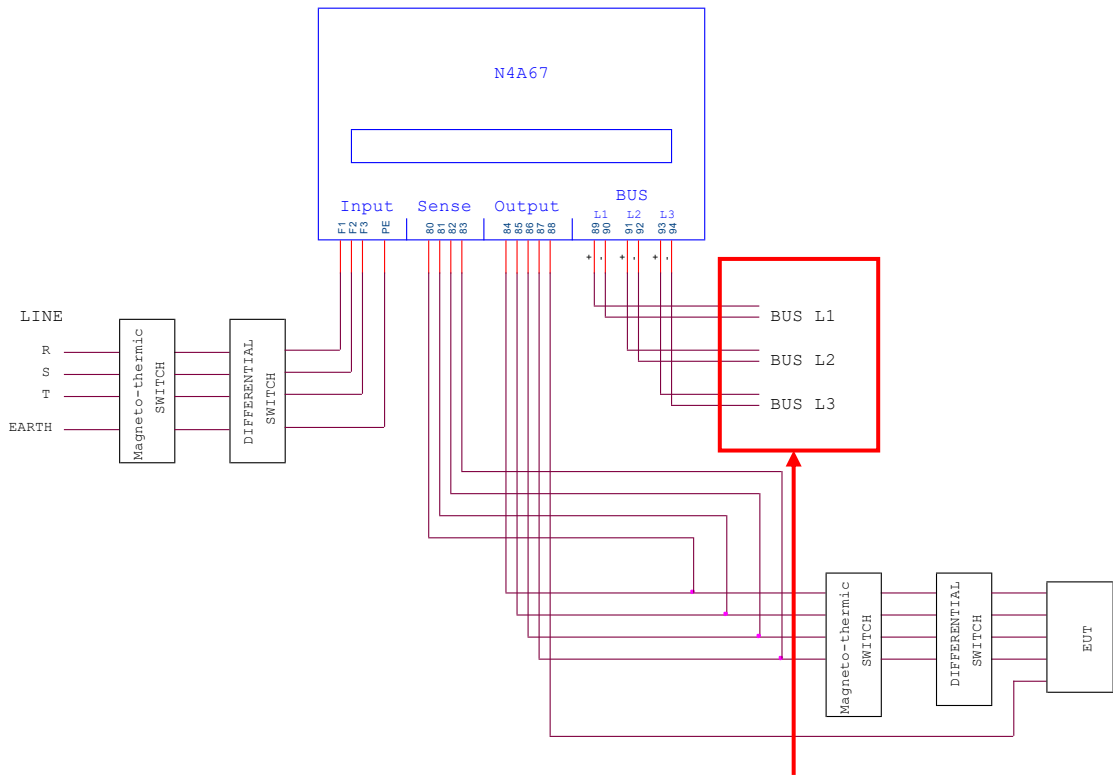
REGEN bus connector  
(optional)



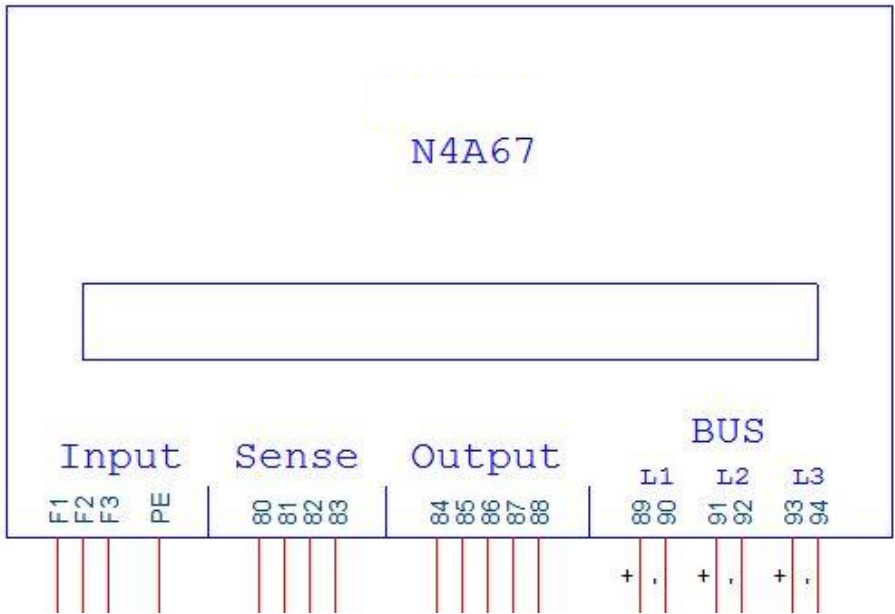
Three phase and Neutral Output terminals  
L1, L2, L3, Neutral

N4A67 & N4A67-HV Connection Diagram

| INPUT |    |    |    | SENSE 3PH |    |    |    | OUTPUT 3PH |    |    |    | BUS L1 |           | BUS L2    |           | BUS L3    |           |           |
|-------|----|----|----|-----------|----|----|----|------------|----|----|----|--------|-----------|-----------|-----------|-----------|-----------|-----------|
| F1    | F2 | F3 | PE | 80        | 81 | 82 | 83 | 84         | 85 | 86 | 87 | 88     | 89        | 90        | 91        | 92        | 93        | 94        |
| L1    | L2 | L2 | PE | L1        | L2 | L3 | N  | L1         | L2 | L3 | N  | E      | L1 Vbus + | L1 Vbus - | L2 Vbus + | L2 Vbus - | L3 Vbus + | L3 Vbus - |



Optional REGEN bus connections



## Appendix C – CommView2 PC Software

CommView2 is a self contained software program for PC, which facilitates communication over RS232, USB or LAN.

CommView2 allows strings to be sent and received between a PC and the N4A. The strings can be viewed in a window and optionally stored in a file. Data received from the N4A may be displayed in normal scientific notation with an identifying label.

Strings to be sent to the N4A can be stored in a “script file” and executed automatically. The script file is created with any text editor and includes three types of lines (interpreted by the first character on each line):

lines beginning with " are sent to the N4A

lines beginning with # are commands for CommView2

any other line is a comment.

The # commands that are recognised:

|                 |                                       |
|-----------------|---------------------------------------|
| #beep           | <i>sound the beeper on the PC</i>     |
| #label,i,string | <i>apply a label to data value[i]</i> |
| #pause,t        | <i>wait for time t</i>                |
| #reply,t        | <i>wait time t for a reply</i>        |

Other functions in CommView2:

|                          |                        |
|--------------------------|------------------------|
| save results             | <i>results menu</i>    |
| set COM port parameters  | <i>configure menu</i>  |
| firmware upgrade         | <i>instrument menu</i> |
| read/store user programs | <i>instrument menu</i> |

## Appendix D – N4AXX Communications Commands

This section provides details on the following communication commands that can be used to control the N4A Source.

**AMPLIF**

**AMPLIT**

**DC**

**FREQUE**

**HARMON**

**HARMSE**

**IEC413**

**IEC417**

**LINKED**

**MODE**

**OFFSET**

**OUTPUT**

**PARALL**

**RANGE**

**RELAY?**

**RING**

**SEQDC**

**SEQUEN**

**SEQUEN?**

**START**

**STOP**

**WAVEFORM**

**WIRING**

**AMPLIF**

Description: Control various amplifier settings

Format: AMPLIF, set, value

**Arguments:**

Set: SENSE  
Value: WIRE2 (2 wire sense)  
WIRE4 (4 wire sense)

Set: COUPL  
Value: AC (AC coupling)  
ACDC (DC coupling)

(External transformer option only)

Set: TRANSFORMER  
Value: OFF (standard output)  
ON (extended output)

(External transformer option only)

Set: AUTO  
Value: OFF  
ON

Reply: None

Example: AMPLIF, SENSE, WIRE4



**INFORMATION.** Use AMPLIF,AUTO,OFF to keep transformer switched in when the voltage (AMPLIT,CH1A,...) is set below the 300V threshold. The transformer will switch in when the amplitude is set greater than 300Vrms, regardless of the state of automatic switching.

---

## AMPLIT

Description: Set the output voltage of the N4A

Format: AMPLIT, channel, amplitude

Arguments:

Channel: CH1A main output amplitude - PH1  
CH1B secondary output amplitude - PH1  
CH2A main output amplitude – PH2  
CH2B secondary output amplitude – PH2  
CH3A main output amplitude – PH3  
CH3B secondary output amplitude – PH3

Amplitude:

range of 0 – 300 (AC) and -425 - +425 (DC)

Reply: None

Example: AMPLIT, CH1A, 240

## DC

Description: Set the DC offset output, in single component mode

Format: DC, phase, value

Arguments:

Phase: PH1

PH2

PH3

Value: +/- 400 V

Reply: None

Example: DC, PH2, -15

## **FREQUE**

Description: Set the fundamental frequency of the N4A

Format: FREQUE, freq

Arguments:

Freq: Range of 1 – 10,000

Reply: None

Example: FREQUE, 50

**HARMON**

Description: Set the secondary amplitude and frequency for dual component mode

Format: HARMON, amp, freq

**Arguments:**

Amp: Range of 0 – 300

Freq: Range of 1 – 10,000

Reply: None

Example: HARMON, 15, 500

## HARMSE

Description: Create a complex waveform comprising a fundamental component and up to 100 harmonics

Format: HARMSE, type, [value1, value2]

Arguments:

Type: CLEAR

Integer between 1 - 100

Value 1: FUNDAMENTAL VOLTAGE

HARMONIC MAGNITUDE

Value 2: FUNDAMENTAL FREQUENCY

HARMONIC PHASE ANGLE

Reply: None

Example: HARMSE, CLEAR

HARMSE, 1, 230, 50

HARMSE, 3, 33.3, 0

Notes: The above example clears the table, sets the fundamental voltage and frequency and adds a 3<sup>rd</sup> order harmonic of magnitude 33.3%.

**IEC413**

Description: Set-up the N4A for the IEC61000-4-13 flat curve test

Format: IEC413, FLAT, class, [value]

Arguments:

|        |          |                 |
|--------|----------|-----------------|
| Class: | CLASS1-3 |                 |
|        | CLASSX   | (value applies) |
| Value: | 70 – 99% |                 |

Reply: None

Example: MODE, IEC610  
IEC413, CLASSX, 75

Notes:

**IEC417**

Description: Set-up the N4A for the IEC61000-4-17 DC input voltage ripple immunity test

Format: IEC417, type, [value]

**Arguments:**

|        |         |                      |
|--------|---------|----------------------|
| Type:  | 1PHASE  | (rectifier waveform) |
|        | 3PHASE  | (rectifier waveform) |
|        | RIPPLE  | (value applies)      |
| Value: | 1 – 30% |                      |

Reply: None

Example: MODE, IEC610  
IEC417, 1PHASE  
IEC417, RIPPLE, 4

Notes

**LINKED**

Description: Link phase amplitude values, or set independently.

Format: LINKED, value

Arguments:

Value: ON (amplitudes linked)  
OFF (amplitudes independent)

Reply: None

Example:

Independent amplitudes

```
LINKED,OFF  
AMPLIT,CH1A,230  
AMPLIT,CH2A,150  
AMPLIT,CH3A,220
```

Linked amplitudes (Phase 1,2 and 3 all 230Vrms)

```
LINKED,ON  
AMPLIT,CH1A,230
```

## MODE

Description: Set the basic operating mode of the N4A

Format: MODE, type

Arguments:

|       |        |                  |
|-------|--------|------------------|
| Type: | GEN    | single component |
|       | HARM   | harmonics        |
|       | DUAL   | dual frequency   |
|       | DC     | DC only          |
|       | IEC610 | iec61000 options |
|       | UL2231 | ringing wave     |

Reply: None

Example: MODE, HARM

## OFFSET

Description: Set the phase angle for each line of a 3-phase output (PH2 and PH3 are relative to PH1)

Format: OFFSET, phase, value

Argument:

Phase: PH2

PH3

Value: -360 to 0

Phase: PH1

Value: 0 to 360

Reply: None

Example: OFFSET, PH2, -120

Notes:

OFFSET,PH1 defines the turn on phase angle. (See [Range setting](#))

OFFSET,[PH2/PH3] defines phase angle relative to phase 1.

## OUTPUT

Description: Turn the output relay of the N4A on and off

Format: OUTPUT,state  
OUTPUT,TYPE,phase

Arguments:

State: ON  
OFF

Phase: 1PHASE  
3PHASE

Reply: None

Example: OUTPUT,ON  
OUTPUT,TYPE,1PHASE

**PARALL**

Description: Turn N4A parallel output on and off

Format: PARALL, state

Arguments:

State: ON  
OFF

Reply: None

Example: PARALL, ON

Notes:

This command only applies to 3-phase units purchased with a parallel output option.

**RANGE**

Description: Set the output range option for each phase

Format: RANGE, phase, type

Argument:

Phase: PH1  
PH2  
PH3

Type: AUTO  
HIGH  
LOW

Reply: None

Example: RANGE,PH3,HIGH

Notes:

For standard units high = 300Vrms, low = 30Vrms

**RELAY?**

Description: Read back the state of output relay(s).

Format: RELAY?

RELAY,phase?

Arguments:

phase:

PH1

PH2

PH3

Reply: 0 or 1 (single phase)

0,0,0 (three phase)

Example: RELAY,PH2?

Notes:

Response format for RELAY? is either x or x,y,z, depending on the model variant being used.

**RING**

Description: Set the UL2231 ringing options

Format: RING,option

Argument:

Option1: PH1  
PH2  
PH3

Option2: 1kHz  
2kHz  
3kHz  
4kHz  
5kHz

Reply: None

Example: RING,PH2  
RING,XkHz

Notes:

Set the phase on which the ringing is applied to in UL mode.

Set the ringing frequency in UL mode, where X is 1,2,3,4 or 5.

**SEQDC**

Description: Used to create and run through a series of dc voltage points.

Format 1: SEQDC, option

Arguments:

Option: SINGLE(single shot)  
REPEAT(continuous sequence loop)  
CLEAR (clear sequence table)

Format 2: SEQUEN, entry, volt, time, trans

Arguments:

Entry: integer value range 1 - 50  
Volt: amplitude in range of 0 – 300 (AC)  
Time: output period in seconds  
Trans: LINEAR or STEP transition between entries

Reply: None

Example: SEQDC, 1, 10, 0.1, LINEAR  
SEQDC, 2, 90, 0.1, STEP

Notes:

**SEQUEN**

Description: Used to create and run through a series of AC voltage and frequency points.

Format 1: SEQUEN, option

Arguments:

Option: SINGLE(single shot)  
REPEAT(continuous sequence loop)  
CLEAR (clear sequence table)

Format 2: SEQUEN, EVENT, phase, value

Arguments:

Phase: PH1, PH2, PH3 (phase the sequence applies to)  
Value: phase offset applied 0 – 360 deg

Format 3: SEQUEN, entry, volt, freq, cycles, event, trans

Arguments:

Entry: integer value range 1 - 50  
Volt: amplitude in range of 0 – 300 (AC)  
Freq: frequency in range of 1 – 10,000  
Cycles: output period in half cycles  
Event: 0 – inactive, 1 – active  
Trans: LINEAR or STEP transition between entries

Reply: None

Example: SEQUEN, 1, 10, 50, 10, 0, LINEAR  
SEQUEN, 2, 90, 50, 10, 0, STEP

Notes: A more detailed view of sequence mode is given in section 0.

**SEQUEN?**

Description: The sequence can be queried to check if it still running or has finished

Format: SEQUEN?

Arguments: None

Reply: 0 (Sequence complete)  
1 (Sequence running)

Example: SEQUEN?  
Data returned ( 0 or 1)

Notes:

**START**

Description: Start a sequence, update a harmonic table or inject a ringing waveform

Format: START

Arguments: None

Reply: None

Example: HARMSE, 1, 230, 50  
HARMSE, 3, 33.3, 0  
START

Notes:

**STOP**

Description: Stop a repeating sequence

Format: STOP

Arguments: None

Reply: None

Example: SEQUEN, REPEAT  
SEQUEN, 1, 10, 50, 10, 0, LINEAR  
SEQUEN, 2, 90, 50, 10, 0, STEP  
START  
STOP

Notes:

**WAVEFORM**

Description: Control output waveform in single component mode

Format: WAVEFORM, wave

Arguments:

Wave: SINEWAVE  
TRIANGLE  
SQUARE

Reply: None

Example: WAVEFORM, TRIANGLE

**WIRING**

Description: Control output configuration

Format: WIRING, value

Arguments:

Value: 1PHASE  
3PHASE

Reply: None

Example: WIRING, 3PHASE

## Appendix E – Available character set

The following characters can be selected in text entry mode.

The table is to be read across then down (e.g., starting at space and repeatedly pressing NEXT gives ! “ # \$ % & ‘ ( ) \* etc.)

|   |   |   |   |    |   |   |   |
|---|---|---|---|----|---|---|---|
|   | ! | “ | # | \$ | % | & | ‘ |
| ( | ) | * | + | ,  | - | . | / |
| 0 | 1 | 2 | 3 | 4  | 5 | 6 | 7 |
| 8 | 9 | : | ; | <  | = | > | ? |
| @ | A | B | C | D  | E | F | G |
| H | I | J | K | L  | M | N | O |
| P | Q | R | S | T  | U | V | W |
| X | Y | Z | [ | \  | ] | ^ | _ |
| ‘ | a | b | c | d  | e | f | g |
| h | i | j | k | l  | m | n | o |
| p | q | r | s | t  | u | v | w |
| x | y | z | { |    | } |   |   |

## Appendix F – Contact details

Website: [www.newtons4th.com](http://www.newtons4th.com)