Features

- 6 sizes – 3 to 36kW, 30 – 360A, 50 – 350V RMS (L-N)
- Sizable for single and 3-phase configurations
- CC, CR, CV, CP, SC, UPF & CNL emulation modes
- Programmable crest factor and power factor
- 12 high-accuracy internal measurements
- User-defined waveforms
- 100-step macro for per cycle loading changes
- PC softpanel GUI with current, voltage & power waveform display
- PC control using Lab VIEW & IVI drivers
- LAN & RS232 communication interfaces
- True short circuit operation

Applications

The 4600 Series AC Electronic Loads are designed for test applications that require linear and non-linear AC loading in several emulation modes with Power (Fig. 1-4) and Crest Factor control (Fig. 1-4). This programmable versatility allows testing with a wide variety of potential field operating conditions to assure unit-under-test (UUT) reliability. Products tested include uninterruptible power supplies (UPS), AC sources, inverters, switches, circuit breakers, fuses, and connectors.

![Emulation Modes](4600 Series front panel view)

**Emulation Modes**

To provide testing under the broadest range of loading conditions, the 4600 Series AC Electronic Load offers 7 different emulation modes. Constant Current (CC) mode provides current to be drawn constantly, making it suitable for non-linear, linear, and regulation loading. Constant Resistance (CR) mode allows the electronic load to emulate a power resistor. Constant Voltage (CV) allows emulating a shunt regulator. Constant Power (CP) mode emulates a constant-power load such as a switching power supply. Short Circuit (SC) mode allows the electronic load to test the UUT’s short circuit protection capability. Unity Power Factor (UPF) (Fig. 1) mode brings power factor to unity, useful when the input voltage is non-sinusoidal. The new Complex Non-Linear Waveform (CNL) mode allows the user to define the waveform to prevent UUT current over-stressing in the event of a voltage collapse. These comprehensive capabilities provide the user almost every conceivable AC loading condition possible.
High Accuracy Measurements

The 4600 Series AC Electronic Load provides high-accuracy frequency, voltage, peak voltage, current, peak current, crest factor, apparent power, true power, peak power, reactive power, power factor, and resistance measurements by combining high-resolution measurements with precision ranging. The ability to make measurements internally eliminates multiple external measurement instruments plus associated signal matrixing. In this manner, the 4600 Series AC Electronic Load provides for a more compact, less costly, and considerably faster test system.

User-Defined Waveforms

The 4600 Series AC Electronic Load has the ability to control current through a user defined waveform (Fig. 5). The waveform is created by a powerful graphical editor that facilitates starting with a straight line or modifying a generated waveform based on current, power, and crest factor. The graphical editor includes an auto-check feature to ensure the settings are compatible with each other and within the capabilities of the electronic load. It also supports waveform smoothing, symmetrical, and asymmetrical waveform creation.

With this editor, waveforms can be quickly created to duplicate complex transient conditions. This would include adding asymmetrical inflections, inserting transient anomalies such as spikes and dropouts, and any shape else that can be drawn as a single-cycle waveform.

100-Step Multi-Mode Macros

Macros are queues of up to 100 steps that can be triggered locally, thereby providing very fast current, power, and crest factor changes, up to every cycle (Fig. 6). Further, a Macro can be executed as a single shot or looped.

emPower® LE Test Executive Option

The 4600 Series AC Electronic Load is supplied with software for a PC softpanel that provides complete instrument control, measurement, and waveform display. Upgrading to a full test executive with drivers for all NH Research, Inc. (NHR) power instruments is also possible through emPower® LE (Fig. 7), which adds a test sequencer, basic test routines, and reporting.
Wide Range of Power Levels

The 4600 Series AC Electronic Load is now offered in 6 power levels between 3 and 36kW (Fig. 8). Any unit can be field expandable in 3kW increments to address future higher power needs. Contact NHR for any loads higher than 36kW.

Graphic User Interface

A PC-hosted graphic user interface eclipses the traditional front panel clutter of knobs, dials, keypads, and digital displays. This traditional clutter is a carry-over from a time in which test instrumentation had a far more limited set of features. In addition to a more comprehensive presentation of operation, measurement, and status information, softpanel advantages include the ability to program and recall Macros, editing user-defined waveforms, along with display of real-time current, voltage, and power waveforms without an oscilloscope.

PC Softpanel provides complete instrument control, measurement and waveform display.

Panel Overview

1. Control Power switch
2. Fault indicator light
3. Circuit breaker
4. LAN port
5. Address switch
6. Status indicators
7. Trig In/Out connectors
8. Chassis GND stud
9. Load Power Input connector
10. LAN/RS 232 switch
11. RS 232 connector
12. COMM In/Out connectors
13. Hold In/Out connectors
14. AC input connector

Any unit can be field expandable in 3kW increments to address future higher power needs.
4600 Series Programmable AC Electronic Load Specifications

Measurements

Constant Current

- **Range (RMS)**: 0 - 30A, 0 - 60A, 0 - 120A, 0 - 180A, 0 - 240A, 0 - 360A
- **Accuracy**: 0.2%
- **Resolution**: 0.02%

Constant Voltage

- **Range**: 0 - 50V, 0 - 100V, 0 - 200V, 0 - 400V, 0 - 800V, 0 - 1600V
- **Accuracy**: 0.05%
- **Resolution**: 0.005%

Constant Power

- **Range**: 0 - 3kW, 0 - 6kW, 0 - 12kW, 0 - 18kW, 0 - 24kW, 0 - 36kW
- **Accuracy**: 0.5%
- **Resolution**: 0.05%

Constant Resistance

- **Range**: 0 - 1, 0 - 5, 0 - 25, 0 - 100, 0 - 500Ω
- **Accuracy**: 1%
- **Resolution**: 0.01%

Crest Factor

- **Range**: 0.1 - 10, 0.1 - 20
- **Accuracy**: 0.5%
- **Resolution**: 0.05%

Power Factor

- **Range**: 0 - 100°, 0 - 200°, 0 - 300°, 0 - 400°, 0 - 500°, 0 - 600°
- **Accuracy**: 1%
- **Resolution**: 0.01%

Voltage

- **Range**: 0 - 500V, 0 - 1000V, 0 - 2000V, 0 - 5000V
- **Accuracy**: 0.5%
- **Resolution**: 0.05%

Frequency

- **Range**: 45 - 40Hz, 45 - 400Hz
- **Accuracy**: 0.1%
- **Resolution**: 0.01%

Apparent Power

- **Range**: 0 - 10.5kVA, 0 - 21kVA, 0 - 42kVA, 0 - 84kVA
- **Accuracy**: 0.2% + 0.003%
- **Resolution**: 0.01%

True Power

- **Range**: 0 - 30A, 0 - 60A, 0 - 120A, 0 - 240A, 0 - 360A
- **Accuracy**: 0.2%
- **Resolution**: 0.02%

Current

- **Range**: 0 - 30A, 0 - 60A, 0 - 120A, 0 - 180A, 0 - 240A, 0 - 360A
- **Accuracy**: 0.2%
- **Resolution**: 0.01%

Peak Current

- **Range**: 0 - 90A, 0 - 180A, 0 - 360A
- **Accuracy**: 0.5%
- **Resolution**: 0.05%

Peak Voltage

- **Range**: 50 - 500V, 50 - 1000V, 50 - 5000V
- **Accuracy**: 0.5%
- **Resolution**: 0.05%

Peak Power

- **Range**: 50 - 500W, 50 - 1000W, 50 - 5000W
- **Accuracy**: 0.5%
- **Resolution**: 0.05%

Peak Frequency

- **Range**: 45 - 40Hz, 45 - 400Hz
- **Accuracy**: 0.1%
- **Resolution**: 0.01%

True Power

- **Range**: 0 - 10.5kW, 0 - 21kW, 0 - 42kW, 0 - 84kVA
- **Accuracy**: 0.2% + 0.003%
- **Resolution**: 0.01%

Apparent Power

- **Range**: 0 - 10.5kVA, 0 - 21kVA, 0 - 42kVA
- **Accuracy**: 0.3%
- **Resolution**: 0.01%

Power Factor

- **Range**: 0 - 1, 0 - 5, 0 - 25, 0 - 100
- **Accuracy**: 0.5%
- **Resolution**: 0.05%

Resistance

- **Range**: 0.1 - 100Ω, 0.1 - 500Ω, 0.1 - 2500Ω
- **Accuracy**: 1%
- **Resolution**: 0.01%

Waveform Display

- **Accuracy**: Continuous updated, graphical display of a full cycle of current, voltage, and/or power waveforms
- **Resolution**: 0.01%

Additional Features

- **3-Phase Operation**: Provides for control of 3 individual units (for example, 3kW units for a total of 9kW, 6kW units for a total of 18kW) to simulate a 3-phase load
- **Remote Voltage Sense**: 1 MegaOhm impedance, 2VDC max drop between sense and load input
- **Performance**: Continuous checking of performance parameters and appropriate error messages and/or LED fault indicators
- **Calibration**: Closed cover, all adjustments made in software and stored in FLASH
- **Input Power**: 115/230 ± 10% VAC, 47 - 63Hz

Specifications subject to change without notice.