

**NEW**

# High-Voltage DC Loads

## 4760 LXI SERIES

- ❑ 600V, 1kW/50A to 36kW/1800A
- ❑ 18 Voltage, Current, Power and Timing Measurements
- ❑ Complex load profile playback
- ❑ Air cooling
- ❑ Touch-panel manual control

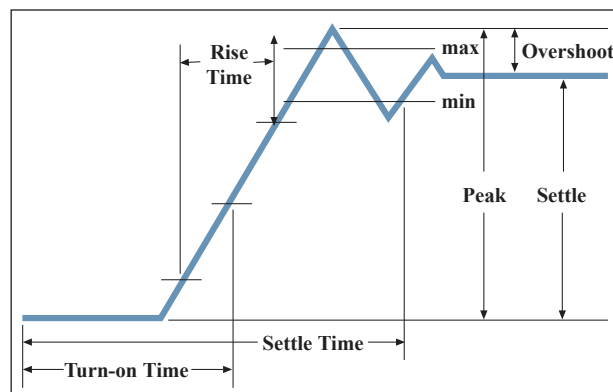


### APPLICATION

4760 LXI Series Electronic Loads are designed for testing applications that require high-power and high-voltage plus measurement of UUT dynamic performance. The Loads provide exceptional reliability combined with the inherent simplicity and safety of air cooling. The 4760 Loads are controlled through either a manual touch-panel, a LabVIEW soft-panel or an emPower™ Test Executive enabled automatic test station. Typical power conversion products to be tested include higher-power DC supplies, telecom rectifiers, fuel cells and batteries.

### EXTENDED INTERNAL MEASUREMENTS

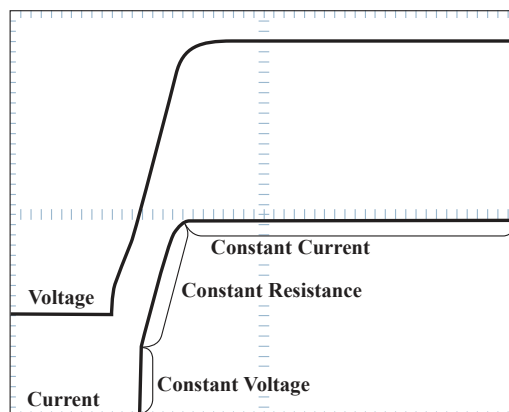
The 4760 Loads eliminate the need for separate external instruments and related switching to capture timing and other dynamic measurements during UUT turn-on and turn-off. This is accomplished by incorporating the task-essential features of a DMM, DSO and Transient Generator. With this built-in capability, the 4760 can rapidly generate engineering-characterization-like test information at faster test speeds with the additional benefit of cost savings from fewer measurement instruments, switches and interconnection wiring.



Turn-on voltage & current measurements

### AUTO MODE

The 4760 contains a unique Auto Mode that provides glitchless automatic switching between CR, CC, CV and CP limits. Previously challenging tests that are now made possible include turn-on into a CR load, confirming the complete V-I curve for Lithium-Ion battery chargers, and preventing device-under-test blowup should a protection circuit fail.



Power supply turn-on voltage & current waveforms in auto mode

**NHR**

## POWERTOUCH MANUAL CONTROL



Actual Size

**Scope Tab**



**Monitor Tab**



**Control tab**

Just as touch-panels have revolutionized the user interface on mobile phones and GPS navigation devices, they now are about to change electronic power instruments. The old paradigm of controlling electronic loads through knobs, meters and keypads has been lacking for years. There are just too many control & display functions to manage, especially with the latest generation of smart loads that contain digitized measurements for oscilloscope-like waveform displays.

The new NHR PowerTouch panel eliminates those limitations forever. The display is organized through

6 tabs, each providing a full screen with complete control & display of related information. For instance, a Monitor tab displays actual measurements either in the local or remote-control mode. A Control tab provides for setting voltage, current, resistance and power as well as the CC, CV, CR and CP Operating Modes. The unique Scope tab provides the ability to zoom in on specific areas of interest as well as take basic measurements on waveform captures. Those waveform captures can then be saved on a SD card for later review on a PC. Load user interfaces have never been as comprehensive or easier to use as is now possible with this touch-panel technology.

# MODEL 4760 LXI DC LOADS

## FAULT TOLERANT

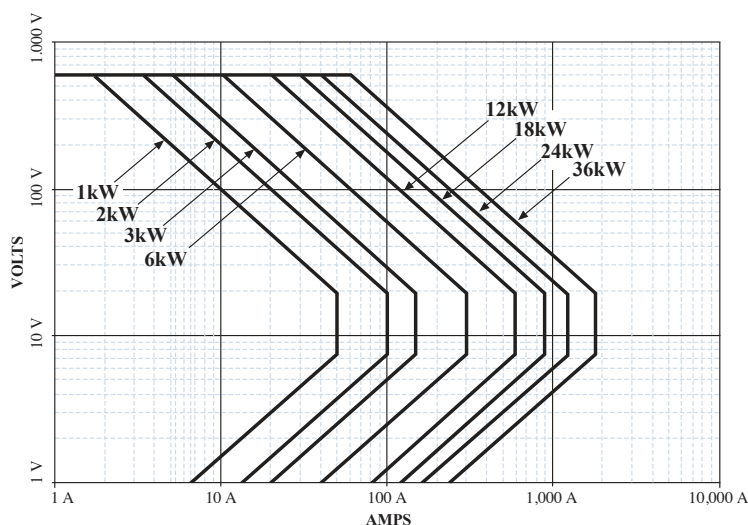
The 4760 Loads are designed to keep running under just about any condition, even certain internal component failures. Standard for this class of instrument is protection against output over-voltage, over-current, over-power, reverse-voltage, and internal over-temperature. In addition, controller intelligence continuously monitors sub-circuit performance and redistributes the current load as necessary. This fault tolerant technique allows the user to continue testing with proper warning of a fault condition. Further load reliability is assured through extensive startup self-test and real-time monitoring.

## FIELD EXPANDABLE

Because the 4760 Loads are modular, synchronously controlled and actively power-balanced, they operate efficiently in parallel as a single load. In this manner the Loads are field expandable with changes only to the input connections. This feature allows selection of only what is currently needed with confidence that future higher power requirements can be accommodated with minimum disruption and cost.

## COMPLEX LOAD PROFILE PLAYBACK

To facilitate ease of re-creating complex, precisely timed, multi-mode load profiles, a 100-step macro-recording capability allows capturing a dynamic sequence for later playback from within the Load. Additional complex profiles can be stored in a system controller library to be downloaded to the Load when required.

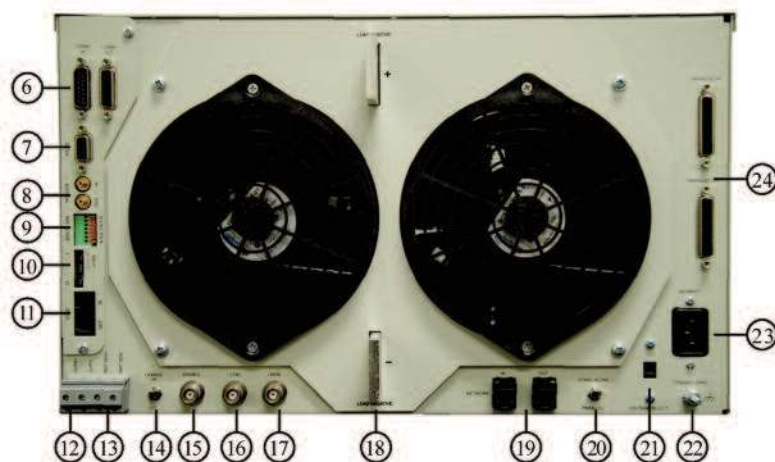


Constant power operating envelopes

## PANEL OVERVIEW



- |                             |                            |
|-----------------------------|----------------------------|
| 1. Power Switch             | 7. RS232 connector         |
| 2. Hardware error indicator | 8. Trig In/Out connectors  |
| 3. USB connector            | 9. DIN/DOUT connector      |
| 4. Touch panel display      | 10. Address switch         |
| 5. LXI status indicators    | 11. Sync In/Out connectors |
| 6. COMM In/Out connectors   | 12. OVPS connector         |



- |                            |                           |
|----------------------------|---------------------------|
| 13. Remote sense connector | 19. Network connectors    |
| 14. I Range switch         | 20. Parallel switch       |
| 15. Enable indicator       | 21. Voltage select switch |
| 16. I Control connector    | 22. Chassis GND stud      |
| 17. I Monitor connector    | 23. AC input connector    |
| 18. Load connections       | 24. Parallel connectors   |

# SPECIFICATIONS<sup>1</sup>

| 4760 Ratings                 | 4760-1                                                                                                                       | 4760-2             | 4760-3              | 4760-6              | 4760-12         | 4760-18         | 4760-24         | 4760-36         |
|------------------------------|------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------------|---------------------|-----------------|-----------------|-----------------|-----------------|
| Power                        | 1 kW                                                                                                                         | 2 kW               | 3 kW                | 6 kW                | 12 kW           | 18 kW           | 24 kW           | 36 kW           |
| Maximum Current <sup>2</sup> | 50 A                                                                                                                         | 100 A              | 150 A               | 300 A               | 600 A           | 900 A           | 1,200 A         | 1,800 A         |
| Voltage Range <sup>3</sup>   | 7.0 - 600 V                                                                                                                  | 7.0 - 600 V        | 7.0 - 600 V         | 7.0 - 600 V         | 7.0 - 600 V     | 7.0 - 600 V     | 7.0 - 600 V     | 7.0 - 600 V     |
| <b>Programmable Modes</b>    | <i>Accuracies: % of Set + % of Range, Resolution: % of Range</i>                                                             |                    |                     |                     |                 |                 |                 |                 |
| Constant Current             |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Ranges <sup>4</sup>          | 5, 50 A                                                                                                                      | 10, 100 A          | 15, 150 A           | 30, 300 A           | 60, 600 A       | 90, 900 A       | 120, 1200 A     | 180, 1800 A     |
| Accuracy                     | 0.12%+0.08%                                                                                                                  | 0.12%+0.08%        | 0.12%+0.08%         | 0.12%+0.08%         | 0.12%+0.08%     | 0.12%+0.08%     | 0.12%+0.08%     | 0.12%+0.08%     |
| Resolution                   | 0.025%                                                                                                                       | 0.025%             | 0.025%              | 0.025%              | 0.025%          | 0.025%          | 0.025%          | 0.025%          |
| Constant Voltage             |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Ranges                       | 20, 200, 600 V                                                                                                               | 20, 200, 600 V     | 20, 200, 600 V      | 20, 200, 600 V      | 20, 200, 600 V  | 20, 200, 600 V  | 20, 200, 600 V  | 20, 200, 600 V  |
| Accuracy                     | 0.05%+0.05%                                                                                                                  | 0.05%+0.05%        | 0.05%+0.05%         | 0.05%+0.05%         | 0.05%+0.05%     | 0.05%+0.05%     | 0.05%+0.05%     | 0.05%+0.05%     |
| Resolution                   | 0.025%                                                                                                                       | 0.025%             | 0.025%              | 0.025%              | 0.025%          | 0.025%          | 0.025%          | 0.025%          |
| Constant Power               |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Range                        | 0 - 1 kW                                                                                                                     | 0 - 2 kW           | 0 - 3 kW            | 0 - 6 kW            | 0 - 12 kW       | 0 - 19 kW       | 0 - 24 kW       | 0 - 36 kW       |
| Accuracy                     | 1% + 1%                                                                                                                      | 1% + 1%            | 1% + 1%             | 1% + 1%             | 1% + 1%         | 1% + 1%         | 1% + 1%         | 1% + 1%         |
| Resolution                   | 0.025%                                                                                                                       | 0.025%             | 0.025%              | 0.025%              | 0.025%          | 0.025%          | 0.025%          | 0.025%          |
| Constant Resistance          |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Range                        | 0.2 - 6000 Ω                                                                                                                 | 0.1 - 3000 Ω       | 0.06 - 2000 Ω       | 0.03 - 1000 Ω       | 0.02 - 500 Ω    | 0.01 - 333 Ω    | 0.008 - 250 Ω   | 0.005 - 167 Ω   |
| Accuracy <sup>5</sup>        | 2%                                                                                                                           | 2%                 | 2%                  | 2%                  | 2%              | 2%              | 2%              | 2%              |
| Slew Rate (10 - 90%)         |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Range                        | 0 - 5 A/μs                                                                                                                   | 0 - 10 A/μs        | 0 - 15 A/μs         | 0 - 30 A/μs         | 0 - 60 A/μs     | 0 - 90 A/μs     | 0 - 120 A/μs    | 0 - 180 A/μs    |
| Rise Time                    | 10 μs - 20 s                                                                                                                 | 10 μs - 20 s       | 10 μs - 20 s        | 10 μs - 20 s        | 10 μs - 20 s    | 10 μs - 20 s    | 10 μs - 20 s    | 10 μs - 20 s    |
| Resolution                   | < 5 μs                                                                                                                       | < 5 μs             | < 5 μs              | < 5 μs              | < 5 μs          | < 5 μs          | < 5 μs          | < 5 μs          |
| Accuracy                     | 1% +/- 5μs                                                                                                                   | 1% +/- 5μs         | 1% +/- 5μs          | 1% +/- 5μs          | 1% +/- 5μs      | 1% +/- 5μs      | 1% +/- 5μs      | 1% +/- 5μs      |
| Short Circuit                |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Resistance                   | 2.0, 0.2 Ω                                                                                                                   | 1.0, 0.1 Ω         | 670, 67 mΩ          | 330, 33 mΩ          | 167, 17 mΩ      | 111, 11 mΩ      | 83, 8.3 mΩ      | 56, 5.6 mΩ      |
| Current Max                  | 8, 80 A                                                                                                                      | 16, 160 A          | 24, 240 A           | 48, 480 A           | 96, 960 A       | 144, 1440 A     | 192, 1920 A     | 290, 2900 A     |
| Macro                        |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Modes                        | Any single Mode                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Repetition                   | Single Burst or Continuous                                                                                                   |                    |                     |                     |                 |                 |                 |                 |
| Settings                     | 100                                                                                                                          |                    |                     |                     |                 |                 |                 |                 |
| Period                       | 40 μs - 20 s                                                                                                                 |                    |                     |                     |                 |                 |                 |                 |
| Delay                        | 20 μs - 20 s                                                                                                                 |                    |                     |                     |                 |                 |                 |                 |
| Resolution                   | 10 μs                                                                                                                        |                    |                     |                     |                 |                 |                 |                 |
| Accuracy                     | 1% +/- 5 μs                                                                                                                  |                    |                     |                     |                 |                 |                 |                 |
| <b>Measurements</b>          | <i>Accuracies: % of Measurement + % of Range, Resolution: % of Range</i>                                                     |                    |                     |                     |                 |                 |                 |                 |
| Current                      |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Ranges                       | 5, 50 A                                                                                                                      | 10, 100 A          | 15, 150 A           | 30, 300 A           | 60, 600 A       | 90, 900 A       | 120, 1200 A     | 180, 1800 A     |
| Accuracy                     | 0.12%+0.06%                                                                                                                  | 0.12%+0.06%        | 0.12%+0.06%         | 0.12%+0.06%         | 0.12%+0.06%     | 0.12%+0.06%     | 0.12%+0.06%     | 0.12%+0.06%     |
| Resolution                   | 0.0015%                                                                                                                      | 0.0015%            | 0.0015%             | 0.0015%             | 0.0015%         | 0.0015%         | 0.0015%         | 0.0015%         |
| DC Voltage                   |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Ranges                       | 20, 200, 600 V                                                                                                               | 20, 200, 600 V     | 20, 200, 600 V      | 20, 200, 600 V      | 20, 200, 600 V  | 20, 200, 600 V  | 20, 200, 600 V  | 20, 200, 600 V  |
| Accuracy                     | 0.01%+0.02%                                                                                                                  | 0.01%+0.02%        | 0.01%+0.02%         | 0.01%+0.02%         | 0.01%+0.02%     | 0.01%+0.02%     | 0.01%+0.02%     | 0.01%+0.02%     |
| Resolution                   | 0.0015%                                                                                                                      | 0.0015%            | 0.0015%             | 0.0015%             | 0.0015%         | 0.0015%         | 0.0015%         | 0.0015%         |
| Power                        |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Ranges                       | Current Range x Voltage Range                                                                                                |                    |                     |                     |                 |                 |                 |                 |
| Accuracy                     | Current Accuracy + Voltage Accuracy                                                                                          |                    |                     |                     |                 |                 |                 |                 |
| Resolution                   | 0.0015% Range                                                                                                                |                    |                     |                     |                 |                 |                 |                 |
| Waveform Capture             |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Bandwidth                    | 25 kHz                                                                                                                       |                    |                     |                     |                 |                 |                 |                 |
| Accuracy                     | 1% R                                                                                                                         |                    |                     |                     |                 |                 |                 |                 |
| Channels                     | Voltage, Current or both MUX'd                                                                                               |                    |                     |                     |                 |                 |                 |                 |
| Digitizing Rate <sup>6</sup> | 100 - 100K Samples/s                                                                                                         |                    |                     |                     |                 |                 |                 |                 |
| Memory                       | 115/230 ± 10% VAC, 47 - 63 Hz                                                                                                |                    |                     |                     |                 |                 |                 |                 |
| Timebase                     | 10 μs - 8 s                                                                                                                  |                    |                     |                     |                 |                 |                 |                 |
| Triggering                   | System or External                                                                                                           |                    |                     |                     |                 |                 |                 |                 |
| Waveform Analysis            | Voltage, Current, Power, Overshoot, Undershoot, Rise/Fall Time, Turn-On Time, Settling Time, Hold-Up Time, AC RMS, AC+DC RMS |                    |                     |                     |                 |                 |                 |                 |
| <b>Control</b>               |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| User Interface               | PC soft panel or manual touch-panel                                                                                          |                    |                     |                     |                 |                 |                 |                 |
| PC Required                  | 3 GHz μP with 512 MB RAM, SVGA display, 80 GB HD                                                                             |                    |                     |                     |                 |                 |                 |                 |
| OS                           | Windows XP, Vista                                                                                                            |                    |                     |                     |                 |                 |                 |                 |
| Test Executive               | NI LabVIEW, emPower™ with integrated datalog/test report support                                                             |                    |                     |                     |                 |                 |                 |                 |
| Communications               | Ethernet (LXI), RS232, NHR RS485                                                                                             |                    |                     |                     |                 |                 |                 |                 |
| Drivers                      | Active X                                                                                                                     |                    |                     |                     |                 |                 |                 |                 |
| <b>Physical</b>              |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Load Connectors              | Bus bars with lugs                                                                                                           |                    |                     |                     |                 |                 |                 |                 |
| Operating Temperature        | 0 - 40° C at full power and <75% duty cycle                                                                                  |                    |                     |                     |                 |                 |                 |                 |
| Input Power                  | 115/230 ± 10% VAC, 47 - 63 Hz                                                                                                |                    |                     |                     |                 |                 |                 |                 |
| Dimensions (HxWxD)           | 5 1/4 x 19 x 22 in                                                                                                           | 5 1/4 x 19 x 22 in | 10 1/2 x 19 x 22 in | 10 1/2 x 19 x 22 in | 35 x 23 x 30 in | 43 x 23 x 30 in | 57 x 23 x 30 in | 72 x 23 x 30 in |
| Weight                       | 40 lbs                                                                                                                       | 50 lbs             | 75 lbs              | 100 lbs             | 250 lbs         | 400 lbs         | 570 lbs         | 815 lbs         |
| <b>Additional Features</b>   |                                                                                                                              |                    |                     |                     |                 |                 |                 |                 |
| Remote Voltage Sense         | 2 VDC max drop between sense and load input                                                                                  |                    |                     |                     |                 |                 |                 |                 |
| Self Test                    | Power-up self test of all major functions including status of input, output, control and protection circuits                 |                    |                     |                     |                 |                 |                 |                 |
| Performance Monitoring       | Continuous checking of performance parameters and appropriate error messages and/or LED fault indicators when necessary      |                    |                     |                     |                 |                 |                 |                 |
| Calibration                  | Closed cover, all adjustments made in software and stored in EEPROM                                                          |                    |                     |                     |                 |                 |                 |                 |
| Protection                   | OP, OC, OV, OT, Reverse Voltage and Undervoltage Lockout                                                                     |                    |                     |                     |                 |                 |                 |                 |
| Trigger Output               | Synchronizes external device to programmed load step                                                                         |                    |                     |                     |                 |                 |                 |                 |
| Trigger Input                | Synchronizes programmed load step to an external device                                                                      |                    |                     |                     |                 |                 |                 |                 |
| Current Monitor              | 0 - 10 V external signal appropriate to 100% current for the selected range                                                  |                    |                     |                     |                 |                 |                 |                 |
| Analog Control               | 0 - 10 V external signal appropriate to 100% current for the selected range                                                  |                    |                     |                     |                 |                 |                 |                 |
| Fan Noise Reduction          | Automatic fan speed control                                                                                                  |                    |                     |                     |                 |                 |                 |                 |

<sup>1</sup> Specifications apply at 23° +/- 5° C after a 10 minute warm up.

<sup>2</sup> Accuracies apply when Settings and/or Measurements >10% of Range.

<sup>3</sup> Current linearly reduced between 7 and 1 V.

<sup>4</sup> Models 2 - 36 kW also have a 5 A /1 KW Range with reduced accuracy .

<sup>5</sup> Set 1000% to 6000% of Range = 10% Accuracy.

<sup>6</sup> Single channel capture. Simultaneous Voltage and Current captures would halve sample rate and memory available.

