AC & DC Electronic Load Product Selector Guide

NH Research

Modular DC Electronic Load With Built-In Measurements

	Model	Voltage	Current	Power
	4312	0.6 - 120V	40, 80, & 150A	150, 300, & 600W
	4350	2.3 - 500V	30, 60, & 120A	150, 300, & 600W

High Performance DC Electronic Load

	Model	Voltage	Current	Power
	4700	1.0 - 120V	200 - 7200A	1kW - 36kW
	4760	7.0 - 600V	50 - 1800A	1kW - 36kW

Programmable AC Electronic Load

	Model	Voltage	Current	Power
	4600	50 - 350VAC	30 - 180A	3kW - 36kW

Regenerative, Bi-Directional DC Source/Load

	Model	Voltage	Current	Power
	9210	40, 120 & 600V	Up to 600A	12kW
	9200	40, 120 & 600V	Up to 7200A	12kW-144kW

AC & DC Regenerative

	Model	Voltage	Current	Power
	9410	155 - 400V	Up to 800A	12kW - 96kW

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4312 Series
Modular 120V DC Electronic Load

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Digitizing DC Load with Built-In Measurements

Features

- 3 Models - 150W, 300W, 600W
- 3 Voltage ranges - 6, 30, & 120V
- 3 Current ranges
- High-resolution waveform capture up to 1M Sample/Sec
- Precision voltage, current, power, & timing measurements
- Constant Loads - CV, CC, CP, CR, & in combination
- Dynamic Loading - 1000 settings
- Advanced Loading - LED, MPPT, & XY loading
- Easy-to-use PC softpanel
- Ethernet (LAN)

Figure 1 *- DC panel graphical user interface*

Advantages

- Modular load maximizes configuration flexibility
- Simplifies automated test stand development
  - Triggerable set & measurment
  - Short circuit mode & over voltage relay
  - Isolated digital inputs & outputs
  - Built-in SW watchdog & safety limits
- Software tools to shorten test development time
  - PC-based Softpanel GUI with scope display (*Fig. 1*)
  - Supplied LabVIEW & IVI-C/IVI-COM drivers
  - Optional: DC Load, *em*Power®, or Enerchron® test sequencer

Benefits

- Modular - up to 16 loads or combinations in single chassis
- Built in features require fewer test devices
- Front connections simplify wiring
- Safety limits protect UUT

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Model 4312 Modular 120V DC Electronic Load Specifications

Overview			
Power	150 W	300 W	600 W
Slots (16 per Mainframe)	1	2	4
Maximum Current	40A	80A	150A
Maximum Voltage	120V	120V	120V
Voltage & Current Measurements	Overshoot, Undershoot, AC RMS, AC+DC RMS, Positive Peak, Negative Peak, Peak-Peak, High-Frequency Peak - Peak (Noise), Rise Time, Fall Time, Settling Time, Hold-Up Time		
Other Measurements	Average Power, Peak Power, Resistance, Trigger-In Time, DIN State & Time		
Programmable Features	*Constant Current Mode, Constant Voltage Mode, Constant Power Mode, Constant Resistance, Auto Mode, LED Driver Mode, Solar PV Panel with MPPT Mode, Slew Rate, Macro, Triggering*		
Measurement Instrumentation			
Current			
Range (±)	0 - 0.8, 4, 40A	0 - 0.8, 8, 80A	0 - 0.8, 16, 150A
Accuracy	0.05% Rdg + 0.05% R	0.05% Rdg + 0.05% R	0.05% Rdg + 0.05% R
Resolution	0.0015% R	0.0015% R	0.0015% R
DC Voltage			
Range (±)	0 - 6, 30, 120V	0 - 6, 30, 120V	0 - 6, 30, 120V
Accuracy	0.02% Rdg + 0.04% R		
Resolution	0.003% R		
Waveform			
Bandwidth			
Voltage	DC - 500kHZ		
Current	DC - 100kHZ		
Accuracy			
Analog	1% R		
Time	(1/sample rate) +0.05 % Rdg		
Digitizing Rate	1 MS/s		
Record Length	256K points		
Trigger	System Trigger, DINS, Voltage		

(continued)			
Power			
Range	IR x VR	IR x VR	IR x VR
Accuracy	I Accuracy + V Accuracy		
Resolution	0.0015% R	0.0015% R	0.0015% R
Resistance			
Range	0 - Inf	0 - Inf	0 - Inf
Accuracy	I Accuracy + V Accuracy		
Resolution	0.0015% R	0.0015% R	0.0015% R
High-Frequency			
PK-PK Noise			
Range	0 - 0.25, 2.5VAC		
Bandwidth	10 Hz - 20MHz		
Accuracy	3% R @I MHz		
Resolution	0.0015% R		
DIN Timing			
Range	100µS to 168 hours	100µS to 168 hours	100µS to 168 hours
Accuracy	0.05% Rdg ± 100 µS	0.05% Rdg ± 100 µS	0.05% Rdg ± 100 µS
Resolution	100 nano S	100 nano S	100 nano S
Additional Features			
OVPS Relay	Connects programmable power supply to test UUT for over-voltage protection, relay connected and 5 A limited (Relay only)		
External Analog Input	0 - 10V signal input to modulate current		
External Current Monitor	0 - 10V output signal corresponding to 100% of Range Current		
Digital Inputs (DINs) per Load	2 isolated, logic level		
Digital Outputs (DOUTs) per load	2 isolated, ±100VDC, 300mA		
Digital Outputs per Mainframe	12 isolated, ±100VDC, 300mA		
Calibration	Closed cover, all adjustments are done in software and stored in on-board flash memory		

R = Range, S = Set Point, Rdg = Readings • Specifications apply at 25°± 5° C after a 10 minute warm up & are subject to change without notice. Accuracies apply when settings and/or measurements >10% of R

Model 4312 Panel Overview

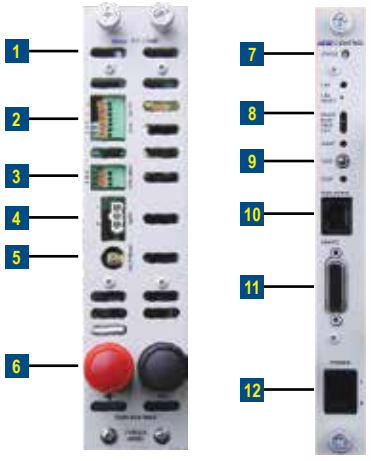

***Figure 1** - Front panel (300 W load) & front panel control*

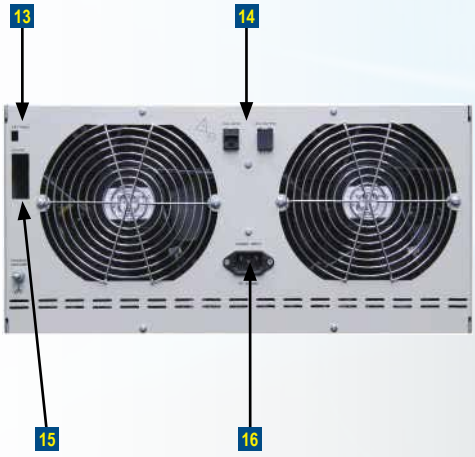

***Figure 2** - Mainframe rear panel*

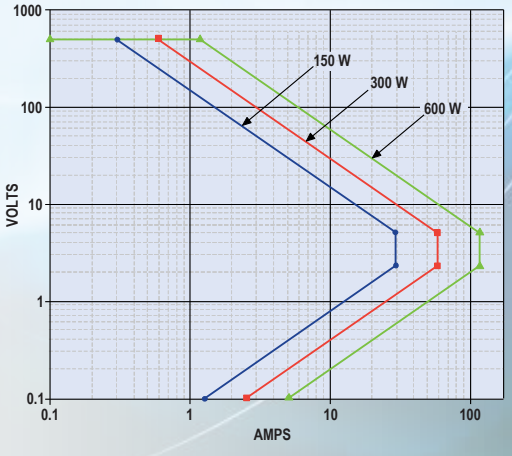

***Figure 3** - Constant Power operating envelope*

1 Load Status Indicator	5 Volt Sense	9 Test Control	13 Settings
2 DINS/DOUTS	6 Load Power	10 Display Connection	14 LAN Connection
3 Current Control	7 Status Indicator	11 Remote Connection	15 DOUTS
4 OVPS	8 Test Status	12 Power Switch	16 Power Input

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4350 Series
Modular 500V DC Electronic Load

NH Research

Digitizing DC Load with Built-In Measurements

Features

- 3 Models - 150W, 300W, 600W
- 3 Voltage ranges - 30, 120, & 500V
- 3 Current ranges
- High-resolution waveform capture up to 1 M Sample/Sec
- Precision voltage, current, power, & timing measurements
- Constant Loads - CV, CC, CP, CR, & in combination
- Dynamic Loading - 1000 settings
- Advanced Loading - LED, MPPT, & XY loading
- Easy-to-use PC softpanel
- Ethernet (LAN)

Figure 1 *- DC panel graphical user interface*

Advantages

- Modular load maximizes configuration flexibility
- Simplifies automated test stand development
  - Triggerable set & measurment
  - Short circuit mode & over voltage relay
  - Isolated digital inputs & outputs
  - Built-in SW watchdog & safety limits
- Software tools to shorten test development time
  - PC-based Softpanel GUI with scope display (*Fig. 1*)
  - Supplied LabVIEW & IVI-C/IVI-COM drivers
  - Optional: DC Load, *em*Power or Enerchron test sequencer

Benefits

- Modular - up to 16 loads or combinations in single chassis
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- Front connections simplify wiring
- Safety limits protect UUT

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Model 4350 Digitizing DC Electronic Load Specifications

Overview			
Power	150 W	300 W	600 W
Slots (16 per Mainframe)	1	2	4
Maximum Current	30 A	60 A	120 A
Maximum Voltage	500 V	500 V	500 V
Voltage & Current Measurements	Overshoot, Undershoot, AC RMS, AC+DC RMS, Positive Peak, Negative Peak, Peak-Peak, High-Frequency Peak - Peak (Noise), Rise Time, Fall Time, Settling Time, Hold-Up Time		
Other Measurements	Average Power, Peak Power, Resistance, Trigger-In Time, DIN State & Time		
Programmable Features	*Constant Current Mode, Constant Voltage Mode, Constant Power Mode, Constant Resistance, Auto Mode, LED Driver Mode, Solar PV Panel with MPPT Mode, Slew Rate, Macro, Triggering*		
Measurement Instrumentation			
Current			
Range (±)	0 - 0.66, 3.0, 30 A	0 - 0.66, 6.0, 60 A	0 - 0.66, 12, 120 A
Accuracy	0.05% Rdg + 0.05% R	0.05% Rdg + 0.05% R	0.05% Rdg + 0.05% R
Resolution	0.0015% R	0.0015% R	0.0015% R
DC Voltage			
Range (±)	0 - 30, 120, 600 V	0 - 30, 120, 600 V	0 - 30, 120, 600 V
Frequency	DC - 500 kHZ	DC - 500 kHZ	DC - 500 kHZ
Accuracy	0.02% Rdg + 0.04% R		
Resolution	0.003% R	0.003% R	0.003% R
Waveform			
Bandwidth			
Voltage	DC - 500 kHZ		
Current	DC - 100 kHZ		
Accuracy			
Analog	1% R		
Time	(1/sample rate) +0.05 % Rdg		
Digitizing Rate	1 MS/s		
Record Length	256K points		
Trigger	System Trigger, DINS, Voltage		

(continued)			
Power			
Range	IR x VR	IR x VR	IR x VR
Accuracy	I Accuracy + V Accuracy		
Resolution	0.0015% R	0.0015% R	0.0015% R
Resistance			
Range	0 - Inf	0 - Inf	0 - Inf
Accuracy	I Accuracy + V Accuracy		
Resolution	0.0015% R	0.0015% R	0.0015% R
High-Frequency			
PK-PK Noise			
Range	0 - 0.25, 2.5 VAC		
Bandwidth	10 Hz - 20 MHz		
Accuracy	3% R @I MHz		
Resolution	0.0015% R		
DIN Timing			
Range	100µS to 168 hours	100µS to 168 hours	100µS to 168 hours
Accuracy	0.05% Rdg ± 100 µS	0.05% Rdg ± 100 µS	0.05% Rdg ± 100 µS
Resolution	100 nano S	100 nano S	100 nano S
Additional Features			
OVPS Relay	Connects programmable power supply to test UUT for over-voltage protection, relay connected and 5 A limited (Relay only)		
External Analog Input	0 - 10 V signal input to modulate current		
External Current Monitor	0 - 10 V output signal corresponding to 100% of Range Current		
Digital Inputs (DINs) per Load	2 isolated, logic level		
Digital Outputs (DOUTs) per load	2 isolated, ±100 VDC, 300 mA		
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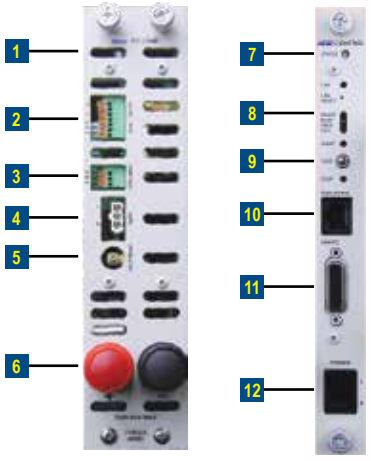
Calibration	Closed cover, all adjustments are done in software and stored in on-board flash memory		

R = Range, S = Set Point, Rdg = Readings • Specifications apply at 25°± 5° C after a 10 minute warm up & are subject to change without notice. Accuracies apply when settings and/or measurements >10% of R

Model 4350 Panel Overview



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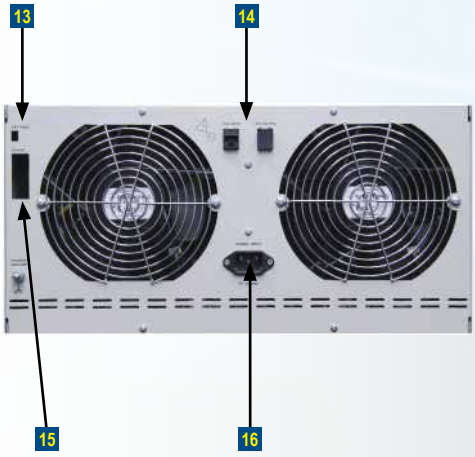

***Figure 2** - Mainframe rear panel*

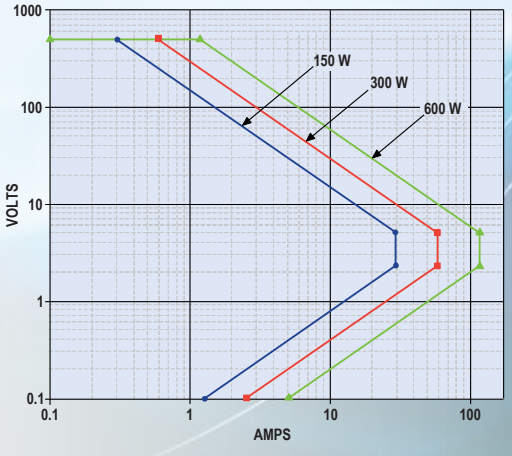

***Figure 3** - Constant Power operating envelope*

1 Load Status Indicator	5 Volt Sense	9 Test Control	13 Settings
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4700 Series
High Performance 120V DC Load

NH Research

High Current DC Electronic Load

4700-6 Series 6kW model

Features

- 8 Models - 1kW to 36kW
- 4 Voltage ranges - 6.6, 20, 66, & 120V
- 2 Current ranges
- High accuracy 1kW low power range
- Waveform capture up to 100k Sample/Sec
- Precision voltage, current, power, & timing measurements
- Constant Loads - CV, CC, CP, CR, & in combination
- Dynamic Loading - 100 settings
- Built-in touch-panel user interface
- Ethernet (LAN)

Advantages

- Field-proven reliability
- Simplifies automated test stand development
  - Triggerable set & measurement
  - True short circuit mode & over voltage relay
  - Digital inputs & outputs
  - Built-in SW watchdog & safety limits
- Software tools to shorten test development time
  - PC-based Softpanel GUI with scope display
  - Supplied LabVIEW & IVI-C/IVI-COM drivers
  - Optional: DC Load, *em*Power®, or Enerchron® test sequencer

Benefits

- Field upgradeable (6kW steps)
- Built in features require fewer test devices
- Safety limits protect UUT

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4700 Series High Performance 120V DC Load Specifications[1]

4700 Models	4700-1-TP	4700-2-TP	4700-3-TP	4700-6-TP	4700-12-TP	4700-18-TP	4700-24-TP	4700-36-TP
Power	1 kW	2 kW	3 kW	6 kW	12 kW	18 kW	24 kW	36 kW
Maximum Current [2]	200 A	400 A	600 A	1200 A	2400 A	3600 A	4800 A	7200 A
Voltage Range [3]	1-120 V	1-120 V	1-120 V	1-120 V	1-120 V	1-120 V	1-120 V	1-120 V
Programmable Modes	**Accuracies: % of Set + % of Range, Resolution: % of Range**							
Constant Current								
Ranges [4]	20, 200 A	40, 400 A	60, 600 A	120, 1200 A	240, 1200 A	360, 3600 A	480, 4800 A	720, 7200 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	6.6, 20, 66,120 V	6.6, 20, 66,120 V	6.6, 20, 66,120 V	6.6, 20, 66,120 V	6.6, 20, 66,120 V	6.6, 20, 66,120 V	6.6, 20, 66,120 V	6.6, 20, 66,120 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 - 18 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	5 mΩ - 180 Ω	2.5 mΩ - 90 Ω	1.67 mΩ - 60 Ω	833 µΩ - 30 Ω	417 µΩ - 15 Ω	278 µΩ - 10 Ω	208 µΩ - 7.5 Ω	136 µΩ - 5 Ω
Accuracy [5]	2%	2%	2%	2%	2%	2%	2%	2%
Slew Rate (10 - 90%)								
Range	1 A/s - 20 A/µs	2 A/s - 40 A/µs	3 A/s - 60 A/µs	6 A/s - 120 A/µs	12 A/s - 240 A/µs	18 A/s- 360 A/µs	24 A/s- 480 A/µs	36 A/s- 720 A/µs
Rise Time	10µs - 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	10µs - 20 s
Resolution	< 5 µs	< 5 µs	< 5 µs	< 5 µs	< 5 µs	< 5 µs	< 5 µs	< 5 µs
Accuracy	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µs
Short Circuit								
Resistance	50, 5 mΩ	25, 2.5 mΩ	17, 1.7 mΩ	8.3 mΩ - 833 µΩ	4.17 mΩ - 417 µΩ	2.78 mΩ - 278 µΩ	2.08 mΩ - 208 µΩ	1.39 mΩ - 139 µΩ
Current Max	33, 333 A	67, 667 A	60, 608 A	120, 1200 A	240, 2400 A	360, 3600 A	480, 4800 A	720, 7200 A
Macro								
Modes	Any single mode			Delay	20 µs - 20 s			
Repetition	Single burst or continuous			Resolution	10 µs			
Settings	100			Accuracy	1% +/- 5 µs			
Period	40 µs - 20 s							
Measurements	**Accuracies: % of Measurement + % of Range, Resolution: % of Range**							
Current								
Ranges	20, 200 A	40, 400 A	60, 600 A	120, 1200 A	240, 2400 A	360, 3600 A	480, 4800 A	720, 7200 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	6.6, 66, 166 V	6.6, 66, 166 V	6.6, 66, 166 V	6.6, 66, 166 V	6.6, 66, 166 V	6.6, 66, 166 V	6.6, 66, 166 V	6.6, 66, 166 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			Memory	16K Samples			
Accuracy	1%R			Timebase	10 µs - 8 s			
Channels	Voltage, Current or both MUX'd			Triggering	System or External			
Digitizing Rate [6]	100 - 100K Samples/s							
Waveform Analysis	Voltage, Current, Power, Overshoot, Undershoot, Rise/Fall Time, Turn-On Time, Settling Time, Hold-Up Time, AC RMS, AC+DC RMS							
Control								
User Interface	PC soft panel or manual touch-panel							
PC Required/OS/Drivers	3 GHz µP with 512 MB RAM, SVGA display, 80 GB HD/Windows XP, Vista/ Active X							
Test Executive	NI LabVIEW, emPower™ with integrated datalog/test report support							
Communications	Ethernet (LXI), RS232, NHR RS485							
Physical								
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
Additional Features								
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/Input	Synchronizes external device to programmed load step/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							

[1] Specifications apply at 23° +/- 5° C after a 10 minute warm up.
[2] Accuracies apply when Settings and/or Measurements >10% of Range.
[3] Current linearly reduced between 1 & 0.15 V.
[4] Models 2 - 36 kW also have a 20 A/1 kW Range with reduced accuracy.
[5] Set 1000% to 6000% of Range = 10% Accuracy.
[6] Single channel capture. Simultaneous Voltage and Current captures would have sample rate & memory available.

Ordering Information	Model	kW Rating	Options	Description
DC Load P/N	4700	- 6	- TP	6kW DC Load with standard Touch Panel
	4700	- 6	(blank)	6kW DC Load without Touch Panel

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4760 Series
High Performance 600V DC Load

NH Research

High Voltage DC Electronic Load

4760-6 Series 6kW model

Features

- 8 Models - 1kW to 36kW
- 3 Voltage ranges - 20, 200, & 600V
- 2 Current ranges
- High accuracy 1kW low power range
- Waveform capture up to 100k Sample/Sec
- Precision voltage, current, power, & timing measurements
- Constant Loads - CV, CC, CP, CR, & in combination
- Dynamic Loading - 100 settings
- Built-in touch-panel user interface
- Ethernet (LAN)

Advantages

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4760 Series High Performance 600V DC Load Specifications[1]

4760 Model	4760-1-TP	4760-2-TP	4760-3-TP	4760-6-TP	4760-12-TP	4760-18-TP	4760-24-TP	4760-36-TP
Power	1 kW	2 kW	3 kW	6 kW	12 kW	18 kW	24 kW	36 kW
Maximum Current [2]	50 A	100 A	150 A	300 A	600 A	900 A	1200 A	1800 A
Voltage Range [3]	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
Programmable Modes	**Accuracies: % of Set + % of Range, Resolution: % of Range**							
Constant Current								
Ranges [4]	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 - 18 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 [5]	2%	2%	2%	2%	2%	2%	2%	2%
Slew Rate (10 - 90%)								
Range	0 - 5 A/µs	10 - 40 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	10µs - 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	10µs - 20 s
Resolution	< 5 µs	< 5 µs	< 5 µs	< 5 µs	< 5 µs	< 5 µs	< 5 µs	< 5 µs
Accuracy	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µSec	1% +/- 5 µs	1% +/- 5 µs	1% +/- 5 µs
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 Ω	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			Delay	20 µs - 20 s			
Repetition	Single burst or continuous			Resolution	10 µs			
Settings	100			Accuracy	1% +/- 5 µs			
Period	40 µs - 20 s							
Measurements	**Accuracies: % of Measurement + % of Range, Resolution: % of Range**							
Current								
Ranges	5, 50 A	10, 100 A	15, 150 A	120, 1200 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	6.6, 66, 166 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			Memory	16K Samples			
Accuracy	1%R			Timebase	10 µs - 8 s			
Channels	Voltage, Current or both MUX'd			Triggering	System or External			
Digitizing Rate [6]	100 - 100K Samples/s							
Waveform Analysis	Voltage, Current, Power, Overshoot, Undershoot, Rise/Fall Time, Turn-On Time, Settling Time, Hold-Up Time, AC RMS, AC+DC RMS							
Control								
User Interface	PC soft panel or manual touch-panel							
PC Required/OS/Drivers	3 GHz µP with 512 MB RAM, SVGA display, 80 GB HD/Windows XP, Vista/ Active X							
Test Executive	NI LabVIEW, emPower™ with integrated datalog/test report support							
Communications	Ethernet (LXI), RS232, NHR RS485							
Physical								
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
Additional Features								
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/Input	Synchronizes external device to programmed load step/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							

[1] Specifications apply at 23° +/- 5° C after a 10 minute warm up.
[2] Accuracies apply when Settings and/or Measurements >10% of Range.
[3] Current linearly reduced between 1 & 0.15 V.
[4] Models 2 - 36 kW also have a 20 A/1 kW Range with reduced accuracy.
[5] Set 1000% to 6000% of Range = 10% Accuracy.
[6] Single channel capture. Simultaneous Voltage & Current captures would have sample rate & memory available.

Ordering Information	Model	kW Rating	Options	Description
DC Load P/N	4760	- 6	- TP	6kW DC Load with standard Touch Panel
	4760	- 6	(blank)	6kW DC Load without Touch Panel

NH Research
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4600 Series
Programmable AC Electronic Load

NH Research

Linear & Non-Linear AC Loading

Features

- 10 Models - 3kW to 36kW
- Operating frequency - 45 to 440Hz
- Waveform capture up to 100k Sample/Sec
- Precision AC power measurement system
- Constant Loads - CV, CC, CP, or CR
- Dynamic Loading - 100 per-cycle settings
- User definable current waveshape
- Easy-to-use PC softpanel
- Serial (RS-2332) & Ethernet (LAN)

Advantages

- Field-proven reliability
- Simplifies automated test stand development
  - Triggerable set & measurement
  - True short circuit mode
  - Built-in SW watchdog
- Software tools to shorten test development time
  - PC-based Softpanel GUI with scope display (*Fig. 1*)
  - Supplied LabVIEW & IVI-C/IVI-COM drivers
  - Optional: AC Load or *em*Power® test sequencers

Benefits

- Field upgradeable (3kW/ϕ steps)
- Built in features reduce cost & simplifies setup
  - Requires fewer additional test devices
  - Fewer devices simplifies test stand wiring
- Sizable for 1ϕ & 3ϕ Configurations

Figure 1 *- AC Load graphical user interface*

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4600 Series Programmable AC Electronic Load Specifications[1]

4600 Ratings	4600-3	4600-6	4600-12	4600-18	4600-24	4600-36[2]
Power	3 kW	6 kW	12 kW	18 kW	24 kW	36 kW
Maximum Current[3]	30 A	60 A	120 A	180 A	240 A	360 A
Voltage Range[3]	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V
Programmable Modes						
Constant Current						
Range (RMS)	0 - 30 A	0 - 60 A	0 - 120 A	0 - 180 A	0 - 240 A	0 - 360 A
Accuracy	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Constant Voltage						
Range	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V
Accuracy	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Constant Power						
Range	300 W - 3 kW	600 W - 6 kW	1.2 - 12 kW	1.8 - 18 kW	2.4 - 24 kW	3.6 - 36 kW
Accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Constant Resistance						
Ranges	2.5-100, 100-1000Ω	1.25-50, 50-500Ω	0.63-25, 25-250Ω	0.42-17, 17-167Ω	0.31-12.5, 12.5-125Ω	0.2-8.3, 8.3-83Ω
Accuracy	1, 5%	1, 5%	1, 5%	1, 5%	1, 5%	1, 5%
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Short Circuit						
Max Surge Current	300 A	600 A	1200 A	1800 A	2400 A	3600 A
A Power Factor						
Range	0 -1, lead/lag	0 -1, lead/lag	0 -1, lead/lag	0 -1, lead/lag	0 -1, lead/lag	0 -1, lead/lag
Accuracy	1%	1%	1%	1%	1%	1%
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Crest Factor						
Range	1.414 - 4	1.414 - 4	1.414 - 4	1.414 - 4	1.414 - 4	1.414 - 4
Accuracy	1%	1%	1%	1%	1%	1%
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%
Macros	Queues of up to 100 commands can be run manually or from a triggered event (phase angle, input voltage level, system trigger)					
Custom Waveforms	Full-screen graphical editor provides control of current, voltage, resistance, power, crest factor and power factor					
Measurements						
Current						
Range (RMS)	0 - 30 A	0 - 60 A	0 - 120 A	0 - 180 A	0 - 240 A	0 - 360 A
Accuracy	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Peak Current						
Ranges	0 - 90 A	0 - 180 A	0 - 360 A	0 - 540 A	0 - 720 A	0 - 1080 A
Accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Voltage						
Ranges	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V
Accuracy	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Peak Voltage						
Ranges	50 - 500 V	50 - 500 V	50 - 500 V	50 - 500 V	50 - 500 V	50 - 500 V
Accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Frequency						
Range	45 - 440 Hz	45 - 440 Hz	45 - 440 Hz	45 - 440 Hz	45 - 440 Hz	45 - 440 Hz
Accuracy	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
True Power						
Range	0 - 10.5 kW	0 - 21 kW	0 - 42 kW	0 - 63 kW	0 - 84 kVA	0 - 126 kVA
Accuracy (R+FS)[4]	0.2% + 0.03%	0.2% + 0.03%	0.2% + 0.03%	0.2% + 0.03%	0.2% + 0.03%	0.2% + 0.03%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Apparent Power						
Range	0 - 10.5 kVA	0 - 21 kVA	0 - 42 kVA	0 - 63 kVA	0 - 84 kVA	0 - 126 kVA
Accuracy	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Reactive Power						
Range	0 - 10.5 kVA	0 - 21 kVA	0 - 42 kVA	0 - 63 kVA	0 - 84 kVA	0 - 126 kVA
Accuracy	0.3%	0.3%	0.3%	0.3%	0.3%	0.3%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Peak Power						
Range	0 - 45 kW	0- 90 kW	0 - 180 kW	0 - 270 kW	0 - 360 kW	0 - 540 kW
Accuracy	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
Resolution	0.1%	0.1%	0.1%	0.1%	0.1%	0.1%
Resistance						
Range	2.5-100, 100-1000Ω	1.25-50, 50-500Ω	0.63-25, 25-250Ω	0.42-17, 17-167Ω	0.31-12.5, 12.5-125Ω	0.2-8.3, 8.3-83Ω
Accuracy	1%, 5%	1%, 5%	1%, 5%	1%, 5%	1%, 5%	1%, 5%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Crest Factor						
Range	1.414 - 4	1.414 - 4	1.414 - 4	1.414 - 4	1.414 - 4	1.414 - 4
Accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Power Factor						
Range	0 -1, lead/lag	0 -1, lead/lag	0 -1, lead/lag	0 -1, lead/lag	0 -1, lead/lag	0 -1, lead/lag
Accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%
Waveform Display	Continuously updated, graphical display of a full cycle of current, voltage and/or power waveforms					
Physical						
Enclosure	Chassis	Chassis (2)	Cabinet	Cabinet	Cabinet, 2-Bay	Cabinet, 2-Bay
Dimensions	8¾ x 19 x 23 in	17½ x 19 x 25 in	57 x 23 x 30 in	72 x 23 x 30 in	57 x 46 x 30 in	72 x 46 x 30 in
Weight	77 lbs/35 kg	154 lbs/70 kg	440 lbs/200 kg	650 lbs/295 kg	860 lbs/391 kg	1250 lbs/568 kg

Control	
User Interface	PC soft panel
PC	Windows XP or Windows 7 with SVGA or better display
OS	Window XP, Windows 7
Test Executive	Optional emPower™ LE & AC Load Sequencer
Communications	RS-232, LAN
Drivers	NI LabVIEW, IVI, Active X
Additional Features	
3-Phase Operation	Provides full 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, 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
Calibration	Closed cover, all adjustments made in software and stored in FLASH
Protection	OP, OCOV, OT, and Undervoltage Lockout
Trigger Output	To initiate an external measurement device and synchronized to programmed load current step
Fan Noise Reduction	Automatic fan speed control
Load Connectors	ITT Cannon DCM-21WA4P/DM 53745-1 plug & socket
Operating Temp.	0 - 50° C, maximum. Continuous and peak power derated 20% above 38° C
Input Power	115/230 ± 10% VAC, 47 - 63 Hz

[1] Specifications apply at 23* +/- 5* C after a 10 minute warm up and are subject to change without notice. All Accuracies and Resolutions are % of full scale

[2] Higher power and custom configurations available

[3] Accuracies apply when Settings and/or Measurements >10% of Range

[4] R+FS = Range + Full Scale

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Pub 02-01-18 JC

9210 Series
Single Channel DC Test System

NH Research

Automated Characterization, Cycling, & Emulation of Batteries

Features

- 3 Modular voltage options 40, 120, & 600V
- Parallels with other 9200 & 9210 systems
- High-resolution waveform capture up to 1.2M Sample/Sec
- Precision voltage, current, power, & energy measurements
- Cycle batteries (charge/discharge) & drive cycles
- Fast dynamic patterns - 1000 step sequence
- State of the art battery emulation mode
- Built-in controller with touch-compatible interface
- Ethernet (LAN)

Advantages

- Battery emulation using OCV & series resistance
- Designed for testing & emulating all battery chemistries
  - Automatic energy integration (full & 1/2 cycle)
  - Multiple safety layers to protect UUT
- Software tools to shorten test development time
  - PC-based Softpanel GUI with charting
  - Supplied LabVIEW & IVI-C/IVI-COM drivers
  - Optional: Enerchron® test sequencer

Benefits

- Modular - full function tester per channel design
- Parallels for high power testing (up to 252kW)
- Safely simulate and emulate “Real World” conditions
  - Sub-mS voltage, current, & mode transition times
  - Emulate over/under charged batteries
  - Safely emulate BMS & battery failures
- Small footprint for easy movement

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Model 9210 Individual Power Module Specifications

	Model 9210-4904			Model 9210-4912			Model 9210-4960		
Programming Capability									
Operating States	Charge (Source), Discharge (Load), Standby, Battery								
Charge/Discharge Modes	Constant-Voltage(CV), Current (CC), Power (CP), Resistance (CR)								
Charging Envelope	0 - 40 V, 8 kW, 600 A			0-120 V, 8 kW, 200 A			0-600 V, 8 kW, 40 A		
Discharging Envelope	1 - 40 V, 12 kW, 600 A			4-120 V, 12 kW, 200 A			10-600 V, 12 kW, 40 A		
Programming	Range	Accuracy[1]	Resolution[1]	Range	Accuracy[1]	Resolution[1]	Range	Accuracy[1]	Resolution[1]
Voltage	0-40 V	0.1% + 0.1%	0.005%	0-120 V	0.1% + 0.1%	0.005%	0-600 V	0.1% + 0.1%	0.005%
Current	±600 A	0.2% + 0.2%	0.005%	±200 A	0.2% + 0.2%	0.005%	±40 A	0.2% + 0.2%	0.005%
Power	±8/-12 kW	0.4% + 0.4%	0.005%	±8/-12 kW	0.4% + 0.4%	0.005%	±8/-12 kW	0.4% + 0.4%	0.005%
Resistance	0 - 34 Ω	2%	0.005%	0 - 100 Ω	2%	0.005%	0 - 500 Ω	2%	0.005%
Slew Rate									
Voltage	0.011 V/s – 80 V/ms			0.033 V/s – 240 V/ms			0.165 V/s – 600 V/ms		
Current	0.17 A/s – 3000 A/ms			0.055 A/s – 1000 A/ms			0.011 A/s – 40 A/ms		
Resistance	0.01 Ω/s – 34 Ω/ms			0.028 Ω/s – 100 Ω/m			0.14 Ω/s – 500 Ω/ms		
Power	2 W/s – 8 kW/s			2 W/s – 8 kW/s			2 W/s – 8 kW/s		
Test Measurement (4-Wire)	Range	Accuracy[1]	Resolution[1]	Range	Accuracy[1]	Resolution[1]	Range	Accuracy[1]	Resolution[1]
Voltage, DC Average	0 -40 V	0.05% + 0.05%	0.005%	0 -120 V	0.05% + 0.05%	0.005%	0 -600 V	0.05% + 0.05%	0.005%
Current, DC Average, Amp-Hr	0 - 600 A	0.1% + 0.1%	0.005%	0 -200 A	0.1% + 0.1%	0.005%	0 - 40 A	0.1% + 0.1%	0.005%
Power, Ah, kWh	± 12 kW	0.2% + 0.2%	0.005%	± 12 kW	0.2% + 0.2%	0.005%	± 12 kW	0.3% + 0.2%	0.005%
Time	1ms - 1 Yr	0.1%	0.005%	1ms - 1 Yr	0.1%	0.005%	1ms - 1 Yr	0.1%	0.005%
Physical									
Test Channel Connectors	Buss Bars			Anderson EBC A32			Anderson SBS75X		
Cabinet[2] Dim. (HxWxD)	43.5 x 28 x 31"/1105 x 711 x 787mm (including casters)								
Cabinet Weight	500lbs/227kg								
Operating Temperature	0 - 35°C full power								
Input Power[2] per Module	3 Ø, 50 - 60 Hz, 200 VAC/30 A, 208 VAC/29 A, 220 VAC/28 A, 380 VAC/21 A or 480 VAC/17 A								

[1] All Accuracies are % of Set + % of Range, All Resolutions are % of Range unless otherwise indicated, [2] Input Voltage set at placement of order

Model 9210-4904

Model 9210-4904 w/ Door Open

Compare to 9200 Height (Right)

9200 Series

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9200 Series
Battery Module/Pack Test System

NH Research

Automated Characterization, Cycling, & Emulation of Batteries

Features

- 3 Modular voltage options 40, 120, & 600V
- Parallels with other 9200 & 9210 systems
- High-resolution waveform capture up to 1.2M Sample/Sec
- Precision voltage, current, power, & energy measurements
- Cycle batteries (charge/discharge) & drive cycles
- Fast dynamic patterns - 1000 step sequence
- State of the art battery emulation mode
- Built-in touch-panel user interface
- Ethernet (LAN)

Advantages

- Battery emulation using OCV & series resistance
- Designed for testing & emulating all battery chemistries
  - Automatic energy integration (full & 1/2 cycle)
  - Multiple safety layers to protect UUT
- Software tools to shorten test development time
  - PC-based Softpanel GUI with charting
  - Supplied LabVIEW & IVI-C/IVI-COM drivers
  - Optional: Enerchron® test sequencer

Benefits

- Modular - full function tester per channel design
- Parallels for high power testing (up to 144kW)
- Safely simulate and emulate “Real World” conditions
  - Sub-mS voltage, current, & mode transition times
  - Emulate over/under charged batteries
  - Safely emulate BMS & battery failures
- Flexible configuration (any 3 modules per system)

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Model 9200 Individual Power Module Specifications

	Model 4904			Model 4912			Model 4924			Model 4960		
Functional Capability												
Operating States	Charge (Source), Discharge (Load), Standby, Battery											
Charge/Discharge Modes	Constant-Voltage(CV), Current (CC), Power (CP), Resistance (CR)											
Charging Envelope	0 - 40V, 8kW, 600A			0-120V, 8kW, 200A			0-240V, 8kW, 100A			0-600V, 8kW, 40A		
Discharging Envelope	1 - 40 V, 12kW, 600A			4-120 V, 12kW, 200A			6-240 V, 12kW, 100A			10-600 V, 12kW, 40A		
Slew Rate	0.011V/S - 30kV/S, 0.0165A - 600kA/S			0.033V/S - 120kV/S, 0.055A - 200kA/S			0.066V/S - 240kV/S, 0.027A - 100kA/S			0.165V/S - 600kV/S, 0.011A/S-40kA/S		
Current Change Time	Less than 5mS											
Current Reverse Time	Less than 10mS											
Parallelability	Synchronous control for up to 12 channels (144kW)											
Macro Test Profiles												
Development Source	Touch-Panel, Import from Excel or User's System Controller											
Maximum Steps	1000											
Minimum Time Delay	50uS											
Maximum Step Delay	1mS - 7 Days											
Programming	Range	Accuracy[1]	Res.[1]	Range	Accuracy[1]	Res.[1]	Range	Accuracy[1]	Res.[1]	Range	Accuracy[1]	Res.[1]
Voltage	0-40V	0.1% + 0.1%	0.005%	0-120V	0.1% + 0.1%	0.005%	0-240V	0.1% + 0.1%	0.005%	0-600V	0.1% + 0.1%	0.005%
Current	±600A	0.2% + 0.2%	0.005%	±200A	0.2% + 0.2%	0.005%	±100A	0.2% + 0.2%	0.005%	±40A	0.2% + 0.2%	0.005%
Power	±8/-12kW	0.4% + 0.4%	0.005%	±8/-12kW	0.4% + 0.4%	0.005%	±8/-12kW	0.4% + 0.4%	0.005%	±8/-12kW	0.4% + 0.4%	0.005%
Resistance	0 - 34Ω	2%	0.005%	0 - 100Ω	2%	0.005%	0 - 200Ω	2%	0.005%	0 - 500Ω	2%	0.005%
Slew Rate												
Voltage	0.011V/s – 80V/ms			0.033V/s – 240V/ms			0.066V/s – 480V/ms			0.165V/s – 600V/ms		
Current	0.17A/s – 3000A/ms			0.055A/s – 1000A/ms			0.027 A/s – 500A/ms			0.011 A/s – 40A/ms		
Resistance	0.01Ω/s – 34Ω/ms			0.028Ω/s – 100Ω/m			0.056Ω/s – 200Ω/m			0.14Ω/s – 500Ω/ms		
Power	2W/s – 8kW/s			2W/s – 8kW/s			2W/s – 8kW/s			2W/s – 8kW/s		
Test Measurement (4-Wire)	Range	Accuracy[1]	Res.[1]	Range	Accuracy[1]	Res.[1]	Range	Accuracy[1]	Res.[1]	Range	Accuracy[1]	Res.[1]
Voltage, DC Average	0 -40V	0.05% + 0.05%	0.005%	0 -120V	0.05% + 0.05%	0.005%	0 - 240V	0.05% + 0.05%	0.005%	0 -600V	0.05% + 0.05%	0.005%
Current, DC Average, Amp-Hr	0 - 600A	0.1% + 0.1%	0.005%	0 - 200A	0.1% + 0.1%	0.005%	0 - 100A	0.1% + 0.1%	0.005%	0 - 40A	0.1% + 0.1%	0.005%
Power, Ah, kWh	± 12kW	0.2% + 0.2%	0.005%	± 12kW	0.2% + 0.2%	0.005%	± 12kW	0.2% + 0.2%	0.005%	± 12kW	0.2% + 0.2%	0.005%
Time	1ms - 1Yr	0.1%	0.005%	1ms - 1Yr	0.1%	0.005%	1ms - 1Yr	0.1%	0.005%	1ms - 1Yr	0.1%	0.005%
Control												
Local User Interface	Touch-Panel with graphic meters and controls plus Macro development/execution screens											
Ext. System Communication	LAN (Ethernet)											
Drivers (Win XP or Win 7)	LabVIEW, IVI-COM, IVI-C											
Analog Current Monitor	0 to +10V charge/0 to -10V discharge											
Analog Voltage Monitor	0 to +10V full scale voltage											
Safety												
Isolation AC Input	1000V AC to DC Output / 1000V AC Input to chassis											
Isolation UUT Input	600V UUT to chassis			1000V UUT to chassis			1000V UUT to chassis			1000V UUT to chassis		
Programmable Safety Limits	Over-Voltage (OV) / Under-Voltage (UV), Over-Current (OC), Over-Power (OP)											
Internal Protection	Over/Under-Voltage, Over-Current, Over-Power, Internal Over-Temperature											
Interlocks	External user input, emergency stop, and rear service door											
Watchdog Timer	Continuously monitors control communications											
Physical												
Test Channel Connectors	Buss Bars			Anderson EBC A32			Anderson EBC A32			Anderson SBS75X		
Cabinet[2] Dimensions (HxWxD)	72 x 28 x 31"/1829 x 711 x 787mm											
Cabinet Weight (3 Channels)	1475lbs/669kg											
Operating Temperature	0 - 35°C full power											
Input Power[3] per Module	3 Ø, 50 - 60Hz, 200VAC/30A, 208VAC/29A, 220VAC/28A, 380VAC/21A or 480VAC/17A											
Calibration	Semi-Automatic , closed cover with standard lab equipment											

[1] All Accuracies are % of Set + % of Range, All Resolutions are % of Range unless otherwise indicated, [2] Standard cabinet contains 1,2 or 3 Modules, [3] Input Voltage set at placement of order

Ordering Information

Typical Configurations	**9200-4904-36**	**9200-4912-36-2**	**9200-4924-36-3**	**9200-4960-36-3**	**9200-4960-36-4**
Number of Test Channels[3] Maximum Test Power	3 @ 12kW 36kW	6 @ 12kW 72kW	9 @ 12kW 108kW	9 @ 12kW 108kW	12 @ 12kW 144kW
Power Modules Voltage Maximum Current	4904 40V 1800A	4912 120V 1200A	4924 240V 700A	4960 600V 360A	4960 600V 480A
Number of Cabinets Floor Space Required (WxD) Cabinet Height	One 28 x 31"/711 x 787mm 72"/1829mm	Two 56 x 31"/1422 x 787mm 72"/1829mm	Three 84 x 31"/2134 x 787mm 72"/1829mm	Three 84 x 31"/2134 x 787mm 72"/1829mm	Four 112 x 31"/2845 x 787mm 72"/1829mm
Part Number Construction	9200-4912-36-2 4912 – Power Module Selection 36 – kW per cabinet (1 module = 12kW, 2 modules = 24kW, 3 modules = 36kW) 2 – Number of Cabinets				

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9410 Series
Regenerative Grid Simulator

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AC/DC Grid Simulator with HiVAR™

Features

- 8 models - 4kW/10.5kVA to 96kW/252kVA
- Two AC Voltage ranges 175, 350VRMS (l-n)
- Two DC Voltage ranges 200, 400VDC
- Two high-accuracy current measurement ranges
- Operating frequency – DC, 30 to 100Hz
- Precision voltage, current, power & energy measurements
- Waveform digitization (capture) up to 125kSamples/sec
- Powerful line disturbance creation tools
- Sink power regenerated back to facility
- Built-in 9” Touch-Panel user Interface
- Programmable via SCPI & NI LabVIEW compliant drivers

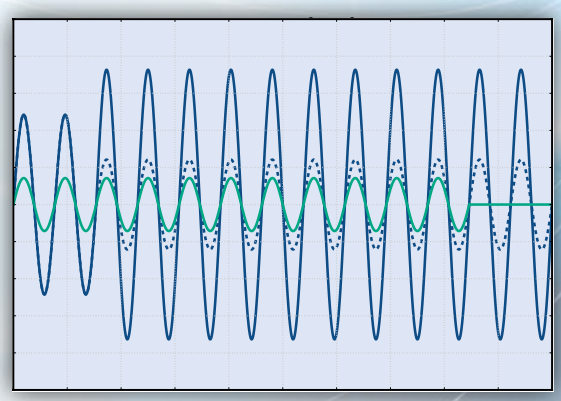
Advantages

- Voltage Ranges matched to Interconnection Standards
  - 175VRMS (l-n) ideal for 120VAC (1Φ) & 240VAC (2Φ)
  - 350VRMS (l-n) ideal for 380 - 480VAC (3Φ)
- Fully programmable & Bi-Directional AC/DC
  - Independent phase voltage & phase angle relationships
  - Phase angle & timed triggerable set controls
  - Sinusoidal or arbitrary voltage waveshapes (harmonics)
- HiVAR: More Reactive Power & current per kW
  - Additional VAR capability supports Volt-VAR testing
  - Crest factor support upto 3x Max IRMS
- Software selectable for 1, 2 or 3 phase operation
- Built-in SW watchdog & safety limits

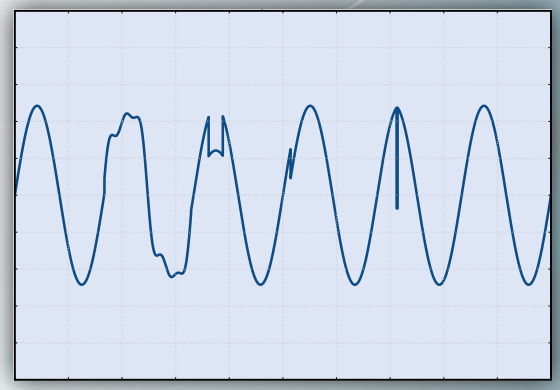
Benefits

- Field upgradeable to higher power
- Fully emulate any utility/grid condition
- Simulate non-ideal Phase angle relationship (A-B & A-C)

Model 9410-12 Regenerative Grid Simulator



Easily Test to UL 1741 - Abnormal Voltage Test



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Model 9410 Regenerative Grid Simulator Specifications

Model Number	9410-4	9410-8	9410-12	9410-24	9410-36	9410-48	9410-72	9410-96
AC Output Ratings								
Phases/Output Channels	1	1 or 2	1, 2, or 3					
Power, Max (1Φ or 3Φ)	4kW/10.5kVA	8kW/21kVA	12kW/31.5kVA	24kW/63kVA	36kW/94.5kVA	48kW/126kVA	72kW/189kVA	96kW/252kVA
Current Ranges (RMS per Φ)	6, 30A/Φ	6, 30A/Φ	6, 30A/Φ	12, 60A/Φ	18, 90A/Φ	24, 120A/Φ	36,180A/Φ	48, 240A/Φ
Current Ranges (RMS 1Φ)	6, 30A	12, 60A	18, 90A	36, 180A	54, 270A	72, 360A	108, 540A	144, 720A
Peak Current	3 X Max RMS							
Frequency	30 – 100Hz							
Voltage Ranges, L-N	175, 350V (Split Phase 250V Max)							
Accuracy	0.2% Set + 0.2% Rng							
Resolution	0.005% Rng							
Distortion (THD)	<1% @ 50/60Hz (Full power into resistive load at 480VRMS (L-L))							
Response Rate	1V/µS (10% to 90% measured at 90 degree turn-on into resistive load)							
Custom Waveforms	Sine, n-Step Sine, Triangle, Clipped-Sine, Arbitrary (user defined)							
Phase Angle Control	0 to 359 degrees / 1 degree resolution							
DC Output Ratings								
Power Max (1ch or 3ch)	4kW	8kW	12kW	24kW	36kW	48kW	72kW	96kW
Current Ranges (Per Ch.)	6, 30A/CH	6, 30A/CH	6, 30A/CH	12, 60A/CH	18, 90A/CH	24, 120A/CH	36, 180A/CH	48, 240A/CH
Current Ranges (Per System)	6, 30A	12, 60A	18, 90A	36, 180A	54, 270A	72, 360A	108, 540A	144, 720A
Voltage Ranges	200, 400VDC							
Accuracy	0.2% Set + 0.2% Rng							
Ripple	< 800mV RMS							
AC & DC Measurements								
Peak Voltage	250, 500V							
Accuracy (AC RMS)	0.1% Rdg + 0.06% Rng							
Accuracy (DC)	0.1% Rdg + 0.1% Rng							
Accuracy (Peak)	0.5% Rdg + 0.2% Rng							
Resolution	0.005% Rng							
Peak Current (per Ch.)	20, 100A	20, 100A	20, 100A	40, 200A	60, 300A	80, 400A	120, 600A	180, 800A
Accuracy (AC RMS)	0.2% Rdg + 0.06% Rng							
Accuracy (DC)	0.2% Rdg + 0.06% Rng							
Accuracy (Peak)	0.5% Rdg + 0.2% Rng							
Resolution	0.005% Rng							
Peak Power	V Range x I Range							
Accuracy (kW or kVA)	0.3% Rdg + 0.025% Rng							
Resolution	0.005% Rng							
Additional Measurements	Energy (Ah, kWh, kVAh), AC Crest Factor, AC Power Factor, Waveform Capture							
Waveform Digitizer								
Data Acquisition	Output Voltage and Current			Aperture Time	1 cycle to 64s			
Sample Rate	125kSamples / sec			Accuracy/Resolution	0.5% Rng / 0.05%			
Memory Depth	64kSamples							
Control								
Local User Interface	Built-in Touch-Panel and PC-Based software tools including graphical user interface							
External System Comm	LAN (Ethernet) supporting SCPI or VXI-11							
Drivers	NI-Compliant LabVIEW Drivers, IVI-C, IVI-COM							
Safety								
Module Protection	Self-protecting for over-voltage, over-current, over-power, and over-temperature							
Physical	Emergency Stop and remote E-Stop connection							
Programmable Limits	Min/Max Voltage, Current (per direction), and Power (per direction) with separate limits and time delay values							
Software Watchdog	Programmable							
Physical								
Connectors	Terminal Block			Bus Bars				
Form	Chassis			Single Cabinet			Double Cabinet	
Dimensions (HxWxD)	15¾ x 19 x 24″/ 400 x 483 x 610mm			49x23x30″/ 1244x584x762mm	61x23x30″/ 1549x584x762mm	78x23x30″/ 1981x584x762mm	78 x 46 x 30″/ 1981 x 1168 x 762mm	
Weight	105lbs/48kg	120lbs/54kg	135lbs/61kg	370lbs/168kg	505lbs/229kg	855lbs/388kg	1340lbs/608kg	1610lbs/730kg
Operating Temp	35°C							
Isolation	Facility to Chassis – 1,000V, Output to Chassis – 500 V, Facility to Output Internal Isolation – 2,000 V							
Input Power								
Voltage	Universal Input – 380V to 480V ± 10% (L-L, 3 Phase, 50/60Hz)							
Efficiency/Power Factor	> 85% / > 0.95							
Current per Φ @ 380 V	9A	17A	25A	49A	73A	97A	144A	192A
Current per Φ @ 400 V	9A	17A	24A	47A	69A	92A	137A	183A
Current per Φ @ 480 V	8A	14A	20A	39A	58A	77A	114A	152A

Ordering Information	Model	kW Rating
Grid Emulator P/N	9410	-12

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