





AC & DC Electronic Load Product Selector Guide




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

4312 Series Modular 120V DC Electronic Load



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)

Advantages

- Modular load maximizes configuration flexibility
- Simplifies automated test stand development
 - Triggerable set & measurement
 - 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, *emPower*[®] 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



Figure 1 - DC panel graphical user interface

Model 4312 Modular 120V DC Electronic Load Specifications

Overview				(continued)			
Power	150 W	300 W	600 W	Power	IR x VR	IR x VR	IR x VR
Slots (16 per Mainframe)	1	2	4	Range	I Accuracy + V Accuracy		
Maximum Current	40A	80A	150A	Accuracy	0.0015% R	0.0015% R	0.0015% R
Maximum Voltage	120V	120V	120V	Resolution			
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			Resistance	0 - Inf	0 - Inf	0 - Inf
Other Measurements	Average Power, Peak Power, Resistance, Trigger-In Time, DIN State & Time			Accuracy	I Accuracy + V Accuracy		
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			Resolution	0.0015% R	0.0015% R	0.0015% R
Measurement Instrumentation				High-Frequency PK-PK Noise			
Current				Range	0 - 0.25, 2.5VAC		
Range (±)	0 - 0.8, 4, 40A	0 - 0.8, 8, 80A	0 - 0.8, 16, 150A	Bandwidth	10 Hz - 20MHz		
Accuracy	0.05% Rdg + 0.05% R	0.05% Rdg + 0.05% R	0.05% Rdg + 0.05% R	Accuracy	3% R @ 1 MHz		
Resolution	0.0015% R	0.0015% R	0.0015% R	Resolution	0.0015% R		
DC Voltage				DIN Timing			
Range (±)	0 - 6, 30, 120V	0 - 6, 30, 120V	0 - 6, 30, 120V	Range	100µS to 168 hours	100µS to 168 hours	100µS to 168 hours
Accuracy	0.02% Rdg + 0.04% R			Accuracy	0.05% Rdg ± 100 µS	0.05% Rdg ± 100 µS	0.05% Rdg ± 100 µS
Resolution	0.003% R			Resolution	100 nano S	100 nano S	100 nano S
Waveform				Additional Features			
Bandwidth				OVPS Relay	Connects programmable power supply to test UUT for over-voltage protection, relay connected and 5 A limited (Relay only)		
Voltage	DC - 500kHz			External Analog Input	0 - 10V signal input to modulate current		
Current	DC - 100kHz			External Current Monitor	0 - 10V output signal corresponding to 100% of Range Current		
Accuracy				Digital Inputs (DINs) per Load	2 isolated, logic level		
Analog	1% R			Digital Outputs (DOUTs) per load	2 isolated, ±100VDC, 300mA		
Time	(1/sample rate) + 0.05 % Rdg			Digital Outputs per Mainframe	12 isolated, ±100VDC, 300mA		
Digitizing Rate	1 MS/s			Calibration	Closed cover, all adjustments are done in software and stored in on-board flash memory		
Record Length	256K points						
Trigger	System Trigger, DINS, Voltage						

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

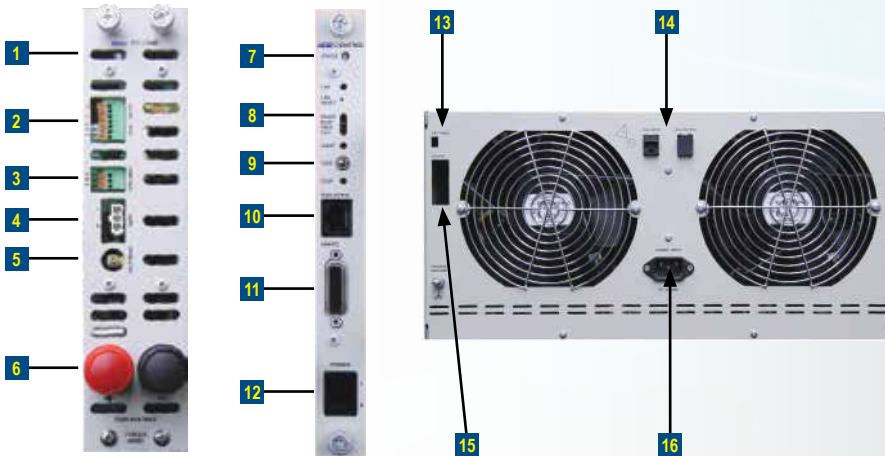


Figure 1 - Front panel (300 W load) & front panel control

Figure 2 - Mainframe rear panel

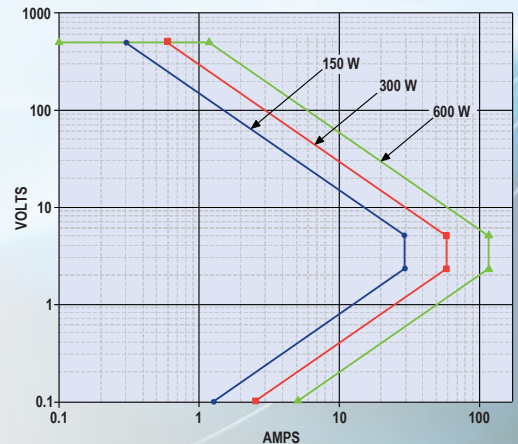


Figure 3 - Constant Power operating envelope

- | | | | |
|-------------------------|--------------------|-----------------------|-------------------|
| 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 |

4350 Series Modular 500V DC Electronic Load



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)

Advantages

- Modular load maximizes configuration flexibility
- Simplifies automated test stand development
 - Triggerable set & measurement
 - 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, *emPower* 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

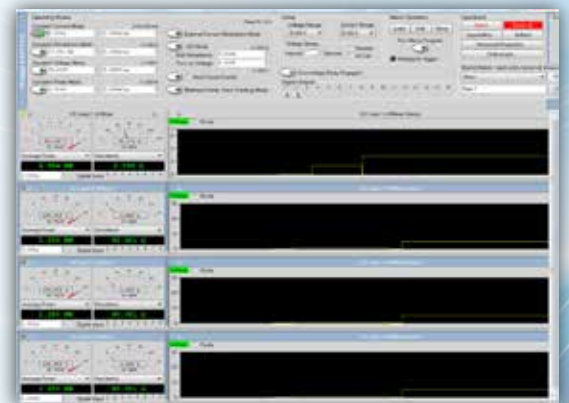


Figure 1 - DC panel graphical user interface

Model 4350 Digitizing DC Electronic Load Specifications

Overview				(continued)			
Power	150 W	300 W	600 W	Power	IR x VR	IR x VR	IR x VR
Slots (16 per Mainframe)	1	2	4	Range	I Accuracy + V Accuracy		
Maximum Current	30 A	60 A	120 A	Accuracy	0.0015% R	0.0015% R	0.0015% R
Maximum Voltage	500 V	500 V	500 V	Resolution			
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			Resistance	0 - Inf	0 - Inf	0 - Inf
Other Measurements	Average Power, Peak Power, Resistance, Trigger-In Time, DIN State & Time			Accuracy	I Accuracy + V Accuracy		
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			Resolution	0.0015% R	0.0015% R	0.0015% R
Measurement Instrumentation				High-Frequency PK-PK Noise			
Current				Range	0 - 0.25, 2.5 VAC		
Range (±)	0 - 0.66, 3.0, 30 A	0 - 0.66, 6.0, 60 A	0 - 0.66, 12, 120 A	Bandwidth	10 Hz - 20 MHz		
Accuracy	0.05% Rdg + 0.05% R	0.05% Rdg + 0.05% R	0.05% Rdg + 0.05% R	Accuracy	3% R @ 1 MHz		
Resolution	0.0015% R	0.0015% R	0.0015% R	Resolution	0.0015% R		
DC Voltage				DIN Timing			
Range (±)	0 - 30, 120, 600 V	0 - 30, 120, 600 V	0 - 30, 120, 600 V	Range	100µS to 168 hours	100µS to 168 hours	100µS to 168 hours
Frequency	DC - 500 KHZ	DC - 500 KHZ	DC - 500 KHZ	Accuracy	0.05% Rdg ± 100 µS	0.05% Rdg ± 100 µS	0.05% Rdg ± 100 µS
Accuracy	0.02% Rdg + 0.04% R			Resolution	100 nano S	100 nano S	100 nano S
Resolution	0.003% R	0.003% R	0.003% R	Additional Features			
Waveform				OVPS Relay	Connects programmable power supply to test UUT for over-voltage protection, relay connected and 5 A limited (Relay only)		
Bandwidth				External Analog Input	0 - 10 V signal input to modulate current		
Voltage	DC - 500 KHZ			External Current Monitor	0 - 10 V output signal corresponding to 100% of Range Current		
Current	DC - 100 KHZ			Digital Inputs (DINs) per Load	2 isolated, logic level		
Accuracy				Digital Outputs (DOUTs) per load	2 isolated, ±100 VDC, 300 mA		
Analog	1% R			Digital Outputs per Mainframe	12 isolated, ±100 VDC, 300 mA		
Time	(1/sample rate) + 0.05 % Rdg			Calibration	Closed cover, all adjustments are done in software and stored in on-board flash memory		
Digitizing Rate	1 MS/s						
Record Length	256K points						
Trigger	System Trigger, DINS, Voltage						

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

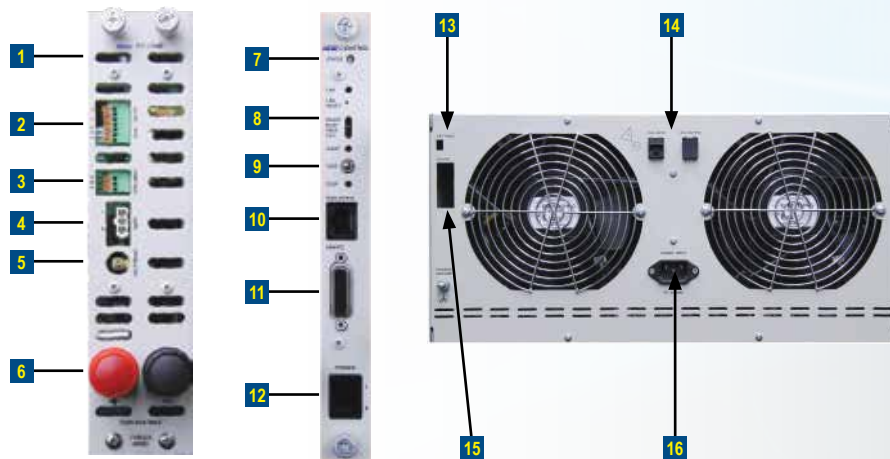


Figure 1 - Front panel (300 W load) & Front panel control

Figure 2 - Mainframe rear panel

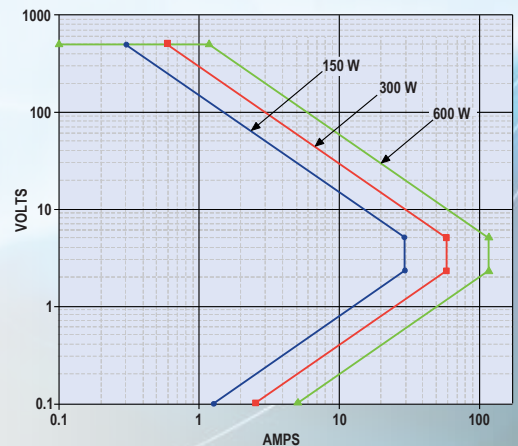


Figure 3 - Constant Power operating envelope

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|-------------------------|--------------------|-----------------------|-------------------|
| 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 |

4700 Series High Performance 120V DC Load



High Current DC Electronic Load

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, *emPower*[®], or *Enerchron*[®] test sequencer

Benefits

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



4700-6 Series 6kW model



4700 Series High Performance 120V DC Load Specifications¹

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	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% +/- 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

NHR
NH Research

High Voltage DC Electronic Load

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

- 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, *emPower*[®], or Enerchron[®] test sequencer

Benefits

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



4760-6 Series 6kW model



4760 Series High Performance 600V DC Load Specifications¹

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	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% +/- 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	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



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4600 Series Programmable AC Electronic Load

NHR
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 *emPower*® 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 1 ϕ & 3 ϕ Configurations

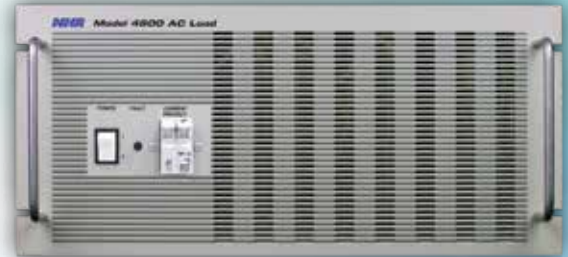


Figure 1 - AC Load graphical user interface

4600 Series Programmable AC Electronic Load Specifications¹

4600 Ratings	4600-3	4600-6	4600-12	4600-18	4600-24	4600-36 ²	Control
Power	3 kW	6 kW	12 kW	18 kW	24 kW	36 kW	User Interface
Maximum Current ³	30 A	60 A	120 A	180 A	240 A	360 A	PC
Voltage Range ³	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	OS
Programmable Modes							Test Executive
Constant Current							Communications
Range (RMS)	0 - 30 A	0 - 60 A	0 - 120 A	0 - 180 A	0 - 240 A	0 - 360 A	Drivers
Accuracy	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	Additional Features
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	3-Phase Operation
Constant Voltage							Remote Voltage Sense
Range	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	50 - 350 V	Self Test
Accuracy	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	Performance Monitoring
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	Calibration
Constant Power							Protection
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	Trigger Output
Accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	Fan Noise Reduction
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	Load Connectors
Constant Resistance							Operating Temp.
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	Input Power
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	

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

⁴R+FS = Range + Full Scale



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9210 Series Single Channel DC Test System



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



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

9200 Series Battery Module/Pack Test System

NHR
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)



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

NHR
NH Research

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

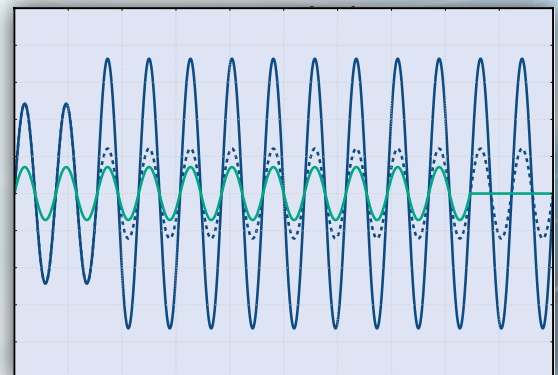
- Voltage Ranges matched to Interconnection Standards
 - 175VRMS (l-n) ideal for 120VAC (1Φ) & 240VAC (2Φ)
 - 350VRMS (l-n) ideal for 380 - 480VAC (3Φ)
- Fully programmable & Bi-Directional AC/DC
 - Independent phase voltage & phase angle relationships
 - Phase angle & timed triggerable set controls
 - 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

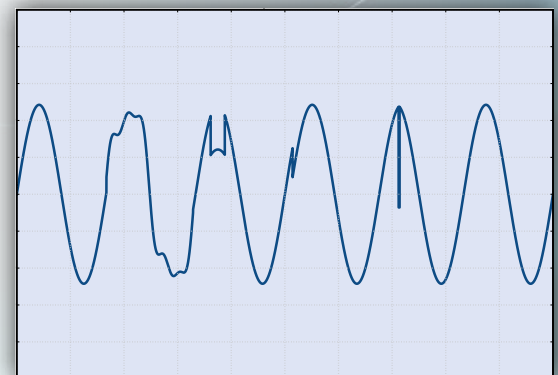
- Field upgradeable to higher power
- Fully emulate any utility/grid condition
- Simulate non-ideal Phase angle relationship (A-B & A-C)



Model 9410-12 Regenerative Grid Simulator



Easily Test to UL 1741 - Abnormal Voltage Test



Easily produce harmonics, Notches, Phase Jumps & more

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)	15¼ 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									
Grid Emulator P/N	Model	kW Rating							
	9410	-12							



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