


AC Electronic Loads & Sources Selector Guide


Product Selector Guide




Regenerative Grid Simulator - AC & DC Source

	Model	Voltage	Current	Power
	9410	175, 350VAC 200, 400VDC	up to 720A	4kW - 96kW

AC Source with HiVAR

	Model	Voltage	Current	Power
	9420	175, 350VAC 200, 400VDC	up to 720A	4kW - 96kW

Regenerative 4 Quadrant AC Load

	Model	Voltage	Current	Power
	9430	175, 350VAC 200, 400VDC	up to 720A	4kW - 96kW

Programmable AC Electronic Load

	Model	Voltage	Current	Power
	4600	50 - 350V	30 - 180A	3kW - 96kW

* For full datasheets, please visit the [Download Library](#) webpage.

9410 Series Regenerative Grid Simulator

AC/DC Grid Simulator with HiVAR™



Features

- 8 models - 4kW/10.5kVA to 96kW/252kVA
- Two AC Voltage ranges 175, 350VRMS (I-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

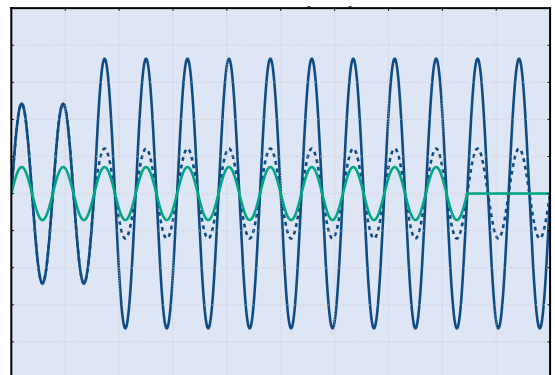
- Voltage Ranges matched to Interconnection Standards
 - 175VRMS (I-n) ideal for 120VAC (1Φ) & 240VAC (2Φ)
 - 350VRMS (I-n) ideal for 380 - 480VAC (3Φ)
- Fully programmable & Bi-Directional AC/DC
 - Independent phase voltage & phase angle relationships
 - Phase angle & timed triggerable set controls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

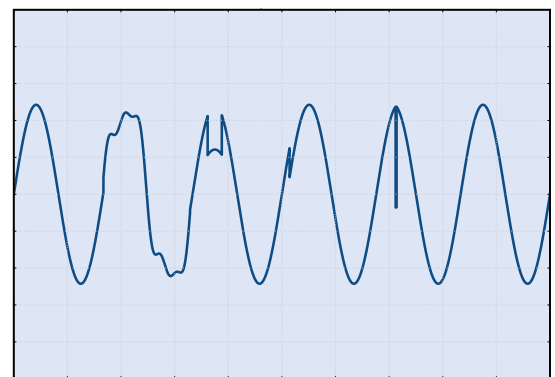
- Field upgradeable to higher power
- Fully emulate any utility/grid condition
- Simulate non-ideal Phase angle relationship (A-B & A-C)



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 (option up to 880Hz)							
Voltage Ranges, L-N	10 - 175, 350VRMS L-N (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	10 - 200, 400VDC							
Accuracy	0.2% Set + 0.2% Rng							
Ripple	< 800mV RMS							
AC & DC Measurements								
Voltage Range (LR, HR)	260, 520V Pk							
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							
Current per Phase (LR, HR)	20, 100A Pk	20, 100A	20, 100A	40, 200A	60, 300A	80, 400A	120, 600A	180, 800A
Accuracy (AC RMS)	0.1% Rdg + 0.1% Rng							
Accuracy (DC)	0.2% Rdg + 0.1% Rng High Range, 0.2% Rdg + 0.3% Rng Low Range							
Accuracy (Peak)	0.5% Rdg + 0.2% Rng							
Resolution	0.005% Rng							
Power	Voltage Range x Current Range							
Accuracy (kW or kVA)	0.2% Rdg + 0.1% 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, Enerchron (opt.)							
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	Phoenix Contact			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	145lbs/66kg	150lbs/68kg	155lbs/70kg	480lbs/218kg	640lbs/290kg	780lbs/354kg	1280lbs/581kg	1560lbs/708kg
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						



9420 Series AC Source with Hivar

AC Power Source with HiVAR™ Technology



Features

- 7 models – 8kW/21kVA to 96kW/252kVA
- Voltage Range – 175/350VRMS, 200/400VDC
- Unique configuration flexibility provides for single, split, three-phase operation plus full-power DC
- HiVAR™ design eliminates derating nominal power due to reactive loads
- Frequency – 30 to 880Hz
- High-resolution waveform digitizer & scope display
- Precision ultra-low current measurements
- Built-in 9" touch-panel user interface for manual control & measurement display
- Graphical waveform editor for user-defined waveforms
- High-level line disturbance programming Macros
- External PC option to host NHR emPower® Test Sequencer
- Alternate programming in LabVIEW, native SCPI, & other IVI-compliant languages
- Improved power density results in half the panel height of a traditional AC source

Advantages

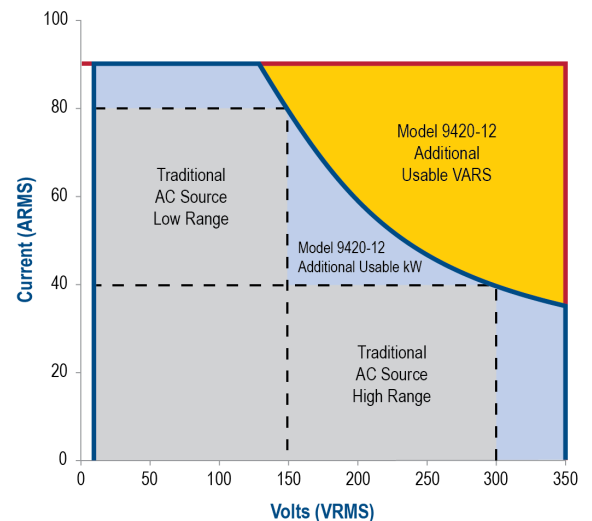
- Operating envelope of 9420 significantly extends the envelope of similarly sized & priced traditional AC sources.
- HiVAR: more reactive power per kW
- Simplifies automated test stand development
 - Software selectable 1, 2, or 3 Phase operation
 - Isolated digital inputs & outputs
 - Built-in SW watchdog & safety limits
- Software tools to shorten test development time
 - PC-based tools & NI certified drivers
 - NI certified LabVIEW & IVI-C/IVI-COM drivers
 - Optional: Enerchron test sequencer

Benefits

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



Model 9420 AC Source with HiVAR Technology



9420 12kW single phase mode Operating Envelope

Model 9420 AC Power Source Specifications

MODEL NUMBER	9420-4		9420-8		9420-12		9420-24		9420-36		9420-48		9420-72		9420-96	
AC Output Programmability																
Phases/Output Channels	Single		Single, Split-Phase		Single, Split or 3-Phase											
Voltage ¹ (LR,HR)	10 - 175, 350VRMS L-N (split-phase limited to 250V max)															
Current Limit Set Ranges ¹ (per Φ)	6, 30A (1Φ)		6, 30A (2Φ)		6, 30A (3Φ)		12, 60A (3Φ)		18, 90A (3Φ)		24, 120A (3Φ)		36, 180A (3Φ)		48, 240A (3Φ)	
Current Limit Set Max ¹ (per Source)	6, 30A (1Φ)		12, 60A (1Φ)		18, 90A (1Φ)		36, 180A (1Φ)		54, 270A (1Φ)		72, 360A (1Φ)		108, 540A (1Φ)		144, 720A (1Φ)	
Power Limit Set Max ² (1, Split, 3Φ)	4kW		8, 8kW		12, 8, 12kW		24, 16, 24kW		36, 24, 36kW		48, 36, 48kW		72, 48, 72kW		96, 64, 96kW	
Maximum Apparent Power ²	10.5kVA		21kVA		31.5kVA		63kVA		94.5kVA		126kVA		189kVA		252kVA	
Frequency	30 -880Hz with ± (0.1% Set) Accuracy						Distortion				<1% @ 60Hz (Full power into resistive load at 480VRMS (L-L)/60Hz)					
Peak Current	3 X Max ARMS															
Phase Angle	0 - 359° with 1° Accuracy						Slew Rate									
DC Output Programmability																
Voltage Ranges ¹ (LR, HR)	10 - 200, 400VDC (< 800mV RMS Ripple)															
Current Limit Set, Max ¹ (per Source)	0 - 6, 30A		0 - 12, 60A		0 - 18, 90A		0 - 36, 180A		0 - 54, 270A		0 - 72, 360A		0 - 108, 540A		0 - 144, 720A	
Power Limit Set, Max ² (per Source)	0 - 4kW		0 - 8kW		0 - 12kW		0 - 24kW		0 - 36kW		0 - 48kW		0 - 72kW		0 - 96kW	
Measurements																
	Range						Accuracy								Resolution	
Voltage (LR, HR)	260, 520V Pk															
AC RMS							±(0.1% Rdg + 0.06% Rng) @<100Hz, ±(0.2% Rdg + 0.12% Rng) @>100Hz								0.005% Rng	
DC							±(0.1% Rdg + 0.1% Rng)								0.005% Rng	
Peak Voltage							±(0.5% Rdg + 0.2% Rng) @<100Hz, ±(1.0% Rdg + 0.4% Rng) @>100Hz								0.005% Rng	
Current per Phase (LR, HR)	20, 100A Pk		20, 100A Pk				40, 200 A Pk		60, 300A Pk		80, 400A Pk		120, 600A Pk		160, 800A Pk	
AC Current							±(0.1% Rdg + 0.1% Rng) @<100Hz, ±(0.2% Rdg + 0.2% Rng) @>100Hz								0.005% Rng	
DC Current							±(0.2% Rdg + 0.1% Rng) High Range, ±(0.2% Rdg + 0.3% Rng) Low Range								0.005% Rng	
Peak Current							±(0.5% Rdg + 0.2% Rng) @<100Hz, ±(1.0% Rdg + 0.4% Rng) @>100Hz								0.005% Rng	
Power (kW, kVA)	Voltage Range X Current Range						±(0.2% Rdg + 0.1% Rng) @<100Hz, ±(0.2% Rdg + 0.2% Rng) @>100Hz								0.005% Rng	
Energy (AH, kWh, kVAH)	Time dependent						0.3% Reading + 0.3% Rng								0.005% Rng	
Power Factor	0 to +1.0						±(0.25% Rdg + 0.25% Rng)								0.005% Rng	
Crest Factor	1 to 3						±(0.6% Rdg + 0.6% Reading Pk)								0.005% Rng	
Ultra-Low Current Measurement	0.1, 1A/Φ		0.1, 1A/Φ				0.2, 2A/Φ		0.3, 3A/Φ		0.4, 4A/Φ		0.6, 6A/Φ		0.8, 8A/Φ	
AC Current Accuracy	±1% Range @ < 100Hz, ± 2 % Range @ > 100Hz															
DC Current Accuracy	±1% Range															
Waveform Capture																
Data Channels	6 channels (3 phases of voltage and current)						Accuracy/Resolution				0.5% Range/0.005% Range					
Bandwidth	DC to 100kHz						Background Measurements				35 total including AC/DC Voltage, Current, True Pwr, Apparent Pwr, Freq., Pwr Factor, Crest Factor, Energy, Phase Angle, Pk V, Pk I, Pk Pwr					
Sample Rate	to 125 kSample/sec						Aperture Measurements									
Memory	64k samples for each of 6 channels															
Aperture	1 cycle to 64 sec (longer apertures will reduce the sample rate)										13 total including AC/DC Voltage, Current, True Pwr, plus min/max Pks					
Custom Waveforms																
Standard	Sine, n-step Sine, Triangle, Clipped Sine, Notched Sine, Arbitrary (User Def.)								User Defined		Graphical wave shape editor or downloaded Excel table					
Control																
User Interface	No Touch Panel. GUI on PC.		Built-In Touch Panel &/or external PC w/ Windows software tools including GUI				External System Communication Drivers				LAN (Ethernet) supporting SCPI or VXI-II Ni-Compliant LabVIEW Drivers, emPower (opt.), Enerchron (opt.)					
Safety																
UUT Programmable Limits	V Min/Max, I Max, W Min/Max, each with time delay values								Watchdog		A continuous communication verification program controlled by a test executive					
Physical	User Interlock, Emergency Stop & remote e-Stop connection															
Internal Protection	Over-Voltage, Over-Current, Over-Power, Over-Temperature								Self Test		An automatic hardware check upon power-up					
Isolation	Facility to Chassis - 1kV, Facility to Output - 2kV, Output to Chassis - 1kV								EMC		CE Mark					
Physical																
Connectors	Phoenix Contact						Terminal blocks and bus bars									
Form	System Only		Chassis		Chassis		Single Cabinet		Single Cabinet		Single Cabinet		Double Cabinet		Double Cabinet	
Dimensions (HxWxD)	5U in S6xx or 5xxx		15¼ x 19 x 28” 400 x 483 x 711mm		15¼ x 19 x 28” 400 x 483 x 711mm		46x23x30” 1168x584x762mm		49x23x30” 1981x584x762mm		61x23x30” 1981x584x762mm		78x46x30” 1981x1168x762mm		78x46x30” 1981x1168x762mm	
Weight	N/A		150lbs/68kg		155lbs/70kg		480lbs/218kg		640lbs/290kg		780lbs/353kg		1280lbs/581kg		1560lbs/708kg	
Operating Temp.	0° - 35°C, Non-Condensing															
Input Power																
Voltage	200 - 240 1, 2, 3Φ		Universal Input - 380 to 480VAC ±10% (L-L, 3-Phase, 50/60Hz)													
Frequency	49 - 51Hz or 59.3 - 60.5Hz															
Current/phase @ 380, 400, 480V	15A@208, 25A@200		17, 17, 14A		25, 24, 20A		49, 47, 39A		73, 69, 58A		97, 92, 77A		144, 137, 114A		192, 183, 152A	
Efficiency	89 -92% (depending on line voltage) at full power into resistive load at 480VRMS (L-L)/60Hz															
Power Factor @ Full Power	Unity PF > 99% at full power into a resistive load at 480VRMS (L-L)/60Hz															
Cooling	Air Cooled 35°C Max Ambient, reduced power from 35 to 50°C															
Calibration																
Method	Closed-cover with standard lab equipment capable of measuring to 0.25 % of device specifications															

¹ Programming Accuracies for Voltage and Current are ±(0.2% Set+0.2% Range) @ < 100Hz & ±(0.4% Set+0.4% Range) @ > 100Hz.

² Programming Accuracies for Power are ±(0.4% Set+0.4% Range) @ < 100 Hz and ±(0.8% Set+0.8% Range) @ > 100Hz

Note: Accuracies apply when Settings &/or Measurements are greater than 10% of Range. Voltage accuracy applies above 50V.

ORDERING INFORMATION			
AC Power Source P/N	9420	kW Rating	-12



9430 Series Regenerative 4 Quadrant AC Load



AC Load that Simulates any Inductive, Capacitive or Resistive Load

Features

- 8 Sizes – 4 to 96kW
- Single, Split or Three-Phase programmable
- 10 to 350VAC
- 30 to 880Hz
- DC operation to 10 to 400VDC
- Reactive power capability 2.6 x Real Power
- Sink power regenerated back to facility with >90% efficiency
- Power factor range: -1 to +1
- Crest factor range: 1.414 to 4.000
- High-resolution waveform digitizer
- 9" Touch-Panel user interface
- High power density/minimum rack space
- Improved power density results in half the panel height of a traditional AC source

Advantages

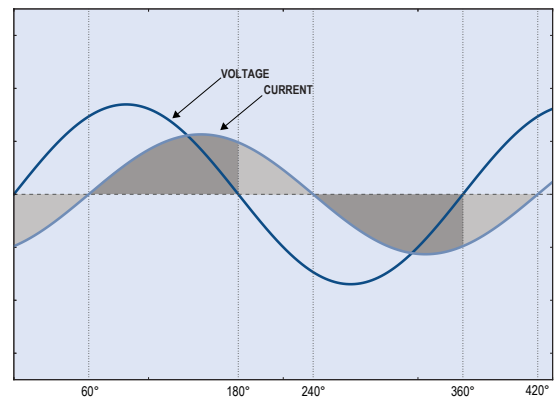
- World's 1st full-featured 4-quadrant AC Electronic Load
- 100% Si-C based design with hi reactive current capabilities
- 350VAC I-n up to 880Hz & 400VDC
- Multiple Loading Modes including Constant Current (CC), Power (CP), VA (CS), Resistance (CR), Series RL (CRL), & User definable current waveforms
- Simplifies automated test stand development
- Built in measurement system
- Software tools to shorten test development time:
 - PC-based tools & NI certified drivers
 - NI certified LabVIEW & IVI-C/IVI-COM drivers

Benefits

- Regenerative, returns > 90% of power to the facility, which provides significant electrical savings.
- Field upgradeable to higher power
- Fully emulate any power usage profile
- Simulate non-ideal & transient phase currents



Model 9430 Regenerative 4 Quadrant AC Load



Inductive load waveform with bi-directional power flows

Model 9430 AC Load Specifications

MODEL NUMBER	9430-4	9430-8	9430-12	9430-24	9430-36	9430-48	9430-72	9430-96
AC Loading Programmability								
Phases/Output Channels	Single		Single, Split-Phase		Single, Split or 3-Phase			
Input Voltage (LR,HR)	10 - 175, 350VRMS L-N (30Hz - 880Hz)							
Current Limit Set Ranges ¹ (per Φ)	6, 30A (1Φ)	6, 30A (2Φ)	6, 30A (3Φ)	12, 60A (3Φ)	18, 90A (3Φ)	24, 120A (3Φ)	36, 180A (3Φ)	48, 240A (3Φ)
Current Limit Set Max ¹ (per Load)	6, 30A (1Φ)	12, 60A (1Φ)	18, 90A (1Φ)	36, 180A (1Φ)	54, 270A (1Φ)	72, 360A (1Φ)	108, 540A (1Φ)	144, 720A (1Φ)
Power Limit Set Max ² (1, Split, 3Φ)	4kW	8, 8kW	12, 8, 12kW	24, 16, 24kW	36, 24, 36kW	48, 36, 48kW	72, 48, 72kW	96, 64, 96kW
Maximum Apparent Power ²	10.5kVA	21kVA	31.5kVA	63kVA	94.5kVA	126kVA	189kVA	252kVA
Normal Mode (CC/CP/CS)			Resistance Mode (CR/CC/CP)			RL Mode (Series CR & CL)		
Crest Factor	1.414 - 4.0 (up to 3x MAX ARMS)		Constant Resistance	-4 to -1000 / 1.5 to 1000		Constant Series-RL	1.5 to 1000 / 0H to 1H	
Power Factor	-1.0 - +1.0		Resolution	10m		Resolution	10m / 1μH	
Slew Rate	10%-90% Range in < 500μs		Resultant Current ¹	Vin / Rset		Resultant Current	Vin / $\sqrt{R^2 + (2 fL)^2}$	
DC Loading Programmability								
Input Voltage	10 - 200, 400VDC							
DC Loading Modes	Constant Voltage (CV), Constant Current (CC), Constant Power (CP), Constant Resistance (CR) in any combination							
Current Limit Set Ranges ¹	0 - 6, 30A	0 - 12, 60A	0 - 18, 90A	0 - 36, 180A	0 - 54, 270A	0 - 72, 360A	0 - 108, 540A	0 - 144, 720A
Power Limit Set Max ²	0 - 4kW	0 - 8kW	0 - 12kW	0 - 24kW	0 - 36kW	0 - 48kW	0 - 72kW	0 - 96kW
Measurements (Accuracies apply when the settings and/or measurements are greater than 10% of Range and input voltage is above 50VRMS.)								
	Range			Accuracy				Resolution
Voltage (LR, HR)	260, 520V Pk							
AC RMS	260, 520V Pk			±(0.1% Rdg + 0.06% Rng) @<100Hz, ±(0.2% Rdg + 0.12% Rng) @>100Hz				0.005% Rng
DC	260, 520V Pk			±(0.1% Rdg + 0.1% Rng)				0.005% Rng
Peak Voltage	260, 520V Pk			±(0.5% Rdg + 0.2% Rng) @<100Hz, ±(1.0% Rdg + 0.4% Rng) @>100Hz				0.005% Rng
Frequency	30-1000Hz			0.1% (Sinusoidal Voltage)				0.01Hz
Current per Phase (LR, HR)	0 - 20, 100A Pk	20, 100A Pk	20, 100A Pk	40, 200A Pk	60, 300A Pk	80, 400A Pk	120, 600A Pk	160, 800A Pk
AC Current	Model Number Dependent			±(0.1% Rdg + 0.1% Rng) @<100Hz, ±(0.2% Rdg + 0.2% Rng) @>100Hz				0.005% Rng
DC Current	Model Number Dependent			±(0.2% Rdg + 0.1% Rng)				0.005% Rng
Peak Current	Model Number Dependent			±(0.5% Rdg + 0.2% Rng) @<100Hz, ±(1.0% Rdg + 0.4% Rng) @>100Hz				0.005% Rng
Power (kW, kVA)	Voltage Range X Current Range			±(0.2% Rdg + 0.1% Rng) @<100Hz, ±(0.2% Rdg + 0.2% Rng) @>100Hz				0.005% Rng
Energy (AH, kWH, kVAH)	Time dependent			0.3% Reading + 0.3% Rng				0.005% Rng
Power Factor	-1.0 to +1.0			±(0.25% Rdg + 0.25% Rng)				0.005% Rng
Crest Factor				±(0.6% Rdg + 0.6% Reading Pk)				0.005% Rng
Phase Angle (ΦX-ΦA)	0 to 360°			+2 deg @ < 100Hz, 6 deg @ < 400Hz, 15 deg @ < 880Hz				1 deg
Waveform Capture								
Data Channels	6 channels (3 phases of voltage and current)			Accuracy/Resolution		0.5% Range/0.005% Range		
Bandwidth	DC to 50kHz							
Sample Rate	to 125 kSample/sec			Background Measurements		35 total including AC/DC Voltage, Current, True Pwr, Apparent Pwr, Freq., Pwr Factor, Crest Factor, Energy, Phase Angle, Pk V, Pk I, Pk Pwr		
Memory	64k samples for each of 6 channels							
Aperture	1 cycle to 64 sec			Aperture Measurements		13 total including AC/DC Voltage, Current, True Pwr		
Custom Current Waveforms								
Standard	Sine, n-step Sine, Triangle, Clipped Sine, Notched Sine, Arbitrary (User Def.)				User Defined	Graphical wave shape editor or downloaded Excel table		
Control								
User Interface	Built-In Touch Panel &/or external PC w/ Windows software tools including GUI			External System Communication Drivers		LAN (Ethernet) supporting SCPI or VXI-II Ni-Compliant LabVIEW Drivers, Enerchron (opt.)		
Safety								
UUT Programmable Limits	V Min/Max, I Max, W Max, each with time delay values			Watchdog		A continuous communication verification program controlled by a test executive		
Physical	User Interlock, Emergency Stop & Remote e-Stop connection							
Internal Protection	Over-Voltage, Over-Current, Over-Power, Over-Temperature			Self Test		An automatic hardware check upon power-up		
Isolation	Facility to Chassis - 1kV, Facility to Output - 2kV, Output to Chassis - 1kV			EMC		CE Mark		
Physical								
Connectors	Terminal blocks			Terminal blocks and bus bars				
Form	Chassis	Chassis	Chassis	Single Cabinet	Single Cabinet	Single Cabinet	Double Cabinet	Double Cabinet
Dimensions (HxWxD)	15¼x19x24"/ 400x483x610mm	15¼x19x24"/ 400x483x610mm	15¼x19x24"/ 400x483x610mm	49x23x30"/ 1245x584x762mm	61x23x30"/ 1549x584x762mm	78x23x30"/ 1981x584x762mm	78x46x30"/ 1981x1168x762mm	78x46x30"/ 1981x1168x762mm
Weight	145lbs/66kg	150lbs/68kg	155lbs/70kg	480lbs/218kg	640lbs/290kg	780lbs/354kg	1280lbs/581kg	1560lbs/708kg
Operating Temp.	0° - 35°C, Non-Condensing							
Input Power								
Voltage / Frequency	Universal Input - 380 to 480VAC ±10% (L-L, 3-Phase, 50/60Hz) / 49 - 51Hz or 59.3 - 60.5Hz							
Current/phase @ 380, 400, 480V	15, 15, 12A		22, 20, 17A	44, 40, 34A	66, 60, 51A	88, 80, 68A	132, 120, 102A	176, 160, 136A
Efficiency	92% @ 480V Facility Input measured at full power when loading 480VRMS (L-L) / 60Hz							
Power Factor	Unity PF > 99% measured at full power when loading 480VRMS (L-L) / 60Hz							
Cooling	Air Cooled 35°C Max Ambient, reduced power from 35 to 50°C							
Calibration								
Method	Closed-cover with standard lab equipment capable of measuring to 0.25 % of device specifications							

¹ Programming Accuracies for Current are ±(0.2% Set+0.2% Range) @ < 100Hz & ±(0.4% Set+0.4% Range) @ > 100Hz.

² Programming Accuracies for Power are ±(0.4% Set+0.4% Range) @ < 100Hz and ±(0.8% Set+0.8% Range) @ > 100Hz.

³ Programming Accuracies for RL Mode are +-(1% * ILoad +300mA) @ < 100Hz & +-(1% * ILoad +600mA) @ > 100Hz.

ORDERING INFORMATION			
AC Load P/N	9430	kW Rating	-12

4600 Series AC Electronic Load



Programmable AC Load for 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-232) & 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 1φ & 3φ Configurations

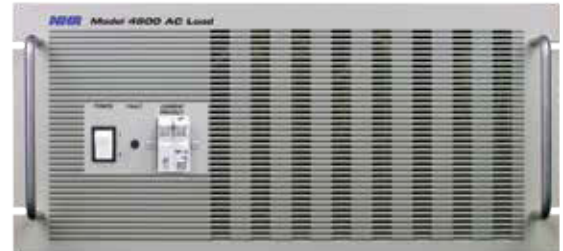



Figure 1 - AC Load graphical user interface

4600 Series Programmable AC Electronic Load Specifications¹

4600 Ratings	4600-3	4600-6	4600-12	4600-18	4600-24	4600-36²	Control	
Power	3kW	6kW	12kW	18kW	24kW	36kW	User Interface	PC soft panel
Maximum Current³	30A	60A	120A	180A	240A	360A	PC	Windows 10 with SVGA or better display
Voltage Range³	50 - 350V	50 - 350V	50 - 350V	50 - 350V	50 - 350V	50 - 350V	OS	Windows 10
Programmable Modes							Test Executive	Optional emPower™ LE & AC Load Sequencer
Constant Current							Communications	RS-232, LAN
Range (RMS)	0 - 30A	0 - 60A	0 - 120A	0 - 180A	0 - 240A	0 - 360A	Drivers	NI LabVIEW, IVI
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	Provides for control of 3 individual units (for example, 3kW units for a total of 9kW, 6kW units for a total of 18kW) to simulate a 3-phase load
Constant Voltage							Remote Voltage Sense	1 MegaOhm impedance, 2VDC max drop between sense and load input
Range	50 - 350V	50 - 350V	50 - 350V	50 - 350V	50 - 350V	50 - 350V	Self Test	Power-up self test of all major functions including status of input, output, control and protection circuits
Accuracy	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	Performance Monitoring	Continuous checking of performance parameters and appropriate error messages and/or LED fault indicators
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	Calibration	Closed cover, all adjustments made in software and stored in FLASH
Constant Power							Protection	OP, OCOV, OT, and Undervoltage Lockout
Range	300W - 3kW	600W - 6kW	1.2 - 12kW	1.8 - 18kW	2.4 - 24kW	3.6 - 36kW	Trigger Output	To initiate an external measurement device and synchronized to programmed load current step
Accuracy	0.5%	0.5%	0.5%	0.5%	0.5%	0.5%	Fan Noise Reduction	Automatic fan speed control
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	Load Connectors	ITT Cannon DCM-21WA4P/DM 53745-1 plug & socket
Constant Resistance							Operating Temperature	0 - 50° C, maximum. Continuous and peak power derated 20% above 38° C
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	115/230 ± 10% VAC, 47 - 63Hz
Accuracy	1, 5%	1, 5%	1, 5%	1, 5%	1, 5%	1, 5%	¹Specifications 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	
Resolution	0.05%	0.05%	0.05%	0.05%	0.05%	0.05%	²Higher power and custom configurations available	
Short Circuit							³Accuracies apply when Settings and/or Measurements >10% of Range	
Max Surge Current	300A	600A	1200A	1800A	2400A	3600A	⁴R+FS = Range + Full Scale	
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		
90A limit	180A limit	360A limit	540A limit	720A limit	1080A limit			
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	User-defined waveforms can be created through a full-screen graphical editor that provides control of current, voltage, resistance, power, crest factor and power factor							
Measurements								
Current								
Ranges (RMS)	0 - 30A	0 - 60A	0 - 120A	0 - 180A	0 - 240A	0 -360A		
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 - 90A	0 - 180A	0 - 360A	0 - 540A	0 - 720A	0 - 1080A		
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 - 350V	50 - 350V	50 - 350V	50 - 350V	50 - 350V	50 - 350V		
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 - 500V	50 - 500V	50 - 500V	50 - 500V	50 - 500V	50 - 500V		
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 - 440Hz	45 - 440Hz	45 - 440Hz	45 - 440Hz	45 - 440Hz	45 - 440Hz		
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								
Ranges	0 - 10.5kW	0 - 21kW	0 - 42kW	0 - 63kW	0 - 84kVA	0 - 126kVA	¹Specifications 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	
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%	²Higher power and custom configurations available	
Resolution	0.01%	0.01%	0.01%	0.01%	0.01%	0.01%	³Accuracies apply when Settings and/or Measurements >10% of Range	
Apparent Power							⁴R+FS = Range + Full Scale	
Range	0 - 10.5kVA	0 - 21kVA	0 - 42kVA	0 - 63kVA	0 - 84kVA	0 - 126kVA		
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 - 10.5kVA	0 - 21kVA	0 - 42kVA	0 - 63kVA	0 - 84kVA	0 - 126kVA		
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 - 45kW	0- 90kW	0 - 180kW	0 - 270kW	0 - 360kW	0 - 540kW		
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 (HxWxD)	8¾x19x23"	17½x19x25"	57x23x30"	72x23x30"	57x46x30"	72x46x30"		
Weight	222x483x58mm	445x483x635mm	1448x584x762mm	1829x584x762mm	1448x1168x762mm	1829x1168x762mm		
	77lbs/35kg	154lbs/70kg	440lbs/200kg	650lbs/295kg	860lbs/390kg	1250 lbs/567 kg		



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