

eLoad[®]

Programmable dc Electronic Loads

AMREL offers the Industry's Widest Selection of Standard Models, as well as Customized COTS and Built-to-Print eLoads

60W-200kW+

up to 1200V and 5000A

High-voltage

High-current

Ultra-low Voltage

Air-cooled

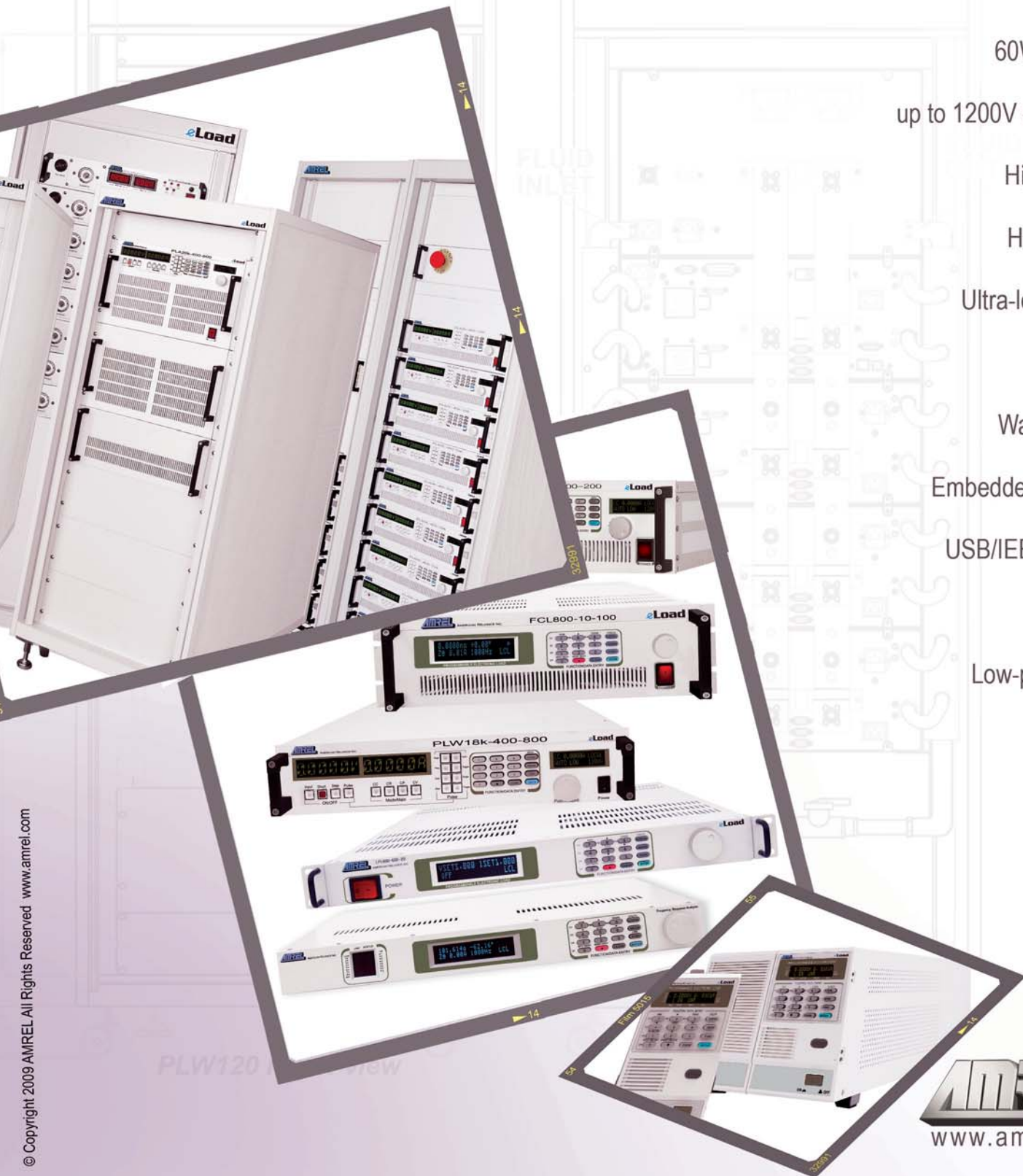
Water-cooled

Embedded Ethernet

USB/IEEE/RS-232

Zero-volt

Low-profile (1U)



1	AMREL'S eLoad SELECTION GUIDE
	WHY AMREL
2	How is AMREL Customer Driven
3	AMREL Sets New Standards
4-5	eLoad PROGRAMMABLE LOAD BANK SOLUTIONS
	LPL Series of Low-profile 1U Air-cooled eLoad Solutions 300 ~ 800W/60 ~ 800Vdc/3 ~ 100Adc or Custom-tailored Ratings Available Interfaces: RS-232, GPIB, Ethernet and USB
6-7	PLA Series of Air-cooled eLoad Solutions 800W ~ 100kW+/60 ~ 1200Vdc/50 ~ 5000Adc or Custom-tailored Ratings Available Interfaces: RS-232, GPIB, Ethernet and USB
8-9	PLW Series of High-power Water-cooled eLoad Solutions 6kW ~ 200kW+/60 ~ 1200Vdc/50 ~ 5000Adc or Custom-tailored Ratings Available Interfaces: RS-232, GPIB, Ethernet and USB
10-11	BPL Series of Bench-top Air-cooled eLoad Solutions 400W or 800W/60 ~ 800Vdc/15 ~ 200Adc or Custom-tailored Ratings Available Interfaces: RS-232, GPIB, Ethernet and USB
12-13	FCL Series of Fuel Cell eLoad Solutions 200W or 1.5kW/10Vdc, 20Vdc or 30Vdc/100 ~ 200Adc or Custom-tailored Ratings Available Interfaces: RS-232, GPIB, Ethernet and USB
14-15	ZVL Series of Zero-volt Air-cooled eLoad Solutions 60W, 100W, 150W, 200W or 300W/10Vdc or 20Vdc/10 ~ 100Adc Custom-tailored Ratings Available Interfaces: RS-232 and GPIB
16-17	FEL Series of Ultra-low Voltage eLoads & PEL Series of Low-power eLoads 60W, 150W or 300W/10Vdc or 20Vdc/50 ~ 200Adc or Custom-tailored Ratings Available Interfaces: RS-232 and GPIB
18	FEL, PEL and ZVL "Rackmount" Solutions 60W, 150W or 300W/10Vdc or 20Vdc/50 ~ 200Adc or Custom-tailored Ratings Available Interfaces: RS-232 and GPIB
19	OTHER SOLUTIONS
	MCU-1 Master Network Controller Multi-Channel Control of up to 8 eLoads Available Interfaces: RS-232, GPIB, USB and 8-Port Ethernet
	AWG "Waveform Capture/Authoring" Arbitrary Waveform Generator Generate 12 Arbitrary Waveforms Digitize and Record Voltage and Current Load Profiles of DUT Author, Edit, Save & Manage Proprietary Load Profiles/Waveforms Available Interfaces: RS-232, GPIB, Ethernet and USB
20-21	FRA Frequency Response Analyzer Cost-effective FRA Solution for less than \$5K Impedance Measurement Program Included 0.1Hz Option Available Available Interfaces: RS-232, GPIB, Ethernet and USB
	APPLICATIONS
22	Battery Testing/Energy Storage & Power Supply/Electronic Components
23	PV
24	Fuel Cell Testing and EIS/Impedance Measurement
25	Military/Defense ATE and Aerospace/Avionics ATE
26	Industrial Solutions
27	University and Research Laboratory Test Solutions
28-31	eLOAD SYSTEMS AND CUSTOMIZED SOLUTIONS
32-33	STANDARD AND CUSTOMIZED HIGH-VOLTAGE SOLUTIONS

Please note: Specifications contained in this catalog are subject to change without notification.


AMREL's eLoad® Selection Guide

1. Choose your maximum power level.
2. Select your required maximum voltage.
3. Find your maximum current requirement.
4. Select the product series from the color legend below.

How to Order
 Power—V-Max—A-Max
 Ex: PLA 1.5k—120Vdc—300Adc

Other standard power, voltage and current ratings are available- please contact AMREL if your required rating is not shown below.

Max Voltage	Maximum Power Level																								
	60 W	100 W	150 W	200 W	300 W	400 W	600 W	800 W	1.5k W	2.0 kW	2.5 kW	3.0 kW	4.0 kW	5.0 kW	6.0 kW	7.5 kW	9.0 kW	12 kW	18 kW	24 kW	36 kW				
10V	50A		100A		200A	100A		100A	100A																
10V	20A	20A		40A	100A			200A	200A																
10V		40A		80A																					
10V		80A	100A																						
20V	50A		100A	100A	200A	100A		100A	100A																
20V						150A		200A	200A																
30V				100A		100A		100A	100A																
30V						150A		200A	200A																
60V	10A		30A		60A	150A		200A							1000A		1500A	1500A	1500A	1500A	1500A	1500A			
60V			60A		120A			100A																	
60V			50A		100A		100A	300A	600A	600A	1000A	1000A	1200A	1200A		1500A									
120V					60A	75A		150A																	
120V								150A							600A		1000A	1200A	1500A	1500A	1500A	1500A			
120V			25A		50A		120A	60A	300A	400A	600A	800A	1000A	1200A		1500A									
150V		20A		40A	40A																				
300V							120A																		
400V						30A	30A	60A																	
400V								50A	100A	150A	200A	300A	360A	400A											
400V			8A		15A			40A							300A		400A	600A	800A	1200A	1500A				
600V						20A	60A	40A																	
600V							20A	30A	60A	100A	120A	150A	200A	240A		400A									
600V								30A							200A		300A	400A	600A	800A	1000A				
600V			5A		10A		30A		60A	100A	120A	150A	200A	240A		400A									
800V			3A		6A	6A	15A	15A	30A			50A	100A	25A	150A				50A	75A	100A	150A			
800V								15A																	
1000V					3A	3A	6A	6A	12A			30A	50A	25A	75A				50A	75A	100A	150A			
1000V																									

PEL SERIES		LPL SERIES	
FEL SERIES		PLA SERIES	
ZVL SERIES		PLW SERIES	
BPL SERIES		FCL SERIES	

* Please Note: Custom-tailored ranges are available. All series with the exception of the PLW series are air-cooled. Additional standard models are available

**High-voltage Load Solutions (pages 32 & 33)



ZVL Zero-volt eLoads (pages 14-15)



LPL Low-profile eLoads (pages 4-5)



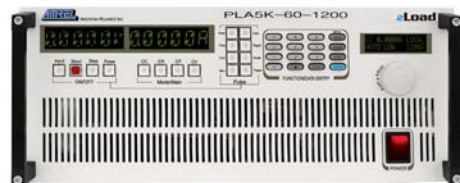
PLW Water-cooled eLoads (pages 8-9)



BPL Bench-top eLoads (pages 10-11)



PEL/FEL eLoads (pages 16-17)



PLA Air-cooled eLoads (pages 6-7)



FCL Fuel Cell eLoads (pages 12-13)

HOW IS AMREL UNIQUENESS “CUSTOMER DRIVEN”?



Tailored Solutions - 80% of AMREL's standard products evolved from our customers built-to-spec requirements, resulting in AMREL developing the widest selection of Programmable Electronic Load Bank Solutions on the market.

Why settle for an “almost” solution? Choose from the broadest selection of standard, tailored and customized Programmable dc Load Bank Solutions!

Customer Support and Satisfaction:

We listen to the customer – to insure your satisfaction. Whether you need a standard eLoad, a “Customized” eLoad, or a full blown built-to-print eLoad –our team will make sure your requirements are met.

Have a post-sales question? Tired of electronic phone systems leading you around in circles? Not at AMREL. When you call AMREL, a live person will connect you to a support engineer ready to answer your technical question.

Replace or upgrade? When your requirements change, AMREL's team of engineers can recommend the most cost effective, time saving solutions. That may in some cases be just a minor upgrade such as adding our field upgradeable Ethernet or USB interfaces. Be assured, whatever your requirements-AMREL's team of engineers will have the best solution for you.

“...offering the widest selection of power products on the market is the greatest testimonial to AMREL's ability to design, build and service quality power solutions.”



AMREL meets your unique application demands with our exclusive custom-tailored dc load bank solutions, including customizable voltage, current and power ratings, while packaged in the industry's smallest foot print.

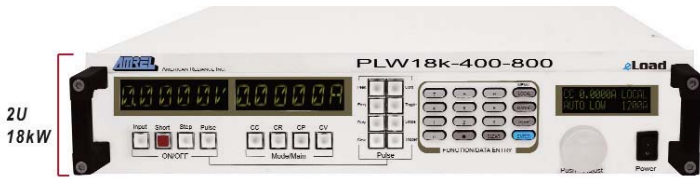
One-Stop Shopping with AMREL

Choose AMREL as your sole-source supplier for programmable dc power supplies and programmable dc electronic loads, because you can:

- Find what you need in our wide selection
- Get what you want through our extensive customization capabilities
- Set-up faster and easier, since the compatibility of our programmable dc electronic loads and power supplies are ensured by functional testing
- Take advantage of superior customer service; on average, your support call will be answered by a live person in less than a minute

AMREL's eLoad® CONTINUES TO SET INDUSTRY STANDARDS

THE HIGHEST POWER DISSIPATION DENSITY 2U 18kW eLoad



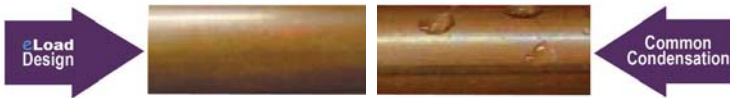
The PLW Series has the highest power dissipation density
6k-18k 2U (17"Wx3.5"Hx27.5"D) 24k-36k 4U (17"Wx3.5"Hx27.5"D)

SAVE RACK SPACE! eLoad has the industry's smallest footprint with the highest current, voltage & power ratings available.

eLoad HAS FIELD ENABLED ETHERNET/USB - SAVING TIME AND \$\$\$



As your needs evolve, so will your eLoad. When you're ready to add the Ethernet and/or USB functionality to your eLoad, a simple phone call is all it takes!



eLoad PROVIDES ANTI-CONDENSATION PROTECTION FOR LIGHTS OUT TESTING

A self-decondensation circuit is provided to eliminate internal condensation. The unique design also offers a water system shutdown when power is removed. This eliminates the chance of condensation resulting from continued water flow during emergency shutdown.

DIGITAL CLOSED-CASE CALIBRATION - SAVES TIME AND \$\$\$



Calibrating an AMRELeLoad

Traditional Method of Calibration

STANDARD WITH eLoad - PC SOFT PANEL & VOLTAGE/CURRENT DATA CAPTURE TO STORE TEST MEASUREMENTS



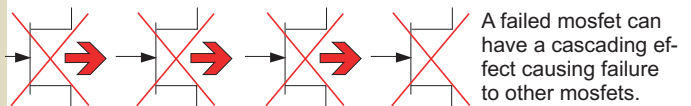
Includes: • Transient Management • Data Monitor



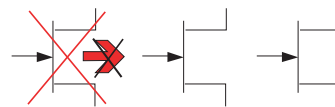
AMREL'S eLoad - THE MOST USER FRIENDLY PANEL IN THE INDUSTRY

Major functions are available through a single button. Most secondary functions that may not be used as frequently require only a few key-strokes. System maintenance and setup functions are menu driven via a LCD display.

eLoad's MOSFET PROTECTION DESIGN FOR MAXIMUM UPTIME



A failed mosfet can have a cascading effect causing failure to other mosfets.



AMREL's unique design decreases the possibility of a single failed mosfet causing additional failures.

An electronic load can contain hundreds of FETs paralleled together. With some standard electronic load designs, the failure of a single FET may damage its parallel FETs or even trigger a catastrophic failure. This may leave the unit beyond repair. On the other hand, AMREL's eLoad is designed to isolate failures by individually protecting each FET.

LPL Series of Low-profile Programmable

Why Choose the LPL Series?

In ATE System Applications, rack space is a highly coveted asset. Traditional modular loads require at least 3U (5.25") of rack space, additional mainframe cost, and are limited in power rating, typically below 300W. Why spend your rack space and budget when you don't need to?

AMREL's LPL Series of "Low-profile" dc Electronic eLoads occupies only 1U (1.75") of rack space, while offering the industry's highest power density, making it an ideal ATE solution. With the industry's widest model selection, the LPL Series ranges from 150W to 800W without the added cost of a mainframe or sacrificing valuable rack space. For an economical solution with all the necessary ATE capabilities in an ultra-compact package, the LPL eLoad is your clear choice!

Markets and Applications:

- Battery/Energy Storage/Ultracapacitor Testing and Validation
- dc Power Supply and Battery Charger Validation and Testing
- Fuel Cell Durability, Lifetime and Performance Characterization
- Single Cell and Short Stack Fuel Cell Characterization
- EIS/Impedance Measurement
- Defense/Aerospace and Avionics ATE, Electronics and Power Sources Testing
- Thin-film, Single- & Poly-silicone PV Design Validation and Testing
- Power Supply, Power Electronics/Components Validation and Testing
- Industrial Applications: Generator/Alternator, UPS/Battery Banks, Datacenter Backup Power, and Automotive Power Electronics & Components
- Lab/Bench-top Applications: Ideal for R&D, Testing and QC Engineers
- Power Electronics/Components, dc Distribution & dc-dc Converters
- Universities
- National Research Labs



LPL SELECTOR GUIDE

LPL XXX - YY - ZZZ and OPTIONS*
XXX-POWER | YY - VOLTAGE | ZZZ - CURRENT

EFU-L = Field Upgradeable Ethernet & USB Available *

UL=Ultra-low Current Range Option Available*

ISOL=Isolated Analog Programming Option*

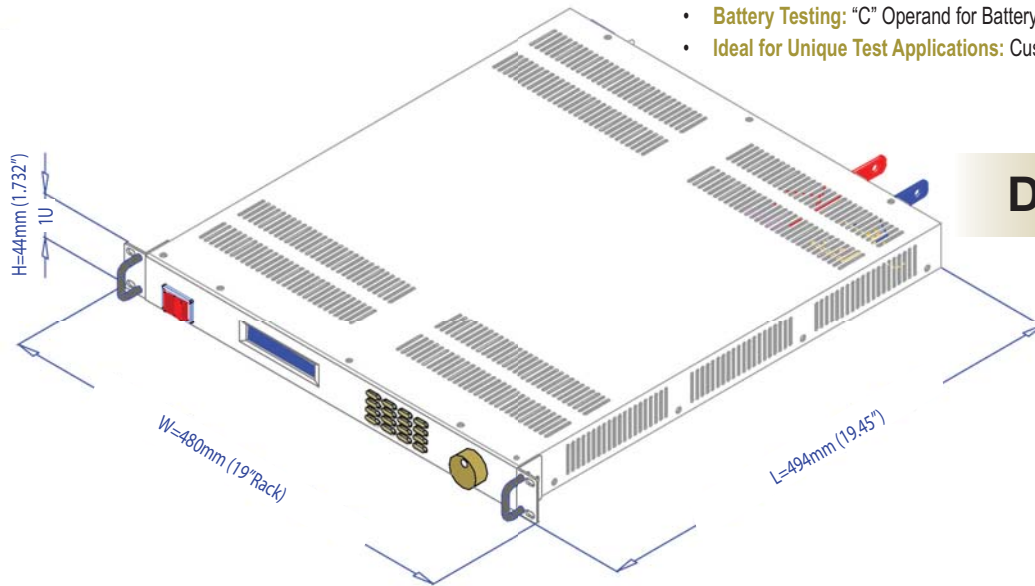
R=Isolation Relay Option (<30Adc)*

Series	Model #	Power (W)	Voltage (Vdc)	Current (Adc)	V _{MIN} at I _{MAX} (Vdc)	Size (Height, Depth)
LPL	LPL150-60-50	150W	60	50	0.5	1U, 21"D
LPL	LPL150-120-25	150W	120	25	1.75	1U, 21"D
LPL	LPL150-400-8	150W	400	8	1.6	1U, 21"D
LPL	LPL150-600-5	150W	600	5	4	1U, 21"D
LPL	LPL300-60-100	300W	60	100	0.6	1U, 21"D
LPL	LPL300-120-50	300W	120	50	1	1U, 21"D
LPL	LPL300-400-15	300W	400	15	1.8	1U, 21"D
LPL	LPL300-600-10	300W	600	10	5	1U, 21"D
LPL	LPL600-60-100	600W	60	100	0.5	1U, 21"D
LPL	LPL600-120-60	600W	120	60	0.72	1U, 21"D
LPL	LPL600-400-30	600W	400	30	1.8	1U, 21"D
LPL	LPL600-600-20	600W	600	20	5	1U, 21"D
LPL	LPL800-60-100	800W	60	100	0.5	1U, 21"D
LPL	LPL800-120-80	800W	120	80	0.96	1U, 21"D
LPL	LPL800-400-40	800W	400	40	2.4	1U, 21"D
LPL	LPL800-600-30	800W	600	30	7.5	1U, 21"D

Voltage Range: 10Vdc ~ 800Vdc Rating
Current Range: 1Adc ~ 100Adc Rating
Power Range: 60W ~ 800W Rating
Current-tailored Ranges Available

Key Features and Benefits:

- **Broadest Model Selection:** 150W, 300W, 600W, 800W Models: 60V, 120V, 400V, 600V, 800V
- **Save Rack Space:** All LPL Models are 1U high & "Zero" Stackable
- **Maximize ROI:** In-rack Closed-case Calibration
- **Ultra-low Compliance Voltage:** Ultra-low Voltage Operation
- **Reliable:** Individual FET Protection to Isolate Power Stage Failures
- **Maximized Uptime:** Redundant Over-temperature and Over-power Protection
- **Fast Response:** 25us Independently Programmable Rise/Fall Time
- **Quiet:** Fan Speed Control for Reduced Acoustic Noise Under Light Load Conditions.
- **Flexible Test Platform:** Five Modes of Operation: CC, CR, CV, CP and Pulse Load Shaping
- **Intuitive Front Panel Control:** User-friendly Function Keys, Full Keypad & Digital Encoder
- **Integrated DMM:** 14-bit 5-digit Voltage and Current Measurement Display
- **Two Loads in One:** Ultra-low Current Range Option for Optimized Accuracy
- **More Ranges:** 3 Full Scale Ranges (100%, 50% & 10%)
- **More Protections:** Anti-oscillation & Programmable Protections: OV, UV, OC, UC, OP, & UP
- **More Interfaces:** Co-resident GPIB/RS-232 & Field-enabled Ethernet/USB Option Available
- **ATE Ready:** Standard LabWindows and LabVIEW Drivers and SCPI Command Set
- **Bench-top Test Automation Ready:** Four Step Profiles; 32 Step Points for Each Profile
- **Fuel Cell Application Ready:**
 - Impedance Measurement via Frequency Response Analyzer (FRA)
 - Current Interruption Mode for Fuel Cell Testing
 - Ultra-low Compliance Voltage to Operate at High Current Down to 0.1Vdc
 - Virtual Panel provides Polarization Curve Sweep and Voltage/Current Cycling Capability
- **0 ~ 10Vdc PLC or DAQ Control Ready:**
 - 0~10Vdc External Analog Programming
 - External On/Off Control
 - External Mode Selection Available
 - Front Panel Key Lockout Prevents Unwanted Key Entry
- **More System Integration Features & Options:**
 - Standard Remote Inhibit (RI) for Interlock Capability
 - Standard Dry Contact Fault for Redundant System Protection
 - Isolated Analog Control/Monitor Option
 - External dc Contactor
 - Reverse Polarity/Isolation Relay Option
- **Battery Testing:** "C" Operand for Battery Testing.
- **Ideal for Unique Test Applications:** Custom-tailored Ratings & Features Available



Dimensions

LPL SPECIFICATIONS

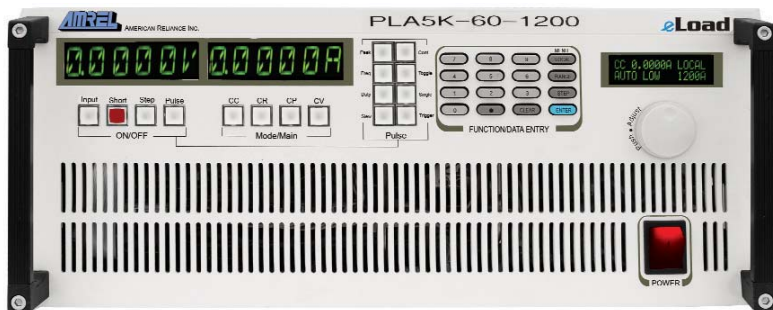
CV MODE SPECIFICATIONS		CC MODE SPECIFICATIONS	
CVL RANGE	0 ~ 10% of Vmax	CCL RANGE	0 ~ 10% of Imax
CVM RANGE	0 ~ 50% of Vmax	CCM RANGE	0 ~ 50% of Imax
CVH RANGE	0 ~ 100% of Vmax	CCH RANGE	0 ~ 100% of Imax
ACCURACY	0.05% of Value ± 0.1% of Rating	ACCURACY	0.05% of Value ± 0.1% of Rating
RESOLUTION	1/16000 of Rated Voltage	RESOLUTION	1/16000 of Rated Voltage
TRANSIENT TIME (SLOW)	0.500~511.9 (ms)	TRANSIENT TIME (SLOW)	0.500~511.9 (ms)
TRANSIENT TIME (FAST)	0.500~51.9 (ms)	TRANSIENT TIME (FAST)	0.050~51.9 (ms)
CR and CP MODE SPECIFICATIONS		PROTECTION	
Please reference website datasheet for details		OVER POWER PROTECTION	110% * Pmax
		OVER VOLTAGE PROTECTION	105% * Vmax
		OVER CURRENT PROTECTION	110% * Imax
		OVER TEMPERATURE PROTECTION	90°C ± 5°C
		REVERSE MAXIMUM CURRENT	110% of Imax
		REMOTE INHIBIT (RI)	Short
		FAULT INDICATOR	SPDT Relay
		Other Programmable Protections: OPP, OVP, OCP, UVL & Anti-Oscillation	
GENERAL SPECIFICATIONS		DIELECTRIC STRENGTH	
REMOTE INTERFACES	RS-232, GPIB & USB/ETHERNET	PRIMARY CIRCUIT TO CHASSIS	1500Vac for 1 Minute
ANALOG PROGRAMMING	0 ~ 10Vdc	PRIMARY CIRCUIT TO LOAD TERMINAL	1500Vac for 1 Minute
ACCURACY	Mode Accuracy ± 0.1% of Rating	LOAD TERMINAL TO CHASSIS	1500Vdc for 1 Minute
VMON ACCURACY	0.10% of RDG ± 0.1% of Rating		
IMON ACCURACY	0.10% of RDG ± 0.1% of Rating		
FREQUENCY RANGE	0.1Hz ~ 10kHz		
ACCURACY	0.10%		
AC INPUT	95~240Vac / 48 ~ 62Hz		
OPERATING TEMPERATURE	5°C ~ 40°C		
DIMENSIONS	21" (L) x 17" (W) x 1.75" (H)		

PLA Series of Programmable

Why Choose the PLA Series?

Traditional dc Electronic Load Solutions are bulky and large in size. Most are offered with standard voltage, current and power ratings. In the ATE world, rack space is a highly coveted asset and application demands are constantly diversifying with new technology development.

AMREL's PLA Series of "Air-cooled" dc Electronic eLoads offers the industry's smallest footprint, the highest power density and current rating, along with the broadest selection of high voltage models on the market. PLA models are capable of being custom-tailored to meet your application requirements.



Markets and Applications:

- Battery/Energy Storage/Ultracapacitor Testing and Validation
- dc Power Supply and Battery Charger Validation and Testing
- Fuel Cell Durability, Lifetime and Performance Characterization
- Single Cell and Short Stack Fuel Cell Characterization
- EIS/Impedance Measurement
- Defense/Aerospace and Avionics ATE, Electronics and Power Sources Testing
- Thin-film, Single- & Poly-silicone PV Design Validation and Testing
- Power Supply, Power Electronics/Components Validation and Testing
- Industrial Applications: Generator/Alternator, UPS/Battery Banks, Datacenter Backup Power, and Automotive Power Electronics & Components
- Lab/Bench-top Applications: Ideal for R&D, Testing and QC Engineers
- Power Electronics/Components, dc Distribution & dc-dc Converters
- Universities
- National Research Labs

PLA SELECTOR GUIDE

PLA XXX - YY - ZZZ and OPTIONS*
XXX - POWER | YY - VOLTAGE | ZZZ - CURRENT

EFU-L = Field Upgradeable Ethernet & USB Available*

ISOL=Isolated Analog Programming Option*

UL=Ultra-low Current Range Option Available*

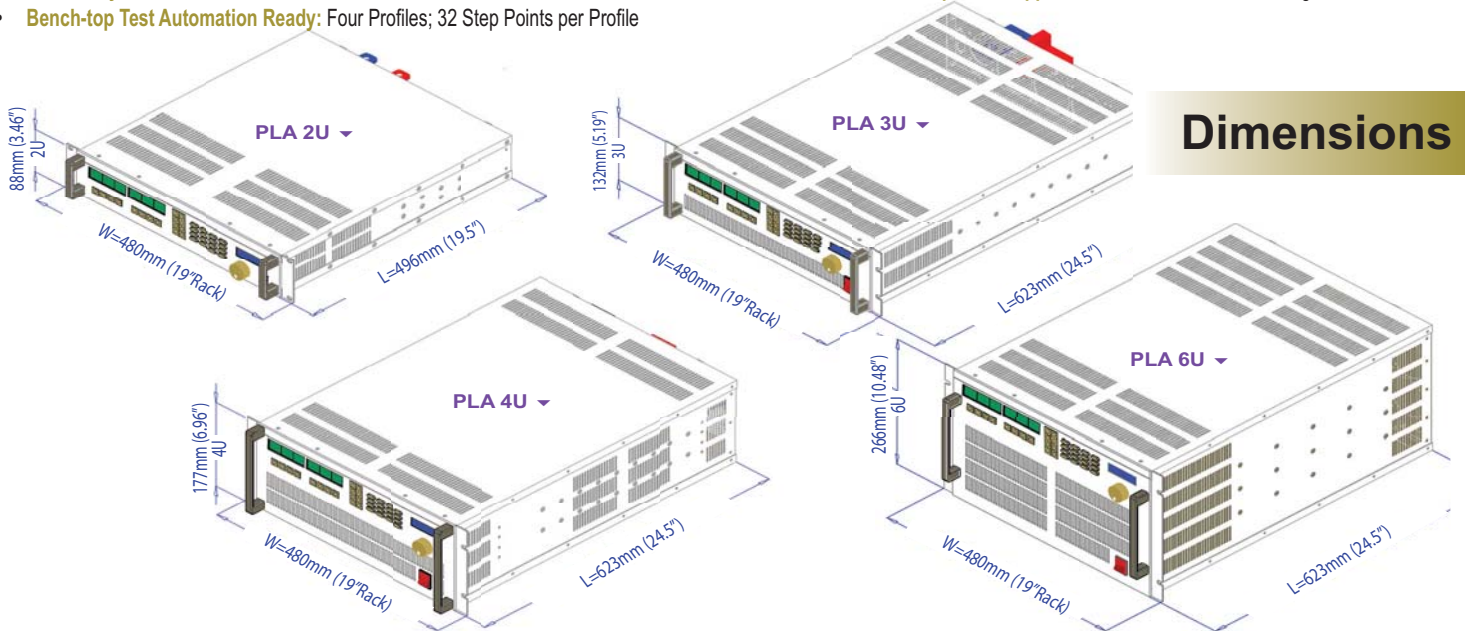
Series	Model #	Power (W)	Voltage (Vdc)	Current (Adc)	V _{MIN} at I _{MAX} (Vdc)	Size (Height, Depth)
PLA	PLA800-60-300	800W	60	300	0.6	2U, 21"D
PLA	PLA800-120-150	800W	120	150	1.8	2U, 21"D
PLA	PLA800-400-50	800W	400	50	2.7	2U, 21"D
PLA	PLA800-600-30	800W	600	30	7.8	2U, 21"D
PLA	PLA1.5K-60-600	1.5kW	60	600	0.6	2U, 21"D
PLA	PLA1.5K-120-300	1.5kW	120	300	1.8	2U, 21"D
PLA	PLA1.5K-400-100	1.5kW	400	100	2.7	2U, 21"D
PLA	PLA1.5K-600-60	1.5kW	600	60	7.8	2U, 21"D
PLA	PLA2K-60-600	2kW	60	600	0.6	3U, 25.5"D
PLA	PLA2K-120-400	2kW	120	400	1.8	3U, 25.5"D
PLA	PLA2K-400-150	2kW	400	150	2.7	3U, 25.5"D
PLA	PLA2K-600-100	2kW	600	100	8.4	3U, 25.5"D
PLA	PLA2.5K-60-1000	2.5kW	60	1000	0.6	3U, 25.5"D
PLA	PLA2.5K-120-600	2.5kW	120	600	1.8	3U, 25.5"D
PLA	PLA2.5K-400-200	2.5kW	400	200	2.7	3U, 25.5"D
PLA	PLA2.5K-600-120	2.5kW	600	120	7.8	3U, 25.5"D
PLA	PLA3K-60-1000	3kW	60	1000	0.6	3U, 25.5"D
PLA	PLA3K-120-800	3kW	120	800	1.6	3U, 25.5"D
PLA	PLA3K-400-300	3kW	400	300	2.7	3U, 25.5"D
PLA	PLA3K-600-150	3kW	600	150	7.2	3U, 25.5"D
PLA	PLA4K-60-1200	4kW	60	1200	0.6	4U, 25.5"D
PLA	PLA4K-120-1000	4kW	120	1000	1.8	4U, 25.5"D
PLA	PLA4K-400-360	4kW	400	360	2.7	4U, 25.5"D
PLA	PLA4K-600-200	4kW	600	200	7.8	4U, 25.5"D
PLA	PLA5K-60-1200	5kW	60	1200	0.6	4U, 25.5"D
PLA	PLA5K-120-1200	5kW	120	1200	1.8	4U, 25.5"D
PLA	PLA5K-400-400	5kW	400	400	2.8	4U, 25.5"D
PLA	PLA5K-600-240	5kW	600	240	7.8	4U, 25.5"D
PLA	PLA7.5K-60-1500	7.5kW	60	1500	0.6	6U, 25.5"D
PLA	PLA7.5K-120-1500	7.5kW	120	1500	1.8	6U, 25.5"D
PLA	PLA7.5K-400-600	7.5kW	400	600	2.7	6U, 25.5"D
PLA	PLA7.5K-600-400	7.5kW	600	400	8.4	6U, 25.5"D

Additional standard models above 7.5kW and up to 250kW+ are available. Please contact AMREL for more details.

Voltage Range: 10Vdc ~ 1200Vdc Rating
Current Range: 10Adc ~ 5000Adc Rating
Power Range: 600W ~ 100KW+ Rating
Custom-tailored Ranges Available

Key Features and Benefits:

- **Broadest Model Selection:** 800W, 1.5kW, 2kW, 2.5kW, 3kW, 4kW, 5kW, 7.5kW, 10kW, 15kW, 20kW Models and Higher-power PLA Systems Over 100kW
- **Exclusive High Voltage Models:** Standard 60V, 120V, 400V & 600V Voltage Ratings and widest selection of exclusive 800Vdc and 1200Vdc PLA Models
- **Save Rack Space:** PLA Models Offer Ultra-compact air-cooled Footprint and are "Zero" Stackable
- **Maximize ROI:** In-rack Closed-case Calibration Without an "Outside" Calibration Lab
- **Ultra-low Compliance Voltage:** Ultra-low Voltage Operation @ 1000's of Amps
- **Reliable:** Individual FET Protection to Isolate Power Stage Failures
- **Maximized Uptime:** Redundant Over-temperature and Over-power Protection
- **Fast Response:** 50µs Independently Programmable Rise/Fall Time
- **Ultra-quiet Operation:** Fan Speed Control for Reduced Acoustic Noise Under Light Load Conditions.
- **Flexible Test Platform:** Five Modes of Operation: CC, CR, CV, CP and Pulse Load Shaping
- **Intuitive Front Panel Control:** User-friendly Function Hot Keys, Full Keypad & Digital Encoder
- **Integrated DMM:** 14-bit Five digit Voltage and Current Measurement Display
- **Two Loads in One:** Ultra-low Current Range Option for Optimized Accuracy
- **More Ranges:** Three Full Scale Ranges (100%, 50% & 10%)
- **More Protections:** Anti-oscillation & Programmable Protections: OV, UV, OC, UC, OP, & UP
- **More Interfaces:** Co-resident GPIB/RS-232 and Optional Field-upgradeable Ethernet/USB
- **ATE Ready:** Standard LabWindows and LabVIEW Drivers and SCPI Command Set
- **Bench-top Test Automation Ready:** Four Profiles; 32 Step Points per Profile
- **Fuel Cell Application Ready:**
 - Impedance Measurement via Frequency Response Analyzer (FRA)
 - Current Interruption Mode for Fuel Cell Testing
 - Ultra-low Compliance (0.1Vdc) Voltage to Operate at High-current
 - Virtual Panel provides Polarization Curve Sweep and Voltage/Current Cycling Capability
- **0 ~ 10Vdc PLC or DAQ Control Ready:**
 - External Analog Programming
 - External On/Off Control
 - External Mode Selection
 - Front Panel Key Lockout Prevents Unwanted Key Entry
- **More System Integration Features & Options:**
 - Standard Remote Inhibit (RI) for Interlock Capability
 - Standard Dry Contact Fault for Redundant System Protection
 - Isolated Analog Control/Monitor Option
 - External dc Contactor Option
 - Reverse Polarity/Isolation Relay Option
- **Battery Testing:** "C" Operand for Battery Testing.
- **Ideal for Unique Test Applications:** Custom-tailored Ratings & Features Available



Dimensions

PLA SPECIFICATIONS

CV MODE SPECIFICATIONS		CC MODE SPECIFICATIONS	
CVL RANGE	0 ~ 10% of Vmax	CCL RANGE	0 ~ 10% of Imax
CVM RANGE	0 ~ 50% of Vmax	CCM RANGE	0 ~ 50% of Imax
CVH RANGE	0 ~ 100% of Vmax	CCH RANGE	0 ~ 100% of Imax
ACCURACY	0.05% of Value ± 0.1% of Rating	ACCURACY	0.05% of Value ± 0.1% of Rating
RESOLUTION	1/16000 of Rated Voltage	RESOLUTION	1/16000 of Rated Voltage
TRANSIENT TIME (SLOW)	0.500 ~ 511.9 (ms)	TRANSIENT TIME (SLOW)	0.500 ~ 511.9 (ms)
TRANSIENT TIME (FAST)	0.500 ~ 51.19 (ms)	TRANSIENT TIME (FAST)	0.050 ~ 51.19 (ms)
CR and CP MODE SPECIFICATIONS		PROTECTION	
PLEASE REFERENCE WEBSITE DATASHEET FOR DETAILS		OVER POWER PROTECTION	110% * Pmax
		OVER VOLTAGE PROTECTION	105% * Vmax
		OVER CURRENT PROTECTION	110% * Imax
		OVER TEMPERATURE PROTECTION	90°C ± 5°C
		REVERSE MAXIMUM CURRENT	110% of Imax
		REMOTE INHIBIT (RI)	Short
		FAULT INDICATOR	SPDT Relay
		OTHER PROGRAMMABLE PROTECTIONS: OPP, OVP, OCP, UVL & ANTI-OSCILLATION	
GENERAL SPECIFICATIONS		DIELECTRIC STRENGTH	
REMOTE INTERFACES	RS-232, GPIB & USB/ETHERNET	PRIMARY CIRCUIT TO CHASSIS	1500Vac for 1 Minute
ANALOG PROGRAMMING	0 ~ 10Vdc	PRIMARY CIRCUIT TO LOAD TERMINAL	1500Vac for 1 Minute
ACCURACY	Mode Accuracy ± 0.1% of Rating	LOAD TERMINAL TO CHASSIS	1500Vdc for 1 Minute
YMON ACCURACY	0.10% of RDG ± 0.1% of Rating		
IMON ACCURACY	0.10% of RDG ± 0.1% of Rating		
FREQUENCY RANGE	0.1Hz ~ 10kHz		
DUTY RANGE	1.000 ~ 100.0%		
FREQUENCY & DUTY ACCURACY	0.1% of Setting		
AC INPUT	95~240Vac 48 ~ 62Hz		
OPERATING TEMPERATURE	5°C ~ 40°C		

PLW Series of High-power Programmable

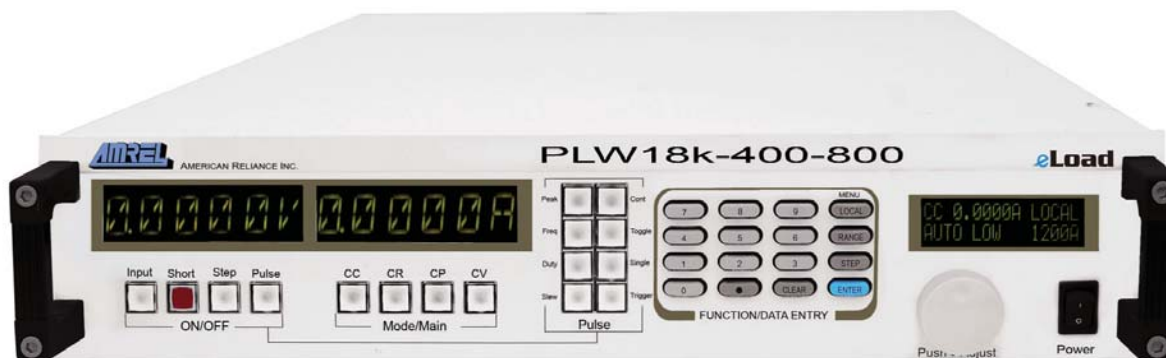
Why Choose the PLW Series?

Traditional Water-cooled dc Electronic Load Solutions are bulky, have limited power handling capability, and are prone to water cooling issues such as condensation and external water valve considerations. Furthermore, only standard voltage, current and power ratings are offered. Rack space, reliability, and the right-solution fit are key parameters for lights-out burn-in of power components, fuel cells, batteries, power supplies, alternators and other electronics.

AMREL's PLW Series of "Water-cooled" dc Electronic eLoads are capable of being custom-tailored to meet your specific application requirements. The PLW Series also offers a unique condensation protection design, the highest power density and current rating, as well as the widest selection of high-voltage models on the market.

Markets and Applications:

- Battery/Energy Storage/Ultra Capacitor Testing and Validation
- Fuel Cell Durability, Lifetime and Performance Characterization
- dc Power Supply and Battery Charger Validation and Testing
- Single Cell and Short Stack Fuel Cell Characterization
- EIS/Impedance Measurement
- Defense/Aerospace and Avionics ATE, Electronics and Power Sources Testing
- Thin-film, Single- & Poly-silicone PV Design Validation and Testing
- Power Supply, Power Electronics/Components Validation and Testing
- Industrial Applications: Generator/Alternator, UPS/Battery Banks, Datacenter Backup Power, and Automotive Power Electronics & Components
- Lab/Bench-top Applications: Ideal for R&D, Testing and QC Engineers
- Power Electronics/Components, dc Distribution & dc-dc Converters
- Universities
- National Research Labs



PLW SELECTOR GUIDE

PLW XXX - YY - ZZZ and OPTIONS*
XXX -POWER | YY - VOLTAGE | ZZZ - CURRENT

EFU-L = Field Upgradeable Ethernet & USB Available*

ISOL=Isolated Analog Programming Option*

UL=Ultra-low Current Range Option Available*

Series	Model #	Power (W)	Voltage (Vdc)	Current (A dc)	V _{MIN} at I _{MAX} (Vdc)	Size (Height, Depth)
PLW	PLW6K-60-1000	6kW	60	1000	0.6	2U, 27.5"D
PLW	PLW6K-120-600	6kW	120	600	1.5	2U, 27.5"D
PLW	PLW6K-400-300	6kW	400	300	3.6	2U, 27.5"D
PLW	PLW6K-600-200	6kW	600	200	12	2U, 27.5"D
PLW	PLW9K-60-1500	9kW	60	1500	0.6	2U, 27.5"D
PLW	PLW9K-120-1000	9kW	120	1000	1.5	2U, 27.5"D
PLW	PLW9K-400-400	9kW	400	400	3.6	2U, 27.5"D
PLW	PLW9K-600-300	9kW	600	300	12	2U, 27.5"D
PLW	PLW12K-60-1500	12kW	60	1500	0.6	2U, 27.5"D
PLW	PLW12K-120-1200	12kW	120	1200	1.5	2U, 27.5"D
PLW	PLW12K-400-600	12kW	400	600	3.6	2U, 27.5"D
PLW	PLW12K-600-400	12kW	600	400	12	2U, 27.5"D
PLW	PLW18K-60-1500	18kW	60	1500	0.6	2U, 27.5"D
PLW	PLW18K-120-1500	18kW	120	1500	1.5	2U, 27.5"D
PLW	PLW18K-400-800	18kW	400	800	3.6	2U, 27.5"D
PLW	PLW18K-600-600	18kW	600	600	12	4U, 27.5"D
PLW	PLW24K-60-1500	24kW	60	1500	0.45	4U, 27.5"D
PLW	PLW24K-120-1500	24kW	120	1500	1.2	4U, 27.5"D
PLW	PLW24K-400-1200	24kW	400	1200	3.6	4U, 27.5"D
PLW	PLW24K-600-800	24kW	600	800	12	4U, 27.5"D
PLW	PLW36K-60-1500	36kW	60	1500	0.45	4U, 27.5"D
PLW	PLW36K-120-1500	36kW	120	1500	0.9	4U, 27.5"D
PLW	PLW36K-400-1500	36kW	400	1500	3.3	4U, 27.5"D
PLW	PLW36K-600-1000	36kW	600	1000	10	6U, 27.5"D

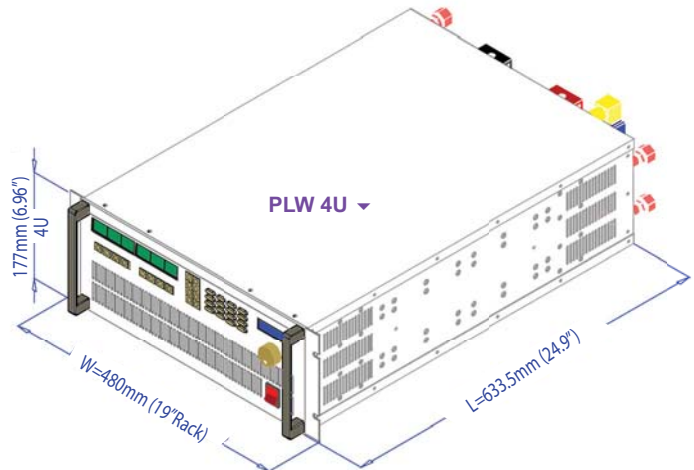
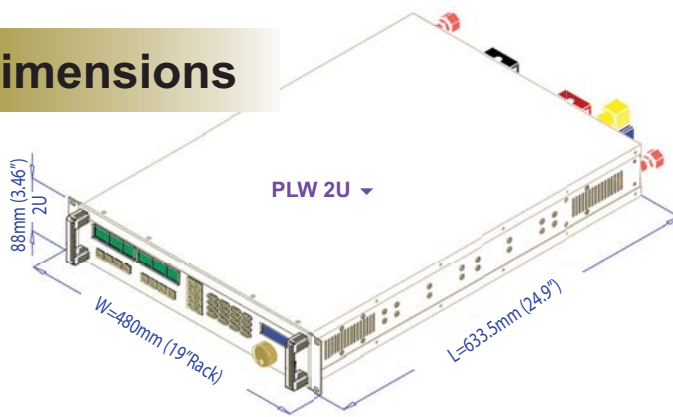
Additional standard models above 36kW and up to 250kW+ are available. Please contact AMREL for more details.

Voltage Range: 10Vdc~1200Vdc Rating
Current Range: 10A dc ~ 5000A dc Rating
Power Range: 6kW ~ 100kW+ Rating
Custom-tailored Ranges Available

Key Features and Benefits:

- **Broadest Model Selection:** 6kW, 9kW, 12kW, 18kW, 24kW, 36kW, 48kW, 60kW, 75kW, 100kW, 120kW Models and Higher Power PLW Systems in Excess of 250kW
- **Exclusive High-voltage Models:** Standard 60V, 120V, 400V & 600V Voltage Ratings and Widest Selection of Exclusive 800Vdc and 1200Vdc PLW Models
- **Save Rack Space:** PLW Models Offer Ultra-Compact Footprint and Boasts the Industry's Highest Power Density
- **Maximize ROI:** In-rack Closed-case Calibration Without "Outside" Calibration Lab
- **Ultra-low Compliance Voltage:** Ultra-low Voltage Operation @ 1000's of Amps (5000Adc)
- **Reliable:** Individual FET Protection to Isolate Power Stage Failures
- **Maximized Uptime:** Redundant Over-temperature and Over-power Protection
- **Anti-condensation:** Intelligent Fully-Integrated Temperature Control Circuit and Solenoid Valve Control Prevent Condensation
- **Fast Response:** 50µs Independently Programmable Rise/Fall Time
- **Flexible Test Platform:** Five Modes of Operation: CC, CR, CV, CP and Pulse Load Shaping
- **Intuitive Front Panel Control:** User-friendly Function Hot Keys, Full Keypad & Digital Encoder
- **Integrated DMM:** 14-bit 5-digit Voltage and Current Measurement Display
- **Two Loads in One:** Ultra-low Current Range Option for Optimized Accuracy
- **More Ranges:** Three Full Scale Ranges (100%, 50% & 10%)
- **More Protections:** Anti-oscillation & Programmable Protections: OV, UV, OC, UC, OP, & UP
- **More Interfaces:** Co-resident GPIB/RS-232 and Optional Field-upgradeable Ethernet/USB
- **ATE Ready:** Standard LabWindows and LabVIEW Drivers and SCPI Command Set
- **Test Automation Ready:** Four Profiles; 32 Step Points per Profile
- **Fuel Cell Application Ready:**
 - Impedance Measurement via Frequency Response Analyzer (FRA)
 - Current Interruption Mode for Fuel Cell Testing
 - Ultra-low Compliance (0.1Vdc) Voltage to Operate at High Current
 - Virtual Panel provides Polarization Curve Sweep and Voltage/Current Cycling Capability
- **0 ~ 10Vdc PLC or DAQ Control Ready:**
 - 0~10Vdc External Analog Programming
 - External On/Off Control
 - External Mode Selection
 - Front Panel Key Lockout Prevents Unwanted Key Entry
- **More System Integration Features & Options:**
 - Standard Remote Inhibit (RI) for Interlock Capability
 - Standard Dry Contact Fault for Redundant System Protection
 - Isolated Analog Control/Monitor Option
 - External dc Contactor Option
 - Reverse Polarity/Isolation Relay Option
- **Battery Testing:** "C" Operand for Battery Testing.
- **Ideal for Unique Test Applications:** Custom-tailored Ratings & Features Available

Dimensions



PLW SPECIFICATIONS

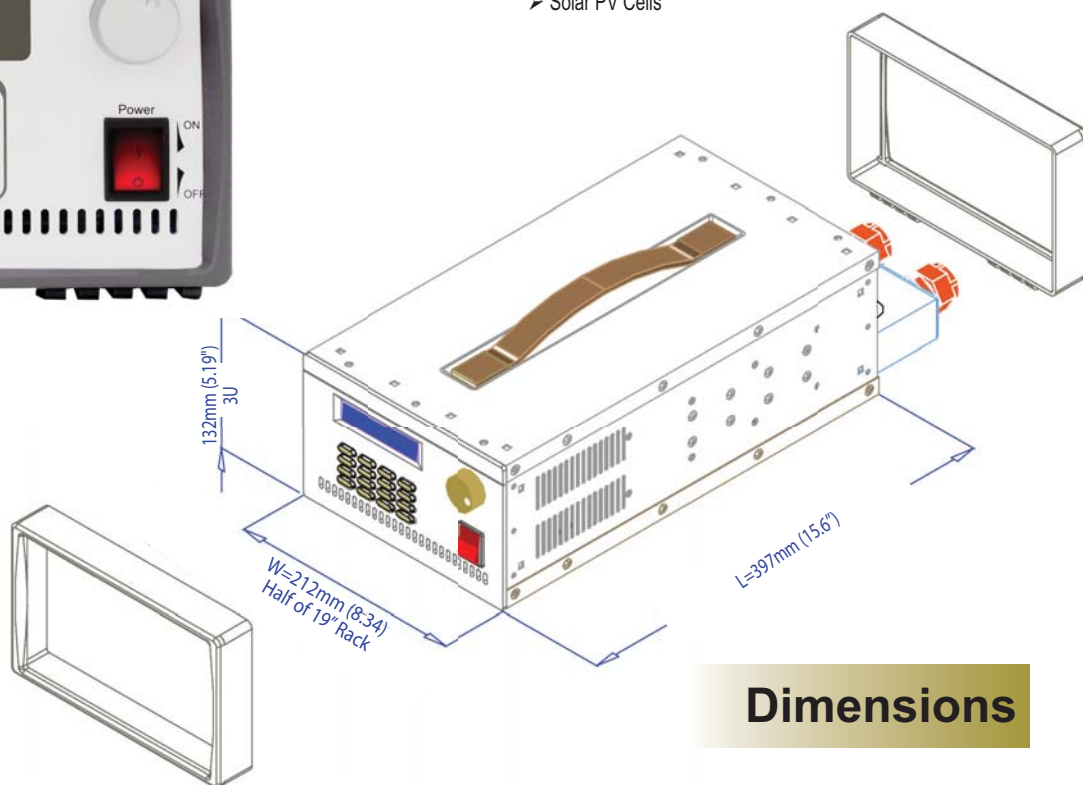
CV MODE SPECIFICATIONS		CC MODE SPECIFICATIONS	
CVL RANGE	0 ~ 10% of Vmax	CCL RANGE	0 ~ 10% of Imax
CVM RANGE	0 ~ 50% of Vmax	CCM RANGE	0 ~ 50% of Imax
CVH RANGE	0 ~ 100% of Vmax	CCH RANGE	0 ~ 100% of Imax
ACCURACY	0.05% of Value ± 0.1% of Rating	ACCURACY	0.05% of Value ± 0.1% of Rating
RESOLUTION	1/16000 of Rated Voltage	RESOLUTION	1/16000 of Rated Voltage
TRANSIENT TIME (SLOW)	0.500 ~ 511.9 (ms)	TRANSIENT TIME (SLOW)	0.500 ~ 511.9 (ms)
TRANSIENT TIME (FAST)	0.500 ~ 51.19 (ms)	TRANSIENT TIME (FAST)	0.050 ~ 51.19 (ms)
CR and CP MODE SPECIFICATIONS		PROTECTION	
Please reference website datasheet for details		OVER POWER PROTECTION	105% * Pmax
		OVER VOLTAGE PROTECTION	105% * Vmax
		OVER CURRENT PROTECTION	110% * Imax
		OVER TEMPERATURE PROTECTION	50°C ± 5°C
		REVERSE MAXIMUM CURRENT	110% of Imax
		REMOTE INHIBIT (RI)	Short
		FAULT INDICATOR	SPDT Relay
		Other Programmable Protections: OPP, OVP, OCP, UVL & Anti-Oscillation	
GENERAL SPECIFICATIONS		DIELECTRIC STRENGTH	
REMOTE INTERFACES	RS-232, GPIB & USB/Ethernet	PRIMARY CIRCUIT TO CHASSIS	1500Vac for 1 Minute
ANALOG PROGRAMMING	0 ~ 10Vdc	PRIMARY CIRCUIT TO LOAD TERMINAL	1500Vac for 1 Minute
ACCURACY	Mode Accuracy ± 0.1% of Rating	LOAD TERMINAL TO CHASSIS	1500Vdc for 1 Minute
VMON ACCURACY	0.10% of RDG ± 0.1% of Rating		
IMON ACCURACY	0.10% of RDG ± 0.1% of Rating		
FREQUENCY RANGE	0.1Hz ~ 10kHz		
DUTY RANGE	1.000 ~ 100.0%		
FREQUENCY & DUTY ACCURACY	0.1% of Setting		
AC INPUT	95 ~ 240Vac / 48 ~ 62Hz		
OPERATING TEMPERATURE	5°C ~ 40°C		

BPL Series of Bench-top Programmable

Why Choose the BPL Series?

The BPL Bench-top eLoad strikes the perfect balance between value, features, and ROI. Built on dual current shunt architecture, the BPL provides accurate current readings for high-currents up to 200Adc and low-current readings down to the micro-amps.

AMREL's BPL Series of "Bench-top" dc Electronic eLoads offers high-end performance, the industry's highest power-density and current-rating, fast response time and unparallelled current measurement accuracy in a 3U 1/2 rack package. The BPL is a full-featured, powerful, ultra-compact, and user-friendly bench-top eLoad.



Dimensions

Markets and Applications:

- Power Electronics Testing
 - dc-dc Converters
 - ac-dc Power Supplies
 - Switching Power Supplies
 - POL (Point of Load)
- Power Electronic Components Testing
- Battery Chargers & Load Profile Simulation
- Battery Testing and Characterization
- Laboratories, Universities and R&D
- Defense/Aerospace/Avionics/Industrial ATE and Integrated Test Systems
- Portable Applications
- dc Power Sources/Energy Storage
 - Batteries
 - Fuel Cells
 - Ultracapacitors
 - Solar PV Cells

BPL SELECTOR GUIDE

BPL XXX - YY - ZZZ - AA and OPTIONS*
XXX - POWER | YY - VOLTAGE | ZZZ - CURRENT

EFU-L = Field Upgradeable Ethernet & USB Available*

Series	Model #	Power (W)	Voltage (Vdc)	Current (Adc)	V _{MIN} at I _{MAX} (Vdc)	Size (Height, Depth)
BPL	BPL400-60-150	400W	60	150	0.75	3U, 17.2"D
BPL	BPL400-120-75	400W	120	75	1.5	3U, 17.2"D
BPL	BPL400-400-30	400W	400	30	3	3U, 17.2"D
BPL	BPL400-600-20	400W	600	20	8.4	3U, 17.2"D
BPL	BPL400-800-15	400W	800	15	7.2	3U, 17.2"D
BPL	BPL800-60-200	800W	60	200	0.75	3U, 17.2"D
BPL	BPL800-120-150	800W	120	150	1.5	3U, 17.2"D
BPL	BPL800-400-60	800W	400	60	3	3U, 17.2"D
BPL	BPL800-600-40	800W	600	40	8.4	3U, 17.2"D
BPL	BPL800-800-30	800W	800	30	7.2	3U, 17.2"D
		Voltage Range: 10Vdc ~ 800Vdc Rating Current Range: 1Adc ~ 200Adc Rating Power Range: 150W ~ 800W Rating Custom-tailored Ranges Available				

Key Features and Benefits:

- **Broadest Model Selection:** 400W, 800W, or Custom-tailored Power Rating
- **Exclusive High-voltage Models:** Standard 60V, 120V, 400V & 600V Voltage Ratings and Widest Selection of Exclusive 800Vdc Models
- **Ideal for Unique Test Applications:** Custom-tailored Ratings & Features Available
- **Ultra-current Precision & Accuracy:** Dual-current Shunt Architecture Provides Ultra-accurate Current Measurements and Essentially Two eLoads in a Single Package
- **Save Bench Space:** BPL Models Offer Ultra-compact Footprint [15.65"(L) x 8.35"(W) x 5.20"(H)] and Boasts the Industry's Highest Power Density
- **Maximize ROI:** On-bench Closed-case Calibration without 3rd Calibration Lab
- **Ultra-low Compliance Voltage:** Ultra-low Voltage Operation @ Up to 200 Amps
- **Reliable:** Individual FET Protection to Isolate Power Stage Failures
- **Maximized Uptime:** Redundant Over-temperature and Over-power Protection
- **Ultra-quiet Operation:** Fan Speed Control for Reduced Acoustic Noise Under Light Load Conditions.
- **Fast Response:** 25µs independently Programmable Rise/Fall Time
- **Flexible Test Platform:** Five Modes of Operation: CC, CR, CV, CP and Pulse Load Shaping
- **Intuitive Front Panel Control:** User-friendly Function Hot Keys, Full Keypad & Digital Encoder
- **Integrated DMM:** 14-bit Five Digit Voltage and Current Measurement Display
- **Two Loads in One:** Ultra-low Current Range Option for Optimized Accuracy
- **More Ranges:** Three Full Scale Ranges (100%, 50% & 10%)
- **More Protections:** Anti-oscillation & Programmable Protections: OV, UV, OC, UC, OP, & UP
- **More Interfaces:** Co-resident GPIB/RS-232 and Optional Field-upgradeable Ethernet/USB
- **ATE Ready:** Standard LabWindows and LabVIEW Drivers and SCPI Command Set
- **Test Automation Ready:** Four Profiles; 32 Step Points per Profile
- **Fuel Cell Application Ready:**
 - Impedance Measurement via Frequency Response Analyzer (FRA)
 - Current Interruption Mode for Fuel Cell Testing
 - Ultra-low Compliance (0.1Vdc) Voltage to Operate at High-current
 - Virtual Panel Provides Polarization Curve Sweep and Voltage/Current Cycling Capability
- **0 ~ 10Vdc PLC or DAQ Control Ready:**
 - 0~10Vdc External Analog Programming
 - External On/Off Control
 - External Mode Selection
 - Front Panel Key Lockout Prevents Unwanted Key Entry
- **More System Integration Features & Options:**
 - Standard Remote Inhibit (RI) for Interlock Capability
 - Standard Dry Contact Fault for Redundant System Protection
 - Isolated Analog Control/Monitor Option
 - External dc Contactor Option
 - Reverse Polarity/Isolation Relay Option
- **Battery Testing:** "C" Operand for Battery Testing.

BPL SPECIFICATIONS

CV MODE SPECIFICATIONS		CC MODE SPECIFICATIONS	
CVL RANGE	0 ~ 10% of V _{MAX}	CCL RANGE	0 ~ 10% of I _{MAX}
CVM RANGE	0 ~ 50% of V _{MAX}	CCM RANGE	0 ~ 50% of I _{MAX}
CVH RANGE	0 ~ 100% of V _{MAX}	CCH RANGE	0 ~ 100% of I _{MAX}
ACCURACY	0.05% of Value ± 0.1% of Rating	ACCURACY	0.05% of Value ± 0.1% of Rating
RESOLUTION	1/16000 of Rated Voltage	CCUL RANGE	0 ~ 10% of I _{MAX}
TRANSIENT TIME (SLOW)	0.250 ~ 255.9 (ms)	CCUL ACCURACY	0.05% of Value ± 0.05% of Range
TRANSIENT TIME (FAST)	0.250 ~ 25.59 (ms)	RESOLUTION	1/16000 of Rated Current
		TRANSIENT TIME (SLOW)	0.250 ~ 255.9 (ms)
		TRANSIENT TIME (FAST)	0.025 ~ 25.59 (ms)
CR and CP MODE SPECIFICATIONS		PROTECTION	
Please reference website datasheet for details		OVER POWER PROTECTION	110% * P _{MAX}
GENERAL SPECIFICATIONS		OVER VOLTAGE PROTECTION	105% * V _{MAX}
REMOTE INTERFACES	RS-232, GPIB & USB/ETHERNET	OVER CURRENT PROTECTION	110% * I _{MAX}
ANALOG PROGRAMMING	0 ~ 10Vdc	OVER TEMPERATURE PROTECTION	90°C ± 5°C
ACCURACY	Mode Accuracy ± 0.1% of Rating	REMOTE INHIBIT (RI)	Short
VMON ACCURACY	0.10% of RDG ± 0.1% of Rating	FAULT INDICATOR	SPDT Relay
IMON ACCURACY	0.10% of RDG ± 0.1% of Rating	Other Programmable Protections: OPP, OVP, OCP, UVL & Anti-Oscillation	
IMON (CCUL) ACCURACY	CCUL Mode Accuracy ± 0.1% of Rating	DIELECTRIC STRENGTH	
FREQUENCY RANGE	0.1Hz ~ 20kHz	Primary Circuit to Chassis	1500Vac for 1 Minute
ACCURACY	0.10%	Primary Circuit to Load Terminal	1500Vac for 1 Minute
AC INPUT	95~240Vac 48 ~ 62Hz	Load Terminal to Chassis	1500Vdc for 1 Minute
OPERATING TEMPERATURE	5°C ~ 40°C		
DIMENSIONS	15.65" (L) x 8.35" (W) x 5.20" (H)		
WEIGHT	22 lbs		

FCL Series of Air-cooled Programmable

Why Choose the FCL Series?

AMREL's Integrated Fuel Cell Load "FCL" Series is the ideal all-in-one solution that packages a booster supply for true "0-volt at high-current" operations. The FCL also has an embedded FRA for impedance measurement/EIS, and a full featured high-speed dynamic dc load in an ultra-compact 3U (5.25") air-cooled package. AMREL's FCL offers the industry's highest current rating of 200Adc, as well as custom-tailored voltage, current and power ratings.

Markets and Applications:

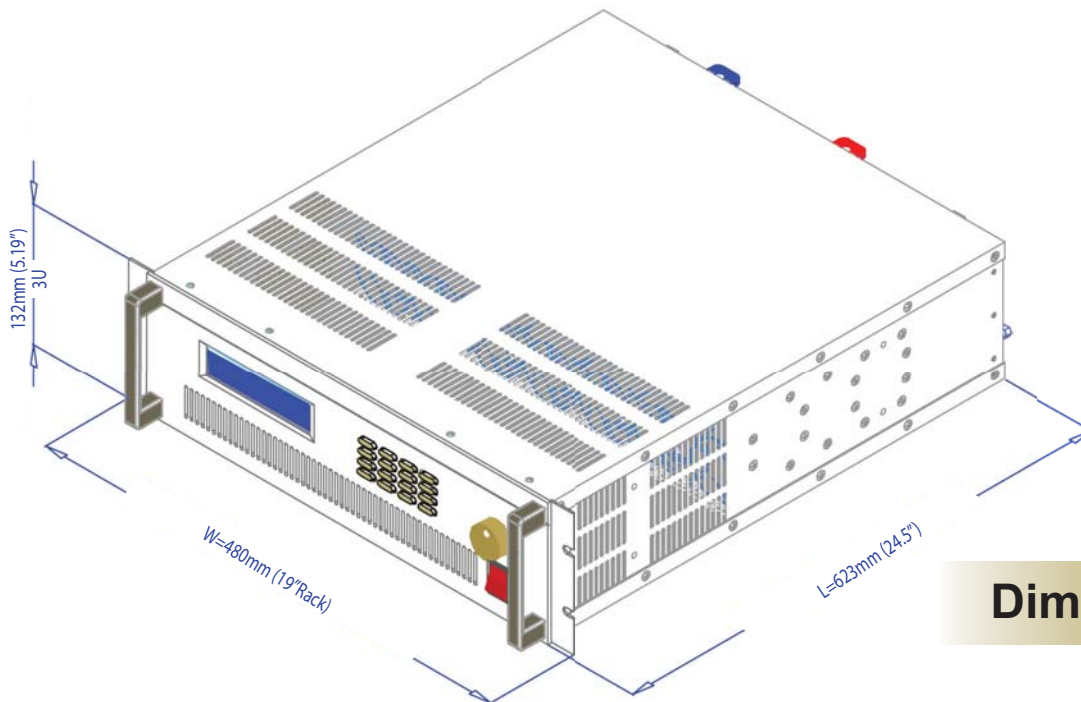
- Fuel Cells
 - Single Cell and Short Stack Fuel Cell Characterization, Break-in and Testing Applications
 - Gstat Impedance Measurement (EIS & AC Modulation)
 - Polarization Curve Data Capture (CV & CC Control)
 - Durability
 - Lifetime Tests
 - Performance/Design Characterization



FCL SELECTOR GUIDE						
FCL XXX - YY - ZZZ and OPTION*						EFU-L = Field Upgradeable Ethernet & USB Available*
XXX -POWER YY - VOLTAGE ZZZ - CURRENT						L=Low Frequency Option*
						UL=Ultra-low Current Range Option Available*
Series	Model #	Power (W)	Voltage (Vdc)	Current (Adc)	V _{MIN} at I _{MAX} (Vdc)	Size (Height, Depth)
FCL	FCL200-10-100	200W	10	100	0	(1.75", 19.5")
FCL	FCL200-20-100	200W	20	100	0	(1.75", 19.5")
FCL	FCL200-30-100	200W	30	100	0	(1.75", 19.5")
FCL	FCL400-10-100	400W	10	100	0	(5.25", 19.5")
FCL	FCL400-20-100	400W	20	100	0	(5.25", 19.5")
FCL	FCL400-30-100	400W	30	100	0	(5.25", 19.5")
FCL	FCL400-10-150	400W	10	150	0	(5.25", 19.5")
FCL	FCL400-20-150	400W	20	150	0	(5.25", 19.5")
FCL	FCL400-30-150	400W	30	150	0	(5.25", 19.5")
FCL	FCL800-10-100	800W	10	100	0	(5.25", 19.5")
FCL	FCL800-20-100	800W	20	100	0	(5.25", 19.5")
FCL	FCL800-30-100	800W	30	100	0	(5.25", 19.5")
FCL	FCL800-10-200	800W	10	200	0	(5.25", 19.5")
FCL	FCL800-20-200	800W	20	200	0	(5.25", 19.5")
FCL	FCL800-30-200	800W	30	200	0	(5.25", 19.5")
FCL	FCL1.5K-10-100	1.5kW	10	100	0	(5.25", 19.5")
FCL	FCL1.5K-20-100	1.5kW	20	100	0	(5.25", 19.5")
FCL	FCL1.5K-30-100	1.5kW	30	100	0	(5.25", 19.5")
FCL	FCL1.5K-10-200	1.5kW	10	200	0	(5.25", 19.5")
FCL	FCL1.5K-20-200	1.5kW	20	200	0	(5.25", 19.5")
FCL	FCL1.5K-30-200	1.5kW	30	200	0	(5.25", 19.5")
Custom-tailored Ranges Available		Voltage Range:10Vdc ~ 800Vdc Rating Current Range:1Adc ~ 200Adc Rating Power Range:60W ~ 1.5kW Rating				

Key Features and Benefits:

- **Embedded FRA** (Frequency Response Analyzer) Without the Hassles of External Cables
- **Built-in Booster Power Supply** to Test Down to 0Vdc at Full Operating Current
- **Fully Integrated** 200W, 400W, 800W and 1.5kW Air-cooled Electronic eLoad
- **Impedance Measurement Software** Without the Costs of Purchasing Additional Software
- **CC/CV/CR/CP Operating Modes** to Meet Demanding Application Specific Requirements
- **Dynamic Operation Up to 20kHz** Provides Accurate Impedance Measurements
- **Dynamic Profile Loading Via Voltage and Current Sweeps** for Polarization Curves, Durability/Lifetime Tests, Simulate Real-world Applications and Other Dynamic Test Requirements
- **LabVIEW & LabWindows Drivers, Virtual Panel & SCPI Commands** for Simple ATE Integration
- **The One-box Solution** for Testing Electrical Specs, Validating Performance Targets and Evaluating the Impedance Losses for Fuel Cells
- **Widest Model Selection**-10Vdc/20Vdc/30Vdc FCL Rated at 100 or 200Amps and Custom-tailored Models Available



Dimensions

FCL SPECIFICATIONS

CV MODE SPECIFICATIONS		CC MODE SPECIFICATIONS	
CVL RANGE	0 ~ 10% of Vmax	CCL RANGE	0 ~ 10% of Imax
CVM RANGE	0 ~ 50% of Vmax	CCM RANGE	0 ~ 50% of Imax
CVH RANGE	0 ~ 100% of Vmax	CCH RANGE	0 ~ 100% of Imax
ACCURACY	0.05% of Value ± 0.1% of Rating	ACCURACY	0.05% of Value ± 0.1% of Rating
RESOLUTION	1/16000 of Rated Voltage	RESOLUTION	1/16000 of Rated Voltage
TRANSIENT TIME (SLOW)	0.150 ~ 153.6 (ms)	TRANSIENT TIME (SLOW)	0.150 ~ 153.6 (ms)
TRANSIENT TIME (FAST)	0.150 ~ 15.36 (ms)	TRANSIENT TIME (FAST)	0.015 ~ 15.36 (ms)
CR and CP MODE SPECIFICATIONS		PROTECTION	
Please reference website datasheet for details		OVER POWER PROTECTION	110% * Pmax
		OVER VOLTAGE PROTECTION	105% * Vmax
		OVER CURRENT PROTECTION	110% * Imax
		OVER TEMPERATURE PROTECTION	90°C ± 5°C
		REVERSE MAXIMUM CURRENT	110% of Imax
		REMOTE INHIBIT (RI)	Short
		FAULT INDICATOR	SPDT Relay
		Other Programmable Protections: OPP, OVP, OCP, UVL & Anti-Oscillation	
GENERAL SPECIFICATIONS		DIELECTRIC STRENGTH	
REMOTE INTERFACES	RS-232, GPIB & USB/ETHERNET	PRIMARY CIRCUIT TO CHASSIS	1500Vac for 1 Minute
ANALOG PROGRAMMING	0 ~ 10Vdc	PRIMARY CIRCUIT TO LOAD TERMINAL	1500Vac for 1 Minute
ACCURACY	Mode Accuracy ± 0.1% of Rating	LOAD TERMINAL TO CHASSIS	1500Vdc for 1 Minute
VMON ACCURACY	0.10% of RDG ± 0.1% of Rating		
IMON ACCURACY	0.10% of RDG ± 0.1% of Rating		
FREQUENCY RANGE	0.1Hz ~ 20kHz		
ACCURACY	0.10%		
AC INPUT	95-240Vac / 48 ~ 62Hz		
OPERATING TEMPERATURE	5°C ~ 40°C		
DIMENSIONS	19.5" (L) x 17" (W) x 5.25" (H)		

ZVL Series of Zero-volt Programmable

Why Choose the ZVL Series?

Traditional dc Electronic Load Solutions have inherent limitations for testing single cell fuel cells and PV cells/modules. DC electronic loads use power dissipating components that require a minimum compliance voltage of 0.6Vdc ~ 1.5Vdc for operation. However, single cell fuel cell and PV cells often require the dc electronic load to operate at below 0.1Vdc. To achieve this, an external booster supply connected in series is required. The drawbacks of using an external booster supply are twofold: cost and cumbersome hardware. This is especially the case for single cell fuel cells. Single cells, depending on the active cell area, can range from 10Adc up to 200Adc. The additional cabling can be troublesome and costly. In addition, booster supplies range between \$500 ~ \$1K+ in cost.

AMREL's ZVL Series of Zero-volt dc Electronic eLoads was designed for Fuel Cell and PV Testing, offering the industry's highest current rating for "0-Volt" operation along with custom-tailored voltage and current ratings to meet diverse applications. All this in a compact fully-integrated rackmount-ready package!

Markets and Applications:

- Fuel Cells
 - Single Cell and Short Stack Fuel Cell Characterization, Break-in and Testing Applications
 - Gstat Impedance Measurement (EIS & AC Modulation)
 - Polarization Curve Data Capture (CV & CC Control)
 - Durability
 - Lifetime Tests
 - Performance/Design Characterization
- Battery Testing
 - Dynamic Profiling
 - Battery Characterization
 - Charge/Discharge and Lifetime/Cycle Tests
- Power Electronics Testing
 - dc-dc Converters
 - ac-dc Power Supplies
 - Switching Power Supplies
 - POL (Point of Load)
- Power Electronic Components Testing
- Battery Chargers & Load Profile Simulation
- Battery Testing and Characterization
- Laboratories, Universities and R&D
- Defense/Aerospace/Avionics/Industrial ATE and Integrated Test Systems
- Portable Applications



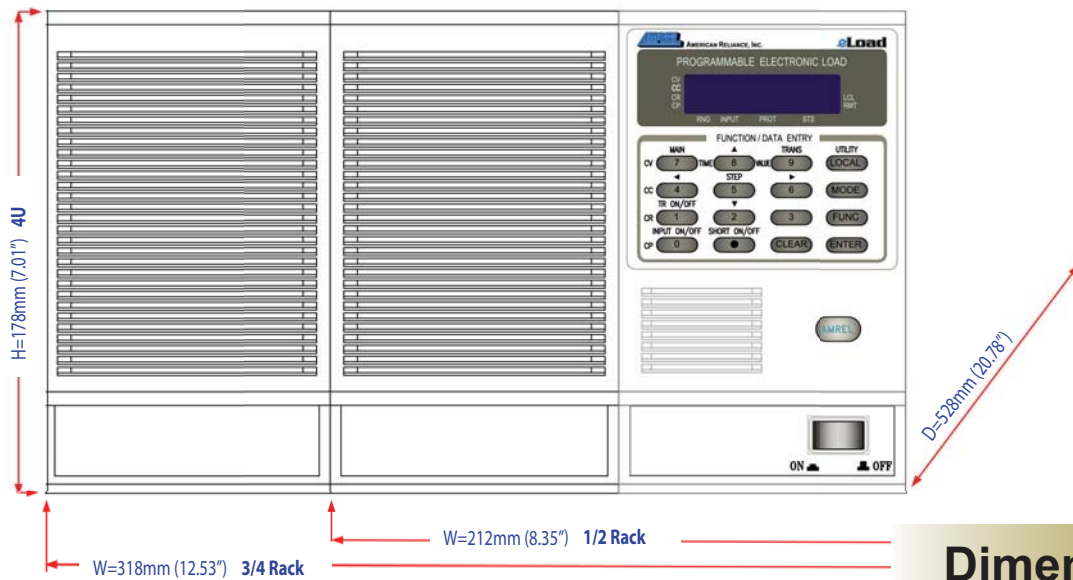
ZVL SELECTOR GUIDE

ZVL XXX - YY - ZZZ
 XXX - POWER | YY - VOLTAGE | ZZZ - CURRENT

Series	Model #	Power (W)	Voltage (Vdc)	Current (Adc)	V _{MIN} at I _{MAX} (Vdc)	Size (Height, Width)
ZVL	ZVL60-10-20L	60	10	20	0	4U, ½Rack
ZVL	ZVL100-10-20L	100	10	40	0	4U, ½Rack
ZVL	ZVL100-10-40L	100	10	40	0	4U, ¾Rack
ZVL	ZVL100-10-80L	100	10	80	0	4U, ½Rack
ZVL	ZVL100-150-20L	100	150	20	0	4U, ½Rack
ZVL	ZVL150-10-100L	150	10	100	0	4U, ½Rack
ZVL	ZVL200-10-40L	200	10	40	0	4U, ½Rack
ZVL	ZVL200-150-40L	200	150	40	0	4U, ½Rack
ZVL	ZVL300-10-100L	300	10	100	0	4U, ¾Rack
ZVL	ZVL300-150-40L	300	150	40	0	4U, ¾Rack
Custom-tailored Ranges Available		Voltage Range: 10Vdc ~ 150Vdc Rating Current Range: 5Adc ~ 100Adc Rating Power Range: 60W ~ 300W Rating				

Key Features and Benefits:

- **Broadest Model Selection:** 60W, 100W, 150W, 200W, 300W or Custom-tailored Power Ratings
- **Exclusive Voltage Models:** Standard 10V, 20V, 150V and Custom-tailored Voltage Ratings
- **Ideal for Unique Test Applications:** Custom-tailored Ratings & Features Available
- **Exclusive Ethernet Models Available:** 400W, 800W and 1.5kW Ethernet-based ZVL Models
- **True Zero volt Operation:** Fully Integrated Booster Supply and dc Electronic Load
- **Rackmount and Bench Ready:** Rackmount Kits Available
- **Maximize ROI:** On-bench Closed-case Calibration Without Outside Calibration Lab
- **Reliable:** Individual FET Protection to Isolate Power Stage Failures
- **Maximized Uptime:** Redundant Over-temperature and Over-power Protection
- **Ultra-Quiet Operation:** Fan Speed Control for Reduced Acoustic Noise Under Light Load Conditions.
- **Flexible Test Platform:** Five Modes of Operation: CC, CR, CV, CP and Pulse Load Shaping
- **More Interfaces:** Co-resident GPIB/RS-232
- **ATE Ready:** Standard LabWindows and LabVIEW Drivers and SCPI Command Set
- **Test Automation Ready:** 99-point Dynamic Profile Simulation in CV or CC Mode
- **Fuel Cell Application Ready:**
 - Impedance Measurement via Frequency Response Analyzer (FRA)
 - 0-volt Operation for Generating Polarization Curves Down to 0-volts
 - Virtual Panel provides Polarization Curve Sweep and Voltage/Current Cycling Capability
 - CSV V-I Data-logging Feature to Store and Organize Important Test Data
- **0 ~ 10Vdc PLC or DAQ Control Ready:**
 - 0~10Vdc External Analog Programming
 - External On/Off Control
 - External Mode Selection
 - Front Panel Key Lockout Prevents Unwanted Key Entry
- **The Smart Solution:** The ZVL is a Fully-integrated Zero-volt eLoad Designed to Maximize Return on Investment with Minimal or Zero Maintenance Costs, Quality High Performance, and Other Useful Features to Jumpstart Your Important Testing Applications Today



Dimensions

ZVL SPECIFICATIONS

CV MODE SPECIFICATIONS		CC MODE SPECIFICATIONS	
CVL RANGE	0 ~ 100% of Vmax	CCL RANGE	0 ~ 10% of Imax
ACCURACY	0.2% of Value ± 0.1% of Rating	CCM RANGE	0 ~ 100% of Imax
RESOLUTION	1/3600 of Rated Voltage	ACCURACY	0.2% of Value ± 0.1% of Rating
CV TRANSIENT TIME	1ms ~ 273ms for 0Vdc to Vmax	RESOLUTION	1/3600 of Rated Current
		CC TRANSIENT TIME	27ms ~ 0.100ms for 0Adc to Imax
CR and CP MODE SPECIFICATIONS		PROTECTION	
Please reference website datasheet for details		OVER POWER PROTECTION (OPP)	110% * Pmax
GENERAL SPECIFICATIONS		RESOLUTION	1/4000 of Rated Power
REMOTE INTERFACES	RS-232 & GPIB	ACCURACY	1% of Setting ± 0.5% of Rating
CC MODE ANALOG PROGRAMMING	0 ~ 10Vdc corresponds to 0 ~ Imax	OVER VOLTAGE PROTECTION (OVP)	110% * Vmax
ACCURACY	Mode Accuracy ± 0.1% of Rating	OVP RESOLUTION	1/4000 of Rated Voltage
VMON ACCURACY	0.10% of RDG ± 0.1% of Rating	OVP ACCURACY	0.20% of Setting ± 0.25% of Rating
IMON ACCURACY	0.10% of RDG ± 0.1% of Rating	OVER CURRENT PROTECTION (OCP)	110% * Imax
AC INPUT	115/230Vac 50/60Hz	OCP RESOLUTION	1/4000 of Rated Current
OPERATING TEMPERATURE	5°C ~ 40°C	OCP ACCURACY	0.20% of Setting ± 0.25% of Rating

PEL & FEL Series of Low-power and Ultra-low Voltage Programmable

Why Choose the PEL Series?

For years the test and measurement industry was in need of a portable, general-purpose dc electronic load. The available load solutions were either rackmount or multi-channel mainframe-based. The form factor aside, trim pots were the standard calibration method. Users in the Test and Measurement Industry demanded a load bank solution that was compact and portable, embedded with GPIB/RS-232, capable of bench-top closed-case calibration, offered dynamic operability such as profile simulation and could easily be calibrated on a bench without removing the cover.

AMREL's PEL Series of "Low-power" dc Electronic eLoads, designed for your daily testing needs, offers affordable value, dynamic pulse shaping, auto-sequencing, embedded GPIB/RS-232 and closed-case calibration in a portable rackmount-ready package.

Why Choose the FEL Series?

Traditional load bank solutions were limited by the minimum compliance voltage of internal power dissipating components and the lack of high-current handling capability. The markets for power electronics/components, emerging fuel cell applications and energy storage sources (batteries, ultra capacitors and others) were demanding a dc electronic load solution that was compact enough for simple portability with a voltage/current performance that allowed low-voltage operation at currents exceeding the standard current ratings.

AMREL's FEL Series of "Low-voltage" dc Electronic eLoads offer affordable, compact rackmount-ready programmable loads for high-current dissipation at ultra-low compliance voltage. High current ratings go up to 200Adc.

Markets and Applications:

- Fuel Cells
 - Single Cell and Short Stack Fuel Cell Characterization, Break-in and Testing Applications
 - Gstat Impedance Measurement (EIS & AC Modulation)
 - Polarization Curve Data Capture (CV & CC Control)
 - Durability
 - Lifetime Tests
 - Performance/Design Characterization
- Battery Testing
 - Dynamic Profiling
 - Battery Characterization
 - Charge/Discharge and Lifetime/Cycle Tests
- Power Electronics Testing
 - dc-dc Converters
 - ac-dc Power Supplies
 - Switching Power Supplies
 - POL (Point of Load)
- Power Electronic Components Testing
- Battery Chargers & Load Profile Simulation
- Laboratories, Universities and R&D
- Defense/Aerospace/Avionics/Industrial ATE and Integrated Test Systems
- Portable Applications

PEL SELECTOR GUIDE

PEL XXX - YY - ZZZ
XXX - POWER | YY - VOLTAGE | ZZZ - CURRENT

Series	Model #	Power (W)	Voltage (Vdc)	Current (Adc)	V _{MIN} at I _{MAX} (Vdc)	Size (Height, Width)
PEL	PEL60-60-10	60W	60	10	1	4U, 1/4Rack
PEL	PEL150-60-30	150W	60	30	1	4U, 1/4Rack
PEL	PEL150-60-60	150W	60	60	1	4U, 1/4Rack
PEL	PEL300-60-60	300W	60	60	1	4U, 1/2Rack
PEL	PEL300-60-120	300W	60	120	1	4U, 1/2Rack
PEL	PEL300-120-60	300W	120	60	1	4U, 1/2Rack
PEL	PEL600-120-120	600W	120	120	1	4U, 3/4Rack
PEL	PEL600-300-120	600W	300	120	1	4U, 3/4Rack
PEL	PEL600-600-60	600W	600	60	1	4U, 3/4Rack
Custom-tailored Ranges Available		Voltage Range: 10Vdc ~ 600Vdc Rating Current Range: 1Adc ~ 120Adc Rating Power Range: 60W ~ 600W Rating				

FEL SELECTOR GUIDE

FEL XXX - YY - ZZZ
XXX - POWER | YY - VOLTAGE | ZZZ - CURRENT

Series	Model #	Power (W)	Voltage (Vdc)	Current (Adc)	Current (Adc @ 0.4Vdc)	Size (Height, Width)
FEL	FEL60-1	60W	10	50	50	4U, 1/4rack
FEL	FEL60-2	60W	20	50	50	4U, 1/4rack
FEL	FEL150-1	150W	10	100	75	4U, 1/4rack
FEL	FEL150-2	150W	20	100	75	4U, 1/4rack
FEL	FEL300-1	300W	10	200	100	4U, 1/2rack
FEL	FEL300-2	300W	20	200	100	4U, 1/2rack
Custom-tailored Ranges Available		Voltage Range: 10Vdc ~ 20Vdc Rating Current Range: 1Adc ~ 200Adc Rating Power Range: 60W ~ 300W Rating				

PEL Key Features and Benefits:

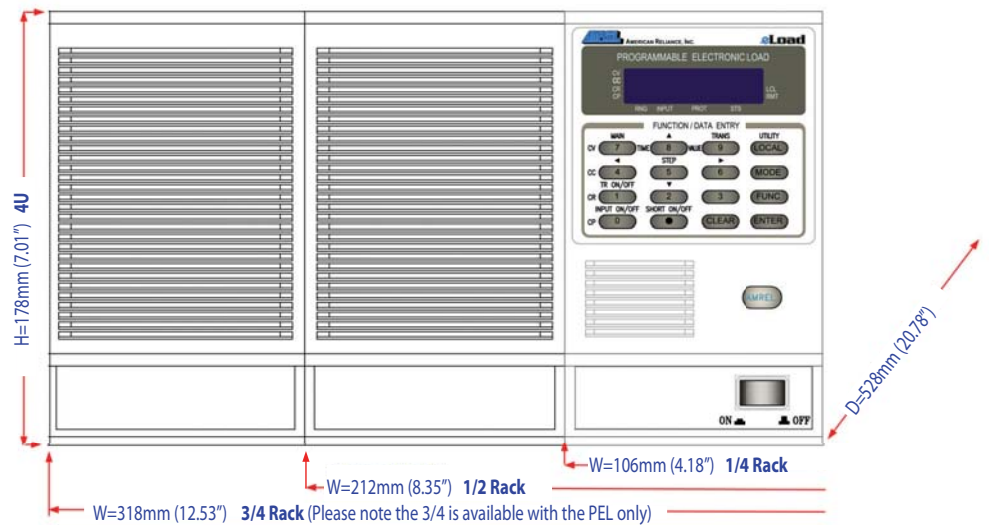
- **Broadest Model Selection:** 60W, 150W, 300W, 600W or Custom-tailored Power Ratings
- **Exclusive Voltage Models:** Standard 60V, 120V, 300V, 600V & Custom-tailored Voltage Ratings
- **Ideal for Unique Test Applications:** Custom-tailored Ratings & Features Available
- **Low-voltage Operation:** Up to 120Adc at 1Vdc and Operable Down to 0.1Vdc

FEL Key Features and Benefits:

- **Broadest Model Selection:** 60W, 150W, 300W or Custom-tailored Power Ratings
- **Exclusive Voltage Models:** Standard 10V, 20V and Custom-tailored Voltage Ratings
- **Ideal for Unique Test Applications:** Custom-tailored Ratings & Features Available
- **Ultra Low-voltage Operation:** Up to 200Adc at 0.8Vdc and Operable Down to 0.1Vdc



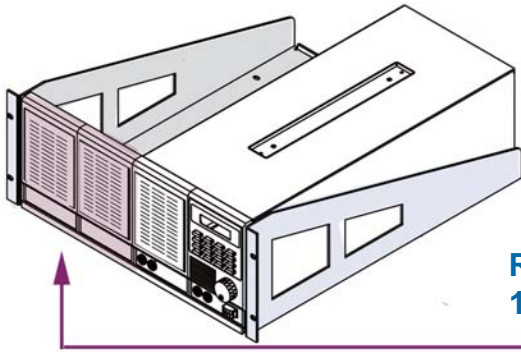
Dimensions



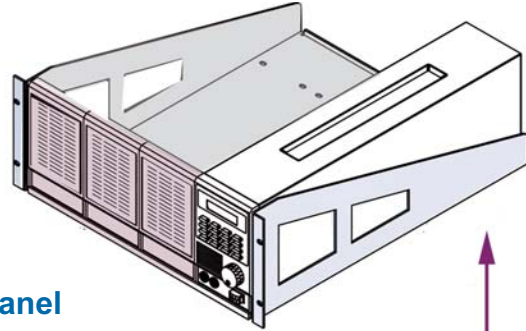
PEL & FEL SPECIFICATIONS

CV MODE SPECIFICATIONS		CC MODE SPECIFICATIONS	
CVL RANGE	0 ~ 100% of Vmax	CCL RANGE	0 ~ 10% of Imax
ACCURACY	0.2% of Value ± 0.1% of Rating	CCM RANGE	0 ~ 100% of Imax
RESOLUTION	1/3600 of Rated Voltage	ACCURACY	0.2% of Value ± 0.1% of Rating
CV TRANSIENT TIME	1ms ~ 270ms for 0Vdc to Vmax	RESOLUTION	1/3600 of Rated Current
CR and CP MODE SPECIFICATIONS		PEL CC TRANSIENT TIME	27ms ~ 0.100ms for 0Adc to Imax
Please reference website datasheet for details		FEL CC TRANSIENT TIME	54ms ~ 0.200ms for 0Adc to Imax
GENERAL SPECIFICATIONS		PROTECTION	
REMOTE INTERFACES	RS-232 & GPIB	OVER POWER PROTECTION (OPP)	110% * Pmax
CC MODE ANALOG PROGRAMMING	0 ~ 10Vdc corresponds to 0 ~ Imax	RESOLUTION	1/4000 of Rated Power
ACCURACY	Mode Accuracy ± 0.1% of Rating	ACCURACY	1% of Setting ± 0.5% of Rating
VMON ACCURACY	0.10% of RDG ± 0.1% of Rating	OVER VOLTAGE PROTECTION (OVP)	110% * Vmax
IMON ACCURACY	0.10% of RDG ± 0.1% of Rating	OVP RESOLUTION	1/4000 of Rated Voltage
AC INPUT	115/230Vac 50/60Hz	OVP ACCURACY	0.20% of Setting ± 0.25% of Rating
OPERATING TEMPERATURE	5°C ~ 40°C	OVER CURRENT PROTECTION (OCP)	110% * Imax
		OCP RESOLUTION	1/4000 of Rated Current
		OCP ACCURACY	0.20% of Setting ± 0.25% of Rating

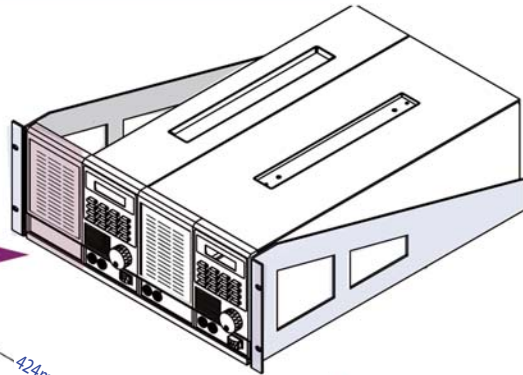
PEL & FEL Series of Rackmount



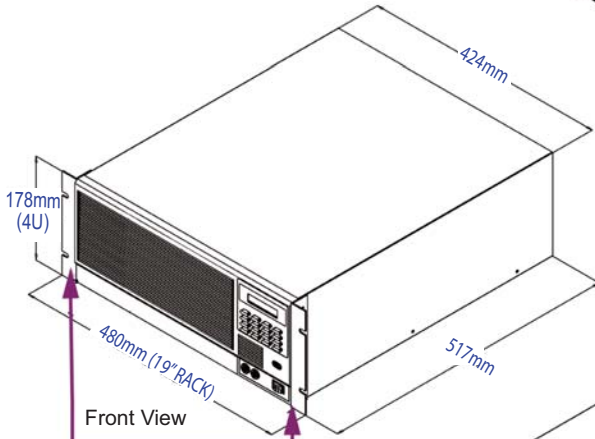
RMP-02A
1/2 Rack Filler Panel



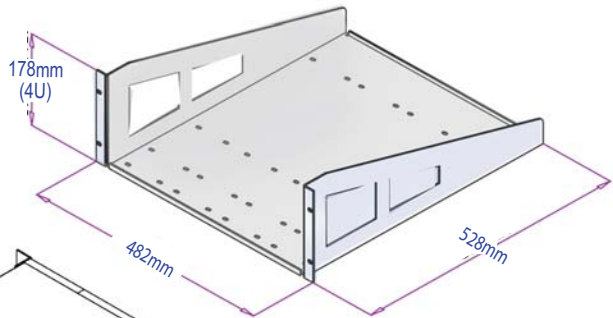
RMP-03A
3/4 Rack Filler Panel



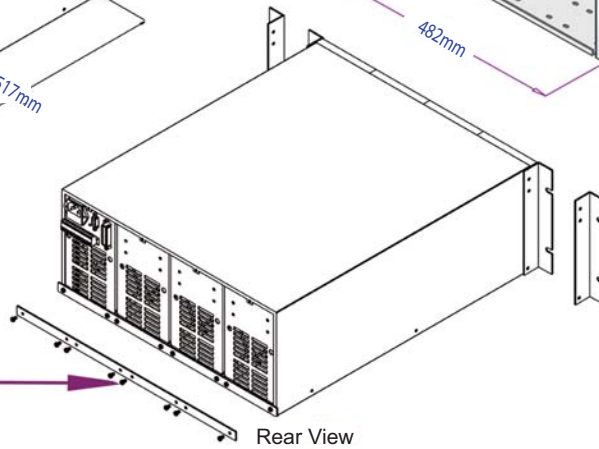
RMP-01A
1/4 Rack Filler Panel



Front View
****RMP-04 Full Rack
Rear Mount**

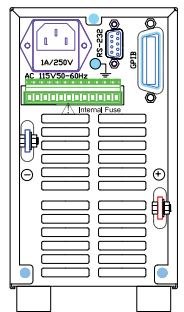
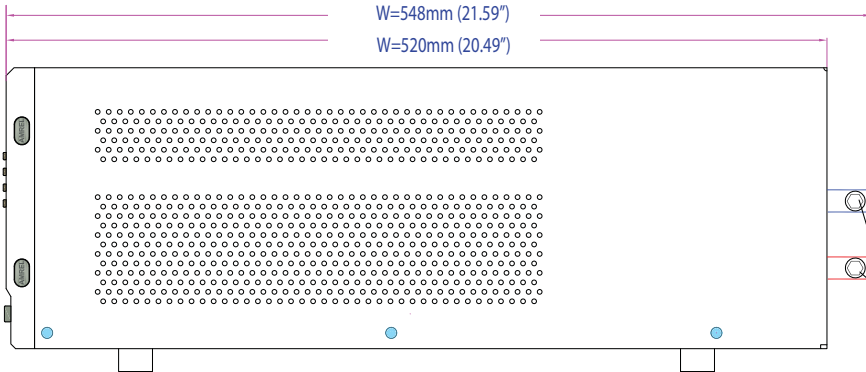
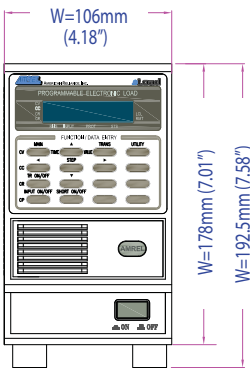


***RM-03 19\"/>**



Rear View

***Please note that when assembled the shelf adds approximately 5mm to the 4U height.**



MCU-1 Master Network Controller

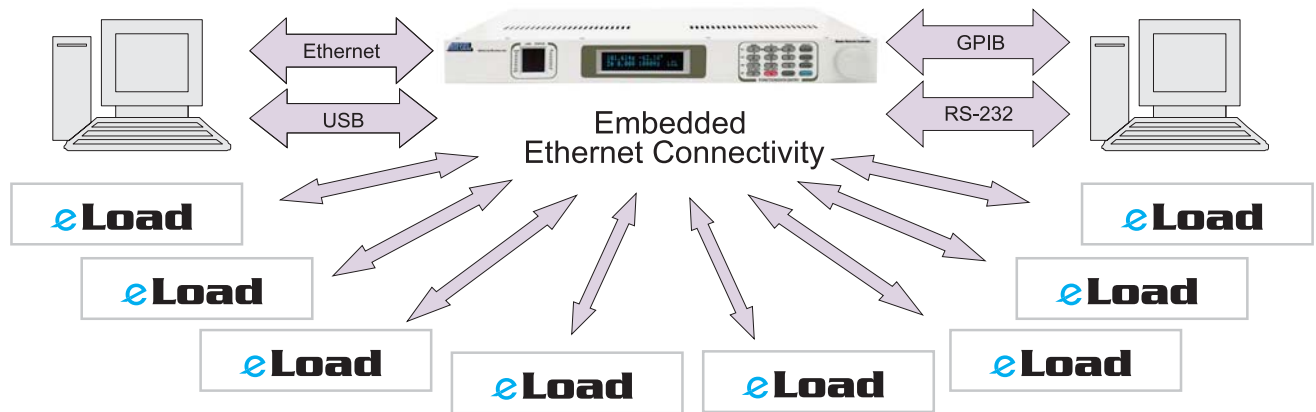
AWG Arbitrary Waveform Generator & Waveform Capture/Edit

Why Choose the MCU Series?

AMREL's MCU-1 Solution provides complete remote access and control of AMREL's eLoad. This is accomplished via the optional embedded Ethernet Interface available with the eLoad. The user can easily connect, initialize, and configure the eLoad to AMREL's MCU-1 Controller as shown in the diagram below.

eTools Software Support Package:

The eTools Software Support Package facilitates the integration of eLoads into an ATE environment. It provides full management control for the devices on either an Ethernet or closed-loop network. eTools also provides portability to test and measurement software platforms such as National Instruments' LabWindows/CVI and LabVIEW, as well as proprietary C/C++ test applications running on Windows.



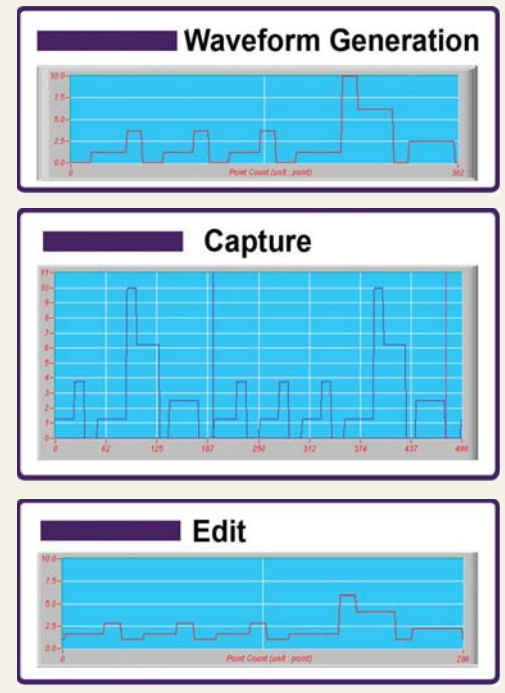
MCU-1 Key Features and Benefits:

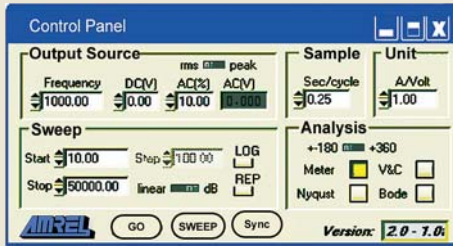
- Integrated Keypad, Digital Encoder and VFD screen
- Compatible with AMREL eLoad and ePower Devices
- Access Up to Eight Ethernet Devices - Expandable to Access Unlimited Devices, via Additional MCU Controllers
- Provides GPIB, USB, RS-232 or Optional Ethernet/USB Interface Connectivity to the Computer via One Single Connection.
- Supports TCP/IP and a Proprietary UDP (User Datagram Protocol) for High Throughput
- Triggering Capability Allows Synchronized Activation of All Connected AMREL Devices
- Faulty Connected Devices are Automatically Isolated from the System and LED Indication Displayed on the Front Panel.

AWG -Arbitrary Waveform Generator & Waveform Capture/ Edit

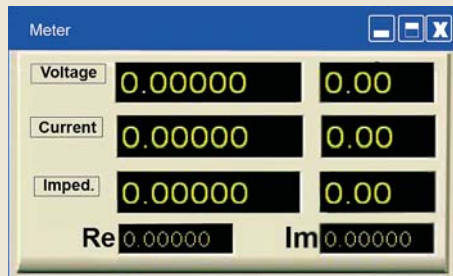
- **Waveform Capture** to Store Dynamic Loading Profiles Required for Fuel Cell Design Validation, Durability, Accelerated Life-Time, Conditioning, Performance Verification and Fuel Cell Power Electronics Test Applications
- **Waveform Generator** Simulates Diverse Loading Profiles, Real Life Applications or Drive Cycles via Stored Loading Profiles or Standard Waveforms
- **Ideal for ATE Environments** With Unique and Diverse Control Loading Algorithms
- **Digitize Voltage and Current Operating Behavior** of the DUT, Store Them as Different Load Profiles and Simulate the DUT Test Criteria Anytime and Hassle-free
- **Select from Over 10 Standard Waveforms** to Meet Unique Application Demands
- **Edit, and Combine Captured Waveform** to Create Automatic Test Sequences or Extremely Long Patterns to Simulate DUT Operating Characteristics
- **Self Authoring Software** to Precisely Generate and Edit Waveform Profile Sequences to Meet Dynamic Test Application Requirements
- **External and Internal Triggering**, Adjustable Sampling Size and Window for Full Control of Digitizing Analog Data

Arbitrary Waveform Generation/ Capture/Edit Demo

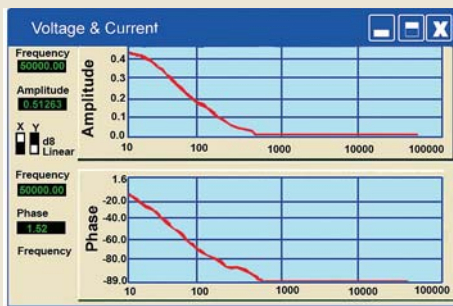




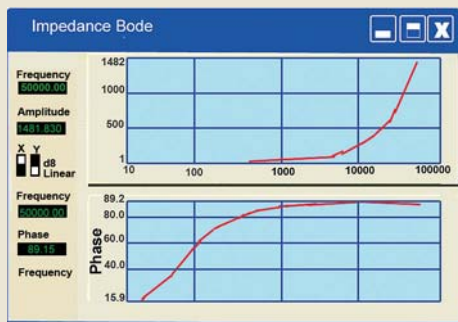
CONTROL PANEL



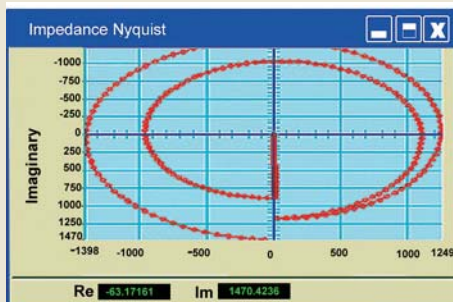
REAL TIME MONITORING



V/I GRAPH



BODE PLOTS

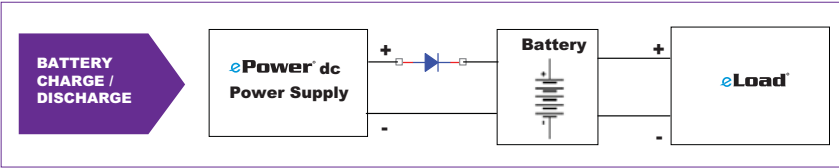
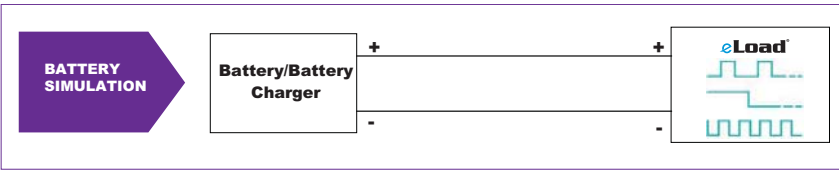


NYQUIST PLOTS

TECHNICAL FEATURES:

- **Digital Sine Correlation** to Remove Harmonics for Accurate Measurements
- **Programmable Integration (Sampling) Time** will Allow Measurement of Micro-ohm Signals Buried Under Noise Without the Need for Auxiliary Equipment
- **Simultaneous V/I Measurement** to Ensure Exact Impedance and Phase Information
- **DDS Sine-wave Generation**, Yielding Frequency Errors Less than 0.02Hz
- **Floating Dual Independent Signal Analyzers** Provide Single-channel Impedance Measurements or Both Channels to Measure Transfer Functions, Transconductance, Impedance, Signal Analysis (FRA) Data and Other Important Parameters in Polar/Rectangular Format
- **User-friendly Features Include:** Auto-gain, Quick-set ac Amplitude, Signal Overload (Signal Saturation) Protection, and Adjustable Sample Interval Without the Complicated Calculations - the Above Features Allow the User to Start Measuring Impedance Without Hassles.
- **Auto-Gain Control and Flexible Ranges** for Measuring Small Signals in Noisy Environments with $1\mu\text{V}$ Sensitivity while Maximizing Resolution and Precision to Obtain an Accurate Measurement
- **Universal ac + dc Output Signals** Critical for Impedance Measurement/AC Modulation Applications in the Battery/Fuel Cell/Electronic Components and Devices R&D, Testing and Production Sectors
- **GPIO/RS-232 and Optional USB/Ethernet** Provide State-of-the-art Connectivity while Satisfying Diverse Throughput/Network Security Requirements
- **System-level Multi-channel Impedance Measurement** can be Achieved Using the Integrated MCU-1 Capability and a Switch Matrix
- **Impedance Measurement Application Program** Included to Save Costs Associated with Existing Expensive Impedance Measurement Software
- **Comprehensive Application Program** with Premium Features - Nyquist, Bode, V/I, Real-time Display of Impedance Measurements and Operating Conditions, Frequency Sweeps with Adjustable Amplitude in Log/Linear Form and Auto-save for Logged Data to Establish AMREL's FRA as the Ultimate Diagnostic Tool
- **0.1Hz Models** Available

BATTERY TESTING/ENERGY STORAGE APPLICATIONS



CAPABILITIES

- **Determine Battery Characterization Parameters**
 - Internal Resistance/Impedance
 - Charge/Discharge Rates
 - Discharge Curves
 - Depth of Discharge (DOD)
 - Temperature Effects
 - Charge Efficiency
 - Cycle Life
 - Capacity Retention & Characteristics
- **Constant Charge/Discharge Loading**
- **Pulsed Mode Testing**
- **Complex Dynamic Load Profile Simulation**
- **Cycle Testing - Charge/Discharge Profiles**
- **Qualification & Lifetime Testing**
- **Constant Current/Constant Power Testing**
- **Battery Charger Validation**
- **High-voltage Battery Characterization**
- **High-current Battery Characterization**
- **High-current Discharge Tests**

RELATED PRODUCTS-BATTERY/ENERGY/POWER SUPPLY/ELECTRONICS

- **High-power, Rackmount & System Solutions**
 - PLA (page 6-7)
 - PLW (page 8-9)
 - System Solutions (page 28-33)
- **Bench-top & Multi-channel Solutions**
 - BPL (page 10-11)
 - LPL (page 4-5)
 - FEL (page 16-17)
 - PEL (page 16-17)
- **Resistance & Impedance Measurement**
 - FRA - Frequency Response Analyzer Battery/Energy Storage (page 20-21)
- **dc Power Supply/Battery Charger Solutions**
 - Dual-channel SPD
 - Low-power SPS
 - Medium-power SPS
 - HPS

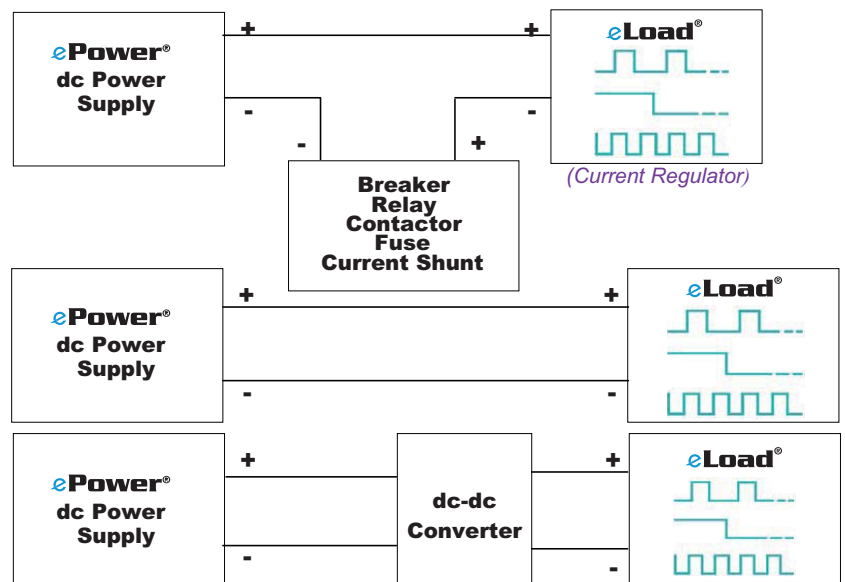
PERFORMANCE MONITOR PARAMETERS

- **State of Charge (SOC)**
- **State of Health (SOH)**
- **Open Circuit Voltage (OCV)**
- **Internal Resistance/Impedance**
- **Voltage/Current/Power**

POWER SUPPLY & ELECTRONIC COMPONENTS

CAPABILITIES

- **Validate dc Power Supply & dc-dc Converter Design and Performance Specifications**
 - Load Transient Recovery & Dynamic Load Regulation
 - Programming Response Time
 - Loop Response
 - Overshoot and Undershoot Characteristics
 - Static Load Regulation
 - Efficiency
 - Start up Time
 - Source Effect (line regulation)
 - PARD
 - Power Factor
 - Drift
 - Voltage Latch-up
 - Over-voltage Protection Validation
 - Short Circuit Current Protection Validation
 - Over-current Protection Validation
- **Dynamic Operating Modes**
 - Auto-sequence Voltage, Current, Resistance & Power Profile
 - Pulse Mode and Continuous Pulse Shaping
 - Program Frequency, Duty Cycle & Rise/Fall Times
- **Exclusive High-voltage, Current and Power Ratings**

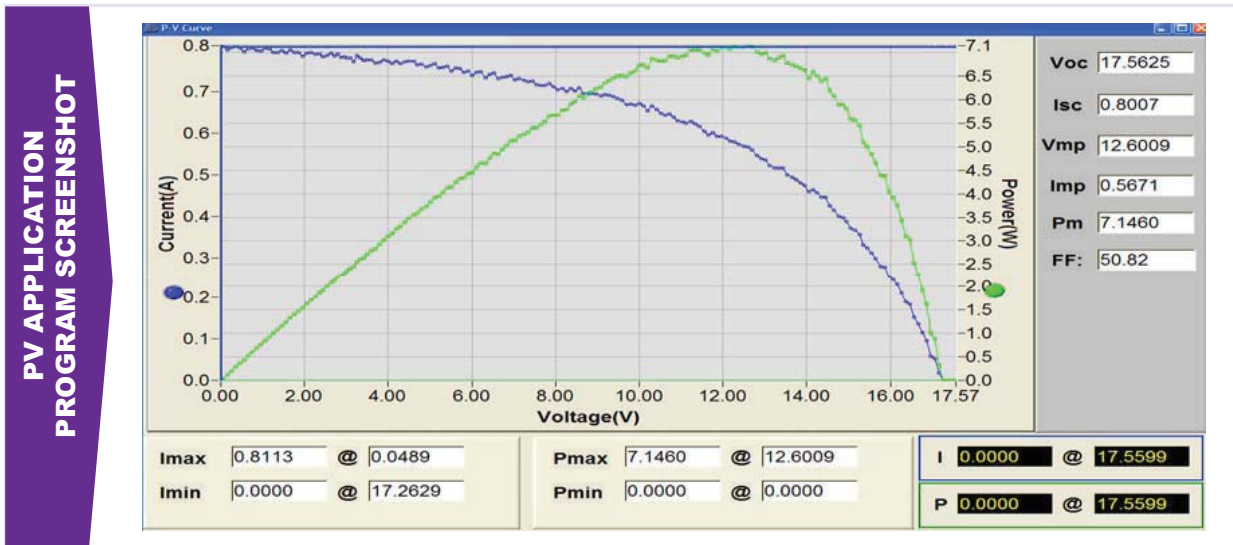
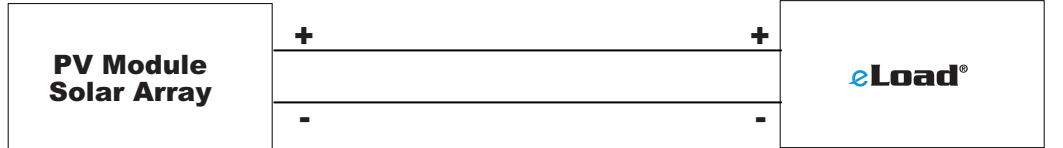
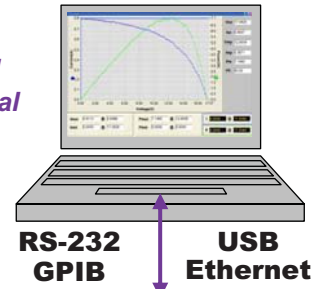


PV Applications

APPLICATIONS



PC Program provides the graphical display of the I-V Curve and numerical data for VMP, IMP, FF, ISC and VOC



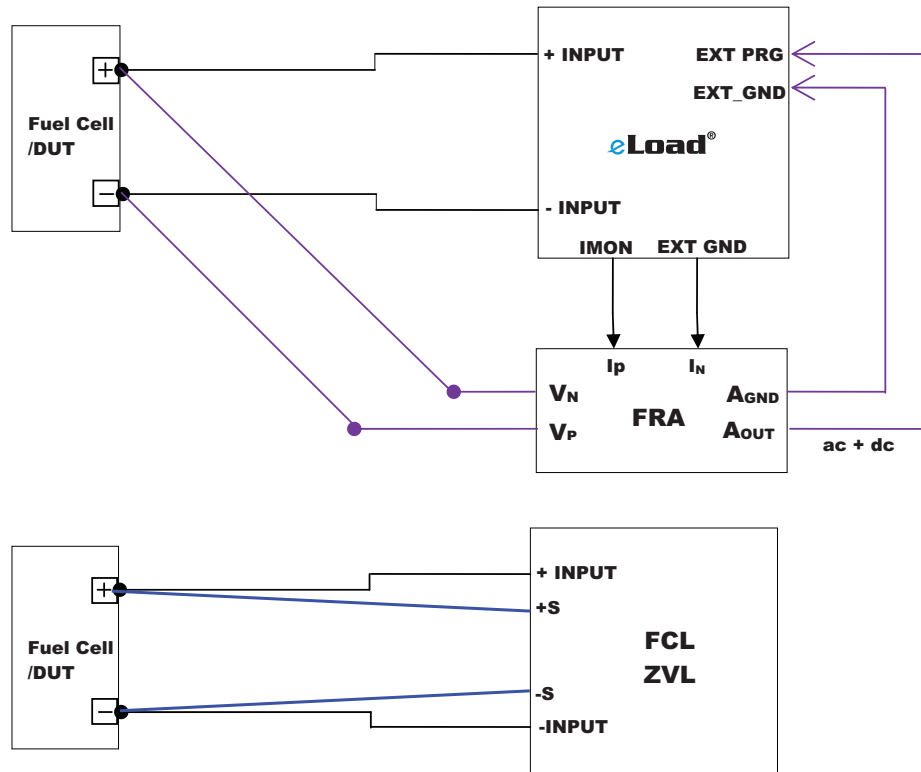
CAPABILITIES

- **Determine PV Performance Parameters**
 - Open Circuit Voltage (Voc)
 - Short Circuit Current (Isc)
 - Voltage at Max Power (Vmp)
 - Current at Max Power (Imp)
 - Power at Max Power (Pmp)
 - Fill Factor
- **Generate I-V Curves**
 - Determine Pmp and Power Curve
 - Auto-loading at Pmp Point
 - Save and Organize Captured Data
- **Validate PV Cell/Module down to 0Vdc**
- **Validate Thin-film, Single and Poly- silicone PV Design & Materials**
- **Validate Solar Concentrator PV Design**

RELATED PRODUCTS

- **High-power, Rackmount & System Solutions**
 - PLA (page 6-7)
 - PLW (page 8-9)
 - System Solutions (page 28-33)
- **Bench-top & Multi-channel Solutions**
 - BPL (page 10-11)
 - LPL (page 4-5)
 - FEL (page 16-17)
 - PEL (page 16-17)
- **Zero Volt Load Solutions**
 - ZVL (page 14-15)
- **MPPT Inverter Test Solutions**
 - Dual-channel SPD
 - Low-power SPS
 - Medium-power SPS
 - HPS

FUEL CELL TESTING AND EIS/IMPEDANCE MEASUREMENT APPLICATIONS



CAPABILITIES

- **Determine Fuel Cell Operating Parameters**
 - Internal Resistance/Impedance
 - Fuel/Oxidant Utilization
 - Gas Concentration
 - Temperature Effects
 - Pressure Effects
 - Validate Balance of System/Plant
- **Impedance Measurement**
 - EIS/AC Modulation
 - Current Interruption
- **Polarization Curves**
- **Single Cell Characterization down to 0Vdc**
- **Short Stack & Full Stack Test**
- **Durability Test**
- **Voltage/Current Cycling**
- **Accelerated Lifetime Test**
- **dc-dc Converter Validation**
- **Electrical Test and Characterization**

RELATED PRODUCTS

- **High-power, Rackmount & System Solutions**
 - PLA (page 6-7)
 - PLW (page 8-9)
 - System Solutions (page 28-33)
- **Bench-top & Multi-channel Solutions**
 - BPL (page 10-11)
 - LPL (page 4-5)
 - FEL (page 16-17)
 - PEL (page 16-17)
- **Zero Volt Load Solutions**
 - ZVL (page 14-15)
 - FCL (page 12-13)
- **EIS/Impedance Measurement**
 - FRA - Frequency Response Analyzer (page 20-21)
 - FCL - Fuel Cell Load Solution (page 12-13)
- **dc Power Supply Solutions**
 - Dual-channel SPD
 - Low-power SPS
 - Medium-power SPS
 - HPS

MILITARY/DEFENSE AND AEROSPACE/AVIONICS ATE APPLICATIONS

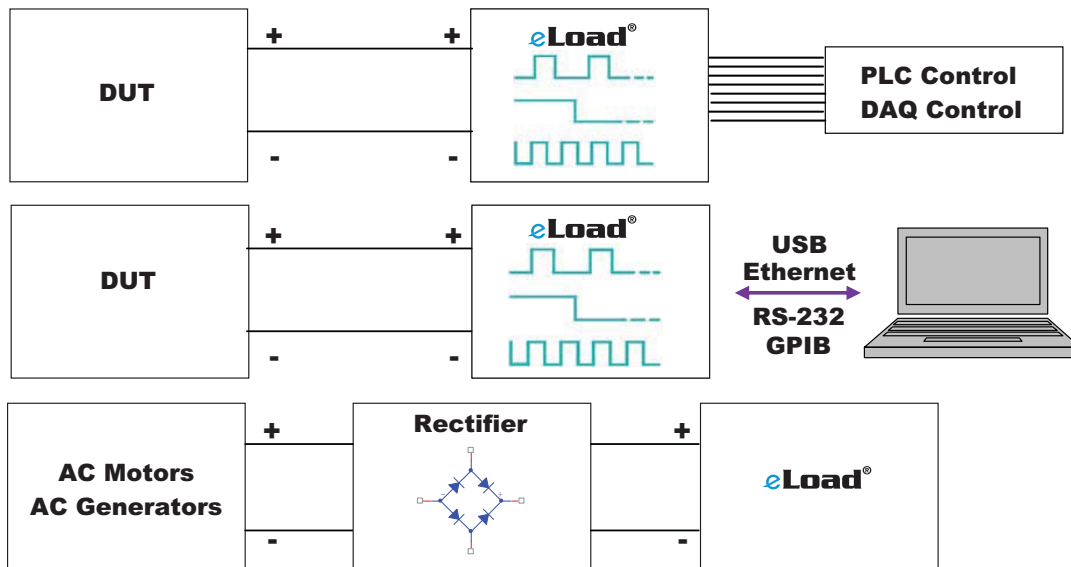


CAPABILITIES

- **Customization**
 - Build-to-Print (design, prototyping, testing, manufacturing & tech support)
 - Pre-sales Consultation & Post-sales Service/Tech Support
 - Hardware Design and Modification
 - Mechanical Design and Modification
 - Design and PCB Layout
 - Custom Software and Firmware Modifications
 - Full Testing Capabilities
 - Custom-tailor Existing Product Ratings and Specs to Meet Unique Application Demands
- **Exclusive System Capabilities and Options**
 - dc Contactor and Emergency Shutdown Panel
 - System Integration of ac and dc Connectors, Power Distribution, and System Wiring
 - AMREL's Exclusive "Anti-condensation" Water Manifold Distribution System
 - Customized System Hardware, Software, Firmware and Mechanical Design
 - NEMA Enclosures Available
 - Full System-level Testing Capabilities
- **Exclusive High-voltage, High-current and High-power Ratings Available**

RELATED PRODUCTS

- **High-power, Rackmount & System Solutions**
 - PLA (page 6-7)
 - PLW (page 8-9)
 - System Solutions (page 28-33)
- **Bench-top & Multi-channel Solutions**
 - BPL (page 10-11)
 - LPL (page 4-5)
 - FEL (page 16-17)
 - PEL (page 16-17)
- **Fuel Cell/Battery Impedance Measurement**
 - FRA - Frequency Response Analyzer (page 20-21)
 - FCL - Fuel Cell Load Solution (page 12-13)
- **dc Power Supply Solutions**
 - Linear Power Supply
 - Dual-channel SPD
 - Low-power SPS
 - Medium-power SPS



CAPABILITIES

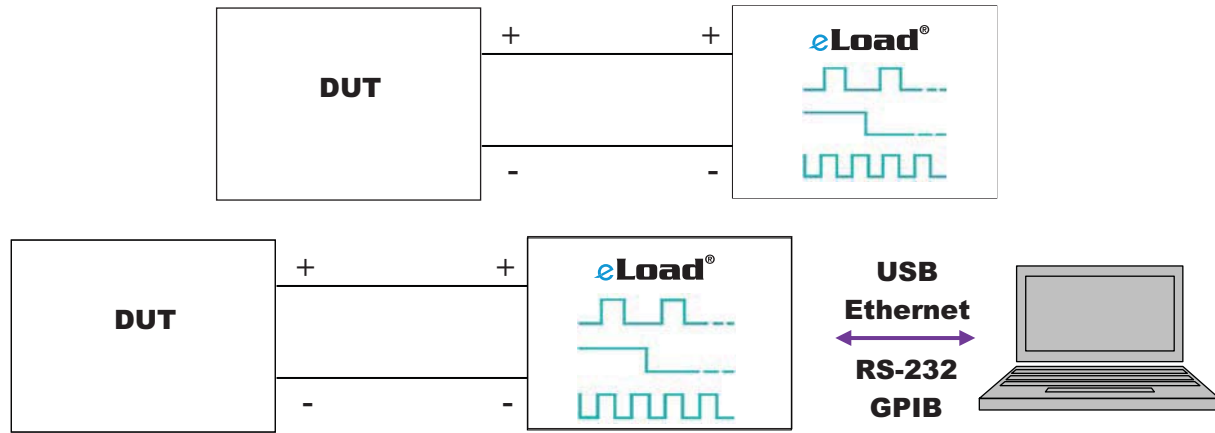
- **Industrial Applications:** AMREL offers the unique capability to tailor dc electronic loads for many diverse industries, including telecommunications, data center, transportation, oil/gas, utility, automotive power electronics and components production sectors. AMREL provides a solution for the specific needs of a wide range of applications, such as generator/alternator testing, UPS/battery back-up discharge tests, and quality testing. In addition, AMREL provides personalized service and post-sales support to ensure that you are running 24/7. Contact AMREL today to discuss your application needs.
- **Customization & Exclusive Options**
 - Isolated Analog Programming, Voltage/Current Monitor
 - TTL CV/CC Mode Selection
 - TTL On/Off Control & Remote Inhibit for Interlock Protection
 - Solid State Reverse Polarity/Isolation Relays
 - Build-to-print Solutions - from Requirements to Product
 - Custom-tailor Existing Products to Meet Unique Demands
 - Pre-sales Consultation & Post-sales Service/Tech Support
 - Special Custom Feature Development & Hardware Design
 - LabVIEW, LabWindows & SCPI Command Set
 - Custom Software/Firmware Modifications Available
- **Widest Line of dc Test Solutions**
 - High Current/Voltage Rated Switch-mode Supplies (1.2kW to 900kW+)
 - Customized Multi-channel Linear Supplies (10W to 2kW)
 - Low-profile (1.75" Rackmount) dc Electronic eLoad
 - Ultra-compact Air-Cooled eLoad (800W to 100kW+)
 - Smallest Footprint Water-cooled eLoad (6kW to 200kW+)
- **Exclusive High-voltage, Current and Power Ratings**
- **Ask about how to Custom-tailor a Cost-effective Solution Today**

RELATED PRODUCTS

- **High-power, Rackmount & System Solutions**
 - PLA (page 6-7)
 - PLW (page 8-9)
 - System Solutions (page 28-33)
- **Bench-top & Multi-channel Solutions**
 - BPL (page 10-11)
 - LPL (page 4-5)
 - FEL (page 16-17)
 - PEL (page 16-17)
- **dc Power Supply Solutions**
 - Linear Power Supply
 - Dual-channel SPD
 - Low-power SPS
 - Medium-power SPS
 - HPS
- **Customized Solutions**
 - Customization Page (page 29-33)

University and Research Laboratory Test Solutions

APPLICATIONS



CAPABILITIES

- **Exclusive Options and Services**
 - Ultra-low Current Range Option for Optimized Precision
 - 3rd Party NIST Calibration Service
 - Solid State Reverse Polarity/Isolation Relays
 - Isolated Analog Programming, Voltage/Current Monitor
 - Pre-sales Consultation & Post-sales Service/Tech Support
 - Custom-tailor an Existing Product to Meet Unique Requirements
- **Exclusive Features and Functionality**
 - Auto-sequencing Voltage, Current, Resistance & Power Profile
 - Pulse Mode and Continuous Pulse Shaping
 - Program Frequency, Duty Cycle & Rise/Fall Times
 - LabVIEW, LabWindows & SCPI Command Set
 - Simple Closed-case Calibration for Internal Metrology Lab
- **Widest Line of dc Test Solutions**
- **Ultra-portable Bench-top Solutions**
 - Customized Precision Multi-channel Linear Supplies (10W to 2kW)
 - Widest Selection of 1.2kW to 3kW Switch-mode Supplies to fit your budget
 - LPL - Low-profile (1.75" Rackmount) dc Electronic **eLoad**
 - BPL - Smallest Footprint Bench-top **eLoad** (400W & 800W)
 - FEL/PEL - Cost-effective Bench-top **eLoad** (60W to 600W)
- **High-power Solutions**
 - High-current/Voltage Rated Switching Supplies (6kW to 900kW+)
 - Ultra-compact Air-cooled **eLoad** (800W to 100kW+)
 - Smallest Footprint Water-cooled **eLoad** (6kW to 200kW+)
 - System Solutions Available
- **Exclusive High-voltage, Current and Power Ratings**
- **Custom-tailored and Customized Solutions Available**

RELATED PRODUCTS

- **High-power, Rackmount & System Solutions**
 - PLA (page 6-7)
 - PLW (page 8-9)
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 - Dual-channel SPD
 - Low-power SPS
 - Medium-power SPS
 - HPS
- **Fuel Cell/Battery Impedance Measurement**
 - Frequency Response Analyzer (page 20-21)
 - Fuel Cell Load Solution (page 12-13)

Programmable dc eLoad Systems and Customized Solutions



Customization Leaders

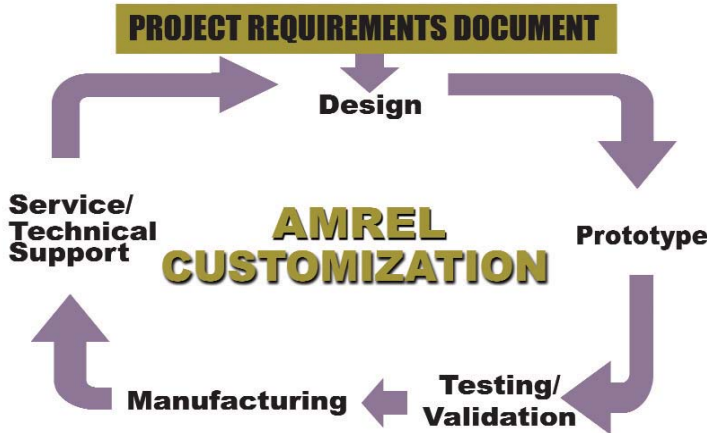
AMREL's team of engineers leads the industry in customized programmable electronic load solutions. From concept to integration, AMREL will perform minor modifications or a complete built-to-print system.

Total Solutions

AMREL will review your specifications and provide a complete technical concept with outline and installation drawings. Whether it is an air-cooled load or water-cooled load, you can be assured AMREL's team will provide the most efficient and cost effective solution available.

GENERAL SYSTEMS CAPABILITIES

- 15U, 30U, 41U Single and Dual-bay Cabinets (Heavy-duty Casters)
- dc Contactor Disconnect Box & AC Emergency Shutdown Switch
- Custom Wiring, dc Power Distribution & Connector(s) Integration
- Select Cooling Method and Custom-tailor Voltage, Current, and Power Ratings



Cooling Method	Voltage Rating	Current Rating	Power Rating
Air-cooled eLoad	0 ~ 1200Vdc	0 ~ 3000Adc+	0 ~ 250kW+
Water-cooled eLoad	0 ~ 1200Vdc	0 ~ 5000Adc+	0 ~ 250kW+

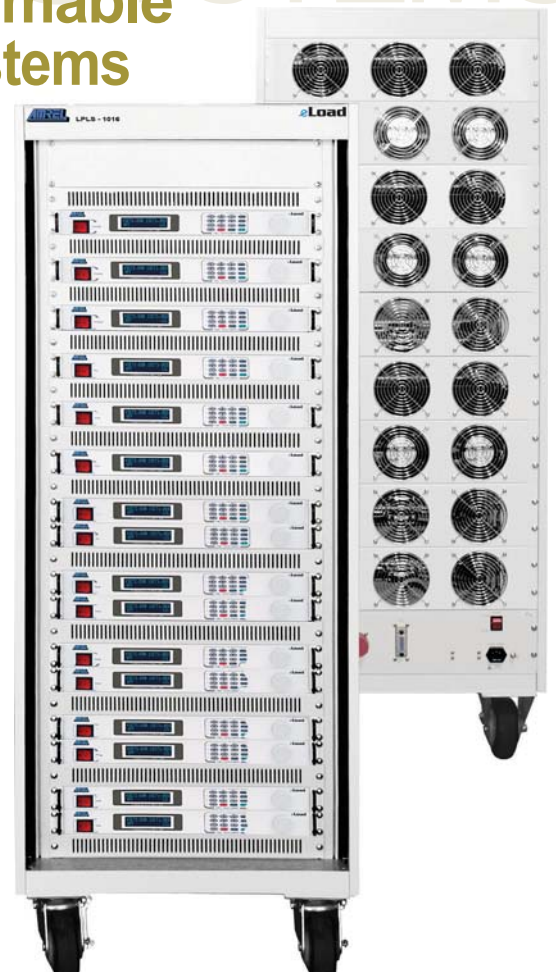
Multi-channel Solutions Available with the LPL Series

MULTI-CHANNEL Programmable Air-cooled Electronic eLoad Systems

CUSTOMIZED REQUIREMENTS

LPLS-1016

- 16 Channel Fully-integrated dc Programmable Load System, System Integration, dc Wiring and Military-grade Output
- Connectors and ac Distribution Wiring
- Optimized Airflow Design with Front Panel Air Intake Vents and Exhaust Heavy-Duty Fans
- Customized Connector Panel with dc Quick Connectors, ac Input and GPIB Connector
- 30U (52.5" Height) Cabinet with Heavy Duty Casters for Reliable Mobility



CUSTOMIZED REQUIREMENTS

PLAS-3001

- Isolated Analog Programming
- System Integration of 16 Loads
- Custom dc and Signal Wiring
- ac Emergency Shut-off Panel
- ac Power Distribution & Wiring
- Dual-bay 41U Rack on Casters
- Front BNC Signal Wiring Panel
- Full System Integration, Calibration and Testing
- Custom dc Connector, dc Distribution and Signal Wiring



Fully Customized Programmable Air-cooled Electronic eLoad Systems

CUSTOMIZED REQUIREMENTS

PLAS10K-60-800

- Built-in Current Shunt
- Built-in dc Contactor
- Custom-designed Contactor Box with Integrated Auxiliary Hardware
- dc Power Distribution & Wiring
- Custom "Blue" Cabinet & Door Filter
- Fully-integrated Air-cooled 10kW
- Front & Rear Panel dc Quick Connect Terminals
- 41U Cabinet with Casters
- Built-to-print System Design



FRONT VIEW



REAR VIEW

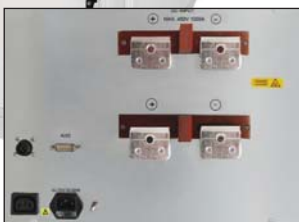


CUSTOMIZED REQUIREMENTS

LDL

- Fully-integrated Laser Diode V-I Curve Simulator System
- Full Design, Prototyping, Engineering, Testing and Manufacturing Services, including Built-to-Print

High-power PLW120k & PLW130k Programmable Water-cooled Electronic eLoad Systems

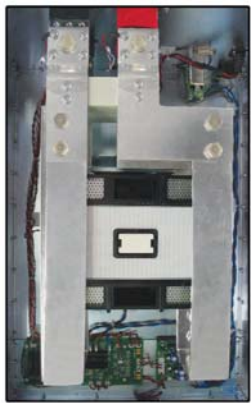


Rear Panel

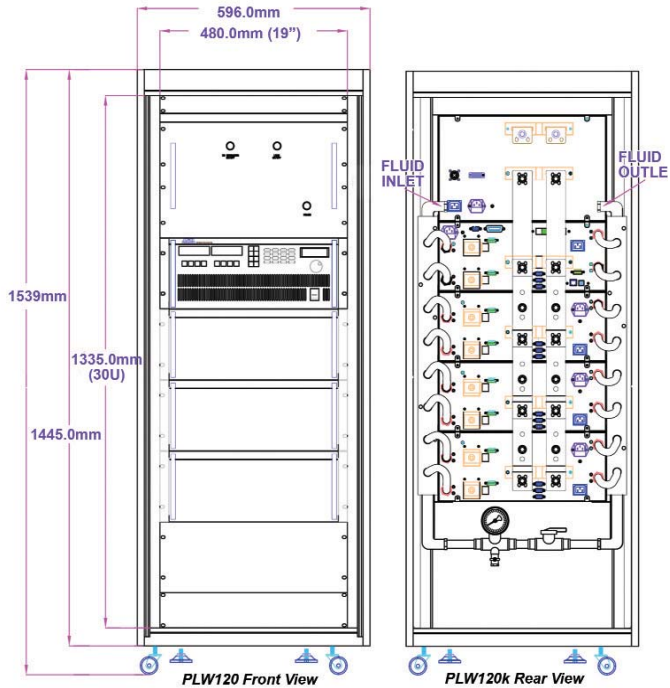
CAPABILITIES

PLW120k-450-1000

- Custom-tailored 120kW/450V/1000A
- System Fault Interlock Shutdown
- Water Manifold Distribution System
- Fully-automated and Seamless Control of dc Contactor Disconnect Box and eLoad System

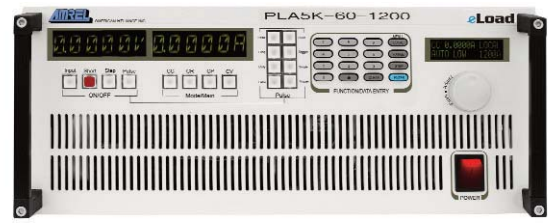


Integrated dc Contactor Disconnect Box (5, 12, or 24Vdc Controlled and LED Indicators)

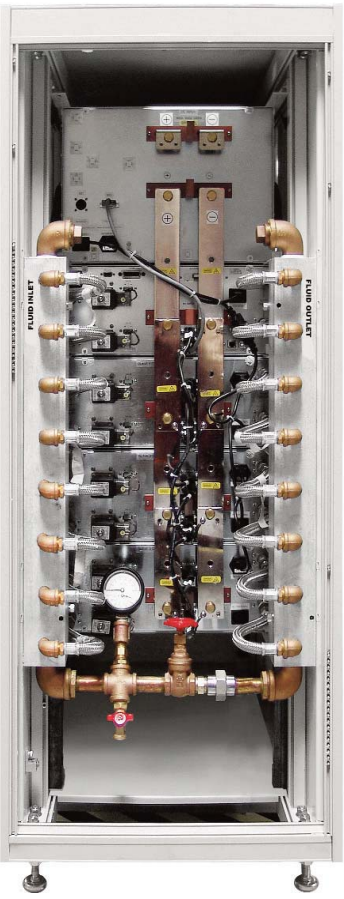


PLW120 Front View

PLW120k Rear View



PLA120 and PLA130

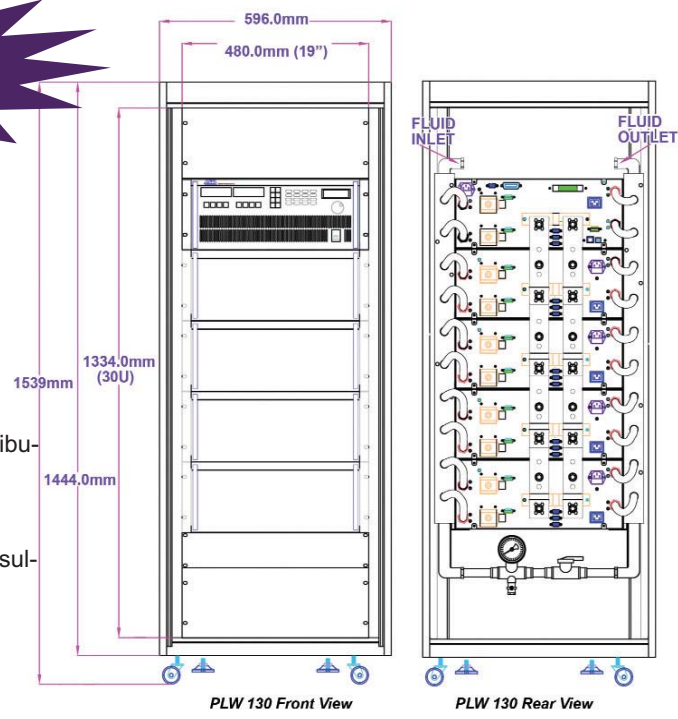


Industry's First High-power 130kW Load

CAPABILITIES

PLW130k-650-400

- Custom-tailored 130kW/650Vdc/1400Adc
- In-rush Soft-start Circuit
- Integrated Water Manifold Distribution System
- dc Distribution Bus
- 30U Rack with Casters
- Engineered with Pre-sales Consultation
- 650Vdc High-voltage Rating



PLW 130 Front View

PLW 130 Rear View

H High-voltage Programmable Air- and Water-cooled Electronic eLoad Solutions



HIGH-VOLTAGE SYSTEMS CAPABILITIES

- Custom-tailored Voltage, Current and Power Ratings
- Customizable System Hardware and Mechanical Design
- Integration of dc Contactors, ac & dc Connectors and Current Shunts, System Wiring, & Power Distribution
- Full System Calibration, Testing and Validation
- Build-to-print High-voltage Solutions
- Air-cooled or Water-cooled Solutions
- Bench-top & rack-mount High-voltage Rated eLoad Solutions Available

High-voltage Models

Series	Model #	Power (W)	Voltage (Vdc)	Current (A dc)	Size (Height, Depth)
PLA	PLA800-800-15	800W	800	15	2U, 21" D
PLA	PLA1.5K-800-30	1.5kW	800	30	2U, 21" D
PLA	PLA3K-800-50	3kW	800	50	3U, 25.5" D
PLA	PLA5K-800-100	5kW	800	100	4U, 25.5" D
PLA	PLA7.5K-800-150	7.5kW	800	150	6U, 25.5" D
PLA	PLA1.5K-1000-12	1.5kW	1000	12	2U, 21" D
PLA	PLA3K-1000-30	3kW	1000	30	3U, 25.5" D
PLA	PLA5K-1000-50	5kW	1000	50	4U, 25.5" D
PLA	PLA7.5K-1000-75	7.5kW	1000	75	6U, 25.5" D

Series	Model #	Power (W)	Voltage (Vdc)	Current (A dc)	Size (Height, Depth)
PLW	PLW6K-800-25	6kW	800	25	2U, 27.5" D
PLW	PLW12K-800-50	12kW	800	50	2U, 27.5" D
PLW	PLW18K-800-75	18kW	800	75	2U, 27.5" D
PLW	PLW24K-800-100	24kW	800	100	4U, 27.5" D
PLW	PLW36K-800-150	36kW	800	150	4U, 27.5" D
PLW	PLW6K-1000-25	6kW	1000	25	2U, 27.5" D
PLW	PLW12K-1000-50	12kW	1000	50	2U, 27.5" D
PLW	PLW18K-1000-75	18kW	1000	75	2U, 27.5" D
PLW	PLW24K-800-100	24kW	1000	100	4U, 27.5" D
PLW	PLW36K-1000-150	36kW	1000	150	4U, 27.5" D

Series	Model #	Power (W)	Voltage (Vdc)	Current (A dc)	Size (Height, Depth)
LPL	LPL150-800-3	150W	800	3	1U, 21" D
LPL	LPL300-800-6	300W	800	6	1U, 21" D
LPL	LPL600-800-15	600W	800	15	1U, 21" D
LPL	LPL800-800-15	800W	800	15	1U, 21" D
LPL	LPL300-1000-3	300W	1000	3	1U, 21" D
LPL	LPL600-1000-6	600W	1000	6	1U, 21" D
LPL	LPL800-1000-6	800W	1000	6	1U, 21" D
BPL	BPL400-800-15	400W	800	6	3U (½ Rack), 15.65" D
BPL	BPL800-800-15	800W	800	15	3U (½ Rack), 15.65" D
BPL	BPL400-1000-3	400W	1000	3	3U (½ Rack), 15.65" D
BPL	BPL800-1000-6	800W	1000	6	3U (½ Rack), 15.65" D

*1200Vdc eLoad Models and Solutions Available. Contact AMREL today.

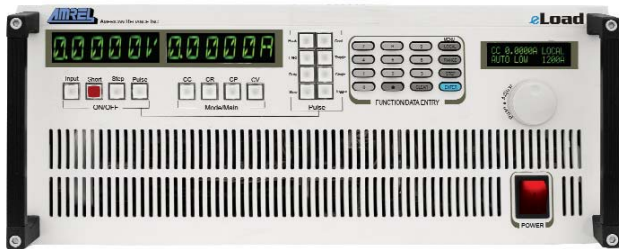
* Other power ratings available

High-voltage Programmable Water- and Air-cooled Electronic Load Systems

CAPABILITIES

PLW75kW-800-300

- System Power is Expandable
- "Anti-condensation" Water Manifold System
- Pressure Regulator, Pressure Bypass and Water manifold
- Exclusive Custom-tailored 800Vdc 75kW Water-cooled eLoad
- Other High-voltage Load Bank Solutions Available



Water-cooled

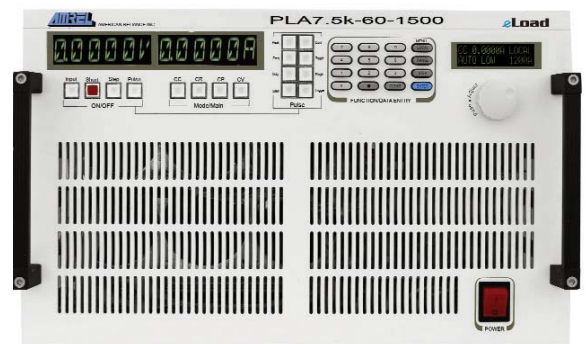
CAPABILITIES

PLA 20kW-800-200

- Exclusive 800Vdc Air-cooled eLoad with the Industry's Smallest Footprint
- Other Custom-tailored Voltage, Current and Power Ratings Available
- Customized Hardware and System Component Integration Available
- Full System Integration, Calibration, Testing and Validation



Air-cooled



ePower[®] Programmable dc Switch Mode & Linear Power Supplies

AMREL's ePower[®] line includes three series and over 200 models of programmable switch mode & linear power supplies:

SPS Series of Mid-power Rackmount Switch Mode Power Supplies

- Wide Ranges 1.2kW to 45kW, Up to 1000Vdc and 2700A dc
- Low-profile, High-power Density 1U (1.2kW and 1.5kW)
- GPIB/SCPI, RS-232, RS-485, USB & Ethernet Interfaces Available
- Built-in Output Isolation & Polarity Reversal Relays Available
- Master Slave Capability Up to 31 Channels
- Available with Full Function Keypad Control, LED Indicators, and/or Encoder Knob Controls, Auto Sequencing and Triggering
- External Analog Programming
- Dual-channel (SPD) Models Available (360W/Channel Mix and Match)
- Closed-case Calibration
- Isolated Analog Programming/Vmon/Imon Available



HPS Series of High-power Cabinet Mounted Switch Mode Power Supplies

- Wide Ranges 20kW to 900kW+, up to 2500Vdc and 7500A dc
- Digital Closed-case Calibration
- Co-existent GPIB/SCPI & RS-232 Interfaces Standard
- Ethernet and USB Interfaces Available (Field Upgradeable)
- External Analog Programming
- Provides High Efficiency & High Power Factor (~0.9) Operation
- Available in Standard 22" to 48" Wide Cabinet Mount Enclosures
- NEMA Weatherized Enclosure Available



PD Series of Low Noise Linear Power Supplies

- Output Ranges 20W to 2000W, 5 to 350Vdc and 0.1 to 50Amps
- Single & Dual Outputs
- CV/CC Crossover
- Co-existent GPIB/SCPI & RS-232 Interfaces Standard
- Ethernet Interface Available
- Low Ripple and Noise (PARD) Output
- Multi-channel Systems, Up to 8 Channels Per Chassis (PDS) Available
- Bench-top Models (BPD) Available W 8.5"x H 7"(4U)x D 15.6"
- Closed-case Calibration
- Customer Defined Rackmount Configuration Available



PDS Series of Customizable "Multi-channel" Linear Power Supplies

- Up to 8 Channels per System: Customize Single, Dual, 4-Channel or 8-Channel PDS Solution According to Your Application Needs
- Choose from Over 200+ Configurations: Custom-tailored Voltage, Current and Power Ratings for Each Channel or Mix and Match
- Master/Slave Multiple 8-Channel Systems: Expandable System via RS-485 Connection & Master/Slave Configuration Saves System Costs

MFP Series of Modified COTS "Military-grade" Fixed-output Power Supplies

- Available Models: 300W and 1.2kW @ 28Vdc
- Sealed & Condensation-proof: Encapsulated Epoxy Coating Ensures Reliability and Long-term Operation
- Wide Operating Temperature: Continuous Operation from -40°C ~ 70°C
- Universal ac Input: 95% PFC; 45Hz - 440Hz @ 95-250Vac
- Convection Cooled: Silent Operation with No Fans to Replace



AMREL Provides Tailored Solutions to Meet Your Specific Requirements
Customization and Modification Available.

Please Note: Specifications subject to change without notification.

AMERICAN RELIANCE, INC.

3445 Fletcher Ave., El Monte, CA 91731

Tel: 800 654-9838 U.S. Only or 626 443-6818 Intl.

pdinfo@amrel.com www.amrel.com

 **NATIONAL INSTRUMENTS**
Alliance Member

