

Introducing the RLS Series

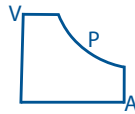
The Industry's most flexible, high performing, and intelligent Regenerative AC & DC Electronic Load



Regenerative



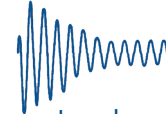
Power Density



Constant Power



High Current



Inrush Current Control



Scalable Power

Key Features

- Regenerative Electronic Load
 - » 4-Quadrant AC & DC Load
 - » Fully Programmable
- High Power Density – Up to 21kW in 4U; Parallel up to 168kVA/kW per Cabinet, or Multiple Cabinets up to 252kW
- AC, DC and AC+DC Capability
- Single, Split, Three-Phase; Multi-Channel Configurations
 - » Isolated Neutrals independent channel modes
- Input Voltage Range: 350Vac L-N/606Vac L-L or ± 500 Vdc
- Wide Frequency Range 15Hz - 1200Hz
- Galvanic Isolation from Facility AC Input to Load Input and Between Input Phases / Channels
- Dynamic, Quiet and Efficient Operation Using Silicon Carbide (SiC) Based Technology
- High AC Current Capability
- Waveform Capture and Scope Display
- Powerful Current Transient Programming Tools
 - » Generate Harmonics and Interharmonics Currents
 - » Analog I/O Signals Standard
- Intuitive User Interface Using Softkeys & Shuttle
- **SmartSource Suite:** Web Browser Control

RLS Series

Regenerative 4-Quadrant AC and DC Load

The RLS Regenerative Load Simulator is designed to emulate real-world normal and abnormal load conditions for testing a wide range of AC or DC power generating or conversion equipment. The RLS's high-power density provides 6kVA/kW up to 21kVA/kW in a 4U chassis and can parallel up to 168kVA/kW in a single 19" cabinet. Dual cabinets can parallel up to 252kVA/kW.

The RLS Series is modular by design and scalable in power. Its flexible channel inputs and advanced control and programming capabilities make it ideal for generating complex user-defined current waveforms.

Full operator control of current, power and power factor allows for testing a wide range AC or DC power sources. The RLS can also support testing your Power Generating Equipment to regulatory compliance standards.

Application Examples:

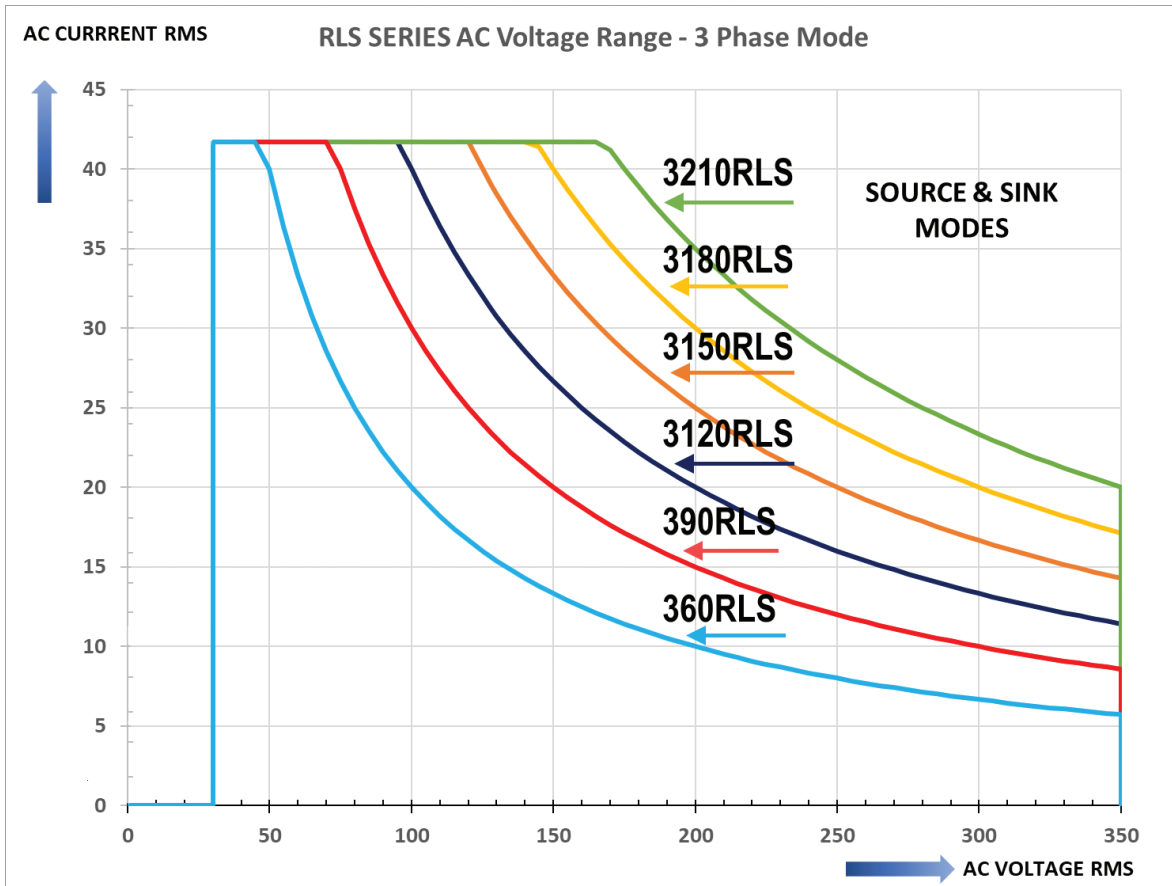
- EV Charger Load Testing, On Board Chargers (OBC), Wallboxes, V2G, V2H, V2X, and EV Charging Cables
- Solar PV/Grid-Tied Inverters RLC Loading for Anti-Islanding
- Energy Storage Systems (ESS), Home ESS Load Testing
- UPS Products and PDUs AC Load Testing
- EV Battery Discharge Testing
- Aerospace Power and Converter Testing
- Utility Power Quality and Grid Usage



Flexible Control

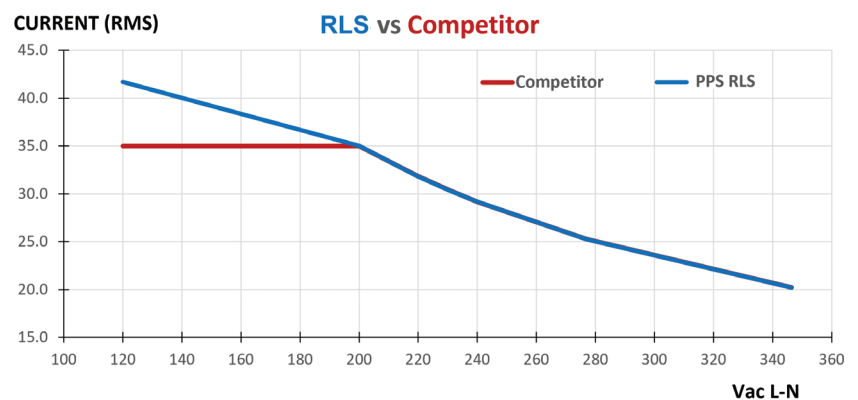
Wide Input Voltage Range

The RLS Series uses a single, constant power voltage input range for both higher current at lower voltage and higher voltages at lower currents load testing, eliminating the need to switch between multiple voltage ranges. Thus, the single RLS's input voltage range allows for testing a broad range of conditions and test requirements without interruption due to range switching.



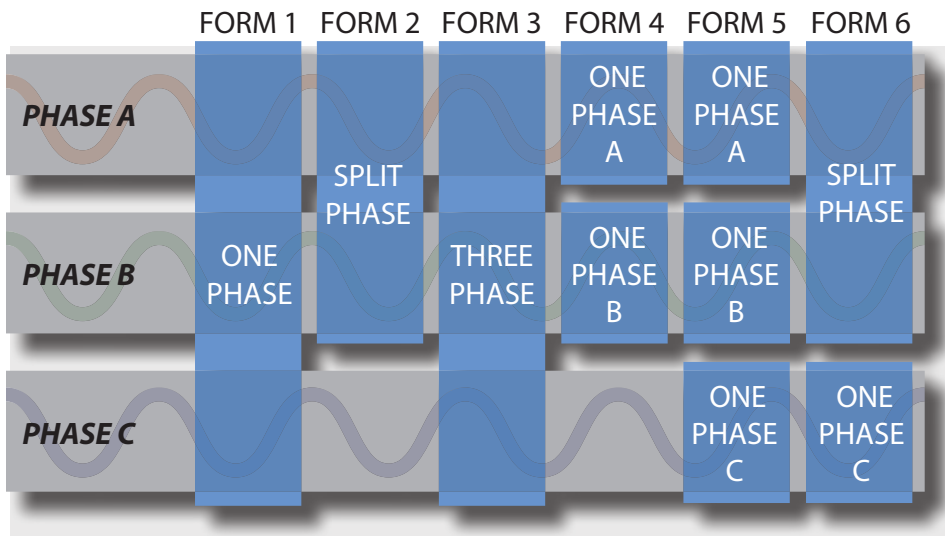
Supports More Current at Low Voltage

The RLS supports a broader range of load current from the UUT, eliminating the risk of over or under sizing the load. This reduces the need for additional capital investment. The diagram to the right illustrates the RLS's capability to sink 20% more current from 120V to 200V when compared to a typical unit that maxes out at 35A/phase.



Ultimate Flexibility With Six Input Configurations

Simultaneous AC & DC Operation on Individual Phases



Automatic Switching of Operation Modes

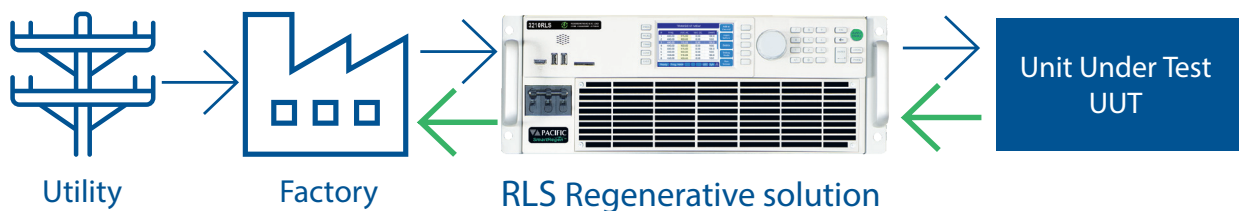
Flexibly test a wide range of EUTs selecting from six different load input configurations. Unique input configuration modes allow different functions per phase: AC mode, DC mode or both.

Forms 1 through 3 are typical for three-phase AC loads and single, split or three-phase AC connections.

The RLS Series has three isolated neutral connections, one for each phase/channel. This supports testing up to three independent sources.

Regenerative Loading Saves Significant Energy and Costs

Regenerative AC & DC loads provide energy efficiency and significant cost savings by returning energy back to the facility or the grid rather than converting to heat. The RLS produces less heat, ensures a stable testing environment for reliability reducing the need for additional cooling systems. Regenerative bidirectional power flows are critical for simulating real-world conditions in transportation and renewable energy systems.



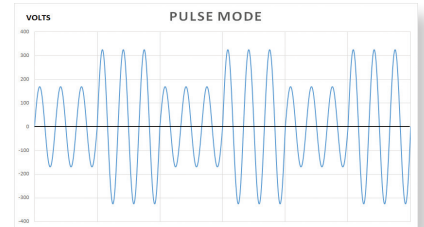
Powerful Waveform & Measurement Tools

The RLS has a built-in waveform digitizer and fast transient capabilities at 200µsec time resolution, supporting LIST, PULSE and STEP current control modes. Waveform generation includes ten Standard, Sine, Square, Triangle, Clipped, Harmonics and Inter-harmonics.

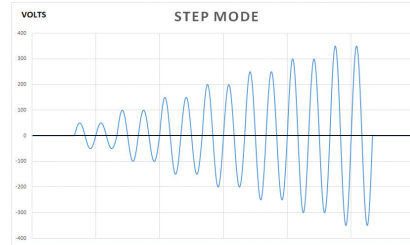
The waveform digitizer is complemented by a digital measurement system with scope function. Capture advanced measurements and waveforms.



List Mode



Pulse Mode



Step Mode

Fully Test AC Power with 4-Quadrant Load

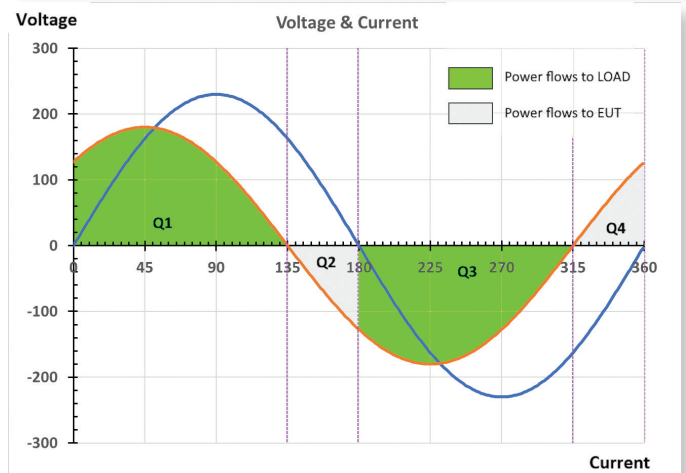
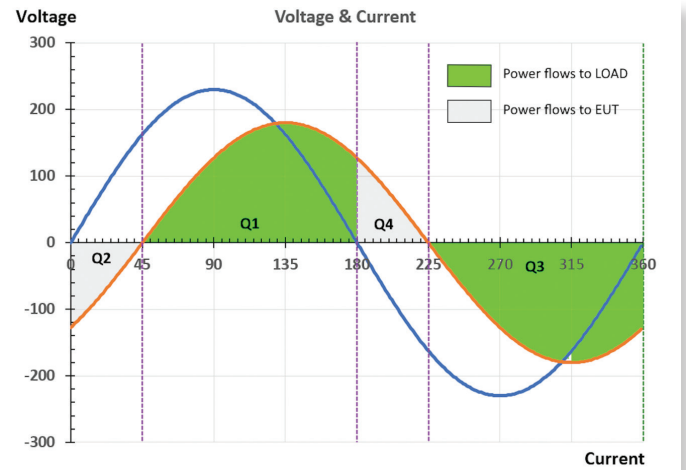
The RLS loads support testing V2G, EV Chargers, EVSE, batteries, UPS, AC power sources and DC power supplies. A key advantage of the RLS Regenerative Load is its ability to operate in all four quadrants using programmable phase shift in CC or CS modes.

Compared to 2-Quadrant non-regenerative AC loads, the RLS allows simulation of inductive and capacitive loads to fully test AC power sources, as shown in the leading and lagging power factor examples.

Regenerative Electronic Load capability with both AC and DC operating modes pushes the boundaries of your test environment. Simulate linear and non-linear loads (including rectified), inductive and capacitive loads.

AC Modes: Constant Current, Constant Power & Apparent Power, Constant Resistance, Constant Voltage, CC+CR, CC / CS Rectifier Mode 1ø & 3ø

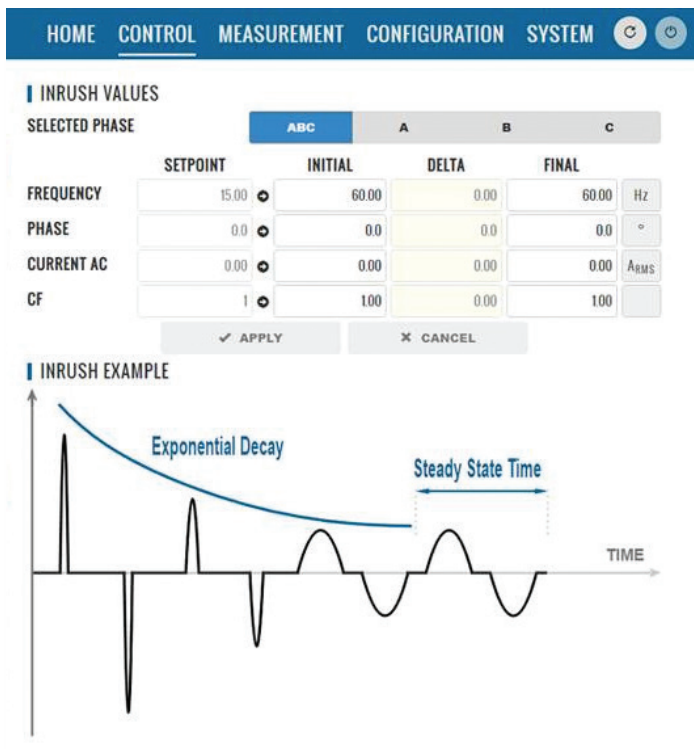
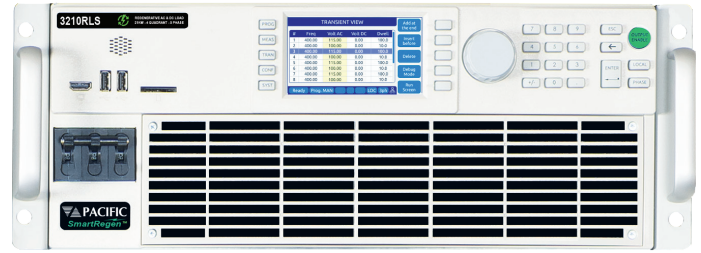
DC Modes: Constant Current, Constant Power, Constant Resistance, Constant Voltage, CR+CC



User Friendly Control Options

Multiple integrated control options include:

- Intuitive Touch Screen LCD Display with Soft Key driven Menus
- SmartSource Suite Web Interface
- LAN, GPIB, RS232 & USB Interfaces, and ModBus (optional)
- Supports external touch screen monitor via Video Output Interface



Simplify Test Automation with SmartSource Suite Remote Control Platform

Easily monitor, control, and manage testing with the RLS's SmartSource Suite remote control platform. Use the embedded, web browser interface with real-time control. Access control panels and test sequences on-premises or on any mobile device (laptop, phone, tablet) via secure client access.

- Full control and measurement capability
- Program settings and measurement read back including digital scope and harmonics data
- Extensive safety protection settings
- Advanced load function control screens such as Inrush Current programming shown here
- Waveform selection, preview and edit modes
- Execution of user's custom test sequences
- Transient data entry and execution screen using a spreadsheet layout

Built-in Galvanic Isolation Reduces Safety Risks

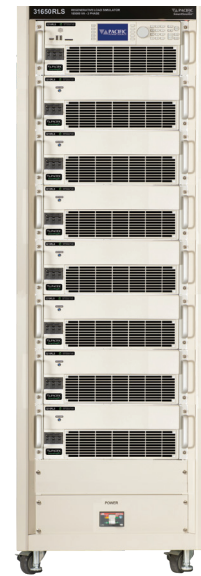
The RLS provides both facility-to-input isolation, and phase to phase or channel to channel isolation. Galvanic isolation provides complete separation between the facility power input and the load's inputs so there is no electron flow between channels. Channel to channel isolation provides flexibility to use each input as its own independent load with full current or power control. The RLS's fully isolated design reduces safety risks for the operator and prevents unexpected UUT damage by preventing unwanted current or ground loops. This built-in capability doesn't require a transformer which saves significant costs and space.

Modular Loading up to 168kW/333A per Cabinet

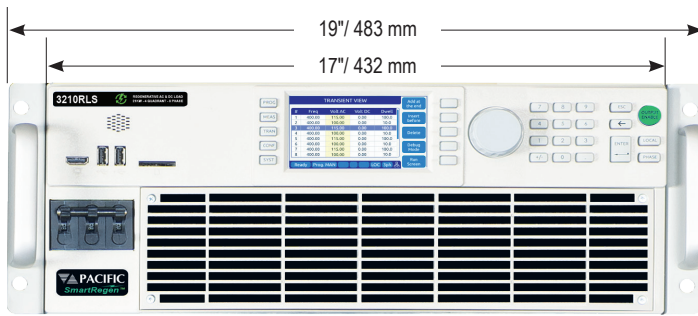
The RLS Series provides modular and scalable load capability to meet changing test requirements. Easily parallel multiple chassis to reach up to 168kW with 333Amps load per cabinet. Cabinets can be paralleled up to 252kW. The ease of reconfiguration allows for flexible test set ups and reduces downtime for repairs or maintenance. The units' shallower depth also allows it to fit into typical 31.5-inch / 800 mm depth cabinets with ample room for air-flow and wiring.

Available parallel unit kits:

Parallel load Kits are available in power ratings of 24kW, 30kW, 36kW, 42kW and higher in increments of 21kW up to 252kW (12 chassis) max. For turnkey, integrated parallel load cabinet systems, contact factory.



RLS Dimensions & Accessories

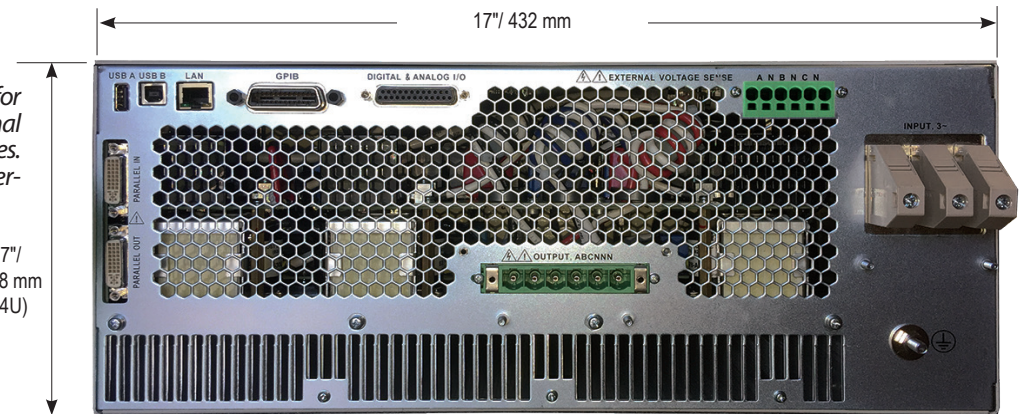


The RLS is designed for bench top or 19" equipment rack operation. Product is shown with included rack mount handles.

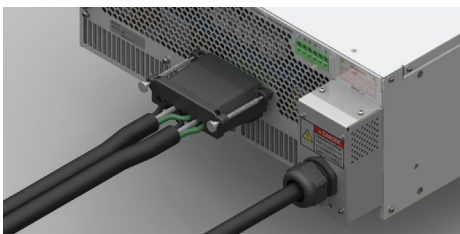
Depth of chassis is only 25.0 inch / 635mm.

Note: Units can be zero-stacked in 19" EIA cabinet when using optional rack-slides. When using L-brackets, allow 1U space between units.

The RLS Rear Panel provides connections for AC Grid Input, AC or DC Load Input, External Sense, Aux I/O and remote control interfaces. Product is shown with standard GPIB Interface.



Safety Cover & Strain Relief Kit Option



This optional kit includes covers for AC Grid input and AC & DC Input connections. Both covers include wire strain relief to prevent accidental release of input or output wiring.

Note: AC Grid input and AC or DC load wiring is NOT included.

Technical Specifications

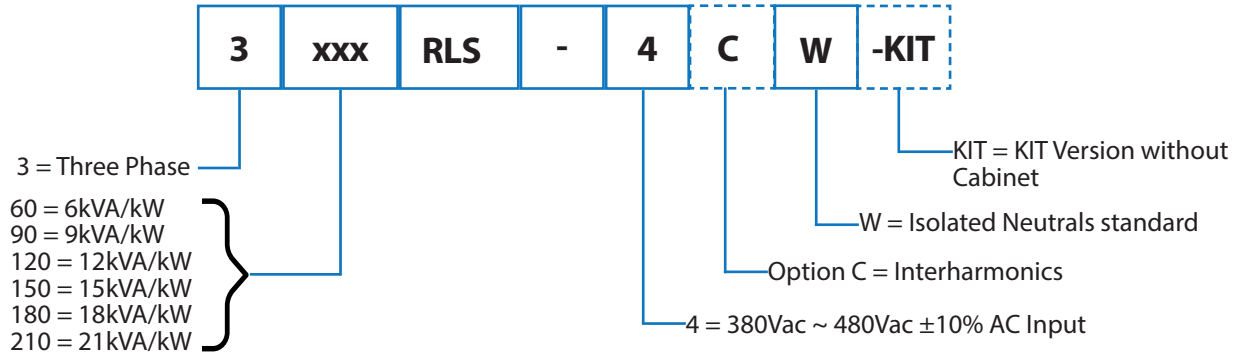
MODEL:	360RLS-4	390RLS-4	3120RLS-4	3150RLS-4	3180RLS-4	3210RLS-4
Modes of Operation						
Constant Current, Constant Power & Apparent Power, Constant Resistance, Constant Voltage, CC+CR, CC / CS Rectifier Mode						
AC or DC Input Power						
Phase Modes (Form)	1, 2 or 3	1, 2 or 3	1, 2 or 3	1, 2 or 3	1, 2 or 3	1, 2 or 3
Maximum Power ¹ (Total)	6 kW/kVA	9 kW/kVA	12 kW/kVA	15 kW/kVA	18 kW/kVA ¹	21 kW/kVA ¹
Per Phase / Channel	2 kW/kVA	3 kW/kVA	4 kW/kVA	5 kW/kVA	6 kW/kVA	7 kW/kVA
Input Voltage						
Input Range	AC Range: 30 - 350 V _{LN} / 50 - 606 V _{LL RMS} (Sync Mode)			DC Range: 0 - ±500 V _{DC}		
Resolution	0.01			Accuracy:	± 0.25% F.S	
Line Regulation	< 0.1% for 10% Line Change					
Current Regulation	± 0.02% (CSC Mode)					
Phase Angle - Range (B, C)	0 - 359.9°			Resolution:	0.1°	
Maximum Current						
3 & 2 Phase modes AC / DC	16.67 ARMS/ 8.3 ADC	25.00 ARMS/ 12.6 ADC	33.33 ARMS/ 16.7 ADC	41.67 ARMS/ 21.0 ADC	41.67 ARMS/ 21.0 ADC	41.67 ARMS/ 21.0 ADC
1 Phase mode AC / DC	50.0 ARMS/ 25.0 ADC	75.00 ARMS/ 50.0 ADC	100.00 ARMS/ 62.5 ADC	125.00 ARMS/ 62.5 ADC	125.00 ARMS/ 62.5 ADC	125.00 ARMS/ 62.5 ADC
Current Crest Factor (AC)	6.3 : 1	4.2 : 1	3.1 : 1	2.5 : 1	2.5 : 1	2.5 : 1
Input Frequency						
Range	15.00 – 1200Hz					
AC Input						
Input Voltage Range / Freq	380Vac – 480Vac ± 10%, 4 Wire, L1, L2, L3 and PE / 47 - 63 Hz					
Nom. Phase Current @ 400Vac / 480Vac	10ARMS/8ARMS	14ARMS/12ARMS	19ARMS/16ARMS	24ARMS/20ARMS	29ARMS/24ARMS	34ARMS/28ARMS
Input Power Factor	0.99			Efficiency:	> 0.90	
Measurements						
Vrms Range / Accuracy	0 – 350 V _{LN} / 0-606 V _{LL} / ± 0.25% F.S.					
Irms Range / Accuracy	17.0 A / ± 0.5% F.S.	25.0 A / ± 0.5% F.S.	34.0 A / ± 0.5% F.S.	42.0 A / ± 0.5% F.S.	42.0 A / ± 0.5% F.S.	42.0 A / ± 0.5% F.S.
Power Range / Accuracy	2 kW / ± 1.5 % F.S.	3 kW / ± 1.5 % F.S.	4 kW / ± 1.5 % F.S.	5 kW / ± 1.5 % F.S.	6 kW / ± 1.5 % F.S.	7 kW / ± 1.5 % F.S.
Transient Functions						
Programming	200 Steps / 400 Segments, LIST, PULSE & STEP Modes, Current AC, Current DC, Waveform, Ramp Time, Dwell Time. Time range: 0.1 - 10000000.0 ms, Time resolution 0.2 ms					
Execution	Run from step # to step #, Run, Step, Restart, Stop			Storage:	Non-volatile, 100 Programs + Transients	
PARAMETERS / FUNCTIONS SPECIFICATIONS						
Remote Control Interfaces						
USB Type B, LAN (LXI), GPIB / IEEE488, RS232, all on rear panel						
External USB WIFI adapter / ModBus TCP / CAN/CAN-FD						
Analog & Digital I/O						
Analog Inputs (4) / Outputs (4)	Analog Inputs: Current phs A,B,C			Analog Outputs: Vmeas A, B, C, Pmeas all Phases		
Digital Inputs (6) / Outputs(6)	Remote Inhibit, Trans. Trig., Phase Sync, User			Output Relay, Transient, Function Strobe, Sync		
Environmental						
Cooling	Variable speed fan, front intake, rear exhaust			Energy Modes:	Standby & Sleep	
Temperature	Operating:	0 to 40 °C / 32 to 104 °F		Storage:	-20 to 70 °C / -4 to 158 °F	
Humidity	< 80%, non-condensing			Altitude:	2000 m / 6500 feet	
System Features						
USB Ports	2 on Front Panel, 1 on Rear Panel, All Type A			SD Card:	32 GB max. Capacity	
Video Output Port	Monitor Out, Front Panel					
Dimensions & Weights						
Chassis Size H x W x D	7.0" x 17.0" x 25.0" / 178 x 432 x 635 mm			Shipping: 20" x 27" x 38" / 508 x 686 x 965 mm		
Weight Single 4U Height Unit	Net:	111.2 lbs. / 50.4 kg		Shipping: 151 lbs / 68.5 kg		
Regulatory Compliance						
Safety	IEC 61010-1:2010 (Edition 3)					
EMC - Emissions / Immunity	EN 55011:2009+A1:2010 / EN 61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8 and EN 61000-4 -11					
Product Category	EN 61326-1:2013 (Measurement, Laboratory and Control Equipment)					
Agency Approvals	CE Mark, NRTL Nemko US/Canada			RoHS (2011/65/EU):	EN50581:2012	

Note 1: Maximum Power rating is reduced below 40Hz on 3180RLS and 3210RLS models

Ordering Information

RLS Series Model Number Encoder:

Note: Solid outlined fields must be specified. Dashed outlined fields are optional.



Order Example

3210RLS-4W

- Bench Model, 21 kVA, 3-Phase, Regenerative Electronic Load, USB, RS232, LAN, GPIB & AUX I/O, Isolated Neutrals

Typical Delivery Items

- Electronic Load
- Rack Mount Handles
- Certificate of Compliance

Available Accessories

- Input shorting adapter for single phase input mode use. P/N 160086 (not for W)
- Paralleling Cable, 1 Ft. (Included with Aux NC models). P/N 778036
- Rack slides. P/N 703251

Service & Support

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