# 6RL Series

| U | I | P | R | OVP | OCP | OPP |
| OTP | ⊓ | ⬚ | ⠿ | 19" | MS | USB |

# Regenerative DC Loads

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**DC Power**

| 6RL Series |
|:---:|
| 3.1kW to 9.3kW |
| Energy Recycling |
| Up to 1500Vdc, 510A |
| 3U Rack Height @ 15kW |
| AC Input 208V, 3Phs |

## KEY BENEFITS OF 6RL REGENERATIVE DC LOADS

- Energy recovery of the supplied DC energy into the local grid reduces utility bills and air conditioning costs
- Galvanically isolated DC input
- Input power ratings: up to 15 kW per unit
- Parallel operation for higher power
- Input voltages: up to 1500 V
- Input currents: up to 510 A per unit
- Three phase input voltage 208Vac for US Market (Refer to 6RL-HP Series for 380Vac~480Vac input)
- FPGA based digital control
- Large color TFT touch panel display
- User profiles, true function generator
- Galvanically isolated analog and USB interface
- Extra USB port on the front for USB memory stick
- Optional, digital, plug & play interfaces
- SCPI command set and ModBus support

*Regenerative DC Loads* like the 6RL Series are excellent for the environment as they produce little or no heat. They also save money by sending the energy sent into the load back on the AC power grid. For many test requirements like full load burn-in, this can save a significant amount in terms of reduced utility bills, often resulting in quick financial payback of the capital invested in the electronic loads. It also reduces HVAC cost as no cooling of the test room is required.

With a wide range of available power levels and input voltage ranges, the 6RL Series of regenerative DC Loads are an excellent choice for many DC test applications. Single chassis power up to 9.3kW and 1500V input.

Master/ Slave mode for series or parallel operation available for higher voltage and or power requirements.
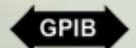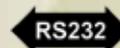
## VALUE & PERFORMANCE BY LEVERAGING MODERN TECHNOLOGY

The 6RL Series of regenerative DC Electronic Loads uses state of the art field programmable logic array (FPGA) technology to implement a digital power conversion topology that combines high efficiency with a rich feature set and excellent specifications. This results in 16-bit resolution precision for both set points and measurements throughout.

Packaged in a compact, standard 19" rack mount chassis, these powerful functions are easily accessible through an easy to use, color touch screen based user interface from the front panel or by sending commands over one of several available digital control interfaces.
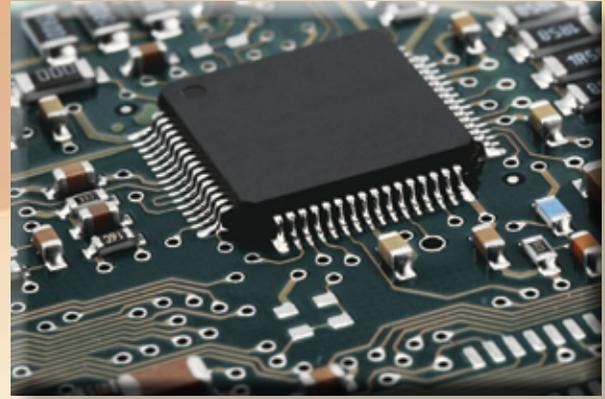


## BROAD RANGE OF APPLICATIONS

The energy efficient operation of the 6RL loads makes them suitable for a broad range of DC power applications where loading of power supplies or discharging of batteries involves high amounts of energy. This is typically the case in Power Supply test and Electric Vehicles power conversion and battery test applications.



*Power Supply Test & Burn-in*



*Electric Vehicle Component Test*



*Research & Development*

## MODERN COLOR TOUCH USER INTERFACE FOR EASE OF OPERATION
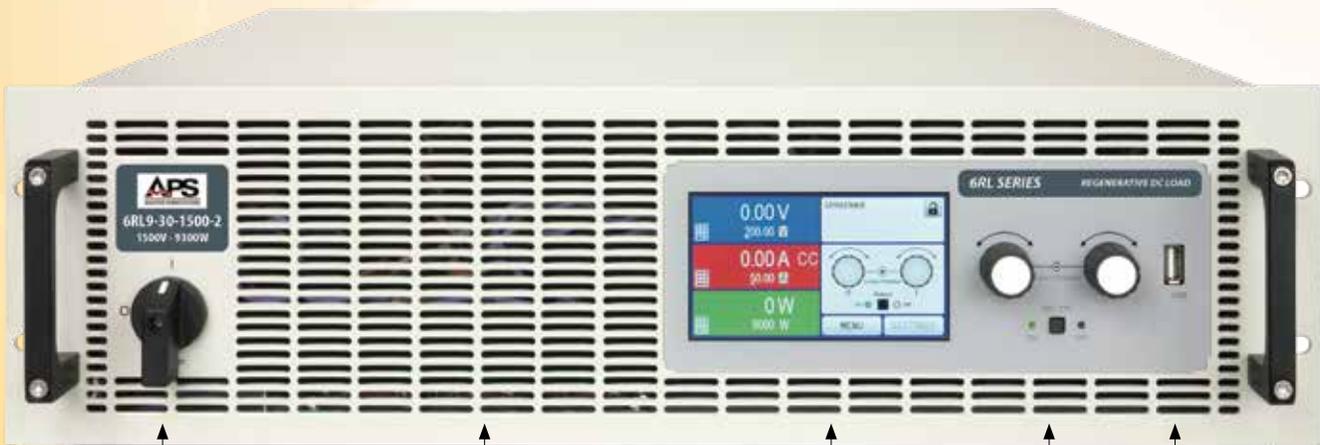


Power On/Off          Air Intake          Color LCD Touch Display          Dual Shuttles Load On/Off          USB Port

All 6RL Series models share an intuitive user interface using a combination of a large color LCD touch screen and two rotary shuttle knobs. This results in an easy to use electronic load for novice and experienced users alike.

The large color LCD allows visualization of output settings and configurations as well as a wide assortment of precision DC measurements.

Changing parameters such as voltage or current can be done using the touch screen or the shuttle.

## VALUE PROPOSITION

### General

The 6LR Series of electronic DC loads offer all the features and function of a conventional DC load but rather than dissipating the absorbed energy as heat, it recovers 95% of this energy back to the mains instead.

The energy recovery function converts the supplied DC energy into a synchronous sine current and feeds it back into the local grid, eliminating the usual heat dissipation to a minimum and saving energy costs at the same time. The large color TFT touch panel offers a different and intuitive kind of manual operation, compared to most electronic loads on the market today.

### Power ratings, voltages, currents

The available input voltage ranges from models with 0~80 V DC input up to 0~1500 V DC. Input currents up to 1000 A are available on two models. The series offers several power classes of 3.1kW, 6.2kW or 9.3KW in only 3U rack space. Higher power requirements can be met using parallelizing multiple loads in cabinets for a significantly high total current.

### Grid Connection

All -2 models require a 208Vac, 3-phase Delta mains input supply connection (no Neutral conductor).

### Energy recovery
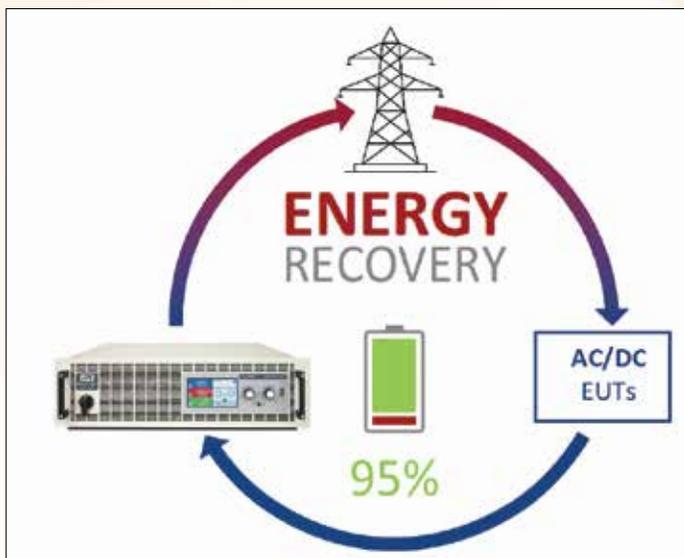


A key feature of these electronic loads is the use of the AC input grid connection for recovery of the received DC energy from the unit under test. It is converted with an efficiency of up to 95%. Recycling energy recovery helps to lower energy costs and avoids expensive cooling systems as required for conventional electronic or resistive loads which convert the DC input energy into heat.

### Function generator

A built-in digital function and arbitrary waveform generator allows for the control and execution of user-programmable load profiles and can generate sine, square, saw tooth and ramp functions in an arbitrary order.
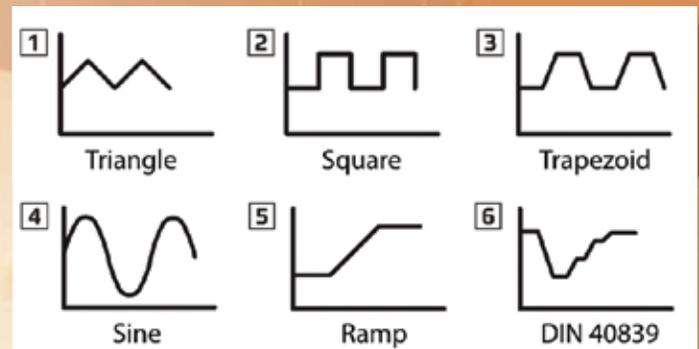


With a programmable value table of 3276 points, the load can simulate non-linear internal resistances, such as those of batteries or LED strings.

### Battery test

Battery test modes for various battery types, such as constant current or constant resistance discharging are supported. This mode displays values for elapsed testing time and consumed capacity (Ah). Adjustable under voltage threshold and maximum test period settings are supported to prevent over-discharge.

### Master-slave Configurations

All models feature a digital master-slave bus. It can be used to connect up to 32 identical models in parallel operation to a bigger system. The configuration of the master-slave system is done from the control panels of the units or by remote control. System control is accomplished by manual or remote control. As an alternative to the standard models, there are specific slave models available.

### Share Bus

The Share Bus is an analog connection used to balance current across multiple similar loads in a parallel connection. It can also be used to create a two-quadrant system with DCS Series power supplies. Such a system supports source-sink capability for battery cycling.

### Power Grid Monitoring

6RL loads feature a switch-off function in case of an interruption of the grid connection. The load constantly monitors its AC input voltage and frequency and will automatically switch off the power stages in case upper or lower limits are exceeded.

## TECHNICAL SPECIFICATIONS 208V Grid Connection Models

| MODEL | Power | Voltage | Current | Resistance | Efficiency | Weight |
|---|---|---|---|---|---|---|
| 6RL3-170-80-2 | 0 ~ 3.1 kW | 0 ~ 80 Vdc | 0 ~ 170 Adc | 0.01 ~ 12 Ω | 92.5% | 17 kg / 37.5 lbs |
| 6RL3-70-250-2 | 0 ~ 3.1 kW | 0 ~ 250 Vdc | 0 ~ 70 Adc | 0.09 ~ 120 Ω | 93.5% | 17 kg / 37.5 lbs |
| 6RL3-30-500-2 | 0 ~ 3.1 kW | 0 ~ 500 Vdc | 0 ~ 30 Adc | 0.42 ~ 480 Ω | 94.5% | 17 kg / 37.5 lbs |
| 6RL3-22-750-2 | 0 ~ 3.1 kW | 0 ~ 750 Vdc | 0 ~ 22 Adc | 0.8 ~ 1100 Ω | 94.5% | 17 kg / 37.5 lbs |
| 6RL6-340-80-2 | 0 ~ 6.2 kW | 0 ~ 80 Vdc | 0 ~ 340 Adc | 0.005 ~ 6 Ω | 92.5% | 24 kg / 52.9 lbs |
| 6RL6-140-250-2 | 0 ~ 6.2 kW | 0 ~ 250 Vdc | 0 ~ 140 Adc | 0.04 ~ 60 Ω | 93.5% | 24 kg / 52.9 lbs |
| 6RL6-60-500-2 | 0 ~ 6.2 kW | 0 ~ 500 Vdc | 0 ~ 60 Adc | 0.21 ~ 240 Ω | 94.5% | 24 kg / 52.9 lbs |
| 6RL6-44-750-2 | 0 ~ 6.2 kW | 0 ~ 750 Vdc | 0 ~ 44 Adc | 0.43 ~ 550 Ω | 94.5% | 24 kg / 52.9 lbs |
| 6RL6-30-1000-2 | 0 ~ 6.2 kW | 0 ~ 1000 Vdc | 0 ~ 30 Adc | 0.83 ~ 950 Ω | 94.5% | 24 kg / 52.9 lbs |
| 6RL9-510-80-2 | 0 ~ 9.3 kW | 0 ~ 80 Vdc | 0 ~ 510 Adc | 0.003 ~ 4 Ω | 92.5% | 31 kg / 68.3 lbs |
| 6RL9-210-250-2 | 0 ~ 9.3 kW | 0 ~ 250 Vdc | 0 ~ 210 Adc | 0.03 ~ 40 Ω | 93.5% | 31 kg / 68.3 lbs |
| 6RL9-90-500-2 | 0 ~ 9.3 kW | 0 ~ 500 Vdc | 0 ~ 90 Adc | 0.14 ~ 160 Ω | 94.5% | 31 kg / 68.3 lbs |
| 6RL9-66-750-2 | 0 ~ 9.3 kW | 0 ~ 750 Vdc | 0 ~ 66 Adc | 0.29 ~ 360 Ω | 94.5% | 31 kg / 68.3 lbs |
| 6RL9-30-1500-2 | 0 ~ 9.3 kW | 0 ~ 1500 Vdc | 0 ~ 30 Adc | 1.2 ~ 1450 Ω | 94.5% | 31 kg / 68.3 lbs |

## TECHNICAL SPECIFICATIONS

| MODEL | All Models |
|---|---|
| **AC Input** | |
| Input Voltage | 208V$_{LL}$ ±10%, 2ph/3ph |
| Frequency | 45~66 Hz |
| **DC Voltage Mode** | |
| Accuracy | < 0.3% of F.S. |
| **DC Current Mode** | |
| Accuracy | < 0.4% of F.S. |
| Load regulation 0-100% ΔVdc | < 0.15% of F.S. |
| Slew Rate 10~90% | < 300 μsec |
| **DC Power Mode** | |
| Accuracy | < 1.5% of F.S. |
| **Resistance Mode** | |
| Accuracy | ≤ 1% of max. resistance + 0.3% of rated current |
| **Protection** | OT, OVP, OCP, OPP, PF |
| **Parallel Operation** | Master-slave, up to 32 units |
| **Regulatory Standards 3U Models** | EN 60950:2006 + A11:2009 + A1:2010 + A12:2011 + AC:2011 + A2:2013 EN 61000-6-3:2011-09, EN 61000-6-4:2011-09 Radiation Class B EN 50160:2011-02 Grid Class 2 |
| **Dimensions** | |
| Width x Height x Depth | 19" x 5.25" x 24" 483 x 133 x 609 mm |

| MODEL | All Models | |
|---|---|---|
| **Environmental** | | |
| Pollution Degree | 2 | |
| Protection Class | 1 | |
| Cooling | Forced air, temperature controlled fans | |
| Temperature      Operating | 0~50 °C / 32~122 °F | |
| Storage | -20~70 °C / -4~158 °F | |
| Relative humidity | <80%, non-condensing | |
| Altitude      Operating | <2000 m (1.242 mi) | |
| **Front Panel** | | |
| Display | Color Touch Screen Graphics LCD | |
| Controls | Dual Rotary Digital Encoders | |
| Output on/off | Push Button | |
| **Digital Interfaces** | | |
| Standard - Front Panel | 1x USB type A | |
| Rear Panel | 1x USB type B for communication | |
| Interface Slot | 1x for retrofittable plug-in modules | |
| Master / Slave Bus (Rear Panel) | 2x RJ45 | |
| Share Bus (Rear Panel) | Terminals | |
| **Analog Interfaces** | | |
| Internal | Built-in, 15 pole D-Sub (female), galvanically isolated | |
| Signal range | 0~5 V or 0~10 V (selectable) | |
| Inputs | V, I, P, R, remote control on-off, DC input on-off, resistance mode on-off | |
| Outputs | V, I, overvoltage, alarms, reference voltage | |
| Accuracy V / I / P / R | 0~10 V: < 0.2% | 0~5 V: < 0.4% |



*3100 W Models, 750V Max.*



*6200 W Models, 1000V Max.*



*9300 W Models, 1500V Max.*

## ORDERING INFORMATION - 208V AC INPUT

| 3.1KW MODELS | DESCRIPTION |
|---|---|
| 6RL3-170-80-2 | DC Regenerative Load, 3100W, 0-80V, 0-170A |
| 6RL3-70-250-2 | DC Regenerative Load, 3100W, 0-250V, 0-70A |
| 6RL3-30-500-2 | DC Regenerative Load, 3100W, 0-500V, 0-30A |
| 6RL3-22-750-2 | DC Regenerative Load, 3100W, 0-750V, 0-22A |
| **6.2KW MODELS** | **DESCRIPTION** |
| 6RL6-340-80-2 | DC Regenerative Load, 6200W, 0-80V, 0-340A |
| 6RL6-140-250-2 | DC Regenerative Load, 6200W, 0-250V, 0-140A |
| 6RL6-60-500-2 | DC Regenerative Load, 6200W, 0-500V, 0-60A |
| 6RL6-44-750-2 | DC Regenerative Load, 6200W, 0-750V, 0-44A |
| 6RL6-30-1000-2 | DC Regenerative Load, 6200W, 0-1000V, 0-30A |
| **9.3KW MODELS** | **DESCRIPTION** |
| 6RL9-510-80-2 | DC Regenerative Load, 9300W, 0-80V, 0-510A |
| 6RL9-210-250-2 | DC Regenerative Load, 9300W, 0-250V, 0-210A |
| 6RL9-90-500-2 | DC Regenerative Load, 9300W, 0-500V, 0-90A |
| 6RL9-66-750-2 | DC Regenerative Load, 9300W, 0-750V, 0-66A |
| 6RL9-30-1500-2 | DC Regenerative Load, 9300W, 0-1500V, 0-30A |

## OPTIONS

| OPTIONS | DESCRIPTION |
|---|---|
| OPT-232 | RS232 Serial Interface |
| OPT-PBUS | Profibus DPV1- Interface |
| OPT-CANO | CANopen Interface |
| OPT-DNET | DeviceNet Interface |
| OPT-MBUS1P | Modbus-TCP 1 Port Interface |
| OPT-MBUS2P | Modbus-TCP 2 Port Interface |
| OPT-ETH1P | Ethernet/IP 1 Port Interface |
| OPT-ETH2P | Ethernet/IP 2 Port Interface |
| OPT-PNET1P | Profinet-IO 1 Port Interface |
| OPT-PNET2P | Profinet-IO 2 Port Interface |
| OPT-CAN | CAN Interface |
| OPT-ECT | EhterCAT Interface |
| OPT-3IF | 3 Way Interface Analog/USB/GPIB |
| Opt-RCT | Redundant Contactors |

## REAR PANEL CONNECTIONS

All grid power input and DC Load input connectors as well as interfaces are located on the rear panel of the load. This supports rack mounting of the unit in ATE systems as all internal cabinet wiring routes to the back of the unit and leaves the front panel display and controls accessible from the front. The illustration below shows the various connector locations on the rear panel.



USB and analog interface (galvanically isolated)
Slot for digital interfaces
Terminals for Share bus & sensing
DC input
AC input with inline EMI filter
Connectors for master-slave
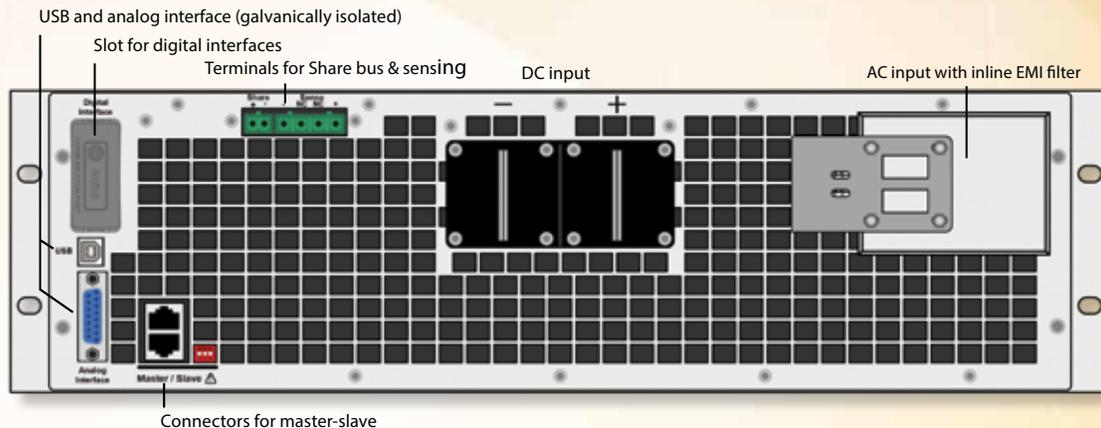
## Service and Support

Adaptive Power Systems' customer support is second to none. Our Customer Support Program provides the training, repair, calibration, and technical support services that our customers value. So, in addition to receiving the right test equipment, our customers can also count on excellent support before, during and after the sale. With company owned support and service centers around the world, support is never far away.

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