

HEINZINGER HELR

Regenerative DC Load



HEL R

Our solution for
Fuel Cell and
Battery-Recycling
applications

Technical Benefits

- Intuitive touch-panel for stand-alone operation
- Test-sequencer for individual drive cycles
- Integrated arbitrary generator
- Modular design for cascading up to 30 systems in parallel
- Master-Slave-Control
- Remote control & connectivity
- Comprehensive security features
- ENS Grid protection module

E-mobility is today becoming a more and more dominant topic and on the one hand promotes new technologies such as energy generation through fuel cells and on the other hand confronts us by the use of familiar battery technology with new challenges in battery recycling. The focus is always on easy operation, efficiency and sustainability throughout the process chain.

The Heinzinger® HELR regenerative electronic DC loads are the ideal solution for test applications such as fuel cells, semiconductor aging and other power sources, where electronic loads are required and energy should be efficiently feed back into the grid. HELR has a high-precision galvanic isolated output up to 2,000V and currents up to 1,000A per unit. Integrated control modes such as CC, CV, CP and CR as well as a range of safety functions are a standard features. The intuitive touch-panel combined with the test-sequencer, arbitrary generator function and master control software, support customer's needs as "standalone" unit. For use as sub-system in a higher-level test environment from the development

stage through to series production the HELR supply several interface like CAN or Ethernet.

Another important application is battery recycling. The requirement for this is the total discharge of the batteries, which can be carried out efficiently, ecologically and economically with the Heinzinger® HELR. Its flexible modular architecture design can meet the test requirement of customers with different current and power combinations from 5 - 30kW as single system and up to 1920 kW as combined system in a Power-Rack. A later power increase can be achieved by simple parallel connection.



Fuel Cell



Battery Recycling

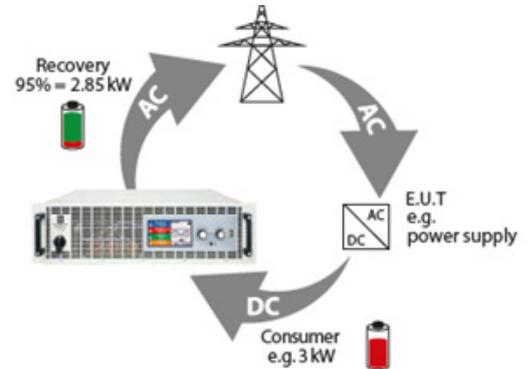
HEINZINGER HELR

Regenerative DC Load technical data

Input			Mains connection		
Device power	5, 10, 15, 30kW		AC input voltage	3x 342...528V AC, 2ph/3ph (30kW US version available)	
Voltage range	0...80 (up to 2000V)		AC input frequency	45...66 Hz	
Current range	up to 1000A/Unit		Power factor	≥ 99%	
Accuracy / dynamics		5-15kW	30kW	Ambient conditions	
Voltage accuracy	≤ 0,1% FS	≤ 0,05% FS		operating temp.	5...5°C
Current accuracy	≤ 0,2% FS	≤ 0,1% FS		Humidity	15...80% (non condensing)
Load regulation	≤ 0,15% FS			Cooling	Air cooled (water optionally)
Slew rate current	≤ 300 μs			Dimensions (WxHxD)	
Power accuracy	≤ 1% FS	≤ 0,3% FS		5, 10, 15kW	482 x 133 x 670 mm
Resistance accuracy	≤ 1% FS	≤ 0,3% FS		30kW	482 x 177 x 670 mm
+ x% rated current	+0,3% FS	+0,3% FS		Standards	
Efficiency	92,5...95,5%			EMC	EN61000-6-2 EN61000-6-3
depending on model				Safety	EN50160:2011-02 Grid Class 2 EN61010-1

High efficient energy recovery

The most important feature of these electronic loads is that the AC input i.e. grid connection is also used as output for the recovery of the supplied DC energy, which will be converted with an efficiency of up to 95.5%. This wax of energy recovery helps to lower energy costs and avoids expensive cooling systems, such as they are required for conventional electronic loads which convert the DC input energy into heat.



Built-in Function Generator

A special feature is the comfortable, FPGA based, digital function and arbitrary generator. It enables to control and run user-customizable load profiles and can generate sine, square, saw toot and ramp functions in arbitrary order.

With a freely programmable digital value table of 3276 points, which is embedded in the control circuit, the devices can reproduce non-linear internal resistances, such as those of batteries or LED chains. For purposes of testing all kinds of batteries, such as for example constant current or constant resistance discharging, the devices offer a battery test mode.



TRIANGLE



RECTANGLE



TRAPEZOID



SINE



RAMP



ARBITRARY

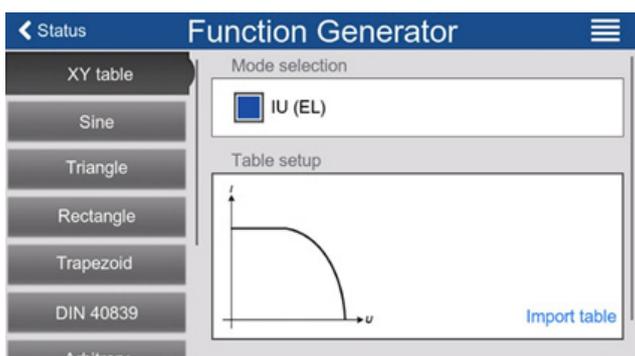
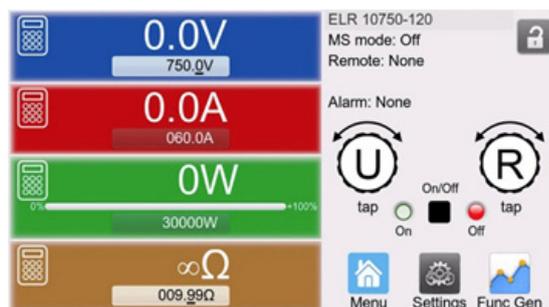
TEST SEQUENCING

Additionally to the standard functions, which are all based upon a so-called arbitrary generator, this base generator is accessible for the creation and execution of complex sets of functions, separated into up to 99 sequences. Those can be used for testing purposes in development and production. The sequences can be loaded from and saved to a standard USB stick via the USB port on the front panel, making it easy to change between different test sequences

TEST APPLICATION

Constant Resistance Mode

User can define a target resistance for drawing the desired current from the fuel cell stack. It can be easily adjusted via the intuitive HMI (Human Machine Interface) or remote interface for altering the resistance value.



XY Table for nonlinear load

User can define different loading current subject to different voltage, by loading this IV table to the unit. It is particularly useful for non-linear output characteristic verification.

Battery recycling

In order to make the recycling or reusability of lithium-ion batteries economical, all processes must run with maximum efficiency. Since lithium-ion batteries and lithium-ion polymer batteries should never be fully discharged during their service life, it can be assumed that most batteries end up for disposal with residual capacity. Before the batteries are subjected to the actual recycling process, they must be fully discharged.



Advantages compared to conventional battery discharge

- The batteries or accumulators are completely discharged during the process
- Fully discharged batteries are not dangerous (high voltage, fire hazard)
- The residual energy is completely returned to the circuit
- The discharge process is controlled, fast and efficient

Available Voltage and Current Combinations:

Power	0...30000W	0...15000W	0...10000W	0...5000 W
Weight	50kg	32kg	25kg	18kg

Model	HELR-80-1000/30	HELR-80-510/15	HELR-80-340/10	HELR-80-170/5
Voltage	0...80V	0...80V	0...80V	0...80V
Current	-1000A	-510A	-340A	-170A
Resistance	0.003...5 Ω	0.006...10 Ω	0.01...13 Ω	0.02...25 Ω
Efficiency	$\leq 94\%$	92.5%	92.5%	92.5%

Model	HELR-200-420/30	HELR-200-210/15	HELR-200-140/10	HELR-200-70/5
Voltage	0...200V	0...200V	0...200V	0...200V
Current	-420A	-210A	-140A	-70A
Resistance	0.0165...25 Ω	0.033...50 Ω	0.05...75 Ω	0.1...150 Ω
Efficiency	$\leq 94,2\%$	93.5%	93.5%	93.5%

Model	HELR-360-240/30	HELR-360-120/15	HELR-360-80/10	HELR-360-40/5
Voltage	0...360V	0...360V	0...360V	0...360V
Current	-240A	-120A	-80A	-40A
Resistance	0.05...90 Ω	0.1...180 Ω	0.15...260 Ω	0.3...520 Ω
Efficiency	$\leq 94,6\%$	93.5%	93.5%	93.5%

Model	HELR-500-180/30	HELR-500-90/15	HELR-500-60/10	HELR-500-30/5
Voltage	0...500V	0...500V	0...500V	0...500V
Current	-180A	-90A	-60A	-30A
Resistance	0.08...170 Ω	0.16...340 Ω	0.25...500 Ω	0.5...1000 Ω
Efficiency	$\leq 95,3\%$	94.5%	94.5%	94.5%

Model	HELR-750-120/30	HELR-750-60/15	HELR-750-40/10	HELR-750-20/5
Voltage	0...750V	0...750V	0...750V	0...750V
Current	-120A	-60A	-40A	-20A
Resistance	0.2...370 Ω	0.4...740 Ω	0.6...1100 Ω	1.2...2200 Ω
Efficiency	$\leq 95,5\%$	94.5%	94.5%	94.5%

Model	HELR-1000-80/30	HELR-1000-40/15
Voltage	0...1000V	0...1000V
Current	-80A	-40A
Resistance	0.4...650 Ω	0.8...1300 Ω
Efficiency	$\leq 94,6\%$	94.5%

Model	HELR-1500-60/30	HELR-1500-30/15
Voltage	0...1500V	0...1500V
Current	-60A	-30A
Resistance	0.8...1500 Ω	2.5...3000 Ω
Efficiency	$\leq 95,3\%$	94.5%

Model	HELR-2000-40/30
Voltage	0...2000V
Current	-40A
Resistance	1.7...2700 Ω
Efficiency	$\leq 95,5\%$

HIGH VOLTAGE
BUT SMART