

# EA-ELR 9000 HP 5 kW - 15 kW



Programmable electronic DC loads with energy recovery



EA-ELR 9200-210



- AC wide range input for 342...528 V
- Energy recovery of the supplied DC energy into the local grid
- Galvanically isolated DC input
- Input power ratings up to 15 kW per unit, expandable to 450 kW
- Input voltages up to 1500 V
- Input currents up to 510 A per unit
- FPGA based digital control
- Multilingual TFT touch panel
- User profiles, true function generator
- Galvanically isolated analog and USB interface
- Master-slave bus for parallel connection
- Optional, digital, plug & play interfaces or alternatively installed GPIB port
- SCPI command language & ModBus RTU
- LabView support

## General

The new series of electronic DC loads with energy recovery to mains, called EA-ELR 9000 HP, is an advancement of the series EA-ELR 9000. It offers a wider AC input range for the operation on industrial grids with **380 V, 400 V or 480 V** three-phase supply.

Furthermore, all models offer a higher power rating and there is a new voltage class for 0...360 V. The insulation of some high voltage models has also been improved.

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 electronic load series of other manufacturers.

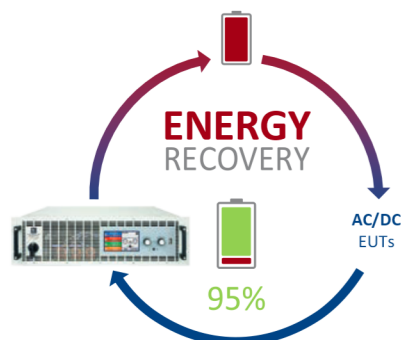
## Power ratings, voltages, currents

The available voltage range portfolio goes from models with 0...80 V DC up to models with 0...1500 V DC. Input currents up to 510 A with only one unit are available. The series offers three power classes with 5 kW, 10 kW or 15 kW in only 3U for single devices, which can be extended up to 480 kW in cabinets for a significantly high total current.

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### Supply

All models require a 2-phase or 3-phase mains supply without N conductor, as typical in the industrial grids. The devices offer a wide range AC input with 342 - 528 V AC, covering common international grid ratings between 380 V and 480 V.



### Energy recovery

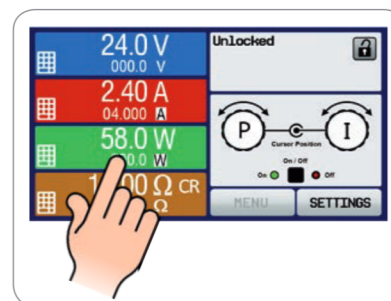
The most important feature of these electronic loads is that the AC input, i.e. grid connection, is also used as output for the recovery of the supplied DC energy, which will be converted with an efficiency of up to 95%. This way of energy recovery helps to lower energy costs and avoids expensive cooling systems, such as they are required for conventional electronic loads which convert the DC input energy into heat.

Operation of these recovering loads in terms of power generation is not intended. Grid protection devices, which could supervise the feedback of energy into the public grid, are available on the market for optional installation and are intended to achieve additional safety of persons and equipment, especially when running the so-called isolated operation. But such a device would usually require the N conductor.

Regardless of whether the user has installed such a supervision unit or not, the devices feature a simple and non-redundant switch-off function for the case of an interruption in the grid connection cable. The device supervises AC voltage and frequency and will automatically switch off the power stages in case upper or lower limits are exceeded.

### Operation (HMI)

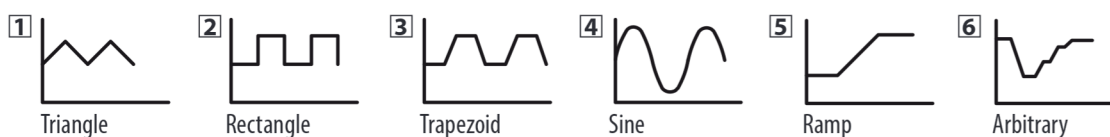
Manual operation is done with a Gorilla glass touch panel, two rotary knobs and a pushbutton. The large color display shows all relevant set values and actual values at a glance. The whole setup is also done with the human-machine interface, as well the configuration of functions (square, triangle, sine) etc. The display is multilingual (German, English, Russian, Chinese).



### Function generator and table control

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 tooth 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.



### Battery test

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. This shows extra values for elapsed testing time and consumed capacity (Ah).

Data recorded by the PC during tests with, for example, EA Power Control can be exported as Excel table in CSV format and analyzed later in MS Excel or similar tools and even visualized as a discharge diagram.

For more detailed setup, there is also an adjustable threshold to stop the battery test on low battery voltage, as well an adjustable maximum test period.

### Master-slave

All models feature a digital master-slave bus by default. It can be used to connect up to 32 units of identical models in parallel operation to a bigger system with total formation of the actual value of voltage, current and power. The configuration of the master-slave system is either completely done on the control panels of the units or by remote control via any of digital communication interfaces. Handling of the master unit is possibly by manual or remote control (any interface). Alternatively to the standard models, there are specific slave models available. See page 111.

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### Share Bus

The so-called „Share Bus“ is an analog connection at the rear of the devices and is used to balance current across multiple similar units in parallel connection, such as with loads of this series and series EA-ELR 9000.

It can also be used to build a two-quadrants system in connection with power supplies of series EA-PSI 9000 or EA-PS 9000. This system is dedicated for testing purposes using the source-sink principle.

### Remote control & connectivity

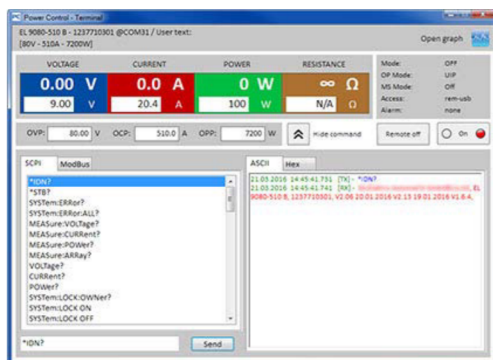
For remote control, there are by default two interface ports (1x analog, 1x USB) available on the rear of the devices, which can also be extended by optional, pluggable and retrofittable, digital interface modules (dedicated slot).

Alternatively to the interface modules slot, all models can be equipped with a three-way interface (option 3W, see below), which then offers 1x GPIB/IEEE488, 1x USB and 1x analog on the rear side of the device.

For the implementation into the LabView IDE we offer ready-to-use components (VIs) to be used with the interface types USB, RS232, GPIB or Ethernet. Other IDEs and interfaces are supported by documentation about the communication protocol.

Windows users can profit from the free software „EA Power Control“. It offers a feature called „Sequencing“, where the device is controlled through a semi-automatic table in CSV format. This table represents a simple test procedure and can be created and edited in MS Excel or other CSV editors and then imported into the software tool.

This software also allows for the control of up to 20 units at once with an optional feature called „Multi Control“ (licensed, not free of charge). See page 118 for more information.



### Options

- Pluggable and retrofittable, digital interface modules for CAN, CANopen, Ethernet, Profibus, ProfiNet, RS232, EtherCAT or ModBus TCP. See page 116.
- Three-way interface (3W) with a rigid GPIB port installed instead of the default slot for retrofittable interface modules
- Water cooling (models up to 200 V rating, for others please inquire)

### Digital interface modules



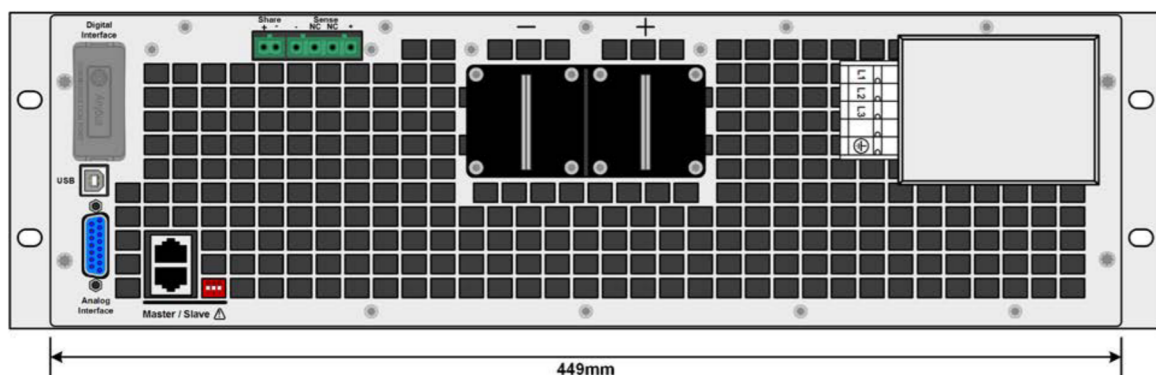
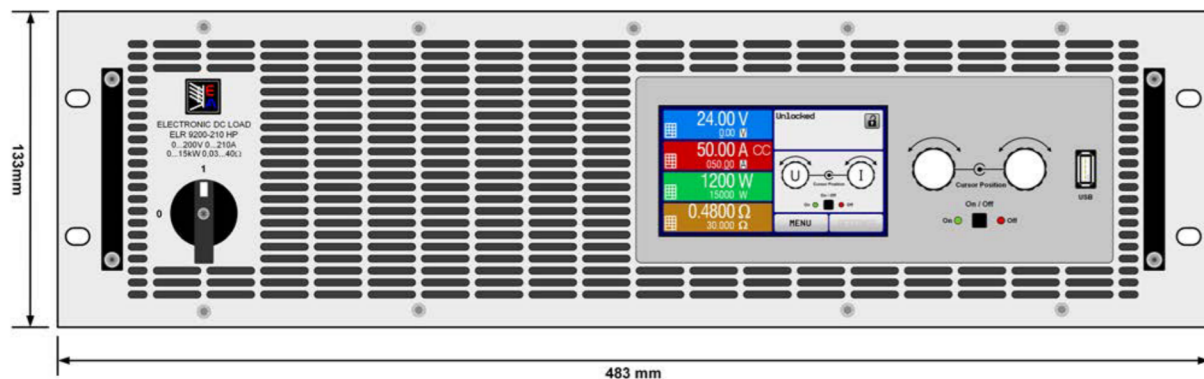
## EA-ELR 9000 HP 5 kW - 15 kW

Model	Power	Voltage	Current	Resistance	Efficiency	Weight	Ordering number <sup>(1)</sup>
EA-ELR 9080-170 HP	0...5 kW	0...80 V	0...170 A	0.02...25 Ω	92.5%	≈18 kg (39.7 lb)	33200435
EA-ELR 9200-70 HP	0...5 kW	0...200 V	0...70 A	0.1...150 Ω	93.5%	≈18 kg (39.7 lb)	33200436
EA-ELR 9360-40 HP	0...5 kW	0...360 V	0...40 A	0.3...520 Ω	93.5%	≈18 kg (39.7 lb)	33200437
EA-ELR 9500-30 HP	0...5 kW	0...500 V	0...30 A	0.5...1000 Ω	94.5%	≈18 kg (39.7 lb)	33200438
EA-ELR 9750-20 HP	0...5 kW	0...750 V	0...20 A	1.2...2200 Ω	94.5%	≈18 kg (39.7 lb)	33200439
EA-ELR 9080-340 HP	0...10 kW	0...80 V	0...340 A	0.01...13 Ω	92.5%	≈25 kg (55.1 lb)	33200440
EA-ELR 9200-140 HP	0...10 kW	0...200 V	0...140 A	0.05...75 Ω	93.5%	≈25 kg (55.1 lb)	33200441
EA-ELR 9360-80 HP	0...10 kW	0...360 V	0...80 A	0.15...260 Ω	93.5%	≈25 kg (55.1 lb)	33200442
EA-ELR 9500-60 HP	0...10 kW	0...500 V	0...60 A	0.25...500 Ω	94.5%	≈25 kg (55.1 lb)	33200443
EA-ELR 9750-40 HP	0...10 kW	0...750 V	0...40 A	0.6...1100 Ω	94.5%	≈25 kg (55.1 lb)	33200444
EA-ELR 9080-510 HP	0...15 kW	0...80 V	0...510 A	0.006...10 Ω	92.5%	≈32 kg (70.5 lb)	33200446
EA-ELR 9200-210 HP	0...15 kW	0...200 V	0...210 A	0.033...50 Ω	93.5%	≈32 kg (70.5 lb)	33200447
EA-ELR 9360-120 HP	0...15 kW	0...360 V	0...120 A	0.1...180 Ω	93.5%	≈32 kg (70.5 lb)	33200448
EA-ELR 9500-90 HP	0...15 kW	0...500 V	0...90 A	0.16...340 Ω	94.5%	≈32 kg (70.5 lb)	33200449
EA-ELR 9750-60 HP	0...15 kW	0...750 V	0...60 A	0.4...740 Ω	94.5%	≈32 kg (70.5 lb)	33200450
EA-ELR 91000-40 HP	0...15 kW	0...1000 V	0...40 A	0.8...1300 Ω	94.5%	≈32 kg (70.5 lb)	33200451
EA-ELR 91500-30 HP	0...15 kW	0...1500 V	0...30 A	2.5...3000 Ω	94.5%	≈32 kg (70.5 lb)	33200452

(1) Ordering number of the EU version, US models or such with option 3W installed have different ordering numbers



### Product views





# EA-ELR 9000 HP 5 kW - 15 kW



Technical Data	Series EA-ELR 9000 HP	
AC: Supply		
- Voltage	342...528 V, 2ph/3ph	
- Frequency	45...66 Hz	
DC: Voltage		
- Accuracy	<0.1% of rated value	
DC: Current		
- Accuracy	<0.2% of rated value	
- Load regulation 1-100% $\Delta U_{DC}$	<0.15% of rated value	
- Slew rate 10-90%	$\leq 300 \mu s$	
DC: Power		
- Accuracy	<1% of rated value	
DC: Resistance		
- Accuracy	$\leq 1\%$ of max. resistance + 0.3% of rated current	
Display / control panel	Graphics display with touch panel	
Digital interfaces		
- Built-in	1x USB type B for communication, 1x GPIB (optional with option 3W)	
- Slot	1x for retrofittable plug-in modules (standard models only)	
Analog interface	Built-in, galvanically isolated	
- Signal range	0...5 V or 0...10 V (switchable)	
- Inputs	U, I, P, R, remote control on-off, DC input on-off, resistance mode on-off	
- Output	U, I, overvoltage, alarms, reference voltage	
- Accuracy U / I / P / R	0...10 V: <0.2%	0...5 V: <0.4%
Parallel operation	Yes, with true master-slave, up to 32 units	
Standards	EN 61010-1:2011-07, EN 61000-6-3:2011-09, EN 61000-6-2:2016-05 Radiation Class B EN 50160:2011-02 Grid Class 2	
Cooling	Temperature-controlled fans (optional: water)	
Ambient temperature	0...50 °C	
Storage temperature	-20...70 °C	
Terminals on rear		
- DC input	Screw terminal	
- Share Bus & Sense	Plug connector 2 pole & 4 pole	
- Analog interface	Sub-D connector 15 pole	
- Digital interfaces	Module socket 50 pole or GPIB 24 pole, USB	
Dimensions (W x H x D)	19" x 3U x 670mm (26.4")	