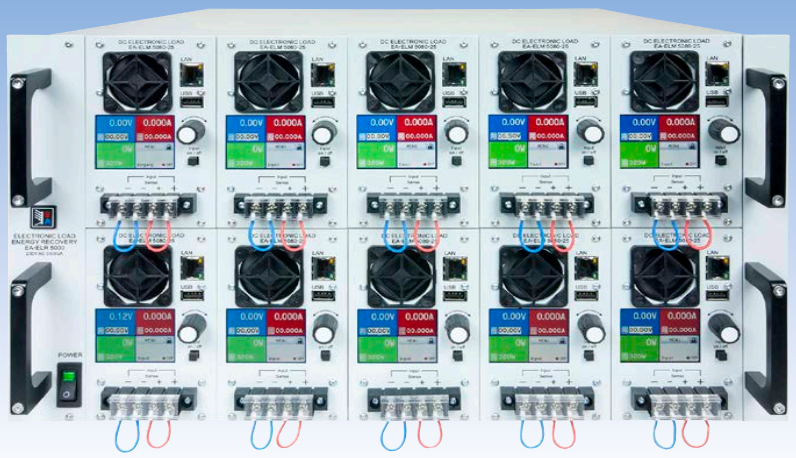
# EA-ELR 5000 320 W - 3200 W

## 能量反馈式多通道直流电子负载 / ENERGY RECOVERING MULTI CHANNEL DC LOAD

U
I
P
OVP
OCP
OPP
OTP
19"
LAN



EA-ELR 5000 机柜

- 多通道直流负载器
- 可将获得的直流能量转化并返回本地电网
- 可供能容纳10台负载模块的19“ 6U机柜
- 输入功率级别分别有：每个模块可达0...320 W
- 输入电压有：0...80 V或0...200 V
- 输入电流由：0...12 A或0...25 A
- 基于微控制器的数字化控制
- 多语言TFT触摸屏
- 序列发生器
- 内置Ethernet/LAN接口
- 支持SCPI指令语言与ModBus

### 概述

新系列EA-ELR 5000是专门设计出来以配置成多通道直流电子负载的。在一个19”的机柜系统内，可以安装10台功率为320 W的直流负载。每个模块可独立操作，但是要求机柜内安装能量转换的DC-AC逆变设备。模块还可扩展，可将模块的直流输入端并联连接起来。

负载模块有两个电压选择，一个是80 V，一个是200 V。并且配有通用的调整模式：恒压(CV)，横流(CC)与恒功率(CP)。

能量返回功能可使产生的直流电同步转化成正弦波电流，然后返回给当地电网。这不仅摆脱了以前的热耗散，同时还节省了用电成本。产品上的巨大彩色TFT触摸屏提供一个不同于其他产品的手动操作。

本产品标配一个以太网端口，从而可将负载产品轻易地集成到LAN产品的网络中。通过随附的Windows软件或者在LabView或其它IDE创建的客户定制应用可以从外部控制。另外还支持SCPI通讯协议与ModBus。

- **Multi-channel DC load**
- **Energy recovery of the supplied DC energy into the local grid**
- **19” 6U rack for up to 10 separate load modules**
- **Input power ratings: up to 0...320 W per module**
- **Input voltages: 0...80 V or 0...200 V**
- **Input currents: 0...12 A or 0...25 A**
- **µController based digital control**
- **Multilingual TFT touch panel**
- **Sequence generator**
- **Ethernet/LAN interface built-in**
- **SCPI command language and ModBus supported**

### General

The new series EA-ELR 5000 was designed to configure a multi-channel electronic DC load. In a rack for 19” systems, up to ten DC load units with 320 W nominal power each can be installed. The modular units operate separately from each other, but require the rack as it contains the energy recovering DC-AC inverter. The modules are also extendable. Parallel connection on the DC inputs of the module is possible.
The load modules come in two voltage variants, 80 V and 200 V, and incorporate the common regulation modes constant voltage (CV), constant current (CC) and constant power (CP).

The energy recovery function inverts the supplied DC energy into a synchronous sine current and feeds it back into the local grid. This reduces the usual heat dissipation to a minimum and saves energy costs at the same time. The colour TFT touch panel offers an intuitive kind of manual operation.

Equipped with an Ethernet port by default, the load units can be easily integrated into a network of LAN devices. External control is possible via an included Windows software or via custom applications created in LabView or other IDEs. The commonly known communication protocols SCPI and ModBus are supported.



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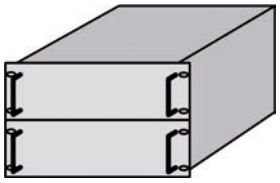
### 功率、电压和电流等级

本系列有两个负载型号。一款型号的输入电压最大为80 V DC，另一款为200 V。两款型号最大功率为320 W。因此80 V型号可以吸收电流25 A，而200 V则可吸收12 A。将10台这样的负载模块装入一单独的机柜内，可以组成最大3200 W的功率。

### 机械结构

装负载模块的机架为6U高，19“宽，深度为480 mm。适合放入不同尺寸的19“机柜。



### 供电

本机架的操作电压为230 V AC (±10%)的，可匹配16 A 的墙插或类似插座。能量反馈功能要求电网上一直接有足够的设备，并且要消耗这返回的能量。

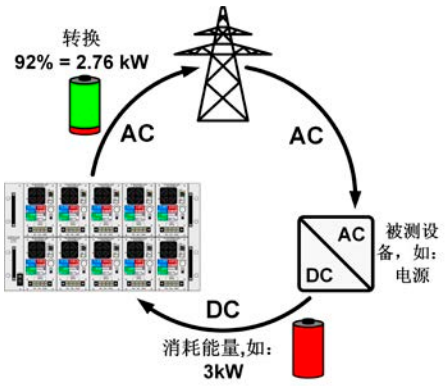
可选择给电网装一监控设备“ENS”（见140页），该设备可拆卸且为模块式。

如选择安装“ENS2”，电网将变成三相电（L1, L2, L3, N, PE）。

### 能量返回

本负载最主要的特点是其AC输入端，即电网连接端，它也可用作直流电返回的输出端，转换效率接近93%。这种能量转换方式有助于降低用电成本，且避免使用昂贵的制冷系统，因为普通电子负载使用过程中会将直流输入电量转化成热量，从而需要制冷系统进行冷却。

原理图如下：




此类回馈式负载不可用作发电。我们还共有另外一个监控设备（自动隔离件，ENS），能加强对人体与设备的安全，特别是在运行此类隔离操作的时候。

不管用户是否装有此类监控设备，我们产品配有一简易无冗余关闭功能，遇到电网连线突然断开时会关闭产品。本产品可监控AC电压和频率，当超过功率上限或下限时会自动关闭功率模块。

### Power ratings, voltages, currents

There are two load models available. One for max. 80 V DC input voltage and one for max. 200 V. Both models have a max. power of 320 W, while the 80 V model can take up to 25 A and the 200 V can take up to 12 A. By installing up to 10 units of these load modules into a single rack it is possible to extend the power to 3200 W max.

### Construction

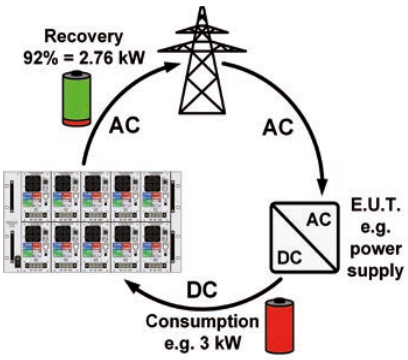
The rack, which is used to hold the load modules, is designed with 19“ width and 6U height, while having an installation depth of 480 mm. This makes it ideal for use in 19“ cabinets of various sizes.

### Supply

The rack can be operated on a normal 230 V AC (±10%), 16 A wall socket or a similar supply. The recovery feature requires to always have sufficient devices on the grid to consume the backfed energy.
The grid connection can be equipped with a supervision unit “ENS2” (see page 140) which is optionally available, retrofittable and modular.
With this option installed, the grid connection will always be three-phase (L1, L2, L3, N, PE).

### 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 approximately 93%. This way of energy recovery helps to lower energy costs and avoids expensive cooling systems, such as required for conventional electronic loads which convert the DC input energy into heat.
Principle view:




Operation of these backfeeding loads in terms of power generation is not intended. There is an additional supervision unit (automatic isolation unit, ENS) available for optional installation and to achieve additional safety of persons and equipment, especially when running the so-called isolated operation.

Regardless of whether the user has installed that 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. They supervise AC voltage and frequency and will automatically switch off the inverter block in case upper or lower limits are exceeded.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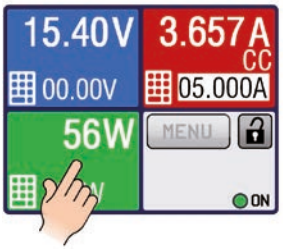
### 操作面板（HMI）

手动操作通过阻性触摸屏、两个旋钮与一个按钮来完成。这个彩色显示器能一次性显示所有设定与实际值。在人机界面也可完成整个设置，包括序列发生器的配置。

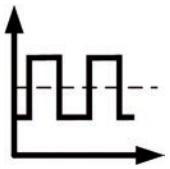



### Operation (HMI)

Manual operation is done with a resistive touch panel, two rotary knobs and a pushbutton. The colour 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 the sequence generator.

### 序列发生器

本产品还有一个特别功能，就是配有数字序列发生器。利用半自动序列块（最多100）可以控制负载产品。这些序列块由可编程的设定电压、电流与功率，再加上时间组成。发生器可以针对任何或所有设定值立刻描绘出一个方形波信号。



### Sequence generator

A special feature is the digital sequence generator. It enables to control the load unit by semi-automatic sequence blocks (max. 100). Those blocks consist of programmable set values for voltage, current and power, plus a time value. The generator can apply a rectangular wave signal to any or all set values at once.

### 远程控制 & 连接

进行远程控制时，可使用模块上面前板默认配置的Ethernet/LAN端口。通过这个连接，用户可以使用SCPI语言或协议控制模块的所有功能。

产品前方还有一个USB端口，用来插U盘，方便上传与保存序列，以便安装控制面板的固件升级文档。

应用到LabView IDE时，我们给Ethernet常用接口提供即用版(VIs)。通过通讯协议文档还可支持其它IDE与接口。可上传和存储文档。

### Remote control & connectivity

For remote control, there is by default an Ethernet/LAN port available on the front of the modules. Via this configurable connection users can completely control all functions of the modules either via SCPI language or ModBus protocol.

A USB port, also located on the front side, is intended for USB flash drives in order to load and save sequences and to install firmware updates for the HMI, i.e. control panel.

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

### 选项

- 配有16个端口的标准以太网交换机，高度仅为1U，适合装入19“机架。

### Options

- Standard Ethernet switch with 16 ports for 19” rack mount and with 1U height

| 技术参数 | Technical Data | EA-ELR 5000 Rack |
|---|---|---|
| **AC输入** | **AC connection** | |
| - 电压 | - Voltage | 230 V AC, ±10%, 45...65 Hz |
| - 功率因素校正 | - Power factor correction (PFC) | >0.99 |
| - 效率 | - Efficiency | ≥92% |
| **制冷** | **Cooling** | |
| - 类型 | - Kind | 温控风扇 / Temperature controlled fans |
| - 工作温度 | - Operation temperature | 0...50 °C |
| - 储存温度 | - Storage temperature | -20...70 °C |
| **端子** | **Terminals** | |
| - 直流输入 | - DC input | 螺丝端 / Screw terminal |
| - 感测端 | - Sense | 螺丝端 / Screw terminal |
| - 其它 | - Other | Ethernet, USB |
| **机械特性** | **Mechanics** | |
| - 每个机架可安装的负载模块 | - Load modules per rack | 最多10 / up to 10 |
| - 机架重量 | - Weight of rack | 12.25 kg |
| - 装满后机架重量 | - Weight of fully equipped rack | 35.8 kg |
| - 机架尺寸 (宽x 高 x 深) | - Dimensions of rack (WxHxD) | 19“ x 6HE / 6U x 500 mm |
| - 保护等级 | - Protection class | 1 |
| - 污染等级 | - Degree of pollution | 2 |
| 订购编号 | **Ordering number** | 33130336 |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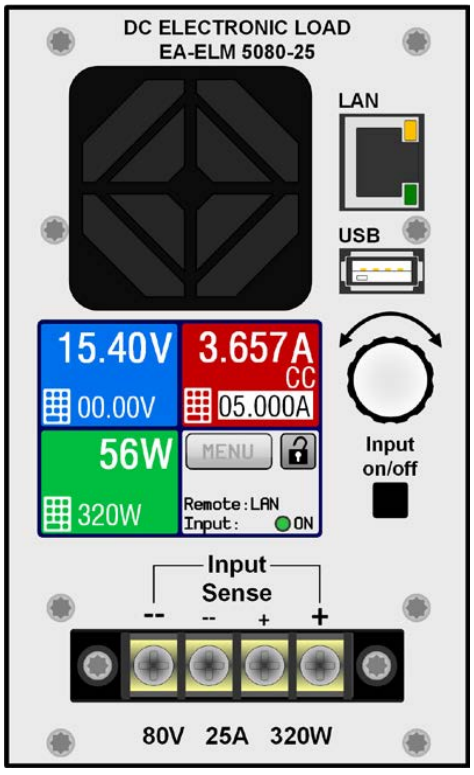
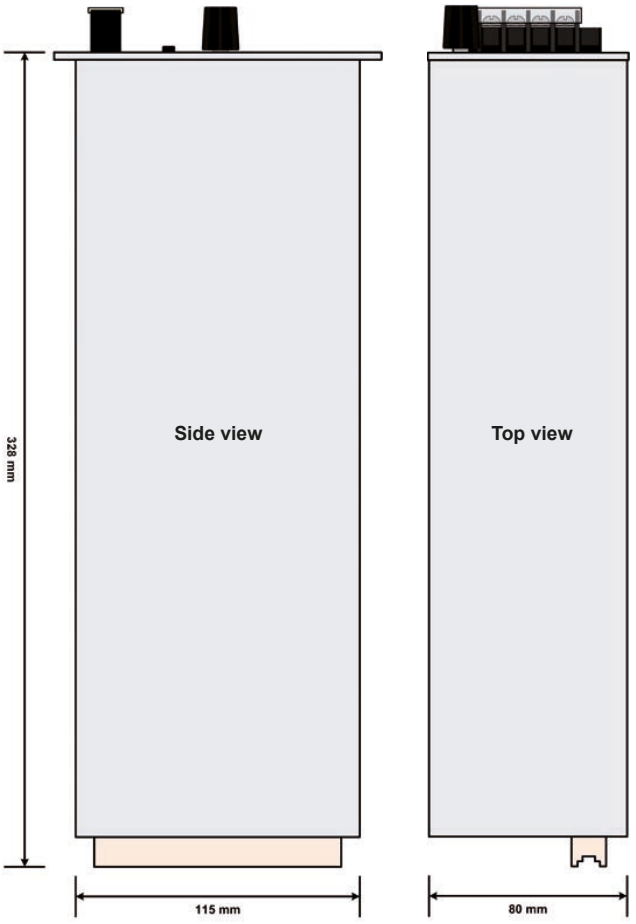
| 技术参数 | Technical Data | EA-ELM 5080-25 | EA-ELM 5200-12 |
|---|---|---|---|
| **DC输入：电压** | **DC input: Voltage** | | |
| - 范围 | - Range | 0...80 V | 0...200 V |
| - 精确度 | - Accuracy | <0.1% | <0.1% |
| - 0-100% $\Delta U_{DC}$负载调整率 | - Load regulation 0-100% $\Delta U_{DC}$ | <0.05% | <0.05% |
| - 10-90% 负载上升时间 | - Response time 10-90% load step | <1 ms | <1 ms |
| **DC输入：电流** | **DC input: Current** | | |
| - 范围 | - Range | 0...25 A | 0...12 A |
| - 精确度 | - Accuracy | <0.1% | <0.1% |
| - 0-100% $\Delta I_{DC}$负载调整率 | - Load regulation 0-100% $\Delta I_{DC}$ | <0.05% | <0.05% |
| **DC输入：功率** | **DC input: Power** | | |
| - 范围 | - Range | 0...320 W | 0...320 W |
| - 精确度 | - Accuracy | <1% | <1% |
| - 0-100% $\Delta U/I_{DC}$负载调整率 | - Load regulation 0-100% $\Delta U/I_{DC}$ | <0.2% | <0.2% |
| **显示器与面板** | **Display and panel** | 控制面板的彩显屏 / Graphics display with touch panel | |
| **数字接口** | **Digital interfaces** | | |
| - 内置(前板) | - Built-in (front side) | 1x U盘用A型USB / 1x USB type A for USB flash drives<br>1x Ethernet (SCPI, ModBus, HTTP, TCP, ICMP) | |
| **制冷** | **Cooling** | | |
| - 类型 | - Kind | 温控风扇 / Temperature controlled fans | |
| - 工作温度 | - Operation temperature | 0...50 °C | |
| - 储存温度 | - Storage temperature | -20...70 °C | |
| **端子** | **Terminals** | | |
| - 直流输入 | - DC input | 螺丝端子 / Screw terminal | |
| - 感测端 | - Sense | 螺丝端子 / Screw terminal | |
| - 其它 | - Other | Ethernet, USB | |
| **机械特性** | **Mechanics** | | |
| - 重量 | - Weight | 2.35 kg | |
| - 尺寸 (宽x 高 x 深) | - Dimensions (WxHxD) | 81 x 132,5 x 310 mm | |
| **订购编号** | **Ordering number** | 33220430 | 33220431 |




带控制面板的负载模块前视图 /
Front view of the load module with control panel



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