U I P R OVP OCP OPP OTP 19" USB MS IFAB

- 输入功率等级: 1,2 kW...7,2 kW
  还可扩展至 72 kW
- 输入电压: 0...80 V 至 0...750 V
- 输入电流：单机每台可达510 A
- 基于FPGA/DSP控制
- 多语言彩色触摸屏
- 用户配置文档，真实函数发生器
- 多个可调保护功能：OVP, OCP, OPP
- 操作模式：CV, CC, CP, CR
- 电隔离接口（模拟接口与USB接口）
- 并联用主-从总线
- 远程感测
- 可选接口有：
  - 即插即用型数字接口
- 支持SCPI & ModBus

- **Input power ratings: 1.2 kW...7.2 kW**
  Expandable in cabinets up to 72 kW
- **Input voltages: 0...80 V up to 0...750 V**
- **Input currents: up to 510 A per unit**
- **FPGA/DSP based control**
- **Multilingual colour touch panel**
- **User profiles, true function generator**
- **Adjustable protections: OVP, OCP, OPP**
- **Operation modes: CV, CC, CP, CR**
- **Galvanically isolated interfaces (analog and USB)**
- **Master-slave bus for parallel connection**
- **Remote sensing**
- **Optional:**
  - **Digital, plug & play interfaces**
- **SCPI & ModBus supported**

概述

EA-EL 9000 B系列是一款新的电子负载，它将代替之前的EA-EL 9000 系列，供应新的电压、电流与功率级别，适用于众多应用。

所有型号都有四种操作模式：恒压（CV)，恒流（CC)，恒功率(CP)和恒阻(CR)。基于FPGA的控制电路具有很多有趣的特征，比如：真实函数发生器，它可使用表格做成的函数模拟非线性内阻。

其功率损耗与高度之间的联系得到很大地提升。所有型号都只为3U高，而每台产品的直流功率的消耗能力可达7.2 kW，这个高度跟旧系列EA-EL 9000相比，降低了一半。

大的彩色TFT触摸屏可以让用户直观地进行手动操作，就像现在流行的智能手机或者平板电脑那样操作。

经模拟或数字接口控制产品时的响应时间也有很大提高，全归因于DSP处理器控制的硬件。

多台产品并联时，可以使用主从总线，将这些产品连接起来，组成更大的系统，从而实际输出值会被汇总，而设定值则分布输出。

General

The new series of compact electronic DC loads, called EA-EL 9000 B, replaces the former series EA-EL 9000 and offers new voltage, current and power ratings for a multitude of applications.
All models support the four common regulation modes constant voltage (CV), constant current (CC), constant power (CP) and constant resistance (CR). The FPGA based control circuit provides interesting features, such as a function generator with a table based function for the simulation of nonlinear internal resistances.

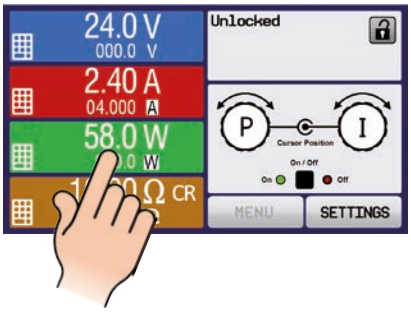
The relation between power consumption and height of the devices has been significantly increased. With only 3U height for all models and the capability of consuming DC power of up to 7.2 kW per unit the height has been reduced to half, compared to the former series EA-EL 9000.
The large colour TFT touch panel offers an intuitive kind of manual operation, such as it is prolific nowadays with smartphones or tablet computers.
Response times for the control via analog or digital interfaces have been improved by the DSP controlled hardware.

In parallel operation of multiple devices, a master-slave bus is used to link the units to a bigger system where the actual values are totalled and the set values distributed.

功率等级、电压和电流
本本系列有0...80 V DC至0...750 V DC输出电压的多个型号，单台机器的输入电流高达510A。单个型号的功率级别有很多，因此多台装入机柜内可扩展至72 kW（见145页），从而获得更大的总电流。

结构
本系列所有型号都组装在一个19“宽，3U高，460 mm深的柜式外壳内，可以很简便地配进不同尺寸的19“机柜，比如42U。，以组成更高的功率。还可将不同的设备安装到机柜系统，比如：电子负载与电源一起，这样可以组成一个大功率的供电-吸收电的系统。

操作面板（HMI）
手动操作通过TFT触摸屏、两个旋钮与一个按钮来完成。大的彩色显示器一次性显示所有设定与实际值。通过人机界面可完成整个设置，包括函数（方形，三角形，正弦形）的配置等。
还提供多语言显示（德文，英文，俄文，中文）。



函数发生器与表格控制
本产品还具有一基于FPGA的数字函数与任意发生器。它可控制和运行用户定制的负载配置文档，并产生任意顺序的正弦、方形、锯齿形以及跳跃型函数。

通过可自由编程的4096点数值表，能实时嵌入到控制电路中，然后可重现非线性内阻，就像电池或LED灯条中的内阻。

远程控制 & 连接
进行远程控制时，可使用产品后板默认配置的两个接口卡端口（1x analog, 1x USB）与一个模拟接口。这些端口还可装上插拔式数字接口模块（指定插槽）进行扩展。

另外，本系列所有型号还配有一个三位接口（3 W功率，见下面描述），它为产品提供了1x GPIB/IEEE，1X USB与1x Analog接口。

应用到LabView IDE时，我们给USB, RS232, GPIB与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。

Share-Bus-共享总线
在产品后板有一个模拟连接端子叫“Share Bus”，可用来并联连接多台类似的产品，从而均衡输出电流，比如本系列的多台负载并联，或者与EA-ELR 9000系列并联。

同时通过此端子连接EA-PSI 9000，EA-PS 9000与EA-PSE 9000，还可组建两象限系统。该系统专门利用源-沉原理做测试用途。

Power ratings, voltages, currents
The available voltage range portfolio goes from models with 0...80 V DC up to models with 0...750 V DC. Input currents up to 510 A with only one unit are available. The series offers various power classes amongst the single models, which can be extended up to 72 kW in cabinets (see from page 145) for a significantly higher total current.

Construction
All models are built in 19“ wide rack enclosures with 3U height and 460 mm depth, which makes them ideal for use in 19“ cabinets of various sizes, for example 42U, and for the design of systems with very high power. It is furthermore possible to build cabinet systems with mixed equipment, i.e. electronic loads and power supplies, in order to achieve the source-sink principle with high power ratings.

Handling (HMI)
Manual operation is done with a TFT touch-panel, two rotary knobs and a pushbutton. The large 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 as 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 controlling and running user-customisable load profiles and can generate sine, square, saw tooth and ramp functions in arbitrary order.
With a freely programmable digital value table of 3276 effective points, which is embedded in the control circuit, the devices can reproduce non-linear internal resistances, such as those of batteries or LED chains.

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 3 W, see below), which then offers 1x GPIB/IEEE, 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 and Ethernet. Other IDEs and interfaces are supported by documentation about the communication protocol.

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, EA-PS 9000 and EA-PSE 9000. This system is dedicated for testing purposes using the source-sink principle.

功率降额

EA-EL 9000 B系列产品具有热降额功能，当产品在最大功率级别下运行时避免过热。

环境温度越低，冷却状况越好，负载可吸收的功率就越大。功率降额后可持续吸收的功率是在25°C室温条件下定义的，并当温度上升时会快速减少。

电池测试模式

本产品还有一电池测试模式，可以通过恒流或恒阻放电来测试各类电池。它会显示累计的测试时间与消耗的容量 (Ah)。

如果用EA Power Control进行测试，数据会记录在电脑上，然后以CSV格式导出数据表。后续可在MS Exce或类似工具下进行分析，甚至能创建可视化的放电图。

关于更详细的设置，可以设定一可调极限值，以便停止低电压电池的测试，或者停止可调最大测试期。

选项

- 可插拔式数字接口模块，如CANopen, Ethernet (1个或2个端口)，Profibus，ProfiNET (1个或2个端口)，RS232，DeviceNet与ModBus-TCP。请见138页。

Power derating

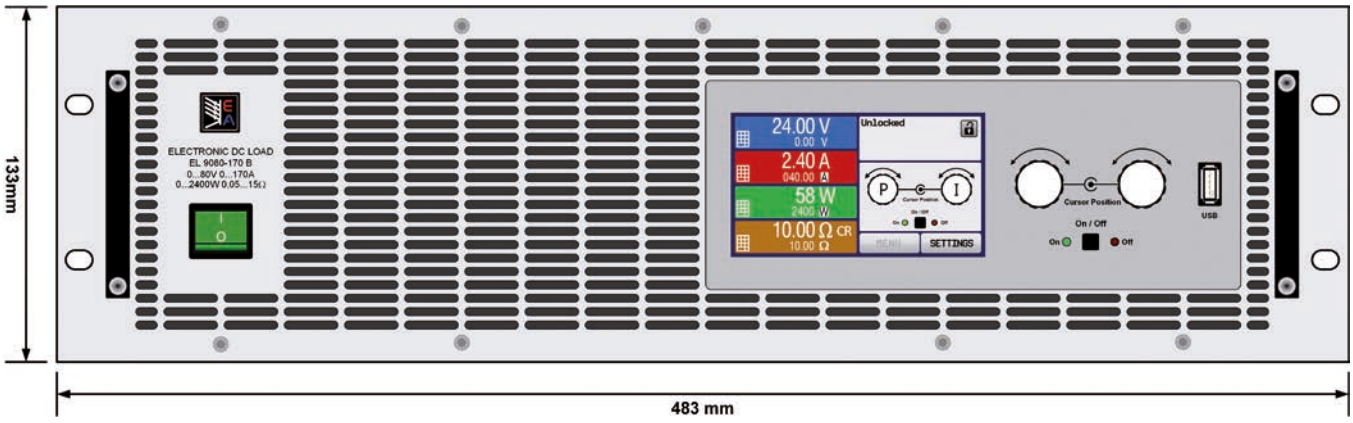
The devices of the EA-EL 9000 B series are equipped with thermal derating in order to avoid overheating when operating in the maximum power range.
The lower the ambient temperature and the better the cooling, the higher the power that the load can take. The continuous intake power after derating is stable up to 50°C ambient temperature.

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 show 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 analysed later in MS Excel or similar tools and even visualised 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.

Options

- Pluggable and retrofittable, digital interface modules for CANopen, Ethernet (1 or 2 ports), Profibus, ProfiNet I/O (1 or 2 ports), RS232, DeviceNet and ModBus-TCP. See page 138.



型号	功率 / Power	电压	电流	Strom	内阻	I最大时的最小电压(3	重量	订购编号 (1
Model	**峰值 / Peak**	**恒定值 (2/ Steady (2**	**Voltage**	**Current**	**Resistance**	**U_{Min} for I_{Max} (3**	**Weight**	**Ordering number (1**
EA-EL 9080-170 B	2400 W	1200 W	0...80 V	0...170 A	0.045...15 Ω	≈ 2.2 V	≈ 9 kg	33200260
EA-EL 9200-70 B	2000 W	1200 W	0...200 V	0...70 A	0.25...85 Ω	≈ 2 V	≈ 9 kg	33200261
EA-EL 9360-40 B	1800 W	1200 W	0...360 V	0...40 A	0.8...270 Ω	≈ 2 V	≈ 9 kg	33200262
EA-EL 9500-30 B	1200 W	1200 W	0...500 V	0...30 A	1.5...500 Ω	≈ 6.5 V	≈ 9 kg	33200263
EA-EL 9750-20 B	1200 W	1200 W	0...750 V	0...20 A	3.5...1100 Ω	≈ 5.5 V	≈ 9 kg	33200264
EA-EL 9080-340 B	4800 W	2400 W	0...80 V	0...340 A	0.023...7.5 Ω	≈ 2.2 V	≈ 13 kg	33200265
EA-EL 9200-140 B	4000 W	2400 W	0...200 V	0...140 A	0.13...43 Ω	≈ 2 V	≈ 13 kg	33200266
EA-EL 9360-80 B	3600 W	2400 W	0...360 V	0...80 A	0.4...135 Ω	≈ 2 V	≈ 13 kg	33200267
EA-EL 9500-60 B	2400 W	2400 W	0...500 V	0...60 A	0.75...250 Ω	≈ 6.5 V	≈ 13 kg	33200268
EA-EL 9750-40 B	2400 W	2400 W	0...750 V	0...40 A	1.75...550 Ω	≈ 5.5 V	≈ 13 kg	33200269
EA-EL 9080-510 B	7200 W	3600 W	0...80 V	0...510 A	0.015...5 Ω	≈ 2.2 V	≈ 17 kg	33200270
EA-EL 9200-210 B	6000 W	3600 W	0...200 V	0...210 A	0.08...28 Ω	≈ 2 V	≈ 17 kg	33200271
EA-EL 9360-120 B	5400 W	3600 W	0...360 V	0...120 A	0.27...90 Ω	≈ 2 V	≈ 17 kg	33200272
EA-EL 9500-90 B	3600 W	3600 W	0...500 V	0...90 A	0.5...167 Ω	≈ 6.5 V	≈ 17 kg	33200273
EA-EL 9750-60 B	3600 W	3600 W	0...750 V	0...60 A	1.2...360 Ω	≈ 5.5 V	≈ 17 kg	33200274

(1 参数此为标准版的订购编号，装3 W选项的型号编号则有不同 / Ordering number of the standard version, models with option 3 W installed have different ordering numbers
(2 室温为 25°C 时的参数 / At 25°C ambient temperature
(3 给负载提供最小的直流输入电压，以获得最大的输入电流 / Minimum DC input voltage to supply for the load to achieve the max. input current

技术参数	Technical Data	Series EA-EL 9000 B / 系列
AC输入电压	**AC input**	
- 电压 / 频率	- Voltage / Frequency	90...264 V, 45...66 Hz
- 功率因素校正	- Power factor correction (PFC)	>0.99
- 功率损耗	- Power consumption	最大40 W
DC输入：电流	**DC input: Current**	
- 精确度	- Accuracy	<0.2%
- 1-100% ΔU_{DC}负载调整率	- Load regulation 1-100% ΔU_{DC}	<0.1%
- 10-90% 负载上升时间	- Rise time 10-90% load step	<50 µs
DC输入：电压	**DC input: Voltage**	
- 精确度	- Accuracy	<0.1%
- 0-100% ΔI_{DC}负载调整率	- Load regulation 0-100% ΔI_{DC}	<0.05%
DC输入：功率	**DC input: Power**	
- 精确度	- Accuracy	<0.5%
DC输入：内阻	**DC input: Resistance**	
- 精确度	- Accuracy	≤额定电流的1% + 0,3% / ≤1% + 0.3% of nominal current
显示器与面板	**Display and panel**	TFT控制面板的彩显屏 / Graphics display with TFT touch panel
数字接口	**Digital interfaces**	
- 内置型	- Built-in	1x USB Typ B (通讯用) / 1x USB type B for communication 1x GPIB (3 W通讯选项用) / 1x GPIB (optional with option 3 W)
- 插槽型	- Slot	1x 可拆装内置模块用 (仅针对标准型号) / 1x for retrofittable plug-in modules (standard models only)
模拟接口	**Analog interface**	
- U / I / P / R设定输入脚	- Setting inputs U / I / P / R	0...10 V / 0...5 V
- U / I监控输出脚	- Monitoring outputs U / I	0...10 V / 0...5 V
- 控制信号	- Control signals	远程开-关，直流输入开-关，内阻模式开-关 / Remote on-off, DC input on-off, resistance mode on-off
- 状态信号	- Status signals	过压保护，过温保护 / Overvoltage, Overtemperature
- 参考电压	- Reference voltage	10 V / 5 V
制冷	**Cooling**	温控风扇 / Temperature controlled fans
- 操作温度	- Operation temperature	0...50 °C
- 储存温度	- Storage temperature	-20...70 °C
前板端子	**Terminals on rear panel**	
- 负载输入	- Load input	螺丝端子 / Screw terminal
- 共享总线 & 远程感测	- Share Bus & Sense	2 & 4针插头/ Plug connector 2 pole & 4 pole
- 模拟接口	- Analog interface	15-针Sub-D连接器 / Sub-D connector 15 pole
- 数字接口	- Digital interfaces	24针GPIB卡用模块插座 / Module socket or GPIB 24pole Master-Slave (2x RJ45), USB
尺寸 [1] (宽x 高 x 深)	- Dimensions [1] (W H D)	19“ 3 HE/U 464 mm

[1] 仅为外壳尺寸 / Enclosure only