EA-EL 9000 DT   400 W - 1200 W

可编程直流电子负载
Programmable Electronic DC loads

EA-EL 9080-60 DT

| U | I | P | R | OVP | OCP | OPP | OTP | ⎍ | USB |

| LAN | ⬚ |

- 输入功率级别：0...400 W至0...1200 W
- 输入电压：0...80 V至0...750 V
- 输入电流：0...5 A至0...60 A
- 多语言彩色触摸屏
- 用户配置文档，真实函数发生器
- 可调保护功能：OVP, OCP, OPP
- 操作模式：CV, CC, CP, CR
- 标配以太网、模拟与USB端口
- 带有倾斜支撑架的提手
- 支持SCPI & ModBus RTU
- 带控制软件(Windows)
- LabView VIs

- Input power ratings: 0...400 W up to 0...1200 W
- Input voltages: 0...80 V up to 0...750 V
- Input currents: 0...5 A up to 0...60 A
- Multilingual colour touch panel
- User profiles, true function generator
- Adjustable protections: OVP, OCP, OPP
- Operation modes: CV, CC, CP, CR
- Ethernet, analog and USB port as standard
- Carrying handle with tilt stand
- SCPI & ModBus RTU supported
- Control software (Windows)
- LabView VIs

概要

EA-EL 9000 DT系列是一款新的小型电子负载，由EA-EL 9000 T系列扩展出来的10款新型号，组装于桌面式外壳内。它提供新的电压、电流与功率，适合实验室、学校或车间日常的众多应用。

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)。控制电路的核心部件是一个微处理器，它具有很多有趣的特征，比如：配通用函数的真实函数发生器，如：正弦波，方波或三角波，还有一个任意函数。
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。

跟旧系列电子负载相比，经模拟或数字接口控制产品时的响应时间已大大提高，全归因于ARM处理器控制的硬件。

General

The new series of compact electronic DC loads, called EA-EL 9000 DT, extends series EA-EL 9000 T by 10 models in a desktop enclosure to round up the portfolio of electronic loads. It offers new voltage, current and power ratings for a multitude of applications for daily use in laboratories, schools or workshops.

All models support the four regulation modes constant voltage (CV), constant current (CC), constant power (CP) and constant resistance (CR). The core of the control circuit is a fast microprocessor which provides interesting features, such as a true function generator with common functions like sine wave, rectangle or triangle, but also an arbitrary function.
The colour TFT touch panel offers an intuitive kind of manual operation, like it is prolific with smartphones or tablet computers.

Response times during the control of the devices via analog or digital interface have been improved by an ARM processor controlled hardware, compared to older electronic load series.

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本系列标配有一些数字接口，如USB与以太网端口，以及模拟端口。所有端口都电隔离。
通过公共协议SCPI和ModBus-RTU以及即用型LabView组件，简化了针对各种定制应用程序的远程控制和应用。

Digital interfaces, such as USB and Ethernet, are standard with this series, as well as an analog one. All interfaces are galvanically isolated.
Remote control and implementation into custom applications for every purpose is simplified by the common protocols SCPI and ModBus RTU, as well as by ready-to-use LabView components.

功率等级、电压和电流

本系列有0...80　V至0...750　V输入电压，0...5A至0...60A输入电流的产品型号。输入功率有两个级别，峰值功率为600W或1200W。
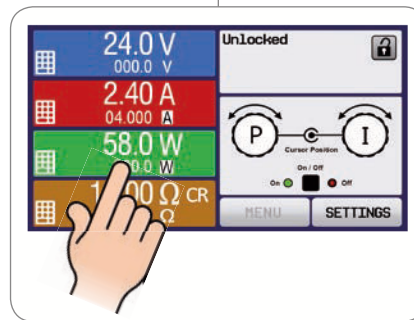
Power ratings, voltages, currents

The voltage range portfolio goes from models with 0...80 V DC up to models with 0...750 V DC. Input currents with 0...5 A up to 0...60 A per unit are available. The series offers two power classes with 600 W or 1200 W peak power.

操作面板（HMI）

通过TFT触摸屏、两个旋钮与一按钮，可对本产品进行手动操作。大的彩显屏会显示所有相关的设定值与实际值。经人机界面可完成整个设置，以及函数的配置（方波，三角波，正弦波）等。

显示器为多语言界面（有德文，中文，英文，俄文）。

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 the configuration of functions (square, triangle, sine) etc.
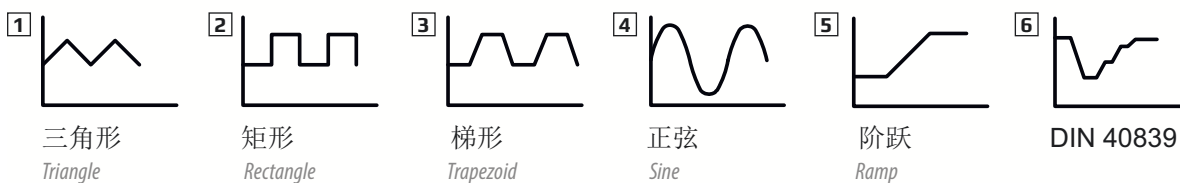The display is multilingual (German, English, Russian, Chinese).

函数发生器

本系列所有型号都具有一可形成如下典型函数的真实函数发生器，并能将它们应用于输入电压或输入电流上。发生器可通过前板的触摸屏进行全面的设置，或经某一数字接口进行远程控制。

预设函数会为用户提供所有必须的参数，如Y偏差值，时间/频率或幅度，整套配置完成。

Function generator

All models within this series include a function generator which can generate typical functions, as displayed in the figures below, and apply them to either the input voltage or the input current. The generator can be completely configured and controlled by using the touch panel on the front of the device, or by remote control via one of the digital interfaces.
The predefined functions offer all necessary parameters to the user, such as Y offset, time / frequency or amplitude, for full configuration ability.

| 1 三角形 Triangle | 2 矩形 Rectangle | 3 梯形 Trapezoid | 4 正弦 Sine | 5 阶跃 Ramp | 6 DIN 40839 |

除了基于任意发生器产生的标准函数外，它还可形成某些复杂的函数，并能分成多达99组序列。这些可用于研发和生产的测试。通过前板的USB端口可将这些序列上载使用或存储于标准U盘上，这样方便更换不同的测试序列。

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. These can be used for testing purposes in development and production. The sequences can be loaded from and saved to a standard USB flash drive via the USB port on the front panel, making it easy to change between different test sequences.

电池测试

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(Ah)与消耗的容量 (Wh)。

EA Power Control测试期间，由电脑记录的数据，可以CSV格式导出Excel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，还可设定一可调极限值，当电池电压低时停止测试，或者停止可调最大测试期。

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. It counts values for elapsed testing time and consumed capacity (Ah) and energy (Wh).
Data recorded by the PC during tests with 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.

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功率降额

EA-EL 9000 DT系列产品具有热降额功能，可避免产品在最大功率下运行时过热。

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。

远程控制 & 连接

本产品后板标配有USB、以太网与模拟端口，可经其进行远程控制。

产品前板还有一个USB端口，可以插U盘，以便上传与保存函数和用户配置文档。

Windows用户还可使用"EA Power Control"免费软件。它具有"排序"功能，通过CSV格式的半自动化表格控制产品。此表能代表简易的测试程序，可在MS Excel或其它CSV编辑器下创建与编写，然后导入软件工具内。

该软件利用"多功能控制"特性（需注册码，非免费），可一次性监控多达20台产品。更多信息见136页

可选项

- 19"系统安装架（2U）

Power derating

The devices of the EA-EL 9000 DT 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 nominal intake power before the derating starts is defined at 25°C ambient temperature.

Remote control & connectivity

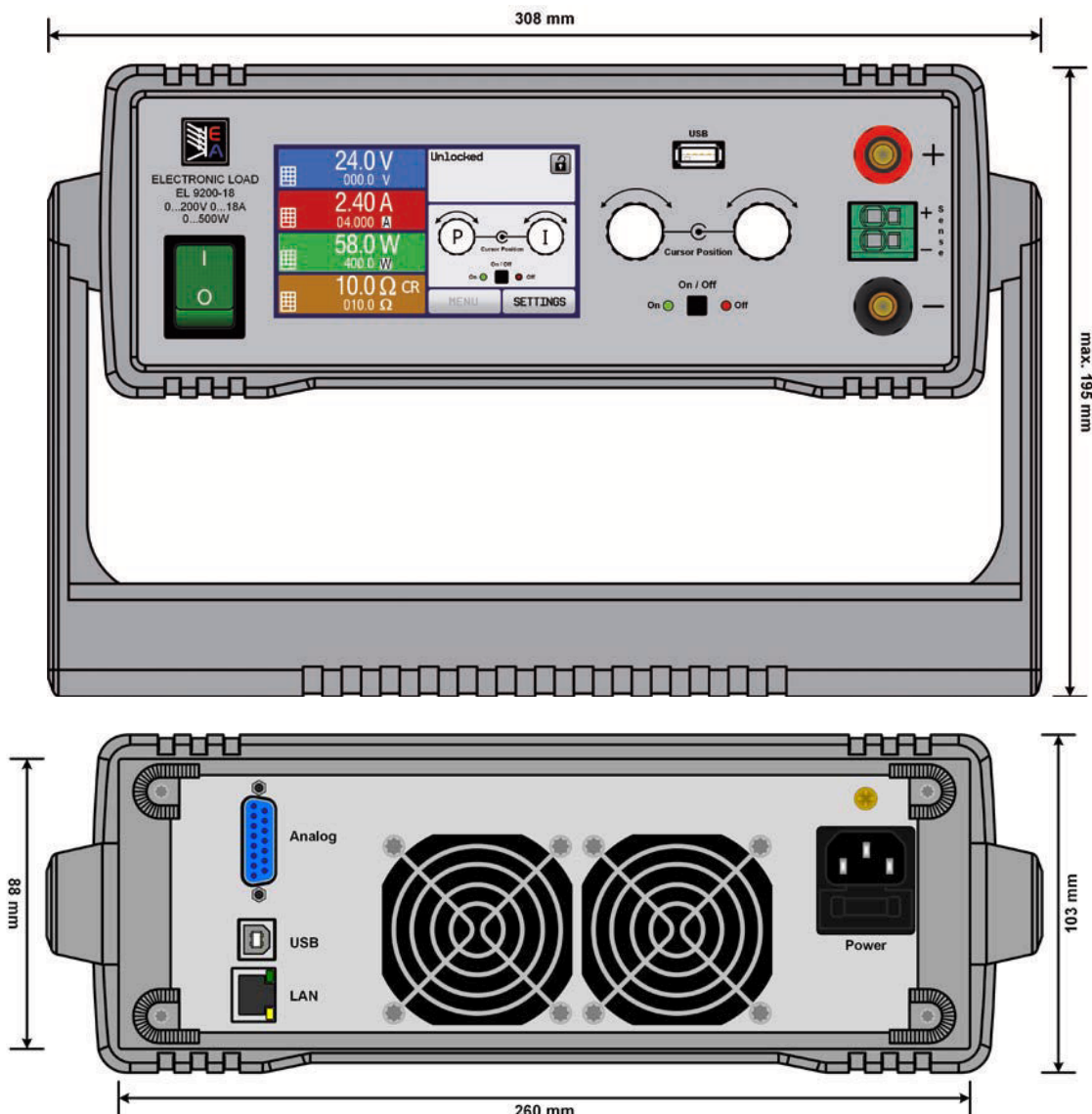For remote control, there are USB, Ethernet and analog ports available as standard on the rear of the devices.

Another USB port, located on the front side, is intended for USB sticks in order to load and save functions and user profiles.

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 136 for more information.

Options

- Mounting frame (2U) for 19" systems

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技术参数	Technical Data	Series EA-EL 9000 DT / 系列	
交流：供电	AC: Supply		
- 电压	- Voltage	90...264 V,	
- 频率	- Frequency	45...66 Hz	
- 功率损耗	- Power consumption	最大 / max. 40 W	
直流：电压	DC: Voltage		
- 精确度	- Accuracy	<额定值的0.1% / <0.1% of rated value	
直流：电流	DC: Current		
- 精确度	- Accuracy	<额定值的0.2% / <0.2% of rated value	
- 1-100% ΔU_{DC}的负载调整率	- Load regulation 1-100% ΔU_{DC}	<额定值的0.1% / <0.1% of rated value	
- 10-90%上升时间	- Rise time 10-90%	<50 μs	
直流：功率	DC: Power		
- 精确度	- Accuracy	<额定值的0.5% / <0.5% of rated value	
直流：内阻	DC: Resistance		
- 精确度	- Accuracy	≤最大电阻的1% + 额定电流的0.3% / ≤1% of max. resistance + 0.3% of nominal current	
显示器与控制面板	Display and control panel	TFT触摸屏彩色显示器 / Graphics display with TFT touch panel	
数字接口	Digital interfaces	1x B类USB端口（通讯用） / 1x USB type B (for communication) 1x A类USB端口（存储设备用） / 1x USB type A (for storage device) 1x Ethernet	
模拟接口	Analog interface	内置，15针D-Sub母插，电隔离 / Built in, 15-pole D-Sub (female), galvanically isolated	
- 信号范围	- Signal range	0...5 V 或 0...10 V (可切换) / 0...5 V or 0...10 V (switchable)	
- 输入脚	- Inputs	U / I / P / R, 远程开-关，直流输入开-关，内阻模式开-关 / U / I / P / R, Remote on-off, DC input on-off, resistance mode on-off	
- 输出脚	- Outputs	U, I,，过压，报警，参考电压 / U, I, overvoltage, alarms, reference voltage	
- U / I / P / R精确度	- Accuracy U / I / P / R	0...10 V: <0.2%	0...5 V: <0.4%
制冷方式	Cooling	温控风扇 / Temperature controlled fans	
工作温度	Operation temperature	0...50 ℃	
储存温度	Storage temperature	-20...70 ℃	
机械结构	Mechanics		
- 尺寸 (宽x高x深) [1]	- Dimensions (W x H x D) [1]	308 x 103 x 415 mm	
- 重量	- Weight	600 W: ~ 6.5 kg	1200 W: ~ 7.5 kg

[1 仅为机身尺寸 / Body only

型号	功率 @ 25℃	功率 @ 40℃	电压	电流	内阻	I_{Max}时U_{Min} [1]	订购编号
Model	Power @ 25℃	Power @ 40℃	Voltage	Current	Resistance	U_{Min} for I_{Max} [1]	Ordering number
EA-EL 9080-45 DT	600 W	500 W	0...80 V	0...45 A	0.09...30 Ω	~ 2.2 V	33210501
EA-EL 9200-18 DT	500 W	500 W	0...200 V	0...18 A	0.5...170 Ω	~ 2 V	33210502
EA-EL 9360-10 DT	450 W	450 W	0...360 V	0...10 A	1.6...540 Ω	~ 2 V	33210503
EA-EL 9500-08 DT	400 W	400 W	0...500 V	0...8 A	3...1000 Ω	~ 6.5 V	33210504
EA-EL 9750-05 DT	400 W	400 W	0...750 V	0...5 A	7...2200 Ω	~ 5.5 V	33210505
EA-EL 9080-60 DT	1200 W	800 W	0...80 V	0...60 A	0.09...30 Ω	~ 2.2 V	33210506
EA-EL 9200-36 DT	1000 W	800 W	0...200 V	0...36 A	0.5...170 Ω	~ 2 V	33210507
EA-EL 9360-20 DT	900 W	800 W	0...360 V	0...20 A	1.6...540 Ω	~ 2 V	33210508
EA-EL 9500-16 DT	600 W	600 W	0...500 V	0...16 A	3...1000 Ω	~ 6.5 V	33210509
EA-EL 9750-10 DT	600 W	600 W	0...750 V	0...10 A	7...2200 Ω	~ 5.5 V	33210510

[1 用最小直流输入电压供给负载以获得最大输入电流 / Minimum DC input voltage to supply for the load to achieve the max. input current