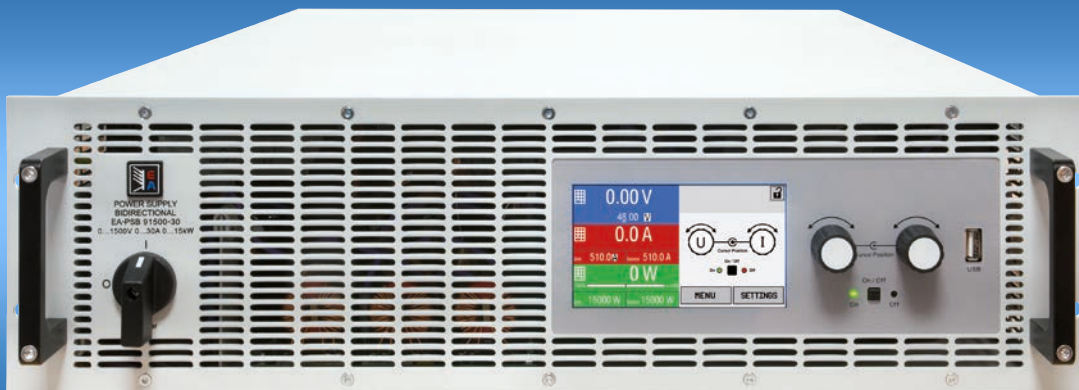


EA-PSB 9000 3U 5 kW - 15 kW



双向可编程直流电源

Programmable bidirectional DC power supplies



EA-PSB 91500-30 3U



- 宽范围交流输入电压：360...528 V，可在400 V与480 V电网下操作
- 双向-电源与负载融为一体
- 高效的能量回馈
- 输出功率：5 kW, 10 kW或15 kW, 还可扩展至480 kW
- 输出电压：60 V 至 1500 V
- 输出电流：30 A 至 360 A
- 灵活的功率调整输出
- 各种保护功能 (OVP, OCP, OPP, OTP)
- TFT触摸屏显示器，可显示参数、状态与报警
- 具自动感测功能的远程感测端
- 电隔离模拟接口
- 内置函数发生器
- 电池测试，MPP追踪模拟
- 本机配USB端口
- 可选数字接口模块
- EMC符合EN 55022等级B标准
- 支持SCPI与ModBus RTU
- 支持并提供LabView VI程序包

- AC wide range input 360-528 V, for operation on 400 V and 480 V grids
- Bidirectional - power supply and load in one
- Energy recovery with high efficiency
- Power ratings: 5 kW, 10 kW or 15 kW, expandable up to 480 kW
- Voltage ratings: 60 V up to 1500 V
- Current ratings: 30 A up to 360 A
- Flexible, power regulated DC->AC stage
- Various protection circuits (OVP, OCP, OPP, OTP)
- Intuitive TFT touch panel with display for values, status and notifications
- Remote sensing with automatic detection
- Galvanically isolated, analog interface
- Integrated function generator
- Battery test, MPP tracking simulation
- USB port integrated
- Optional, digital interface modules
- SCPI and ModBus RTU
- LabView support by VI package

概要

这款微处理器控制的双向电源EA-PSB 9000 3U系列，融合了两个设备，一台电源（源）与一台能量回馈式负载（汇）。基于这两个设备的特征，产品也具有标准的两象限功能。其内部的电子负载通过给直流端子上的必要电容放电来实现高电压动态。如果连接的是电源，本产品是具有能量回馈功能的全电子负载，比如像EA-ELR 9000。

General

The microprocessor controlled, bidirectional power supplies of series EA-PSB 9000 3U incorporate two devices in one: a power supply (source) and an electronic load (sink) with energy recovery. Based on these two features the devices incorporate the functionality of two-quadrants operation as standard. The internal electronic loads achieves a high voltage dynamics by discharging the necessary capacitors located on the DC terminal. For a connected source, the device is a full electronic with energy recovery feature, such as in series EA-ELR 9000.

EA-PSB 9000 3U 5 kW - 15 kW

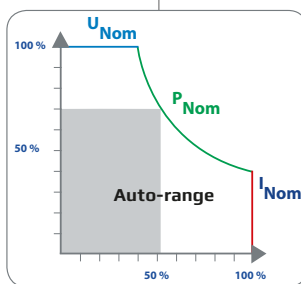
在电源操作模式下，本产品可以被当做灵活调整的宽范围电源，如EA-PSI 9000系列。将两种设备类型的优点融合在一起，同时消除了单个产品关于重量、空间和花时间去将其应用到定制测试软件中的缺点。

AC输入/输出

所有型号都采用主动式功率因数，专门为标准的400 V至480 V AC 两相或三相交流电而设计。作为负载运行时，本产品会转化损耗的直流电能，并将其返回到本地电网。这有助于节省大量的用电成本。

自动调整的功率级

本系列所有型号的双向功率都可灵活调整。可在较低电流时输出较高电压，或在低电压时输出较高电流，但总是维持在最大额定功率范围内。因此仅用一台产品就能覆盖广泛的应用。



直流输出

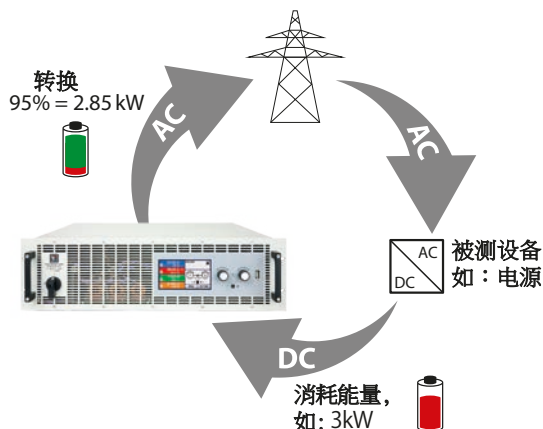
本系列有0...60 V和0...1500 V电压，0...30 A和0...360 A电流，0...5 kW, 0...10 kW或0...15 kW输出功率的不同型号。输出端位于产品后板上。

汇-源操作

本系列的另外一个重要特征是将称为汇电子负载，跟称为源的电源集成在一个产品上。意思是，它不仅可以当汇操作，也可当源运行。两种操作模式间的切换没有任何终端，也没有时间延迟。这也称为两象限操作。实际的操作模式会显示于显示器上。

能量返回

本负载最主要的特点是，当与电网连接时，其AC输入端，也可用作带载操作期间所供直流电量返回时的输出端，且转换效率高达95%。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。原理示意图如下：



In source operation mode the device becomes a flexible, auto-ranging power supply like those of series EA-PSI 9000. It incorporates the advantages of both device types into one and at the same time it eliminates the disadvantages of separate units regarding weight, space requirement and effort to implement them into custom test software.

AC input/output

All models are provided with an active Power Factor Correction circuit and are designed for a usage on a two- or three-phase supply with the typical standard rating of 400 V or 480 V AC. During load operation, the device regenerates the consumed DC energy and feeds it back into the local power network. This help saving a lot of energy costs.

Auto-ranging power stage

All models are equipped with a flexible auto-ranging bi-directional power stage which provides a higher output voltage at lower output current, or a higher output current at lower output voltage, always limited to the max. nominal output power. The power set value is adjustable with these models. Therefore, a wide range of applications can already be covered by the use of just one unit.

DC output

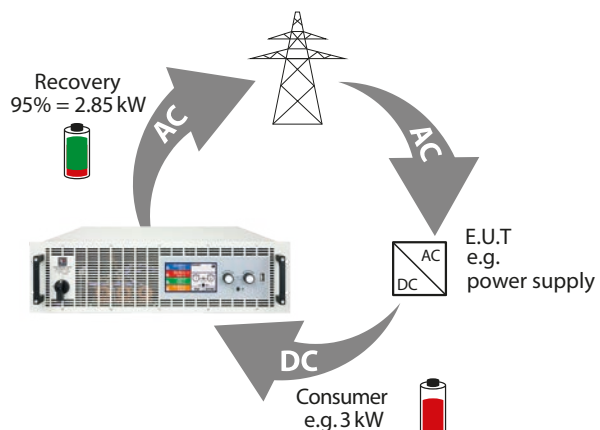
DC voltages between 0...60 V and 0...1500 V, currents between 0...30 A and 0...360 A and output power ratings of 0...5 kW, 0...10kW, 0...10 kW or 0...15 kW are available. The DC terminal is located on the rear panel.

Source-sink operation

One salient feature of these devices is the coalescence of an electronic load, also called sink, and a power supply, also called source, into one unit. It means, the device can not only arbitrarily operate as sink or source, the switchover between these two operating modes occurs without interruption and time loss. This is also called two-quadrants operation. The actual operating mode is indicated in the display.

Energy recovery

The most important feature of these devices is that the AC input while connected to the grid is also used as output for the recovery of the supplied DC energy, which is converted with an efficiency of up to 95%. This way of energy recovery helps to lower costs and can avoid expensive cooling systems, such as they are required for conventional electronic loads which only convert energy into heat. Principle view:



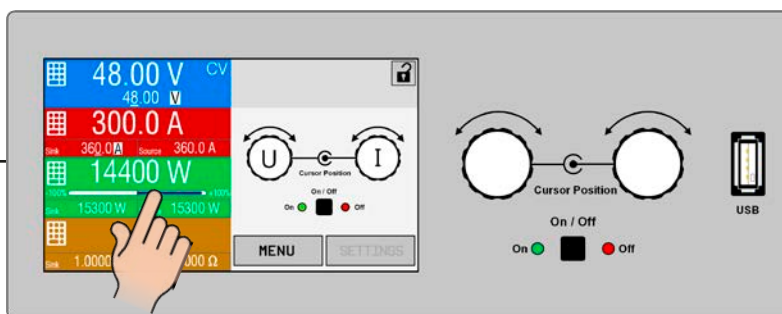
EA-PSB 9000 3U 5 kW - 15 kW



显示器与控制面板

Display and control panel

带触摸屏的显示器
Display with touch panel



轻松调节参数用旋钮
Knobs for comfortable value adjustment

上传和存储函数用的USB端口
USB port for loading and saving functions

设定与实际输出电压、电流与功率都清晰显示于图形显示器上。彩色的TFT屏幕为点触式，用一个手指就能控制所有功能。

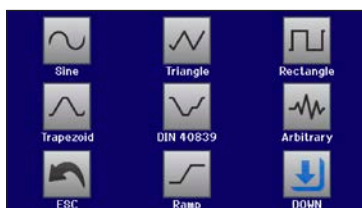
Set values and actual values of input & output voltage / current / power are clearly represented on the graphic display. The colour TFT screen is touch sensitive and can be intuitively used to control all functions of the device with just a finger.

通过旋钮或者数字键盘直接输入参数，也可调节设定电压、电流、功率或阻值（内阻模拟）。若想防止意外操作，可锁定所有操作键。

Set values of voltage, current, power or resistance can be adjusted using the rotary knobs or entered directly via a numeric pad. To prevent unintentional operations, all operation controls can be locked.

多语言控制面板

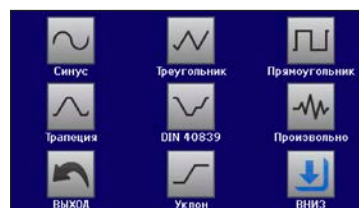
Multi-language control panel



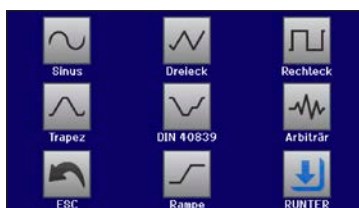
英文 / English



中文 / Chinese



俄文 / Russian



德文 / German

函数发生器

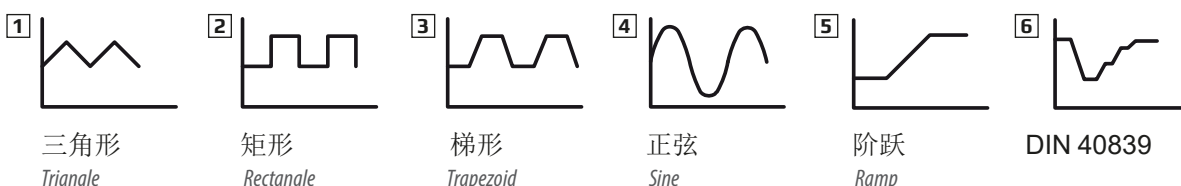
Function generator

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出电压或输出电流上。发生器可通过前板的触摸屏设置，或经某一数字接口远程配置。

All models within this series include a true function generator which can generate typical functions, as displayed in the figure below, and apply them to either the output voltage or the output 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.

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。

The predefined functions offer all necessary parameters to the user, such as Y offset, time / frequency or amplitude, for full configuration ability.



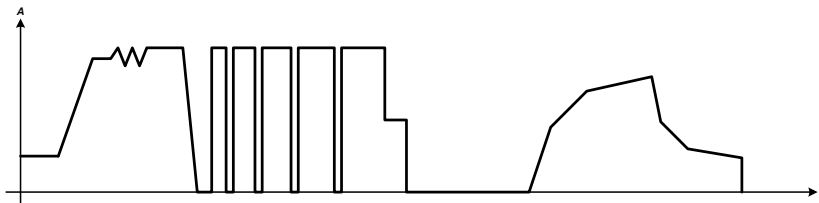
EA-PSB 9000 3U 5 kW - 15 kW

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，这样可方便更换不同的测试序列。

下图是任意发生器可实现的由40个序列组成的复杂曲线，仅为虚构范例。可以在产品外或者于产品上创建函数，然后上载或保存：

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 sequence points. Those 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.

The figure below shows a fictional example of a complex function of 40 sequences, as it can be realised with the arbitrary generator. The function can be created on the device or externally and then loaded or saved:



主-从操作

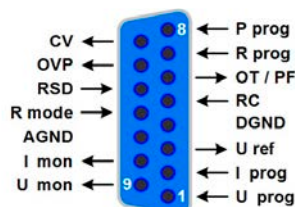
所有产品标配有一个数字式主-从总线。通过它可并联最多32台同型号产品，将实际电压、电流与功率汇总，形成更大的系统。经产品上的控制面板，或经任意数字通讯接口的远程控制，可完成主-从系统的全部配置。主机的操作也手动控制，也可远程控制（任意接口）。

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 totals 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).

内置模拟接口

产品后板上装有一隔离模拟接口端子。它具有一模拟输入脚，接上0 V...10 V或0 V...5 V电压，可设置0...100%的输出电压、电流、功率与内阻。要监控输出电压与电流，可给模拟输出脚接上0 V...10 V或0 V...5 V电压来完成。此外，还有几个输入脚和输出脚，可用来控制和监控产品状态。

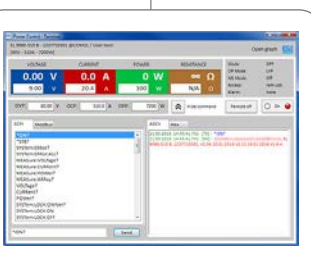


Analog interface

There is a galvanically isolated analog interface terminal, located on the rear of the device. It offers analog inputs to set voltage, current, power and resistance from 0...100% through control voltages of 0 V...10 V or 0 V...5 V. To monitor the output voltage and current, there are analog outputs with 0 V...10 V or 0 V...5 V. Also, several inputs and outputs are available for controlling and monitoring the device status.

控制软件

本产品还配有适合Windows系统下操作的控制软件，可以远程控制多台同型号产品，甚至不同型号产品。它有一个清晰的主界面，显示所有设定值与实际值，SCPI与ModBus RTU指令的直接输入模式，固件升级特性，以及被称为“排序”的半自动化控制表格。



Control software

Included with the device is a control software for Windows PC, which allows for the remote control of multiple identical or even different types of devices. It has a clear interface for all set and actual values, a direct input mode for SCPI and ModBus RTU commands, a firmware update feature and the semi-automatic table control named "Sequencing".

选项

- 适合RS232、CAN、CANopen、ModBus TCP、Profibus、Profinet/IO、EtherCAT或Ethernet的绝缘数字接口模块。接口插槽位于产品后板（仅针对标准型号），方便用户插上新模块或替换当前模块。产品会自动检测接口，并提示需要进行少许的配置或不用配置。也可参考132。
- 还可安装带固定 GPIB端口的三位接口（3 W），代替接口模块用的默认插槽。

Options

- Digital interface modules for RS232, CAN, CANopen, ModBus TCP, Profibus, Profinet/IO, EtherCAT or Ethernet. The interface slot is located on the rear panel (standard models only), making it easy for the user to plug in a new interface or to replace an existing one. The interface will be automatically detected by the device and requires no or only little configuration. See page 132.
- Three-way interface (3W) with a rigid GPIB port installed instead of the default slot for retrofittable interface modules



EA-PSB 9000 3U 5 kW - 15 kW


技术参数	Technical Data	Series PSB 9000 3U / 系列
交流输入	AC supply	
- 电压	- Voltage	360...528 V, 2ph/3ph
- 频率	- Frequency	45...66 Hz
- 功率因数	- Power factor	>0.99
直流: 电压	DC: Voltage	
- 精确度	- Accuracy	<额定值的0.1% / <0.1% of rated value
- 0-100%的负载调整率	- Load regulation 0-100%	<额定值的0.05% / <0.05% of rated value
- $\pm 10\% \Delta U_{AC}$ 线性调整率	- Line regulation $\pm 10\% \Delta U_{AC}$	<额定值的0.02% / <0.02% of rated value
- 带载10-100%调整需时	- Regulation 10-100% load	<2 ms
- 带载10-90%斜率(源)	- Slew rate (source) 10-90%	最大 / Max. 30 ms
- 过压保护	- Overvoltage protection	可调, 0...110% U_{Nenn} / Adjustable, 0...110% U_{Nom}
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0.15% / <0.15% of rated value
- 带载10-90%斜率(汇)	- Slew rate (sink) 10-90%	<50 μ s
直流: 功率	DC: Power	
- 精确度	- Accuracy	<额定值的1% / <1% of rated value
直流: 阻值	DC: Resistance	
- 精确度	- Accuracy	\leq 最大阻值的1% + 额定电流的0,3% $\leq 1\%$ of max. resistance + 0.3% of nominal current
保护功能	Protection	OT, OVP, OPP, OCP, PF ⁽²⁾
隔离耐压	Insulation	
- 直流输出对外壳 (PE)	- DC output to enclosure (PE)	型号不同而不同, 具体见型号规格表 / Depending on model, see tables
污染等级	Degree of pollution	2
保护等级	Protection class	1
显示器与面板	Display and panel	带触摸屏的图形显示器 / Graphics display with touch panel
数字接口	Digital interfaces	
- 内置	- Built-in	1x 通讯用B类USB端口 / 1x USB type B for communication 1x GPIB (3W选项功能时可选) / 1x GPIB (optional with option 3W)
- 插槽	- Slot	1x 可拆卸内置模块 (不包括带3W选项功能的型号) / 1x for retrofittable plug-in modules (not with option 3W)
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...5V 或 0...10V (可切换) / 0...5V or 0...10V (switchable)
- 输入脚	- Inputs	U, I, P, R, 远程开-关, 直流输出开-关, 内阻模式开-关 / U, I, P, R, Remote on-off, DC output 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%
并联操作	Parallel operation	可实现, 通过真实主-从操作, 可连接多达32台产品 / Yes, with master-slave, up to 32 units
安规标准	Standards	IEC 1010, EN 61010, EN 60950
制冷方式	Cooling	温控风扇 (可选: 水冷) / Temperature controlled fans (optional: water)
工作温度	Operation temperature	0...50 °C
储存温度	Storage temperature	-20...70 °C
湿度	Relative humidity	<80%, 无凝露 / non-condensing
工作高度	Operation altitude	<2000 m
尺寸 (宽 高 深) ⁽¹⁾	Dimensions (W H D) ⁽¹⁾	19" 3 HE / 3U 670 mm

(1) 仅为标准版的外壳尺寸, 非整体尺寸 / Enclosure only, not overall
(2) 见第144页 / See page 144

EA-PSB 9000 3U 5 kW - 15 kW

技术参数	Technical Data	PSB 9060-120 3U	PSB 9080-120 3U	PSB 9200-70 3U	PSB 9360-40 3U
额定电压与范围	Rated voltage & range	0...60 V	0...80 V	0...200 V	0...360 V
- 纹波 (供电源) ⁽¹⁾	- Ripple (source) ⁽¹⁾	<200 mV _{PP} / <16 mV _{RMS}	<200 mV _{PP} / <16 mV _{RMS}	<300 mV _{PP} / <40 mV _{RMS}	<320 mV _{PP} / <55 mV _{RMS}
隔离耐压	Insulation				
- 直流负极 <-> PE	- Negative DC pole <-> PE	±400 V DC	±400 V DC	±400 V DC	±400 V DC
- 直流正极 <-> PE	- Positive DC pole <-> PE	±400 V DC	±400 V DC	±600 V DC	±600 V DC
额定电流与范围	Rated current & range	0...120 A	0...120 A	0...70 A	0...40 A
额定功率与范围	Rated power & range	0...5000 W	0...5000 W	0...5000 W	0...5000 W
效率	Efficiency	~95%	~95%	~95%	~95%
重量 ⁽²⁾	Weight ⁽²⁾	~18 kg	~18 kg	~18 kg	~18 kg
订购编号 ⁽³⁾	Ordering number ⁽³⁾	30000319	30000301	30000302	30000303

技术参数	Technical Data	PSB 9500-30 3U	PSB 9750-20 3U	PSB 9060-240 3U	PSB 9080-240 3U
额定电压与范围	Rated voltage & range	0...500 V	0...750 V	0...60 V	0...80 V
- 纹波 (供电源) ⁽¹⁾	- Ripple (source) ⁽¹⁾	<350 mV _{PP} / <70 mV _{RMS}	<800 mV _{PP} / <200 mV _{RMS}	<320 mV _{PP} / <25 mV _{RMS}	<320 mV _{PP} / <25 mV _{RMS}
隔离耐压	Insulation				
- 直流负极 <-> PE	- Negative DC pole <-> PE	±1500 V DC	±1500 V DC	±400 V DC	±400 V DC
- 直流正极 <-> PE	- Positive DC pole <-> PE	±1800 V DC	±1800 V DC	±400 V DC	±400 V DC
额定电流与范围	Rated current & range	0...30 A	0...20 A	0...240 A	0...240 A
额定功率与范围	Rated power & range	0...5000 W	0...5000 W	0...10000 W	0...10000 W
效率	Efficiency	~95%	~95%	~95%	~95%
重量 ⁽²⁾	Weight ⁽²⁾	~18 kg	~18 kg	~25 kg	~25 kg
订购编号 ⁽³⁾	Ordering number ⁽³⁾	30000304	30000305	30000320	30000306

技术参数	Technical Data	PSB 9200-140 3U	PSB 9360-80 3U	PSB 9500-60 3U	PSB 9750-40 3U
额定电压与范围	Rated voltage & range	0...200 V	0...360 V	0...500 V	0...750 V
- 纹波 (供电源) ⁽¹⁾	- Ripple (source) ⁽¹⁾	<300 mV _{PP} / <40 mV _{RMS}	<320 mV _{PP} / <55 mV _{RMS}	<350 mV _{PP} / <70 mV _{RMS}	<800 mV _{PP} / <200 mV _{RMS}
隔离耐压	Insulation				
- 直流负极 <-> PE	- Negative DC pole <-> PE	±400 V DC	±400 V DC	±1500 V DC	±1500 V DC
- 直流正极 <-> PE	- Positive DC pole <-> PE	±600 V DC	±600 V DC	±1800 V DC	±1800 V DC
额定电流与范围	Rated current & range	0...140 A	0...80 A	0...60 A	0...40 A
额定功率与范围	Rated power & range	0...10000 W	0...10000 W	0...10000 W	0...10000 W
效率	Efficiency	~95%	~95%	~95%	~95%
重量 ⁽²⁾	Weight ⁽²⁾	~25 kg	~25 kg	~25 kg	~25 kg
订购编号 ⁽³⁾	Ordering number ⁽³⁾	30000307	30000308	30000309	30000310

技术参数	Technical Data	PSB 9060-360 3U	PSB 9080-360 3U	PSB 9200-210 3U	PSB 9360-120 3U
额定电压与范围	Rated voltage & range	0...60 V	0...80 V	0...200 V	0...360 V
- 纹波 (供电源) ⁽¹⁾	- Ripple (source) ⁽¹⁾	<320 mV _{PP} / <25 mV _{RMS}	<320 mV _{PP} / <25 mV _{RMS}	<300 mV _{PP} / <40 mV _{RMS}	<320 mV _{PP} / <55 mV _{RMS}
隔离耐压	Insulation				
- 直流负极 <-> PE	- Negative DC pole <-> PE	±400 V DC	±400 V DC	±400 V DC	±400 V DC
- 直流正极 <-> PE	- Positive DC pole <-> PE	±400 V DC	±400 V DC	±600 V DC	±600 V DC
额定电流与范围	Rated current & range	0...360 A	0...360 A	0...210 A	0...120 A
额定功率与范围	Rated power & range	0...15000 W	0...15000 W	0...15000 W	0...15000 W
效率	Efficiency	~95%	~95%	~95%	~95%
重量 ⁽²⁾	Weight ⁽²⁾	~32 kg	~32 kg	~32 kg	~32 kg
订购编号 ⁽³⁾	Ordering number ⁽³⁾	30000321	30000312	30000313	30000314

⁽¹⁾ RMS值: 在BWL 300 kHz时测量的LF值, PP值: 在BWL 20MHz时测量的HF值 / RMS value: measures at LF with BWL 300 kHz, PP value: measured at HF with BWL 20MHz

⁽²⁾ 为标准版的重量, 带选项功能的则不同 / Weight of the base version, models with option(s) may vary

⁽³⁾ 为标准版的订购编号, 带选项功能的则不同 / Ordering number of the base version, models with option(s) installed have different ordering numbers



EA-PSB 9000 3U 5 kW - 15 kW



技术参数	Technical Data	PSB 9500-90 3U	PSB 9750-60 3U	PSB 91000-40 3U	PSB 91500-30 3U
额定电压与范围	Rated voltage & range	0...500 V	0...750 V	0...1000 V	0...1500 V
- 纹波 (供电源) ⁽¹⁾	- Ripple (source) ⁽¹⁾	<350 mV _{pp} / <70 mV _{RMS}	<800 mV _{pp} / <200 mV _{RMS}	<1600 mV _{pp} / <300 mV _{RMS}	<2400 mV _{pp} / <400 mV _{RMS}
隔离耐压	Insulation				
- 直流负极 <-> PE	- Negative DC pole <-> PE	±1500 V DC	±1500 V DC	±1500 V DC	±1000 V DC
- 直流正极 <-> PE	- Positive DC pole <-> PE	±1800 V DC	±1800 V DC	±1800 V DC	±1800 V DC
额定电流与范围	Rated current & range	0...90 A	0...60 A	0...40 A	0...30 A
额定功率与范围	Rated power & range	0...15000 W	0...15000 W	0...15000 W	0...15000 W
效率	Efficiency	~95%	~95%	~95%	~95%
重量 ⁽²⁾	Weight ⁽²⁾	~32 kg	~32 kg	~32 kg	~32 kg
订购编号 ⁽³⁾	Ordering number ⁽³⁾	30000315	30000316	30000317	30000318

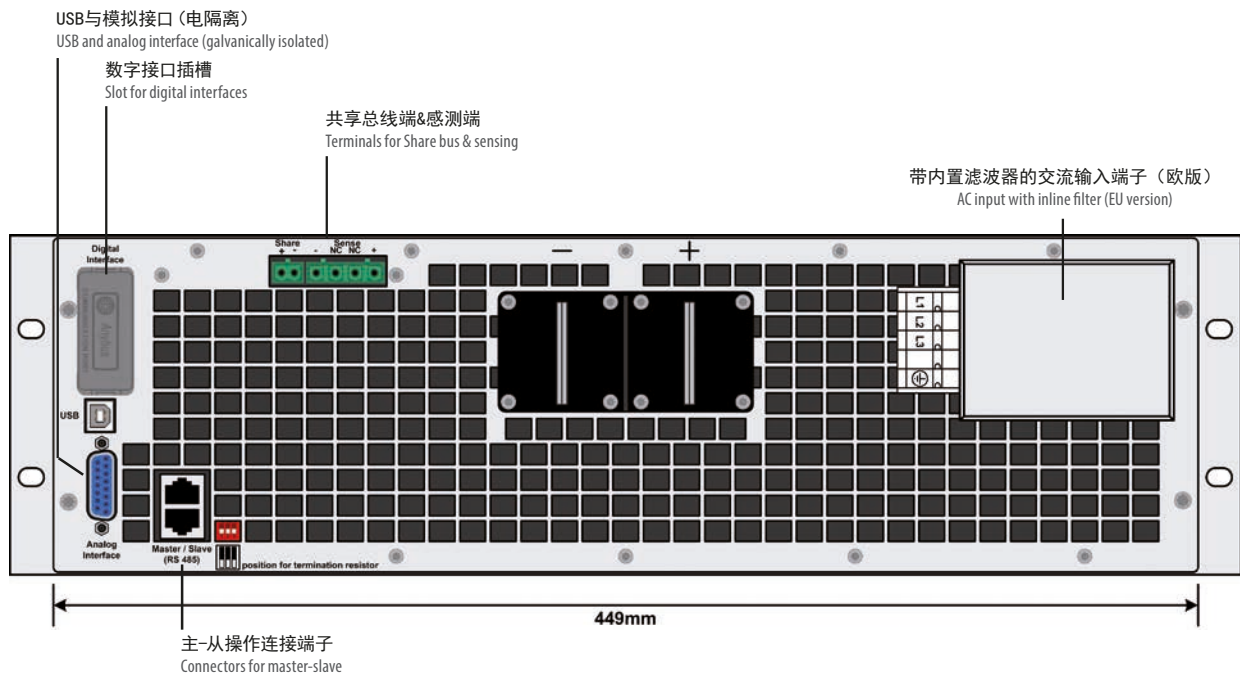
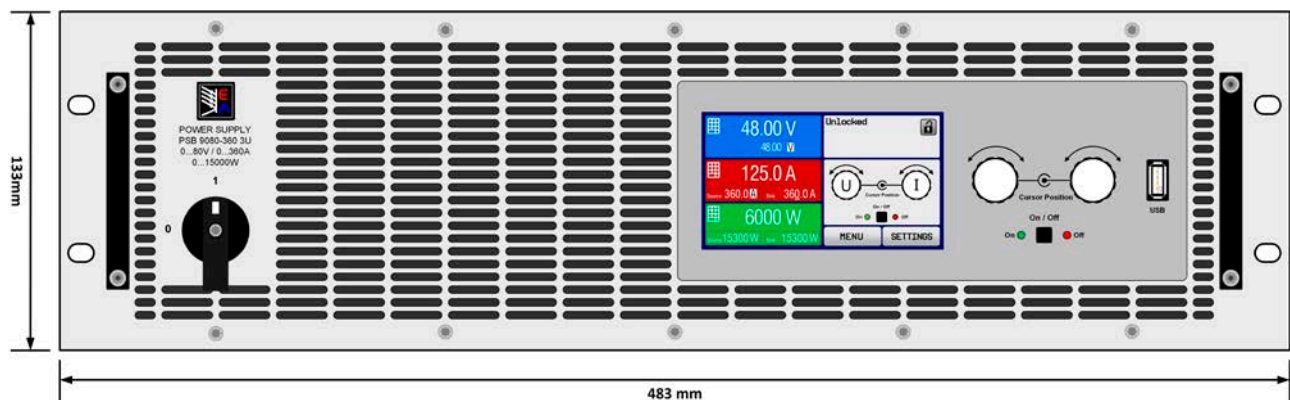
(1) RMS值：在BWL 300 kHz时测量的LF值，PP值：在BWL 20MHz时测量的HF值 / RMS value: measures at LF with BWL 300 kHz, PP value: measured at HF with BWL 20MHz

(2) 为标准版的重量，带选项功能的则不同 / Weight of the base version, models with option(s) may vary

(3) 为标准版的订购编号，带选项功能的则不同 / Ordering number of the base version, models with option(s) installed have different ordering numbers

产品图

Product views



基本型号的后视图

Rear view of base model