

# EA-PS 9000 3U 3.3 kW - 15 kW



Programmable high efficiency DC Power supplies



EA-PS 9500-90 3U



- For 208 V, 400 V or wide range 342...528 V AC supply
- High efficiency of up to 95.5%
- Output power ratings: 3.3 kW, 5 kW, 6.6 kW, 10 kW or 15 kW, expandable up to 450 kW
- Output voltages: 0...40 V up to 0...1500 V
- Output currents: 20 A up to 510 A
- Autoranging output stage
- Various protection circuits (OVP, OCP, OPP, OTP)
- Control panel with pushbuttons and color TFT for actual values, set values, status and alarms
- Galvanically isolated, analog interface
- Temperature-controlled fans for cooling
- Discharge circuit ( $U_{out} < 60 \text{ V}$  in  $\leq 10 \text{ s}$ )
- USB and Ethernet port integrated or alternatively installed GPIB port
- EMC TÜV approved for EN 61010 Class B
- SCPI command set and ModBus RTU support
- LabView VIs and control software for Windows

## General

The microprocessor-controlled high efficiency laboratory power supplies of series EA-PS 9000 3U offer many functions and features in their standard version, making the use of this equipment remarkably easy and most effective.

The clearly arranged control panel features two rotary knobs, six pushbuttons and two LEDs. Together with a color TFT display for all values and status it simplifies the use of the devices.

In order to achieve even higher output power than the single units can supply, cabinets with up to 150 kW and up to 42U size can be configured to suit the user's requirements. Also see page 122.

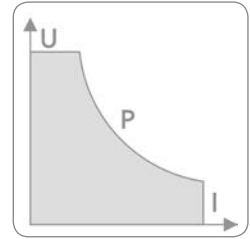
## AC supply

All models are provided with an active Power Factor Correction circuit. There is a choice of three different AC supply input ranges. The standard models run with **400 V** (L-L,  $\pm 15\%$ ), while there are also models for **208 V** (L-L,  $\pm 10\%$ ), for the **US** and Japan market. The third choice are wide range (**WR**) models with 342...528 V, which cover typical worldwide grid voltages of **380 V**, **400 V** and **480 V**.

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### Power

The devices are equipped with a flexible autoranging output stage which provides a higher output voltage at lower output current, or a higher output current at lower output voltage, always limited to the rated power. Therefore, a wide range of applications can already be covered by the use of just one unit.



### DC output

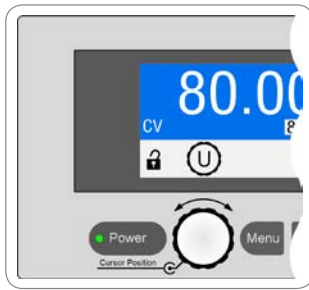
DC output voltages between 0...40 V and 0...1500 V, output currents between 0...20 A and 0...510 A and several output power ratings between 0...3.3 kW and 0...15 kW are available. The output terminal is located in the rear panel.

### Discharge circuit

Models with a nominal output voltage of 200 V or higher include a discharge circuit for the output capacitors. For no load or low load situations, it ensures that the dangerous output voltage can sink to under 60 V DC after the DC output has been switched off. This value is considered as limit for voltages dangerous to human safety.

### Protective features

For protection of the equipment connected, it is possible to set an overvoltage protection threshold (OVP), as well as one for overcurrent (OCP) and overpower (OPP). As soon as one of these thresholds is reached for any reason, the DC output will be immediately shut off and a status signal will be generated on the display and via the interfaces. There is furthermore an overtemperature protection, which will shut off the DC output if the device overheats.



### Display and controls

All important information is clearly visualized on a color TFT display.

With this, information about the actual output values and set values of voltage and current, the actual control state (CV, CC, CP) and other statuses, as well as alarms and settings of the setup menu are clearly displayed.

In order to ease adjusting of values by the rotary knobs, pushing them can switch between decimal positions of a value. All these features contribute to an operator friendliness.

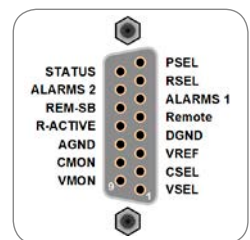
With a panel lock feature, the whole panel can be locked in order to protect the equipment and the loads from unintentional misuse.

### Extensibility

The single units can be combined into various configurations upon request and in cabinets of up to 42U height, in order to build parallel systems of up to 450 kW total power. Also see page 122.

### Digital and analog interfaces

All models features two galvanically isolated, digital interfaces by default (1x USB & 1x Ethernet), which are located on the rear side. With option 3W there will be a GPIB port instead of Ethernet. All three digital interfaces can be used to control and monitor the devices either with SCPI language commands or ModBus RTU protocol (not via GPIB). There is furthermore a galvanically isolated analog interface port, also on the rear of the device. It offers analog inputs to set voltage, current and power from 0...100% through control voltages of 0...10 V or 0...5 V. To monitor the output voltage and current, there are analog outputs for voltage ranges of 0...10 V or 0...5 V. Also, several status inputs and outputs are available.



### Remote sensing

The standard sensing input can be connected directly to the load in order to compensate voltage drops along the power cables. If the sensing input is connected to the load, the power supply will adjust the output voltage automatically to ensure the required voltage is available at the load.

### Options

- High speed ramping (see page 120) \*
- Water cooling (upon request, also see page 121)
- Three-way interface (3W) with a rigid GPIB port installed instead of the default Ethernet port

\* Not available for all voltages - please quote for availability



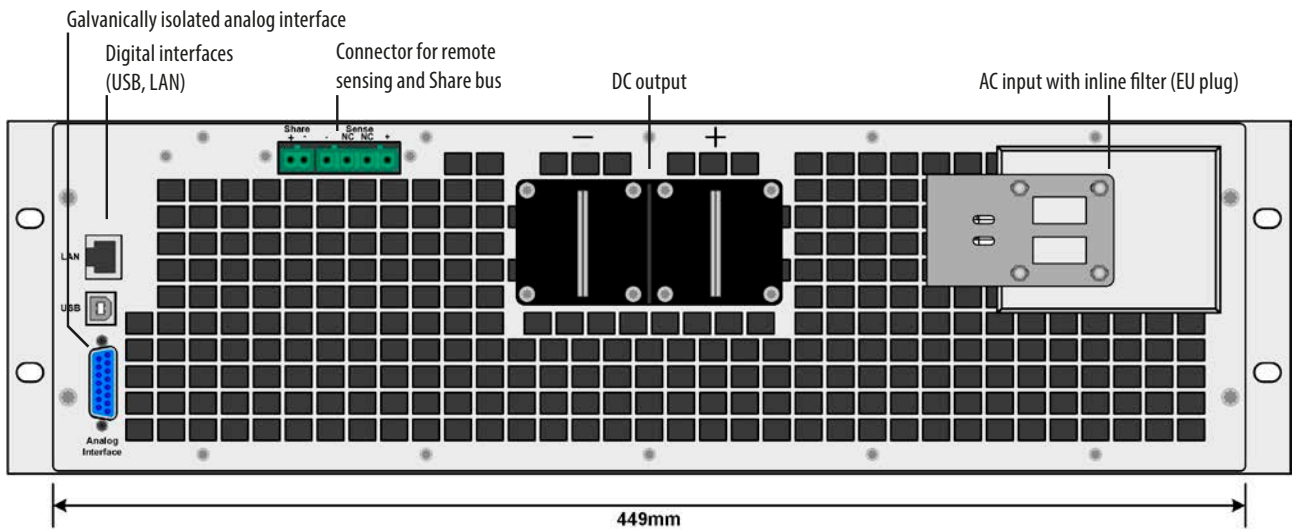
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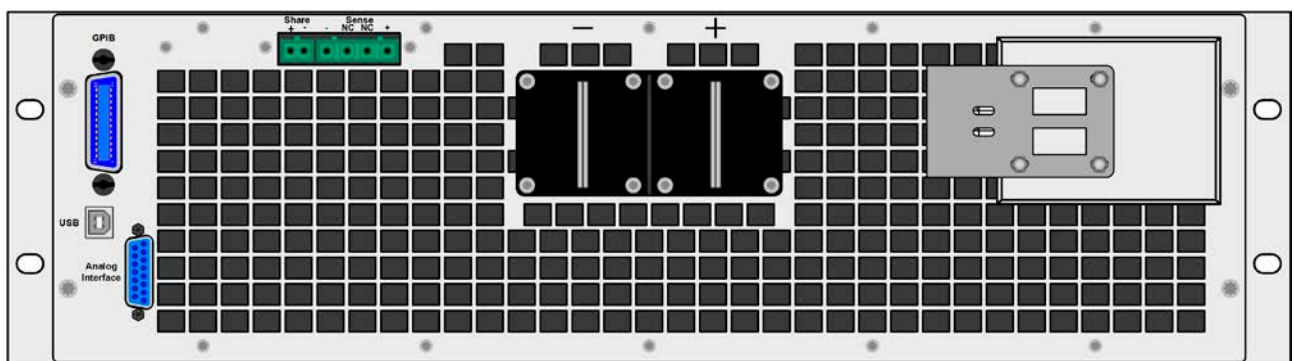
## Product views



Front view



Rear view (standard version)



Rear view (with option 3W)

# EA-PS 9000 3U 3.3 kW - 15 kW

Technical Data	Series PS 9000 3U
AC: Supply	
- Voltage	US 208V models: 188...229 V, 2ph/3ph Standard 400 V models: 340...460 V, 2ph/3ph Wide range models: 342...528V, 2ph/3ph
- Frequency	45...66 Hz
- Power factor	>0.99
DC: Voltage	
- Accuracy	<0.1% of rated value
- Load regulation 0-100%	<0.05% of rated value
- Line regulation $\pm 10\% \Delta U_{AC}$	<0.02% of rated value
- Regulation 10-100% load	<2 ms
- Rise time 10-90%	Max. 30 ms
- Overvoltage protection	Adjustable, 0...110% $U_{Nom}$
- No load discharge time on DC off	100% U to <60 V: less than 10 s
DC: Current	
- Accuracy	<0.2% of rated value
- Load regulation 1-100% $\Delta U_{DC}$	<0.15% of rated value
- Line regulation $\pm 10\% \Delta U_{AC}$	<0.05% of rated value
DC: Power	
- Accuracy	<1% of rated value
Overvoltage category	2
Protection	OTP, OVP, OCP, OPP, PF <sup>(1)</sup>
Insulation	
- AC input to enclosure	2500 V DC
- AC input to DC output	2500 V DC
- DC output to enclosure (PE)	Depending on model, see tables
Degree of pollution	2
Protection class	1
Display and panel	Color display, knobs and pushbuttons
Digital interfaces	
- Built-in	1x USB type B for communication, 1x Ethernet Optional: 1x GPIB (with option 3W)
Analog interface	Built in, 15 pole D-Sub (female), galvanically isolated
- Signal range	0...5 V or 0...10 V (switchable)
- Accuracy U / I / P	0...10 V: <0.2% 0...5 V: <0.4%
- Inputs	U, I, P, remote control on-off, DC output on-off
- Outputs	U, I, overvoltage, alarms, reference voltage
Parallel operation	Possible
- Master-Slave	No
Standards	EN 61326, IEC 1010, EN 61010 EMC TÜV approved according to IEC 61000-6-2:2005 and IEC 61000-6-3:2006 Class B
Cooling	Temperature-controlled fans (optional: water)
Operation temperature	0...50 °C
Storage temperature	-20...70 °C
Humidity	<80%, non-condensing
Operation altitude	<2000 m (1.242 mi)
Dimensions (W x H x D) <sup>(2)</sup>	US 208 V models: 19" x 3U x 683 mm (26.9") Standard 400 V models: 19" x 3U x 609 mm (24") Wide range models: 19" x 3U x 669 mm (26.3")

<sup>(1)</sup> See page 126

<sup>(2)</sup> Enclosure of the standard version and not overall size, versions with options may vary



## EA-PS 9000 3U 3.3 kW - 15 kW



Technical Data	PS 9040-170 3U	PS 9060-170 3U	PS 9080-170 3U	PS 9200-70 3U
Rated voltage & range	0...40 V	0...60 V	0...80 V	0...200 V
- Ripple <sup>(1)</sup>	<200 mV <sub>PP</sub> / <16 mV <sub>RMS</sub>	<200 mV <sub>PP</sub> / <16 mV <sub>RMS</sub>	<200 mV <sub>PP</sub> / <16 mV <sub>RMS</sub>	<300 mV <sub>PP</sub> / <40 mV <sub>RMS</sub>
Insulation negative DC pole <-> PE	±400 V DC	±400 V DC	±400 V DC	EU model: ±400 V DC US/WR model: ±725 V DC
Insulation positive DC pole <-> PE	±400 V DC	±400 V DC	±400 V DC	EU model: ±600 V DC US/WR model: ±1000 V DC
Rated current & range	0...170 A	0...170 A	0...170 A	0...70 A
Rated power & range	0...3300 W	0...5000 W	0...5000 W	0...5000 W
Efficiency	≈93%	≈93%	≈93%	≈95%
Weight <sup>(2)</sup>	≈18 kg (39.7 lb)	≈18 kg (39.7 lb)	≈18 kg (39.7 lb)	≈18 kg (39.7 lb)
Ordering nr. (US 208 V model)	not available	not available	06238251	06238252
Ordering nr. (400 V model)	06230250	not available	06230251	06230252
Ordering nr. (WR model)	not available	inquire	inquire	inquire

Technical Data	PS 9360-40 3U	PS 9500-30 3U	PS 9750-20 3U	PS 9040-340 3U
Rated voltage & range	0...360 V	0...500 V	0...750 V	0...40 V
- Ripple <sup>(1)</sup>	<550 mV <sub>PP</sub> / <65 mV <sub>RMS</sub>	<350 mV <sub>PP</sub> / <70 mV <sub>RMS</sub>	<800 mV <sub>PP</sub> / <200 mV <sub>RMS</sub>	<320 mV <sub>PP</sub> / <25 mV <sub>RMS</sub>
Insulation DC negative to PE	EU model: ±400 V DC US/WR model: ±725 V DC	EU model: ±725 V DC US/WR model: ±1500 V DC	EU model: ±725 V DC US/WR model: ±1500 V DC	±400 V DC
Insulation DC positive to PE	EU model: ±600 V DC US/WR model: ±1000 V DC	EU model: ±1000 V DC US/WR model: ±1800 V DC	EU model: ±1000 V DC US/WR model: ±1800 V DC	±400 V DC
Rated current & range	0...40 A	0...30 A	0...20 A	0...340 A
Rated power & range	0...5000 W	0...5000 W	0...5000 W	0...6600 W
Efficiency	≈93%	≈95.5%	≈94%	≈93%
Weight <sup>(2)</sup>	≈18 kg (39.7 lb)	≈18 kg (39.7 lb)	≈18 kg (39.7 lb)	≈25 kg (55.1 lb)
Ordering nr. (US 208 V model)	06238253	06238254	06238255	not available
Ordering nr. (400 V model)	06230253	06230254	06230255	06230256
Ordering nr. (WR model)	inquire	inquire	inquire	not available

Technical Data	PS 9040-510 3U	PS 9060-340 3U	PS 9080-340 3U	PS 9200-140 3U
Rated voltage & range	0...40 V	0...60 V	0...80 V	0...200 V
- Ripple <sup>(1)</sup>	<320 mV <sub>PP</sub> / <25 mV <sub>RMS</sub>	<320 mV <sub>PP</sub> / <25 mV <sub>RMS</sub>	<320 mV <sub>PP</sub> / <25 mV <sub>RMS</sub>	<300 mV <sub>PP</sub> / <40 mV <sub>RMS</sub>
Insulation DC negative to PE	±400 V DC	±400 V DC	±400 V DC	EU model: ±400 V DC US/WR model: ±725 V DC
Insulation DC positive to PE	±400 V DC	±400 V DC	±400 V DC	EU model: ±600 V DC US/WR model: ±1000 V DC
Rated current & range	0...510 A	0...340 A	0...340 A	0...140 A
Rated power & range	0...10000 W	0...10000 W	0...10000 W	0...10000 W
Efficiency	≈93%	≈93%	≈93%	≈95%
Weight <sup>(2)</sup>	≈31 kg (68.3 lb)	≈25 kg (55.1 lb)	≈25 kg (55.1 lb)	≈25 kg (55.1 lb)
Ordering nr. (US 208 V model)	not available	not available	06238257	06238258
Ordering nr. (400 V model)	06230264	not available	06230257	06230258
Ordering nr. (WR model)	not available	inquire	inquire	inquire

(1) RMS value: measured at LF with BWL 300 kHz, PP value: measured at HF with BWL 20MHz

(2) Weight of the standard version, models with options may vary

## EA-PS 9000 3U 3.3 kW - 15 kW

Technical Data	PS 9360-80 3U	PS 9500-60 3U	PS 9750-40 3U	PS 91000-30 3U
Rated voltage & range	0...360 V	0...500 V	0...750 V	0...1000 V
- Ripple <sup>(1)</sup>	<550 mV <sub>PP</sub> / <65 mV <sub>RMS</sub>	<350 mV <sub>PP</sub> / <70 mV <sub>RMS</sub>	<800 mV <sub>PP</sub> / <200 mV <sub>RMS</sub>	<1600 mV <sub>PP</sub> / <350 mV <sub>RMS</sub>
Insulation negative DC pole <-> PE	EU model: ±400 V DC US/WR model: ±725 V DC	EU model: ±725 V DC US/WR model: ±1500 V DC	EU model: ±725 V DC US/WR model: ±1500 V DC	EU model: ±1000 V DC US/WR model: ±1500 V DC
Insulation positive DC pole <-> PE	EU model: ±600 V DC US/WR model: ±1000 V DC	EU model: ±1000 V DC US/WR model: ±1800 V DC	EU model: ±1000 V DC US/WR model: ±1800 V DC	EU model: ±1500 V DC US/WR model: ±1800 V DC
Rated current & range	0...80 A	0...60 A	0...40 A	0...30 A
Rated power & range	0...10000 W	0...10000 W	0...10000 W	0...10000 W
Efficiency	≈93%	≈95%	≈94%	≈95%
Weight <sup>(2)</sup>	≈25 kg (55.1 lb)	≈25 kg (55.1 lb)	≈25 kg (55.1 lb)	≈25 kg (55.1 lb)
Ordering nr. (US 208 V model)	06238259	06238260	06238261	06238262
Ordering nr. (400 V model)	06230259	06230260	06230261	06230262
Ordering nr. (WR model)	inquire	inquire	inquire	inquire

Technical Data	PS 9060-510 3U	PS 9080-510 3U	PS 9200-210 3U	PS 9360-120 3U
Rated voltage & range	0...60 V	0...80 V	0...200 V	0...360 V
- Ripple <sup>(1)</sup>	<320 mV <sub>PP</sub> / <25 mV <sub>RMS</sub>	<320 mV <sub>PP</sub> / <25 mV <sub>RMS</sub>	<300 mV <sub>PP</sub> / <40 mV <sub>RMS</sub>	<550 mV <sub>PP</sub> / <65 mV <sub>RMS</sub>
Insulation negative DC pole <-> PE	±400 V DC	±400 V DC	EU model: ±400 V DC US/WR model: ±725 V DC	EU model: ±400 V DC US/WR model: ±725 V DC
Insulation positive DC pole <-> PE	±400 V DC	±400 V DC	EU model: ±600 V DC US/WR model: ±1000 V DC	EU model: ±600 V DC US/WR model: ±1000 V DC
Rated current & range	0...510 A	0...510 A	0...210 A	0...120 A
Rated power & range	0...15000 W	0...15000 W	0...15000 W	0...15000 W
Efficiency	≈93%	≈93%	≈95%	≈93%
Weight <sup>(2)</sup>	≈31 kg (68.3 lb)	≈31 kg (68.3 lb)	≈31 kg (68.3 lb)	≈31 kg (68.3 lb)
Ordering nr. (US 208 V model)	not available	06238264	06238265	06238266
Ordering nr. (400 V model)	not available	06230264	06230265	06230266
Ordering nr. (WR model)	inquire	inquire	inquire	inquire

Technical Data	PS 9500-90 3U	PS 9750-60 3U	PS 91000-40 3U	PS 91500-30 3U
Rated voltage & range	0...500 V	0...750 V	0...1000 V	0...1500 V
- Ripple <sup>(1)</sup>	<350 mV <sub>PP</sub> / <70 mV <sub>RMS</sub>	<800 mV <sub>PP</sub> / <200 mV <sub>RMS</sub>	<2000 mV <sub>PP</sub> / <300 mV <sub>RMS</sub>	<2400 mV <sub>PP</sub> / <400 mV <sub>RMS</sub>
Insulation negative DC pole <-> PE	EU model: ±725 V DC US/WR model: ±1500 V DC	EU model: ±725 V DC US/WR model: ±1500 V DC	EU model: ±1000 V DC US/WR model: ±1500 V DC	EU model: ±1000 V DC US/WR model: ±1500 V DC
Insulation positive DC pole <-> PE	EU model: ±1000 V DC US/WR model: ±1800 V DC	EU model: ±1000 V DC US/WR model: ±1800 V DC	EU model: ±1500 V DC US/WR model: ±1800 V DC	EU model: ±1500 V DC US/WR model: ±1800 V DC
Rated current & range	0...90 A	0...60 A	0...40 A	0...30 A
Rated power & range	0...15000 W	0...15000 W	0...15000 W	0...15000 W
Efficiency	≈95%	≈94%	≈95%	≈95%
Weight <sup>(2)</sup>	≈31 kg (68.3 lb)	≈31 kg (68.3 lb)	≈31 kg (68.3 lb)	≈31 kg (68.3 lb)
Ordering nr. (US 208 V model)	06238267	06238268	06238270	06238269
Ordering nr. (400 V model)	06230267	06230268	06230270	06230269
Ordering nr. (WR model)	inquire	inquire	inquire	inquire

(1) RMS value: measured at LF with BWL 300 kHz, PP value: measured at HF with BWL 20MHz

(2) Weight of the standard version, models with options may vary

