EA-PSI 9000 3U + WR 3.3 kW - 15 kW

Programmable high efficiency DC Power supplies

EA-PSI 9200-210 3U

U | I | P | R | OVP | OCP | OPP | OTP | 19" | MS | USB | Option: IFAB | IEEE | WC

- **For 208 V, 400 V or wide range 342...528 V AC supply**
- **High efficiency up to 95.5%**
- **Output power ratings: 3.3 kW, 5 kW, 6.6 kW, 10 kW or 15 kW, expandable up to 480 kW**
- **Output voltages: 40 V up to 1500 V**
- **Output currents: 20 A up to 510 A**
- **Flexible, power regulated output 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 and USB port**
- **Integrated function generator with photovoltaics array simulation, including EN 50530**
- **Internal resistance simulation and regulation**
- **40 V and 60 V models compliant to SELV**
- **Discharge circuit (Uout < 60 V in ≤ 10 s)**
- **Optional, digital interface modules or alternatively installed GPIB port**
- **SCPI and ModBus RTU/TCP command set**
- **LabView VIs and control software for Windows**

General

The microprocessor-controlled high efficiency laboratory power supplies of series EA-PSI 9000 3U offer multiple functions and features in their standard version. User-friendly, interactive menu navigation makes the use of this equipment remarkably easy and most effective.
User and process profiles can be edited, saved and archived so that the reproducibility of a test or other application is improved. In order to achieve even higher output power, cabinets with up to 150 kW and up to 42U size can be configured to suit the user's requirements.

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, ±15%), while there are also models for **208 V** (L-L, ±10%) for the US or Japan market. The third choice are wide range (**WR**) models with **342...528 V**, which cover the typical worldwide grid voltages **380 V**, **400 V** and **480 V**.

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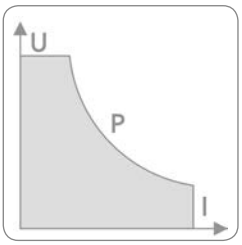
Autoranging power stage
All models are equipped with a flexible autoranging output stage which provides a higher output voltage at lower output current, or a higher output current at lower output voltage, always limited to the adjustable power set value or the rated power. Therefore, a wide range of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

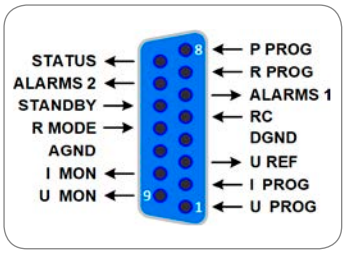


DC output
DC output voltages between 0...40 V and 0...1500 V, output currents between 0...20 A and 0...510 A and several output power ratings between 0...3.3 kW and 0...15 kW are available. The DC output terminal is located on the rear panel.

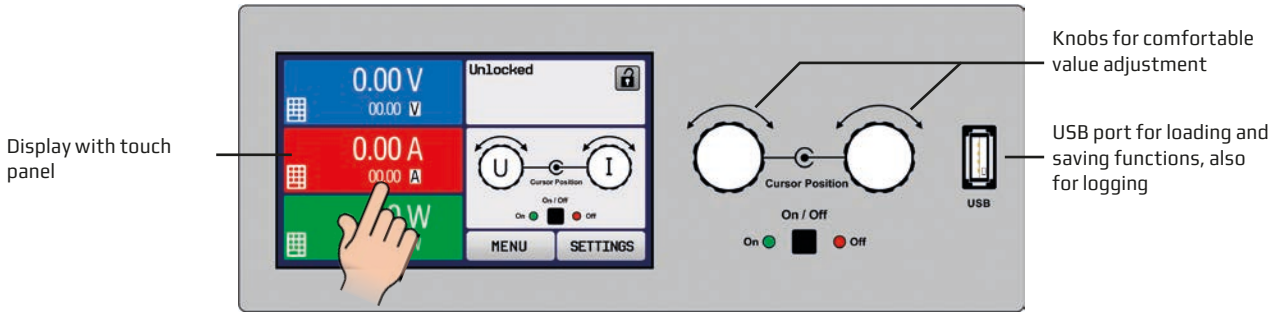
Discharge circuit
Models with a nominal output voltage of 200 V or higher include a discharge circuit for the output capacities. For no load or low load situations, it ensures that the dangerous output voltage can sink to under 60 V DC after the DC output has been switched off. This value is considered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

Protective features
For protection of the equipment connected, it's 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.

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.



Display and control panel



Set values and actual values of output voltage, output current and output power are clearly represented on the graphic display. The color TFT screen is touch sensitive and can be intuitively used to control all functions of the device with just a finger tip.
Set values of voltage, current, power or resistance (internal resistance simulation) can be adjusted using the rotary knobs or entered directly via a numeric pad. To prevent unintentional operations, all operation controls can be locked.

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).

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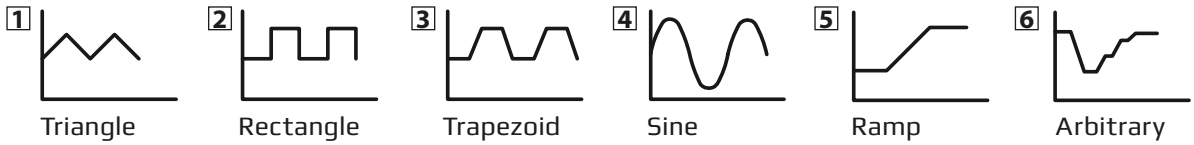
Function generator

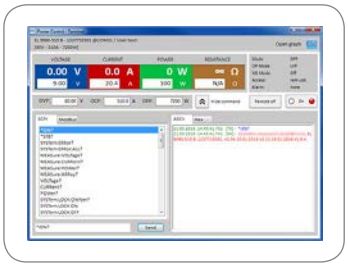
All models in this series include a software based function generator which can generate typical functions, as displayed in the figure below, and apply them to either the output voltage or the output current. The generator can be completely configured and controlled by using the touch panel on the front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



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. Those can be used for testing purposes in development and production. The sequences can be loaded from and saved to a standard USB stick via the USB port on the front panel, making it easy to change between different test sequences.
There is furthermore an XY generator, which is used to generate other functions, such as UI or IU, which are defined by the user in form of tables (CSV file) and then loaded from USB stick. For photovoltaics related tests, a PV curve can be generated and used from user-adjustable key parameters. It also supports the european standard EN 50530.

Control software

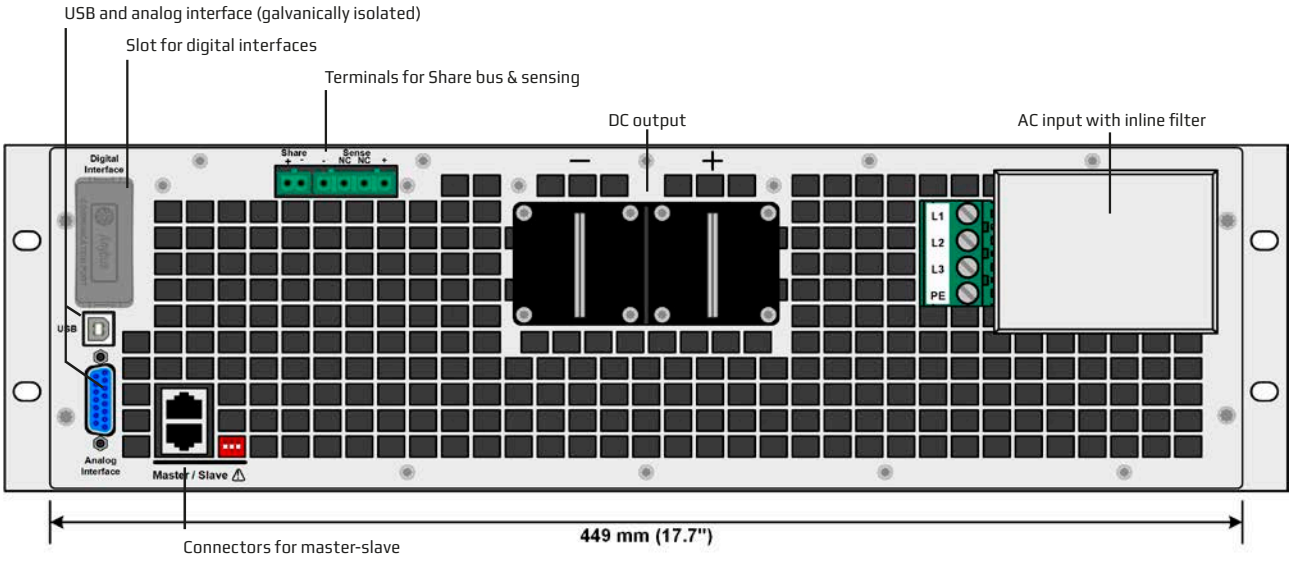
Included with the devices is a control software for Windows PC, which allows for the remote control of multiple identical or even different types of devices. It has a clear interface for all set and actual values, a direct input mode for SCPI and ModBus RTU commands, a firmware update feature and the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



Options

- Digital interface modules for RS232, CAN, CANopen, ModBus TCP, Profibus, Profinet, EtherCAT or Ethernet.
- Three-way interface (3W) with a rigid GPIB port installed instead of the default slot for retrofittable interface modules
- High Speed ramping (upon request)
- Water-cooling (upon request)

Product views



Rear view of 208 V model (without options)

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Technical Data	Series PSI 9000 3U / PSI 9000 WR	
AC: Supply		
- Voltage / Phases	208 V models: 188...229 V, 2ph/3ph 400 Vmodels: 340...460 V, 2ph/3ph Wide range models: 342...528 V, 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 ±10% ΔU_{AC}	≤0.02% of rated value	
- Regulation 10-100% load	≤2 ms	
- Slew rate 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 rating	
- Load regulation 0-100% ΔU_{DC}	≤0.15% of rated value	
- Line regulation ±10% ΔU_{AC}	≤0.05% of rated value	
DC: Power		
- Accuracy	≤1% of rated value	
Overvoltage category	2	
Protection	OT, OVP, OCP, OPP, PF	
Insulation 1		
- 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	Graphics display with touch panel	
Digital interfaces		
- Built-in	1x USB type B for communication, 1x GPIB (optional with option 3W)	
- Slot	1x for retrofittable plug-in modules (standard models only)	
Analog interface	Built-in, 15 pole D-Sub (female), galvanically isolated	
- Signal range	0...5 V or 0...10 V (switchable)	
- Inputs	U, I, P, R, remote control on-off, DC output on-off, resistance mode on-off	
- Outputs	U, I, alarms, reference voltage, status	
- Accuracy U / I / P / R	0...10 V: ≤0.2%	0...5 V: ≤0.4%
Parallel operation	Yes, with true master-slave, up to 32 units	
Standards	EN 61010-2:2010, EN 61000-6-2:2016-05, IEC 61000-6-3:2011-09 Class B	
Cooling	Temperature-controlled fans (optional: water)	
Operation temperature	0...50 °C	
Storage temperature	-20...70 °C	
Relative humidity	≤80%, non-condensing	
Operation altitude	≤2000 m (1.242 mi)	
Dimensions (W x H x D) (1	208 V models: 19" x 3U x 683 mm (26.9") 400 V models: 19" x 3U x 609 mm (24") Wide range models: 19" x 3U x 669 mm (26.3")	

(1 Enclosure only, not overall

EA-PSI 9000 3U +WR 3.3 kW - 15 kW

Technical Data	PSI 9040-170 3U	PSI 9060-170 3U	PSI 9080-170 3U	PSI 9200-70 3U
Rated voltage & range	0...40 V	0...60 V	0...80 V	0...200 V
Voltage ripple (1	≤200 mV_{PP} / ≤16 mV_{RMS}	≤200 mV_{PP} / ≤16 mV_{RMS}	≤200 mV_{PP} / ≤16 mV_{RMS}	≤300 mV_{PP} / ≤40 mV_{RMS}
Insulation (DC- to PE)	±400 V	±400 V	±400 V	400 V model: ±400 V Other models: ±725 V
Insulation (DC+ to PE)	±400 V	±400 V	±400 V	400 V model: ±600 V Other models: ±1000 V
Rated current & range	0...170 A	0...170 A	0...170 A	0...70 A
Current ripple (1	≤80 mA_{RMS}	≤80 mA_{RMS}	≤80 mA_{RMS}	≤22 mA_{RMS}
Rated power & range	0...3300 W	0...5000 W	0...5000 W	0...5000 W
Efficiency	≈ 93%	≈ 93%	≈ 93%	≈ 95%
Weight (2	≈ 18 kg (39.7 lb)	≈ 18 kg (39.7 lb)	≈ 18 kg (39.7 lb)	≈ 18 kg (39.7 lb)
Ordering nr. (400 V model)	06230350	not available	06230351	06230352
Ordering nr. (208 V model)	not available	not available	06238351	06238352
Ordering nr. (WR model)	not available	06270350	06270351	06270352

Technical Data	PSI 9360-40 3U	PSI 9500-30 3U	PSI 9750-20 3U	PSI 9040-340 3U
Rated voltage & range	0...360 V	0...500 V	0...750 V	0...40 V
Voltage ripple (1	≤550 mV_{PP} / ≤65 mV_{RMS}	≤350 mV_{PP} / ≤70 mV_{RMS}	≤800 mV_{PP} / ≤200 mV_{RMS}	≤320 mV_{PP} / ≤25 mV_{RMS}
Insulation (DC- to PE)	400 V model: ±400 V Other models: ±725 V	400 V model: ±725 V Other models: ±1500 V	400 V model: ±725 V Other models: ±1500 V	±400 V
Insulation (DC+ to PE)	400 V model: ±600 V Other models: ±1000 V	400 V model: ±1000 V Other models: ±1800 V	400 V model: ±1000 V Other models: ±1800 V	±400 V
Rated current & range	0...40 A	0...30 A	0...20 A	0...340 A
Current ripple (1	≤18 mA_{RMS}	≤16 mA_{RMS}	≤16 mA_{RMS}	≤160 mA_{RMS}
Rated power & range	0...5000 W	0...5000 W	0...5000 W	0...6600 W
Efficiency	≈ 93%	≈ 95.5%	≈ 94%	≈ 93%
Weight (2	≈ 18 kg (39.7 lb)	≈ 18 kg (39.7 lb)	≈ 18 kg (39.7 lb)	≈ 25 kg (55.1 lb)
Ordering nr. (400 V model)	06230353	06230354	06230355	06230356
Ordering nr. (208 V model)	06238353	06238354	06238355	not available
Ordering nr. (WR model)	06270353	06270354	06270355	not available

Technical Data	PSI 9040-510 3U	PSI 9060-340 3U	PSI 9080-340 3U	PSI 9200-140 3U
Rated voltage & range	0...40 V	0...60 V	0...80 V	0...200 V
Voltage ripple (1	≤320 mV_{PP} / ≤25 mV_{RMS}	≤320 mV_{PP} / ≤25 mV_{RMS}	≤320 mV_{PP} / ≤25 mV_{RMS}	≤300 mV_{PP} / ≤40 mV_{RMS}
Insulation (DC- to PE)	±400 V	±400 V	±400 V	400 V model: ±400 V Other models: ±725 V
Insulation (DC+ to PE)	±400 V	±400 V	±400 V	400 V model: ±600 V Other models: ±1000 V
Rated current & range	0...510 A	0...340 A	0...340 A	0...140 A
Current ripple (1	≤240 mA_{RMS}	≤160 mA_{RMS}	≤160 mA_{RMS}	≤44 mA_{RMS}
Rated power & range	0...10000 W	0...10000 W	0...10000 W	0...10000 W
Efficiency	≈ 93%	≈ 93%	≈ 93%	≈ 95%
Weight (2	≈ 31 kg (68.3 lb)	≈ 25 kg (55.1 lb)	≈ 25 kg (55.1 lb)	≈ 25 kg (55.1 lb)
Ordering nr. (400 V model)	06250363	not available	06230357	06230358
Ordering nr. (208 V model)	not available	not available	06238357	06238358
Ordering nr. (WR model)	not available	06270356	06270357	06270358

(1 RMS value: measured at LF with BWL 300 kHz, PP value: measured at HF with BWL 20MHz
(2 Weight of the base version, models with option(s) may vary

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Technical Data	PSI 9360-80 3U	PSI 9500-60 3U	PSI 9750-40 3U	PSI 91000-30 3U
Rated voltage & range	0...360 V	0...500 V	0...750 V	0...1000 V
Voltage ripple (1	≤550 mV_{PP} / ≤65 mV_{RMS}	≤350 mV_{PP} / ≤70 mV_{RMS}	≤800 mV_{PP} / ≤200 mV_{RMS}	≤1600 mV_{PP} / ≤350 mV_{RMS}
Insulation (DC- to PE)	400 V model: ±400 V Other models: ±725 V	400 V model: ±725 V Other models: ±1500 V	400 V model: ±725 V Other models: ±1500 V	400 V model: ±1000 V Other models: ±1500 V
Insulation (DC+ to PE)	400 V model: ±600 V Other models: ±1000 V	400 V model: ±1000 V Other models: ±1800 V	400 V model: ±1000 V Other models: ±1800 V	400 V model: ±1500 V Other models: ±1800 V
Rated current & range	0...80 A	0...60 A	0...40 A	0...30 A
Current ripple (1	≤35 mA_{RMS}	≤32 mA_{RMS}	≤32 mA_{RMS}	≤22 mA_{RMS}
Rated power & range	0...10000 W	0...10000 W	0...10000 W	0...10000 W
Efficiency	≈ 93%	≈ 95%	≈ 94%	≈ 95%
Weight (2	≈ 25 kg (55.1 lb)	≈ 25 kg (55.1 lb)	≈ 25 kg (55.1 lb)	≈ 25 kg (55.1 lb)
Ordering nr. (400 V model)	06230359	06230360	06230361	06230362
Ordering nr. (208 V model)	not available	06238360	06238361	06238362
Ordering nr. (WR model)	06270359	06270360	06270361	06270362

Technical Data	PSI 9060-510 3U	PSI 9080-510 3U	PSI 9200-210 3U	PSI 9360-120 3U
Rated voltage & range	0...60 V	0...80 V	0...200 V	0...360 V
Voltage ripple (1	≤320 mV_{PP} / ≤25 mV_{RMS}	≤320 mV_{PP} / ≤25 mV_{RMS}	≤300 mV_{PP} / ≤40 mV_{RMS}	≤550 mV_{PP} / ≤65 mV_{RMS}
Insulation (DC- to PE)	±400 V	±400 V	±725 V	400 V model: ±400 V Other models: ±725 V
Insulation (DC+ to PE)	±400 V	±400 V	±1000 V	400 V model: ±600 V Other models: ±1000 V
Rated current & range	0...510 A	0...510 A	0...210 A	0...210 A
Current ripple (1	≤240 mA_{RMS}	≤240 mA_{RMS}	≤66 mA_{RMS}	≤50 mA_{RMS}
Rated power & range	0...15000 W	0...15000 W	0...15000 W	0...15000 W
Efficiency	≈ 93%	≈ 93%	≈ 95%	≈ 93%
Weight (2	≈ 31 kg (68.3 lb)	≈ 31 kg (68.3 lb)	≈ 31 kg (68.3 lb)	≈ 31 kg (68.3 lb)
Ordering nr. (400 V model)	not available	06230364	06230365	06230366
Ordering nr. (208 V model)	not available	06238364	06238365	not available
Ordering nr. (WR model)	06270363	06270364	06270365	06270366

Technical Data	PSI 9500-90 3U	PSI 9750-60 3U	PSI 91000-40 3U	PSI 91500-30 3U
Rated voltage & range	0...500 V	0...750 V	0...1000 V	0...1500 V
Voltage ripple (1	≤350 mV_{PP} / ≤70 mV_{RMS}	≤800 mV_{PP} / ≤200 mV_{RMS}	≤2000 mV_{PP} / ≤300 mV_{RMS}	≤2400 mV_{PP} / ≤400 mV_{RMS}
Insulation (DC- to PE)	400 V model: ±725 V Other models: ±1500 V	400 V model: ±725 V Other models: ±1500 V	400 V model: ±1000 V Other models: ±1500 V	400 V model: ±1000 V Other models: ±1500 V
Insulation (DC+ to PE)	400 V model: ±1000 V Other models: ±1800 V	400 V model: ±1000 V Other models: ±1800 V	400 V model: ±1500 V Other models: ±1800 V	400 V model: ±1800 V Other models: ±1800 V
Rated current & range	0...90 A	0...60 A	0...40 A	0...30 A
Current ripple (1	≤48 mA_{RMS}	≤48 mA_{RMS}	≤22 mA_{RMS}	≤26 mA_{RMS}
Rated power & range	0...15000 W	0...15000 W	0...15000 W	0...15000 W
Efficiency	≈ 95%	≈ 94%	≈ 95%	≈ 95%
Weight (2	≈ 31 kg (68.3 lb)	≈ 31 kg (68.3 lb)	≈ 31 kg (68.3 lb)	≈ 31 kg (68.3 lb)
Ordering nr. (400 V model)	06238367	06238368	not available	06238369
Ordering nr. (208 V model)	06238367	06238368	not available	06238369
Ordering nr. (WR model)	06270367	06270368	06270370	06270369

(1 RMS value: measured at LF with BWL 300 kHz, PP value: measured at HF with BWL 20MHz
(2 Weight of the base version, models with option(s) may vary