

PSI 9000 WR Series

5 kW to 15 kW



High Efficiency
Programmable DC
Power Supply

INTEPRO
SYSTEMS

THE POWER TEST EXPERTS

PSI 9000 WR Series

5 kW to 15 kW



Product Overview

The PSI 9000 WR 3U is an auto-ranging power supply that has a wide range of input. Our PSI 9000 WR are provided with an active Power Factor Correction circuit and are designed for use on industrial three-phase supplies with 400 V or 480 VAC rating. The effective wide input range is defined as 360... 528 VAC.



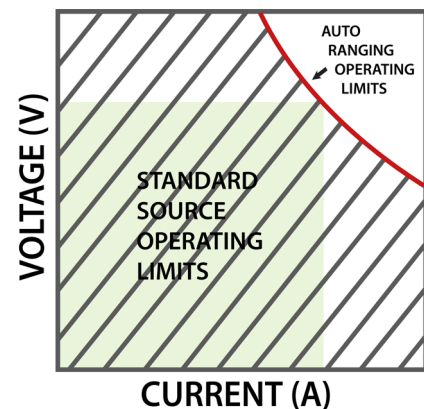
PSI 9000 WR 3U

Applications

The PSI 9000 WR Series is an auto-ranging programmable DC Supply that employs state-of-the-art technology efficiently to help you power through a wide array of applications. It has been used for burn-in and EOL/Production as well as in R&D/Lab environments for Medical Device, Communications, EMC and MIL/Defense applications. The built in standard features provides for a versatile device that really stands out in just about any test environment.

Auto-ranging power stage

All models are equipped with a flexible auto-ranging 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 max. nominal output power. The power set value is adjustable with these models. Therefore, a wide range of applications can already be covered by a single unit.



Featured Benefits

- *Wide range multi-phase input for 400/480 VAC*
- *High efficiency up to 95.5%*
- *Output power ratings: 5kW - 15kW, expandable up to 480 kW*
- *Output voltages: 60 V up to 1500 V*
- *Output currents: 30 A up to 510 A, expandable up to 5100 A*
- *Flexible, power regulated output stage*
- *Various protection circuits (OVP, OCP, OPP, OTP)*
- *Intuitive TFT touch panel with display for values, status and notifications*
- *Integrated true function generator*
- *Remote sensing with automatic detection*
- *Galvanically isolated, analog interface*
- *Photovoltaic array simulation*
- *Internal resistance simulation and regulation*
- *60 V models compliant to SELV (EN 60950)*
- *Discharge circuit ($U_{out} < 60\text{ V}$ in $s < 10\text{ s}$)*
- *USB port integrated*
- *EMC TUV approved for EN 61010 Class B*
- *Optional, digital interface modules or alternatively installed IEEE/GPIB port*
- *SCPI command language supported*

Discharge circuit

Models with a nominal output voltage of 200 V or higher include a discharge circuit for the output capacitance. 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 the limit for voltages dangerous to human safety.

Remote Sensing

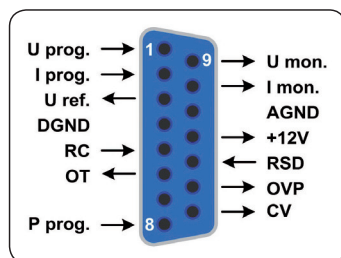
The standard sensing input can be connected directly to the load in order to compensate voltage drops along the power cables up to a certain level. If the sensing input is connected to the load, the power supply will adjust the output voltage automatically to make ensure the accurate required voltage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

Display & Controls

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.

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.

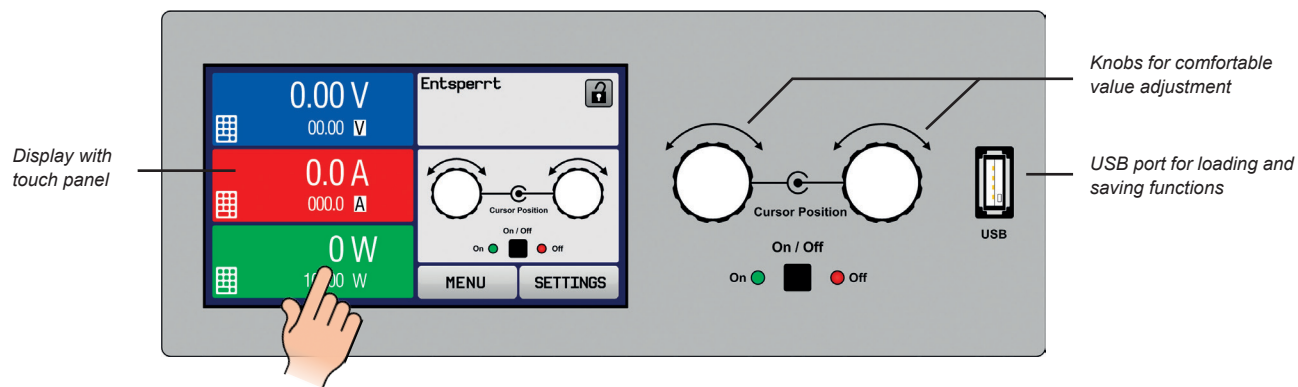


Analog Interface

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.

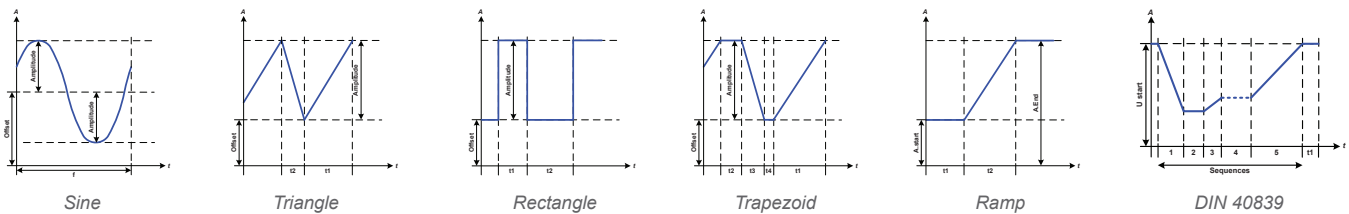
Display and Control Panel



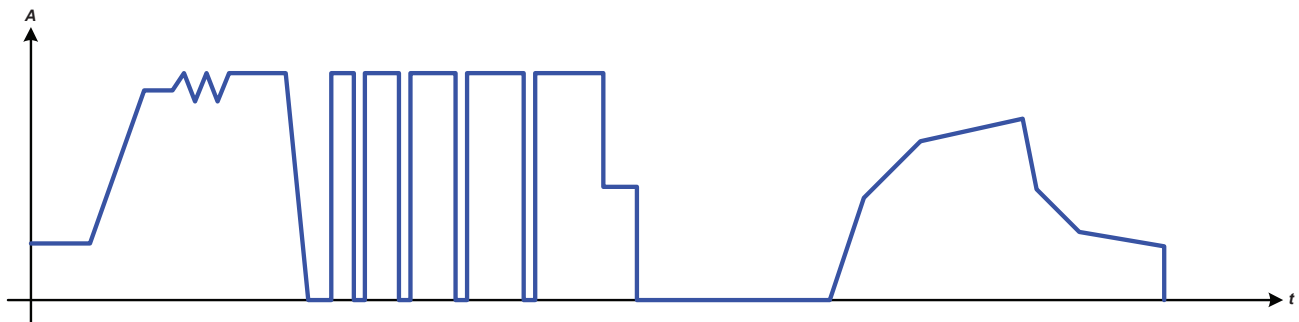
Function Generator

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. 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 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:



There is furthermore a 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 via USB drive. For photovoltaics related tests, a PV curve can be generated and used from user-adjustable key parameters. Even more characteristics can be installed for user selection by applying future firmware updates.

Control Software

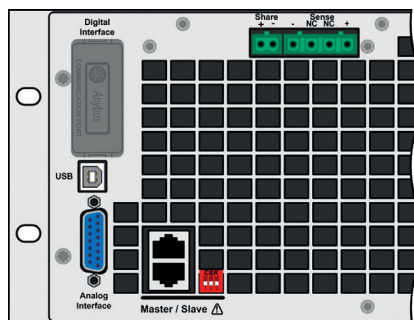
Included with the device is a control software for Windows PC, which allows for the remote control of multiple identical or even different types of devices. It has a clear interface for all set and actual values, a direct input mode for SCPI and ModBus RTU commands, a firmware update feature and the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

Master-Slave

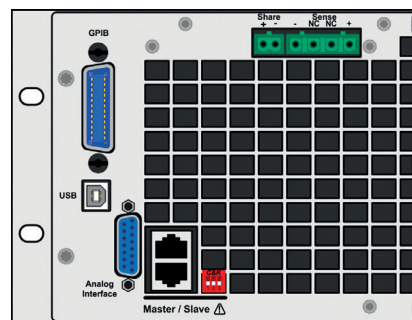
All models feature a digital master-slave bus by default. It can be used to connect up to 32 units of identical models in parallel operation to a bigger system with totals formation of the actual value of voltage, current and power. The configuration of the master-slave system is either completely done 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).

Options

- Digital interface modules for RS232, CANopen, Modbus TCP, Profibus, Profinet/IO, Devicenet 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.
- Three-way interface (3W) with a rigid GPIB port installed instead of the default slot for retrofittable interface modules.
- High Speed ramping*
- Water Cooling **
- High Speed Ramping increases voltage slew rates by as much as 20x. Contact Intepro for details.



Rear connectors of the standard models



Rear connectors of models with option 3W

* Not available for all voltages - please quote for availability

** Generally available for models up to 200 V, for other models upon request

Technical Data	Series PSI 9000 WR 3U	
Input AC		
- Voltage standard	360...528 V, 2ph/3ph	
- Frequency	45...66 Hz	
- Power factor	>0.99	
Output voltage DC		
- Accuracy	<0.1%	
- Load regulation 0-100%	<0.05%	
- Line regulation $\pm 10\% \Delta U_{AC}$	<0.02%	
- Regulation 10-100% load	<2 ms	
- Overvoltage protection	adjustable, 0...110% U_{Nom}	
- Slew Rate 10-90%	Max. 30ms	
- No load discharge time on DC off	100% U to <60 V: less than 10 s	
Output current		
- Accuracy	<0.2%	
- Load regulation 0-100% ΔU_{DC}	<0.15%	
- Line regulation $\pm 10\% \Delta U_{AC}$	<0.05%	
Output power		
- Accuracy	<1%	
Overvoltage category	2	
Protection	OT, OVP, OPP, PF, OCP ⁽¹⁾	
Isolation		
- Input to enclosure	2500 V DC	
- Input to output	2500 V DC	
- Output to enclosure (PE)	Depending on model, see tables	
Pollution degree	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	
- Input range	0...5 V or 0...10 V (switchable)	
- Accuracy U / I / P / R	0...10 V: <0.2%	0...5 V: <0.4%
- Control Signals	Remote on-off, DC output on-off, resistance mode on-off	
- Status Signals	Overtemperature	
Series operation	Possible, but depending on the isolation of DC- against PE	
Parallel operation	Yes, with true master-slave, up to 10 units	
Standards	EN 61326, IEC 1010, EN 61010 EMC TÜV approved according to IEC 61000-6-2:2005, IEC 61000-6-3:2006 Class B	
Cooling	Fans (optional: water)	
Operation temperature	0...50 °C	
Storage temperature	-20...70 °C	
Relative humidity	<80%, n.c.	
Operation altitude	<2000 m	
Dimensions (W H D) ⁽²⁾	19" 3 HE / 3U 609 mm	

⁽¹⁾ See page 13 of User Manual

⁽²⁾ Enclosure only, not overall

Technical Data	PSI 9060-170 WR 3U	PSI 9080-170 WR 3U	PSI 9200-70 WR 3U	PSI 9360-40 WR 3U
Output voltage DC	0...60 V	0...80 V	0...200 V	0...360 V
- Ripple ⁽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}
-Sensing compensation	~1 V	~2 V	~5 V	~7.5 V
Insulation				
- Negative output <-> PE	±400 V DC	±400 V DC	±725 V DC	±725 V DC
- Positive output <-> PE	±400 V DC	±400 V DC	±1000 V DC	±1000 V DC
Output current	0...170 A	0...170 A	0...70 A	0...40 A
- Ripple ⁽¹⁾	<80 mA _{RMS}	<80 mA _{RMS}	<22 mA _{RMS}	<18 mA _{RMS}
Output power	0...3300 W	0...5000 W	0...5000 W	0...5000 W
Efficiency	~93%	~93%	~95%	~93%
Programming resolution U	≤2 mV	≤4 mV	≤9 mV	≤15 mV
Programming resolution I	≤7 mA	≤7 mA	≤3 mA	≤2 mA
Weight ⁽²⁾	~18 kg	~17 kg	~18 kg	~17 kg

Technical Data	PSI 9500-30 WR 3U	PSI 9750-20 WR 3U	PSI 9060-340 WR 3U	PSI 9040-510 WR 3U
Output voltage DC	0...500 V	0...750 V	0...60 V	0...40 V
- Ripple ⁽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}
-Sensing compensation	~10 V	~15 V	~1 V	~1 V
Insulation				
- Negative output <-> PE	±1000 V DC	±1000 V DC	±400 V DC	±400 V DC
- Positive output <-> PE	±1800 V DC	±1800 V DC	±400 V DC	±400 V DC
Output current	0...30 A	0...20 A	0...340 A	0...510 A
- Ripple ⁽¹⁾	<16 mA _{RMS}	<16 mA _{RMS}	<160 mA _{RMS}	<120 mA _{RMS}
Output power	0...5000 W	0...5000 W	0...6600 W	0...10000 W
Efficiency	~95.5%	~94%	~93%	~93%
Programming resolution U	≤21 mV	≤31 mV	≤2 mV	≤2 mV
Programming resolution I	≤2 mA	≤1 mA	≤14 mA	≤21 mA
Weight ⁽²⁾	~18 kg	~18 kg	~25 kg	~32 kg

Technical Data	PSI 9080-340 WR 3U	PSI 9200-140 WR 3U	PSI 9360-80 WR 3U	PSI 9500-60 3U
Output voltage DC	0...80 V	0...200 V	0...360 V	0...500 V
- Ripple ⁽¹⁾	<320 mV _{PP} <25 mV _{RMS}	<300 mV _{PP} <40 mV _{RMS}	<320 mV _{PP} <55 mV _{RMS}	<350 mV _{PP} <70 mV _{RMS}
-Sensing compensation	~ 2 V	~ 5 V	~ 7.5 V	~ 10 V
Insulation				
- Negative output <-> PE	±400 V DC	±725 V DC	±725 V DC	±1000 V DC
- Positive output <-> PE	±400 V DC	±1000 V DC	±1000 V DC	±1800 V DC
Output current	0...340 A	0...140 A	0...80 A	0...60 A
- Ripple ⁽¹⁾	<160 mA _{RMS}	<44 mA _{RMS}	<35 mA _{RMS}	<32 mA _{RMS}
Output power	0...10000 W	0...10000 W	0...10000 W	0...10000 W
Efficiency	~93%	~95%	~93%	~95%
Programming resolution U	≤4 mV	≤9 mV	≤15 mV	≤21 mV
Programming resolution I	≤14 mA	≤6 mA	≤4 mA	≤3 mA
Weight ⁽²⁾	~25 kg	~25 kg	~25 kg	~25 kg

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

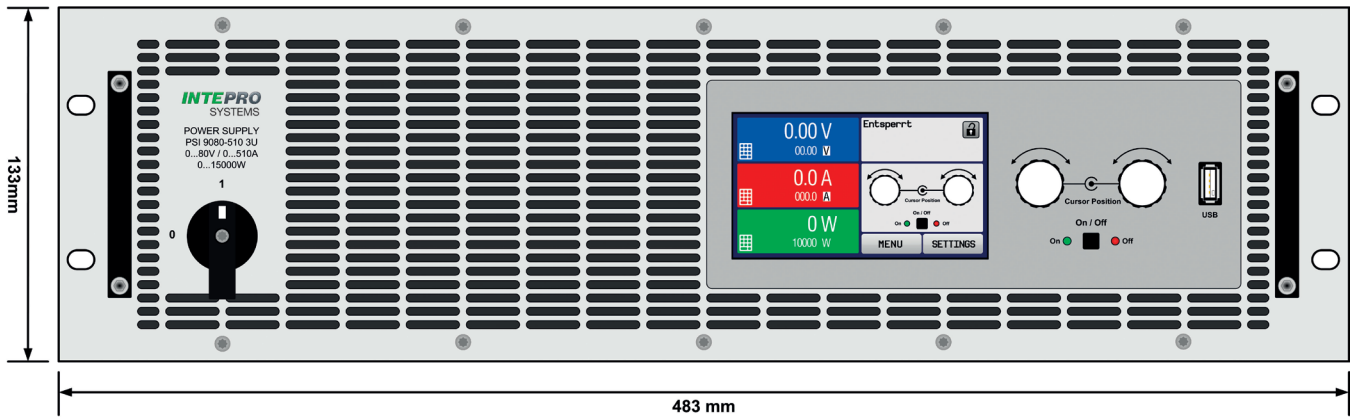
(2) Weight of standard version, models with options may vary

(3) Article number of the standard version, models with option 3W installed have different article numbers

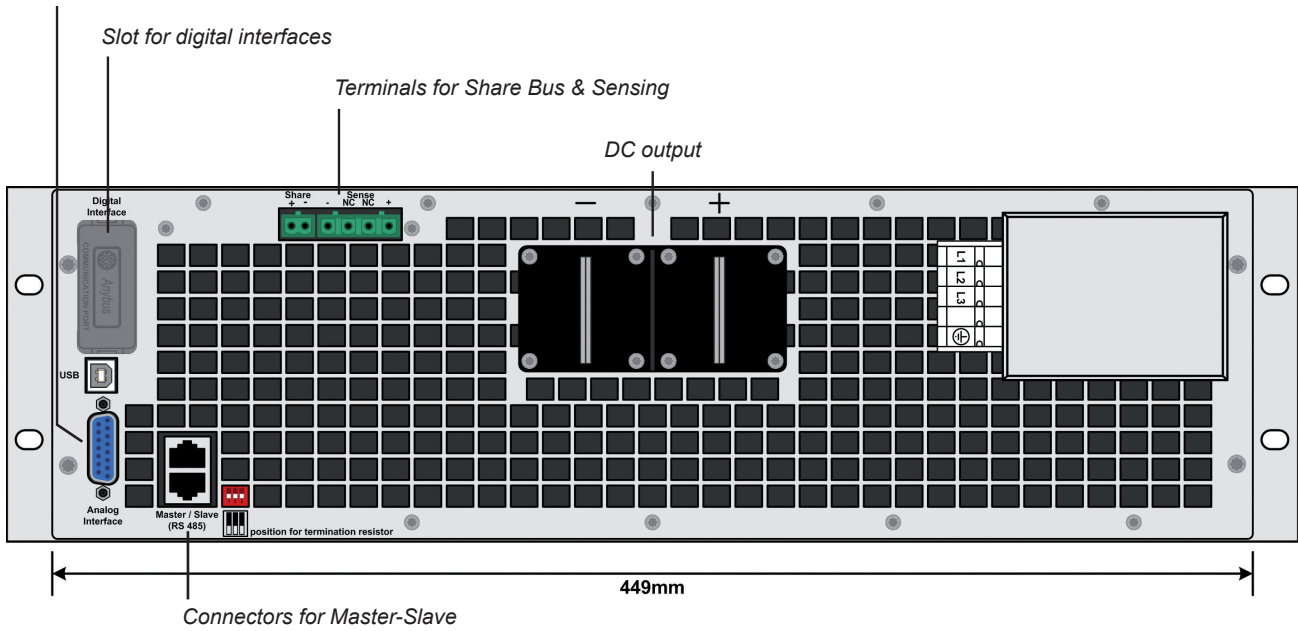
Technical Data	PSI 9750-40 WR 3U	PSI 91000-30 WR 3U	PSI 9080-510 WR 3U	PSI 9200-210 WR 3U
Output voltage DC	0...750 V	0...1000 V	0...80 V	0...200 V
- Ripple ⁽¹⁾	<800 mV _{PP} <200 mV _{RMS}	<1600 mV _{PP} <350 mV _{RMS}	<320 mV _{PP} <25 mV _{RMS}	<300 mV _{PP} <40 mV _{RMS}
-Sensing compensation	~15 V	~20 V	~2.5 V	~6 V
Insulation				
- Negative output <-> PE	±1000 V DC	±1000 V DC	±400 V DC	±725 V DC
- Positive output <-> PE	±1800 V DC	±1800 V DC	±400 V DC	±1000 V DC
Output current	0...40 A	0...30 A	0...510 A	0...210 A
- Ripple ⁽¹⁾	<32 mA _{RMS}	<22 mA _{RMS}	<240 mA _{RMS}	<66 mA _{RMS}
Output power	0...10000 W	0...10000 W	0...15000 W	0...15000 W
Efficiency	~94%	~95%	~93%	~95%
Programming resolution U	≤31 mV	≤41 mV	≤4 mV	≤9 mV
Programming resolution I	≤2 mA	≤2 mA	≤21 mA	≤9 mA
Weight ⁽²⁾	~25 kg	~25 kg	~32 kg	~32 kg

Technical Data	PSI 9360-120 WR 3U	PSI 9500-90 WR 3U	PSI 9750-60 WR 3U	PSI 91000-40 WR 3U	PSI 91500-30 3U
Output voltage DC	0...360 V	0...500 V	0...750 V	0...1000 V	0...1500 V
- Ripple ⁽¹⁾	<320 mV _{PP} <55 mV _{RMS}	<350 mV _{PP} <70 mV _{RMS}	<800 mV _{PP} <200 mV _{RMS}	<2200 mV _{PP} <310 mV _{RMS}	<2400 mV _{PP} <400 mV _{RMS}
-Sensing compensation	~7.5 V	~10 V	~15 V	~20 V	~30 V
Isolation					
- Negative output <-> PE	±725 V DC	±1000 V DC	±1000 V DC	±1000 V DC	±1000 V DC
- Positive output <-> PE	±1000 V DC	±1800 V DC	±1800 V DC	±1800 V DC	±1800 V DC
Output current	0...120 A	0...90 A	0...60 A	0...40 A	0...30 A
- Ripple ⁽¹⁾	<50 mA _{RMS}	<48 mA _{RMS}	<48 mA _{RMS}	<22 mA _{RMS}	<26 mA _{RMS}
Output power	0...15000 W	0...15000 W	0...15000 W	0...15000 W	0...15000 W
Efficiency	~93%	~95%	~94%	~95%	~95%
Programming resolution U	≤15 mV	≤21 mV	≤31 mV	≤41 mV	≤61 mV
Programming resolution I	≤5 mA	≤4 mA	≤3 mA	≤2 mA	≤2 mA
Weight ⁽²⁾	~32 kg	~32 kg	~32 kg	~32 kg	~32 kg

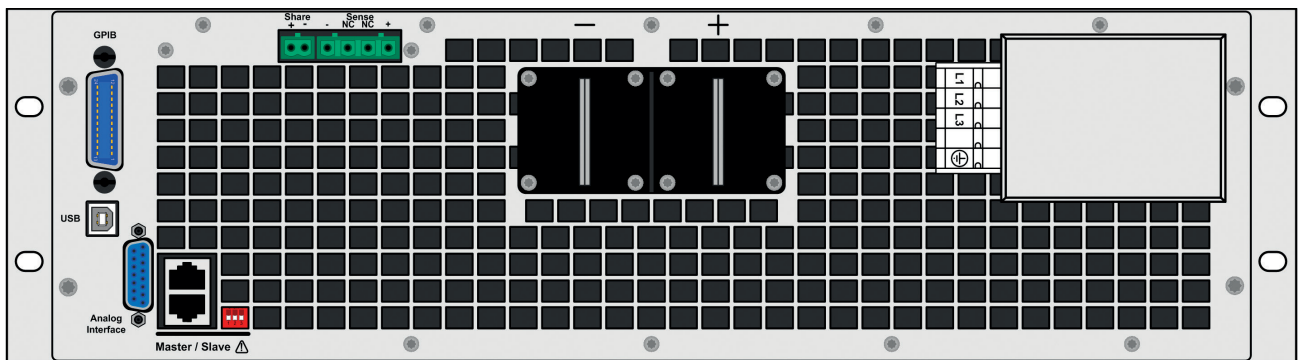
(1) RMS value: measures at LF with BWL 300 kHz, PP value: measured at HF with BWL 20MHz
(2) Weight of standard version, models with options may vary



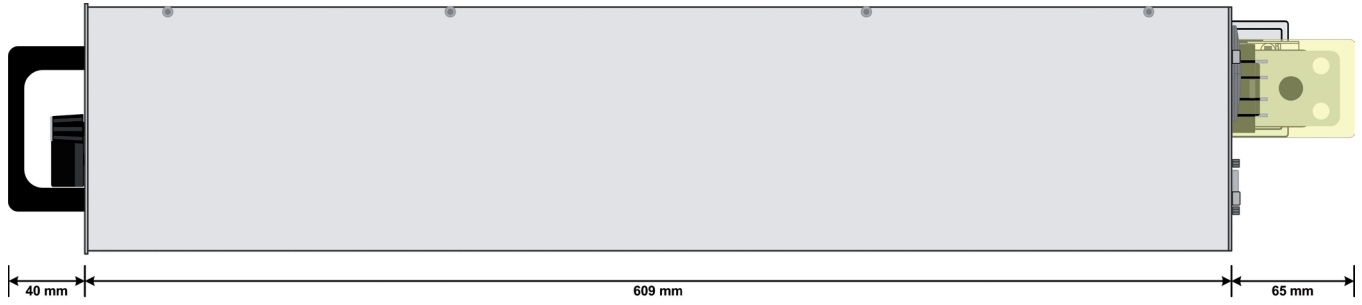
USB and analog interface



Rear view of base model



Rear view with option 3W



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