

# PSI 9000 3U Series

3.3 kW to 480 kW



High Performance  
Programmable DC  
Power Supply

**INTEPRO**  
SYSTEMS

THE POWER TEST EXPERTS

# PSI 9000 3U Series

3.3 kW to 480 kW



## Product Overview

The PSI 9000 3U is an auto-ranging power supply that has a wide range of applications. Our PSI 9000 are provided with an integrated function generator and are designed for use on industrial three-phase supplies with 208 V or 480 VAC rating.



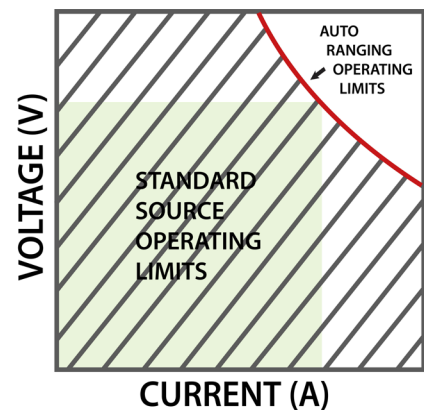
PSI 9000 3U

## Applications

The PSI 9000 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

- *Auto-ranging output*
- *High efficiency up to 95.5%*
- *Output power ratings: 0-3.3kW, 0-5kW, 0-10kW and 0-15kW in a single 3U chassis*
- *Expandable to 480kW and 5,100A or more*
- *Output voltages: 0...40 V up to 0...1500 V*
- *Output currents: 0...30 A up to 0...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*
- *Integrated true function generator*
- *Remote sensing with automatic detection*
- *Galvanically isolated, analog interface with:*
  - *U / I / P programmable via 0...10 V or 0...5 V*
  - *U / I monitoring via 0...10 V or 0...5 V*
- *Photovoltaic array simulation*
- *Internal resistance simulation and regulation*
- *Temperature controlled fans for cooling*
- *Fuel cell simulation*
- *USB port integrated*
- *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

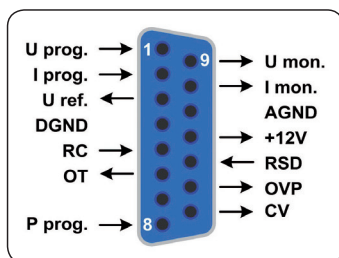
The standard sensing input can be connected directly to the load in order to compensate voltage drops along the power cables up to a certain level. If the sensing input is connected to the load, the power supply will adjust the output voltage automatically to make ensure the accurate required voltage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

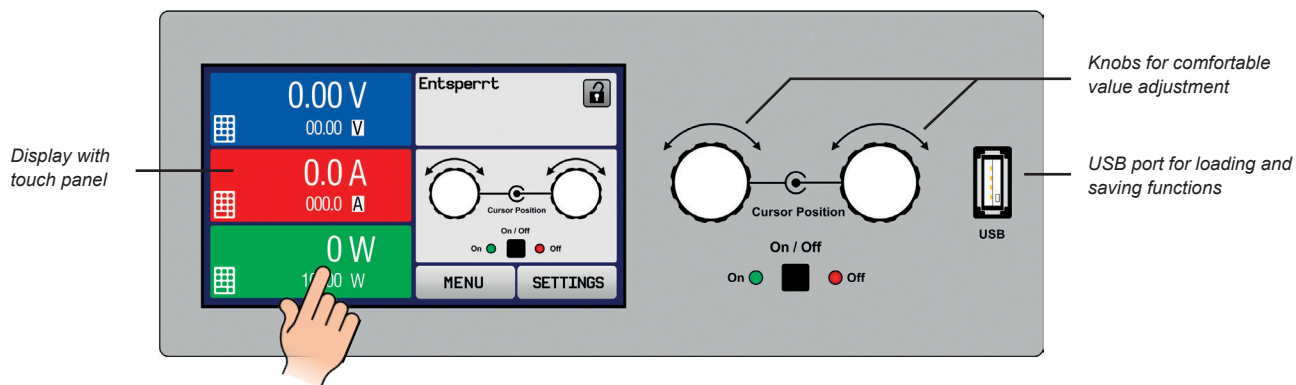


## Analog Interface

There is a galvanically isolated analog interface terminal, located on the rear of the device. It offers analog inputs to set voltage, current and power 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 voltage ranges of 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



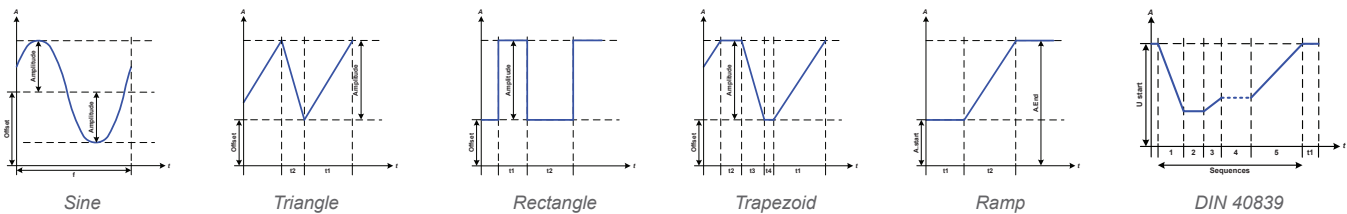
# Function Generator

All models within this series is based on 4096 data points and generates typical functions, as displayed in the figures below, and applies 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.

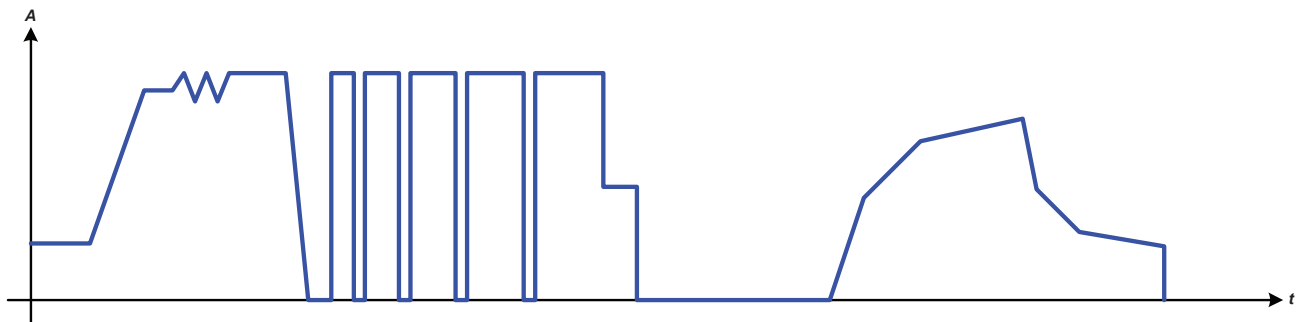
The predefined functions offer all necessary parameters to the user, such as Y offset, time / frequency or amplitude, for full configuration ability.

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 100 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.



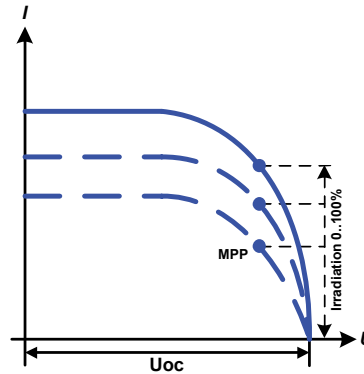
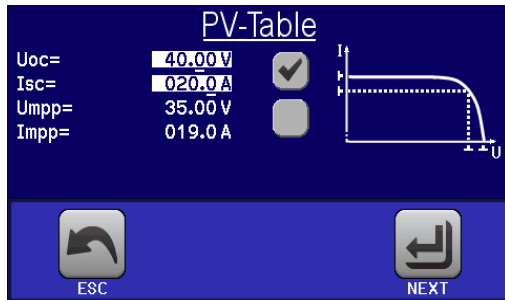
The figure below shows a fictional example of a complex function of 40 sequences, as it can be realized with the arbitrary generator. The function can be created on the device or externally and then loaded or saved:



There is furthermore a XY generator, which is used to generate other functions like UI or IU, which are defined by the user in form of tables (CSV file) and then loaded from USB drive.

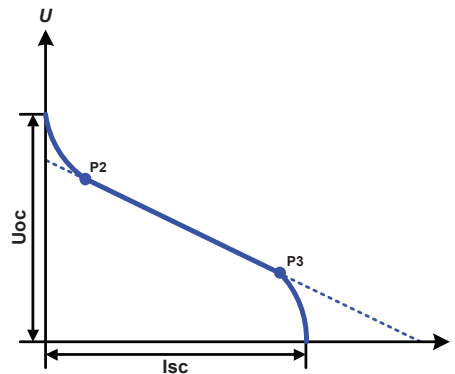
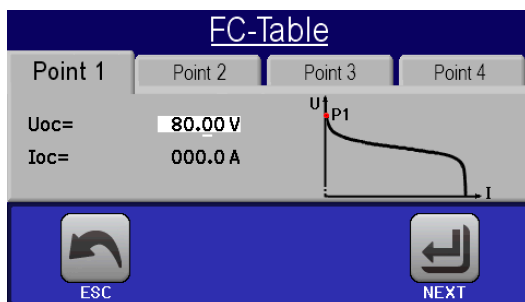
## Photovoltaic Solar Array Simulation

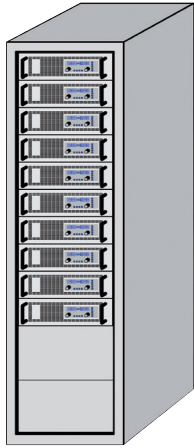
The PSI is an ideal solution for simulating static or dynamic irradiance levels of solar array. The high accuracy irradiance curve is based on 16,400 data points and adjustable in 1% increments. Isc, Uoc, MPP and Imp are user programmable.



## Fuel Cell Simulation

An embedded Fuel Cell table function is used to simulate the characteristics of voltage and current of a fuel cell. Simply define slope points and the data is automatically calculated then transferred to the function generator and output from the DC source.





## Parallel for High Power

Chassis can be paralleled up to 480kW or more. Intepro offers turn-key integrated solutions in chassis up to 42U and allow installation of auxiliary equipment such as DC loads, DMM's and oscilloscope. Contact Intepro with your system configuration requirements.

## Supervision Features

All models offer supervision features for voltage and current steps. The supervision is configurable to monitor voltage or current over- and undershooting. As a reaction, the device can generate a notification of selectable type:

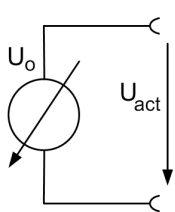
- Signals are displayed only; even if the fault is still active, without affecting the output.
- Warnings remain active and must be acknowledged after the fault is removed.
- Alarms will shut off the output instantly and can also be signaled acoustically.

## Programmable Impedance

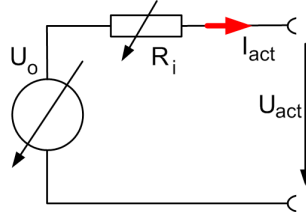
Internal resistance control provides a means to virtually simulate an internal resistance which is in series to the voltage source and thus also in series to the load. According to Ohm's Law, this causes a voltage drop, which will result in a difference between adjusted output voltage and the actual output voltage.

The adjustable resistance range is generally defined between 0 and  $30 * U_{NOM} / I_{NOM}$  of the particular model. The voltage setting in dependency of the resistance set value and the output current is done by calculation of the microcontroller and thus will be significantly slower than the other controllers inside the control circuit.

U//P Operation



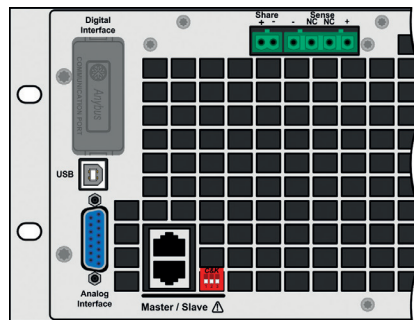
U//R Operation



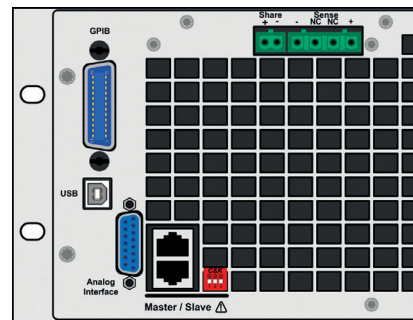
$$U_{Set} = U_0 - I_{Act} * R_{Set} \quad \left| \begin{matrix} P_{Set} \\ I_{Set} \end{matrix} \right.$$

## 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 3U
<b>Input AC</b>	
- Voltage standard	208VL-L; +/- 10%, 400VL-L; +/- 10%, 480VL-L; +/- 10%
- Frequency	45...66 Hz
- Power factor	>0.99
<b>Output voltage DC</b>	
- Accuracy	<0.1%
- Load regulation 0-100%	<0.05%
- Line regulation $\pm 10\% \Delta U_{AC}$	<0.02%
- Regulation 10-100% load	<2 ms
- Max Rise Time 10-90%	30msec max
- Overvoltage protection	adjustable, 0...110% $U_{Nom}$
- No load discharge time on DC off	100% U auf / to <60 V: weniger als 10 s / less than 10 s
<b>Output current</b>	
- Accuracy	<0.2%
- Load regulation 0-100% $\Delta U_{DC}$	<0.15%
- Line regulation $\pm 10\% \Delta U_{AC}$	<0.05%
<b>Output power</b>	
- Accuracy	<1%
<b>Overvoltage category</b>	2
<b>Protection</b>	OT, OVP, OPP, PF, OCP <sup>(1)</sup>
<b>Isolation</b>	
- Input to enclosure	2500 V DC
- Input to output	2500 V DC
- Output to enclosure (PE)	Depending on model, see tables
<b>Pollution degree</b>	2
<b>Protection class</b>	1
<b>Display and panel</b>	Graphics display with touch panel
<b>Digital interfaces</b>	
- Built-in	1x USB type B for communication, 1x GPIB (optional with option 3W)
- Slot	1x for retrofittable plug-in modules (standard models only)
<b>Analog interface</b>	built-in, 15-pole D-Sub, female
- Input range	0...5 V or 0...10 V (switchable)
- Accuracy U / I	0...10 V: <0.2%      0...5 V: <0.4%
- Programming resolution	see tables below
<b>Series operation</b>	Possible, but depending on the isolation of DC- against PE
<b>Parallel operation</b>	Yes, with true master-slave, up to 32 units via ShareBus
<b>Standards</b>	EN 61326, IEC 1010, EN 61010 EMC TÜV approved according to IEC 61000-6-2:2005, IEC 61000-6-3:2006 Class B
<b>Cooling</b>	Fans (optional: water)
<b>Operation temperature</b>	0...50 °C
<b>Storage temperature</b>	-20...70 °C
<b>Relative humidity</b>	<80%, n.c.
<b>Operation altitude</b>	<2000 m
<b>Dimensions (W H D) <sup>(2)</sup></b>	19" 3 HE / 3U 609 mm

(1 See page 13 of User Manual

(2 Enclosure only, not overall

Technical Data	PSI 9040-170 3U	PSI 9080-170 3U	PSI 9200-70 3U	PSI 9360-40 3U
Output voltage DC	0...40 V	0...80 V	0...200 V	0...360 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>	<300 mV <sub>PP</sub> <40 mV <sub>RMS</sub>	<320 mV <sub>PP</sub> <55 mV <sub>RMS</sub>
-Sensing compensation	~1 V	~2 V	~5 V	~7.5 V
<b>Isolation</b>				
- Negative output <-> PE	±400 V DC	±400 V DC	±400 V DC	±400 V DC
- Positive output <-> PE	±400 V DC	±400 V DC	±600 V DC	±600 V DC
Output current	0...170 A	0...170 A	0...70 A	0...40 A
- Ripple <sup>(1)</sup>	<80 mA <sub>RMS</sub>	<80 mA <sub>RMS</sub>	<22 mA <sub>RMS</sub>	<18 mA <sub>RMS</sub>
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 accuracy U	≤40 mV	≤80 mV	≤200 mV	≤360 mV
Programming resolution I	≤7 mA	≤7 mA	≤3 mA	≤2 mA
Programming accuracy I	≤340 mA	≤340 mA	≤140 mA	≤80 mA
Weight <sup>(2)</sup>	~17 kg	~17 kg	~17 kg	~17 kg

Technical Data	PSI 9500-30 3U	PSI 9750-20 3U	PSI 9040-340 3U	PSI 9040-510 3U
Output voltage DC	0...500 V	0...750 V	0...40 V	0...40 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>	<320 mV <sub>PP</sub> <25 mV <sub>RMS</sub>	<320 mV <sub>PP</sub> <25 mV <sub>RMS</sub>
-Sensing compensation	~10 V	~15 V	~1 V	~1 V
<b>Isolation</b>				
- Negative output <-> PE	±725 V DC	±725 V DC	±400 V DC	±400 V DC
- Positive output <-> PE	±1000 V DC	±1000 V DC	±400 V DC	±400 V DC
Output current	0...30 A	0...20 A	0...340 A	0...510 A
- Ripple <sup>(1)</sup>	<16 mA <sub>RMS</sub>	<16 mA <sub>RMS</sub>	<160 mA <sub>RMS</sub>	<120 mA <sub>RMS</sub>
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 accuracy U	≤500 mV	≤750 mV	≤40 mV	≤40 mV
Programming resolution I	≤2 mA	≤1 mA	≤14 mA	≤21 mA
Programming accuracy I	≤60 mA	≤40 mA	≤680 mA	≤1.1 A
Weight <sup>(2)</sup>	~17 kg	~17 kg	~24 kg	~30 kg

Technical Data	PSI 9080-340 3U	PSI 9200-140 3U	PSI 9360-80 3U	PSI 9500-60 3U
Output voltage DC	0...80 V	0...200 V	0...360 V	0...500 V
- Ripple <sup>(1)</sup>	<320 mV <sub>PP</sub> <25 mV <sub>RMS</sub>	<300 mV <sub>PP</sub> <40 mV <sub>RMS</sub>	<320 mV <sub>PP</sub> <55 mV <sub>RMS</sub>	<350 mV <sub>PP</sub> <70 mV <sub>RMS</sub>
-Sensing compensation	~ 2 V	~ 5 V	~ 7.5 V	~ 10 V
<b>Isolation</b>				
- Negative output <-> PE	±400 V DC	±400 V DC	±400 V DC	±725 V DC
- Positive output <-> PE	±400 V DC	±600 V DC	±600 V DC	±1000 V DC
Output current	0...340 A	0...140 A	0...80 A	0...60 A
- Ripple <sup>(1)</sup>	<160 mA <sub>RMS</sub>	<44 mA <sub>RMS</sub>	<35 mA <sub>RMS</sub>	<32 mA <sub>RMS</sub>
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 accuracy U	≤80 mV	≤200 mV	≤350 mV	≤500 mV
Programming resolution I	≤14 mA	≤6 mA	≤4 mA	≤3 mA
Programming accuracy I	≤680 mA	≤280 mA	≤160 mA	≤120 mA
Weight <sup>(2)</sup>	~24 kg	~24 kg	~24 kg	~24 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

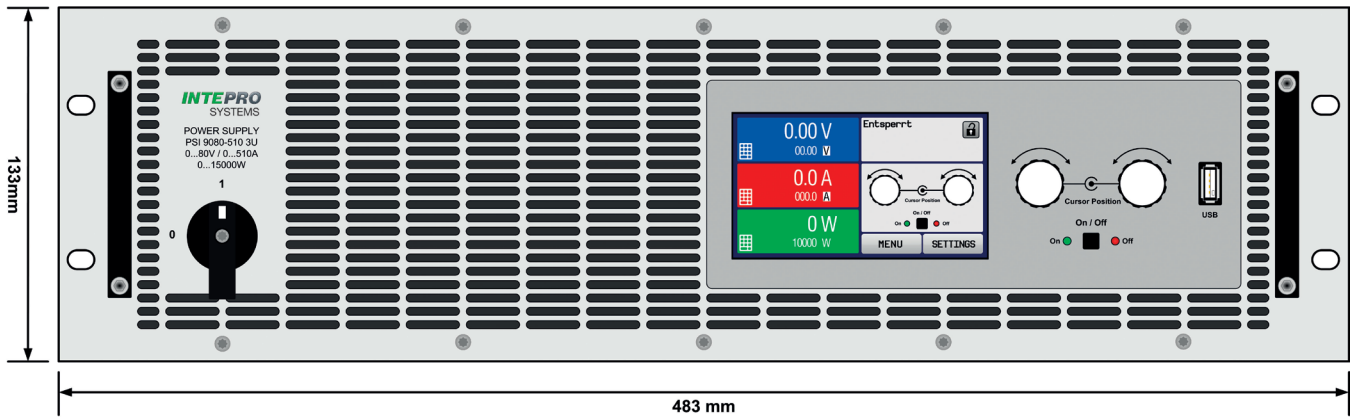
(3) Article number of the standard version, models with option 3W installed have different article numbers

Technical Data	PSI 9750-40 3U	PSI 91000-30 3U	PSI 9080-510 3U	PSI 9200-210 3U
Output voltage DC	0...750 V	0...1000 V	0...80 V	0...200 V
- Ripple <sup>(1)</sup>	<800 mV <sub>PP</sub> <200 mV <sub>RMS</sub>	<1600 mV <sub>PP</sub> <350 mV <sub>RMS</sub>	<320 mV <sub>PP</sub> <25 mV <sub>RMS</sub>	<300 mV <sub>PP</sub> <40 mV <sub>RMS</sub>
-Sensing compensation	~15 V	~20 V	~2.5 V	~6 V
<b>Isolation</b>				
- Negative output <-> PE	±725 V DC	±725 V DC	±400 V DC	±400 V DC
- Positive output <-> PE	±1000 V DC	±1000 V DC	±400 V DC	±600 V DC
Output current	0...40 A	0...30 A	0...510 A	0...210 A
- Ripple <sup>(1)</sup>	<32 mA <sub>RMS</sub>	<22 mA <sub>RMS</sub>	<240 mA <sub>RMS</sub>	<66 mA <sub>RMS</sub>
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 accuracy U	≤750 mV	≤1 V	≤80 mV	≤200 mV
Programming resolution I	≤2 mA	≤2 mA	≤21 mA	≤9 mA
Programming accuracy I	≤80 mA	≤60 mA	≤1.1 A	≤420 mA
Weight <sup>(2)</sup>	~24 kg	~24 kg	~30 kg	~30 kg

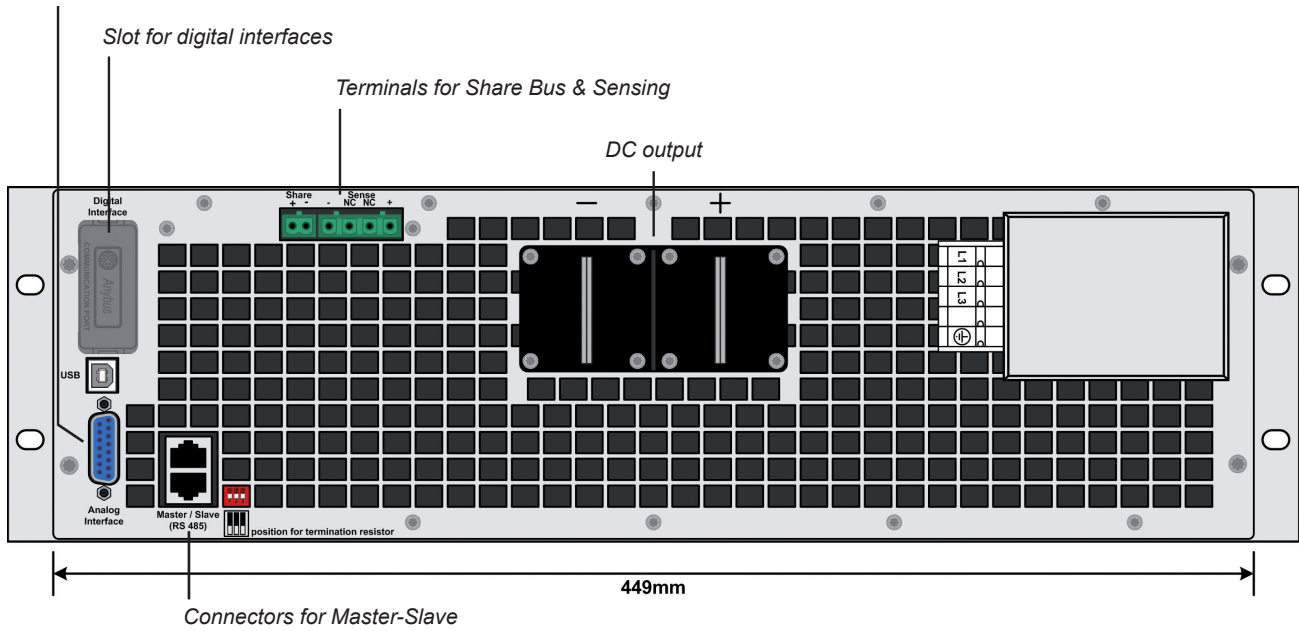
Technical Data	PSI 9360-120 3U	PSI 9500-90 3U	PSI 9750-60 3U	PSI 91500-30 3U
Output voltage DC	0...360 V	0...500 V	0...750 V	0...1500 V
- Ripple <sup>(1)</sup>	<320 mV <sub>PP</sub> <55 mV <sub>RMS</sub>	<350 mV <sub>PP</sub> <70 mV <sub>RMS</sub>	<800 mV <sub>PP</sub> <200 mV <sub>RMS</sub>	<2400 mV <sub>PP</sub> <400 mV <sub>RMS</sub>
-Sensing compensation	~7.5 V	~10 V	~15 V	~30 V
<b>Isolation</b>				
- Negative output <-> PE	±400 V DC	±725 V DC	±725 V DC	±725 V DC
- Positive output <-> PE	±600 V DC	±1000 V DC	±1000 V DC	±1500 V DC
Output current	0...120 A	0...90 A	0...60 A	0...30 A
- Ripple <sup>(1)</sup>	<50 mA <sub>RMS</sub>	<48 mA <sub>RMS</sub>	<48 mA <sub>RMS</sub>	<26 mA <sub>RMS</sub>
Output power	0...15000 W	0...15000 W	0...15000 W	0...15000 W
Efficiency	~93%	~95%	~94%	~95%
Programming resolution U	≤15 mV	≤21 mV	≤31 mV	≤61 mV
Programming accuracy U	≤350 mV	≤500 mV	≤750 mV	≤1.5 V
Programming resolution I	≤5 mA	≤4 mA	≤3 mA	≤2 mA
Programming accuracy I	≤240 mA	≤180 mA	≤120 mA	≤60 mA
Weight <sup>(2)</sup>	~30 kg	~30 kg	~30 kg	~30 kg

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

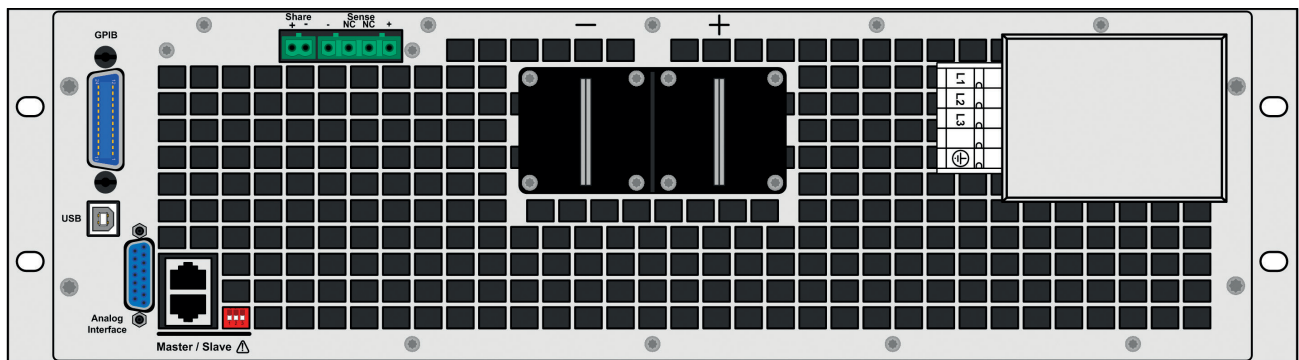
(2) Weight of standard version, models with options may vary



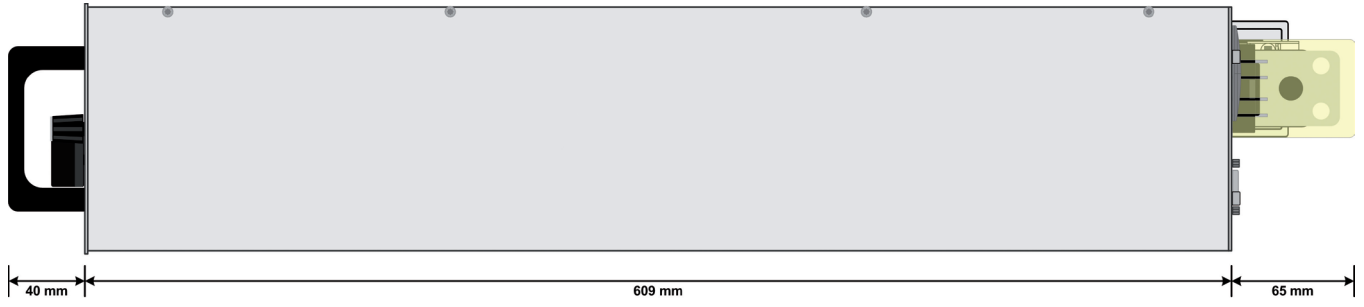
USB and analog interface



Rear view of base model



Rear view with option 3W



## Contact Us

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