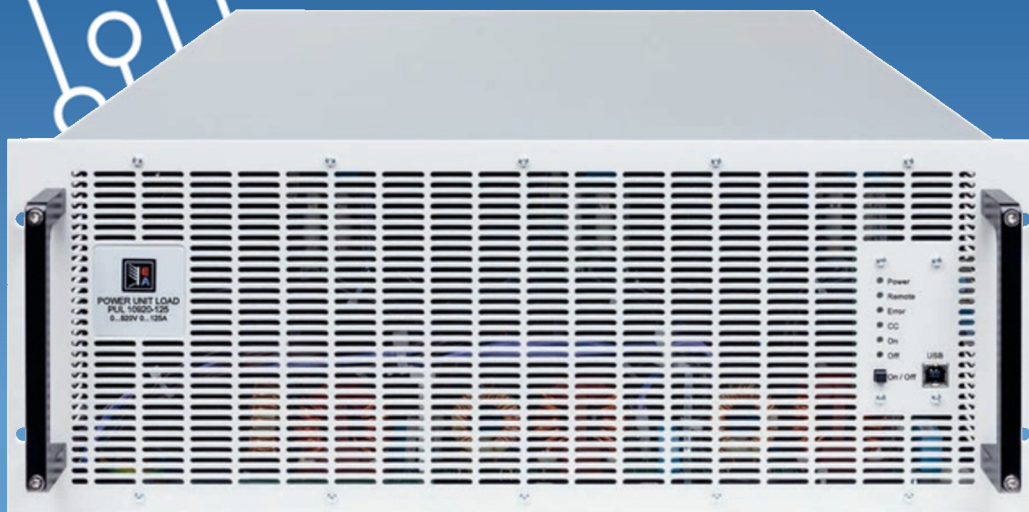




Elektro-Automatik



30 kW

PSI 10000 4U

Advanced Programmable DC Power Supply for Versatile Applications | 30 kW

Flexible Autoranging Output: Delivers maximum power across a wide range of voltage and current combinations.

High Efficiency: Achieves up to 96% efficiency, minimizing energy costs and heat output.

Integrated Function Generator: Supports predefined curves, photovoltaic simulation, and customizable test sequences.

Scalable Power Systems: Combine up to 64 units for a total output of 1920 kW and 64,000 A.

Advanced Interfaces: Includes USB, Ethernet, and optional industrial interfaces like CAN and EtherCAT.

EA-PSI 10000 4U 30 kW

Programmable DC power supply



Features

- Wide range input: 208 V - 480 V, +10%, 3ph AC
- Active Power Factor Correction, typical 0.99
- Very high efficiency of up to 96%
- High performance with 30 kW per unit
- Voltages from 0 - 10 V up to 0 - 2000 V
- Currents from 0 - 40 A up to 0 - 1000 A
- Flexible, power-regulated DC output stages (autoranging)
- Regulation modes CV, CC, CP, CR with fast crossover
- Digital regulation, high resolution with 16-bit ADCs and DACs, selection of voltage regulation speed: Normal, Fast, Slow
- Color 5" TFT display with touch control and intuitive user interface
- Galvanically isolated Share Bus for parallel operation of all power classes in the 10000 series
- Master-Slave Bus for parallel operation of up to 64 units of the same type in all power classes of the 10000 series
- Integrated function generator with predefined curves
- Automotive test procedures for LV123, LV124, and LV148
- Photovoltaics test mode (EN 50530)
- Command languages and drivers: SCPI and ModBus, LabVIEW, IVI

Built-in interfaces

- USB
- Ethernet
- Analog
- USB (front panel)
- Master-Slave-Bus
- Share-Bus

Optional interfaces

- CAN
- CANopen
- RS232
- Profibus
- EtherCAT
- Profinet, with one or two ports
- Modbus, with one or two ports
- Ethernet, with one or two ports

Software

- EA - Power Control
- EA - Battery Simulation



Options

- Water Cooling in stainless steel

SPECIFICATIONS

AC Input

- **Voltage, Phases:**
 - Range 1: 208 V, $\pm 10\%$, 3ph AC (with DC output power derating to 18 kW)
 - Range 2: 380–480 V, $\pm 10\%$, 3ph AC
- **Frequency:** 45–65 Hz
- **Power Factor:** ca. 0.99
- **Leakage Current:** < 10 mA
- **Inrush Current / Phase Current:** ≤ 56 A
- **Overvoltage Category:** 2

DC Output (static)

- **Load Regulation CV:** $\leq 0.05\%$ FS (0 - 100% load, constant output voltage and constant temperature)
- **Line Regulation CV:** $\leq 0.01\%$ FS (208V - 480 V +10% supply voltage, constant load and constant temperature)
- **Stability CV:** $\leq 0.02\%$ FS (during 8h of operation, after 30 minutes warm-up, at constant output voltage, load, and temperature)
- **Temperature Coefficient CV:** ≤ 30 ppm/ $^{\circ}$ C (after 30 minutes warm-up)
- **Compensation (Remote Sense):** $\leq 5\%$ UNominal
- **Load Regulation CC:** $\leq 0.1\%$ FS (0 - 100% load, constant output voltage and constant temperature)
- **Line Regulation CC:** $\leq 0.01\%$ FS (208 V - 480 V AC +10% supply voltage, constant load and constant temperature)
- **Stability CC:** $\leq 0.02\%$ FS (during 8h of operation, after 30 minutes warm-up, at constant output voltage, load, and temperature)
- **Temperature Coefficient CC:** ≤ 50 ppm/ $^{\circ}$ C (after 30 minutes warm-up)
- **Load Regulation CP:** $\leq 0.3\%$ FS (0 - 100% load, constant output voltage and constant temperature)
- **Load Regulation CR:** $\leq 0.3\%$ FS + 0.1% FS current (0 - 100% load, constant output voltage and constant temperature)

Protective Functions

- **Overvoltage Protection (OVP):** Adjustable 0 - 110% UNominal
- **Overcurrent Protection (OCP):** Adjustable 0 - 110% INominal
- **Overpower Protection (OPP):** Adjustable 0 - 110% PNominal
- **Overtemperature Protection (OT):** DC output shuts down in case of insufficient cooling

DC Input (Dynamic)

- **Rise Time 10 - 90% CC:** ≤ 2 ms
- **Fall Time 90 - 10% CC:** ≤ 2 ms

Insulation

- **AC Input to DC Output:** 3750 Vrms (1 minute, creepage distance > 8 mm)
- **AC Input to Case (PE):** 2500 Vrms
- **DC-Output to case (PE):** Depending on the model, see model table
- **DC Output to Interfaces:** 1000 V DC (models up to 360 V rating), 1500 V DC (models from 500 V rating)

Interfaces (Digital)

- **Built-in, Galvanically Isolated:** USB, Ethernet (100 MBit), USB front panel, all for communication
- **Optional, Galvanically Isolated:** CAN, CANopen, RS232, Modbus TCP, Profinet, Profibus, EtherCAT, Ethernet

Interfaces (Analog)

- **Built-in, Galvanically Isolated:** 15-pole D-Sub
- **Signal Range:** 0 - 10 V or 0 - 5 V (switchable)
- **Inputs:** U, I, P, R, remote control on/off, DC output on/off, resistance mode on/off
- **Outputs:** Monitor U and I, alarms, reference voltage, DC output status, CV/CC regulation mode
- **Accuracy (U/I/P/R):** 0-10 V: $\leq 0.2\%$, 0-5 V: $\leq 0.4\%$

Device Configuration

- **Parallel Operation:** Up to 64 units of any power class in the 10000 series, with Master-Slave Bus and Share Bus

Safety and EMC

- **Safety Standards:** EN 61010-1, IEC 61010-1, UL 61010-1, CSA C22.2 No 61010-1, BS EN 61010-1
- **EMC Compliance:** EN 55011 (Class B), CISPR 11 (Class B), FCC 47 CFR part 15B (Class B)
- **EN 61326-1 Includes tests:** EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6
- **Safety Protection Class:** Class 1
- **Ingress Protection:** IP20

Environmental Conditions

- **Operating Temperature:** 0–50 $^{\circ}$ C (32–122 $^{\circ}$ F)
- **Storage Temperature:** -20–70 $^{\circ}$ C (-4–158 $^{\circ}$ F)
- **Humidity:** $\leq 80\%$ relative humidity, non-condensing
- **Altitude:** ≤ 2000 m ($\leq 6,600$ ft)
- **Pollution Degree:** 2

Mechanical Construction

- **Cooling:** Forced air flow from front to rear (temperature-controlled fans), optional water cooling
- **Dimensions (W x H x D):** 19" x 4U x 668 mm
- **Weight:** 50 kg (110 lbs)
- **Weight with water cooling:** 56 kg (126 lbs)

Available Models

Parameter	PSI 10060-1000	PSI 10080-1000	PSI 10200-420	PSI 10360-240	PSI 10500-180
Voltage Range	0 - 60 V	0 - 80 V	0 - 200 V	0 - 360 V	0 - 500 V
Ripple in CV (rms)	≤25 mV (BW 300 kHz)	≤25 mV (BW 300 kHz)	≤40 mV (BW 300 kHz)	≤55 mV (BW 300 kHz)	≤70 mV (BW 300 kHz)
Ripple in CV (pp)	≤320 mV (BW 20 MHz)	≤320 mV (BW 20 MHz)	≤300 mV (BW 20 MHz)	≤320 mV (BW 20 MHz)	≤350 mV (BW 20 MHz)
Current Range	0 - 1000 A	0 - 1000 A	0 - 420 A	0 - 240 A	0 - 180 A
Power Range	0 - 30000 W	0 - 30000 W	0 - 30000 W	0 - 30000 W	0 - 30000 W
Resistance Range	0.003 Ω - 5 Ω	0.003 Ω - 5 Ω	0.0165 Ω - 25 Ω	0.05 Ω - 90 Ω	0.08 Ω - 170 Ω
Output Capacitance	25380 μF	25380 μF	5400 μF	1800 μF	675 μF
Efficiency	95.1%	95.5%	95.3%	95.8%	96.5%

Available Models

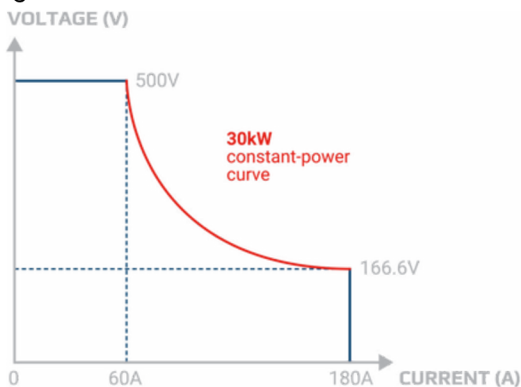
Parameter	PSI 10750-120	PSI 10920-125	PSI 11000-80	PSI 11500-60	PSI 12000-40
Voltage Range	0 - 750 V	0 - 920 V	0 - 1000 V	0 - 1500 V	0 - 2000 V
Ripple in CV (rms)	≤200 mV (BW 300 kHz)	≤200 mV (BW 300 kHz)	≤300 mV (BW 300 kHz)	≤400 mV (BW 300 kHz)	≤500 mV (BW 300 kHz)
Ripple in CV (pp)	≤800 mV (BW 20 MHz)	≤800 mV (BW 20 MHz)	≤1600 mV (BW 20 MHz)	≤2400 mV (BW 20 MHz)	≤3000 mV (BW 20 MHz)
Current Range	0 - 120 A	0 - 125 A	0 - 80 A	0 - 60 A	0 - 40 A
Power Range	0 - 30000 W	0 - 30000 W	0 - 30000 W	0 - 30000 W	0 - 30000 W
Resistance Range	0.2 Ω - 370 Ω	0.25 Ω - 550 Ω	0.4 Ω - 650 Ω	0.8 Ω - 1500 Ω	1.7 Ω - 2700 Ω
Output Capacitance	450 μF	100 μF	200 μF	75 μF	50 μF
Efficiency	96.5%	96.5%	95.8%	96.5%	96.5%

General

The PSI 10000 4U series by EA Elektro-Automatik efficiently converts energy from the grid into a regulated DC voltage with up to 96% efficiency. Its broad range of voltage and current configurations from 0–60 V to 0–2000 V and 0–40 A to 0–1000 A enables unparalleled flexibility. The autoranging output stage ensures that the device can provide full power across this wide range, simplifying operations and reducing equipment needs. For larger systems, the Master-Slave Bus supports up to 64 parallel devices, enabling scalable setups reaching up to 1920 kW and 64,000 A. With comprehensive software solutions, advanced control interfaces, and additional functionality like a function generator, the PSI 10000 4U series is designed to meet the complex demands of modern engineering and laboratory environments.

DC Connection

The PSI 10000 4U series features a robust and efficient DC connection system designed for high performance and scalability. The rear-mounted copper blades provide secure and durable connections for reliable operation. For applications requiring greater power output, multiple units can be seamlessly connected in parallel using vertical copper rails, simplifying setup and enhancing scalability. A protective cover ensures safety while maintaining ease of access, making the PSI 10000 4U series an ideal solution for complex, high-power configurations.



The Principle of Autoranging

The energy recovery capability is exemplified in typical applications where a device under test (DUT) draws power, converts it to DC, and feeds it into the PUL 10000 4U. The system then reconverts the DC energy into AC, feeding it back into the grid with minimal losses. This closed-loop system significantly reduces energy waste and enhances sustainability.

AC Connection

The PSI 10000 4U series is equipped with active power factor correction (PFC), ensuring high efficiency and minimal energy consumption. Its wide input voltage range—208–480 V across three phases—allows seamless integration into most global grid configurations. The device automatically adjusts to the available grid voltage without the need for manual reconfiguration, making it highly adaptable to diverse industrial and laboratory applications.

DC Output

The PUL 10000 4U series supports a broad input range of 0–80 V to 0–2000 V, accommodating currents from 0–40 A to 0–1000 A. Its autoranging technology dynamically adjusts voltage and current to maintain constant power across this range, enabling engineers to work with multiple configurations without needing additional devices. The design emphasizes flexibility and efficiency, making it ideal for dynamic and variable testing conditions.

Function Generator

The integrated function generator offers predefined waveforms such as sine, triangle, and square, as well as custom programmable functions. These features enable detailed testing and simulation of various conditions, including solar photovoltaic systems and fuel cell behavior. The ability to save and reload test sequences further enhances productivity, making the PSI 10000 4U an indispensable tool for advanced testing and research.

Interfaces

The PSI 10000 4U series is equipped with a wide range of built-in interfaces to ensure seamless integration into modern test environments. Standard options include USB, Ethernet, and a configurable analog interface, all of which are galvanically isolated for safe and precise operation. These interfaces enable real-time monitoring and control of voltage, current, power, and resistance. Optional industrial interfaces such as CAN, EtherCAT, Profinet, and Modbus further expand compatibility with automation systems. This comprehensive suite of interfaces makes the PSI 10000 4U series a reliable and adaptable solution for both laboratory and industrial applications.

High-Performance Systems

The PSI 10000 4U series is designed to handle high-power applications with ease, offering scalable configurations that can reach up to 1920 kW and 64,000 A. By connecting multiple units in parallel using vertical copper rails, users can create powerful systems while maintaining a compact footprint. For example, a 19" cabinet can house up to 240 kW of power in just 0.6 m² of floor space. This modular approach allows for unparalleled flexibility, making the PSI 10000 4U ideal for industries requiring high power density and efficient use of space.

Master-Slave-Bus and Share-Bus

The integrated Master-Slave Bus and Share Bus simplify the operation of multi-unit systems by allowing them to function as a single device. The Master-Slave Bus consolidates total power and current data, displaying it clearly on the master unit while also managing alarms and warnings from all connected devices. The Share Bus ensures balanced load distribution across units, enhancing system reliability and extending the lifespan of individual components. This intelligent system architecture enables engineers to scale power solutions effortlessly while maintaining precision and efficiency.



Example Representation

A fully assembled and operational 240 kW system.

Applications

Relay Test in Production

The PSI 10000 4U series is ideal for relay testing in production environments, providing precise control over voltage and current for coil and contact evaluations. Critical parameters such as operating, holding, and decay current, as well as voltage consistency and disconnect thresholds, can be accurately measured and documented. With dynamic voltage, current, power, and resistance controls, the PSI 10000 4U ensures optimal testing conditions. Its diverse interface options enable seamless integration into automated test systems, delivering reliable data without the need for additional measuring equipment.

Fuel Cell Simulation

Engineered for fuel cell testing, the PSI 10000 4U series supports the simulation of energy storage systems and components powered by fuel cells. Its integrated safety features, including overcurrent protection (OCP) and voltage monitoring, safeguard connected devices and ensure safe, reproducible testing conditions. These capabilities make the PSI 10000 4U the preferred choice for applications requiring precise data collection and system reliability, advancing the development and optimization of fuel cell technologies.

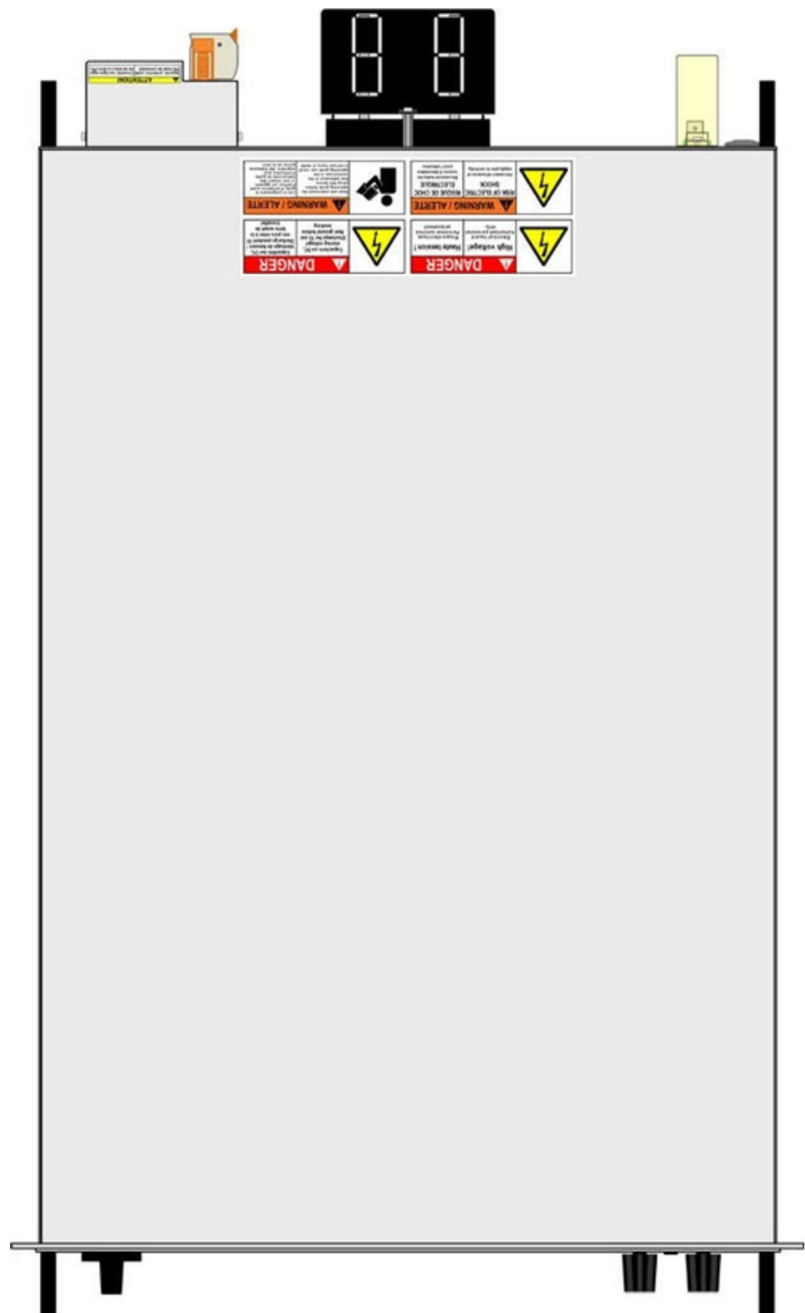
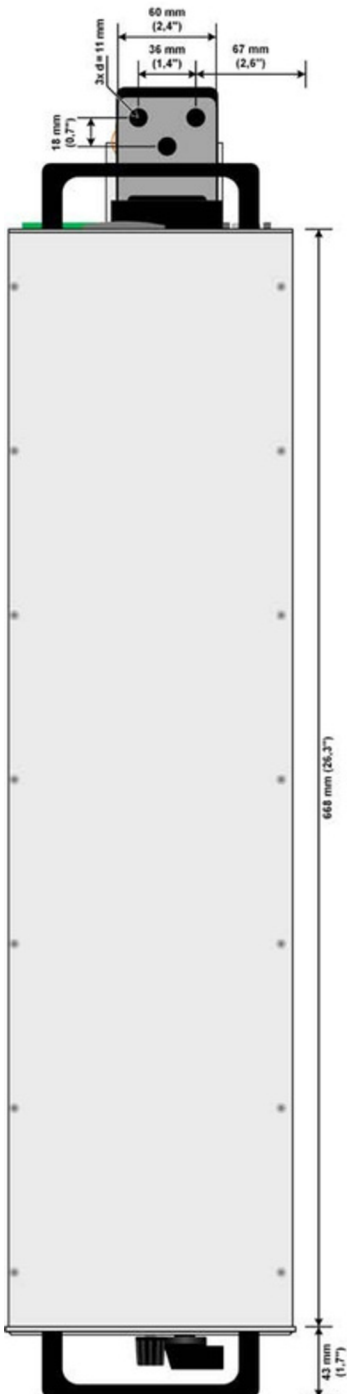
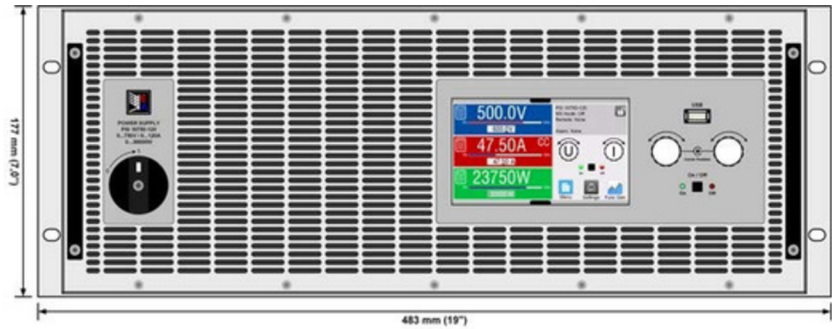
On-Board Charger Test

The PSI 10000 4U simplifies on-board charger (OBC) testing by offering flexible sequencing and logging functions for precise and reproducible results. Its adjustable voltage regulation speeds (Normal, Fast, and Slow) ensure smooth operation, avoiding conflicts between the test system and the device under test. For complete testing solutions, the PSI 10000 4U can be paired with the ELR 10000 series electronic DC load, creating a comprehensive source-and-sink setup for in-depth evaluations.

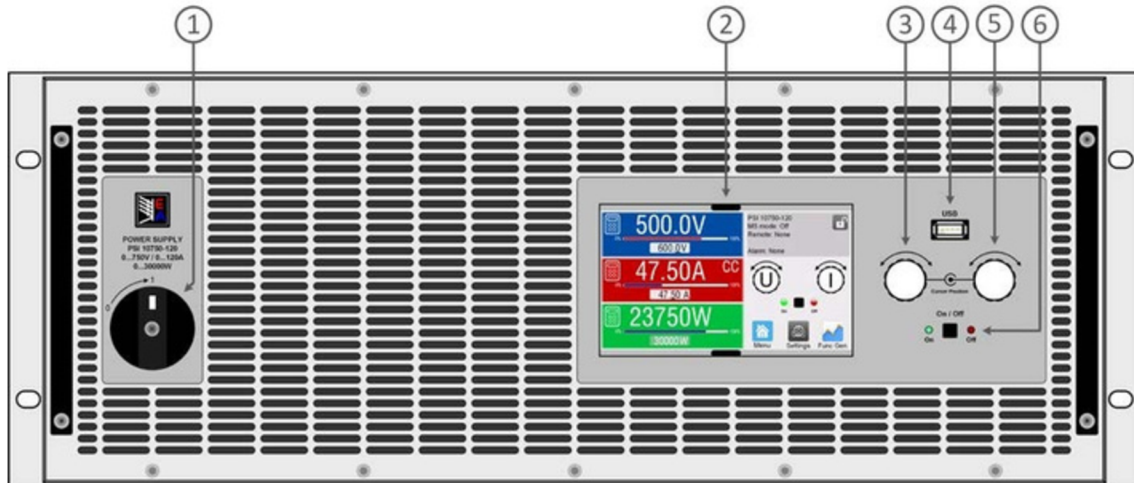
Solar Array Simulation

With advanced solar array simulation capabilities, the PSI 10000 4U is perfectly suited for testing photovoltaic (PV) inverters. It supports industry standards such as EN 50530 and allows for detailed parameter adjustments, including irradiation, panel technology, and temperature. The device's 16-bit resolution and high sampling rate ensure precise and reliable results, enabling engineers to test efficiency, performance, and electrical characteristics under real-world conditions. These results can be easily documented and exported for further analysis.

Technical drawings PSI 10000 4U <200 V

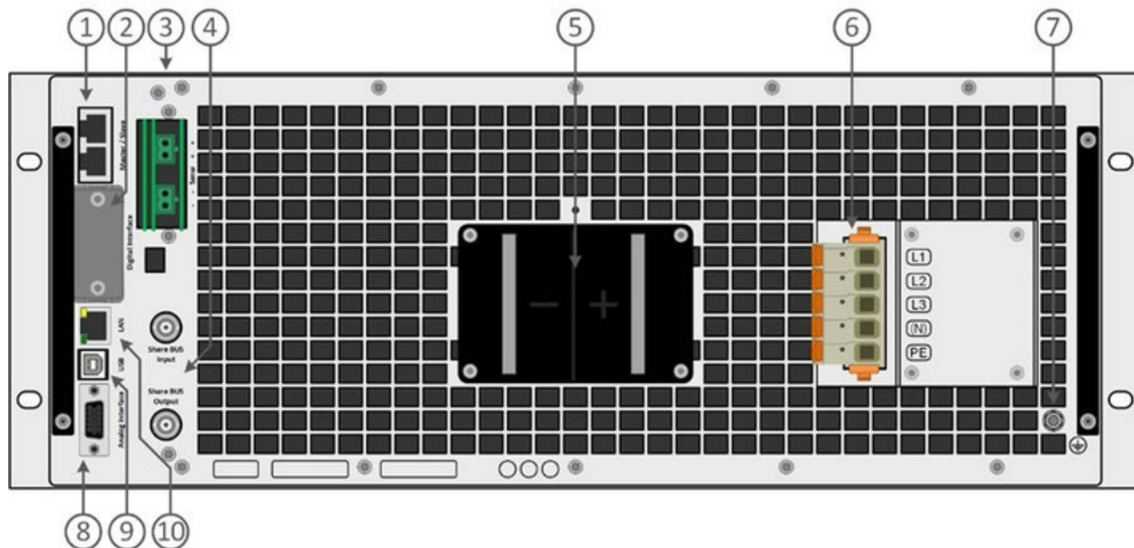


Front panel description PSI 10000 4U



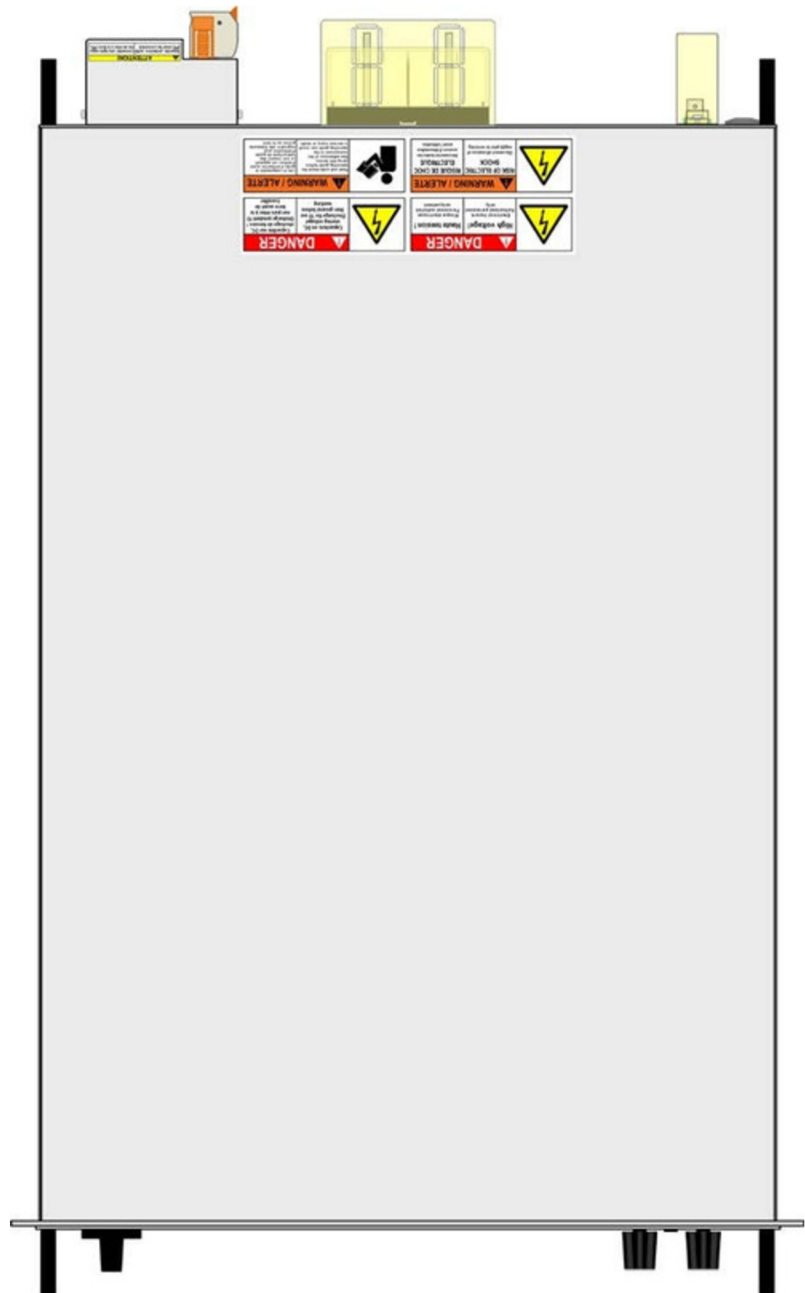
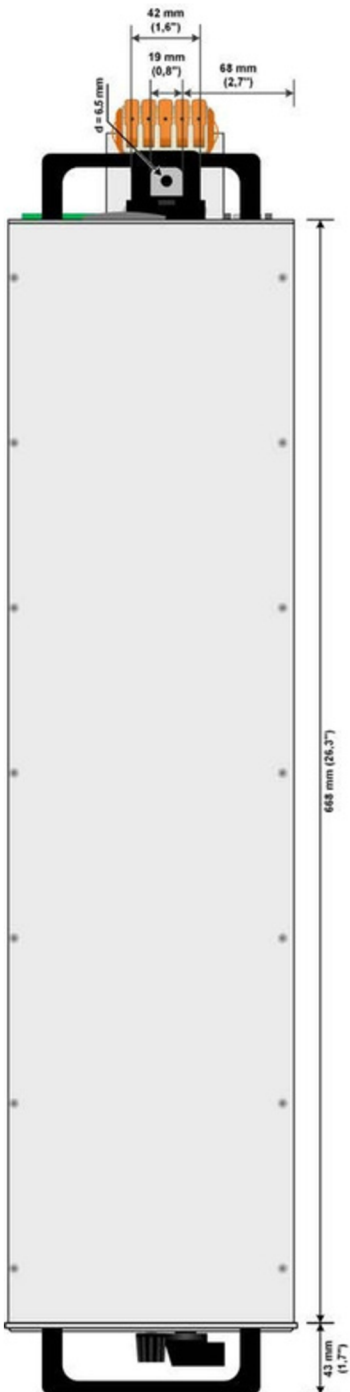
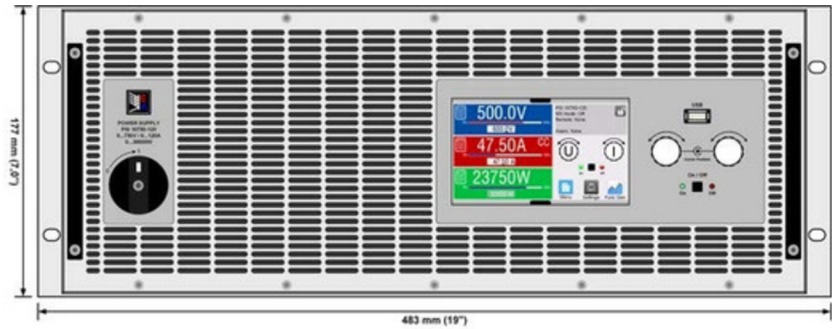
1. Power switch
2. TFT control interface, interactive operation and display
3. Rotary knob with push-button action, for settings and control
4. USB host, uses USB sticks for data logging and sequencing
5. Rotary knob with push-button action, for settings and control
6. On / Off push-button with LED status display

Rear panel description PSI 10000 4U <200 V

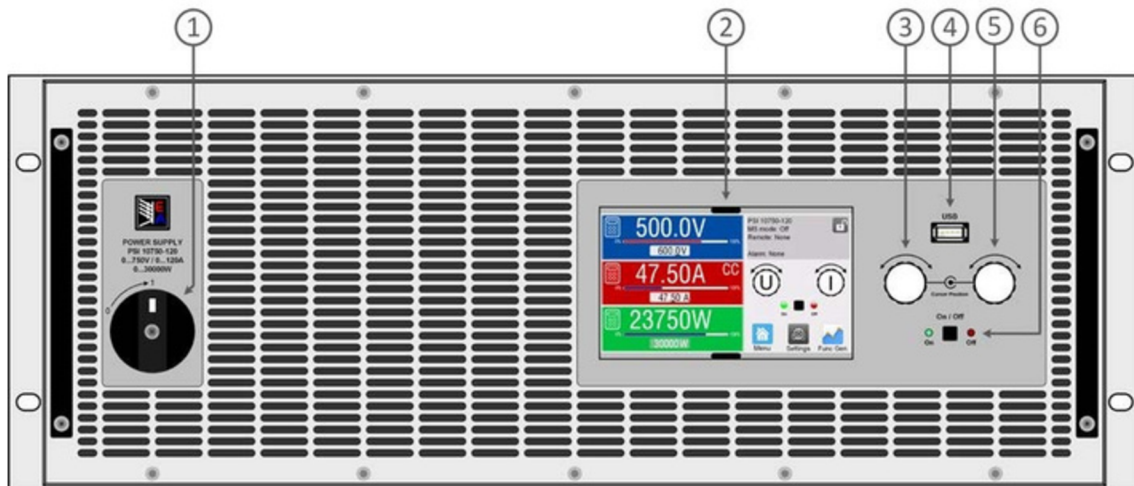


1. Master-Slave-Bus connectors to set up a system for parallel connection
2. Slot for interfaces
3. Remote sense connectors
4. Share bus connectors to set up a system for parallel connection
5. DC output connector (copper blades)
6. AC input connector
7. Grounding connection screw (PE)
8. Connector (DB15 female) for isolated analog programming, monitoring and other functions
9. USB interface
10. Ethernet interface

Technical drawings PSI 10000 4U >360 V

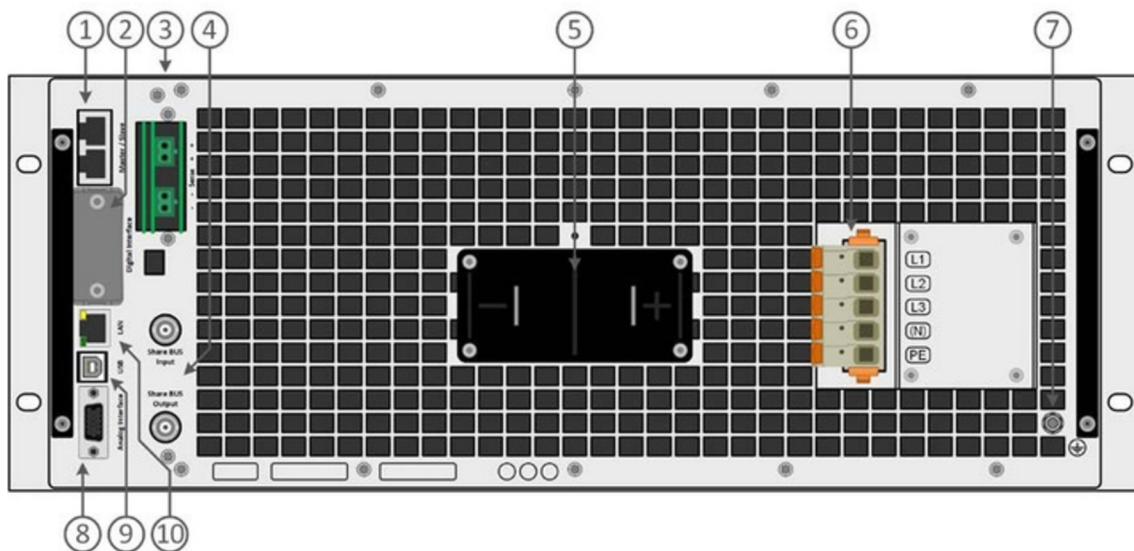


Front panel description PSI 10000 4U



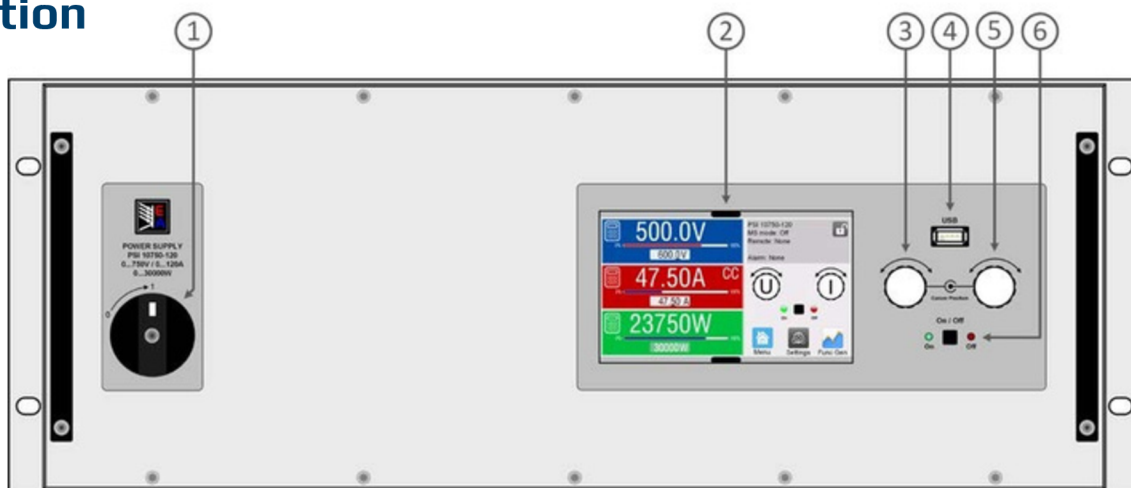
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5. Rotary knob with push-button action, for settings and control
6. On / Off push-button with LED status display

Rear panel description PSI 10000 4U >360 V



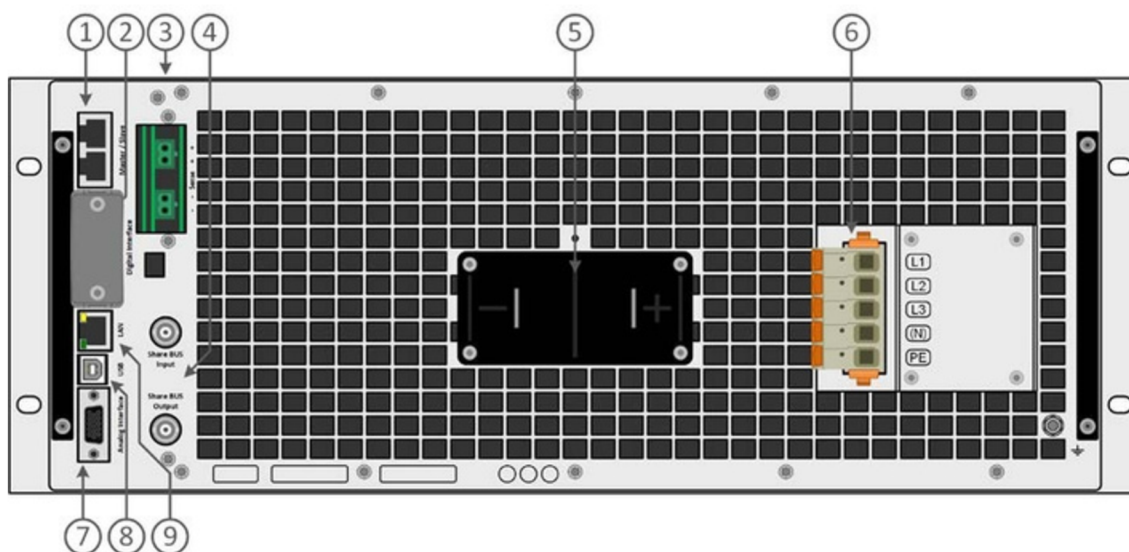
1. Master-Slave-Bus connectors to set up a system for parallel connection
2. Slot for interfaces
3. Remote sense connectors
4. Share bus connectors to set up a system for parallel connection
5. DC output connector (copper blades)
6. AC input connector
7. Grounding connection screw (PE)
8. Connector (DB15 female) for isolated analog programming, monitoring and other functions
9. USB interface
10. Ethernet interface

Front panel description PSI 10000 4U with Water Cooling option



1. Power switch
2. TFT control interface, interactive operation and display
3. Rotary knob with push-button action, for settings and control
4. USB host, uses USB sticks for data logging and sequencing
5. Rotary knob with push-button action, for settings and control
6. On / Off push-button with LED status display

Rear panel description PSI 10000 4U with Water Cooling option



1. Master-Slave-Bus connectors to set up a system for parallel connection
2. Slot for interfaces
3. Remote sense connectors
4. Share bus connectors to set up a system for parallel connection
5. Inlets and outlets for water-cooling
6. DC output connector (copper blades)
7. AC input connector
8. Grounding connection screw (PE)
9. Connector (DB15 female) for isolated analog programming, monitoring and other functions
10. USB interface
11. Ethernet interface

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