LABORATORY POWER SUPPLIES, 320 - 1300W SERIES 9000

EA-PS 9032-20

- **Output Power 320W, 650W and 1300W, PFC on 650 and 1300 Watt units**
- **Output voltage 0...16V, 0...32V, 0...65V, 0...150V, 0...300V**
- **Output current 2 to 40A**
- **Laboratory and Systems applications**
- **Primary switched mode**
- **Output via SAFTY SOCKETS**
- **Adjustable constant voltage, coarse and fine**
- **Adjustable constant current, coarse and fine**
- **Output switchable (Stand-by)**
- **V + A externally programmable, IEEE-BUS + RS232 CAN BUS as option**
- **Monitor outputs V + A, 0...10V for 0...100%**
- **Overvoltage protection (OVP) adjustable**
- **Volt- and Ammeter class 2,0 illuminated LCD meters optional**
- **Preset and Actual indication for V and A selectable**
- **Remote sense, selectable**
- **Mode indications:**
  "CV" = Constant Voltage
  "CC" = Constant Current
- **Master Slave Operation**
- **Safety: EN 60950**
- **EMI: EN 50081 Part 1, EN 50082 Part 1**

General:

These primary switched laboratory power supplies incorporate state of the art switch mode technology. A comprehensive range of control and fine adjustment is available whilst maintaining a high power density. The 650W and 1300W units are equipped with an active power factor corrected input stage ensuring sinusoidal input current.

Mains voltage:

230V±15% on the 320W units, 90...264V on the 650W and 1300W units. The 650 and 1300 Watt units are equipped with primary current limiting. The output power is, on input voltages below 180V, linearly reduced to 50% of the rated power.

Voltage and Current setting:

The output values of voltage and current can be preset in stand-by mode course and fine (**Preset**) on the front panel.

Stand-by:

The output voltage can be switched off with the push button **"Output"**. The remote operation of the Stand-by function is available via the analog interface (15-pol. Sub-D-socket) on the front panel.

The units may be operated as a constant voltage source with current limiting (LED "**CV**") or as a constant current source with voltage limiting (LED "**CC**").

Remote Sense
Remote sense is standard in this series. The sense can be activated with the code switch "**Mode**" and connected to the 15-pole Sub-D-socket on the front panel.

The following voltages can be compensated: 0,8V on 16V, 1,5V on 32V, 3,2V on 65V units.

Two sense modes are available:
Internal- and external sense

Internal Sense:
When the voltage on the output sockets must be constant, the internal sense must be used. In this case, the code switch S1, switches 3 and 4 must be "**ON**".
Connect no external sense cable in this mode.

External Sense:
When the voltage on the load must be constant, the external sense must be used. On the code switch S1, the switches 3 and 4 must be "**OFF**". The sense cables are to be connected direct to the load: +Sense (Pin 14 of D-Sub socket) to +Load and –Sense (Pin 15 of D-Sub socket) to –Load.

Overvoltage protection (OVP):
The OVP value can be set with the "**OVP**" potentiometer on the front panel within the range of 0V up to 10% above the max. output voltage. The OVP value is displayed on the voltmeter, when the **OVP** push button is activated and the LED "**Preset**" is lit. Above this voltage the output is shut down.

Meters:
Separate Volt and Ammeter class 2,0. As an option, illuminated 3½ digit LCD-meters (Order suffix "**LCD**").

Parallel and Series connection:
Two or more power supplies can be connected in series or parallel. In this case one unit can operate as the master unit controlling the others in slave operation. Series operation up to 300V is allowed.

Dimensions W x H x D: 331 x 133 x 350mm
Weight: 320W = 6,8kg, 650W = 7,9kg, 1300W = 10kg

Ambient conditions
During operation, at full load or constant operation, the ambient temperature may lie between 0...50°C. The storage temperature can be between -40°C and +70°C. The relative humidity should not exceed 90% non-condensing.

External Programming and Monitor outputs:
Voltage and current can be externally programmed and monitored by external DC Voltages of 0...10V. The connections are located on the front panel (Pin 15 of D-Sub socket). The selection **Internal/External** is made on the Mode-Switch. The programming inputs are related to the negative output.

Remote ON / OFF
Using the control connection **"Remote On/Off"** (Pin 10) the switch mode unit can be set into Stand-by mode.

Options:
Combined carry handle and tilt stand, suffix "**TG**".
IEEE-BUS: suffix **"IEC"**
RS232 CAN-Bus: suffix **"RS232 CAN"**
19"-Rack: suffix **" 19"-Rack"**
LCD-Meter: suffix **"LCD"**

Type Nb.	Output Voltage	Stability 10-90% Load	Stability ±10% ΔV_I	Ripple	Regulation 10-100% Load	OVP Range	Current	Stability 0...100% ΔV_O	Ripple	Article Number
EA-PS 9016-20	**0...16V**	≤ 10mV	≤ 2mV	≤10mV pp	500µsec.	3...17,5V	**0...20A**	≤ 20mA	≤50mA eff.	15100500
EA-PS 9016-40	**0...16V**	≤ 10mV	≤ 1mV	≤12mV pp	500µsec.	3...17,5V	**0...40A**	≤ 40mA	≤100mA eff.	15100501
EA-PS 9032-10	**0...32V**	≤ 20mV	≤ 2mV	≤15mV pp	500µsec.	3...35V	**0...10A**	≤ 10mA	≤25mA eff.	15100503
EA-PS 9032-20	**0...32V**	≤ 20mV	≤ 2mV	≤17mV pp	500µsec.	3...35V	**0...20A**	≤ 20mA	≤50mA eff.	15100504
EA-PS 9032-40	**0...32V**	≤ 20mV	≤ 2mV	≤15mV pp	500µsec.	3...35V	**0...40A**	≤ 40mA	≤100mA eff.	15100505
EA-PS 9065-05	**0...65V**	≤ 40mV	≤ 4mV	≤20mV pp	500µsec.	3...72V	**0...5A**	≤ 5mA	≤15mA eff.	15100506
EA-PS 9065-10	**0...65V**	≤ 40mV	≤ 4mV	≤20mV pp	500µsec.	3...72V	**0...10A**	≤ 10mA	≤25mA eff.	15100507
EA-PS 9065-20	**0...65V**	≤ 40mV	≤ 4mV	≤20mV pp	500µsec.	3...72V	**0...20A**	≤ 20mA	≤50mA eff.	15100508
EA-PS 9150-04	**0...150V**	≤ 60mV	≤ 6mV	≤100mV pp	500µsec.	3...165V	**0...4A**	≤ 0,8mA	≤20mA eff.	15100510
EA-PS 9300-02	**0...300V**	≤ 80mV	≤ 8mV	≤100mV pp	500µsec.	3...330V	**0...2A**	≤ 0,4mA	≤2mA eff.	15100513

LABORATORY POWER SUPPLIES, SWITCH MODE, 2KW - 9kW, SERIES 9000

EA-PS 9036-60

- ❑ **Power Factor Correction (PFC)**
- ❑ **Primary switched, light weight & compact**
- ❑ **19" Rack or Bench version**
- ❑ **Automatic remote sensing**
- ❑ **Output switchable (Stand-by)**
- ❑ **Mode indications**
- ❑ **Remote programming, IEEE-BUS option**
- ❑ **Master/Slave Operation**
- ❑ **Short recovery time, High efficiency**
- ❑ **Monitor outputs for V and A, 0...10V ⇨ 0...100%**
- ❑ **Safety: EN 60950**
- ❑ **EMI: EN 50081 Part 2, EN 50082 - Part 2**
- ❑ **Laboratory and Systems applications**
- ❑ **Output power 2000W, 3000W, 6000W & 9000W**
- ❑ **Output voltage 0...18V, 0..36V, 0...72V (***
- ❑ **V and A 10-turn potentiometer adjustment**
- ❑ **OVP adjustable and indicated**
- ❑ **Preset and Actual indication for V and I**
- ❑ **External V and A programming, 2 years warranty**
- ❑ **High regulation , Low ripple**
- ❑ **Analog instruments class 2.0**
- ❑ **Option: Illuminated LCD displays for V and A**

(* higher voltages on request

General
These new primary switched laboratory power supplies have been specifically designed for laboratory and system applications. The units provide highly stable output voltage and current, and offer extensive facilities for various operation modes.

Design concept
The units are available in 19" rack- or bench versions. State-of-the Art switched mode technology makes it possible, to reduce the size and the weight compared with other linear regulated power supplies. The weight of a 2000 Watt unit is 16kg (35lb.) only one quarter of a comparable unit using standard linear technology. The height is 3HE instead of 8HE. A temperature dependent regulated fan ensures low audible noise and high reliability. (1HE=44,45mm, 1TE=5,08mm).

Meters
The units are equipped with separate analogue volt and ampmeters class 2,0. As an option, illuminated 3½ digit LCD meters with 13mm digits are available. In both cases it is possible to independently switch between the value set, the actual value or the OVP value.

Voltage and Current setting
The output values of the voltage and current can be preset in Stand-by mode with 10-turn precision potentiometers.
The push switches "**Voltage**" and "**Current**" must be activated.
The corresponding LED's "**Preset**" lights on and the preset value is indicated on the meters. The LED's "**Actual**" are indicating that the actual values are displayed on the meters.

Mode Indication
When the LED "**CV**" is on, the unit operates as a constant voltage source, the LED "**CC**" indicates that the unit operates as a constant current source. This change over is automatic.

Remote Sense
The remote sense feature can be used to compensate for the voltage loss between the output terminals and the load (max. 0,8V on 18V; 1,6V on 36V; 3,2V on 72V on each cable).
In this case the "**Sense**" input sockets are connected to the load using a small cross section cable. The Sense terminals are on the rear of the unit. The switch over to remote sensing mode is automatic.

Overload protection - Current regulation
The output is protected against a continuous short circuit. The max. output current is adjustable from zero up to the rated current.

The Lab-Power-Supplies series **EA-PS 9000** are equipped with an active power factor correction circuit (PFC) to achieve a power factor better than 0,98, so the reactive current becomes almost zero and the input current is a sine wave. Only actual power is drawn from the mains.

Remote adjustment of the output voltage
The output voltage can be externally set by means of an external voltage of 0...10V for 0... V_0 - $V_{max.}$ The terminals for the external programming are on the rear of the unit.

Remote adjustment of the output current
The output current can be externally set by means of an external voltage of 0...10V for 0... IA_0 - A_{max}. The terminals for the external programming are on the rear of the unit.

IEEE BUS (Option "IEC")
As an option the units can be equipped with an IEEE BUS interface (**EA-PSP 5612, see page 91**). The connection terminals are located on the rear of the unit.

Overvoltage protection (OVP)
This series is equipped with OVP as standard. Any value between 3V and 10% over the max. rated voltage can be set via the OVP potentiometer on the front panel. The preset OVP value is indicated after activating the OVP switch and the "**Preset**" LED lights.
If the output voltage becomes higher (for any reason) than the preset voltage (i.e. operators fault, defective components, external voltage), the switching oscillator is blocked, and no further energy comes to the output. The LED „**OVP**" lights on. To reset the OVP, the unit must first be switched off for a few seconds and after switching back on, the unit then is once again operational.

Parallel & Series connection, Master/Slave Operation
Two or more power supplies can be connected in series or parallel. In this case one unit will operate as the master unit controlling the others in slave operation.

Output terminals
The main output terminals are located on the rear of the unit. On the front panel are two monitoring sockets for test purposes, internally fused with 10A. The (+) and (-) output sockets are floating so that either one may be grounded.

Stand-by operation
The output voltage can be isolated via "**Output**" switch. The "**Off**" LED lit = output zero. "**On**" LED lit = output active.

Over temperature protection (OT)
If the unit is overheated (i.e. Fan defective, ventilation in- and outlet obstructed etc.) it will automatically switch off and the "**OT**" LED will illuminate. After cooling down the unit will switch on automatically.

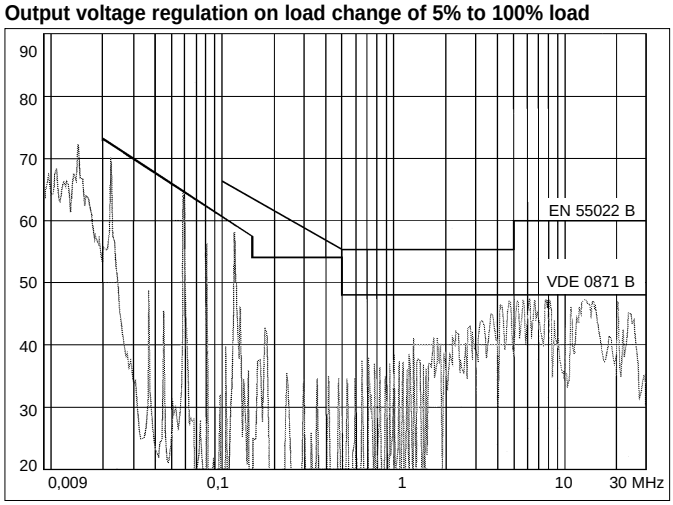
Ambient conditions
During operation, at full load or constant operation, the ambient temperature may lie between 0...50°C. The storage temperature can be between -40°C and +70°C. The relative humidity should not exceed 90% non-condensing.

Technical Data EA-	PS 9018-100	PS 9028-100	PS 9018-300	PS 9036-060	PS 9036-080	PS 9036-180	PS 9036-240
Input voltage 45...440Hz	184...265V	184...265V	3ph. +MP 318...458V	184...265V	207...265V	3ph. +MP 318...458V	3ph. +MP 318...458V
input current, sine wave	9,5A	9,5A	9,5A	11,2A	16A	11,2A	16A
Output voltage	0...18V	0...28V	0...18V	0...36V	0...36V	0...36V	0...36V
-Stability 0...100% load	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%
-Stability ±10% V_{INPUT}	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%
-Ripple	≤9mV p-p	≤9mV p-p	≤16mV p-p	≤9mV p-p	≤10mV p-p	≤16mV p-p	≤20mV p-p
-Regulation 0...100% load	≤1ms	≤1ms	≤1ms	≤1ms	≤1ms	≤1ms	≤1ms
Overvoltage protection (OVP)	3...20V	3...20V	3...20V	≤...40V	3...40V	3...40V	3...40V
Output current	0...100A	0...100A	0...300A	0...60A	0...80A	0...180A	0...240A
-Stability 0...100% V_{OUT}	≤0,15%	≤0,15%	≤0,15%	≤0,15%	≤0,15%	≤0,15%	≤0,15%
-Stability ±10% V_{INPUT}	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%
-Ripple	≤100mA p-p	≤100mA p-p	≤160mA p-p	≤60mA p-p	≤100mA p-p	≤100mA p-p	≤150mA p-p
Dimensions	3HE/466 deep	3HE/466 deep	9HE/466 deep	3HE/466 deep	3HE/466 deep	9HE/466 deep	9HE/466 deep
Weight	16kg	16kg	45kg	16kg	17kg	45kg	48kg
Article Nb. (19" Version)	15130700	15130716	15134701	15130702	15130706	15134703	15134707
Article Nb. (Bench Version)	15100700	15100716	15144701	15100702	15100706	15144703	15144707

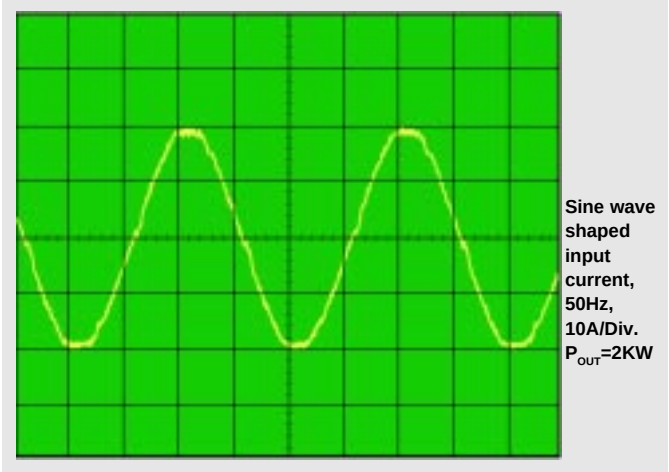
Technical Data EA-	PS 9056-050	PS 9072-030	PS 9072-040	PS 9072-090	PS 9072-120	PS 9150-19	PS 9250-10
Input voltage 45...440Hz	207...265V	184...265V	207...265V	3ph. +MP 318...458V	3ph. +MP 318...458V	184...265V	184...265V
input current, sine wave	16A	11,2A	16A	11,2A	16A	11,2A	12,3A
Output voltage	0...56V	0...72V	0...72V	0...72V	0...72V	0...150V	0...250V
-Stability 0...100% load	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%
-Stability ±10% V_{INPUT}	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%
-Ripple	≤12mV p-p	≤12mV p-p	≤12mV p-p	≤18mV p-p	≤20mV p-p	≤30mV p-p	≤100mV p-p
-Regulation 0...100% load	≤1ms	≤1ms	≤1ms	≤1ms	≤1ms	≤1ms	≤1ms
Overvoltage protection (OVP)	3...62V	3...80V	3...80V	3...80V	3...80V	3...160V	3...265V
Output current	0...50A	0...30A	0...40A	0...90A	0...120A	0...19A	0...10A
-Stability 0...100% V_{OUT}	≤0,15%	≤0,15%	≤0,15%	≤0,15%	≤0,15%	≤0,15%	≤0,15%
-Stability ±10% V_{INPUT}	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%	≤0,05%
-Ripple	≤40mA p-p	≤30mA p-p	≤40mA p-p	≤100mA p-p	≤100mA p-p	≤100mA p-p	≤10mA p-p
Dimensions	3HE/466 deep	3HE/466 deep	3HE/466 deep	9HE/466 deep	9HE/466 deep	3HE/466 deep	3HE/466 deep
Weight	17kg	16kg	17kg	45kg	48kg	17kg	17kg
Article Nb. (19" Version)	15130721	15130704	15130708	15134705	15134709	15200710	15130738
Article Nb. (Bench Version)	15100721	15100704	15100708	15144705	15144709	-	15100738

Output voltage regulation on load change of 5% to 100% load

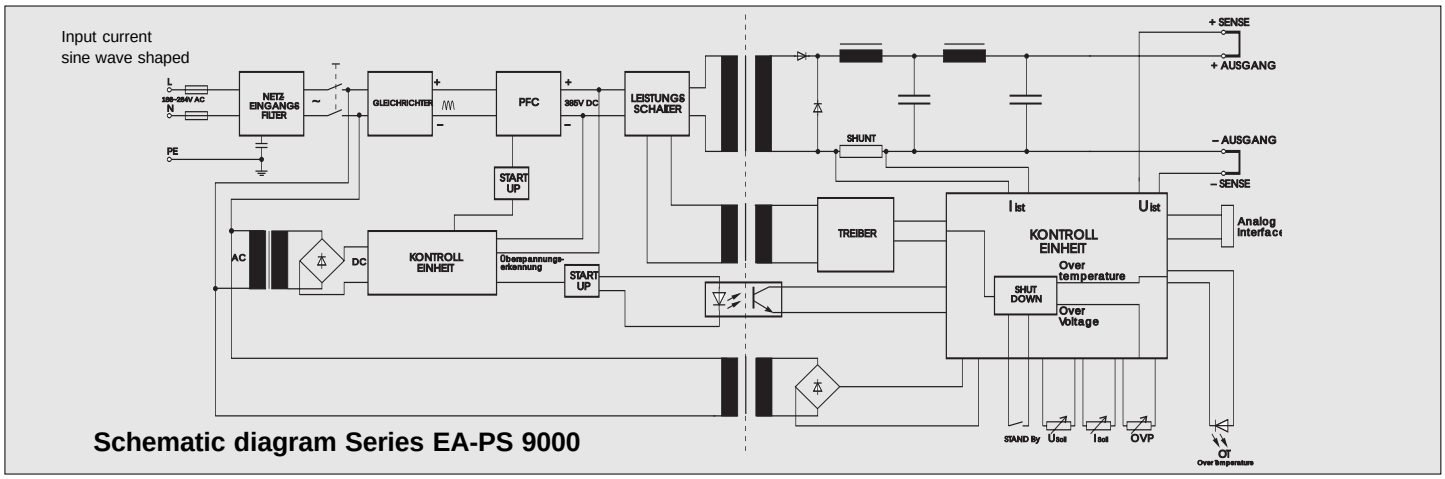
Output voltage regulation on load change of 100% to 5% load



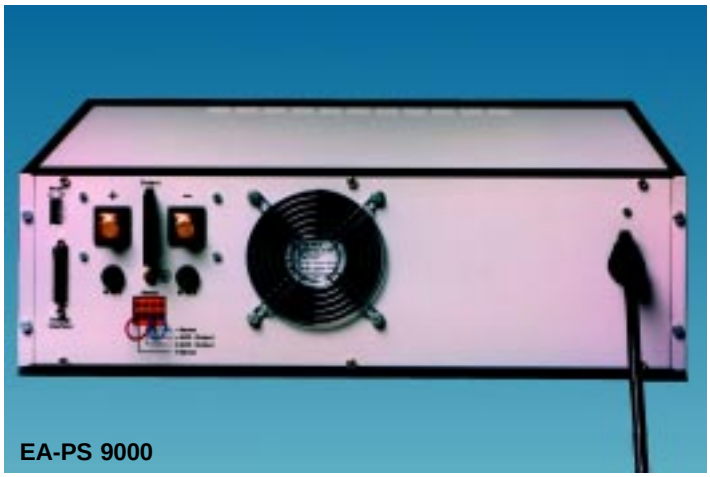
Conducted RFI at input according to VDE 0871 B and EN 55022 B



Mains input current sine wave shaped, Power factor >0.98 through PFC



Schematic diagram Series EA-PS 9000



EA-PS 9000

The following in- and outputs are available on the 25-pole Sub-D socket:

Voltage actual value	(0...10V)
Current actual value	(0...10V)
Current preset-value	(0...10V)
Voltage preset-value	(0...10V)
External programming, 0V =	change over to external, for both current & voltage (Through open collector or relays)
C/V indication external,	Current = 10V, Voltage = 0V
External OVP indication,	OVP = 12V, OVP aus = 0V
External ON/OFF,	0V = OFF, (Through open collector or relays)

LABORATORY AND FIXED VOLTAGE POWER SUPPLIES 6 + 12KW

EA-PS 9036-60

General
These new primary switched laboratory power supplies are specifically designed for laboratory and system applications. The units provide highly stable output voltage and current, and offer extensive facilities for various operation modes.

Design concept
The units are available as bench supplies, or for 19" rack mounting. State-of-the art switched mode technology makes it possible, to reduce the size and the weight when compared to linear regulated power supplies. A temperature dependent regulated fan ensures low audible noise and high reliability.

Meters
The units are equipped with separate analog volt- and ammeters class 2,0. As an option, illuminated 3½ digit LCD meters with 13mm digits are available. In both cases it is possible to independently switch between the value set, the actual value or the OVP value.

Voltage and Current setting
The output values of the voltage and current can be preset in Stand-by mode with 10-turn precision potentiometers.
The push switches "**Voltage**" and "**Current**" must be activated. The corresponding "**Preset**" LEDs lights and the preset value is indicated on the meters. The "**Actual**" LEDs indicate that the actual values are represented on the meters.

Mode Indication
When the "**CV**" LED is lit, the unit operates as a constant voltage source, the "**CC**" LED indicates that the unit operates as a constant current source. This change over is automatic.

Remote Sense
The remote sense feature can be used to compensate for the voltage loss between the output terminals and the load (max. 4,5 to 5% of the rated output voltage). In this case the "**Sense**" input sockets are connected to the load using a small cross section cable. The Sense terminals are on the rear of the unit.

- ❑ **Laboratory and System applications**
- ❑ **Output voltage 0..36V, 0...72V ***
- ❑ **Output power 6000W & 12000W**
- ❑ **Remote control, CAN BUS & IEEE-BUS option**
- ❑ **Short recovery time, high efficiency**
- ❑ **Monitor outputs for V and A, 0...10V ⇨ 0...100%**
- ❑ **Safety: EN 60950**
- ❑ **EMI: EN 50081 part 1 and EN 50082 part 1**
- ❑ **V and A adjustable via 10-turn potentiometer**
- ❑ **Overvoltage protection adjustable and indicated**
- ❑ **Preset and Actual indicators for V and A**
- ❑ **External V and A programming**
- ❑ **High regulation accuracy, Low Ripple**
- ❑ **Analogue volt and ammeters class 2.0**
- ❑ **Option: Illuminated LCD meters for V and A**

*** Other voltages and output power up to 24kW on request**

Overload protection - Current regulation
The output is protected against a continuous short circuit. The max. output current is adjustable from zero up to the rated current.

Power Factor Control (PFC)
The Lab-Power-Supplies series **EA-PS 9000** are equipped with an active power factor correction circuit to achieve a power factor better than 0,98, so the reactive current is nearly zero and the input current is sine wave shaped.
Only actual power is drawn from the mains.

Remote adjustment of the output voltage
The output voltage can be externally set by means of an external voltage of 0...10V for 0... V_0 - $V_{max.}$ The terminals for the external programming are on the rear of the unit.

Remote adjustment of the output current
The output current can be externally set by means of an external voltage of 0...10V for 0... IA_0 - A_{max}. The terminals for the external programming are on the rear of the unit.

IEEE BUS (Option "IEC")
As an option the units can be equipped with an IEEE BUS interface (**EA-PSP 5612, see page 91**). The connection terminals are located on the rear of the unit.

Overvoltage protection (OVP)
This series is equipped with overvoltage protection as standard. Any value between 3V and 10% over the max. rated voltage can be set with the OVP potentiometer on the front panel. The preset OVP value is indicated after activating the OVP switch and the "**Preset**" LED lights.
If for any reason the output voltage becomes higher than the preset voltage (i.e. operators fault, defective components, external voltage), the switching oscillator is blocked, and no further energy is available on the output. The „**OVP**" LED lights. To reset the OVP, the unit must first be switched off for a few seconds and after switching back on, the unit then is once again operational.

Parallel & Series connection, Master-Slave Operation
Two or more power supplies can be connected in series or parallel. In this case one unit will operate as the master unit controlling the others in slave operation.

Output terminals
The main output terminals are located on the rear of the unit. On the front panel are two monitor sockets for testing purposes. (internally fused with 10A) The (+) and (-) output sockets are floating so that either one may be grounded if required.

Stand-by operation
The output voltage can be switched off with the "**Output**" switch. The "**Off**" LED lit = output zero. The "**On**" LED lit = output active.

Over temperature protection (OT)
If the unit is overheates (i.e. Fan defective, ventilation in- and outlet dirty etc.) it will automatically switch off and the "**OT**" LED will illuminate. After cooling down the unit will switch on automatically.

Ambient conditions
During operation, at full load or constant operation, the ambient temperature may lie between 0...50°C. The storage temperature can be between -40°C and +70°C. The relative humidity should not exceed 90% non-condensing.

Fixed Voltage:
The units are supplied as fixed voltage power supplies. In this case voltage and current are set by means of 10-turn potentiometers on the front panel or externally programmed with voltages from 0...10V DC.

IEEE BUS (Option "IEC")
As an option the units can be equipped with an IEEE BUS interface (**EA-PSP 5612, see page 91**). The connection terminals are located on the rear of the unit.

CAN -BUS (Option)
The RS232C - CAN-Bus interface can be used to control max. 16 power supplies via the RS232C interface on the PC. In each controled power supply is one CAN-SLIO card installed, which are controled via the Controler Area Network with the capability characteristics of the CAN-protocol, with high disturbance strenght from the PC. The interface is connected via a 25-pole D-Sub-Connector with the PC. The Can-Bus is isolated from the PC and the SLIO cards, so the connected power supplies are also isolated
Programming is carried out with standardized SCAPI commands, given out as ASCII signs via the RS232C interface. Also the measurement values are returned as ASCII-string.

Baud rate: 9600 baud, **Data format**: 8 Bit, (8,N,1)
Protocol: DTR-DSR, **Isolation**: 1kV DC

Technical Data	EA-PS 9036-175	EA-PS 9072-085	EA-PS 9036-350	EA-PS 9072-170
Input voltage	3x400V AC ±10% 50/60Hz	3x400V AC ±10% 50/60Hz	3x400V AC ±10% 50/60Hz	3x400V AC ±10% 50/60Hz
Input current	3x13A	3x13A	3x32A	3x32A
Output voltage	0...36V	0...72V	0...36V	0...72V
-Stability 0...100% load	≤0,2%	≤0,2%	≤0,2%	≤0,2%
-Stability ±10% V_{INPUT}	≤0,05%	≤0,05%	≤0,05%	≤0,05%
-Ripple	≤20mV p-p	≤30mV p-p	≤20mV p-p	≤30mV p-p
-Regulation 0...100% load	≤10ms	≤10ms	≤10ms	≤10ms
Overvoltage protection (OVP)	0...40V	0...80V	0...40V	0...80V
Output current	0...175A	0...85A	0...350A	0...170A
-Stability 0...100% V_{OUTPUT}	≤0,4%	≤0,3%	≤0,5%	≤0,4%
-Stability ±10% V_{INPUT}	≤0,05	≤0,05	≤0,05	≤0,05
-Ripple	≤0,1%	≤0,1%	≤0,1%	≤0,1%
Output power	6kW	6kW	12kW	12kW
Dimensions	19", 4HE/460mm deep	19", 4HE/460mm deep	19", 4HE/560mm deep	19", 4HE/560mm deep
Weight	20kg	20kg	35kg	35kg
Article Nb. (Rack Version)	15 130 740	15 130 741	15 130 742	15 130 743