

19" / 1U – High Voltage Power Supplies

GPS-series 300 W and 800 W

Manual

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Attention!

It is forbidden to use the unit if the covers have been removed to avoid the possibility of lethal shock to the operator!

We decline all responsibility for damages and injuries caused by an improper use of the module. It is strongly recommended to read the operators manual before operation!

Note:

All information in this document is subject to change without notice. We take no responsibility for any error in this document. We reserve the right to make changes in the product design without any notification to the users.

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1. Safety instructions

This High Voltage Power Supply has to be installed by skilled personnel only. Following instructions are made for the personal safety of the operator, the safe use of this product and the connected units.



Caution



Dangerous Voltage

This unit is supplied from line voltage of 230V and generates an output voltage of up to 30 kV.

The disregard of this voltage condition can cause death, heavy injuries or material damage.



Danger in case of missing connector at the HV output

The **LEMO-HV** connector will be used for units which generate output voltages > 6kV. It is forbidden to switch on this unit without a suitable connector inclusive a cable which is connected to the output connector and the load.

Before connecting to the local mains it must be proofed that the nominal line voltage of this unit is equal to the local mains.

Caution: After system-assembly the guard connections have to be checked if they are connected correctly !

The guard connection has to be proofed through a correct mains cable. An additional guard connection is possible via the green-yellow guard connector next to the HV Output (\perp /PE-connector).

The shield of the HV output is always connected to the housing (\perp /PE-connector).

If this shield is intended to use as "reverse line" , then a jumper has to be plugged between the "0 V" (reverse current) and the " \perp /PE" connector.

If this jumper has been removed, the "0 V" connector close to ground can be float to max. \pm 300 V. In this case the user is responsible that - due to the voltage between "0 V" and " \perp /PE" connector - no danger for the user may occur.

If the potential between "0 V" and " \perp /PE" connector is > |300|V then - in order to avoid damages for the unit - the connections are short circuited with help of electronically protection circuits.

The unit is prepared to be mounted into a 19"-cabinet. In this case the necessary air flow conditions through the according air input and output slots have to be guaranteed.

If the unit will be used as desk top instrument then the enclosed unit bases have to be glued on the bottom sheet in order to guarantee a certain distance to the desk.

Before the cover of the unit will be removed the mains connection has to be disconnected, the discharge time of at least (> 15 s) of the output capacitance has to be kept and the discharge status has to be checked afterwards.

Only skilled and authorized people are allowed to do any service, repair or maintenance for this unit.

2. Description

The High Voltage PS of the GPS - 300 W series provide an output voltage of 0 up to 30 kV-DC at max. 300 W output power.

The High Voltage PS of the GPS - 800 W series provide an output voltage of 0 up to 15 kV-DC at max. 800 W output power.

Mains voltage is 85 - 264 V -AC 50/60 Hz (PFC is standard).

The output voltage and current are limited due to the hardware circuitry. The polarity is factory fixed (¹x=p: positive; ¹x=n: negative).

The shield of the HV output is always connected to the housing (⊥/PE-connector).

If this shield is intended to use as “reverse line”, then a jumper has to be plugged between the “0 V” (reverse current) and the “⊥/PE” connector.

If this jumper has been removed, the “0 V” connector close to ground can be float up to max. ±300 V.

In this case the user is responsible that - due to the voltage between “0 V” and “⊥/PE” connector - no danger for the user may occur.

If the potential between “0 V” and “⊥/PE” connector is $> |300|V$ then - in order to avoid damages for the unit - the connections are short circuited with help of internal electronically protection circuits.

The high voltage output is equipped with SHV connector for the units with output voltages up to 6 kV and with the according Lemo connector for the units with output voltages $6\text{ kV} < V_{\text{OUT}} \leq 30\text{ kV}$.

The high voltage output is located on the front panel for the units with SHV connector (optional on the rear) and on the rear panel for the units with Lemo connector.

The unit will be controlled via a direct-coupled analogue I/O (male Sub-D-9 connector on the rear) with set and monitor voltages from 0 to 5 V, after signal HV_ON = LOW.

After switching “POWER ON” the unit is ready to use.

There are two control modes:

Voltage control “VC” up to a preset current limit I_{MAX} :

The output voltage following the set voltage $V_{\text{V-SET}}$

$$\text{for } 0 \leq I_{\text{OUT}} \leq I_{\text{MAX}} \quad \text{with } 0 \leq I_{\text{MAX}} \leq I_{\text{OUTmax}} \text{ setting through } 0 \leq V_{\text{I-SET}} \leq 5\text{ V} = V_{\text{REF}}$$

The actual output voltage V_{OUT} will be checked via the monitor voltage $V_{\text{V-MON}}$.

Current control “CC” up to a preset voltage limit V_{MAX} :

The output current following the set voltage $V_{\text{I-SET}}$

$$\text{for } 0 \leq V_{\text{OUT}} \leq V_{\text{MAX}} \quad \text{with } 0 \leq V_{\text{MAX}} \leq V_{\text{OUTmax}} \text{ setting through } 0 \leq V_{\text{V-SET}} \leq 5\text{ V} = V_{\text{REF}}$$

The actual output current I_{OUT} will be checked via the monitor voltage $V_{\text{I-MON}}$.

Output voltage and current are internal limited to V_{OUTmax} resp. I_{OUTmax} .

The TTL signal „INHIBIT“ (LOW = active) switch off the high voltage generation without ramp. If the “INHIBIT” signal is no longer active (HIGH or n.c.) restoring the output voltage will be start according to V_{SET} with ramp.

The TTL signal „HV_ON“ (LOW = active) switch on resp. off the high voltage generation with ramp.

The internal and external loads will discharge the internal and external capacities in either cases. The discharge time is 15 s at least without external load.

3. Technical Data

19" / 1U - series GPS 300 W		GPX ¹ 10 307	GPX ¹ 20 157	GPX ¹ 30 107	GPX ¹ 40 756	GPX ¹ 60 506	GPX ¹ 80 356	GPX ¹ 120 256	GPX ¹ 150 206	GPX ¹ 200 156	GPX ¹ 300 106
Output voltage V_{OUTnom} [kV]											
¹ X = p: Polarity positive		+1	+2	+3	+4	+6	+8	+12	+15	+20	+30
¹ X = n: Polarity negative		-1	-2	-3	-4	-6	-8	-12	-15	-20	-30
Output current I_{OUTnom} [mA]		300	150	100	75	50	35	25	20	15	10
HV-connector		SHV rear side					Lemo-HV-connector rear side				
		$V_{OUTnom} \leq 16kV$: Lemo ERA.1Y.416.CLL $V_{OUTnom} > 16kV$: Lemo ERA.3Y.425.CLL Attention: Use with connected HV connector only !									
Output power		max. 300 W									
Ripple & noise		$< 1 * 10^{-4} * V_{OUTnom}$ (V_{P-P})									
Voltage stability and control accuracy		$< 1 * 10^{-4} * V_{OUTnom}$ (no load to full load, ΔV_{IN} and repeatability) in the output voltage range: $5 V \leq V_{OUT} \leq V_{OUTmax}$									
Current stability		$< 2 * 10^{-3} * I_{OUTnom}$ ($R_{Lmin} \leq R_L < \text{no load and } \Delta V_{IN}$) in the output voltage range: $5 V \leq V_{OUT} \leq V_{OUTnom}$									
Temperature coefficient		$< 2 * 10^{-4} / K$									
Voltage control with V_{V-SET}		$V_{V-SET} = 0 \text{ to } 5 V \Rightarrow V_{OUT} = 0 \text{ to } V_{OUTnom}$									
Current control with V_{I-SET}		$V_{I-SET} = 0 \text{ to } 5 V \Rightarrow I_{OUT} = 0 \text{ to } I_{OUTnom}$									
Monitor voltage V_{V-MON}		$V_{OUT} = 0 \text{ to } V_{OUTnom} \Rightarrow V_{V-MON} = 0 \text{ to } 5 V$									
Monitor voltage V_{I-MON}		$I_{OUT} = 0 \text{ to } I_{OUTnom} \Rightarrow V_{I-MON} = 0 \text{ to } 5 V$									
Digital control signals	INHIBIT	TTL level, LOW = active $\Rightarrow V_{OUT} = 0$ (without ramp) HIGH (or open) $\Rightarrow V_{OUT}$ according to V_{SET} (with ramp)									
	HV_ON	TTL level, LOW $\Rightarrow V_{OUT}$ according to V_{SET} HIGH (or open) $\Rightarrow V_{OUT} = 0$ (either with ramp)									
Rate of change of output voltage		$v_{Vout} \approx V_{OUTnom} / 4 s$									
Supply		$V_{IN} = 85$ up to 264 V-AC with PFC $I_{IN} = 1,7 A$ at 230V-AC / 3,5 A at 115 V-AC via mains connector and switch "POWER", isolated from HV-output, fused with 2 * 6,3 A / slow.									
Dimension / Weight		1U -19" compatible / depth: 450 mm / ca. 4,8 kg									
Cooling		Internal fan									
Protection		Over load and short circuit , voltage supply and temperature									
Environment conditions		Operating temperature: 5 up to 35 °C Humidity: 30% up to 80 %, no condensation									
Storage temperature		0 up to 60 °C									

19" / 1U - series GPS 800 W		GPX ¹ 10 807	GPX ¹ 20 407	GPX ¹ 30 257	GPX ¹ 40 207	GPX ¹ 60 137	GPX ¹ 80 107	GPX ¹ 120 656	GPX ¹ 150 506	
Output voltage V _{OUTnom} [kV]										
¹ x = p: Polarity positive		+ 1	+ 2	+ 3	+ 4	+ 6	+ 8	+ 12	+ 15	
¹ x = n: Polarity negative		- 1	- 2	- 3	- 4	- 6	- 8	- 12	- 15	
Output current I _{OUTnom} [mA]		800	400	250	200	130	100	65	50	
HV connector		SHV rear side					Lemo-HV-connector			
							rear side: Lemo ERA.1Y.416.CLL			
		Attention: Use with connected HV connector only !								
Output power		max. 800 W								
Ripple & noise		$< 1 * 10^{-4} * V_{OUTnom} (V_{P-P})$								
Voltage stability and control accuracy		$< 1 * 10^{-4} * V_{OUTnom}$ (no load to full load, ΔV_{IN} and repeatability) in the output voltage range: $5 V \leq V_{OUT} \leq V_{OUTnom}$								
Current stability		$< 2 * 10^{-3} * I_{OUTnom}$ ($R_{Lmin} \leq R_L <$ no load and ΔV_{IN}) in the output voltage range: $5 V \leq V_{OUT} \leq V_{OUTnom}$								
Temperature coefficient		$< 2 * 10^{-4} / K$								
Voltage control with V _{V-SET}		V _{V-SET} = 0 to 5 V \Rightarrow V _{OUT} = 0 to V _{OUTnom}								
Current control with V _{I-SET}		V _{I-SET} = 0 to 5 V \Rightarrow I _{OUT} = 0 to I _{OUTnom}								
Monitor voltage V _{V-MON}		V _{OUT} = 0 to V _{OUTnom} \Rightarrow V _{V-MON} = 0 to 5 V								
Monitor voltage V _{I-MON}		I _{OUT} = 0 to I _{OUTnom} \Rightarrow V _{I-MON} = 0 to 5 V								
Digital control signals	INHIBIT	TTL level, LOW = active \Rightarrow V _{OUT} = 0 (without ramp) HIGH (or open) \Rightarrow V _{OUT} according to V _{SET} (with ramp)								
	HV_ON	TTL level, LOW \Rightarrow V _{OUT} according to V _{SET} HIGH (or open) \Rightarrow V _{OUT} = 0 (either with ramp)								
Rate of change of output voltage		$v_{Vout} \approx V_{OUTnom} / 4 s$								
Supply		V _{IN} = 85 up to 264 V-AC with PFC I _{IN} = 4,5 A at 230 V-AC / 9 A at 115 V-AC via mains connector and switch "POWER", isolated from HV-output, fused with 2 * 10 A / slow.								
Dimension / Weight		1U -19" compatible / depth: 450 mm / ca. 5 kg								
Cooling		Internal fan								
Protection		Over load and short circuit , voltage supply and temperature								
Environment conditions		Operating temperature: 5 up to 35 °C Humidity: 30% up to 80 %, no condensation								
Storage temperature		0 up to 60 °C								

4. Description of analogue I/O

Analog I/O with male SUB - D - 9 connector			
Pin 1	@GND		
Pin 2	V _{I-MON}	Current monitor	
Pin 3	INHIBIT	TTL-level / Input	Low = active: ⇒ V _{OUT} = 0 without ramp High / open: ⇒ V _{OUT} according setting with ramp
Pin 4	V _{I-SET}	Current control	
Pin 5	HV_ON	TTL-level / Input	Low = active: ⇒ V _{OUT} according setting with ramp High / open: ⇒ V _{OUT} = 0 with ramp
Pin 6	@GND		
Pin 7	V _{V-MON}	Voltage monitor	
Pin 8	V _{V-SET}	Voltage control	
Pin 9	V _{REF}	Internal reference voltage	V _{REF} = 5 V / 1 mA

5. Trouble shooting

- Unit does not provide output voltage ⇒
- check mains voltage and connection
 - ⇒
 - Check of environmental temperature (T_u ≤ 35°C)
 - Check of control
- During switch ON external fuses are blowing ⇒
- Replace to slow blow fuse (switch ON current peak 25 A)
 - Attend the thermal delay time!
 - Restart the unit only after ca. 6 min.

If these provisions do not lead to a good result this unit has to be checked from an authorized agent or must be shipped to the factory.