Technical Documentation
Last modified on: 10.01.2020

GPS Series

GPS 300W, GPS 350W – COMPACT, GPS 800W

Document history

Version	Date	Major changes
1.0	10.01.2020	Initial release

Disclaimer / Copyright

The information in this manual is subject to change without notice. We take no responsibility for any mistake in the document. We reserve the right to make changes in the product design without reservation and without notification to the users. We decline all responsibility for damages and injuries caused by an improper use of the device.

Safety

This section contains important security information for the installation and operation of the device. Failure to follow safety instructions and warnings can result in serious injury or death and property damage.

Safety and operating instructions must be read carefully before starting any operation.

We decline all responsibility for damages and injuries caused which may arise from improper use of our equipment.

Depiction of the safety instructions

DANGER!

DANGER!

"Danger!" indicates a severe injury hazard. The non-observance of safety instructions marked as "Danger!" will lead to possible injury or death.

WARNING!

WARNING!

"Warning!" indicates an injury hazard. The non-observance of safety instructions marked as "Warning!" could lead to possible injury or death.

CAUTION!

CAUTION!

Advices marked as "Caution!" describe actions to avoid possible damages to property.

INFORMATION

INFORMATION

Advices marked as "Information" give important information.

Read the manual.

Attention high voltage!

Important information.

Intended Use

The device may only be operated within the limits specified in the data sheet. The permissible ambient conditions (temperature, humidity) must be observed. The device is designed exclusively for the generation of high voltage as specified in the data sheet. Any other use not specified by the manufacturer is not intended. The manufacturer is not liable for any damage resulting from improper use.

Qualification of personnel

A qualified person is someone who is able to assess the work assigned to him, recognize possible dangers and take suitable safety measures on the basis of his technical training, his knowledge and experience as well as his knowledge of the relevant regulations.

General safety instructions

- Observe the valid regulations for accident prevention and environmental protection.
- Observe the safety regulations of the country in which the product is used.
- Observe the technical data and environmental conditions specified in the product documentation.
- You may only put the product into operation after it has been established that the high-voltage device complies with the country-specific regulations, safety regulations and standards of the application.
- The high-voltage power supply unit may only be installed by qualified personnel.

Important safety instructions

DANGER!


DANGER!

Before operations at the load or the high voltage output of the power supply are started, the device has to be switched off, the discharge of residual voltage has to be finished and the high voltage output of the power supply must be properly grounded. Depending on application residiual voltages can be present for long time periods. These residiual voltages can lead to severe injuries.

DANGER!


DANGER!

High-voltage power supplies of the GPS device class are supplied by a single-phase mains voltage and generate an output voltage of up to 70 kV. Failure to observe these voltage conditions may result in death, serious injury and/or property damage.

WARNING!


WARNING!

To avoid injury of users it is not allowed to open the unit. There are no parts which can be maintained by users inside of the unit. Opening the unit will void the warranty.

WARNING!


WARNING!

The high-voltage cable must be professionally connected to the **consumer**/load and the connection insulated with the appropriate dielectric strength. Do not power the **consumer**/load outside of its specified range.

WARNING!


WARNING!

Before connecting or disconnecting HV cables or any operation on the HV output or the application, the unit has to be switched off and discharge of residual voltage has to be finished. Depending on application residual voltages can be present for long time periods.

WARNING!


WARNING!

Do not operate the unit in wet or damp conditions.

WARNING!


WARNING!

Do not operate the unit in an explosive atmosphere.

WARNING!

Do not operate the unit if you suspect the unit or the connected equipment to be damaged.

WARNING!

The mains connection is made with basic insulation and protective conductor. The device may only be operated with the protective earth conductor (PE) connected!

The protective conductor connections must be checked for proper function after installation.

WARNING!

The protective conductor connection must be ensured by an appropriate mains cable. Before connecting to the local power supply, check whether the nominal voltage of the devices corresponds to the mains voltage.

WARNING!

For the device classes GPS, 300W and 800W, the user must ensure that the potential difference between the return conductor and the protective conductor does not pose a hazard!

For the device classes GPS, 300W and 800W, the interface connection has the same potential as the "0V" connection.

WARNING!

For the device classes GPS 300W and 800W the factory installed short-circuit bridge must be mounted between the connections "0V" and "⏚".

If this short-circuit bridge is not installed, an additional conductor with a cross-section of at least 1.5 mm² must be used as the return conductor. This is connected to the "0V" connection.

The "0V" terminal can accept a voltage related to the earth potential.

WARNING!

At an ambient temperature greater than 35°C, the temperature of the housing can exceed 45°C!

CAUTION!


Caution!

When installing the units, make sure that an air flow through the corresponding air inlet and outlet openings is possible.

CAUTION!


Caution!

A specified air flow rate (see technical details) has to be guaranteed under any circumstances.

The air inlet and outlet openings must not be covered or obstructed.

CAUTION!


Caution!

For devices equipped with a LEMO high voltage connector (L16, L30), the high voltage must not be switched on until the corresponding counterpart has been contacted.

CAUTION!


Caution!

The GPS 350 - COMPACT device is prepared for installation in a device carrier. The fixing points on both sides can be used for this purpose.

The screw-in depth of the M4 screws used for fastening must not be more than 4 mm, measured from the housing surface.

If the device is used as a desk top instrument, the enclosed distance pieces have to be installed at the bottom side of the device.

The unit may only be operated at this minimum distance (10 mm) from the stand surface.

INFORMATION


INFORMATION

The shield of the high voltage output is always connected to the housing and can be used as a return conductor.

INFORMATION


INFORMATION

It is strongly recommended to read the manual before operation!

Table of contents

1 Device description

1.1 Short description

High-voltage power supplies of the GPS device class are supplied by a single-phase mains voltage and generate an output voltage up to 70 kV and an output current up to 800 mA.

The device can be controlled nd monitored via:

- the analogue interface

Main features:

- excellent control characteristics
- very low residual ripple/noise and good EMC

1.2 Options

- optional capacitor charger (CLD)
- optional ARC management (ARC)
- optional 10 V AIO Voltage (A0)

OPTION	OPTIONS CODE	EXAMPLE	HEX CODE
Polarity	Positive: **x = p** Negative: **x = n**	GP**p** 10 807	
Capacitor charger	**CLD**	GPp 10 807 - **CLD**	40
ARC management	**ARC**	GPp 10 807 - **ARC**	4
ARC management and capacitor charger	**CAR**	GPp 10 807 - **CAR**	44
Monitor voltage 10V	**A0**		A0

Table 1: Options

1.3 Package contents

Device	inclusive	optional
GPS 300W	Mains cable, high voltage cable (3m, standard)	
GPS 800W	Mains cable, high voltage cable (3m, standard)	
GPS − COMPACT	Mains cable, high voltage cable (3m, standard)	

Table 2: Package contents

1.4 Functional description

The simplified functionality of the device is described below.

Next to the mains there is a EMI/RFI filter, which feeds the power factor correction unit (PFC) and the inrush current limitation circuit. The PFC draws sinusoidal currents from the mains, which are in phase with the supply voltage.

INFORMATION


INFORMATION

With an input voltage greater than 255 V, the PFC only functions as a rectifier and the current consumption is no longer sinusoidal. In the input voltage range below 100 V, either the output power or the ambient temperature must be reduced (see Figure 13: Power reduction vs. input voltage: Power reduction as a function of the input voltage).

Furthermore the PFC provides a DC link voltage, that is buffered by electrolytic capacitors. An inverter with a connected resonance circuit transforms the DC-Link voltage into a controllable sinusoidal voltage. The HV transformer and HV rectifier provide an output voltage corresponding to the external set voltage. Output voltage and current are measured by high precision voltage dividers and a shunt and are fed back to the control circuit. A damping resistor connected to the output capacitance limits the output current during a load change or ARC.

High voltage power supplies of this class work with a fixed switching frequency. The output parameters are controlled via a pulse width modulation (PWM).

The control circuit controls and limits the output voltage and current corresponding to the set values. Normalized monitor voltages for voltage and current are provided for read back. The control circuit is also monitoring the input voltages, auxiliary voltages and the temperatures of cooling air and single components.

The power supply is turned ON/OFF with a switch installed at the front panel of the power supply (applies to device classes 300W and 800W).

Optionally, the device is equipped with an ARC management.

Optionally, the device can be supplied as a capacitor charger (CLD - very low overshoot of the output voltage).

1.5 Technical data

1.5.1 GPS 300W

TECHNICAL DATA		GPS 300W	
Output power P_{nom}		300 W	
Polarity		fixed, positive or negative	
Efficiency		> 80% (V_{in} = 230 V, P_{nom})	
Ripple (voltage control)	Standard	ΔV_{out} < 0.01% • V_{nom} (> 10 Hz), V_{out} ≤ 8 kV	ΔV_{out} < 0.05% • V_{nom} (> 10 Hz), V_{out} > 8 kV
	CLD	ΔV_{out} < 1.5% • V_{nom} (> 10 Hz)	
Stability [1]		ΔV_{out} < 0.01% • V_{nom}	
Voltage regulation		ΔV_{out} < 0.01% • V_{nom} (ΔV_{in}, 0 ≤ I_{out} ≤ I_{nom}, 5 V ≤ V_{out} ≤ V_{nom})	
Current regulation		ΔI_{out} < 0.2% • I_{nom} (ΔV_{in}, 5 V ≤ V_{out} ≤ V_{nom})	
Accuracy [2]		Voltage: < 1 % • V_{OUT} Current: < 1 % • I_{OUT}	
Temperature coefficient		< 200 ppm	
Control	AIO	Analog signals: Level 0 V – 5 V Digital signals: Low level 0 V – 1 V High level 3.5 V – 5 V or open	
Supply		V_{in} = 85 – 264 VAC (PFC), I_{in} < 1.7 A (V_{in} = 230 V, P_{nom}), I_{in} < 3.5 A (V_{in} = 115 V, P_{nom}), Mains frequency 47 Hz < f < 63 Hz internally fused with a fuse 2 x 6.3 A with a slow characteristic, inrush current peak internally limited to max. 25 A	
Supply fuse		6.3 A, with slow characteristic	
Cooling		Forced cooling with integrated fan (≤ 10 m³/h)	
Controls		Mains voltage, auxiliary voltage, overvoltage, temperature, ARC	
Operating parameters		Temperature: -20 °C ... 35 °C Humidity: 20 % ... 90%, non-condensing	
Storage parameters		Temperature: -25 °C ... 80 °C Humidity: 20 % ... 90%, non-condensing	
Electromagnetic Compatibility	Emission	EN 55011 Limit value curve B	
	Immunity	EN 61000 4-2, EN 61000 4-3, EN 61000 4-4, EN 61000 4-8	
Safety standard		EN 61010-1 (VDE 0411)	
Arcing (ARC)		See: 2.3 ARC Management	
Voltage ramp	Standard	0.25 • V_{nom} kV/s	
	CLD	10 • V_{nom} kV/s	
Electrically isolated return of the high voltage		Potential difference between return conductor and protective conductor up to ± 400 V	

Notes:
[1] for 8 h under constant conditions, after ½ h warmup
[2] for one year

Table 3: Technical data for 300W Series

CONFIGURATIONS GPS 300W							
Device	**V_{nom}**	**I_{nom}**	**High-voltage connection**	**Size**	**Weight**	**Manufacturer code**	**Options** [1]
GPx 10 307	1 kV	300 mA	SHV	1U, 19“, 410 mm,	5 kg	GP010307xZZZZZZZ0200	CLD, ARC, A0
GPx 20 157	2 kV	150 mA	SHV	1U, 19“, 410 mm	5 kg	GP020157xZZZZZZZ0200	CLD, ARC, A0
GPx 30 107	3 kV	100 mA	SHV	1U, 19“, 410 mm	6,5 kg	GP030107xZZZZZZZ0200	CLD, ARC, A0
GPx 40 756	4 kV	75 mA	SHV	1U, 19“, 410 mm	6,5 kg	GP040756xZZZZZZZ0200	CLD, ARC, A0
GPx 60 506	6 kV	50 mA	SHV	1U, 19“, 410 mm	7 kg	GP060506xZZZZZZZ0300	CLD, ARC, A0
GPx 80 356	8 kV	35 mA	SHV	1U, 19“, 410 mm	7 kg	GP080356xZZZZZZZ0300	CLD, ARC, A0
GPx 120 256	12 kV	25 mA	L16 / G21 [2	1U, 19“, 410 mm	7 kg	GP120256xZZZZZZZ1400	CLD, ARC, A0
GPx 150 206	15 kV	20 mA	L16 / G21 [2	1U, 19“, 410 mm	7 kg	GP150206xZZZZZZZ1400	CLD, ARC, A0
GPx 200 156	20 kV	15 mA	L30 / G21 [2	1U, 19“, 410 mm	7 kg	GP200156xZZZZZZZ1500	CLD, ARC, A0
GPx 300 106	30 kV	10 mA	L30 / G31 [2	1U, 19“, 410 mm	7 kg	GP300106xZZZZZZZ1500	CLD, ARC, A0

Notes:
[1] ARC and A0 cannot be combined with each other
[2] optional
x Polarity (positive, negative)
Z The complete manufacturer coding is formed from the device-specific properties (e.g. 1.2 Options), see 5 Ordering information and accessories

Table 4: Configurations for 300W Series

1.5.2 GPS 350W - COMPACT

TECHNICAL DATA		GPS 350W – COMPACT
Output power P_{nom}		350 W
Polarity		Fixed, positive or negative
Efficiency		> 80% (V_{in} = 230 V, P_{nom})
Ripple (voltage control)	Standard	$\Delta V_{out} < 0.25\% \cdot V_{nom}$
	CLD	$\Delta V_{out} < 2.5\% \cdot V_{nom}$
Stability [1]		$\Delta V_{out} < 0.02\% \cdot V_{nom}$
Voltage regulation	Standard	$\Delta V_{out} < 0.02\% \cdot V_{nom}$, ($\Delta V_{in}$, $0 \le I_{out} \le I_{nom}$, $5\ V \le V_{out} \le V_{nom}$)
	CLD	$\Delta V_{out} < 0.1\% \cdot V_{nom}$, ($\Delta V_{in}$, $0 \le I_{out} \le I_{nom}$, $5\ V \le V_{out} \le V_{nom}$)
Current regulation		$\Delta I_{out} < 0.2\% \cdot I_{nom}$ (ΔV_{in}, $0\ V \le V_{out} \le V_{nom}$, $5\ V \le V_{out} \le V_{nom}$
Accuracy [2]		Voltage: < 1 % • V_{OUT} Current: < 1 % • I_{OUT}
Temperature coefficient		< 200 ppm
Control	AIO	Analog signals: Level 0 V – 5 V Digital signals: Low level 0 V – 1 V High level 3,5 V – 5 V or open
Supply		V_{in} = 85 – 264 VAC (PFC), I_{in} < 5 A (Vin = 85 V, P_{nom}), Mains frequency 47 Hz < f < 63 Hz internally fused with a fuse 2 x 6.3 A with a slow characteristic, inrush current peak internally limited to max. 25 A
Supply fuse		6.3 A, with slow characteristic
Cooling		Forced cooling, 2-level with integrated fan (≤ 70 m³/h)
Controls		Mains voltage, auxiliary voltage, overvoltage, temperature, ARC
Operating parameters		Temperature: -20 °C ... 50 °C Humidity: 20 % ... 90 %, non-condensing
Storage parameters		Temperature: -25 °C ... 80 °C Humidity: 20 % ... 90 %, non-condensing
Electromagnetic Compatibility	Emission	EN 55011 Limit value curve B
	Immunity	EN 61000 4-2, EN 61000 4-3, EN 61000 4-4, EN 61000 4-8
Safety standard		EN 61010-1 (VDE 0411)
Arcing (ARC)		See: 2.3 ARC Management
Voltage ramp	Standard	0.25 • V_{nom} kV/s
	CLD	10 • V_{nom} kV/s
Electrically isolated return of the high voltage		Return conductor and protective conductor are permanently connected
Notes: [1] for 8 h under constant conditions, after ½ h warmup [2] for one year		

Table 5: Technical data for 350W Series

CONFIGURATIONS GPS 350W - COMPACT							
Device	**V_{nom}**	**I_{nom}**	**High-voltage connection**	**Size**	**Weight**	**Manufacturer code**	**Options** [1]
GPx 10 357	1 kV	350 mA	G11	254mm, 10“, 81 mm	3,5 kg	GP010357xZZZZZZZ0600	CLD, ARC, A0
GPx 20 177	2 kV	175 mA	G11	254mm, 10“, 81 mm	3,5 g	GP020177xZZZZZZZ0600	CLD, ARC, A0
GPx 30 127	3 kV	120 mA	G11	254mm, 10“, 81 mm	3,5 kg	GP030127xZZZZZZZ0600	CLD, ARC, A0
GPx 50 706	5 kV	70 mA	G11	254mm, 10“, 81 mm	3,5 kg	GP050706xZZZZZZZ0600	CLD, ARC, A0
GPx 80 456	8 kV	45 mA	G11	254mm, 10“, 81 mm	3,5 kg	GP080456xZZZZZZZ0600	CLD, ARC, A0
GPx 100 356	10 kV	35 mA	G11	254mm, 10“, 81 mm	3,5 kg	GP100356xZZZZZZZ0600	CLD, ARC, A0
GPx 150 236	15 kV	23 mA	G21	254mm, 10“, 81 mm	3,5 kg	GP150236xZZZZZZZ0700	CLD, ARC, A0
GPx 200 186	20 kV	18 mA	G21	254mm, 10“, 81 mm	4,5 kg	GP200186xZZZZZZZ0700	CLD, ARC, A0
GPx 300 126	30 kV	12 mA	G31	254mm, 10“, 81 mm	4,5 kg	GP300126xZZZZZZZ0800	CLD, ARC, A0
GPx 400 905	40 kV	9 mA	E70	254mm, 10“, 106 mm	6,5 kg	GP400905xZZZZZZZ2400	CLD, ARC, A0
GPx 500 705	50 kV	7 mA	E70	254mm, 10“, 106 mm	6,5 kg	GP500705xZZZZZZZ2400	CLD, ARC, A0
GPx 600 605	60 kV	6 mA	E70	254mm, 10“, 106 mm	6,5 kg	GP600605xZZZZZZZ2400	CLD, ARC, A0
GPx 700 505	70 kV	5 mA	E70	254mm, 10“, 106 mm	7 kg	GP700505xZZZZZZZ2400	CLD, ARC, A0

Notes:
[1)] ARC and A0 cannot be combined with each other
x - Polarity (positive, negative)
Z - The complete manufacturer coding is formed from the device-specific properties (e.g. 1.2 Options), see 5 Ordering information and accessories

Table 6: Configurations for 350W Series

1.5.3 GPS 800W

TECHNICAL DATA		GPS 800W	
Output power P_{nom}		800 W	
Polarity		Fixed, positive or negative	
Efficiency		> 85% (V_{in} = 230 V, P_{nom})	
Ripple (voltage control)	Standard	ΔV_{out} < 0.01% • V_{nom} (> 10 Hz), V_{out} ≤ 8 kV	ΔV_{out} < 0.05% • V_{nom} (> 10 Hz), V_{out} > 8 kV
	CLD	ΔV_{out} < 1.5% • V_{nom} (> 10 Hz)	
Stability [1]		ΔV_{out} < 0.01% • V_{nom}	
Voltage regulation		ΔV_{out} < 0.01% • V_{nom} (ΔV_{in}, 0 ≤ I_{out} ≤ I_{nom}, 5 V ≤ V_{out} ≤ V_{nom})	
Current regulation		ΔI_{out} < 0.2% • I_{nom} (ΔV_{in}, 5 V ≤ V_{out} ≤ V_{nom})	
Accuracy [2]		Voltage: < 1 % • V_{OUT} Current: < 1 % • I_{OUT}	
Temperature coefficient		< 200 ppm	
Control	AIO	Analog signals: Level 0 V – 5 V Digital signals: Low level 0 V – 1 V High level 3.5 V – 5 V or open	
Supply		V_{in} = 85 – 264 VAC (PFC), I_{in} < 5 A (V_{in} = 230 V, P_{nom}), I_{in} = 9 A (V_{in} = 115 V, P_{nom}) Mains frequency 47 Hz < f < 63 Hz internally fused with a fuse 2 x 10 A with a slow characteristic, inrush current peak internally limited to max. 25 A	
Supply fuse		10 A, with slow characteristic	
Cooling		Forced cooling, 2-level with integrated fan (≤ 20 m³/h)	
Controls		Mains voltage, auxiliary voltage, overvoltage, temperature, ARC	
Operating parameters		Temperature: -20 °C ... 35 °C, Humidity: 20 % ... 90 %, non-condensing	
Storage parameters		Temperature: -25 °C ... 80 °C Humidity: 20 % ... 90 %, non-condensing	
Electromagnetic Compatibility	Emission	EN 55011 Limit value curve B	
	Immunity	EN 61000 4-2, EN 61000 4-3, EN 61000 4-4, EN 61000 4-8	
Safety standard		EN 61010-1 (VDE 0411)	
Arcing (ARC)		See: 2.3 ARC Management	
Voltage ramp	Standard	0,25 • V_{nom} kV/s	
	CLD	10 • V_{nom} kV/s	
Electrically isolated return of the high voltage		Potential difference between return conductor and protective conductor up to ± 400 V	

Notes:
[1] for 8 h under constant conditions, after ½ h warmup
[2] for one year

Table 7: Technical data for 800W Series

CONFIGURATIONS GPS 800W							
Device	**V_{nom}**	**I_{nom}**	**High-voltage connection**	**Size**	**Weight**	**Manufacturer code**	**Options** [1]
GPx 10 807	1 kV	800 mA	SHV	1U, 19“, 410mm	5 kg	GP010807xZZZZZZZ0200	CLD, ARC, A0
GPx 20 407	2 kV	400 mA	SHV	1U, 19“, 410mm	5 kg	GP020407xZZZZZZZ0200	CLD, ARC, A0
GPx 30 257	3 kV	250 mA	SHV	1U, 19“, 410mm	5 kg	GP030257xZZZZZZZ0200	CLD, ARC, A0
GPx 40 207	4 kV	200 mA	SHV	1U, 19“, 410mm	5 kg	GP040207xZZZZZZZ0200	CLD, ARC, A0
GPx 60 137	6 kV	130 mA	SHV	1U, 19“, 410mm	5 kg	GP060137xZZZZZZZ0300	CLD, ARC, A0
GPx 80 107	8 kV	100 mA	SHV	1U, 19“, 410mm	5 kg	GP080107xZZZZZZZ0300	CLD, ARC, A0
GPx 120 656	12 kV	65 mA	L16 / G21 [2	1U, 19“, 410mm	7 kg	GP120656xZZZZZZZ1400	CLD, ARC, A0
GPx 150 506	15 kV	50 mA	L16 / G21 [2	1U, 19“, 410mm	7 kg	GP150506xZZZZZZZ1400	CLD, ARC, A0

Notes:
[1] ARC and A0 cannot be combined with each other
[2] optional
x Polarity (positive, negative)
Z The complete manufacturer coding is formed from the device-specific properties (e.g. 1.2 Options), see 5 Ordering information and accessories

Table 8: Configurations for 800W Series

1.6 Electrical wiring of the high voltage output

1.6.1 Device class GPS 350W – COMPACT

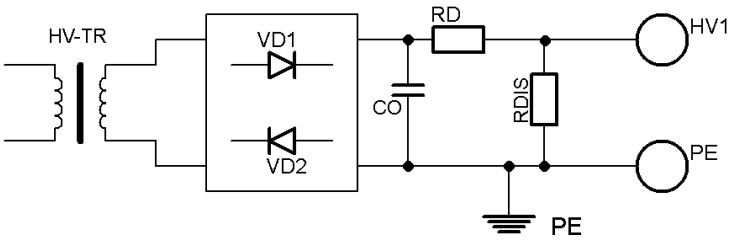


Figure 1: Electrical wiring of the high voltage output, device class GPS 350W - COMPACT

1.6.2 Device class GPS 300W und 800W

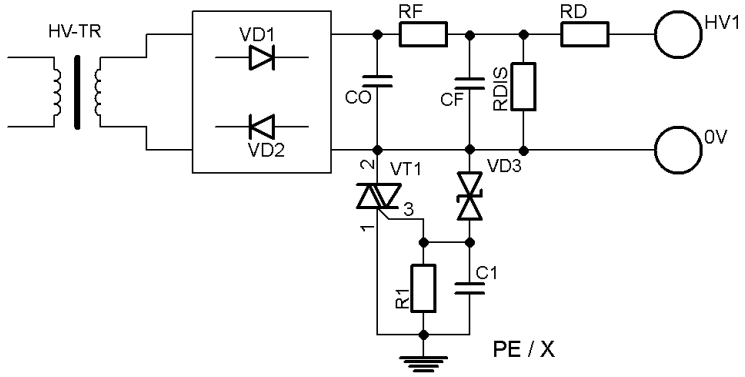


Figure 2: Electrical wiring of the high voltage output, device class GPS 300W and 800W

1.7 Dimensional drawings

1.7.1 GPS 300W

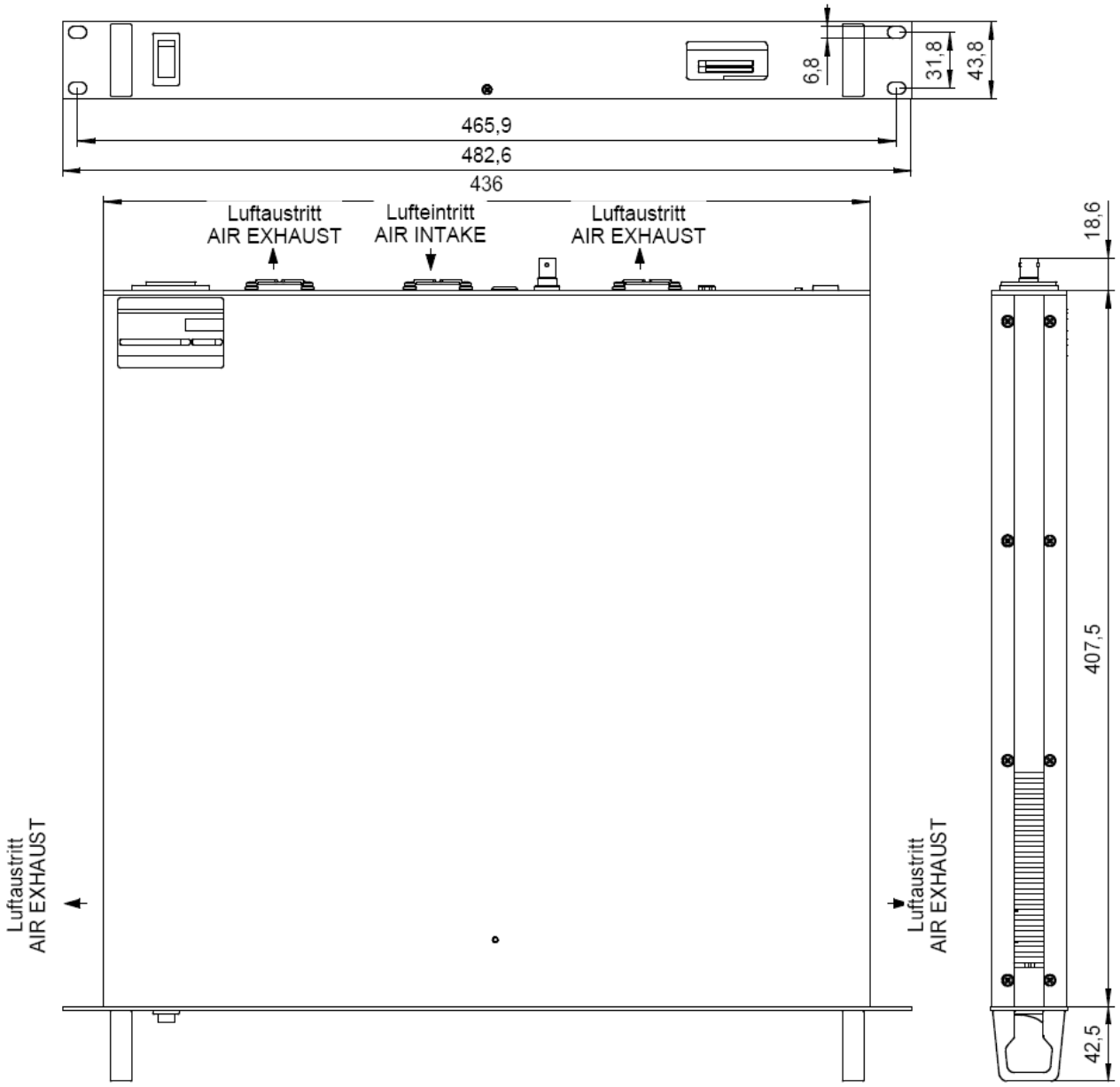


Figure 3: GPS 300W

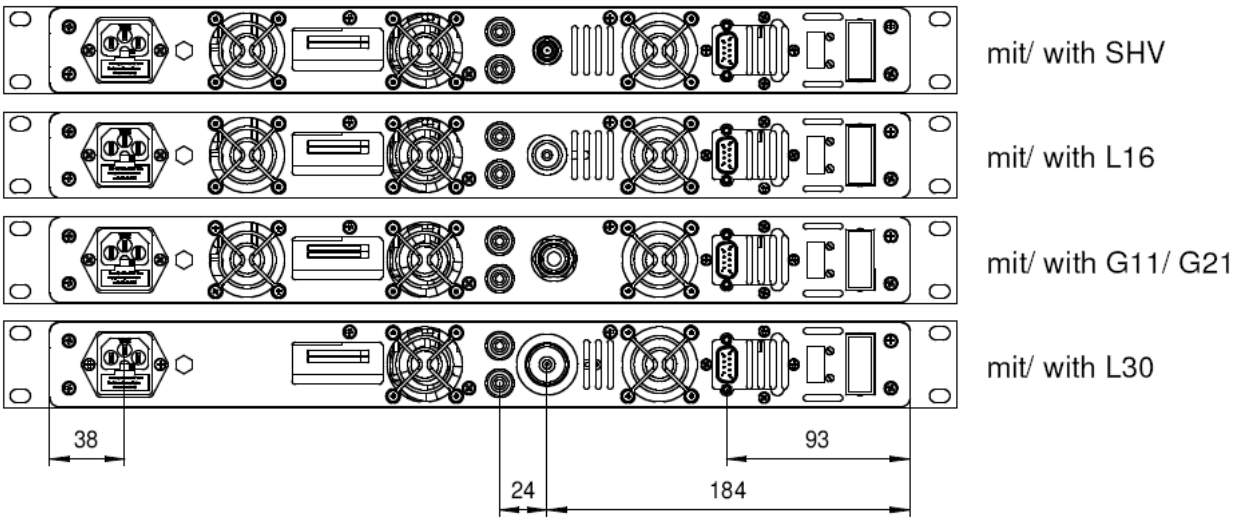


Figure 4: GPS 300W, Rear panel variants

1.7.2 GPS 350W – COMPACT

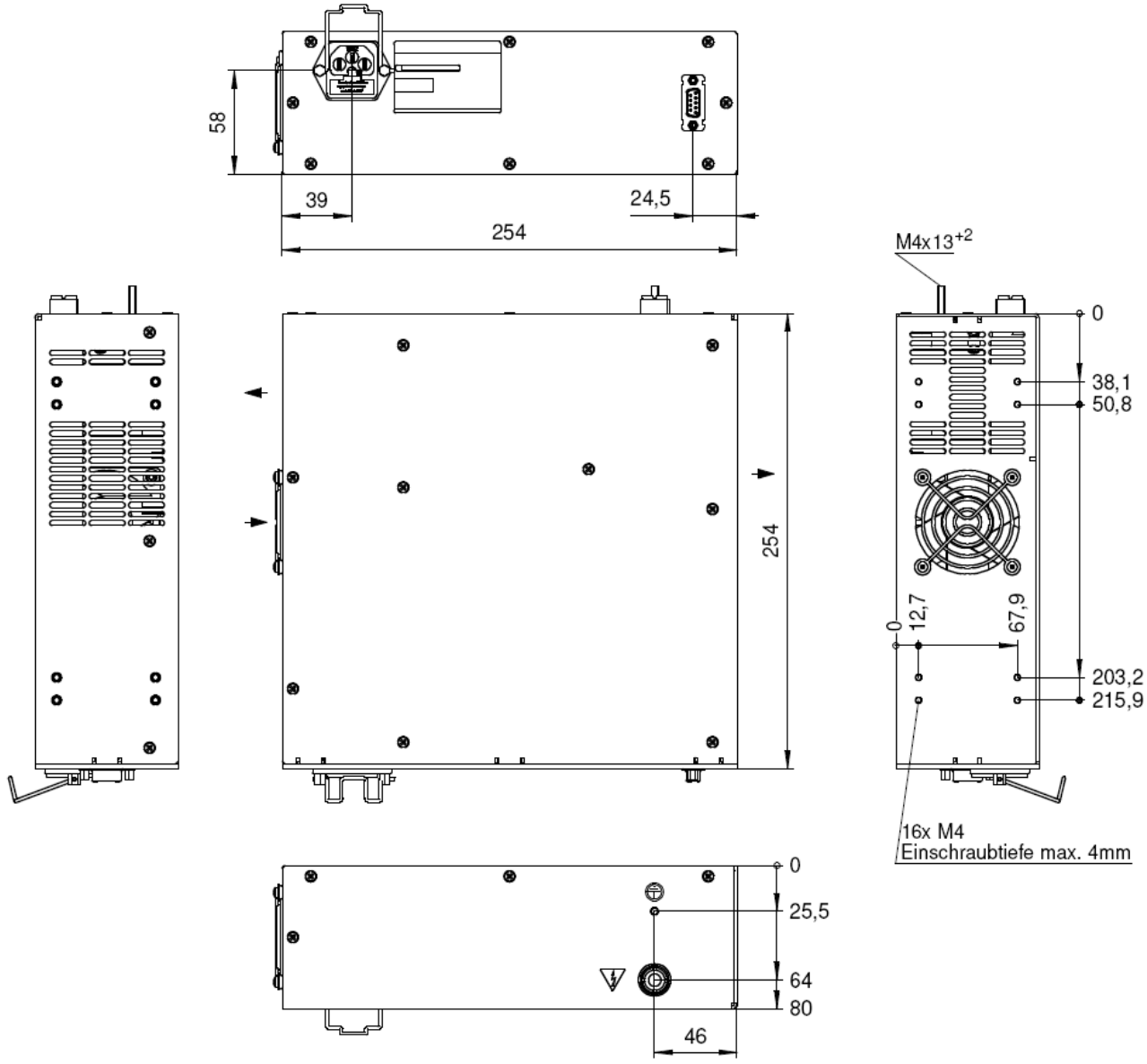


Figure 5: GPS 350W – COMPACT 1 kV ≤ V_{nom} ≤ 30 kV

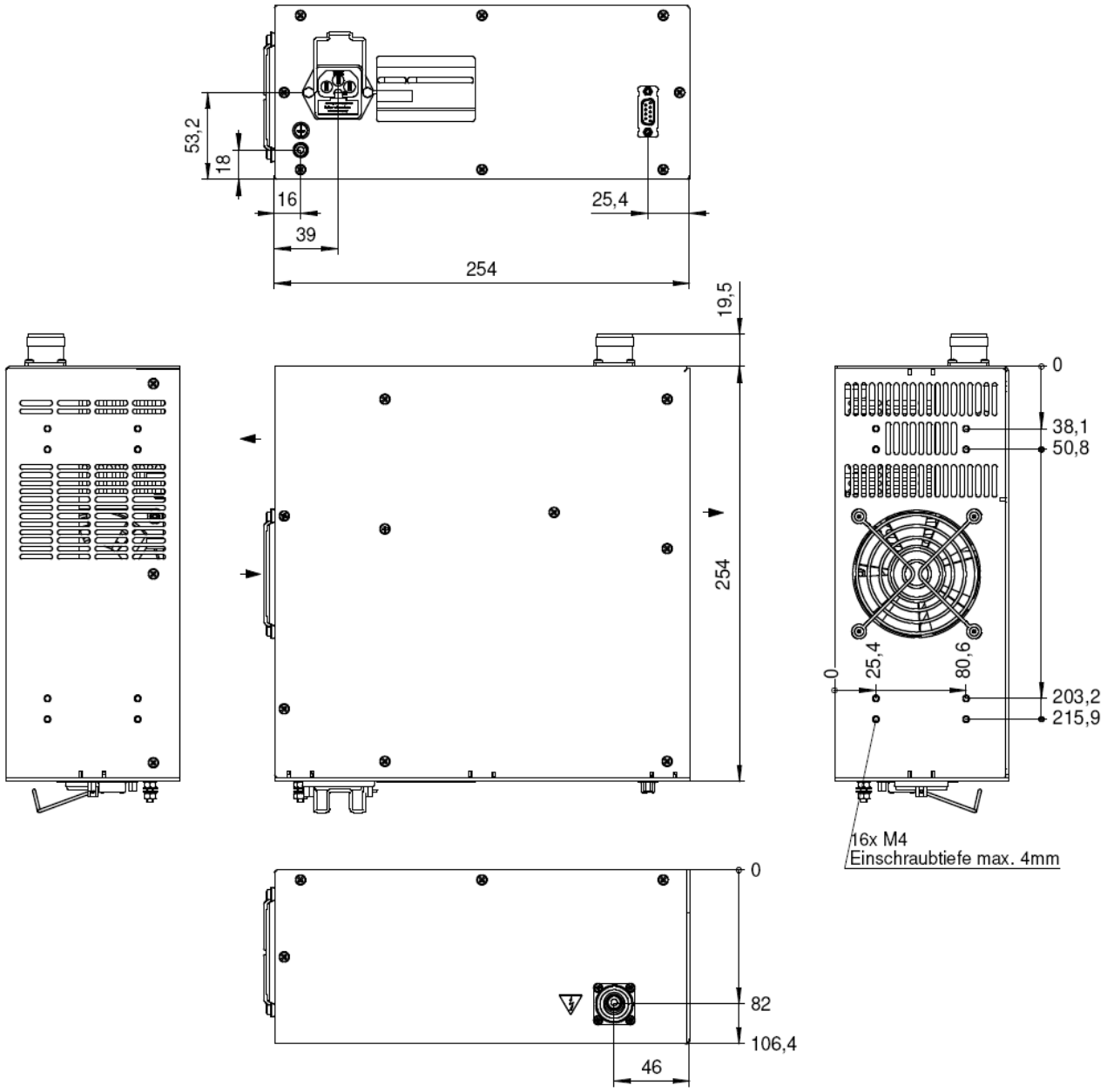


Figure 6: GPS 350W − COMPACT 40 kV ≤ V_{nom} ≤ 70 kV

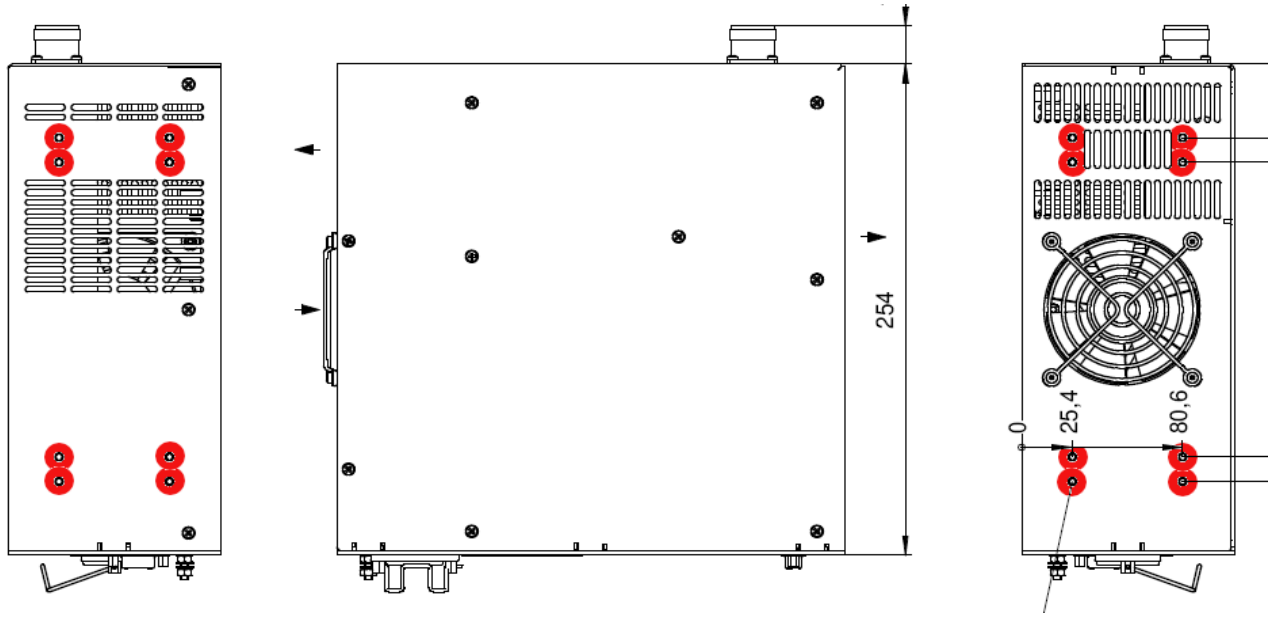


Figure 7: Mounting points on both sides e.g. V_{nom} > 40kV

CAUTION!

Caution!

The screw-in depth is max. 4mm!

1.7.3 GPS 800W

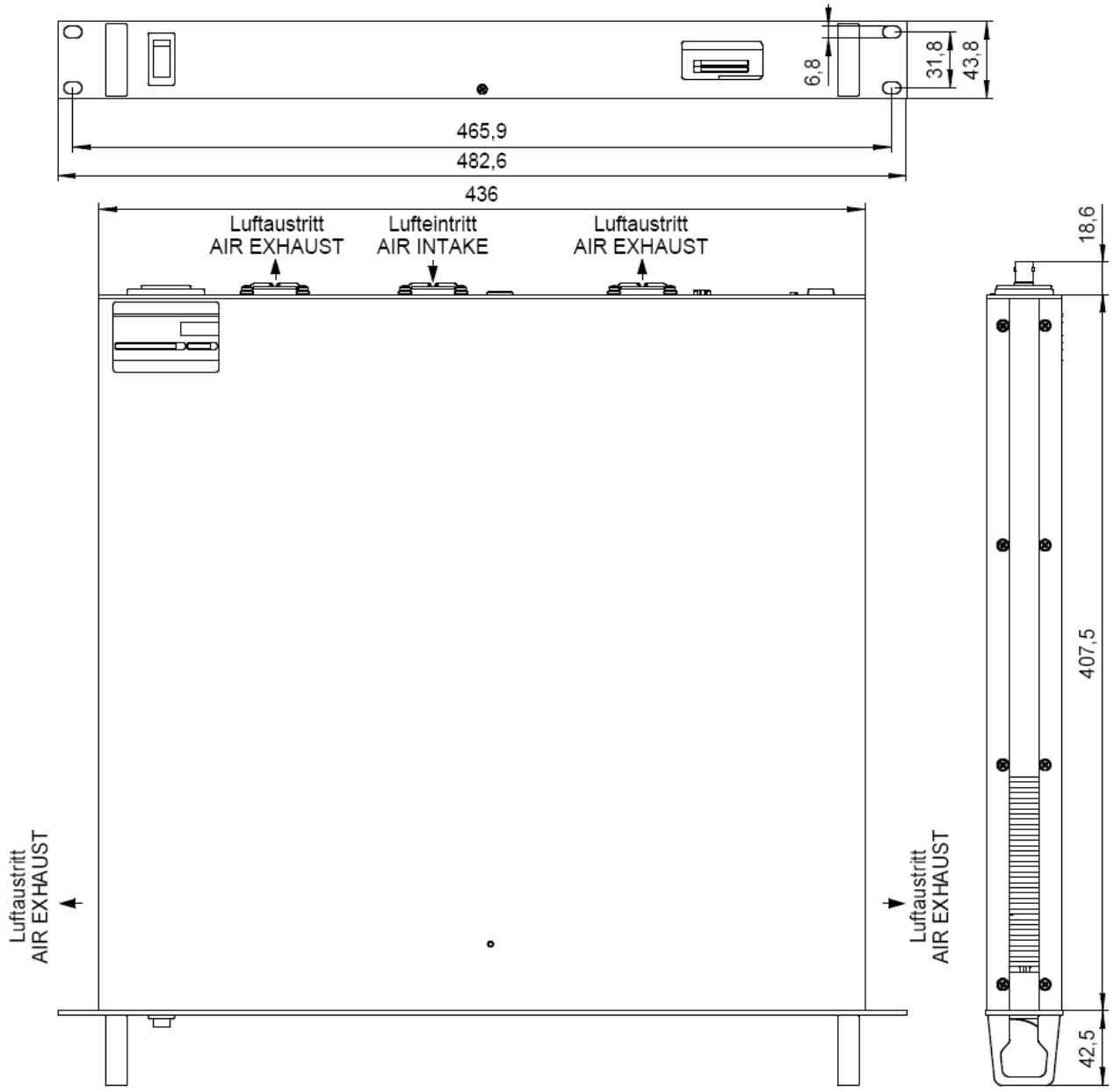


Figure 8: GPS 800W

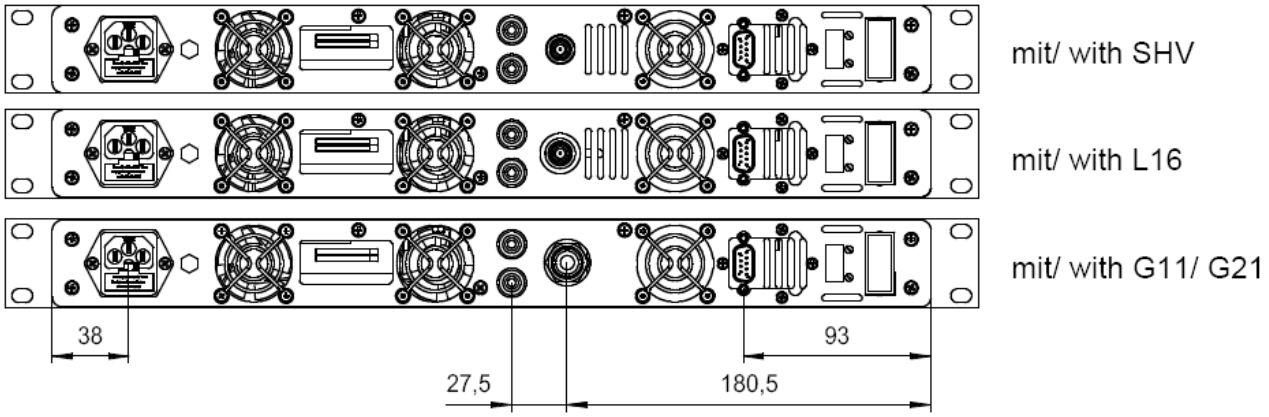


Figure 9: GPS 800W, Rear panel variants

1.8 Connector assignment

1.8.1 Power connection

The unit is connected to mains net using the power connector on the back panel.

1.8.2 High voltage connection

DANGER!

DANGER!

Before operations at the load or the high voltage output of the power supply are started, the device has to be switched off, the discharge of residual voltage has to be finished and the high voltage output of the power supply must be properly grounded. Depending on application residiual voltages can be present for long time periods. These residiual voltages can lead to severe injuries.

The device has one high voltage output.

The HV cable has to be connected to the load properly and isolated according to proof-voltage.

The shield of the high voltage output is always connected to the housing and can be used as a return conductor.

For the GPS 300W and 800W device classes, the factory installed short-circuit bridge (see Figure 10: Example illustration of the short-circuit bridge) must be mounted between the connections "0V" and "⏚".

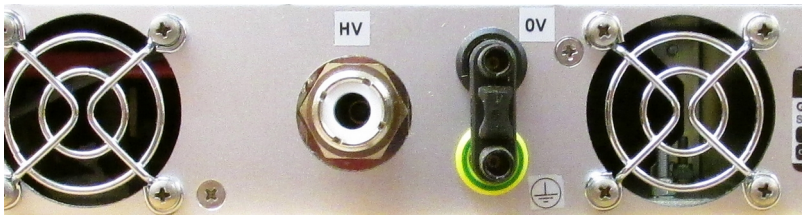


Figure 10: Example illustration of the short-circuit bridge

Devices of the 350W - COMPACT series have an ground bolt (M4 thread).

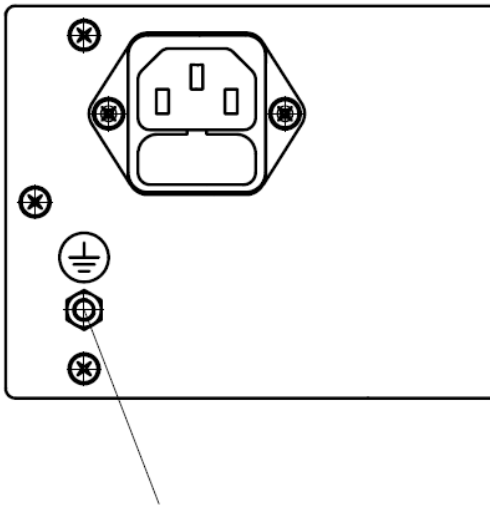


Figure 11: ground bolt

1.8.3 Return conductor connection (Device GPS 300W und 800W)

If the short-circuit bridge (see Figure 10: Example illustration of the short-circuit bridge) is not installed, an additional conductor with a cross-section of at least 1.5 mm² must be used as the return conductor. This is connected to the "0V" connection. The potential difference between the connection "0V" and the protective conductor can be up to ± 400 V.

For potential differences of > I 400 l V between "0 V" and protective conductor, these connections are short-circuited via an electronic protective circuit to prevent damage to the device.

1.8.4 Interface connection

see 3 Remote control via interface.

1.9 Connectors and PIN assignment

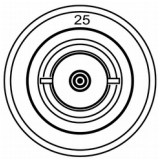
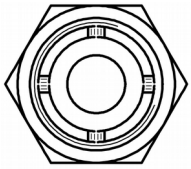
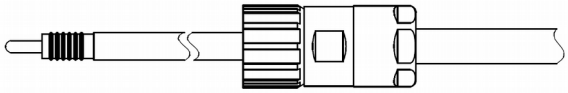
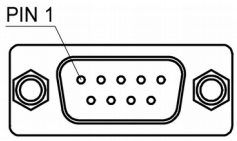
HV PIN ASSIGNMENT				
Name	SHV	L16	L30	G11 /G21 / G31
Figure				
HV PIN ASSIGNMENT				
Name	E70 - Connector			
Figure				
PIN ASSIGNMENT				
Name	SUB D9			
Figure	 The assignment is described under 3 Remote control via interface			

Table 9: connector

PART NUMBER (Manufacturer code / iseg Accessories Article code)			
HIGH VOLTAGE SIDE		**CABLE SIDE**	
SHV (ROSENBERGER)			
Socket	57S501-200N3	Connector	57K101-006N3 / Z590162
S08 (RADIALL)			
Socket	R317.580.000	Connector	R317.005.000 / Z592474
L16 (LEMO)			
Socket	ERA.1Y.416.CLL	Connector	FFR1Y.416.CFAE55R / Z592437
L30 (LEMO)			
Socket	ERA.3Y.425.CCL	Connector	FFR.3Y.425.CFAE55 / Z592495
G11 (GES)			
Socket	7311020	Connector	7310020 / Z592516
G21 (GES)			
Socket	7321020	Connector	7320020 / Z592391
G31 (GES)			
Sockete	7331053	Connector	7331052 / Z592501
E70			
Socket	Manufactured by ISEG	Connector	Manufactured by ISEG

Table 10: Article number Information

2 Functional Description

2.1 Operating States

The Figure 12 shows the operating area of the device. There are two different modes for high-voltage generation:

1. constant voltage source CV:

   Regulation of the output voltage according to the set value of the output voltage under the condition measured output current (I_{MON}) < set value output current (I_{SET}).

2. constant current source CC:

   Regulation of the output current according to the set value of the output current under the condition measured output voltage (V_{MON}) < set value output voltage (V_{SET}).

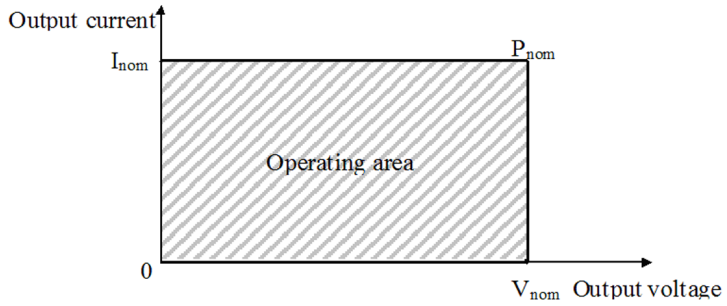


Figure 12: Operating area of the device

2.2 Monitoring

2.2.1 Voltage

The DC link voltage and the internal auxiliary voltages are monitored. If one of these voltages is below or above the specified limit, high voltage generation is stopped.

WARNING!

WARNING!

High voltage generation is reactivated immediately if the limit values are no longer exceeded or fallen below.

If the device has the option CLD, the maximum value of the output voltage is monitored with an OVP (over voltage protection) comparator. The factory setting of this voltage threshold is approx. 110% of the maximum output voltage. If the operational amplifier threshold is exceeded (e.g. due to an internal device error), high voltage generation is blocked.

The output power of the unit must be reduced in accordance with Figure 13: Power reduction vs. input voltage, if the input voltage is smaller than 95 VAC otherwise the DC link voltage decreases. If the DC link voltage drops below a specified limit, high voltage generation is blocked.

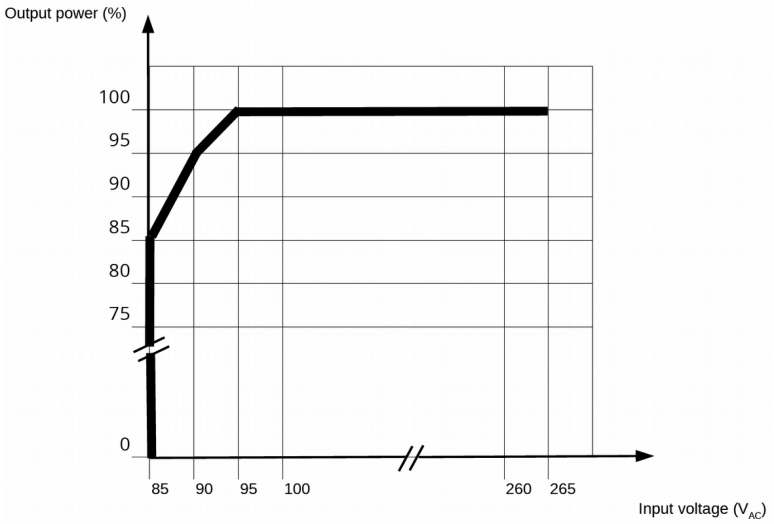


Figure 13: Power reduction vs. input voltage

2.2.2 Temperature

The operating temperature is monitored at several points in the device. High voltage generation is stopped in case the external air temperature exceeds 35°C (or 50°C for the device class GPS, 350 W, COMPACT) or internal temperature of several modules exceeds a predefined limiting value.

INFORMATION

INFORMATION

High voltage generation is reactivated immediately if the limit values are no longer exceeded.

2.3 ARC Management

An ARC is defined as an almost complete discharge per time unit. The device detects an ARC when the output current is $I_{OUT} = (I_{SET} + 0,5 \cdot I_{NOM})$.

2.3.1 Devices without option ARC

CAUTION!

Caution!

For devices without the ARC option, the user must ensure that the permissible number of ARCs is not exceeded. These devices do not protect themselves against high-frequency ARCs.

The permissible number of ARCs depends on the device class, the output voltage as well as the installed options and is specified in Table 11: Permissible number of ARCs.

Device	Number of ARCs / second
GPS 350W, COMPACT	1
GPS 350W, COMPACT – CLD (V_{nom} ≤ 2 kV)	2
GPS 350W, COMPACT – CLD (2 kV < V_{nom} ≤ 50 kV)	2.5
GPS 350W, COMPACT – CLD (V_{nom} > 50 kV)	0.8
GPS 300W	1
GPS 300W – CLD (V_{nom} ≤ 2 kV)	10
GPS 300W – CLD (2 kV < V_{nom} ≤ 15 kV)	4
GPS 300W – CLD (V_{nom} > 15 kV)	2
GPS 800W	1
GPS 800W – CLD (V_{nom} ≤ 2 kV)	10
GPS 800W – CLD (V_{nom} > 2 kV)	2

Table 11: Permissible number of ARCs

2.3.2 Devices with Option ARC

As an option, the device has an ARC management, see Figure 14: ARC Management).

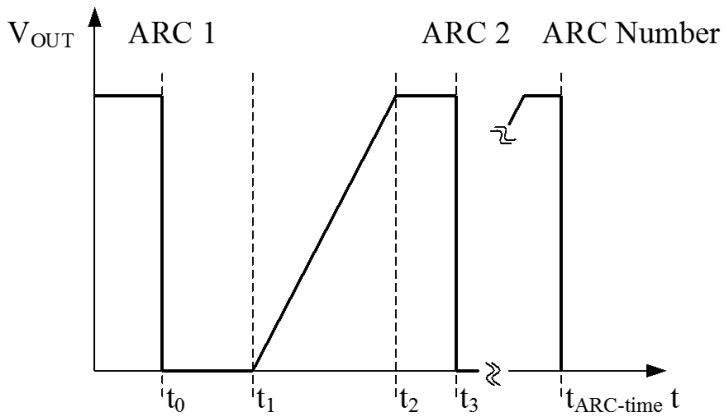


Figure 14: ARC Management

After an ARC was detected, the control signals of the inverter are blocked within some µ-seconds for the blanking time (ARC-Wait, $t_{ARC\text{-}Wait} = t_1 - t_0$).

At the same time, the internal set value of the output voltage V_{SET} is set to zero. At the time instance $t=t_1$ the internal set value of the output voltage is increased with the voltage ramp (ARC ramp).

The ARC Management parameters are listed in Table 12: Parameters of the ARC Management.

Device	Number of ARCs / second	ARC-Wait	ARC-Ramp time
GPS 350 W, COMPACT	1	200 ms ± 10%	800 ms ± 10%
GPS 350 W, COMPACT – CLD (V_{nom} ≤ 2 kV)	2	100 ms ± 10%	400 ms ± 10%
GPS 350 W, COMPACT – CLD (2 kV < V_{nom} ≤ 50 kV)	2.5	80 ms ± 10%	320 ms ± 10%
GPS 350 W, COMPACT – CLD (V_{nom} > 50 kV)	0.8	250 ms ± 10%	1000 ms ± 10%
GPS 300 W	1	200 ms ± 10%	800 ms ± 10%
GPS 300 W – CLD (V_{nom} ≤ 2 kV)	10	12 ms ± 10%	88 ms ± 10%
GPS 300 W – CLD (2 kV < V_{nom} ≤ 15 kV)	4	35 ms ± 10%	215 ms ± 10%
GPS 300 W – CLD (V_{nom} > 15 kV)	2	100 ms ± 10%	400 ms ± 10%
GPS 800 W	1	200 ms ± 10%	800 ms ± 10%
GPS 800 W – CLD (V_{nom} ≤ 2 kV)	10	12 ms ± 10%	88 ms ± 10%
GPS 800 W – CLD (V_{nom} > 2 kV)	2	100 ms ± 10%	400 ms ± 10%

Table 12: Parameters of the ARC Management

3 Remote control via interface

3.1 Description of the AIO interface

WARNING!

WARNING!

Before connecting or disconnecting the interface cable, the device must be switched off or disconnected from the mains.

All analog and digital inputs and outputs are located on the D-SUB 9 connector. This connector has the following pin assignment:

AIO, D Sub 9 Connector			
Pin 1		GND	Return of pins 2-9
Pin 2		I_{mon} (0 .. 5 V) [1]	Monitor output current
Pin 3		INHIBIT	Digital input signal
Pin 4		I_{set} (0 .. 5 V) [1]	Nominal value Output current
Pin 5		ON	Digital input signal
Pin 6	Standard version	GND	Return of pins 2-9
	Option ARC	ARC	Digital output signal
Pin 7		V_{mon} (0 .. 5 V) [1]	monitor output voltage
Pin 8		V_{set} (0 .. 5 V) [1]	Nominal value Output voltage
Pin 9		V_{ref} 5,1 V [1]	Reference
Notes: [1] optional AIO with $V_{set/mon}$ and $I_{set/mon}$ = 0 to 10V and V_{ref} = 10,2V			

Table 13: AIO

The wiring of the analog and digital inputs and outputs is shown in the following figure.

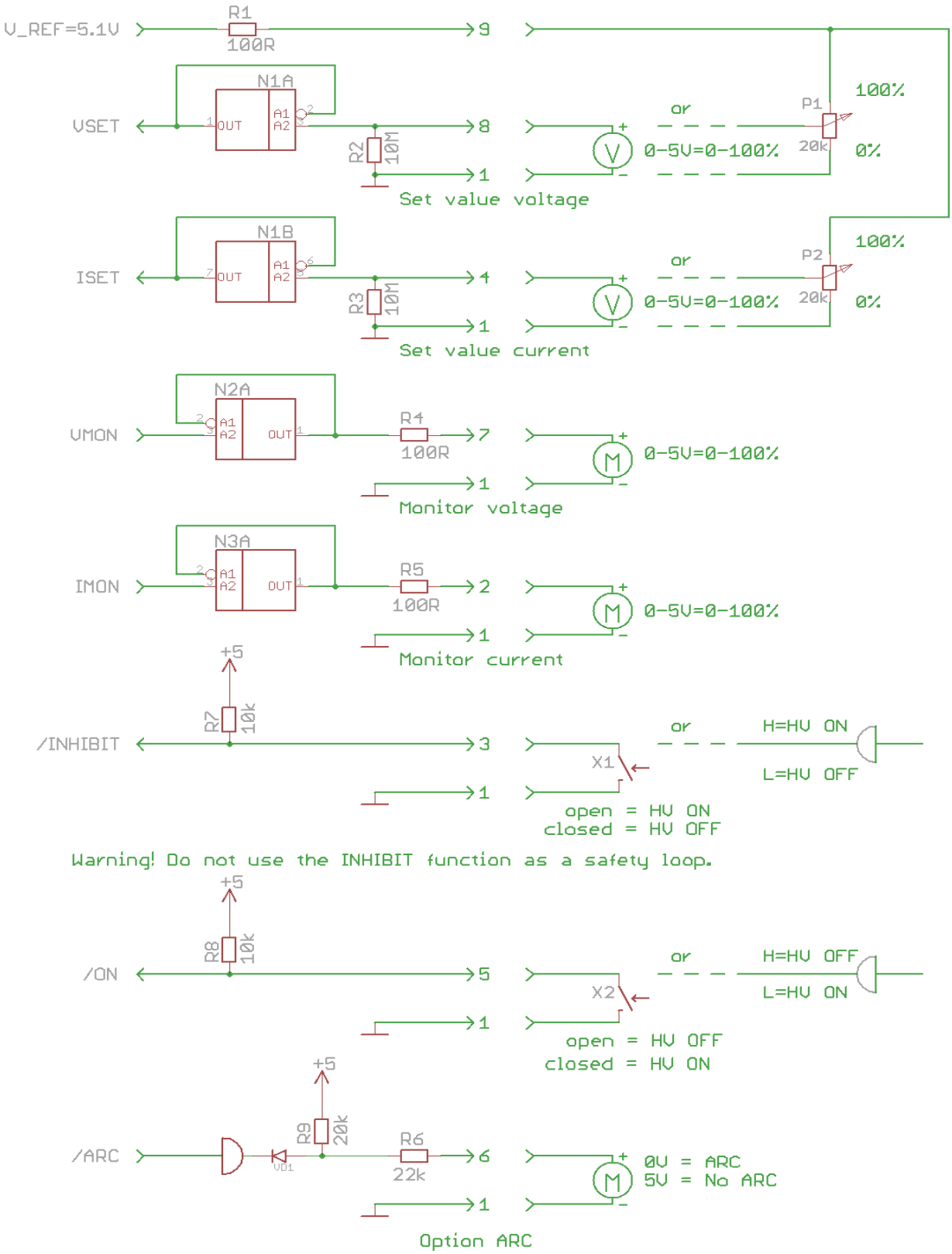


Figure 15: Wiring of analog and digital inputs and outputs

The high voltage is turned on/off with the analogue interface control signals “ON” and/or “INHIBIT”.

3.1.1 Set values

A voltage of 0 – 5 V [1], applied to pin 8 (reference potential pin 1) of the signal connector "AIO", controls the output voltage of 0 - V_{nom}. Pin 4 controls the output current from 0 - I_{nom} in the same way.

3.1.2 Monitor voltages

Monitor voltages (0 - 5 V) proportional to the output voltage and output current are available at Pin 7 and Pin 2 of the connector “AIO”, respectively (reference potential Pin 1).

3.1.3 INHIBIT

By applying a low level signal at pin 3 of the connector “AIO“, the high voltage generation will be shut off immediately and will be blocked. High voltage generation is activated with a high level signal or open contact at pin 3 of the connector “AIO“.

3.1.4 ON

If high voltage generation is enabled (INHIBIT) and after a falling edge at pin 5 of signal connector "AIO" (reference potential pin 1) the output voltage increases to the set value (VSET_V at pin 8 of connector "AIO") or until the set value of the output current is reached (VSET_I at pin 4 of connector "AIO").

By applying a high level signal at Pin 5 of the connector “AIO“, the high voltage ramps down with the specified voltage ramp speed.

3.1.5 ARC (only with option ARC)

If an ARC is detected (see 2.3 ARC Management) the level at pin 6 of signal connector "AIO" (reference potential pin 1) is low for approx. 1 ms.

1 optional AIO with $V_{set/mon}$ and $I_{set/mon}$ = 0 to 10V and V_{ref} = 10,2V

4 Troubleshooting

Trouble		Solution
• Device does not supply output voltage • Fans do not rotate	➜	Check mains voltage Check mains connection
• Device does not supply output voltage • Fans rotate	➜	Check mains voltage Ambient temperature check
• External circuit breakers trip when the power is switched on.	➜	Use fuses with slow characteristic (inrush current peak 25 A)

INFORMATION

INFORMATION

If these instructions do not lead to success, the device must be inspected by authorized specialists or sent to the manufacturer for inspection.

5 Ordering information and accessories

HIGH VOLTAGE CABLES AND ORDERING INFORMATION				
HIGH VOLTAGE SIDE	**CABLE**	**CABLE DESCRIPTION**	**LOAD SIDE PLUG**	**ORDER NUMBER** ***LLL = length in m*** [1]
SHV	04	Shielded HV cable 30 kV (HTV-30S-22-2)	open	SHV_C04-*LLL*
S08	04	Shielded HV cable 30 kV (HTV-30S-22-2)	open	S08_C04-*LLL*
L16	02	Lemo HV Cable shielded 30kV (Lemo 130660)	open	*L16_C02-LLL*
L30	02	Lemo HV Cable shielded 30kV (Lemo 130660)	open	*L30_C02-LLL*
G11	02	Lemo HV Cable shielded 30kV (Lemo 130660)	open	G11_C02-*LLL*
G21	02	Lemo HV Cable shielded 30kV (Lemo 130660)	open	G21_C02-*LLL*
G31	02	Lemo HV Cable shielded 30kV (Lemo 130660)	open	G31_C02-*LLL*
E70	06	HV Cable shielded 100kV (HVP C2124)	open	E70_C06-LLL
[1] *Length examples: 10cm ➜ 0.1, 2.5m ➜ 2.5, 12m ➜ 012, 999m ➜ 999*				

Table 14: High-voltage cables

CONFIGURATION AND ORDERING INSTRUCTION (parts of article code)								
GP	**150**	**506**	**p**	**000**	**05**	**5**	**14**	**00**
Device	V_{nom}	I_{nom}	Ppolarity	Options (hex)	Monitor voltage	Mains supply	HV connection	Customer-specific adjustment
GPS-Series	three significant digits • 100V Example: 150: 150 • 100V = 15 kV	two significant digits + number of zeros. Example: 506: 50 • 10^6 nA = 50mA	p = positive n = negative	see options CLD - 40 ARC - 04	05 = 5 Volt A0 = 10 Volt	5 = Wide range with PFC	02 = SHV 03 = S08 06 = G11 07 = G21 08 = G31 14 = L16 15 = L30 24 = E70	

Table 15: Configuration and ordering instructions

INFORMATION

INFORMATION

Use only original iseg parts such as power cables, CAN cables and terminators for stable and safe operation.

ACCESSORIES ARTICLES	ORDER NUMBER
Original power cable - EU Plug	Z592069
SHV coupler screw, (for RG58)	Z590162
SHV coupler screw, >5kV (for RG58)	Z592474
Lemo HV plug 16kV straight	Z592437
Lemo HV plug 30kV straight	Z592495
GES HV plug 10 kV, single-pole type HS 11 T	Z592516
GES HV plug 20 kV, single-pole type HS 21 T	Z592391
GES HV plug 30 kV, single-pole type HS 31 T	Z592501

Table 16: Accessories

6 Appendix

For further information please use the following download link:

This document
https://iseg-hv.com/download/AC_DC/GPS/iseg_manual_GPS_300W-350W-800W_eng.pdf

7 Glossary

SHORTCUT	MEANING
V_{nom}	nominal output voltage
V_{out}	output voltage
V_{set}	set value of output voltage
V_{mon}	monitor voltage
V_{meas}	digital measured value of voltage
V_{p-p}	peak to peak ripple voltage
V_{in}	input / supply voltage
V_{type}	type of output voltage (AC, DC)
V_{ref}	internal reference voltage
V_{max}	limit (max.) value of output voltage
ΔV_{out} – $[\Delta V_{in}]$	deviation of V_{out} dep. on variation of supply voltage
ΔV_{out} – $[\Delta R_{load}]$	deviation of V_{out} dep. on variation of output load
V_{bounds}	Voltage bounds, a tolerance tube $V_{set} \pm V_{bounds}$ around V_{set}.
I_{nom}	nominal output current
I_{out}	output current
I_{set}	set value of output current
I_{mon}	monitor voltage of output current
I_{meas}	digital measured value of current
I_{trip}	current limit to shut down the output voltage
I_{in}	input / supply current
I_{max}	limit (max.) value of output current
I_{limit}	Current Limit.
I_{bounds}	Current bounds, a tolerance tube $I_{set} \pm I_{bounds}$ around I_{set}.
P_{nom}	nominal output power
P_{in}	input power
P_{in_nom}	nominal input power
T	temperature
T_{REF}	Reference temperature
ON	HV ON/OFF
/ON	HV OFF/ON
CH	channel(s)
HV	high voltage
LV	low voltage
GND	signal ground
INH	Inhibit
POL	Polarity
KILL	KillEnable

8 Warranty & Service

This device is made with high care and quality assurance methods. The standard factory warranty is 12 months. Please contact the iseg sales department if you wish to extend the warranty.

CAUTION!

CAUTION!

Repair and maintenance may only be performed by trained and authorized personnel.

For repair please follow the RMA instructions on our website: www.iseg-hv.com/en/support/rma

9 Disposal

INFORMATION

INFORMATION

All high-voltage equipment and integrated components are largely made of recyclable materials. Do not dispose the device with regular residual waste. Please use the recycling and disposal facilities for electrical and electronic equipment available in your country.

10 Manufacturer´s contact

iseg Spezialelektronik GmbH
Bautzner Landstr. 23
01454 Radeberg / OT Rossendorf
GERMANY
FON: +49 351 26996-0 | FAX: +49 351 26996-21
www.iseg-hv.com | info@iseg-hv.de | sales@iseg-hv.de