

Technical documentation

Last changed on: 2024-02-20

DPS series

High Precision Built-in or System Capable High Voltage Power Supply Module

- Versions from 500 V – 6 kV
- patented resonance converter technology
- available as metal-box or 3U MMC version
- combinable in a multichannel THQ AC/DC HV power supply
- INHIBIT, adjustable hardware limits
- very low ripple and noise, low EMI
- high precision, high stability
- version with reversible polarity



Document history

Version	Date	Major changes
3.9	2024-02-20	Additions in the chapter 3.3.2 polarity and order guides
3.8	2024-01-24	Notes HV connection SHV in version S08 (table 5 and 7)
3.7	2023-09-06	New product picture, remove chapter 7 "Revisions", Specification of the length for HV cable, table 3: specification for DPS-mini removed (footnote 1), example for order options (table 6), description picture number 7 edited, order guides revised
3.6	2023-04-18	HV cable connection (Figure 9: HV cable connection), Color of the LED negative fixed, Description and pictures (Jumper) edited under 3.4.3separation supply ground from signal ground, Glossary refresh
3.5	2022-11-07	short article names, rename document
3.4	2022-08-11	improved documentation
3.3	2021-12-07	Improved documentation connectors, revisions, Overview, Glossary, Table of Contents, Configurations for DP and DK modules, separation of the modules DPS compact metal box/ DPS 3U Euro cassette and DPSmini
3.2	2020-09-03	Improved documentation
3.1	2020-08-18	Improved documentation (Set / Monitor accuracy)
3.0	2020-07-13	Improved documentation (safety information, changing polarity)
2.5	2019-09-11	Improved documentation
2.4	2019-07-30	error correction
2.3	2019-06-13	Improved documentation
2.2	2019-03-25	Fixed dimensions for DPS mini Improved documentation
2.1	2017-08-30 2018-06-13	Fixed dimensions for DPS mini Improved documentation
2.0	2017-02-28	Relayouted documentation

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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!	<p>“Danger!” indicates a severe injury hazard. The non-observance of safety instructions marked as “Danger!” will lead to possible injury or death.</p>
WARNING!	
 WARNING!	<p>“Warning!” indicates an injury hazard. The non-observance of safety instructions marked as “Warning!” could lead to possible injury or death.</p>
CAUTION!	
 CAUTION!	<p>Advices marked as “Caution!” describe actions to avoid possible damages to property.</p>
INFORMATION	
 INFORMATION	<p>Advices marked as “Information” give important information.</p>



Read the manual.



Attention high voltage!

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

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!



WARNING!

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

CAUTION!



CAUTION!

Before changing the polarity of modules with switchable polarity, the high voltage generation must be switched off. The HV-Output including connected loads must not have any residual voltage.

Nonobservance of this condition may damage the module.

CAUTION!



CAUTION!

The devices (3UC) must only be used in combination with iseg approved crates.

INFORMATION



INFORMATION

Please check the compatibility with the devices used.

Table of Contents

Document history	2
Disclaimer / Copyright	2
Safety	3
Depiction of the safety instructions	3
Intended Use	4
Qualification of personnel	4
General safety instructions	4
Important safety instructions	5
1. General description	8
2. Overview	8
2.1. DPS – compact metal box	8
2.2. DPS – 3U Euro cassette	9
3. Technical Data	10
3.1. Specifications	10
3.2. Configurations	11
3.3. Options	11
3.4. Functional description	12
3.4.1. INHIBIT	12
3.4.2. Switchable Polarity	12
3.4.3. separation supply ground from signal ground	13
4. Dimensional drawings	14
4.1. DPS – compact metal box	14
4.2. HV-Cable configuration	14
4.3. DPS – 3UC Euro cassette	15
5. Connectors and PIN assignments	16
5.1. Interface connector D-SUB 9 (compact metal box)	17
5.2. System connector H15 (3UC Euro cassette)	18
6. Order guides	19
7. References	20
8. Glossary	21
9. Warranty & Service	22
10. Disposal	22
11. Manufacturer contact	22

1. General description

DPS modules are highly precise and highly stable analog controlled high voltage power supplies. The modules are available as compact metal box or system capable in 3U Euro cassette. DPS modules (compact metal box) can be used as standalone DC/DC converters, DPS (compact metal box) can be combined to a multichannel AC/DC supply in a THQ AC/DC HV unit or integrated in a modular MMC system as 3U module. The output voltage is controllable via analog interface with either a potentiometer (internal reference voltage) or an analog control voltage. The polarity of standard DPS modules is electronically switchable. To protect the connected load the modules are equipped with INHIBIT, standard DPS modules are also equipped with adjustable current and voltage limits.

Customized versions can be produced on [request](#).

2. Overview

2.1. DPS – compact metal box

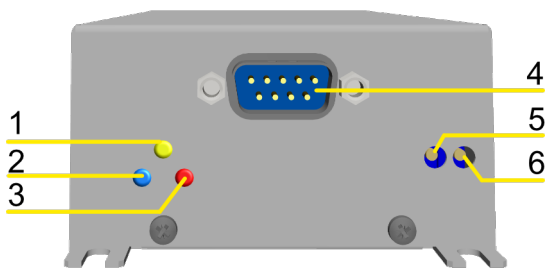


Figure 1: Front side

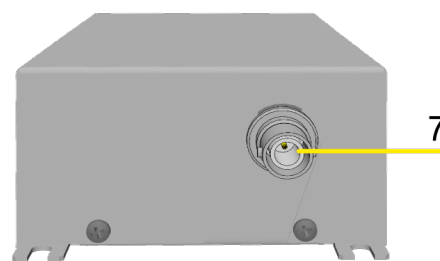


Figure 2: Back side – with HV connector

Number	Description	Detailed explanation in chapter	
[1]	HV ON LED	Signals output voltage	3.4.2 Switchable Polarity
[2]	Polarity LED	voltage output is negative	3.4.2 Switchable Polarity
[3]	Polarity LED	voltage output is positive	3.4.2 Switchable Polarity
[4]	Interface connector	Power supply and control signal	5.1 Interface connector D-SUB 9 (compact metal box)
[5]	Current Limit	setting a limit for current (I_{nom})	3 Technical Data, 3.2 Specifications
[6]	Voltage Limit	setting a limit for voltage (V_{nom})	3 Technical Data, 3.2 Specifications
[7] ⁽¹⁾	High voltage output	Sample for DPS with SHV connector	Table 4: Configurations: DPS – compact metal box
Notes:			
1) – depending on model (SHV or cable)			

Table 1

2.2. DPS – 3U Euro cassette

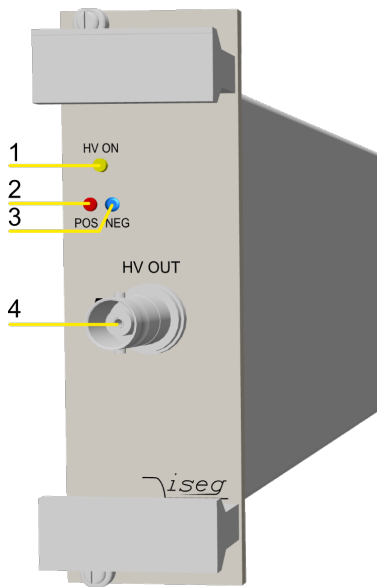


Figure 3: Front side, 3UC

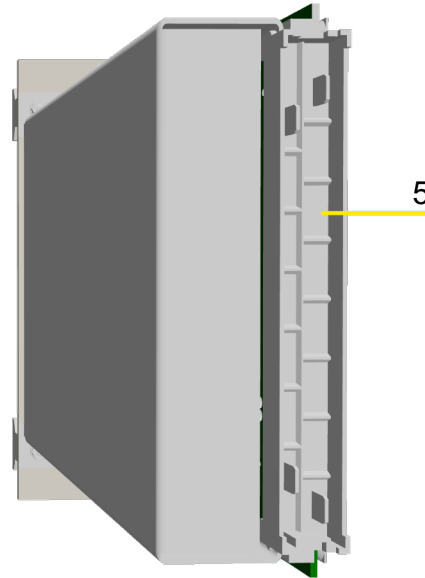


Figure 4: Back side, 3UC

Number	Description		Detailed explanation in chapter
[1]	HV ON LED	Signals output voltage	3.4.2 Switchable Polarity
[2]	Polarity LED	voltage output is positive	3.4.2 Switchable Polarity
[3]	Polarity LED	voltage output is negative	3.4.2 Switchable Polarity
[4]	High voltage output		3 Technical Data
[5]	Interface connector	Power supply and control signal	5.2 System connector H15 (3UC Euro cassette)

Table 2

3. Technical Data

3.1. Specifications

SPECIFICATIONS	DPS	DPS 3UC
Output voltage V_{nom}	500 V – 6 kV	
Polarity	Switchable	
Ripple and noise ($f > 10$ Hz) ⁽¹⁾	typ. < 3 mV _{p-p} , max. 7 mV _{p-p}	
Stability – [ΔV_{out} vs. ΔV_{in}] ⁽¹⁾	< $1 \cdot 10^{-5} \cdot V_{nom}$	
Stability – [ΔV_{out} vs. ΔR_{load}] ⁽¹⁾	< $5 \cdot 10^{-5} \cdot V_{nom}$	
Temperatur coefficient	50 ppm/K	
Supply voltage V_{in}	22.8 – 25.2V	
Supply current I_{in} at $V_{out} = 0$ at $V_{out} = V_{nom}$ / with load	< 120 mA < 800 mA	
Set / Monitor voltage V_{set}	0 – 5 V opt. 0 – 10 V	0 – 5 V
Set / Monitor accuracy	$\pm 1 \% \cdot V_{nom}$	
Voltage ramp up/down	$0.25 \cdot V_{nom} / s$	
Protection	Overload and short circuit protected (ATTENTION: there is only one short circuit or arc per second allowed!)	
	INHIBIT, V/I-limit (setting with potentiometer LIMIT I resp. V)	INHIBIT
Remote connector	D-Sub 9	H15
HV connector	HV-cable ⁽²⁾ SHV	SHV
Case	metal box (also THQ version)	3U cassette (MMC capable)
Dimensions – L/W/H	185/75/40 mm ³	160mm/8HP/3U
Operating temperature	0 – 40 °C	
Storage temperature	-20 – 85°C	
Humidity	max. 70 %	
Notes: 1) – Specifications for stability, ripple and noise are guaranteed in the range $2\% \cdot V_{nom} < V_{out} \leq V_{nom}$ 2) – the HV cable has a length of 600mm as standard, see Figure 9: HV cable connection		

Table 3: Technical data: Specifications

3.2. Configurations

CONFIGURATIONS DPS – compact metal box								
	V _{nom}	I _{nom}	Standard Ripple (mV _{p-p})	Internal Capacitance nominal (nF)	Damping Resistor (kOhm)	Discharge Resistor (MOhm)	HV connector ⁽¹⁾	Item Code
DPR 05 106	500 V	10 mA	7	450	0,22	12	cable	DP005106r240000ccRk
DPR 10 106	1 kV	10 mA	7	240	0.22	12	cable	DP010106r240000ccRk
DPR 15 805	1.5 kV	8 mA	7	130	0,22	12	cable	DP015805r240000ccRk
DPR 20 605	2 kV	6 mA	7	20	0,22	25	cable	DP020605r240000ccRk
DPR 30 405	3 kV	4 mA	7	22	0,22	25	cable	DP030405r240000ccRk
DPR 40 305	4 kV	3 mA	7	27	0.22	30	cable	DP040305r240000ccRk
DPR 50 205	5 kV	2 mA	7	10	0.68	30	cable	DP050205r240000ccRk
DPR 60 155	6 kV	1.5 mA	7	10	0.68	30	cable	DP060155r240000ccRk

Notes:
replacement characters: o – options, c – connector, R – revision, k – customization, y – monitor voltages
1) – the HV cable has a length of 600mm as standard, see Figure 9: HV cable connection

Table 4: Configurations: DPS – compact metal box

CONFIGURATIONS DPS – 3U Euro cassette								
	V _{nom}	I _{nom}	Standard Ripple (mV _{p-p})	Internal Capacitance nominal (nF)	Damping Resistor (kOhm)	Discharge Resistor (MOhm)	HV connector	Item Code
DPR 05 106	500 V	10 mA	7	450	0.1	12	SHV	DK005106r245000ccRk
DPR 10 106	1 kV	10 mA	7	240	0.1	12	SHV	DK010106r245000ccRk
DPR 15 805	1.5 kV	8 mA	7	130	0.1	12	SHV	DK015805r245000ccRk
DPR 20 605	2 kV	6 mA	7	40	0.1	25	SHV	DK020605r245000ccRk
DPR 30 405	3 kV	4 mA	7	40	0.1	25	SHV	DK030405r245000ccRk
DPR 40 305	4 kV	3 mA	7	27	0.22	30	SHV	DK040305r245000ccRk
DPR 50 205	5 kV	2 mA	7	10	0.68	30	SHV ⁽¹⁾	DK050205r245000ccRk
DPR 60 155	6 kV	1.5 mA	7	10	0.68	30	SHV ⁽¹⁾	DK060155r245000ccRk

Notes:
replacement characters: o – options, c – connector, R – revision, k – customization
1) – SHV connector, version S08

Table 5: Configurations: DPS – 3U Euro cassette

3.3. Options

OPTIONS / ORDER INFO	INFO	EXAMPLE
Set / monitor voltage ⁽¹⁾	0 – 5V, standard 0 – 10V, optional	DPR 05 106 DPR 05 106_A0
3UC	3U , Height unit based on the 19-inch standard housing, MMC capable version	

Notes:
1) – only for compact metal box

Table 6: Technical data: Options and order information

3.4. Functional description

If the high voltage excitation is switched on and off via PIN ON, it rises or falls by means of ramp up (see 3.4.2 Switchable Polarity) to the maximum set voltage via V_{SET} . A monitor voltage for the output current and output voltage is available via the I_{MON} and V_{MON} connections. The pin REF (reference) can be used for the V_{SET} voltage via an additional circuit (see Figure 5: VSET)

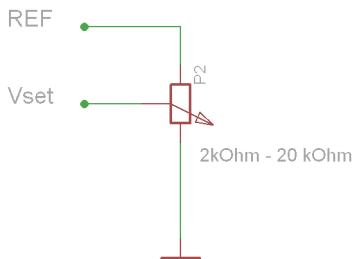


Figure 5: VSET

3.4.1. INHIBIT ¹

Modules equipped with the option INHIBIT ² provide the possibility to shut down single channels, a group of channels (monitor group) or the entire module with or without ramp, triggered by an external signal.

3.4.2. Switchable Polarity

The polarity can be switched via the input POL:

signal	level	polarity
POL	High or NC	→ positive
POL	Low	→ negative

INFORMATION



INFORMATION

Switching the polarity is only possible with output voltages from 0 to 64 V. At higher voltages, the changeover process is blocked to protect the changeover relay.

The HV ON LED (yellow) indicates that the output voltage is still greater than 64V. If the output voltage is less than 64V, it is switched off.

If the level at the POL input (see chapter 5 Connectors and PIN assignments) changes from high to low or from low to high, the generation of high voltage is stopped first. If the voltage has fallen below 64V, the polarity is switched and the voltage value specified at input V_{set} is approached with a voltage ramp of $0.25 \cdot V_{nom}/s$.

¹ Only for 3U Euro cassette

² Only for 3U Euro cassette

3.4.3. separation supply ground from signal ground

In version 3UC, the supply ground (0V) can be separated from the signal ground (GND) by removing the jumper. See Figure 6: view of the top and Figure 7: detail view of Figure 6: view of the top (Jumper red marked).

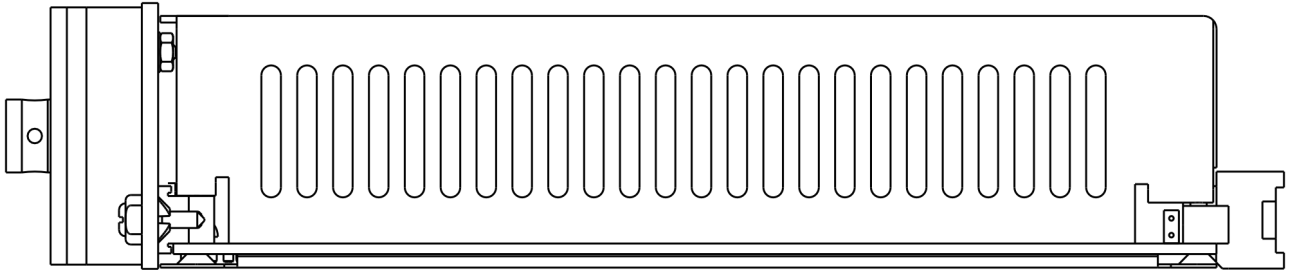


Figure 6: view of the top

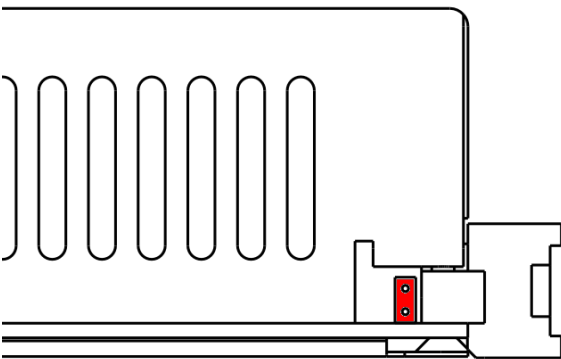


Figure 7: detail view of Figure 6: view of the top (Jumper red marked)

4. Dimensional drawings

4.1. DPS – compact metal box

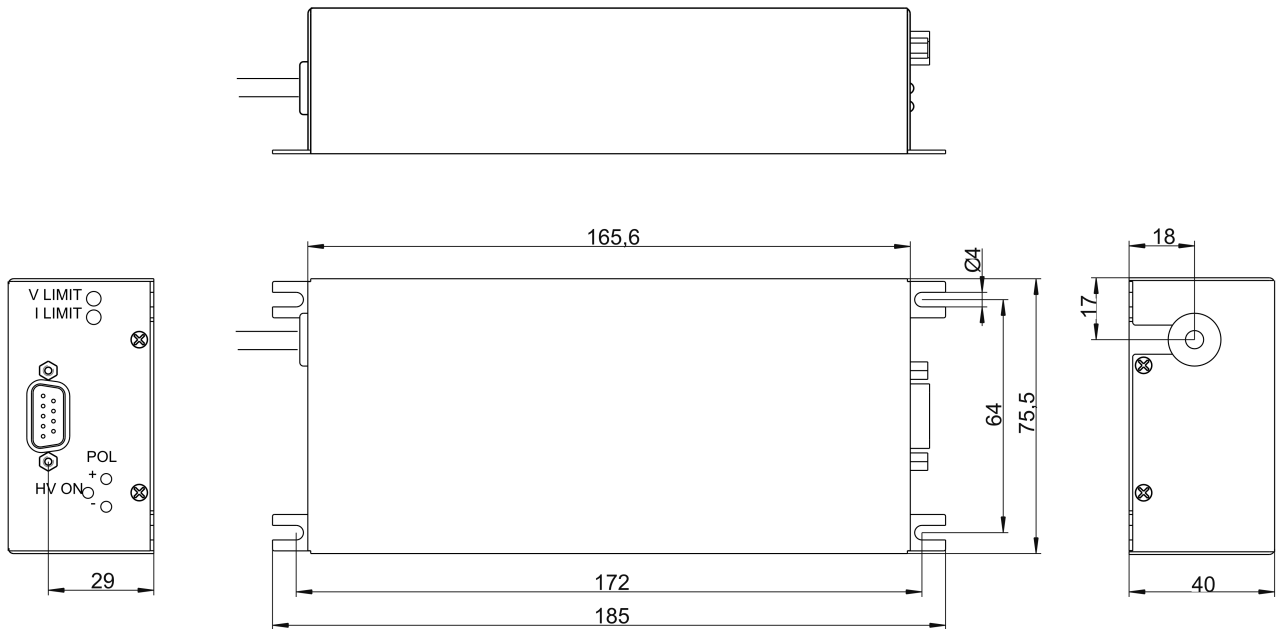


Figure 8: dimensional drawing DPS with cable

4.2. HV-Cable configuration

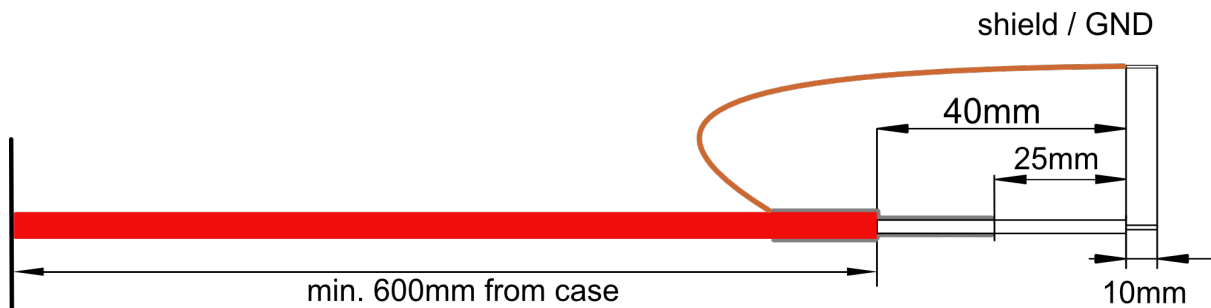


Figure 9: HV cable connection

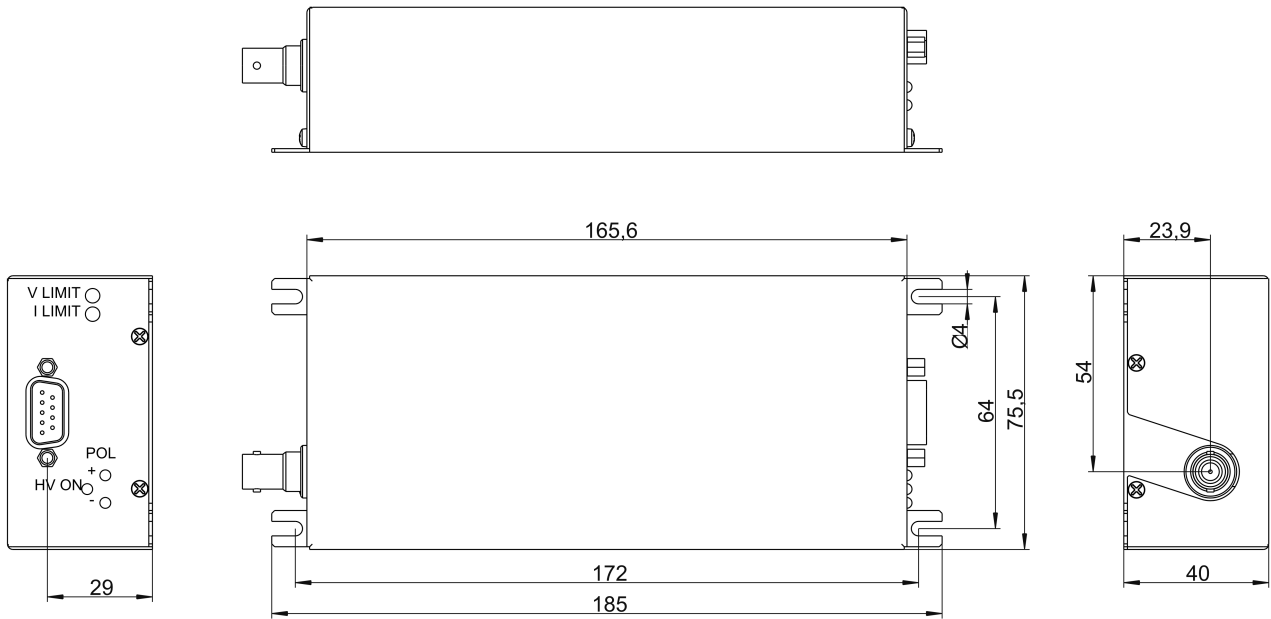


Figure 10: dimensional drawing DPS with SHV

4.3. DPS – 3UC Euro cassette

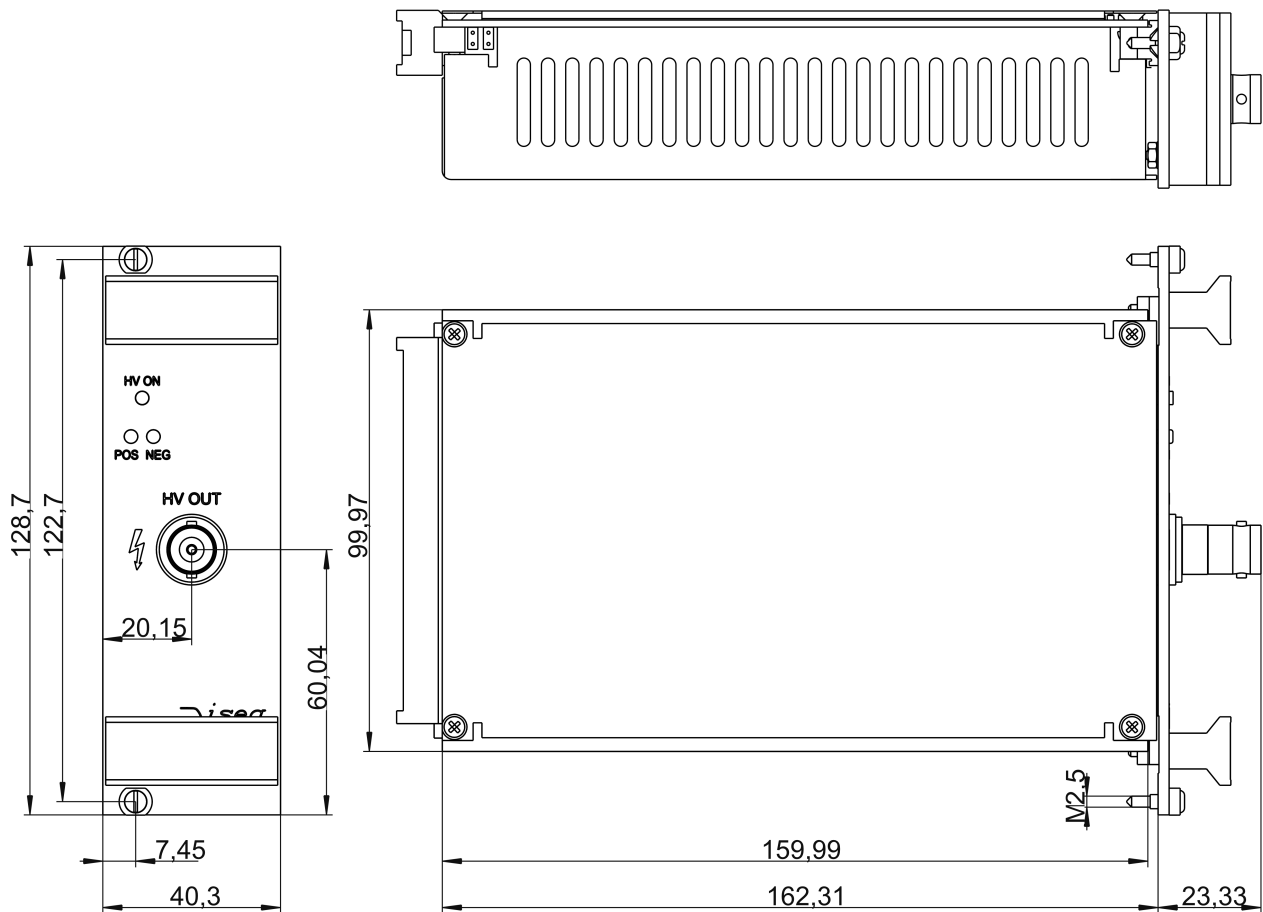


Figure 11: dimensional drawing DPS 3UC

5. Connectors and PIN assignments

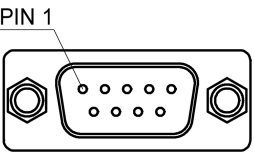


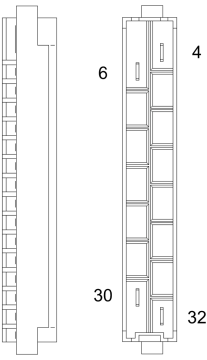
CONNECTORS – POWER SIDE		PART NUMBERS (manufacturer code / iseg accessory parts item code)	
D-SUB9 - male		CABLE SIDE	
 Figure 12	connector manufacturer iseg part number	D SUD9, Female different producers	(DIN 41652)
SHV		CABLE SIDE	
 Figure 13	part number manufacturer iseg part number	57K101-006N3 Rosenberger Z590162	
SHV Version S08		CABLE SIDE	
 Figure 14	part number manufacturer iseg part number	R317.005.000 Radiall Z592474	
H15		CABLE SIDE	
 Figure 15	connector manufacturer iseg part number	Female power plug type H15, compatible with iseg crates different producers	(DIN 41612 / IEC 60603-2)

Table 7

5.1. Interface connector D-SUB 9 (compact metal box)

PIN	NAME	DESCRIPTION	VALUE
1	0V ⁽¹⁾	Supply ground	0 V
2	IMON	I _{mon} Monitor voltage of output current	0 ... 5 V (optionally: 0 ... 10 V)
3	ON	HV ON/OFF with voltage ramp	TTL-level: LOW → HV ON HIGH or not connected → HV OFF
4	POL	Polarity	HIGH or not connected → positive LOW → negative
5	VIN	V _{in} Supply voltage	+24 V DC
6	GND ⁽¹⁾	Signal ground	
7	VMON	V _{mon} Monitor voltage	0 ... 5 V (optionally: 0 ... 10 V)
8	VSET	V _{set} Set value of output voltage	0 ... 5V (optionally: 0 ... 10 V)
9	REF	V _{ref} Internal reference voltage	5 V (optionally: 10V)

Notes:
Case is connected to GND
1) – internally connected

Table 8: PIN Assignment D-SUB 9

5.2. System connector H15 (3UC Euro cassette)

PIN	NAME	DESCRIPTION	VALUE
6	0V	Supply ground	
8	REF	V_{ref} Internal reference voltage	5 V
10	0V	Supply ground	
12	GND	Signal ground	
14	IMON	I_{mon} Monitor voltage of output current	0 ... 5 V
16	ON	HV ON/OFF with voltage ramp	TTL-level: LOW → HV ON HIGH or not connected → HV OFF
18	VIN_C ⁽¹⁾	$V_{in,s}$ Supply voltage (Control)	+24 V DC
20	VSET	V_{set} Set value of output voltage	0 ... 5 V
22	POL	Polarity	HIGH or not connected → positive LOW → negative
24	VMON	V_{mon} Monitor voltage	0 ... 5 V
26	VIN ⁽¹⁾	V_{in} Supply voltage (Power)	+24 V DC
28	ISET	I_{set} Set voltage of output current	0 ... 5 V
30	KILL_ENA ⁽²⁾	Killenable, high active	TTL-level
32	INH	Inhibit, LOW = active, shut down the output voltage	TTL-level: LOW → HV OFF HIGH or not connected → HV ON

Notes:
Case is connected to **0V** and with Jumper J1 connected to **GND**, see chapter 3.4.3 separation supply ground from signal ground
1) – internally connected
2) – If KillEnable is active the occur of Inhibit will trigger a Kill-signal. This signal will switch off the HV immediately without ramp. Restoring the output voltage is only possible after operating KILL-ENA or HV_ON.

Table 9: PIN Assignment 3U Euro cassette (H15)

6. Order guides

CONFIGURATION ORDER GUIDE (item code parts)									
Dx	030	405	r	24	50	000	02	0	0
Type	V _{nom}	I _{nom} (nA)	Polarity	Input Voltage	Monitor Voltage	Option	HV Connector	Revision	Customized Version
	three significant digits • 100V For Example: 030 = 3000V	two significant digits + number of zeros For Example: 405 = 4mA	r = reversible	two significant digits For Example: 24 = 24 Volt	two significant digits 1.th hex • 1V 2.th dez • 0,1V For Example: 50 = 5V A0 = 10V		00 = Cable 02 = SHV 03 = SHV, version S08	one digit Example: 0 = no revision	one digit Example: 0 = no customization
Notes: x = P - Metal box, x = K - 3U Cassette, x = T - for THQ									

Table 10: Configuration item code

CABLE ORDER GUIDE					
POWER SUPPLY SIDE CONNECTOR	V _{max}	CABLE CODE	CABLE DESCRIPTION	LOAD SIDE CONNECTOR	ORDER CODE LLL = length in m ⁽¹⁾
SHV	≤ 5 kV	04	HV cable shielded 30kV (HTV-30S-22-2)	open	SHV_C04-LLL
S08	≤ 8 kV	04	HV cable shielded 30kV (HTV-30S-22-2)	open	S08_C04-LLL
Notes: 1) - Length building examples: 10cm → 0.1, 2.5m → 2.5, 12m → 012, 999m → 999					

Table 11: Guideline for cable ordering

7. References

For more information please use the following download links:

<p>This document</p> <p>https://iseg-hv.com/download/DC_DC/DPS/iseg_datasheet_DPS_en.pdf</p>
<p>DPS series</p> <p>https://iseg-hv.com/en/products/detail/DPS</p>
<p>Archives</p> <p>https://iseg-hv.com/download/?dir=DC_DC/DPS/archive</p>
<p>Cables and Connectors</p> <p>https://iseg-hv.com/download/ACCESSORIES/Adapters%20and%20Cables/iseg_Cables%20and%20Connectors_en.pdf</p>

Manufacturers website (connectors)	
Radiall	https://www.radiall.com/
Rosenberger	https://www.rosenberger.com/

8. Glossary

SHORTCUT	MEANING
0V	Supply ground
V_{nom}	nominal output voltage
V_{out}	output voltage
V_{set}	set value of output voltage
V_{mon}	monitor voltage of output voltage
V_{meas}	digital measured value of output voltage
V_{p-p}	peak to peak ripple voltage
V_{in}	input / supply voltage
$V_{IN,C}$	$V_{in,s}$ Supply voltage (Control)
V_{type}	type of output voltage (AC, DC)
V_{ref}	internal reference voltage
V_{max}	limit (max.) value of output voltage
V_{limit}	voltage limit
$\Delta V_{out} - [\Delta V_{in}]$	deviation of V_{out} depending on variation of supply voltage
$\Delta V_{out} - [\Delta R_{load}]$	deviation of V_{out} depending 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	HV OFF
CH	channel(s)


SHORTCUT	MEANING
HV	high voltage
LV	low voltage
GND	signal ground
INH	Inhibit
POL	Polarity
KILL	KillEnable

Table 12: Glossary

9. 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!




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

CAUTION!

10. Disposal

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.

INFORMATION

11. Manufacturer contact

iseg Spezialelektronik GmbH

Bautzner Landstr. 23

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