



# USER MANUAL

EN

Edition: 2 from 01.02.2022

Supersedes the edition: 1 from 23.03.2021

## **Power supplies HPSG2 series**

v1.0

### **Buffer switched mode power supply Grade 2**



**Features:**

- compliance with norm EN50131-6:2017 in grade 1, 2 and II environment class
- compliance with norm EN60839-11:2013 in grade 1, 2 and II environment class
- supply voltage ~200 - 240 V
- uninterrupted voltage of DC 13,8 V or 27,6 V
- available versions with current efficiencies  
**13,8 V: 2A/3A/5A/10A/20A**  
**27,6 V: 2A/3A/5A/10A**
- high efficiency (up to 89%)
- battery charging current jumper selectable
- START function of manual switch to battery power
- LED optical indication
- deep discharge battery protection (UVP)
- dynamic battery test
- battery circuit continuity control
- battery voltage control
- battery charging and maintenance control
- battery output protection against short circuit and reverse connection
- protections:
  - SCP short circuit protection
  - OLP overload protection
  - OVP overvoltage protection
  - surge protection
  - antisabotage protection: unwanted enclosure opening
- warranty – 2 years from the production date

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**1. Technical description.****1.1. General description.**

The buffer power supply is designed in accordance with the requirements of the (I&HAS) EN50131-6:2017 and (KD) EN60839-11:2013 standard, grade 1, 2 and II environmental class. The power supplies units are intended for for an uninterrupted supply of I&HAS and KD devices requiring stabilized voltage of 12 or 24 V DC ( $\pm 15\%$ ).

**Table 1. Displaying parameters of the power supply:**

PSU's name	Output voltage	Output current max.	Output current (in standby mode for grade 2 EN50131-6, EN60839-11)	Charging current
HPSG2-12V2A-B	13,8 V	2,5 A	0,58 A	0,5 / 1 A
HPSG2-12V3A-C	13,8 V	3,5 A	1,41 A	0,5 / 1 A
HPSG2-12V5A-C	13,8 V	5 A	1,41 A	1 / 2 A
HPSG2-12V7A-C	13,8 V	7 A	1,41 A	1 / 2 A
HPSG2-12V7A-D	13,8 V	7 A	3,33 A	1 / 2 A
HPSG2-12V10A-D	13,8 V	10 A	3,33 A	1 / 4 A
HPSG2-12V20A-E	13,8 V	20 A	5,41 A	2 / 4 / 8 A
HPSG2-24V2A-B	27,6 V	2,5 A	0,58 A	0,5 / 1 A
HPSG2-24V3A-B	27,6 V	3,5 A	0,58 A	0,5 / 1 A
HPSG2-24V3A-C	27,6 V	3,5 A	1,41 A	0,5 / 1 A
HPSG2-24V5A-C	27,6 V	5 A	1,41 A	1 / 2 A
HPSG2-24V5A-D	27,6 V	5 A	3,33 A	1 / 2 A
HPSG2-24V10A-C	27,6 V	10 A	1,41 A	1 / 2 / 4 A
HPSG2-24V10A-D	27,6 V	10 A	3,33 A	1 / 2 / 4 A

Total current of the receivers + battery charging current mustn't cross maximum current of power supply.

In case of power decay, a battery back-up is activated immediately. The PSU is housed in a metal enclosure (colour RAL 9003) which can accommodate a battery. Enclosure is equipped with a tamper switch signaling opening the door (front panel).



PSU module should be configured properly, depending on application, to work in burglary and assault signalling systems or access control. For this purpose, appropriate charging current should be selected (taking into account battery capacity and required charging time).

1.2. Block diagram (Fig.1).

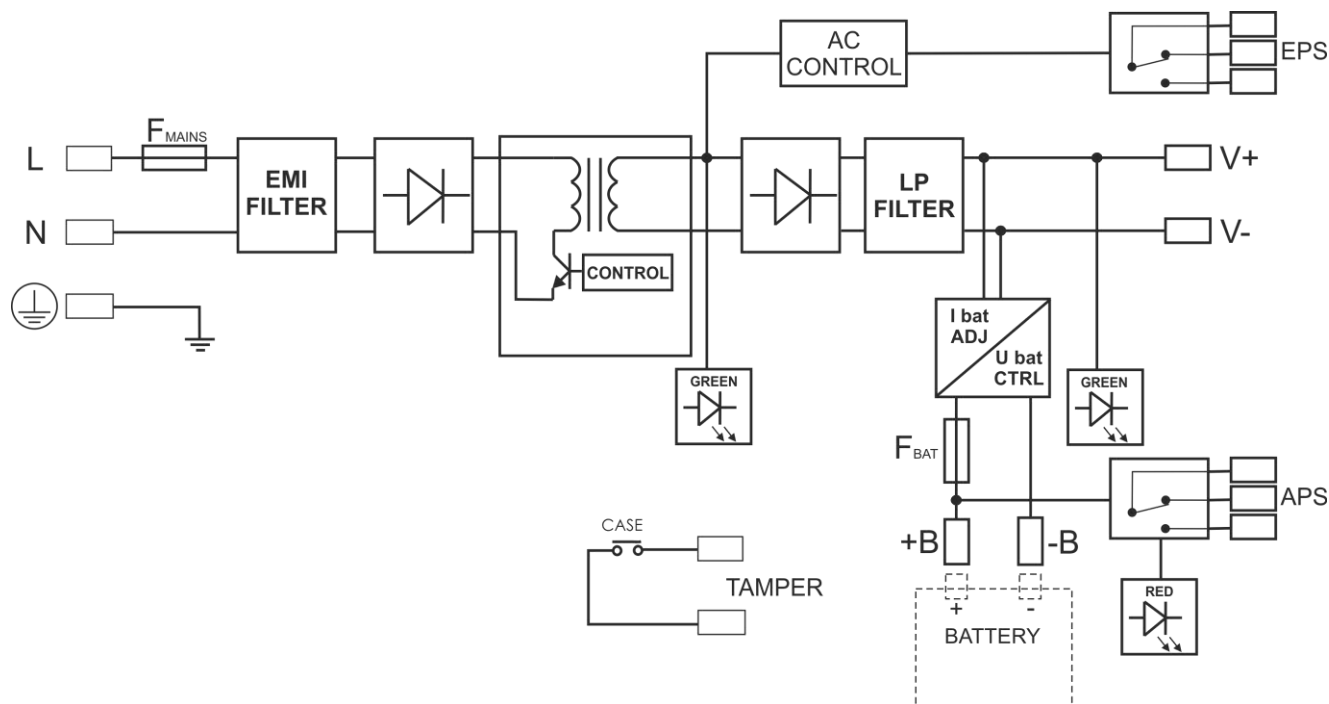














Fig.1. Block diagram of PSU.

1.3. Description of PSU components and connectors.

Table 2. Elements and connector of PSU (see Fig. 2a, 2b, 2c).

Element no.	Description
[1]	LED for DC output voltage
[2]	Optical LED indication connector
[3]	Selection jumper for charging current: Models 12V2A; 12V3A; 12V5A; 12V7A; 12V10A; 24V2A; 24V3A; 24V5A: • I <sub>BAT</sub> =  , I <sub>BAT</sub> = I1 • I <sub>BAT</sub> =  , I <sub>BAT</sub> = I2 Models 12V20A; 24V10A: • I1 =  I2 =  I3 =  I <sub>BAT</sub> = I1 • I1 =  I2 =  I3 =  I <sub>BAT</sub> = I2 • I1 =  I2 =  I3 =  I <sub>BAT</sub> = I3
[4]	START button (launching from battery)
[5]	The output of the PSU (V+, V-)
[6]	Battery terminals (B+, B-)
[7]	APS – technical output of battery failure
[8]	EPS – technical output of AC power loss indication
[9]	L-N power supply connector 230 V AC,  – connector for connection of a protective conductor
[10]	Battery fuse

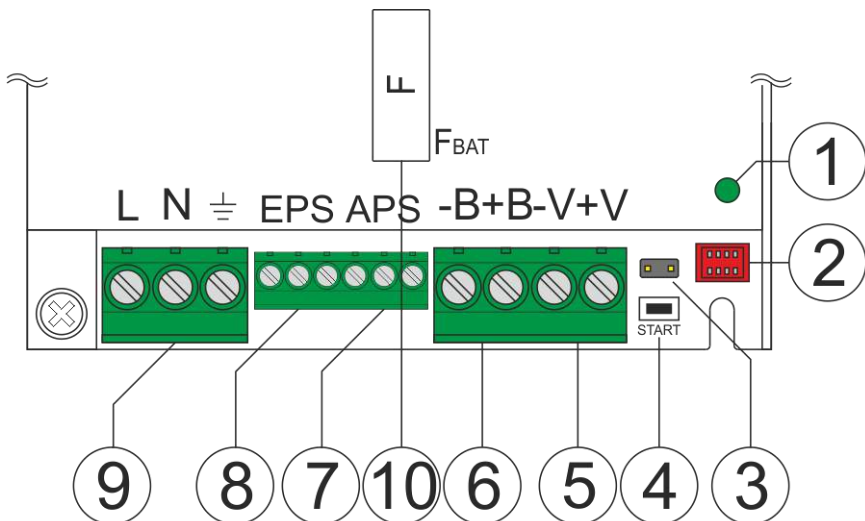


Fig. 2a. View of power supply module (12V2A, 12V3A, 12V5A, 12V7A, 24V2A, 24V3A models)

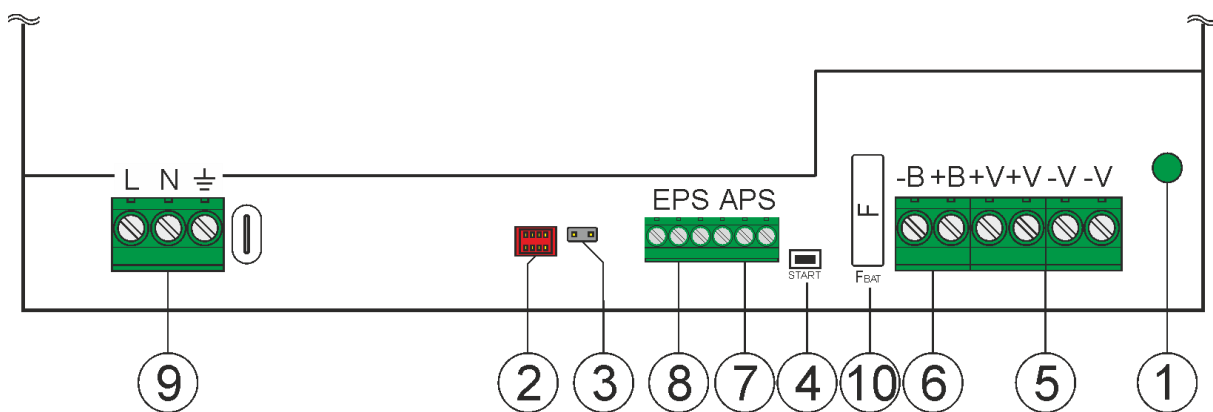


Fig. 2b. View of power supply module (12V10A, 24V5A models)

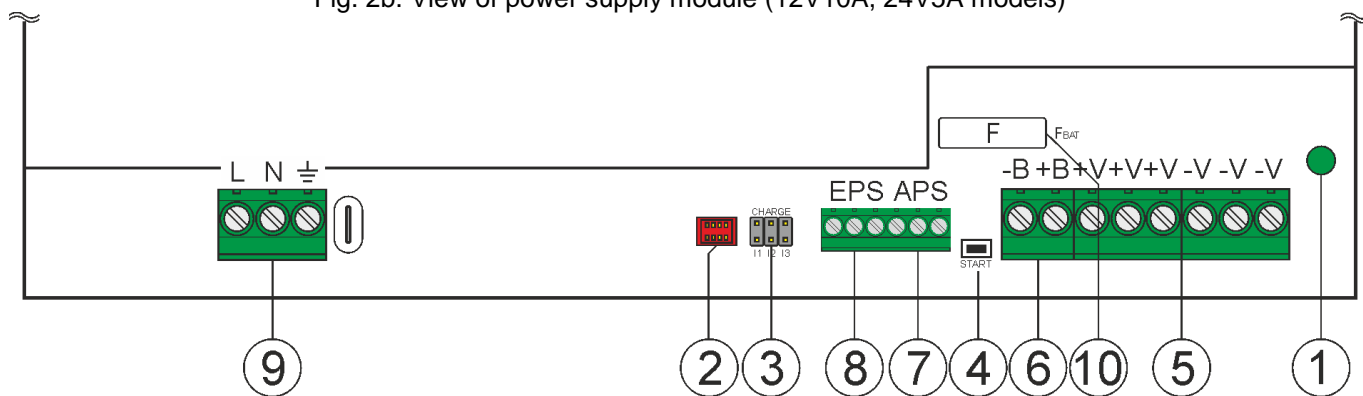


Fig. 2c. View of power supply module (12V20A, 24V10A models)

Table 3. View of PSU (see Fig. 3).

Element no.	Description
[1]	PSU module
[2]	Cable grommet
[3]	TAMPER; microswitch of antisabotage protection (NC)
[4]	Battery connectors: +BAT = red, - BAT = black

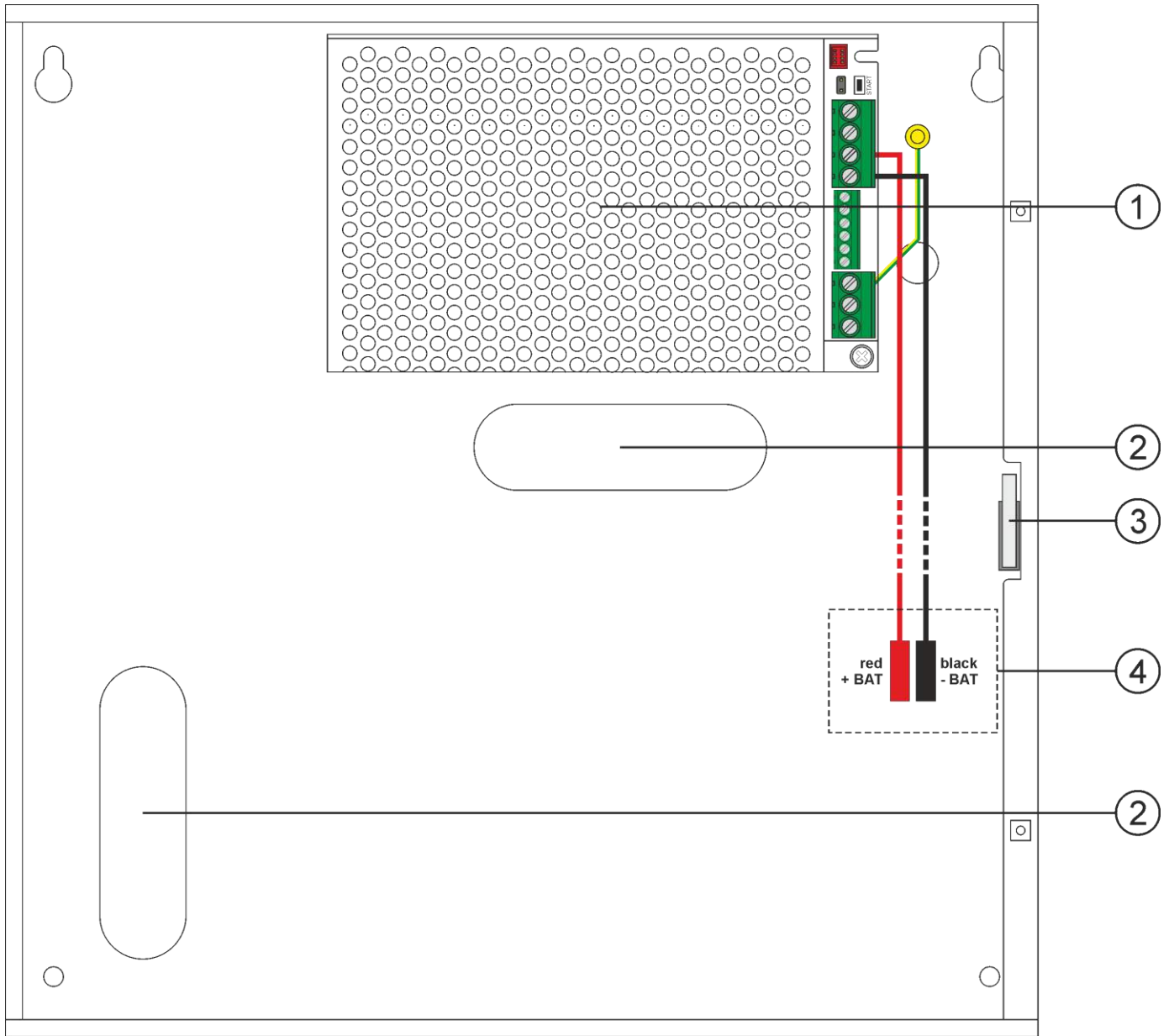
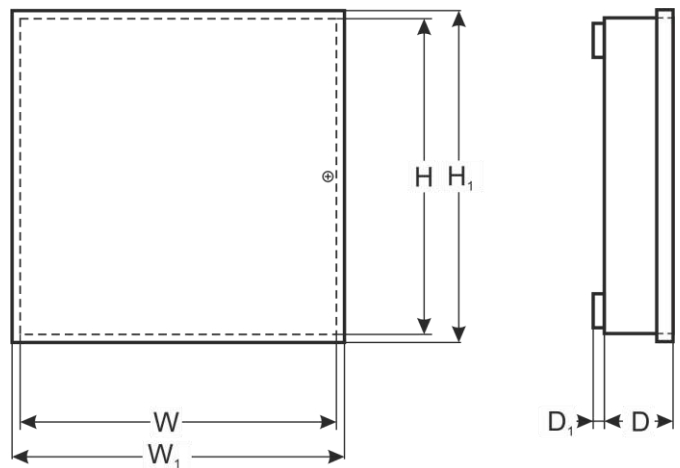


Fig.3. View of PSU.

**1.4. Specifications:**

- electrical parameters (tab. 4)
- mechanical parameters (tab. 5)
- operation safety (tab. 6)
- operating parameters (tab. 7)



**Table 4. Electrical parameters.**

Model	HPSG2-12V2A-B	HPSG2-12V3A-C	HPSG2-12V5A-C	HPSG2-12V7A-C	HPSG2-12V7A-D	HPSG2-12V10A-D	HPSG2-12V20A-E
<b>PSU type</b>	A (EPS - External Power Source), Environmental Class II						
<b>Supply voltage</b>	~ 200 - 240 V						
<b>Current consumption</b>	0,4 A	0,5 A	0,8 A	1 A	1 A	1,3 A	1,5 A
<b>Power frequency</b>	50/60 Hz						
<b>Inrush current</b>	40 A						60 A
<b>PSU power</b>	35 W	48 W	69 W	96 W	96 W	138 W	276 W
<b>Output current max.</b>	2,5 A	3,5 A	5 A	7 A	7 A	10 A	20 A
<b>Efficiency</b>	86%	86%	87%	87%	87%	88%	87%
<b>output voltage</b>	11 - 13,8 V – buffer operation 10 - 13,8 V – battery-assisted operation						
<b>Ripple voltage (max.)</b>	100 mV p-p						
<b>Current consumption by the PSU systems during battery-assisted operation</b>	30 mA	30 mA	30 mA	30 mA	30 mA	50 mA	40 mA
<b>Fitting battery</b>	7-9 Ah (SLA)	17-20 Ah (SLA)	17-20 Ah (SLA)	40-45 Ah (SLA)	40-45 Ah (SLA)	40-45 Ah (SLA)	65Ah (SLA)
<b>Charging current (jumper selectable)</b>	I1: 0,5 A I2: 1 A	I1: 0,5 A I2: 1 A	I1: 1 A I2: 2 A	I1: 1 A I2: 2 A	I1: 1 A I2: 2 A	I1: 1 A I2: 4 A	I1: 2 A I2: 4 A I3: 8 A
<b>Net/gross weight</b>	1,3/1,4 kg	1,7/1,8 kg	1,7/1,8 kg	1,8/1,9 kg	4,6/5,2 kg	5,3/5,9 kg	6,9/7,7 kg
<b>Overload protection (OLP)</b>	105÷150% of power supply, automatic recovery						
<b>Over voltage protection (OVP)</b>	>19 V (activation requires disconnecting the load or supply for about approx. 1 min.)						
<b>Battery circuit protection SCP and reverse polarity connection</b>	- F <sub>BAT</sub> fuse (in case of a failure, fuse-element replacement required – under power supply cover)					- F <sub>BAT</sub> fuse (in case of a failure, fuse-element replacement required)	
<b>Deep discharge battery protection UVP</b>	U<9,5 V (± 5%) – disconnection of battery terminal						
<b>Technical outputs:</b> - EPS; output indicating AC power failure - APS; output indicating battery failure	- relay type: 1A@ 30VDC/50VAC						
<b>Tamper protection:</b> - TAMPER indicates enclosure opening	- microswitch, NC contacts (enclosure closed), 0,5 A@50 V DC (max.)						
<b>Optical indication</b>	- LED on PCB of power supply unit - LED indicators on power supply's cover (see section 3.1)						
<b>Fuses: - F<sub>BAT</sub></b>	F 3,15A/250V	F 4A/250V	T 6,3A/250V	F 8A/250V	F 8A/250V	T 10A	T 20A
<b>Terminals:</b> <b>Mains supply:</b> <b>Outputs:</b> <b>Battery outputs:</b> <b>TAMPER</b>	0,5 – 2,5 mm <sup>2</sup> (AWG 26 – 12)						
	Battery wires 6,3F – 45cm, angle muffs ML062					Battery wires Φ6 (M6-2,5), 45cm	
	wires, 40cm						
<b>Notes</b>	Convectonal cooling						Forced cooling

Model	HPSG2-24V2A-B	HPSG2-24V3A-B	HPSG2-24V3A-C	HPSG2-24V5A-C	HPSG2-24V5A-D	HPSG2-24V10A-C	HPSG2-24V10A-D
PSU type	A (EPS - External Power Source), Environmental Class II						
Supply voltage	~ 200 - 240 V						
Current consumption	0,8 A	1 A	1 A	1,3 A	1,3 A	1,5 A	
Power frequency	50/60 Hz						
Inrush current	40 A					60 A	
PSU power	69 W	96 W	96 W	138 W	138 W	276 W	
Output current max.	2,5 A	3,5 A	3,5 A	5 A	5 A	10 A	
Efficiency	89%	89%	89%	89%	89%	87%	
output voltage	22 - 27,6 V – buffer operation 20 - 27,6 V – battery-assisted operation						
Ripple voltage (max.)	100 mV p-p						
Current consumption by the PSU systems during battery-assisted operation	20 mA	30 mA	30 mA	40 mA	40 mA	40 mA	
Fitting battery	7-9 Ah (SLA)	7-9 Ah (SLA)	17-20 Ah (SLA)	17-20 Ah (SLA)	40-45 Ah (SLA)	17-20 Ah (SLA)	40-45 Ah (SLA)
Charging current (jumper selectable)	I1: 0,5 A I2: 1 A	I1: 0,5 A I2: 1 A	I1: 0,5 A I2: 1 A	I1: 1 A I2: 2 A	I1: 1 A I2: 2 A	I1: 1 A I2: 2 A I3: 4 A	
Net/gross weight	1,8/1,9 kg	2,3/2,4 kg	4,6/5,2 kg	5,2/5,8 kg	6,6/7,4 kg	5,6/6,2 kg	6,9/7,7 kg
Overload protection (OLP)	105±150% of power supply, automatic recovery						
Over voltage protection (OVP)	>37 V (activation requires disconnecting the load or supply for about approx. 1 min.)						
Battery circuit protection SCP and reverse polarity connection	- FBAT fuse (in case of a failure, fuse-element replacement required)			- FBAT fuse (in case of a failure, fuse-element replacement required)			
Deep discharge battery protection UVP	U<19 V (± 5%) – disconnection of battery terminal						
Technical outputs: - EPS; output indicating AC power failure - APS; output indicating battery failure	- relay type: 1 A@ 30 V DC / 50 V AC						
Tamper protection: - TAMPER indicates enclosure opening	- microswitch, NC contacts (enclosure closed), 0,5 A@50 V DC (max.)						
Optical indication	- LED on PCB of power supply unit - LED indicators on power supply's cover (see section 3.1)						
Fuses: - F <sub>BAT</sub>	F 3,15A/250V	F 4A/250V	F 4A/250V	T 5A	T 5A	T 10A	
Terminals: Mains supply: Outputs: Battery outputs: TAMPER	0,5 – 2,5 mm <sup>2</sup> (AWG 26 – 12)						
	Battery wires 6,3F – 45cm, angle muffs ML062			Battery wires Φ6 (M6-2,5), 45cm			
	wires, 40cm						
Notes	Convictional cooling					Forced cooling	

**Table 5. Mechanical parameters.**

	HPSG2-12V2A-B	HPSG2-12V3A-C HPSG2-12V5A-C HPSG2-12V7A-C HPSG2-24V2A-B	HPSG2-24V3A-B	HPSG2-12V7A-D HPSG2-12V10A-D HPSG2-24V3A-C HPSG2-24V5A-C HPSG2-24V10A-C	HPSG2-12V20A-E HPSG2-24V5A-D HPSG2-24V10A-D
Enclosure dimensions (WxH) [±2mm]	200x230	230x300	300x300	330x380	460x390
Enclosure dimensions (W <sub>1</sub> xH <sub>1</sub> xD <sub>1</sub> +D) [±2mm]	205x237x82+8	237x305x82+8	305x305 x105+8	335x385x173+14	465x395x173+14
Fixing (WxH)	175x202	205x272	274x265	298x310	425x322
Space for battery (WxHxD)	190x100x75	215x172x75	250x172x100	325x178x168	450x190x168
Enclosure	Steel sheet DC01 0,7mm			Steel sheet DC01 1mm	
Closing	Cheese head screw (at the front), (lock assembly possible)				
Notes	Enclosure does not adjoin assembly surface so that cables can be led				

**Table 6. Operation safety.**

Protection class EN 62368-1	I (first)
Degree of Protection EN 60529	IP20
Electrical strength of insulation: - between input and output circuits of the PSU (I/P-O/P) - between input circuit and protection circuit - between output circuit and protection circuit	2500 V AC min. 1500 V AC min. 500 V AC min.
Insulation resistance: - between input circuit and output or protection circuit	100 MΩ, 500 V DC

**Table 7. Operating parameters.**

Environmental Class	II
Operating temperature	-10°C...+40°C
Storage temperature	-20°C...+60°C
Relative humidity	20%...90%, without condensation
Vibrations during operation	unacceptable
Impulse waves during operation	unacceptable
Direct insulation	unacceptable
Vibrations and impulse waves during transport	Wg PN-83/T-42106

## 2. Installation.

### 2.1 Requirements.

The buffer PSU shall be mounted by a qualified installer with appropriate permissions and qualifications for 230 V AC installations and low-voltage installations (required and necessary for a given country). The unit should be mounted in confined spaces, in accordance with the II environmental class, with normal relative humidity (RH=90% maximum, without condensing) and temperature from -10°C to 40°C. The PSU shall work in a vertical position that guarantees sufficient convective air-flow through ventilating holes of the enclosure.

The unit should be mounted in a metal enclosure (cabinet) in a vertical position so as to ensure free, convection air flow through the vents. In order to meet the EU requirements, follow the guidelines on: power supply, enclosures and shielding: - according to application.

As power supply is designed for a continuous operation and is not equipped with a power-switch, therefore, an appropriate overload protection in power supply circuit should be provided. Moreover, user should be informed how to disconnect power supply unit from mains supply (most frequently through separating and assigning an appropriate fuse in the fuse-box).



## 2.2 Installation procedure.



### CAUTION!

Before installation, cut off voltage in 230 V power-supply circuit. To switch power off, use an external switch, in which distance between contacts of all poles in disconnection state is not less than 3mm.

It is required to install an installation switch with a nominal current of 6 A in the power supply circuits outside the power supply unit..

1. Mount the PSU in a selected location and connect the wires.
2. Connect the power cables (~230 V) to L-N clips of the PSU. Connect ground wire to clip marked by earth symbol  $\oplus$ . Use a three-core cable (with a yellow and green protection wire  $\oplus$ ) to make the connection. Lead the cables to the appropriate clips through the insulating bushing of the PSU.



The shock protection circuit shall be done with a particular care: the yellow and green wire coat of the power cable should be connected to the terminal marked with the grounding symbol on the PSU enclosure. Operation of the PSU without the properly made and fully operational shock protection circuit is UNACCEPTABLE! It can cause damage to the equipment or an electric shock.

3. If needed, connect the device cables to the technical outputs:
  - EPS; technical output of AC network absence indication
  - APS; technical output indicating battery failure
4. Connect equipment to the appropriate output terminals of power supply (positive connector +V, negative connector -V).
5. Use the  $I_{BAT}$  jumper to set the maximum battery charging current, taking into account charging capacity and required charging time.
6. Mount the battery(s) in the battery compartment of the enclosure. Connect the batteries with the PSU paying special attention to the correct polarity and type of connections (Fig.4):

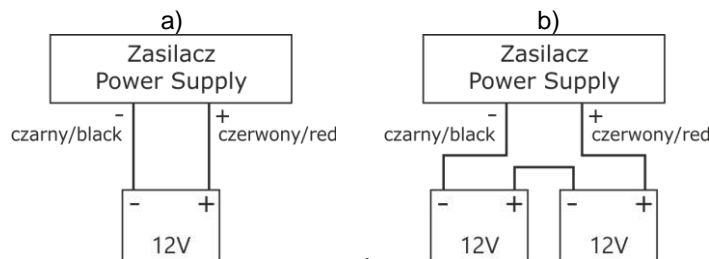


Fig. 4 Connecting batteries depending on voltage version of power supply:  
a) version 12V, b) version 24V,

7. Switch on 230 V supply. LEDs on cover of power supply should light (LED APS shines only in case of battery failure, see section 3.1).

**Output voltage of the PSU, without load  $U = 13,8$  (27,6) V DC.**

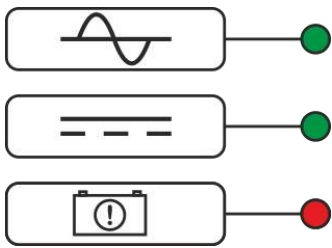
**During battery charge, voltage can amount to  $U = 11 - 13,8$  (22 - 27,6) V DC.**

8. Run the PSU test: check the LED and acoustic indication (see section 3.1), technical output; through:
  - **cutting off the 230 V current:** cutting off the 230 V current: LED AC (Fig. 2 level 2), EPS technical output after time 30s
  - **battery disconnection:** APS technical output will change its state after battery test (~ 5min), and the red APS LED will light up.

### 3. Operating status indication.

#### 3.1 Optical indication.

The power supply unit features LED status indication:



**Green LED AC:**

- on – the PSU is supplied with 230 V AC,
- off – no 230 V supply, battery-assisted operation

**Green LED DC:**

- on – presence of DC voltage in the output of the PSU
- off – no voltage in the output of the PSU

**Red LED APS:**

- off – no failure
- on – indicates battery failure status

Moreover, PSU is equipped with LED indicating presence of voltage at PSU output, located on PCB of PSU module.

#### 3.2 Technical outputs.

The PSU is equipped with indication outputs:

- **EPS FLT - output indicating 230 V power loss.**

The output indicates 230 V power failure. In case of power failure, contacts of relay change over after about 30 seconds.

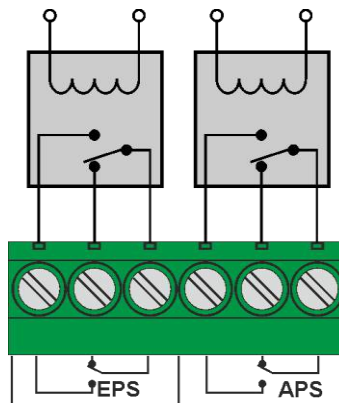
- **APS FLT - output indicating battery failure.**

The output indicates the PSU failure. In case of failure, contacts of relay change over.

PSU failure can be caused by the following events:

- defective or low battery
- battery fuse failure
- no continuity in the battery circuit
- battery voltage below 11,5 (23) V during battery-assisted operation

A battery failure is detected within a maximum of 5 minutes - after each battery test.



**CAUTION!** The figure set of contacts shows a potential-free status of relay, which corresponds to power supply failure.

#### 3.3 Standby time.

Battery-assisted operating depends on battery capacity, charging level and load current. To maintain an appropriate standby time, current drawn from the PSU in battery mode should be limited. Required battery capacity can be calculated using following formula:

$$Q_{AKU} = \text{standby time} * (I_{WY} + I_z)$$

where:

- $Q_{AKU}$  – minimum battery capacity [Ah]
- $I_{WY}$  – power supplies output current (drawing by the load)
- $I_z$  – PSU current consumption (including optional modules) [A] (Table 4)

**Total current of the receivers + battery charging current mustn't cross maximum current of power supply.**

### 3.4 Battery charging time.

The PSU has a battery circuit charged with direct current. The current selection is done with use of the  $I_{BAT}$  jumpers. The table below shows how long does it take to charge a (fully discharged) battery up to min. 80% of its nominal capacity.

**Table 8. Approximate battery charging time up to the capacity of 0,8.**

Battery	Charging current				
	0,5 A	1 A	2 A	4 A	8 A
7Ah	13h	7h	-	-	-
17Ah	31h	16h	8h	4h	-
28Ah	-	26h	13h	7h	-
40Ah	-	36h	18h	9h	5h
65Ah	-	-	30h	15h	8h

### 3.5 Running PSU on battery backup.

Power supply allows you to run on battery backup when necessary. To do this, press the START button on PCB.

## 4. Maintenance.

Any and all maintenance operations may be performed following the disconnection of the PSU from the power supply network. The PSU does not require performing any specific maintenance measures, however, in the case of significant dust rate, its interior is recommended to be cleaned with compressed air. In the case of a fuse replacement, use a replacement of the same parameters.



#### WEEE LABEL

**Waste electrical and electronic equipment must not be disposed of with normal household waste. According to the European Union WEEE Directive, waste electrical and electronic equipment should be disposed of separately from normal household waste.**



**CAUTION!** *The power supply unit is adapted for cooperation with the sealed lead-acid batteries (SLA). After the operation period they must not be thrown but recycled according to the applicable law.*

### Pulsar sp. j.

Siedlec 150, 32-744 Łapczyca, Poland  
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 e-mail: [biuro@pulsar.pl](mailto:biuro@pulsar.pl), [sales@pulsar.pl](mailto:sales@pulsar.pl)  
 http:// [www.pulsar.pl](http://www.pulsar.pl), [www.zasilacze.pl](http://www.zasilacze.pl)