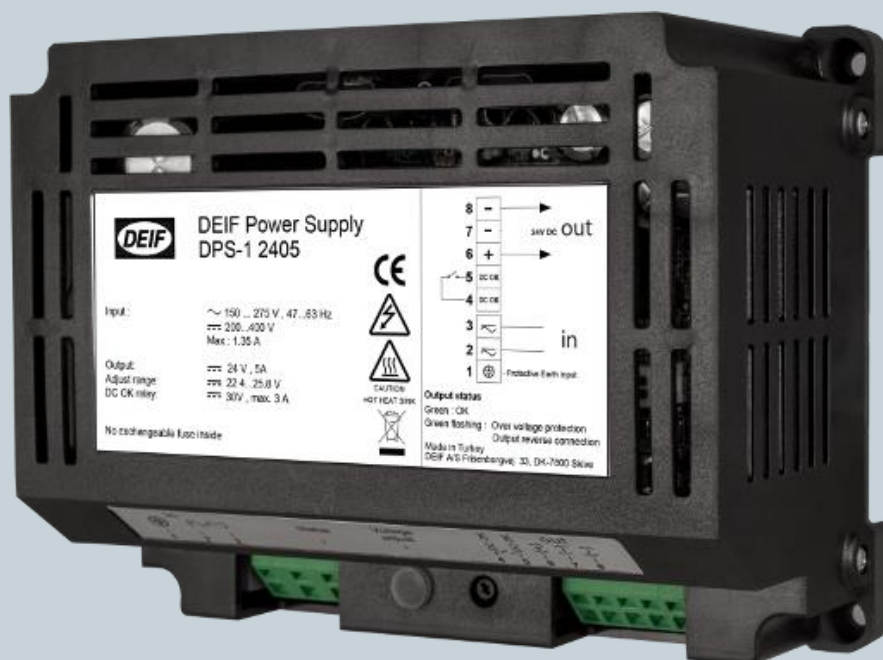




DATASHEET



Power supply DPS-1



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1. Introduction

This document describes the DPS-1. The document is mainly intended for persons responsible for the integration of the DPS-1 in their product as well as buyers and R&D engineers who needs detailed information about the DPS-1.

For specific information about the installation of the DPS-1, refer to the *DPS-1 installation instructions*.

This document can be printed on either a colour or monochrome printer with no loss of information.




1.1 Revision history

Apart from editorial changes the following changes have been made in this revision:

Date	Revision	Changes
2018-08-27	D	<ul style="list-style-type: none"> Picture updated Technical information section updated
2017-06-27	C	New format. 10 A version removed
2012-12-14	B	This is the first version of the document.
N/A	A	Not used

1.2 Conventions

The following conventions are used in this document:

Used in document	Description
	A yellow symbol that illustrates hazard type (this symbol is an example for general hazard). There are different types such as electrical, chemical and so on.
Danger!	A signal word used to indicate an imminently hazardous situation, which if not avoided, will result in death or serious injury. (ISO 3864)
Warning!	A signal word used to indicate an imminently hazardous situation, which if not avoided, could result in death or serious injury. (ISO 3864)
Caution!	A signal word used to indicate a potentially hazardous situation, which if not avoided, could result in minor or moderate injury. (ISO 3864)
	A blue symbol illustrates a need for mandatory action. In this example read instructions. Other types of blue symbols exist and always indicate mandatory action.
	A symbol used to draw attention to extra information or an action that is not mandatory

2. Safety information

**Danger!**

Hazardous live currents and voltages. Do not touch any AC supply inputs as this could lead to injury or death. Only authorised personnel may install or operate the unit.

The installation and service of the units should only be handled by qualified persons, who are conscious of the risks involved.

Ensure that the grounded connection wire of the line is correctly connected to the line input of the unit. Load and service or measuring setup must be grounded, if possible, in order to protect the units and the persons working with them.

During normal operation, the persons working with the units have absolutely no contact to dangerous voltages within the unit.

3. General product information

3.1 Application

The DPS-1 is a 24 V DC power supply built for both 1 phase AC input and wide DC input. It is designed to operate in harsh environments and can operate down to temperatures of - 40°C. Automatic recovery and protection against overload and short circuit are standard functionalities of the DPS-1.

The DPS-1 can be used alone, in parallel operation with the same power supply type or in series with the same power supply type.

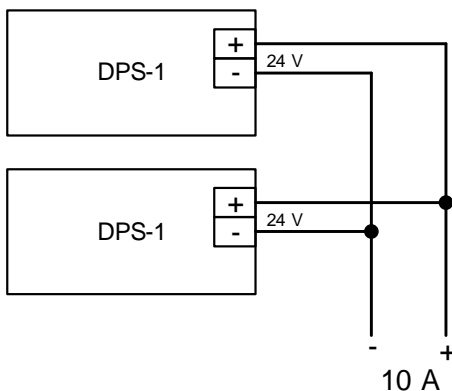
Parallel operation can be used to achieve higher current, redundancy or both.

Serial operation can be used to achieve higher voltage

Voltage drop across wires can be compensated for by the adjusting the variable output voltage. This feature can also be used to determine which one of two parallel connected power supplies will be active, and which one will be backup.

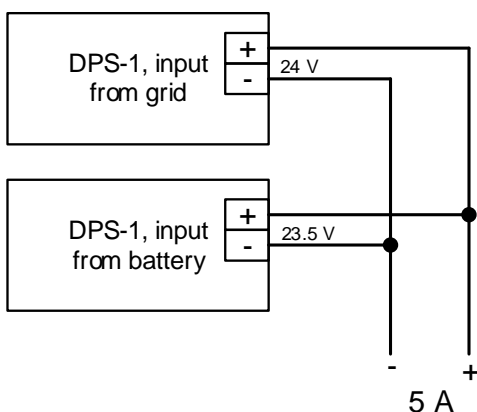
3.1.1 Typical application: 24 VDC 10A

In this application, two DPS-1 2405 power supplies are connected in parallel with the same output voltage, thus able to deliver 10 A.



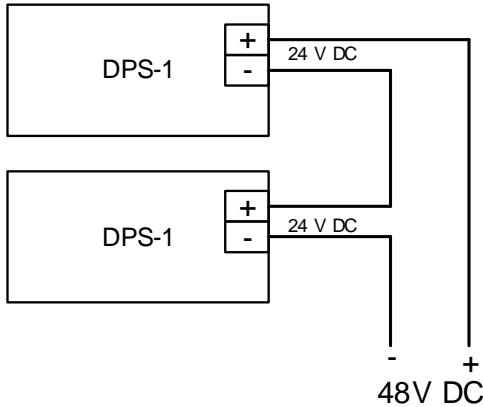
3.1.2 Typical application: 24 V DC 5 A with backup

In this application, the two DPS-1 2405 power supplies are connected in parallel with the output voltage of the power supply connected to the battery slightly lower. This way only the power supply connected to the grid will deliver the output, and if the grid is disconnected, the power supply connected to the battery will take over. The given voltages in the following drawing are examples.



3.1.3 Typical application: 48 V DC

In this application, the two DPS-1 power supplies are connected in series so the output voltage is doubled. There is no limit to the number of power supplies that can be connected in series, and thus any DC voltage can be achieved (in multiples of 24).



3.2 Features

The DPS-1 offers the following features:

- Wide input range (150 – 275 V AC, 200-400V DC)
- Low minimum operating temperature (-40°C)
- DIN rail and chassis mounting (with four fixing holes)
- Visual and electrical monitoring (LED and relay contact)
- Convection cooling (no moving parts)
- Short-circuit and reverse polarity protected output
- High temperature-protection (power derating at high temperature)
- Low output ripple and noise level
- Lower volume and weight compared to similar alternatives
- Galvanically isolated input and output, typically 4 kV
- Low cost
- High efficiency
- High reliability (MTBF >60,000 hours. @ 70°C/full load)
- Long life

3.3 Product ordering information

DPS-1 2405, part no. 1240050001.

4. Technical information

This section describes technical aspects of the DPS-1.

4.1 Automatic power derating

The DPS-1 has an automatic high temperature protection designed to allow safe operation at all times. The output power is automatically derated above 60°C of ambient temperature (at nominal output power) on a linear curve, see the figure below. The power is derated by lowering the output voltage. Note that the derating is power dependent. If for example only 25% of the nominal current is used, the DPS-1 will not derate before the ambient temperature reaches 70°C.

An ambient temperature above 70°C will cause the power to derate further towards a voltage output of 0V DC. In this area, the operation zone is undefined.

This function ensures that the high temperature will have a limited influence on the lifetime of the DPS-1.

The following figure illustrates the power derating:

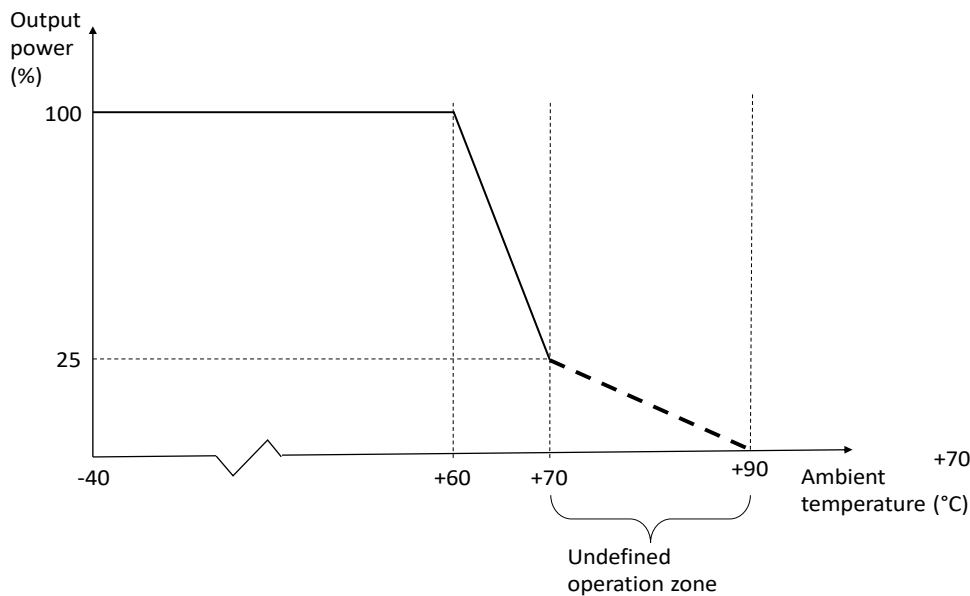


Figure 1 Power derating

4.2 Output characteristics

The output voltage is held constant as long as the load does not exceed the nominal current. A load exceeding the nominal current will automatically reduce the output voltage according to DIN41772/DIN41773 IU characteristic as shown in the following figure:

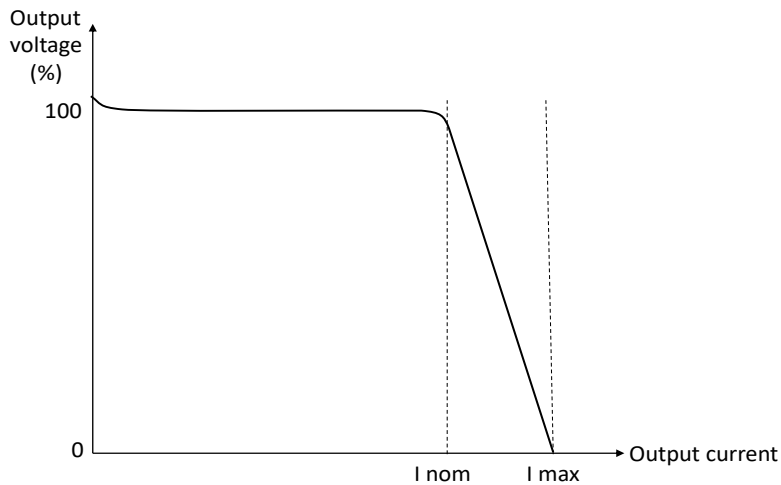


Figure 2 Output characteristics

4.3 Technical specifications

4.3.1 Input

Input voltage (V_{in})	150 – 275 V AC or 200 – 400 V DC (overvoltage Cat. 2)
Input current	Max 1.2 A _{RMS} (full load)
Peak inrush current	Cold conditions: max. 20 A Warm conditions: max. 100 A
Fuse	Input fuse: internal safety fuse (not exchangeable). If blown, it will cause the power supply to stop working. Can only be exchanged by DEIF.
Frequency range	47-63 Hz (supply)
Power factor AC input ($\cos \varphi$)	0.55 capacitive
Voltage protection	Protected against under-voltage on line input

4.3.2 Output

Voltage	Adjustable 22.4 – 25.8 V DC (potentiometer on the front) (Factory setting: 24.0V DC +/-1%)	
Current	Nominal current: 5.0 A Maximum current (short circuit.): 6.0 A	
Power derating	Automatic derating according to ambient temperature	
Ripple	<1.3% of nominal output voltage @ 10 Hz-100 kHz	
Regulation	Line: maximum 1% Load:	
	Load range in % of I nom	Maximum deviation
	0 - 5	3%
	5 – 95	1%
	95 - 100	6%
Protection	Protected against short circuit Protected against overvoltage on output. The unit shuts down when an overvoltage on output terminals arises Protected against continuous no load operation	

4.3.3 Monitoring

DPS-1 has two monitoring types:

- Electrical monitoring: DPS-1 has a dry contact “DC OK” relay output which is closed (energised) under normal operating conditions (no failure).

Contacts voltage rating	Contacts current rating
30 V DC	3 A

- Visual monitoring: A green “STATUS” LED provides visual indication of the DPS-1 operational status.

The behavior of the LED and relay is according to the following table:

Table 1 STATUS LED and DC OK relay functions

Status	STATUS LED	DC OK relay contact
Normal operation with or without load	Green	Closed
High temperature/power derating	Green	Closed
Reverse polarity connection on output	Green, flashing*	Alternate open and closed*
Overvoltage on output	Green, flashing*	Alternate open and closed*
Output overload, output voltage under 20.5 V DC	Off	Open
Short circuit on output	Off	Open

Status	STATUS LED	DC OK relay contact
No input voltage	Off	Open
Under-voltage on input	Off	Open

* Changes state every approximately 0.5 seconds.

4.3.4 General

Case	Polycarbonate plastic (top cover), and aluminium alloy (bottom part).
Weight	0.74 kg (1.6 lbs)
Dimensions	W x H x D in mm ("):154 mm (6.06") x 120 mm (4.72") x 79 mm (3.10")
Mounting	DIN rail, EN 50022-35, or Chassis mounting through four Ø 4.5 mm holes. To obtain optimum cooling, it is imperative to comply with the specified installation position, where the terminals are at the bottom. If the mounting differs from this, a reduction in output must be expected, depending on the ambient temperature. If placed in conditions with vibrations, it might be necessary to use chassis mounting instead of DIN rail Free space around DPS-1: 100 mm top and bottom, 30 mm on each side.
Terminals	Spring-loaded connectors, maximum cross section 2.5 mm ²
Temperature range	Operating, free convection: -40°C to +70°C Storage: -40°C to +85°C Note: Protected against high temperature by temperature dependent automatic power derating
Altitude	Maximum 2000 m
Humidity	Maximum 95% (operating, not condensing)
Efficiency	>85%
EMC	IEC/EN 61000-6-3 IEC/EN 61000-6-4 IEC/EN 61000-6-1 IEC/EN 61000-6-2 RFI suppression: according to EN55011 class B Static discharge ESD: 4 kV contact discharge IEC/EN 61000-4-2: 8 kV free air discharge Electromagnetic fields: 10 V/m according to IEC/EN 61000-4-3 Burst IEC/EN 61000-4-4: 2 kV AC/DC ports Surge IEC/EN 61000-4-5: differential mode (DM) 1 kV, common mode (CM) 2 kV

CE	<p>DPS-1 is CE-marked to the EMC Directive and the Low Voltage Directive. However, the following comments concerning EN 61000-3-2 (limits for harmonic current emissions) apply and must be observed when installing the DPS-1:</p> <ul style="list-style-type: none"> • If the DPS-1 with 230V AC supply is used as part of an apparatus which has a rated AC power of 1 kW or more, there is no requirement for compliance with EN 61000-3-2. • If the DPS-1 with 230V AC supply is used as part of an apparatus which has a rated AC power less than 1 kW, compliance with EN 61000-3-2 must be ensured by the maker of the apparatus. In this case, the maker of the apparatus containing the DPS-1 with 230V AC supply must carry out CE marking to EN 61000-3-2 himself. All other parts of the CE marking provided by DEIF A/S are still valid. • Alternatively, permission to connect the DPS-1 with 230V AC supply must be given by the local power supply authority of the place of installation of the DPS-1, as stipulated by EN 61000-3-2, clause 4. In this case, the entire CE marking provided by DEIF A/S, including to EN 61000-3-2, is valid. 	
Vibration (specification applies for chassis mounting only)	10 – 57 hz 0.15 mm peak-peak 57 -150 hz 1 gn peak	IEC 61800-5-1 & IEC61800-2
	3 – 13.2 hz 2 mm peak-peak 13.2 – 100 hz 0.7 gn peak	DNV A
	3 – 13.2 hz 6 mm peak-peak 13.2 – 50 hz 2.1 gn peak	DNV C
Shock (specification applies for chassis mounting only)	<p>50 gn peak, 11 ms, half sine. Tested with 3 impacts in each direction in all 3 axes. A total of 18 impacts per test.</p> <p>IEC 60068-2-27, test Ea</p>	
Bump (specification applies for chassis mounting only)	<p>25 gn peak, 6 ms, half sine. Tested with 1000 bumps in each direction in all 3 axes. A total of 6000 bumps per test.</p> <p>IEC 60068-2-27, test Ea</p>	
Safety	<p>IEC EN 60950/IEC EN 61010-1</p> <p>Protection: class I</p> <p>Leakage current: <0.75 mA (50...60 Hz ± 5%)</p>	
Protection	IP 20, IEC/EN 60529	

4.3.5 Galvanic separation

Electrical isolation values according to groups are listed in the following table:

	DC output	DC OK relay
Mains input	4 kV	4 kV
DC OK relay	2.5 kV	N/A
Earth	500V AC	2.5 kV
DC output	N/A	2.5 kV

5. Mechanical drawings

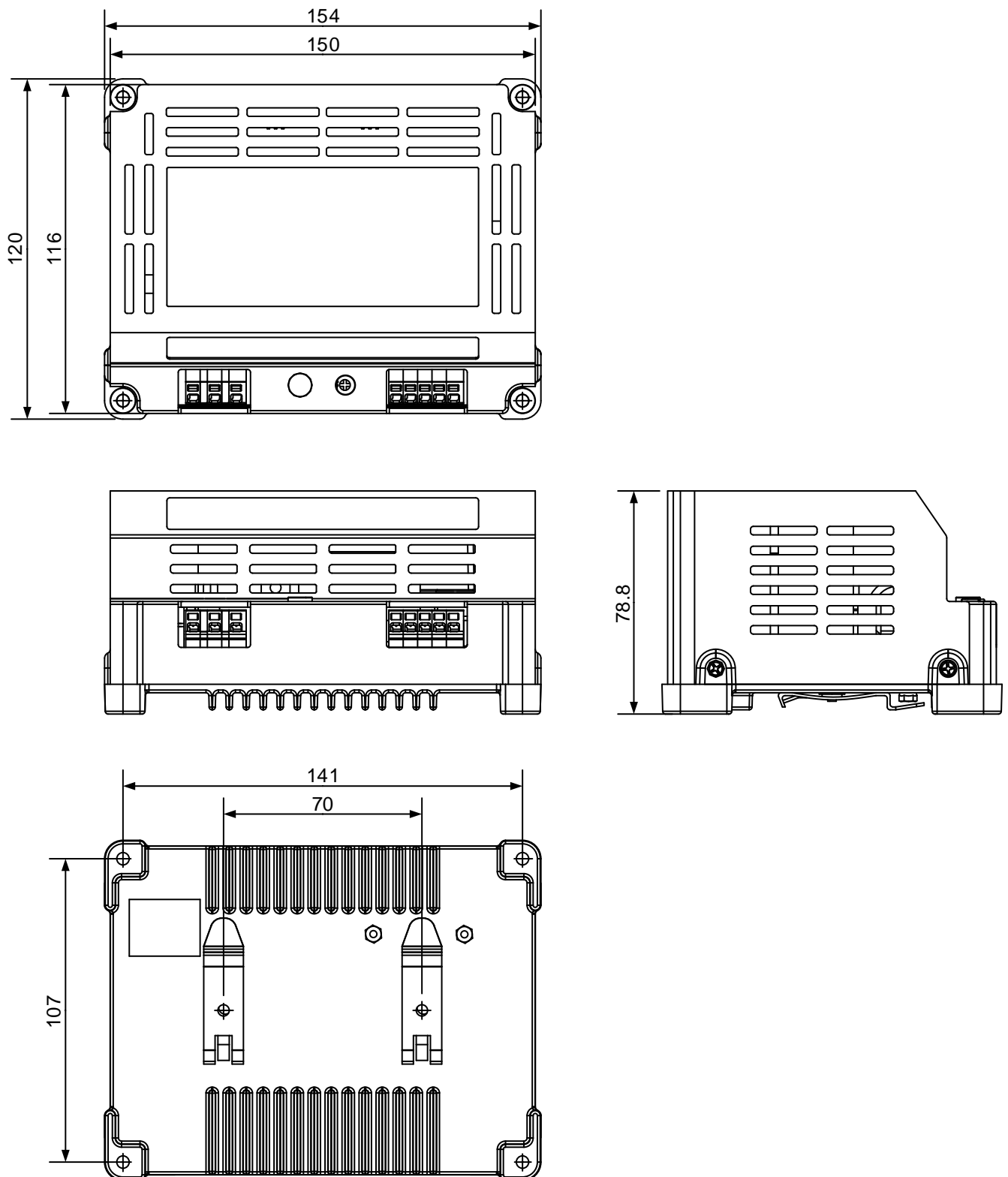


Figure 3 DPS-1 2405 mechanical drawing

6. Connections

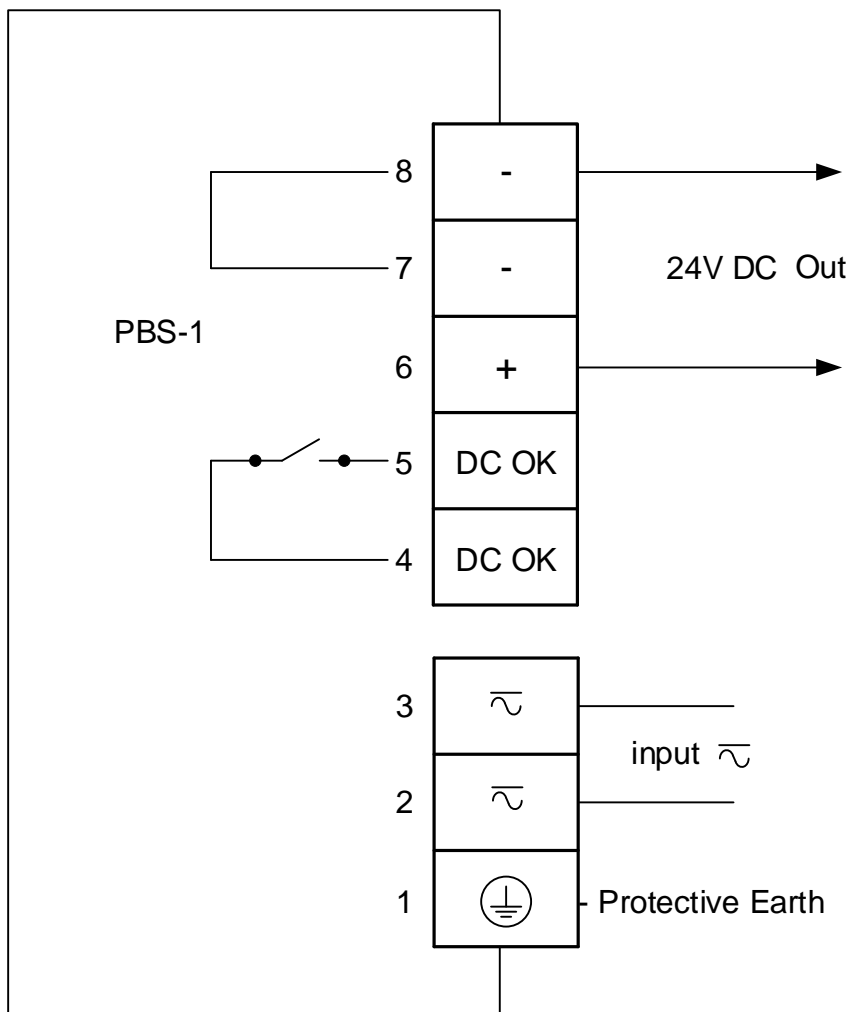


Figure 4 Connection diagram



Info

Terminals 7 and 8 are internally connected.

7. Glossary

7.1 Terms and abbreviations

LED	Light emitting diode
MCB	Main circuit breaker
DPS	DEIF Power Supply

7.2 Units

Unit	Unit Name	Quantity name	US unit	US name	Conversion	Alternative units
A	ampere	Current				
°C	degrees Celsius	Temperature	°F	Fahrenheit	$T[^{\circ}C] = \frac{(T[^{\circ}F] - 32^{\circ}) \times 5}{9}$	
g	gram	Weight	oz	ounce	1 g = 0.03527 oz	
gn peak	Gravity zero to peak	Gravity force				
Hz	hertz	Frequency (cycles per second)				
kg	kilogram	Weight	lb	pound	1 kg = 2.205 lb	
m	metre	length	ft	foot (or feet)	1 m = 3.28 ft	
mA	milliampere	Current				
mm	millimetre	Length	in	inch	1 mm = 0.0394 in	
ms	millisecond	Time				
mm peak-peak	Milimeter peak to peak	Displacement				
Nm	Newton metre	Torque	Lb-in	pound-force inch	1 Nm = 8.85 lb-in	
s	second	Time				
V	volt	Voltage				
V AC	volt (alternating current)	Voltage (alternating current)				
V DC	volt (direct current)	Voltage (direct current)				
W	watt	Power				