22. USED SUBSTANCES

The unit does not release any silicone and is suitable for the use in paint shops.

The unit conforms to the RoHS directive 2002/96/EC

Electrolytic capacitors included in this unit do not use electrolytes such as Quaternary Ammonium Salt Systems.

Plastic housings and other molded plastic materials are free of halogens, wires and cables are not PVC insulated.

The production material within our production does not include following toxic chemicals:
Polychlorized Biphenyl (PCB), Polychlorized Terphenyl (PCB), Pentachlorophenol (PCP), Polychlorinated naphthalene (PCN), Polybrom Biphenyl (PBB), Polybrom Bipheny-oxyd (PBO), Polybrominated Diphenylether (PBDE), Polychlorinated Diphenylether (PCDE), Polydibromphenyl Oxyd (PBDO), Cadmium, Asbest, Mercury, Silicia

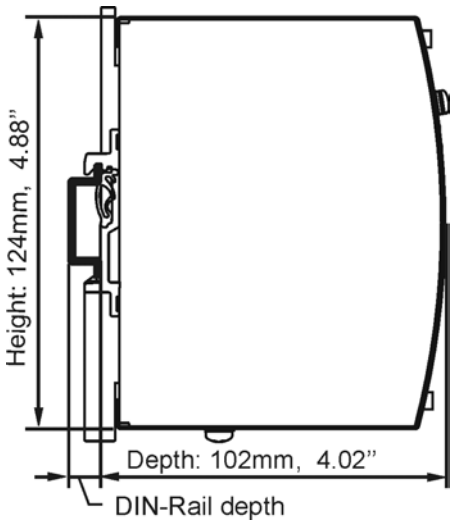
23. PHYSICAL DIMENSIONS AND WEIGHT

Weight	430g / 0.95lb
DIN-Rail	Use 35mm DIN-rails according to EN 60715 or EN 50022 with a height of 7.5 or 15mm. The DIN-rail height must be added to the depth (102mm) to calculate the total required installation depth.

Electronic files with mechanical data can be downloaded at www.pulspower.com

Fig. 23-1 **Front view**

Fig. 23-2 **Side view**



24. INSTALLATION AND OPERATION INSTRUCTIONS

Mounting:
Output terminal must be located on top and input terminal on the bottom. For other orientations see chapter 26.12. An appropriate electrical and fire end-product enclosure needs to be considered in the end use application.

Cooling:
Convection cooled, no forced cooling required. Do not cover ventilation grid (e.g. cable conduits) by more than 30%!

Installation clearances:
40mm on top, 20mm on the bottom, 5mm on the left and right sides are recommended when loaded permanently with full power. In case the adjacent device is a heat source, 15mm clearance are recommended.

Risk of electrical shock, fire, personal injury or death!
Do not use the unit without proper earth connection (Protective Earth). Use the pin on the terminal block for earth connection and not one of the screws on the housing.
Turn power off before working on the power supply. Protect against inadvertent re-powering.
Make sure the wiring is correct by following all local and national codes.
Do not open, modify or repair the unit.
Use caution to prevent any foreign objects from entering into the housing.
Do not use in wet locations or in areas where moisture or condensation can be expected.

Service parts:
The unit does not contain any service parts. The tripping of an internal fuse is caused by an internal defect. If damage or malfunctioning should occur during operation, immediately turn power off and send unit to factory for inspection!

25. ACCESSORY

ZM1.WALL Wall mounting bracket

This bracket is used to mount Dimension units onto a flat surface without utilizing a DIN-Rail. The two aluminum brackets and the black plastic slider of the unit have to be detached, so that the two steel brackets can be mounted.

(Picture shows a different power supply)

Fig. 25-1 **ZM1.WALL Wall Mounting Bracket**

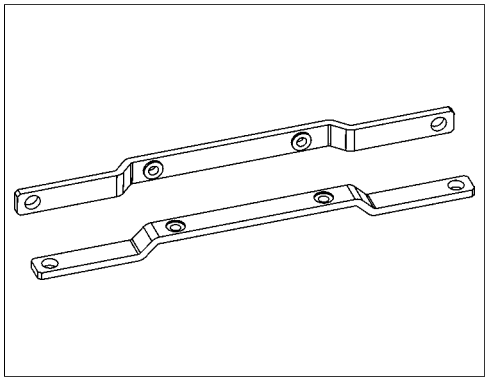
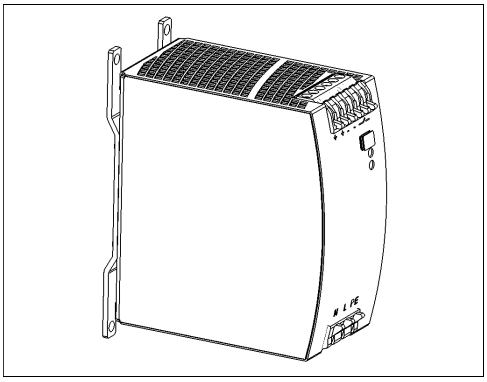


Fig. 25-2 **Assembled Wall Mounting Bracket**



ZM11.SIDE Side mounting bracket

This bracket is used to mount Dimension units sideways with or without utilizing a DIN-Rail. The two aluminum brackets and the black plastic slider of the unit have to be detached, so that the steel brackets can be mounted.

For sideway DIN-rail mounting, the removed aluminum brackets and the black plastic slider need to be mounted on the steel bracket.

(Pictures show a different power supply)

Fig. 25-3 **ZM13.SIDE Side Mounting Bracket**

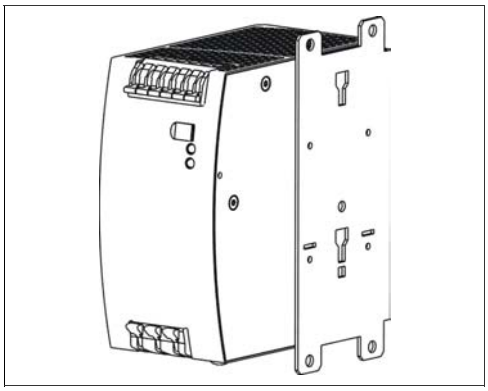
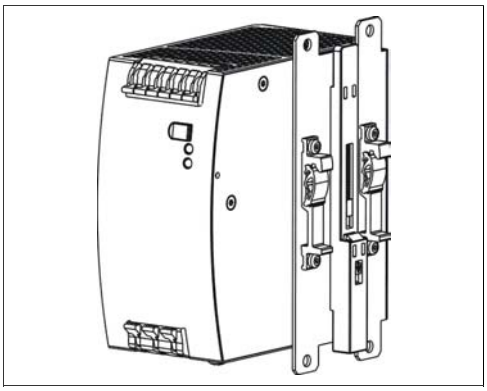


Fig. 25-4 **Side Mounting with DIN-rail brackets**



26. APPLICATION NOTES

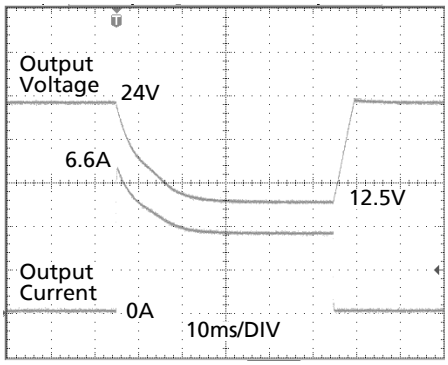
26.1. PEAK CURRENT CAPABILITY

Solenoids, contactors and pneumatic modules often have a steady state coil and a pick-up coil. The inrush current demand of the pick-up coil is several times higher than the steady state current and usually exceeds the nominal output current (including the PowerBoost) The same situation applies, when starting a capacitive load.

Branch circuits are often protected with circuit breakers or fuses. In case of a short or an overload in the branch circuit, the protective device needs a certain amount of over-current to trip or to blow. The peak current capability ensures the safe operation of subsequent circuit breakers.

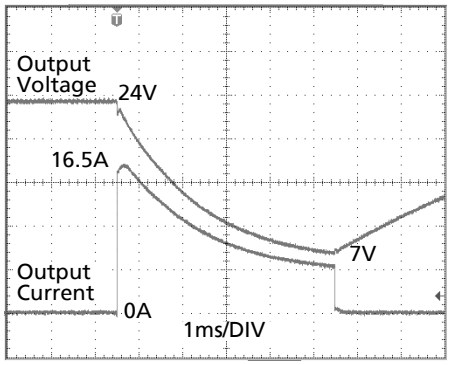
Assuming the input voltage is turned on before such an event, the built-in large sized output capacitors inside the power supply can deliver extra current. Discharging this capacitor causes a voltage dip on the output. The following two examples show typical voltage dips:

Fig. 26-1 **Peak load 6.6A for 50ms, typ.**



Peak load 6.6A (resistive) for 50ms
Output voltage dips from 24V to 12.5V.

Fig. 26-2 **Peak load 16.5A for 5ms, typ.**



Peak load 16.5A (resistive) for 5ms
Output voltage dips from 24V to 7V.

26.2. CHARGING OF BATTERIES

The power supply shall not be used to charge batteries.

26.3. BACK-FEEDING LOADS

Loads such as decelerating motors and inductors can feed voltage back to the power supply. This feature is also called return voltage immunity or resistance against Back- E.M.F. (Electro Magnetic Force).

This power supply is resistant and does not show malfunctioning when a load feeds back voltage to the power supply. It does not matter, whether the power supply is on or off.

The maximum allowed feed back voltage is 35Vdc. The absorbing energy can be calculated according to the built-in large sized output capacitor which is specified in chapter 9.

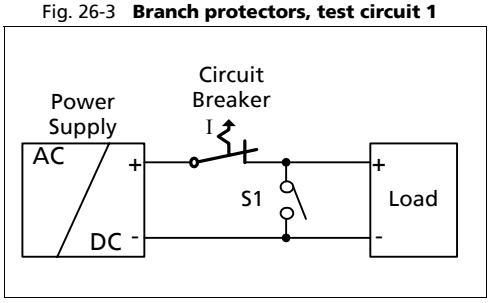
26.4. OUTPUT CIRCUIT BREAKERS

Standard miniature circuit breakers (MCBs) can be used for branch protection. Ensure that the MCB is rated for DC voltage, too. The following tests show which circuit breakers the power supply typically trips.

Circuit breakers have large tolerances in their tripping behavior. Therefore, these typical tests can only be used as a recommendation or for comparing two different power supplies. Furthermore, the loop impedance has a major influence on whether a breaker trips or not. Two tests were performed, representing typical situations:

Test 1: Short circuit with S1 on the power supply end of the cable (loop impedance approx. 20mOhm)

Fig. 26-3 **Branch protectors, test circuit 1**



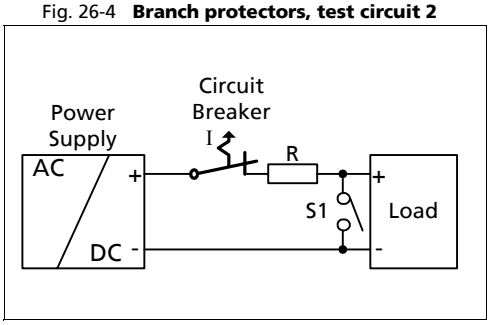
Parameters:
Input voltage: 230Vac, load current: 0A

The following circuit breaker tripped during the test:

A- or **Z**- Characteristic::	equal or smaller 6A
B- Characteristic:	no tripping ≥ 6A no breaker available < 6A
C- Characteristic:	equal or smaller 1A

Test 2: Short circuit with S1 on the load end (additional impedance included; represents longer load wire length).

Fig. 26-4 **Branch protectors, test circuit 2**



Parameters:
Input voltage: 230Vac, load current: 0A

The following circuit breaker tripped during the test:

A- or **Z**- Characteristic::	≤ 4A and R= 220mOhm
B- Characteristic:	no tripping ≥ 6A no breaker available < 6A
C- Characteristic:	≤ 1A and R= 390mOhm

What does this resistance mean in wire length?

	0.5mm²	0.7mm²	1.0mm²	1.5mm²	2.5mm²	4.0mm²
220mOhm	6.1m	8.6m	12.3m	18.4m	30.6m	49m
390mOhm	10.9m	15.2m	21.7m	32.6m	54.3m	86.9m

Example:
Which wire gauge must be used to trip a C-Characteristic circuit breaker with a rating of 1A? The load wire length is 25m.

Answer: A 1A C-Characteristic circuit breaker requires a loop impedance of less than 390mOhm (test results). The wire length table shows that up to 32.6m wire with a cross section of 1.5mm² are below 390mOhm. A wire not smaller than 1.5mm² shall be used.

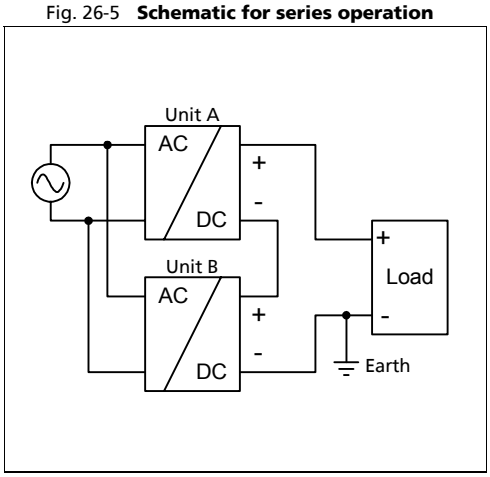
26.5. INDUCTIVE AND CAPACITIVE LOADS

The unit is designed to supply any type of load, including unlimited capacitive and inductive loads.

26.6. SERIES OPERATION

The power supply can be put in series to increase the output voltage.

Fig. 26-5 **Schematic for series operation**



Instructions for use in series:

a) It is possible to connect as many units in series as needed, providing the sum of the output voltage does not exceed 150Vdc.
b) Voltages with a potential above 60Vdc are not SELV any more and can be dangerous. Such voltages must be installed with a protection against touching.
c) For serial operation use power supplies of the same type.
d) Earthing of the output is required when the sum of the output voltage is above 60Vdc.
e) Keep an installation clearance of 15mm (left/right) between two power supplies and avoid installing the power supplies on top of each other.

Note: Avoid return voltage (e.g. from a decelerating motor or battery) which is applied to the output terminals.

26.7. PARALLEL USE TO INCREASE OUTPUT POWER

The power supply shall not be used in parallel to increase the output power.

26.8. PARALLEL USE FOR 1+1 REDUNDANCY

Power supplies can be paralleled for 1+1 redundancy to gain a higher system reliability. Redundant systems require a certain amount of extra power to support the load in case one power supply unit fails. The simplest way is to put two C-Series power supplies in parallel. In case one power supply unit fails, the other one is automatically able to support the load current without any interruption. This simple way to build a redundant system has two major disadvantages:

- The faulty power supply can not be recognized. The green LED will still be on since it is reverse-powered from the other power supply.
- It does not cover failures such as an internal short circuit in the secondary side of the power supply. In such a - situation the defective unit becomes a load for the other power supplies and the output voltage can not be maintained any more.

This above conditions can be avoided by utilizing decoupling diodes which are included in the decoupling module YR2.DIODE or redundancy module YRM2.DIODE.

Other recommendations for building redundant power systems:

a) Use separate input fuses for each power supply.
b) Monitor the individual power supply units. A DC-ok lamp and a DC-ok contact is included in the redundancy module YRM2.DIODE. This feature reports a faulty unit.
c) When possible, connect each power supply to different phases or circuits.

26.9. EXTERNAL INPUT PROTECTION

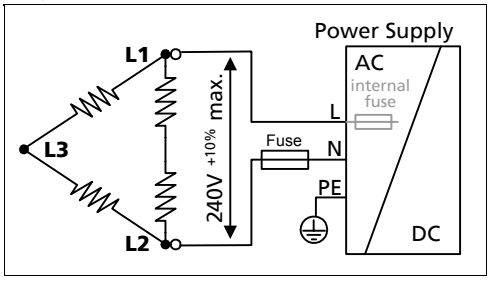
The unit is tested and approved for branch circuits up to 20A. External protection is only required if the supplying branch has an ampacity greater than this. In some countries local regulations might apply. Check also local codes and requirements.

If an external protective device is utilized, a minimum value is required to avoid undesired tripping of the fuse.

		B-Characteristic	C-Characteristic
Ampacity	max.	20A	20A
	min.	10A	6A

26.10. OPERATION ON TWO PHASES

Fig. 26-6 **Schematic for two phase operation**



Instructions for two phase operation:

a) A phase to phase connection is allowed as long as the supplying voltage is below 240V$^{+10\%}$.

b) Use a fuse or a circuit breaker to protect the N input. The N input is internally not protected and is in this case connected to a hot wire.

Appropriate fuses or circuit breakers are specified in section 26.9 “External Input Protection”.

26.11. USE IN A TIGHTLY SEALED ENCLOSURE

When the power supply is installed in a tightly sealed enclosure, the temperature inside the enclosure will be higher than outside. The inside temperature defines the ambient temperature for the power supply.

Results from such an installation:

Power supply is placed in the middle of the box, no other heat producer inside the box

Enclosure:	Rittal Type IP66 Box PK 9516 100, plastic, 110x180x165mm
Input:	230Vac
Load:	24V, 3.3A; load is placed outside the box
Temperature inside the box:	45.7°C (in the middle of the right side of the power supply with a distance of 1cm)
Temperature outside the box:	27.3°C
Temperature rise:	18.4K
Load:	24V, 2.64A; (=80%) load is placed outside the box
Temperature inside the box:	41.8°C (in the middle of the right side of the power supply with a distance of 1cm)
Temperature outside the box:	26.5°C
Temperature rise:	15.3K

26.12. MOUNTING ORIENTATIONS

Mounting orientations other than input terminals on the bottom and output on the top require a reduction in continuous output power or a limitation in the max. allowed ambient temperature. The amount of reduction influences the lifetime expectancy of the power supply. Therefore, two different derating curves for continuous operation can be found below:

Curve A1 Recommended output current.
Curve A2 Max allowed output current (results approx. in half the lifetime expectancy of A1).

Fig. 26-7
Mounting Orientation A
Standard Orientation

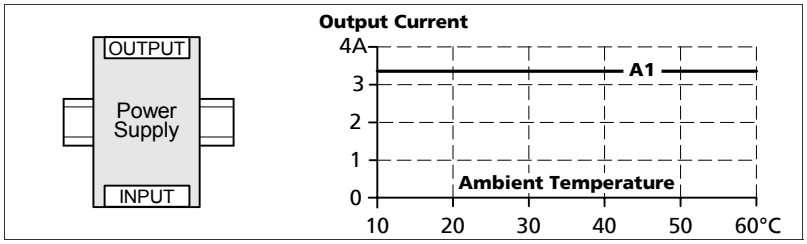


Fig. 26-8
Mounting Orientation B
(Upside down)

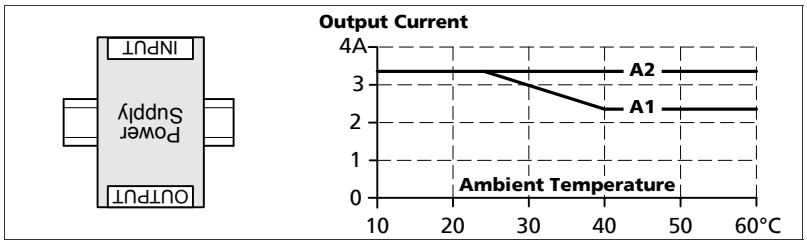


Fig. 26-9
Mounting Orientation C
(Table-top mounting)

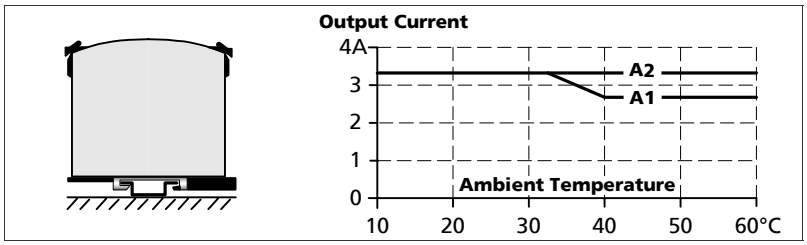


Fig. 26-10
Mounting Orientation D
(Horizontal cw)

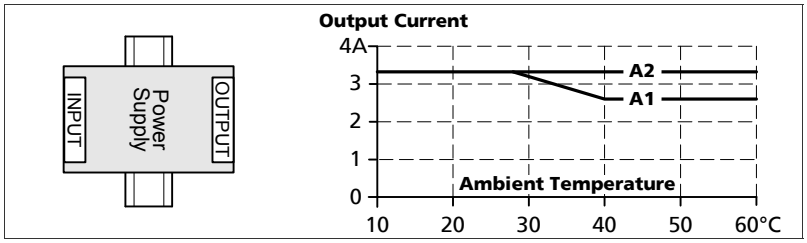


Fig. 26-11
Mounting Orientation E
(Horizontal ccw)