

# AC/DC Converter

## PVA70-27Bxx Series

# MORNSUN®

70W isolated AC-DC converter with ultra-wide, ultra-high 85 - 900VAC input for coalmine



RoHS



## FEATURES

- Specially designed for electrical equipment in coal mining industry
- Ultra-wide 85 - 900VAC input voltage range
- Industrial grade operating temperature: -25°C to +70°C
- High I/O isolation test voltage of 4000VAC
- High reliability, high efficiency, long lifespan
- Output short circuit, over-current and over-voltage protection
- Immunity, EFT/Surge: ±4KV perf. Criteria B

PVA70-27Bxx series is a special power supply designed for customers who provide electrical equipment for coal mining industry to meet the requirements of safety in providing power supply, easy mounting and technology innovation etc. It features ultra-wide input voltage range from 85 to 900VAC which covers 127/220/380/660VAC used in coal mining industry, high isolation voltage, excellent EMS performance, multiple protections and high efficiency. They are widely used in monitoring and security sectors of coal mining industry.

## Selection Guide

| Part No.*   | Output Power | Nominal Output Voltage and Current (Vo/Io) | Efficiency at 330VAC (%) Typ. | Capacitive Load (μF) Max. |
|-------------|--------------|--------------------------------------------|-------------------------------|---------------------------|
| PVA70-27B24 | 70W          | 24V/2917mA                                 | 87                            | 800                       |
| PVA70-27B28 | 70W          | 28V/2500mA                                 | 87                            | 800                       |
| PVA70-27B35 | 70W          | 35V/2000mA                                 | 87                            | 800                       |

Note: \*Use suffix "H" for can be used in harsh working conditions in coal mines (with transient peak voltage).

## Input Specifications

| Item                | Operating Conditions | Min.                                                                         | Typ. | Max. | Unit |
|---------------------|----------------------|------------------------------------------------------------------------------|------|------|------|
| Input Voltage Range | AC input             | 85                                                                           | --   | 900  | VAC  |
| Input Frequency     |                      | 47                                                                           | --   | 63   | Hz   |
| Input Current       | 127VAC               | --                                                                           | --   | 1.20 | A    |
|                     | 330VAC               | --                                                                           | --   | 0.80 |      |
|                     | 660VAC               | --                                                                           | --   | 0.50 |      |
| Inrush Current      | 330VAC               | --                                                                           | 80   | --   |      |
|                     | 660VAC               | --                                                                           | 140  | --   |      |
|                     | 900VAC               | --                                                                           | 180  | --   |      |
| External input Fuse |                      | 1000VAC/3A, required<br>(brand: Adler models: A851300b00 base models: BH300) |      |      |      |
| Hot Plug            |                      | Unavailable                                                                  |      |      |      |

## Output Specifications

| Item                     | Operating Conditions                    | Min.                              | Typ.  | Max. | Unit |
|--------------------------|-----------------------------------------|-----------------------------------|-------|------|------|
| Output Voltage Accuracy  | All load range                          | --                                | ±2    | --   | %    |
| Line Regulation          | Rated load                              | --                                | ±0.5  | --   |      |
| Load Regulation          | 10% - 100% load                         | --                                | ±1    | --   |      |
| Ripple & Noise*          | 20MHz bandwidth<br>(peak-to-peak value) | 24V/28V output                    |       | 100  | mV   |
|                          |                                         | 35V output                        |       | 150  |      |
| Temperature Coefficient  |                                         | --                                | ±0.02 | --   | %/°C |
| Short Circuit Protection |                                         | Hiccup, continuous, self-recovery |       |      |      |
| Over-current Protection  |                                         | ≥110%Io, hiccup, self-recovery    |       |      |      |
| Over-voltage Protection  | 24V output                              | ≤35VDC                            |       |      |      |
|                          | 28V output                              | ≤40VDC                            |       |      |      |
|                          | 35V output                              | ≤45VDC                            |       |      |      |

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|                     |                                          |              |    |     |    |
|---------------------|------------------------------------------|--------------|----|-----|----|
| Min. Load           |                                          | 0            | -- | --  |    |
| Trim                | The total output power remains unchanged | --           | -- | ±10 | %  |
| Hold-up Time        | Room temperature, full load              | 330VAC input | -- | 40  | -- |
|                     |                                          | 660VAC input | -- | 80  | -- |
| Start-up Delay Time | 85-900VAC                                | --           | 2  | 3   | s  |

Note: \* The "Tip and barrel method" is used for ripple and noise test, please refer to AC-DC Converter Application Notes for specific information;

\*\* Delay Time is tested over the full input voltage and the full output load range (The cooling-time between input power-off and power-on again is greater than 15s).

## General Specifications

| Item                  | Operating Conditions                             |                                                                     | Min.                  | Typ. | Max. | Unit                  |
|-----------------------|--------------------------------------------------|---------------------------------------------------------------------|-----------------------|------|------|-----------------------|
| Isolation             | Input - output                                   | Electric Strength Test for 1min., leakage current $\leq 3\text{mA}$ | 4000                  | --   | --   | VAC                   |
| Insulation Resistance | 500VDC                                           |                                                                     | $\geq 50 \times 10^6$ |      |      | $\Omega$              |
| Operating Temperature |                                                  |                                                                     | -25                   | --   | +70  | $^{\circ}\text{C}$    |
| Storage Temperature   |                                                  |                                                                     | -40                   | --   | +85  |                       |
| Storage Humidity      |                                                  |                                                                     | --                    | --   | 95   | %RH                   |
| Power Derating        | -25 $^{\circ}\text{C}$ to -10 $^{\circ}\text{C}$ |                                                                     | 2.6                   | --   | --   | %/ $^{\circ}\text{C}$ |
|                       | +50 $^{\circ}\text{C}$ to +70 $^{\circ}\text{C}$ | 28V/35V output                                                      | 2.0                   | --   | --   |                       |
|                       | +50 $^{\circ}\text{C}$ to +60 $^{\circ}\text{C}$ | 24V output                                                          | 1.4                   | --   | --   |                       |
|                       | +60 $^{\circ}\text{C}$ to +70 $^{\circ}\text{C}$ | 24V output                                                          | 3.0                   | --   | --   |                       |
|                       | 85VAC - 100VAC                                   |                                                                     | 2.0                   | --   | --   | % /VAC                |
|                       | 850 VAC - 900VAC                                 | 24V output                                                          | 0.4                   | --   | --   |                       |
|                       |                                                  | 28V/35V output                                                      | 0.3                   | --   | --   |                       |
| Switching Frequency   |                                                  |                                                                     | --                    | 65   | --   | kHz                   |
| Altitude              |                                                  |                                                                     | --                    | --   | 5000 | m                     |
| MTBF                  | MIL-HDBK-217F@25 $^{\circ}\text{C}$              |                                                                     | $\geq 300,000$ h      |      |      |                       |

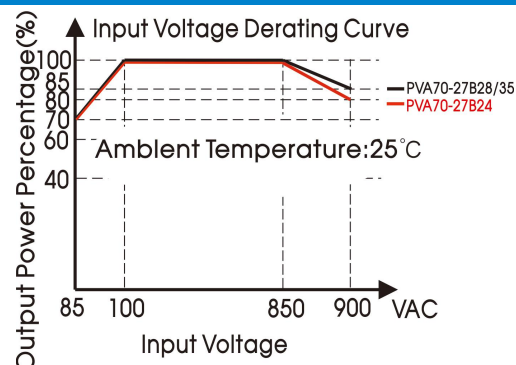
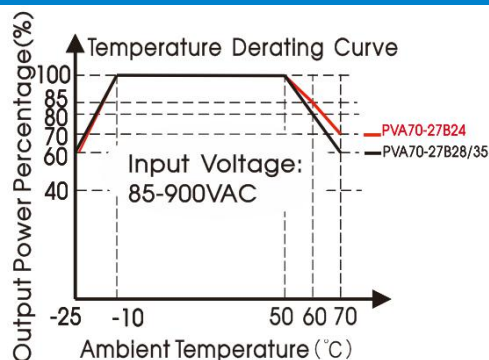
## Mechanical Specifications

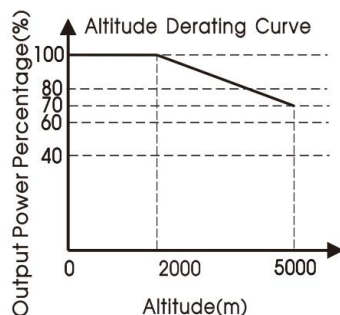
|                |                          |
|----------------|--------------------------|
| Dimensions     | 155.00 x 95.00 x 41.00mm |
| Weight         | 340g (Typ.)              |
| Cooling Method | Free air convection      |

## Electromagnetic Compatibility (EMC)

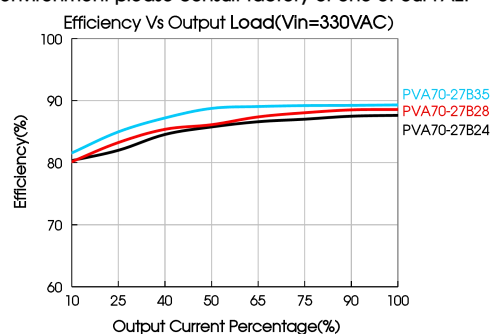
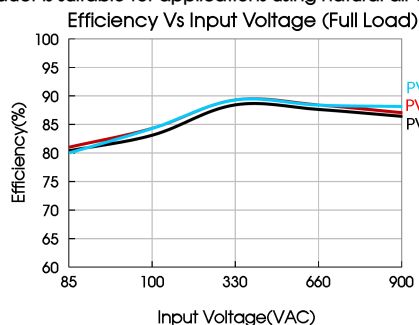
|          |       |                 |                                                                |                  |
|----------|-------|-----------------|----------------------------------------------------------------|------------------|
| Immunity | ESD   | IEC/EN61000-4-2 | Contact $\pm 6\text{kV}$                                       | perf. Criteria B |
|          | RS    | IEC/EN61000-4-3 | 10V/m                                                          | perf. Criteria A |
|          | EFT   | IEC/EN61000-4-4 | $\pm 4\text{kV}$                                               | perf. Criteria B |
|          | Surge | IEC/EN61000-4-5 | line to line $\pm 2\text{kV}$ /line to ground $\pm 4\text{kV}$ | perf. Criteria B |
|          | CS    | IEC/EN61000-4-6 | 10Vr.m.s                                                       | perf. Criteria A |

## Product Characteristic Curve





Note: ① With an input between 85 - 100VAC/850 - 900VAC, the output power must be derated as per temperature derating curves;  
 ② For operation of this converter series in an altitude between 2000 - 5000m, the output power must be derated as per the altitude derating curve;  
 ③ This product is suitable for applications using natural air cooling; for applications in closed environment please consult factory or one of our FAE.



## Design Reference

### 1. Typical application

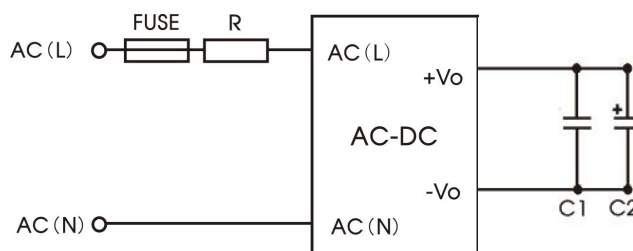


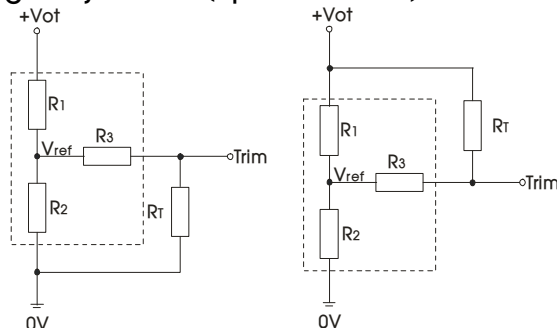
Fig. 1

| Model       | FUSE                                                                         | C1  | C2   | R      |
|-------------|------------------------------------------------------------------------------|-----|------|--------|
| PVA70-27Bxx | 1000VAC/3A, required<br>(brand: Adler models: A851300b00 base models: BH300) | 1uF | 10uF | 1Ω/≥5W |

#### Output Filter Components:

We recommend using an electrolytic capacitor with high frequency, and low ESR rating for C2 (refer to manufacture's datasheet). Choose a capacitor voltage rating with at least 20% margin, in other words not exceeding 80%. C1 is a ceramic capacitor used for filtering high-frequency noise.

### 2. Trim Function for Output Voltage Adjustment (open if unused)



TRIM resistor connection (dashed line shows internal resistor network)

Calculating Trim resistor values:

$$\begin{aligned} \text{up: } R_T &= \frac{\alpha R_2}{R_2 - \alpha} \cdot R_3 & \alpha &= \frac{V_{ref}}{V_{ot} - V_{ref}} \cdot R_1 \\ \text{down: } R_T &= \frac{\alpha R_1}{R_1 - \alpha} \cdot R_3 & \alpha &= \frac{V_{ot} - V_{ref}}{V_{ref}} \cdot R_2 \end{aligned}$$

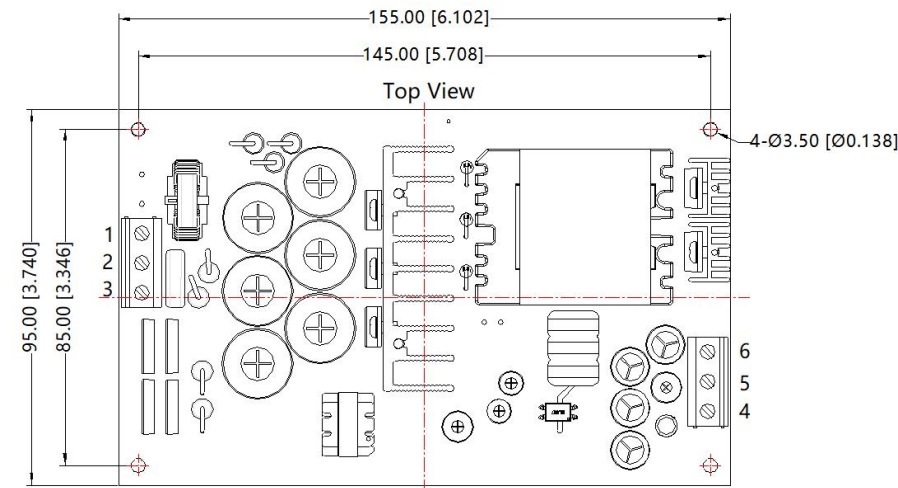
$R_T$  = Trim Resistor value;  
 $\alpha$  = Self-defined parameter;

| V <sub>out</sub> | R <sub>1</sub> (K $\Omega$ ) | R <sub>2</sub> (K $\Omega$ ) | R <sub>3</sub> (K $\Omega$ ) | V <sub>ref</sub> (V) | V <sub>ot</sub> (V)                                     |
|------------------|------------------------------|------------------------------|------------------------------|----------------------|---------------------------------------------------------|
| 24V              | 12.4                         | 1.43                         | 1                            | 2.5                  | Resulting trimmed output voltage, range $\leq \pm 10\%$ |
| 28V              | 12.4                         | 1.2                          | 1                            | 2.5                  |                                                         |
| 35V              | 12.4                         | 0.94                         | 1                            | 2.5                  |                                                         |

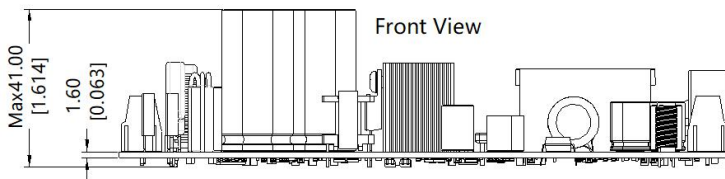
3. For more information Please find the application notes on [www.mornsun-power.com](http://www.mornsun-power.com).

## Dimensions and Recommended Layout

THIRD ANGLE PROJECTION 



| Pin | Function        |
|-----|-----------------|
| 1   | AC(L)           |
| 2   | NC              |
| 3   | AC(N)           |
| 4   | Trim            |
| 5   | -V <sub>o</sub> |
| 6   | +V <sub>o</sub> |



Note:

Unit: mm[inch]

Wire range: 24-12AWG

Tightening torque: Max 0.4 N·m

General tolerances:  $\pm 1.00 [\pm 0.039]$

The layout of the device is for reference only, please refer to the actual product

Note:

- For additional information on Product Packaging please refer to [www.mornsun-power.com](http://www.mornsun-power.com). Packaging bag number: 58220071;
- Unless otherwise specified, parameters in this datasheet were measured under the conditions of  $T_a = 25^\circ\text{C}$ , humidity  $< 75\%$  with nominal input voltage and rated output load;
- All index testing methods in this datasheet are based on our company corporate standards;
- We can provide product customization service, please contact our technicians directly for specific information;
- Products are related to laws and regulations: see "Features" and "EMC";
- Our products shall be classified according to ISO14001 and related environmental laws and regulations, and shall be handled by qualified units.

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