# DC/DC Converter

## PV1000-27Bxx Series

MORNSUN®

1000W isolated DC-DC converter with ultra-wide, ultra-high 300 -1000VDC input for Renewable Energy

CE Report EN62109-1 UKCA BS EN62109-1 RoHS

## FEATURES

- Ultra-wide input voltage range of 300-1000VDC (Full voltage range without derating, support transient 1100VDC/60s)
- Industrial grade operating temperature -40℃ to +70℃ (Free air convection)
- Rated power 1008W, 110% over-load for 1 hour
- High I/O isolation voltage up to 4000VAC
- High reliability, efficiency up to 93%
- Input under-voltage protection, input reverse polarity protection, over-temperature protection, output short circuit, over-current, over-voltage protection
- Support 2+1 parallel redundancy, current sharing
- Operating altitude up to 5000m
- Safety according to UL1741, IEC62109

*PV1000-27Bxx is a regulated DC-DC series converter with an ultra-wide and ultra-high DC input of 300-1000VDC, which design based on standard of UL1741, IEC62109. The products feature high efficiency, high reliability, high insulation and a high level of safety protection. It is widely used in renewable energy industries such as photovoltaic inverter, energy storage systems, charging pile, industrial control. The converters provide multiple protection features and guarantee stable and safe operating environments even under abnormal working conditions. It is recommended to add a protector if the product is used in an environment with harsh electromagnetic compatibility.*

## Selection Guide

| Certification | Part No.* | Output Power (W)** | Nominal Output Voltage and Current (Vo/Io) | Output Voltage Adjustable Range ADJ (V) | Efficiency at 600VDC(%) Typ | Capacitive Load (μF) Max. |
|---|---|---|---|---|---|---|
| EN | PV1000-27B24 | 1008W | 24V/42A | 21.6-26.4 | 93 | 8800 |
| | PV1000-27B48 | | 48V/21A | 43.2-52.8 | | 4400 |

Note: *When using the current sharing function for all models, do not directly increase the load on the system beyond the rated load of a single unit when the power is turned on for the first time;
**Products meet 110% over-load for 1 hour, 30min break after 1 hour.

## Input Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Input Voltage Range | | 300 | -- | 1000 | VDC |
| Input Current | 300VDC | -- | -- | 4 | A |
| | 600VDC | -- | -- | 2 | |
| Inrush Current | 1000VDC | -- | 300 | -- | |
| Input Under-voltage Protection | Lockout activation range | 260 | -- | 295 | VDC |
| | Lockout deactivation range | 275 | -- | 305 | |
| Input Reverse Polarity Protection | | Available | | | |
| Required External Input Fuse | | 10A/1500VDC, required | | | |
| Hot Plug | | Unavailable | | | |

## Output Specifications

| Item | Operating Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|
| Output Voltage Accuracy | All load range | -- | ±1 | -- | % |
| Line Regulation | Rated load | -- | ±1 | -- | |
| Load Regulation | 0% - 100% load | -- | ±2 | -- | |
| Ripple & Noise* | 20MHz bandwidth (peak-to-peak value) | -- | -- | 300 | mV |
| Temperature Coefficient | | -- | ±0.02 | -- | %/℃ |
| Short Circuit Protection | | Hiccup, continuous, self-recovery | | | |
| Over-current Protection | 24V output | ⩾110%Io, hiccup | | | |
| | 48V output | | | | |


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| | | | | | | |
|---|---|---|---|---|---|---|
| Over-voltage Protection | 24V output | | ≤32VDC | Output voltage clamp or hiccup | | |
| | 48V output | | ≤58VDC | | | |
| Over-temperature Protection** | Full voltage, rated load, self-recover | Over-temperature protection start | -- | -- | 75 | ℃ |
| | | Over-temperature protection release | 55 | -- | -- | |
| Minimum Load | | | 0 | -- | -- | % |
| Hold-up Time | Room temperature, full load | 600VDC | -- | 5 | -- | ms |
| Start-up Delay Time*** | Room temperature | | -- | 3 | 5 | s |

Note: *The "Tip and barrel method" is used for ripple and noise test, please refer to PV Converter Application Notes for specific information;
**Output voltage turn off, self-recovery after fault conditions is removed, the over-temperature point is the ambient temperature of the product;
***Full input voltage / 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 ＜10mA | 4000 | -- | -- | VAC |
| | Input - PE | | 4000 | -- | -- | |
| | Output - PE | | 4000 | -- | -- | |
| Insulation Resistance | Input - output | 500VDC | 50 | -- | -- | MΩ |
| | Input - PE | | | | | |
| | Output - PE | | | | | |
| Operating Temperature | | | -40 | -- | +70 | ℃ |
| Storage Temperature | | | -40 | -- | +85 | |
| Storage Humidity | | | -- | -- | 95 | %RH |
| Power Derating | | -40℃ to -10℃ | 1.33 | -- | -- | %/℃ |
| | | +55℃ to +70℃ | 2 | -- | -- | |
| | | 3000- 5000m | 10 | -- | -- | %/Km |
| Switching Frequency | | | -- | 72 | -- | kHz |
| Safety Standard | | | EN62109-1(Report), BS EN62109-1; Design refer to UL1741, IEC62109 -1 | | | |
| MTBF | | MIL-HDBK-217F@25℃ | ≥300,000 h | | | |

## Mechanical Specifications

| | |
|---|---|
| Case Material | Metal |
| Dimensions | 292.00 x 225.00 x 58.00mm |
| Weight | 3850g (Typ.) |
| Cooling Method | Free air convection |

## Electromagnetic Compatibility (EMC)

| | | | |
|---|---|---|---|
| Emissions | CE | CISPR32/EN55032 CLASS A | |
| | RE | CISPR32/EN55032 CLASS A | |
| Immunity | ESD | IEC/EN61000-4-2 Contact ±6KV/Air ±8KV | Perf. Criteria A |
| | RS | IEC/EN61000-4-3 10V/m | Perf. Criteria A |
| | EFT | IEC/EN61000-4-4 ±4KV | Perf. Criteria B |
| | Surge | IEC/EN61000-4-5 Line to line ±2KV/line to PE ±4KV | Perf. Criteria B |
| | CS | IEC/EN61000-4-5 10Vr.m.s | Perf. Criteria A |
| | PFMF | IEC/EN61000-4-8 30A/m | Perf. Criteria A |


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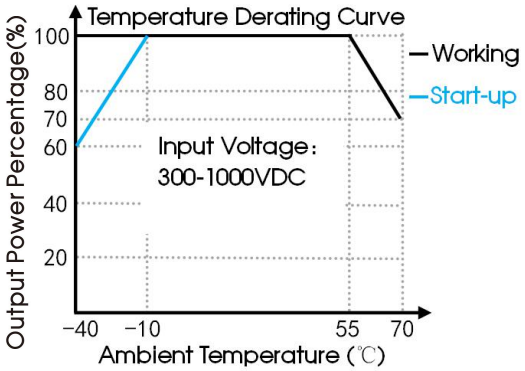
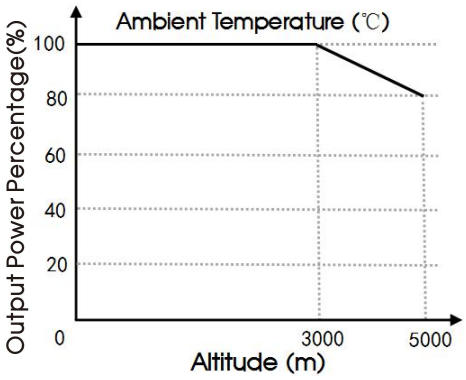
## Functional Specifications

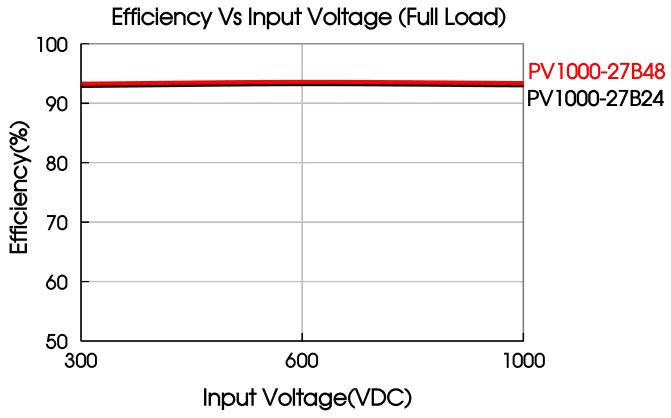
| Item | Operating Conditions | | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| Current Sharing Accuracy | When units in parallel, each power supply needs to carry a rated load of more than 50% | | -- | ±5 | -- | % |
| LED Signal | Output status indication | Normal output | Green on | | | / |
| | | Output protection | Flicker/light off | | | |
| | | Power off | Light off | | | |

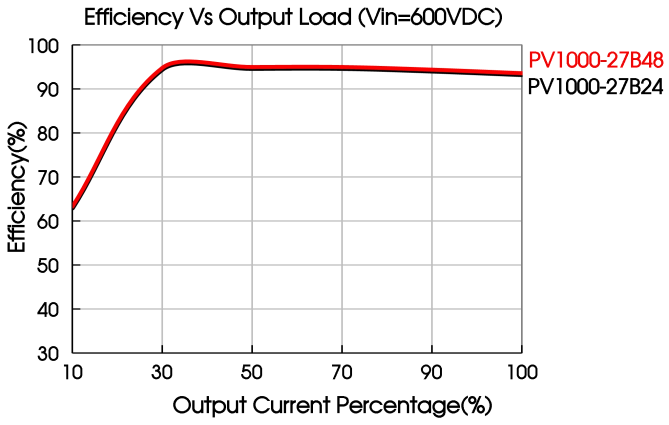
## Product Characteristic Curve




Note: This product is suitable for applications using natural air cooling; for applications in closed environment please consult Mornsun FAE.




## Design Reference

1. Typical application circuit

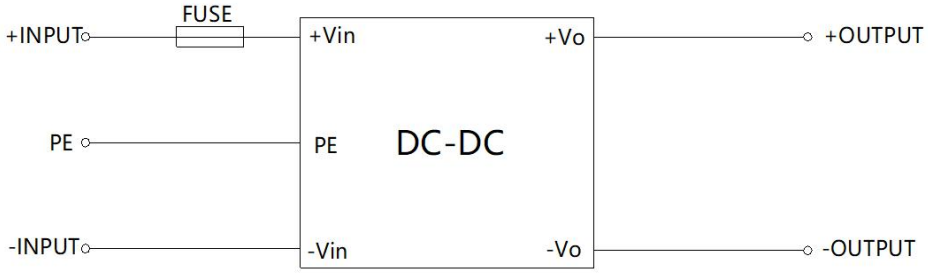



Fig. 1

| Model | Recommended value |
|---|---|
| FUSE | 10A/1500VDC, required |

2. For additional information please refer to application notes on www.mornsun-power.com.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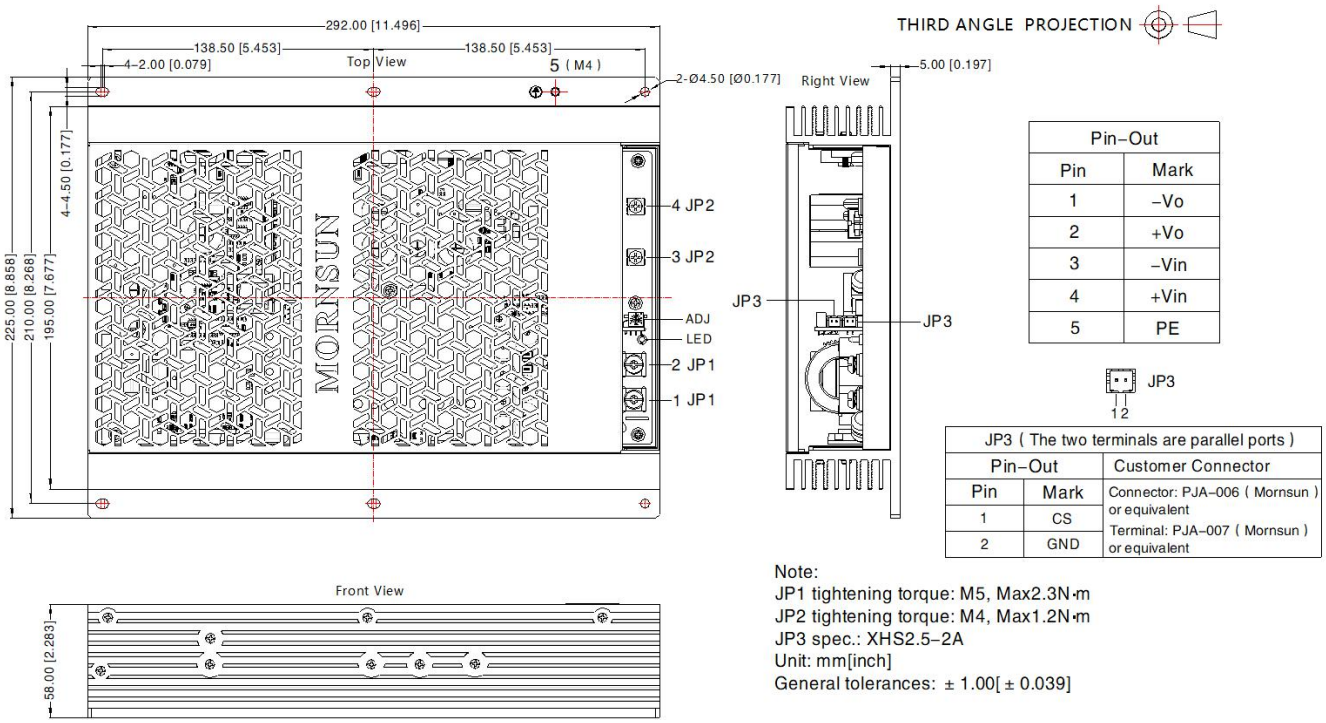
## Dimensions and Recommended Layout




| Pin-Out | |
|---|---|
| Pin | Mark |
| 1 | -Vo |
| 2 | +Vo |
| 3 | -Vin |
| 4 | +Vin |
| 5 | PE |

JP3
1 2

| JP3 ( The two terminals are parallel ports ) | | |
|---|---|---|
| Pin-Out | | Customer Connector |
| Pin | Mark | Connector: PJA-006 ( Mornsun ) or equivalent<br>Terminal: PJA-007 ( Mornsun ) or equivalent |
| 1 | CS | |
| 2 | GND | |

Note:
JP1 tightening torque: M5, Max2.3N·m
JP2 tightening torque: M4, Max1.2N·m
JP3 spec.: XHS2.5-2A
Unit: mm[inch]
General tolerances: ± 1.00[ ± 0.039]

Note:

1. For additional information on Product Packaging please refer to www.mornsun-power.com. Packaging bag number: 58220274;
2. Unless otherwise specified, parameters in this datasheet were measured under the conditions of Ta=25℃, humidity<75% with nominal input voltage and rated output load;
3. All index testing methods in this datasheet are based on our company corporate standards;
4. We can provide product customization service, please contact our technicians directly for specific information;
5. Products are related to laws and regulations: see "Features" and "EMC";
6. The out case needs to be connected to PE (⏚) of system when the terminal equipment in operating;
7. 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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# PV1000-27Bxx Series Parallel Redundancy and Current Sharing Application Notes


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# Parallel Operating

## 1. Redundancy

The output of the power module can be connected in parallel to achieve redundancy, thereby improving system reliability. The maximum power of the redundant system needs to be derated to ensure that the redundant system can still meet the rated load requirements when a power module fails. At present, the common practice is to build a redundant system using the N+1 method, that is, N+1 power supplies are connected in parallel. It supports the maximum load current N*Iomax, where Iomax is the rated output current of each power supply, for example, the rated output current of each power supply is 42A, and 2+1 are only connected in parallel to build a 2*42A=84A redundant system.

The power modules support 2+1 parallel redundant operation. When any power module in the parallel connection fails, other power modules can continue to work.

Note: When used in parallel, the maximum load current cannot exceed the maximum output current of a single power module at startup, otherwise the entire parallel power supply system will not be able to start and work normally. When any power supply in the parallel connection fails, its current-sharing connection terminal needs to be removed to prevent other power modules from being affected by it, resulting in a decrease in output voltage.

## 2. Current Sharing

The each power module has a current sharing connection terminal (JP3). If the current sharing function is required, the current sharing terminals of all power modules must be connected together when working in parallel. The wiring method of the current sharing function is shown in the figure below:


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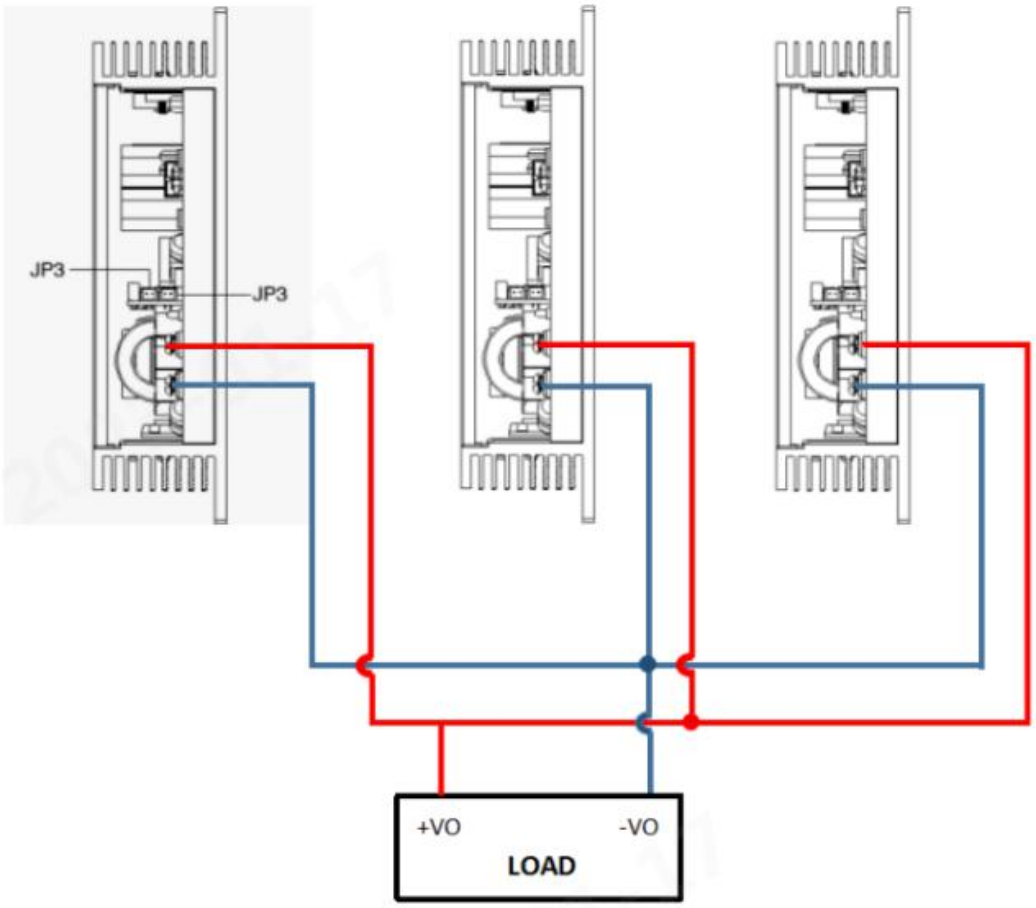


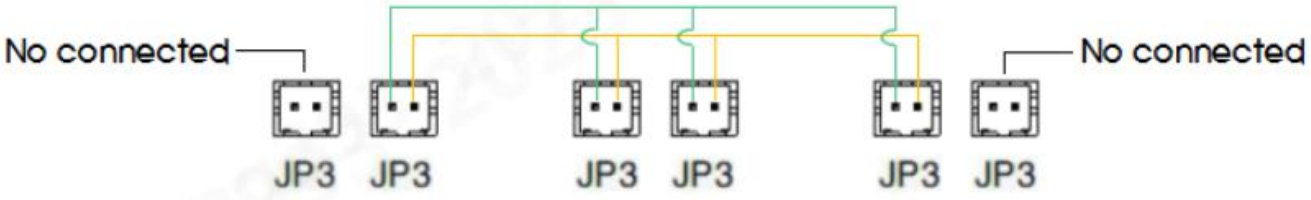


Note: The JP3 ports of each power module have the same function, and there is no sequence.

The output voltage of each power module will affect the accuracy of current sharing. It is recommended that the output voltage of the power module be the rated voltage ±50mV. In practical applications, if the output voltage value needs to be adjusted, the output voltages of all parallel-connected power modules need to be adjusted to the same voltage. The recommended voltage range is: target voltage value ±50mV.

After the output load of each power module is greater than 50% of the rated load, the current sharing accuracy is required to be ±5%. The formula for calculating the average current is:

$$\text{Current Sharing Accuracy}=\frac{Io\max - Io\min}{Io\max}*100\%$$

Iomax: The maximum output current value of the power modules connected in parallel
Iomin: The minimum output current value of the power modules connected in parallel


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