Inverter

Pure Sine Wave Inverter with Transfer Switch and RCD

NV1500E01 (12V-230V-2KW EU)

NV1500K01 (12V-230V-2KW UK)

NV2000E01 (12V-230V-2KW EU)

NV2000K01 (12V-230V-2KW UK)

NV3000E01 (12V-230V-3KW EU)

NV3000K01 (12V-230V-3KW UK)

NV3000E0124 (24V-230V-3KW EU)

NV3000K0124 (24V-230V-3KW UK)

User Manual

Please Keep This Manual For Future Reference

- For safe and optimum performance,the Inverter must be used properly.
- Carefully read and follow all instructions and guidelines in this manual and give special attention to the Caution and Warning statements.

Disclaimer

- While every precaution has been taken to ensure the accuracy of the contents of the guide,we assumes no responsiblity for errors or omissions.
- Note as well that specifications and product functionaity may change without notice.

Important

- Please be sure to read and save the entire manual before using your Inverter.
- Misuse may result in damage to the unit and/or cause harm or serious injury.
- Read manual in its entirety before using the unit and save manual for future reference.

Table of contents

1. Introduction

1.1 Important Safety Information

Thank you for purchasing the Inverters.With our state of the art,easy to use design,this product will ofer you reliable service for providing AC power for your home, boat, caravan, 4WD or commercial vehicle.The Inverters can run many AC powered appliances when you need AC power anywhere. This manual will explain how to use this unit safely and effectively. Please read and follow these instructions and precautions carefully.

- Risk of electrical shock and energy hazard. All failures should be examined by the qualified technician. Please do not remove the case of the inverter by yourself.
- Please do not install the inverter in places with high moisture or near water.
- Please do not install the inverter in places with high ambient temperature, under direct sunlight or near flame source.
- Please only connect batteries with the same brand and model number in one battery bank. Using batteries from different manufacturers or different capacity is strictly prohibited.
- Never allow a spark or flame in the vicinity of the batteries because it may generate explosive gases during normal operation.
- Make sure the air flow from the fan is not obstructed at both sides (front and back) of the inverter. Please allow at least 15cm of space.
- Please do not stact any object on the inverter.

WARNING: Batteries will have an aging problem after years of operation. It is suggested to execute regular battery maintenance (e.g. every year). Once aged, the batteries should be replaced by professional technician, otherwise the failed batteries may cause fire or other hazards.

1.2 CE EMC Information

This equipment has been tested and found to comply with the limits for CE EMC standard.These limits are designed to provide reasonable protection against harmful interference in a residential installation.This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which

can be determined by turning the equipment of and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit diferent from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help.

2. Product Deseription

Pure sine wave inverter with transfer switch is a combination of an inverter and AC auto-transfer switch.

2.1 Sine Wave Inverter Key Features

The Sine Wave Inverter utilizes advanced high frequency switching technology in the power conversion process. The circuits are similar to those used in power supplies for electronic equipments.

- Pure sine wave output (THD<3%)
- High efficiency up to 91%
- Auto AC Transfer Function
- Power-Saving Mode
- Compliance to CE, FCC and E-Mark
- Car Ignition Function
- Low Voltage Protection (Four Stages Optional)
- 18months global warranty
- High surge capability: for "hard-to-start" AC loads
- Light weight: for easy installation
- Output voltage can be set by user
- Output frequency 50Hz or 60Hz cab be set by user

2.2 Inverter Function

When connected properly and the power switch is turned to the "ON", the inverter draws power from a battery and delivers a true sine wave AC output voltage. If the battery voltage is within the operating range of the unit, the inverter will continue to deliver AC power to the loads connected. High and low battery voltage shutdowns will engage if the battery voltage falls out of the specified range of operation. (10-15.5 VDC on 12V models, 20-31 VDC on 24V models.)

2.3 Automatic Transfer Switch

The Pure Sine Wave Inverter are equipped with a transfer relay.. When utility AC power fails, the transfer relay is deenergized and the load is automatically transferred to the inverter output within 30 milliseconds. Once AC utility is restored, the relay energizes and the load is automatically reconnected to AC utility.

3. Feature Setting

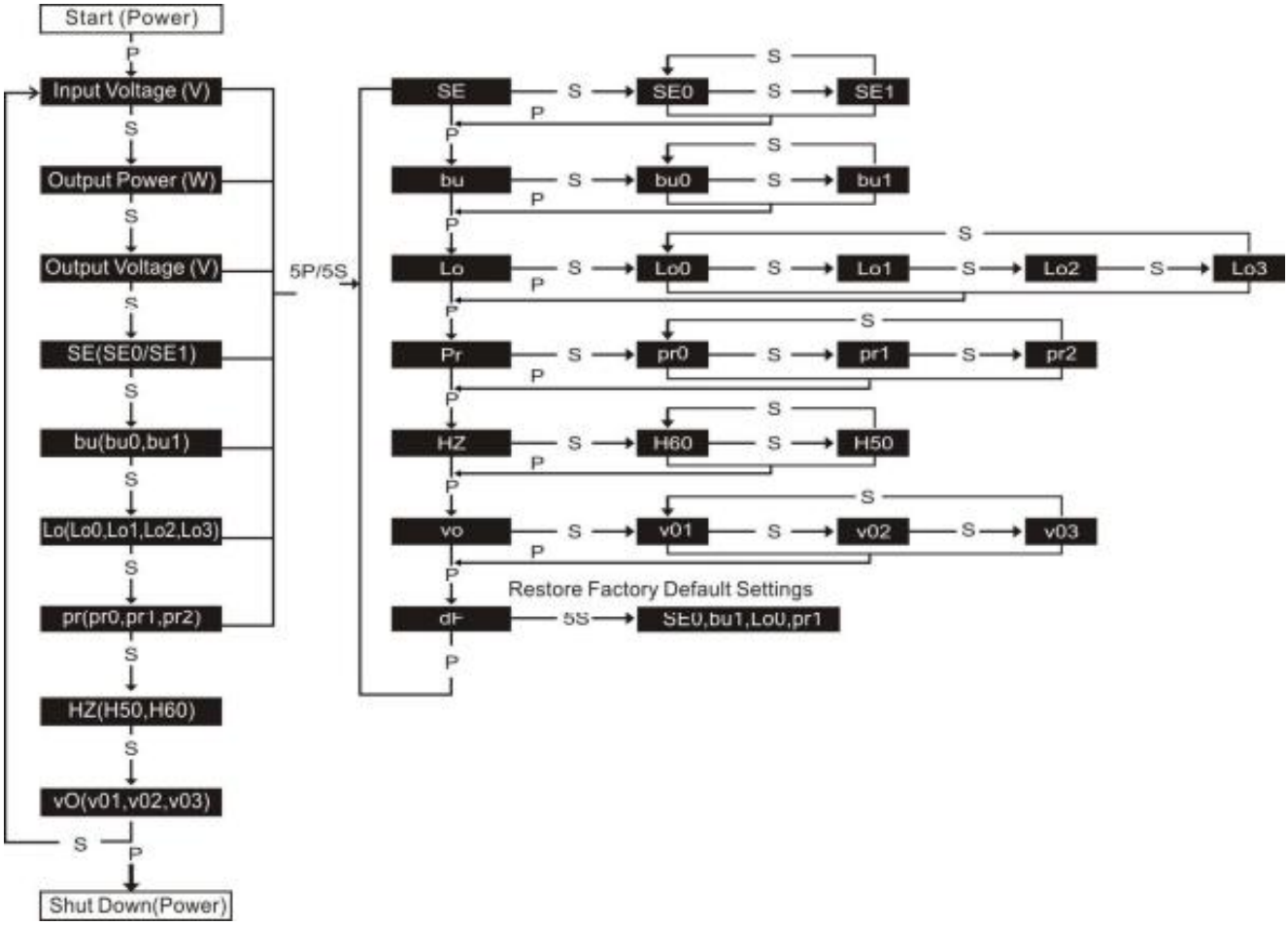
To understand more about the unit features, read the following section and follow the instructions to make changes to the desired setting

3.1 Understanding the Unit Settings

Power Saving Mode	SE	SE0	POWER SAVE mode OFF ***(default)***
		SE1	You would want to enable POWER SAVE mode if the inverter is only being used periodically to power loads. This allows the inverter to draw less power from the batteries during non-use periods. The POWER SAVE mode will be activated when the output power is less than 15W. When output power is more than 20W, the inverter will automatically return to normal status.
Buzzer Alarm	bu	bu0	Turn off the buzzer. It only shows fault code and the buzzer doesn't alarm when the inverter has any fault.
		bu1	The buzzer works normally. It shows fault code and the buzzer alarms when the inverter has any fault.***(default)***
Low Voltage Protection Setting	Lo	Lo0	Battery voltage setting is 10.5V/ 21V (24V) ***(default)***
		Lo1	Battery voltage setting is 10.8V/ 21.6V (24V)
		Lo2	Battery voltage setting is 11.3V/ 22.6V (24V)
		Lo3	Battery voltage setting is 11.8V/ 23.6V (24V)
Priority (ATS)	pr	pr0	Use as Inverter only. No Bypass function.
		pr1	Inverter automatically turns ON when AC blackout. ***(default)***
		pr2	The inverter will shutdown when the utility fails, then the inverter needs to be started manually and enter into "INVERTER" mode; But Once AC utility is restored, the load is automatically reconnected to AC utility.
Frequency	HZ	H50	50HZ
		H60	60HZ
Output Voltage setting	vo	v01	The output voltage setting is 220V for the 230v series.
		v02	The output voltage setting is 230V for the 230v series.
		v03	The output voltage setting is 240V for the 230v series.
Default	dF		Restore factory default settings.
Remarks: factory default setting is SE0, bu1, Lo0 and pr1.			

3.2 Operation Chart

If you want to set the above functions , please see the following chart.



Remarks:	
P	Press "Power"
5P	Hold "Power" 5 seconds
S	Press "Select"
5S	Hold "Select" 5 seconds
To program new settings	Select desired settings---hold "Select" 5 seconds---record & show next setting
Exit program mode	Hold "Power" and "Select" together for 5 seconds, exit program mode.

Enter the Function Menu for unit setting:

- To enter the unit Function Menu, presee and hold "Power" and "Select" buttons together for about 5 seconds until a beep is heard.

When are you in the Function Menu:

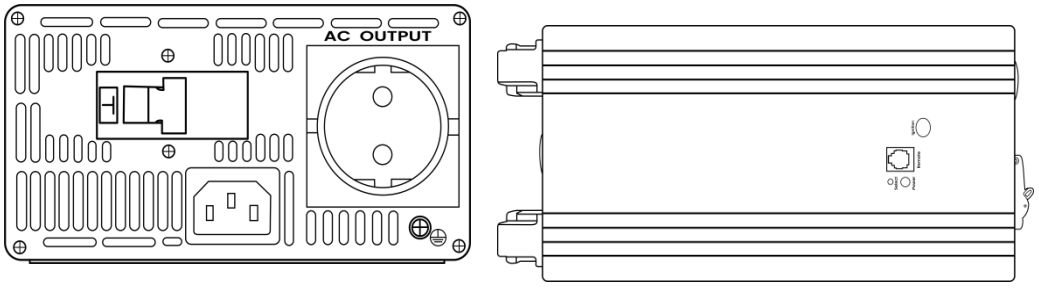
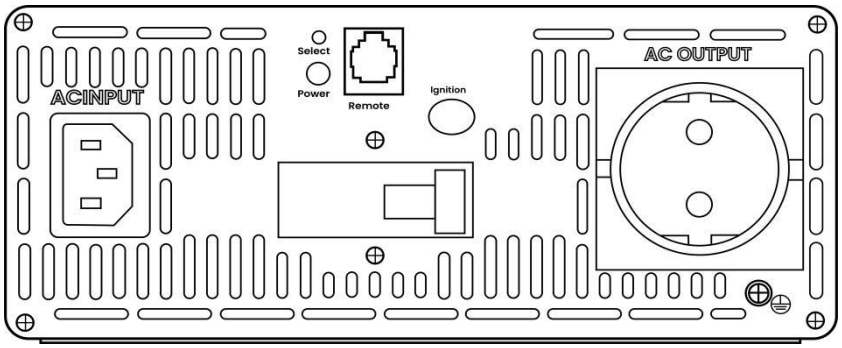
- Press "Power" button for 1 second to toggle between different Function Menus like "SE", "bu", "Lo" and "Pr" ete.
- Press "Select" button for 1second to enter Individual Function Menu and you can make changes to the settings.
- The unit will EXIT to the Main Menu automatically if "Power" or "Select" buttons are not triggered within 5 seconds.

When you are in Individual Function Set Menu:

- Press "Select" button for 1second to toggle between different setting values.
- Press "Select" button for 5 seconds to set selected setting and exit to next menu.
- See more details on the above flow chart.

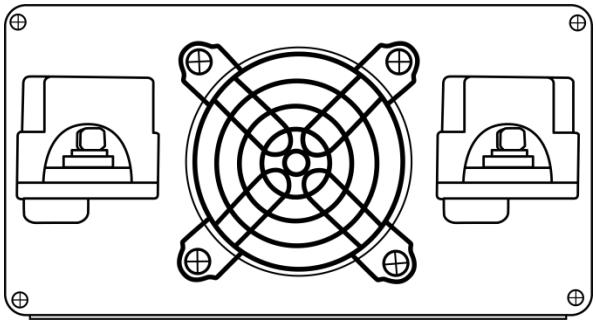
4. Understanding the Front Panel & Rear Panel

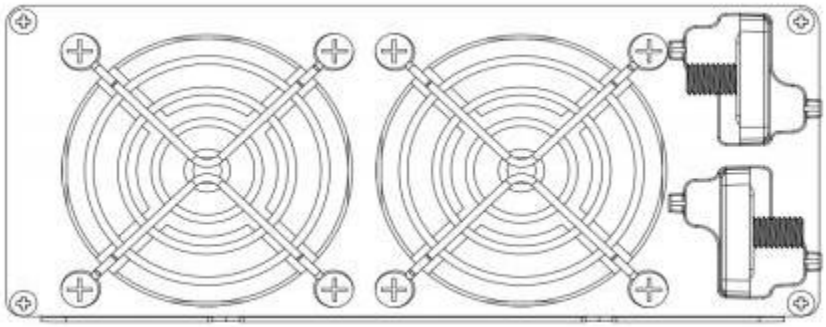
4.1 Front Panel

The Front Panel of 1500W Pure Sine Inverter with Transfer Switch and RCD	
The Front Panel of 2000W and 3000W Pure Sine Inverter with Transfer Switch and RCD	
Power Button	Turns the inverter ON/OFF during Battery Mode. To turn the inverter ON: press and hold "Power" button until hearing the beep. The display will show the Display revision levels "Dx.x" and then the Main Board revision levels "rx.x" (where x=any number) To turn the inverter OFF: press and hold “Power” button until hearing the beep.

<table>
<tr><td>Select Button</td><td colspan="3">Check the unit setting: Press once to check or verify units present set functions</td></tr>
<tr><td rowspan="6">LED Lights</td><td rowspan="4">status</td><td>Amber(solid)</td><td>Battery/Inverter Mode</td></tr>
<tr><td>Green(solid)</td><td>Bypass Mode</td></tr>
<tr><td>Amber(flashing)</td><td>Battery/Inverter mode and AC input is detected and unit will switch to Bypass mode within 20 seconds</td></tr>
<tr><td>Red(solid)</td><td>Fault. Display shows error code</td></tr>
<tr><td>DC-V</td><td colspan="2">Display shows measured battery voltage.</td></tr>
<tr><td>AC-P</td><td colspan="2">Display shows total output AC power in KW.(ex.1000W will show 1.00)</td></tr>
<tr><td>AC-V</td><td colspan="2">Display shows measured output voltage.</td></tr>
<tr><td>USB Port</td><td>5V, 2.1A</td><td colspan="2">It is available when the inverter switchs on.</td></tr>
<tr><td>Remote Port</td><td>RJ12</td><td colspan="2">Route the RJ12 cable from the unit to your desired location for the Remote Control Switch.The provided 6 pin standard RJ12 "rollover" cable is used.</td></tr>
<tr><td>Ignation Port</td><td colspan="3">Ignition Control Feature to turn inverter on/off via a 12VDC/24VDC signal and to minimize battery drain by switching the inverter off when the ignition key is turned off.</td></tr>
<tr><td>AC OUTPUT</td><td colspan="3">The outlet socket for direct plug in.</td></tr>
<tr><td>AC INPUT</td><td colspan="3">Connect the utility power.When utility power is avilable, the unit is runnng in AC Bypass mode. AC ouput is supplied from the utility.</td></tr>
<tr><td>RCD</td><td colspan="3">Included in the unit is a RCD Safety Switch. This eliminates the need for retrofitting a residual current circuit breaker in inverter operation.
The primary function of a residual current circuit breaker (RCD) is to protect people from dangerous electrical currents.
The RCD detects both large residual currents and the smallest current differences caused by minor insulation faults or by touching live parts. Thanks to its fast response time and interruption of the current flow, the RCD protects people from electric shock and reduces the risk of fire.</td></tr>
</table>

4.2 Rear Panel

The Rear Panel of 1500W Pure Sine Inverter with Transfer Switch and RCD	

The Rear Panel of 2000W and 3000W Pure Sine Inverter with Transfer Switch and RCD	
DC battery terminals	Connect the inverter to batteries or other power sources. Negative (-) and positive (+) DC terminals should be kept insulated to protect from accidental short circuits.
Cooling fan	Temperature and load controlled.

5. Installation & Wiring

5.1 Wiring for Batteries

Wire connections should be as short as possible and less than 1.5 meter is highly recommended. Long DC wires tend to lose efficiency and reduce the overall performances of an inverter. Make sure that suitable wires are chosen based on the rating of current. A cross-sectional area that is too small can lead to overheating, thereby causing certain dangers. Please refer to Table 4-1.

Note: Please consult our local distributors if you have any questions.

Rated Current of Equipment (amp)	Cross-section of Lead (mm^2)	AWG	Suggested Wiring
16A-25A	2.5	12	Safety Wiring Range
25A-32A	4	10	
32A-40A	6	8	
40A-60A	10	6	
63A-80A	16	4	
80A-100A	25	2	
100A-125A	35	1	
≥125A	50	0	
Remarks: -All DC cables require insulated multi-strand low resistance cable. -The DC cables must be copper and must be rated 105°minimum.			

Table 5-1 Suggestion for Wire Selection

CAUTION

Use of smaller gauge cable or longer cable length may cause the inverter to shutdown under heavy load. This may also lead to the cables melting or catching fire. This could result in death or serious injury. Choice of the cable size should also match with the rating of the DC fuse used.

5.2 DC Fuse or DC circuit breaker

DC-rated fuse or DC-rated circuit breaker connected along the DC positive line is required.

Fuse/Circuit Breaker Rating	12V 2000W System	12V 3000W System
	250Adc-300Adc	350-400Adc

5.3 To make DC wiring connections

CAUTION

- Clean battery terminals before making connections
- Wear eye protection to keep corrosion from coming in contact with eyes.
- Reversing the DC Input terminal will damage the unit and cannot be repaired. Damage caused by reverse polarity connection is not covered by the warranty.

- Connect one end of the negative DC input cable to the Inverter DC negative terminal.
- Connect the other end of the negative DC input cable to the battery negative.
- Connect one end of the positive DC input cable to the Inverter DC positive terminal.
- Connect the other end of the positive DCinput cable to the battery positive.

Observe the polarities carefully while performing the installation and do not reverse the polarities.And make sure all the DC connections are tight. Loose connections will overheat and could result in a potential fire hazard.

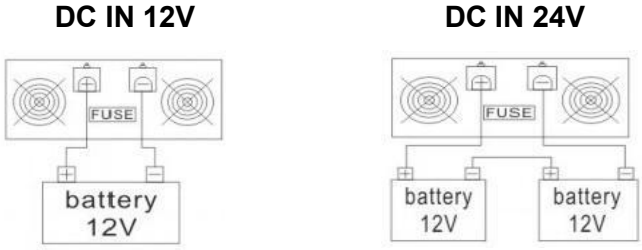


Figure 5.3: Battery connections

5.4 Requirement of Installation

The unit should be mounted on a flat surface or holding rack with suitable strenth. In order to ensurethe lifespan of the unit, please refrain from operating in environment of high dust, high

temperature or high moisture. This is a power supply with built-in DC fan. Please make sure that ventilation is not blocked.

(Note: There should be no barriers within 15cm of the ventilating holes.)

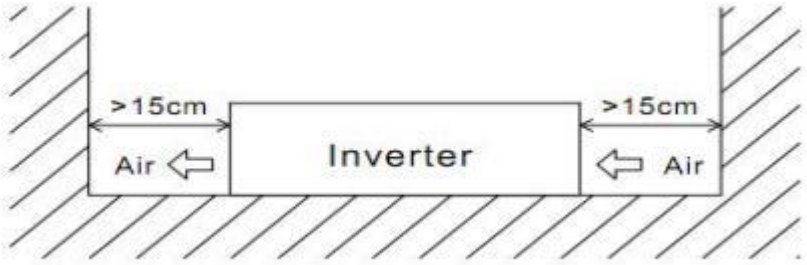


Figure 5.4: Example of Installation

5.5 Mounting Suggestion

There are 4 semi-circular cutout on the side flanges of the inverter. It can be used for fixing inverter onto the system enclosure. The device can be installed horizontally or vertically. Please make sure the ventilation openings are free from obstruction.

Tips: The AC INPUT and AC OUTPUT of the inverter must not be mixed (or indirectly connected). If you integrate the AC OUTPUT into the distribution board of the camper, then the AC INPUT can only be connected to the external power supply (shore power) socket, and cannot be connected to the power socket on the camper, otherwise it will cause the AC INPUT and AC OUTPUT to form a loop, which will cause damage to the inverter!

If you connect the AC INPUT to the power socket on the camper, then the AC OUTPUT socket can only be connected to 230V appliances and cannot be integrated into the distribution board of the camper.

5.6 12V&24V Battery Banks

- The use of deep cycle battery is highly recommended for power inverter application.
- For battery size,you need to identify how much and how long the inverter has to provide AC power to the loads (based on Amps x hour energy consumption).It is recommended to purchase as much battery capacity as possible.

Folllowing run times are estimates for reference,based on using diferent battery bank sizes. Actual run times may vary on battery type used.

Estimate runtime on different 12V/24V Battery Bank size					
AC Load	60AH	120AH	180AH	240AH	300AH
50W	11 hrs.	22 hrs.	33 hrs.	44 hrs.	55 hrs.
100W	5 hrs.	11.5 hrs.	17 hrs.	23 hrs.	29 hrs.
200W	2.5 hrs.	5 hrs.	8 hrs.	11 hrs.	13.5 hrs.
500W	49 mins	2 hrs.	3 hrs.	4 hrs.	5 hrs.
1000W	15 mns	49 mins	1.5 hrs.	2 hrs.	2.5 hrs.

1500W	8 mins	27 mins	49 mins	1 hr	1.5 hrs
2000W	N.R.	15 mins	34 mins	49 mins	1 hrs
2600W	N.R.	11 mins	25 mins	37 mins	49 mins
Note:N.R.-Not Recommended					

6. Troubleshooting

6.1 Understanding the Error Code

Code	Condition	Corrective Action
F01	Low voltage shutdown	Recover manually after the inverter shutdown. (The inverter will auto recover when the battery voltage goes back to a normal level wthin 20s.)
F02	Over input votlage protection	Recover manually after the inverter shutdown. (The inverter will auto recover when the battery voltage goes back to a normal level within 20s.)
F03	Over load protection	The inverter shutdown when output power is overloaded around 120%, it needs to be recovered manually.
	Short circuit protection	Manual recovery
F04	Over temperature protection	The inverter will automatically return to normal status when the internal temperature drops to 80±5°C.
F05	Low voltage alarm	Buzzer sounds and fault light turns red
F06	Over load alarm	Buzzer sounds and fault light turns red when output power is overloaded around 110%.But the BUZZ and F06 code will not occur when the output power drops to a normal level within 20s.
F07	Over temperature alarm	Buzzer sounds and fault light turns red when the inverter's internal temperature is higher than the limit value(90±5°C).
F08		The display will show the code F08 when the thermostats in the inverter is broken.
F09	AC input overload protection	The fan will start to work when the relay temperature is up to 60±5°C; but it will stop working when the relay temperature drops to 50±5°C. The unit will alarm and no AC output when relay temperature is up to 75±5°C; but it will auto recover when the relay temperature drops to normal value.

To truoubleshoot the unit, please note the error code displayed on the main unit and review "Understand the Error Codes" in this section.

Control Panel Indication	Fault Condition	Solution
HIGH BATT SHUTDOWN (code: F02)	Battery voltage too high	Check the battery charging system for faults. Manually reset inverter by pressing switch "POWER"
LOW BATT SHUTDOWN (code: F01)	Battery voltage too low	Charge battery. Manually reset inverter by pressing switch "Power"
OVERLOAD SHUTDOWN (code: F03)	Battery current too high, probable AC overload	Reduce load on inverter.
OVERTEMP SHUTDOWN (Code: F04)	System over-temperature	Improve ventilation and cooling and/or reduce load on inverter.

7. Derating

Notes on output load:

The inverter can continuously power most devices that require AC power. But for certain types of loads, the unit may not work properly.

- Since inductive loads or motor-based equipments require a large starting current (6~ 10 times of its rated current), the inverter may not start successfully with these kinds of loads.
- When the output are capacitive or rectified equipments (such as switching power supply), it is suggested to operate these equipments at no load or light load. To ensure proper operation, you should increase the load only after the inverter has been started up.

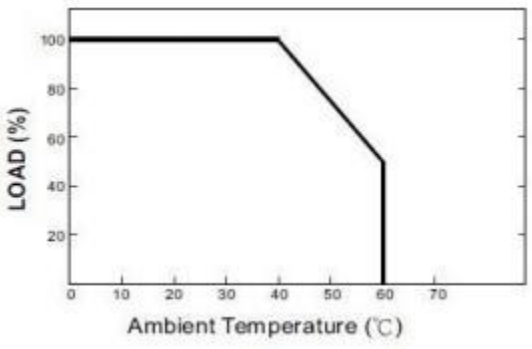


Figure 7.1 Output Derating Curve

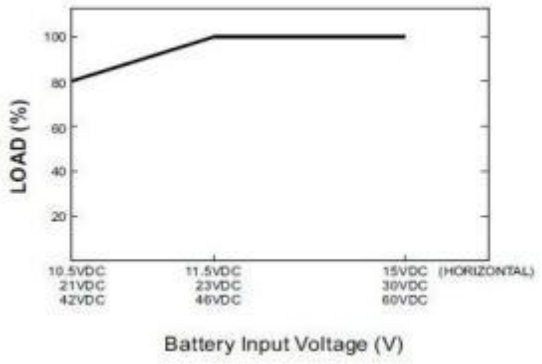


Figure 7.2 Input Derating Curve

8. Specification

Model	NV1500E01 NV1500K01	NV2000E01 NV2000K01	NV3000E01 NV3000K01	NV3000E0124 NV3000K0124
Continuous Power	1500W	2000W	3000W	3000W
Peak Power	3000W	4000W	6000W	6000W
DC Voltage	DC12V	DC12V	DC12V	DC24V
AC Voltage	220 / 230 / 240VAC (Can be set by user)			
No Load Current Draws	1A	1A	1.2A	0.5A
Max AC Input Current	6.8A	8.7A	13A	13A
Frequency	50Hz ± 0.5Hz or 60Hz ± 0.5Hz (Can be set by user)			
Output Waveform	Pure Sine Wave			
AC Regulation	THD<3% (Linear load)			
Output Efficiency	up to 91%			
Transfer relay rating	16A	30A	30A	30A
Transfer time AC to inverter and inverter to AC	Less than 30ms			
Remote Control (Optional)	Remote control port is RJ12. Cable length: 15m is available.			
Ignition Control Feature	Ignition Control Feature to turn inverter on/off via a 12VDC/24VDC signal and to minimize battery drain by switching the inverter off when the ignition key is turned off.			
DC Input Protection				
DC Voltage Range	10V-15.5V			20V-31V
Low Voltage Alarm	Lo0(10.5V): 11V±0.3V			Lo0(21V): 22V±0.3V
	Lo1(10.8V): 11.3V±0.3V			Lo1(21.6V): 22V±0.3V
	Lo2(11.3V): 11.3V±0.3V			Lo2(22.6V): 23.6V±0.3V
	Lo3(11.8V): 12.3V±0.3V			Lo3(23.6V): 24.6V±0.3V
Low Voltage Shut Down	Lo0(10.5V): 10.5V±0.3V			Lo0(21V): 21V±0.3V
	Lo1(10.8V): 10.8V±0.3V			Lo1(21.6V): 21.6V±0.3V
	Lo2(11.3V): 11.3V±0.3V			Lo2(22.6V): 22.6V±0.3V
	Lo3(11.8V): 11.8V±0.3V			Lo3(23.6V): 23.6V±0.3V
Low Voltage Alarm Recovery	Lo0(10.5V): 11.3V±0.3V			Lo0(21V): 22.6V±0.3V
	Lo1(10.8V): 11.6V±0.3V			Lo1(21.6V): 23.2V±0.3V
	Lo2(11.3V): 12.1V±0.3V			Lo2(22.6V): 24.2V±0.3V
	Lo3(11.8V): 12.6V±0.3V			Lo3(23.6V): 25.2V±0.3V
Low Voltage Protection Recovery	Lo0(10.5V): 12V±0.3V			Lo0(21V): 24V±0.3V
	Lo1(10.8V): 12.3V±0.3V			Lo1(21.6V): 24.6V±0.3V
	Lo2(11.3V): 12.8V±0.3V			Lo2(22.6V): 25.6V±0.3V

	Lo3(11.8V): 12.8V±0.3V			Lo3(23.6V): 25.6V±0.3V
Over Voltage Shut Down	15.7V±0.3V			31.5V±0.3V
Over Voltage Recovery	15.3V±0.3V			29.5V±0.3V
Fuse	Internal	USB port	5V, 2. 1A	
Working Temperature	-10°C--+50°C	Product Size	330x150x78mm(1500w)	
			321x197x82mm(2000w)	
			351x197x82mm(3000w)	
Storage Temperature	-30°C--+70°C	Cooling Way	Intelligent cooling fan	
RCD Performance	Rated current: 16 A			
	Rated residual current: 30 mA			
Start	Bipolar soft-start	Certification	CE, FCC and E-mark	

9. Warranty

18 months of global warranty is provided for inverter under normal operating conditions. Please do not change components or modify the unit by yourself, otherwise FACTORY may reserve the right not to provide the complete warranty.