

MINIVERTER user's manual

**Version 1.2
September 2008**



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1.- INVERTER DESCRIPTION

The Miniverter is a sinewave inverter designed specifically for solar photovoltaic applications. With this inverter, you can get a clean 230V/50Hz sinewave from a 12 to 48 Volt battery system. The architecture is based on a high-performance microcontroller and a high efficiency MOSFET power stage with PWM modulation.

The inverter can supply the power peak required by TV sets, projectors, VCR or low power computers.

The inverter is protected against shortcircuit, overload, overvoltage, undervoltage, overtemperature and polarity inversion. All this protections are non-destructive (no fuses involved). The inverter restarts either automatically or manually, depending on which condition tripped the inverter:

Automatically: overvoltage, undervoltage, overtemperature.

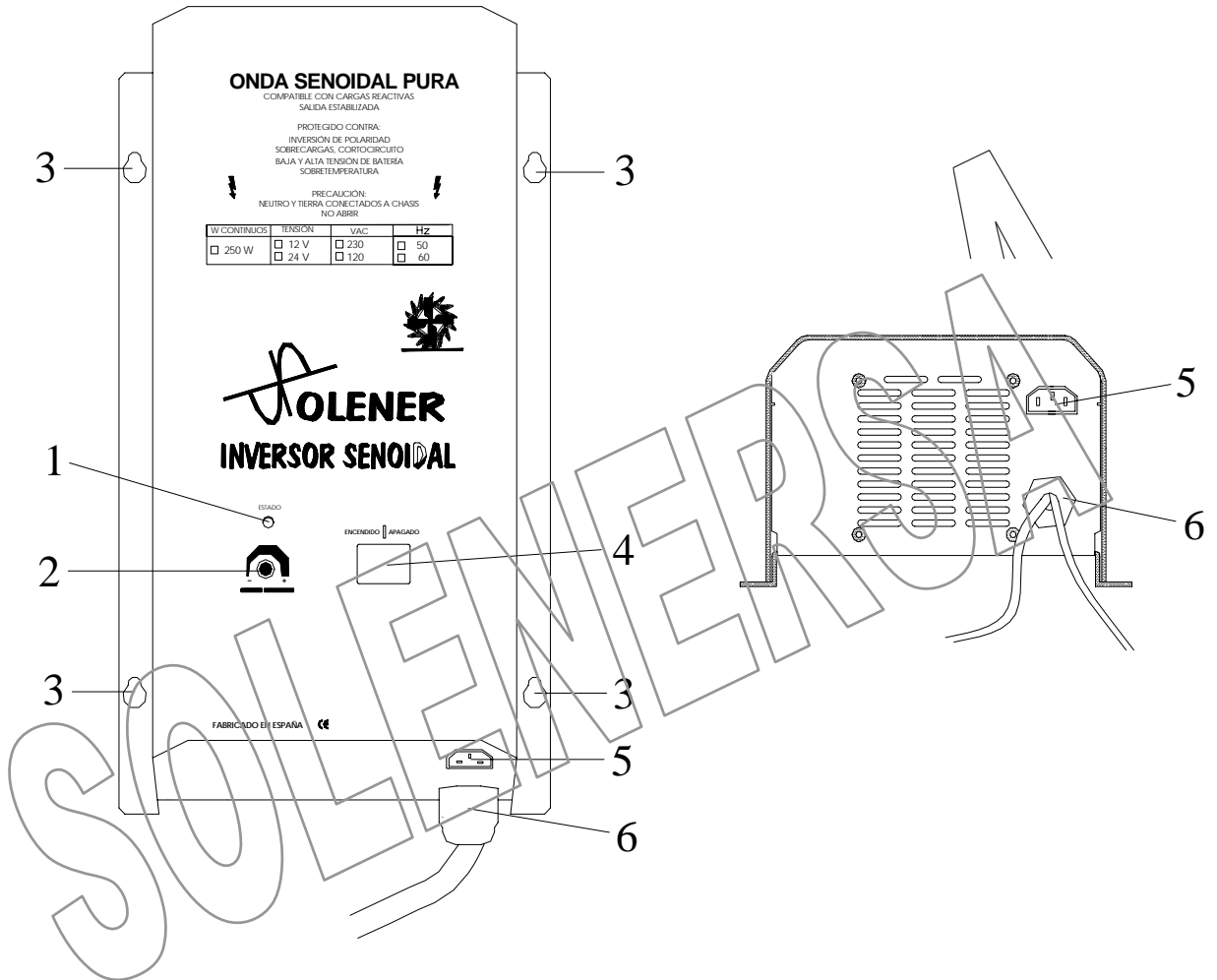
Manually: overload, shorcircuit

There is a load detection mechanism for no-load consumption reduction: the inverter generates short load-detection pulses until a load is found. When the load is disconnected the inverter starts the load detection phase again. You can adjust the load detection threshold (turning a external knob) from 0W (continuous output) to 40 W. If the load is lower than this threshold it will be powered once per second.





2.- FRONT PANEL DESCRIPTION



The picture above shows the inverter front panel. These elements will be commented throughout this manual.

- 1. Status indicator
- 2. Detection threshold adjusting knob
- 3. Mounting holes
- 4. ON/OFF switch
- 5. AC output plug
- 6. DC wires



3.- OPERATION

When powering the inverter it starts an auto test. If a failure is detected the inverter will report about it using the status indicator. This failures are critical, so the inverter will not supply AC. During the auto test the internal fan will rotate for a second.

Once the auto test is finished the inverter will ramp up the output from 0 to the nominal voltage (soft start). The load detection mechanism will activate in order to save power.

If the battery voltage goes below a preset threshold the status indicator will show "Low battery alarm". After 10 seconds in this situation the inverter will turn off the output and show "Low battery shutdown" alarm. If the battery voltage goes up again (recharging the battery, for example) the inverter restarts.

If the battery voltage is greater than the nominal voltage times $\frac{4}{3}$ the inverter turns off the output, showing "High battery alarm" in the status indicator. If the battery voltage goes down the inverter restarts.

When the power stage gets hotter than 50°C the internal fan starts, stopping when the temperature goes below 40°C . If the temperature is greater than 60°C the inverter will lower the output voltage, reducing power dissipation; if the temperature gets greater than 80°C the inverter turns off the output, showing "Overtemperature shutdown" in the status indicator. When the temperature goes below 60°C the inverter restarts; Meanwhile, the fan is running.

If the output is shorted the inverter will protect itself, showing "Short circuit alarm" in the status indicator. If this condition lasts more than 10 seconds the inverter turns off the output, showing "Shortcircuit/overload shutdown" in the status indicator. After removing the short circuit you must cycle the ON/OFF switch once to get AC output again.

If you overload the output, the inverter turns off after a time (variable with the overload amount). The status indicator show "Shortcircuit/overload shutdown" and you must cycle the ON/OFF switch once to get AC output again.

4.- INDICATORS

A multicolour LED lamp in the front panel acts as status indicator. The valid combinations of colours and blinks are:

- **Steady green:** normal status, AC output active
- **Blinking green:** load detection mode
- **Blinking red:** low battery voltage alarm
- **Steady red:** shortcircuit alarm or overload/short circuit shutdown
- **Blinking yellow:** over temperature shutdown
- **Steady yellow:** low/high battery voltage shutdown

The load detection mechanism is factory-set at 2% of the nominal power. If you have a load lower than this, you must adjust the knob counter clockwise or connect a bigger load in parallel.



5.- INSTALLATION

5.1.- Physical

The inverter must be installed on a vertical surface, with the wires at the bottom. Allow 5 cm or more at the top and bottom ends for air circulation. You must install it outside the reach of children and animals.

The inverter must be installed firmly using four adequately sized screws.

5.2.- Electrical

The AC output has a IEC320 female connector, and the DC input has two wires, one marked red (the positive) and the other black or blue (the negative).

Follow this steps:

- Turn off the ON/OFF switch
- Connect the AC output to the protection devices in your application
- Connect the negative wire **directly** to the battery
- Connect the positive wire **directly** to the battery

Warning: the AC output is very dangerous. You must always install a residual current breaker (not supplied). Always turn off the inverter before manipulating in the AC side.

6.- STARTUP PROCEDURE

- Double check the connections.
- Turn on the inverter using the ON/OFF switch
- Close the residual current breaker in the AC side
- The inverter will supply AC output to the loads

7.- SHUTDOWN PROCEDURE

- Open the residual current breaker
- Turn off the inverter using the ON/OFF switch

8.- WARNINGS

- Don't open the inverter. There are no serviceable parts inside
- Don't connect a generator to the output
- Don't cover the air vents
- The unit is for indoor use only
- Don't insert anything in the air vents.



9.- MAINTENANCE

The only maintenance needed is a periodic cleaning with a dry cloth. Be careful not to throw anything inside the inverter. If the inverter is very dirty you can use a cloth lightly dampened with water and a bit of dish soap.

10.- FAILURE RECOVERY

FAILURE	CONSEQUENCE	SOLUTION
Over temperature	The inverter stops showing "Over temperature shutdown" status	Restarts automatically when the temperature goes down
DC polarity inversion	The inverter does nothing	Make correct connection
Overload/shortcircuit	The inverter stops after a while, showing "Shortcircuit/overload shutdown" status	Remove the short circuit or the excessive load. Cycle the ON/OFF switch
High battery voltage	The inverter stops immediately, showing "Low/high battery voltage shutdown" status	Restarts automatically when the battery voltage goes below a threshold
Low battery voltage	The inverter stops after a while, showing "Low/high battery voltage shutdown" status	Restarts automatically when the battery voltage goes above a threshold



11.- TECHNICAL CHARACTERISTICS

ELECTRICAL

Wave form.....	Pure sine wave
Nominal output power.....	300 W
Input voltage.....	10 to 16 V _{cc}
Output voltage.....	230.0±11.5 V _{ca}
Output frequency	50.0±0.1 Hz
Harmonic distortion	< 5%
Efficiency	85% < η < 90%
Self consumption	< 40 mA

Shutdown time versus overload:

- 300 to 360W: 3 minutes
- 360 to 480W: 1 minute
- > 480W: 1 second

PHYSICAL

Length.....	115 mm
Height	230 mm
Width	154 mm
Weight	3670 g

Epoxy-painted aluminium enclosure