MLT
INVERTER

USER MANUAL v1.0

6KVA 36 / 48V

MODEL

M6000/36/48

Table of Contents

ALTERNATIVE ENERGY SOLUTIONS

MLT DRIVES CC
97 Garfield Road · Kenilworth · 7700 · Cape Town · RSA
PO Box 14446 · Kenwyn · 7790 · Cape Town · RSA
Telephone +27 21 683 3310 · Facsimile +27 21 674 2823
info@mltdrives.com

1. Welcome

Thank you for purchasing an **MLT Drives Inverter**. The **MLT Drives Inverter** range uses state of the art digital technology to provide a pure sine wave output that is suitable for a range of uses.

Your **MLT Inverter** will serve you well if proper care is taken during installation and operation. Consult this user manual for installation procedures and operating limits.

Your **MLT Inverter** contains potentially hazardous electronic equipment inside which may result in death or injury. We recommend service and maintenance to be completed by qualified electrical personnel only. All service and maintenance during the warranty period must be completed by an MLT approved Agent or your warranty agreement will be null-in-void and you may be liable for charges to the repair of your unit.

Contact us for information on dealers, agents and distributors in your area.

The MLT Drives Team
January 2003

2. Precautions

- WARNING: THE INVERTER GENERATES HIGH VOLTAGES AND CURRENTS. INCORRECT USE MAY CAUSE ELECTRICAL SHOCK AND DEATH.
- The inverter contains sophisticated electronic equipment. Installation should be referred to a qualified electrical technician. Any queries should be referred to the appropriate service provider.
- Any work performed on the inverter and the installation of the inverter must comply with local and national electrical regulations.
- All precautions relating to the installation and operation of mains voltage equipment must be observed when installing the inverter. This includes considerations to insulation of cabling, access to bare conductors, earthing, protection from moisture etc.
- Use extreme caution when working with the batteries. Lead acid batteries produce explosive and corrosive gases. Inadvertent shorting of the battery terminals can cause serious damage and injury from flash and acid burns. Always wear eye protection and protective clothing when working near the batteries. Insulate all tools used for battery connection.
- Never smoke or allow a spark in the vicinity of the batteries. Remove any metal items on clothes or person when working with the batteries to reduce the risk of a spark or short circuit.
- Do not operate the inverter with any panels or covers removed. Do not operate the inverter if it is not properly installed.
- After being disconnected, the inverter may still contain high voltages in the capacitors. Ensure that these have been fully discharged before working on the inverter.
- Do not use the inverter outside the permissible ambient conditions.

3. Product Brief

MLT Drives Inverter Model: MICRO6000VA

Power: 6000VA Input: 36/48VDC Output: 230VAC single-phase

4. Standard Features

This **MLT Inverter** is equipped with the following features:

- Sine wave output – less than 5% total harmonic distortion
- Robust construction
- Automatic operation
- Battery low cut-out protection
- Electronic reset-able overload protection
- High short-term overload capability – 150% for 10 seconds, 200% for 5 seconds
- High efficiency – typical 90%
- **Load sensing – configurable on the key pad**
- Low stand-by consumption – typical 4W/KW or 0,4% of full load
- Corrosion resistant epoxy-coated housing
- Silent operation
- Galvanic isolation between battery and output
- Maintenance free
- Starts fluorescent lights, dimmers, SCR controlled appliances
- Supplies the heavy starting current required by the following appliances: fridges, motors, pumps, power tools
- LCD display and keyboard for setting changes.

5. Applications

Due to the many features the inverter incorporates it is the ideal solution for the following applications:

- Remote housing
- Boating
- Remote education
- Medical
- Mobile application – off-road, etc.
- Recreation
- Sophisticated electrical equipment
- Other, e.g. Telecommunications applications, field service, testing

6. Equipment Description

All **MLT Inverters** are housed in an epoxy coated box with an aluminium heatsink and a removable steel cover. The box is specifically designed to be dust and vermin proof, whilst providing adequate heat dissipation. LEDs on the front panel indicate : Power, Over temperature, Over Voltage, Over load, Under Voltage and Short Circuit . A reset button is for resetting after overload conditions.

The inverter uses high frequency pulse-width modulated technology and the latest field-effect devices. This system allows the inverter to run with high efficiency and to operate silently. The use of toroidal iron cores and ferrite magnetic cores give the inverters their robust quality. Each inverter is fitted with colour-coded battery leads, two output plugs for immediate convenience and an output terminal block for ease of connection to the complete installation. All functions are microprocessor-controlled using the latest DSP technology.
An LCD screen enables viewing of many parameters and a keyboard for the convenience of the customers to change their settings.

(a) Parts Description:

The following parts of the inverter should be identified:

- Free standing steel casing
- Removable cover
- 8mm DC input studs
- 6mm AC output studs
- LCD and keypad on top cover
- Input and output circuit breakers on the front cover

(b) Explanations of Features:

Load sensing facility

After the inverter had been successfully connected and switched on it will begin to pulse on and off at intervals configured on the keypad. This facility is called load sensing as it will only turn the inverter on when the inverter has sensed the load sense wattage. Load sense wattage is set on the keypad along with the pulse time. The pulse time is the interval between load sense pulses. If you would like to disable the load sense completely, set the load sense time to zero. An explanation of how to configure these settings is explained later

Battery Low Cut-Out Protection

A lead-acid battery will suffer permanent damage if it is allowed to remain in a fully discharged state for even a short period of time. MLT inverters incorporate a battery-low shut-down circuit which switches off the inverter when the battery voltage falls below a certain level. The inverter will automatically restart when the battery level returns to normal.

Electronic Overload Protection

The inverter is capable of supplying 1.5 times its rated output power for 10 seconds. This enables it to handle motor starting currents and other surges that occur when equipment is switched on. Overloads in excess of the above, short circuits and lesser overloads of longer duration will cause the inverter to switch off.
After overload, the inverter will not operate until the reset button has been pushed. On pressing the reset the inverter will start up again. Please check first why your inverter is overloaded and remove the excess load before re-initialising the inverter.

The length of time for which the inverter will run before it switches off is dependent on the severity of the overload. This provides another feature; the ability to run intermittent loads in excess of the rated output of the inverter (e.g. for running kitchen appliances or power tools). For further details see the specifications.

Galvanic Isolation

Galvanic isolation in the inverter achieves maximum resistance between the battery and the mains output. This eliminates the chance of problems occurring where there is an existing connection between the battery and earth.

Incorrect Battery Voltage Protection

If during charging of the battery, the battery voltage rises to an unacceptable level the inverter will switch off to protect the electronic components. It will automatically restart once the voltage has returned to normal.

If the inverter is connected to a battery of too high a voltage, the inverter will switch off. Please note that this only operates to within reason.

7. Installation

(a) Site Selection

The Inverter is for interior use only. Exposure to moisture, dust, corrosive gasses or direct sunlight can damage the inverter.
The high cost of heavy duty cabling required for connecting the batteries and the inverter ordinarily dictates that the inverter be sited close to the batteries (see also section on cabling).
Choose a location that is as cool as possible.
To ensure optimum performance the inverter should be installed in a well ventilated area. The following should be avoided: installation in close proximity to a generator or similar heat-emitting device.

(b) Mounting

The inverter has been designed as a freestanding device but can be custom made to your specification.

(c) Cabling

When installing the battery cables, please ensure that the correct cable thickness is observed. Incorrect cable thickness will result in a loss of efficiency and a tendency for the inverter to cut out under heavy loads. Please, also be aware, that the insulation requirements appropriate for the cabling must be observed.

(d) Linking

The inverter may be used together with other devices such as generators, battery chargers, timers, solar panels, wind generators etc. However, it is essential that the correct procedures are followed in connecting up these devices. These installations are only to be done by a qualified technician .
PLEASE NOTE THAT INVERTERS MUST BE CONNECTED TO THE BATTERIES FIRST AND THEREAFTER TO THE SOLAR REGULATOR OR OTHER DEVICES.

(e) Connecting and Starting

The load voltage is delivered by the output studs and must be connected with the brown wire as live and the blue as neutral. Please note that both wires can shock.
Ensure that all connections are tightened.
Before connecting the batteries / supply voltage, make certain that the input breaker is off.
Connect the batteries or supply voltage as follows: Red to positive and Black to negative.
Ensure that the connections to the batteries and the load are secure and correctly insulated. Ensure that the inverter is correctly installed with other devices (see Section on Linking).
Switch on the input breaker.
If any settings need to be configured or changed . E.g. If load sense needs to be disabled or battery low changed to a higher or lower value, scroll through the menu and make the changes now before connecting the load. (SEE F. KEYBOARD OPERATING TO CHANGE SETTINGS)
The inverter will now begin to run and if load sensing is enabled it will begin to pulse on and off until it senses a load.
Switch on the output breaker to deliver power to the load.

(f) Key board operating to change settings

Press + and - to scroll displays options and to read the various parameters.
Press Menu to enter the menu and then + and – to scroll through menu options.
Press enter on an option to enter that menu.
Change values by pressing + or – to increase or decrease the value, pressing enter accepts the new value. Once all the values have been changed the LCD will display the message
"Press reset to update settings."
Pressing reset will now restart the inverter with the new settings.

8. Fault Finding

(a) Overload

The inverter can be overloaded if a high overload current trips the electronic overload sensor causing the Error LED to come on, and the LCD will show Error! OverLoad. This must be reset by pushing the RESET BUTTON . Ensure that the load causing the inverter to be overloaded is disconnected before restarting.

All other Errors will also cause the Error LED to come on and the display will show Error! And then The appropriate error, these can be:
Over Temperature – Caused when the heatsink temperature rises above 80˚C
Over voltage – Caused when the battery voltage rises above the Battery high setting
Overload – As above
Under Voltage – Caused when the battery voltage falls below the battery low setting
Short Circuit – Caused when the AC output is subjected to a dead short or a massive overload
Remove the cause of the error before pressing reset.

9. Service and Warranty

Service is available from MLT´s network of agents.

MLT Drives manufacturers the inverters and supplies a one year limited warranty.

10. Specifications

	36v	**48v**
Input Voltage Range	32V to 43.2V	40.8V to 67.4V
Output Voltage	230VAC ± 5%	230VAC ± 5%
Number of Output Phases	One	One
Output Frequency	50Hz ± 1%	50Hz ± 1%
Waveform	Pure Sine wave	Pure Sine wave
Nominal Apparent Power	6000VA	6000VA
Operating Ambient Temperature	-5ºC to 50ºC	-5ºC to 50ºC
Efficiency (between 2500W and 5000W)	> 88%	> 90%
No Load Loss	< 85W	< 85W
Standby current	1,3 amps	1,2 amps
Overload profiles	150% for 10 seconds 200% for 5 seconds	150% for 10 seconds 200% for 5 seconds
Output Overload Protection	✓	✓
Input Over-voltage Protection	✓	✓
Insulating Transformer	✓	✓
Dimensions	L420 x D460 x H460	L420 x D460 x H460
Weight	68 KG	68 KG

11. About MLT Drives

MLT Drives CC was established in 1986, based on Michel Malengret's idea of "contributing to the development of Africa through manufacturing excellent products while developing skills in-house". This philosophy is carried through all levels of business: from the way clients are serviced, to the way the research and development of new projects are tackled.

MLT Drive's products are used extensively across the globe. Approximately 15000 inverters are currently in use, from small rural villages to large installations in both remote areas and developed cities.

A privately owned company, with revenue climbing from ZAR 3 million (US$300 000) in 2001 to ZAR 7 million (US$ 700 000) for 2002, MLT Drives has shown exceptional growth, and immense scope for further growth and development.

With 25 employees, MLT Drives is headquartered at the foot of Table Mountain in Cape Town, South Africa, with distributors in Germany, Italy, Syria, Australia, France, Thailand and India.

12. Other Products

MLT Drives CC also produces the following products. Contact us for more information:

Stand-Alone Mini Inverter – 300VA
- Stand-Alone Micro Inverter – 500VA – 850VA
- Stand-alone Midi Inverter – 1000va – 1500va- 2000va
- Stand-Alone Maxi Inverter – 4000VA –6000va

- Grid-Connected Inverters – please enquire for range

- Solar Power UPS
- Stand Alone UPS

- Industrial Battery Chargers
- Heavy Duty Industrial Battery Chargers

- Single-to-Three Phase Converters

- Wind Generator Regulators