

# Magnus Power

*ME3 Mobile Cabinet Three Phase Frequency Converter - Manual*

## ME3 Mobile Cabinet Three Phase Frequency Converter, Operation and Maintenance.



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## SPECIFICATION

Input Requirement	<p>Three Phase + Neutral      380/400/415V 50Hz</p> <p>Voltage Tolerance            +/-10%</p> <p>Frequency Tolerance         +/-5%</p>
Output Capability	<p>Three Phase + Neutral      115V Phase-Neutral</p> <p>Frequency                      200V Phase-Phase</p> <p>   400Hz +/-1%</p> <p>The maximum load permitted on any phase is one third of the total output rating</p> <p>There is no requirement for the load to be balanced on all phases</p> <p>The output neutral is linked to mains earth (ground) internally. This link may be removed if floating output is required, or if the output neutral is to be grounded elsewhere.</p>
Operating Environment	<p>0 to 40 degrees, derating to 30 degrees at 2000m</p> <p>40 to 60% RH (recommended)</p> <p>0 to 90% RH (extreme)</p> <p>Below 55dBA at 1m</p>

## OPERATING RESTRICTIONS AND SAFETY ADVICE

Ensure adequate air circulation around the unit in normal operation, for correct function of the cooling fans. Allow for the dissipation of waste heat produced by the Converter, which will amount to around 10% of its output rating when operating at full load. Do not attempt parallel operation of the Converter output with any other power source.

**Dangerous voltages are present at numerous points within the Converter, and great care should be taken if running with any of the covers removed.**

**The DC Busbars are alive at 750V dc during Converter operation. A fault current of hundreds of amps is available within the DC Circuitry, and great care should be taken if using tools in this area when there is any possibility of charge remaining. Discharge Resistors are connected across the DC Busbars, and these will take about 2 minutes to complete their task after power is removed.**

## **INSTALLATION AND COMMISSIONING**

Installation includes positioning the Converter, the provision of input and output cables and an input isolator, and connection of the input and output cables to the Converter terminals. Installation is normally carried out by the customer, or by an electrical contractor working on behalf of the customer.

Magnus Power recommends that the system is commissioned by one of their engineers after installation, but the customer may opt to carry out this work. It consists of checks on the operating environment, the voltage and phase rotation of the incoming supply, input and output connections at the Converter, and the earth (ground) connection. Internal plug-and-socket connections are checked for correct mating. After initial start-up of the system, its operation will be checked and any necessary adjustments made. Finally a demonstration of the operation of the system will be offered, and a commissioning status report will be prepared.

If Magnus Power does not carry out commissioning, it is recommended that when power is applied for the first time, the Output Circuit Breaker is left set to Off. The procedure is described elsewhere in this document.

## **Installation Procedure**

Position the Converter at the required location, and ensure that its weight is adequately supported. Allow at least 400mm clearance at the rear for air circulation, and for access to the circuit breakers (inside narrow door at rear). A similar clearance will be needed at the front, for ventilation and to allow an operator to reach the control panel.

Access to the sides of the machine is not required during normal operation, but may be needed for maintenance purposes. If flexible input and output cables of suitable length are fitted during installation, it will be possible to move the machine on its casters between a normal service position where it takes up least space, and a maintenance position offering all round access.

The input and output terminals are at the lower rear of the cabinet behind a removable terminal cover, which may be drilled for cable access. Connect the output (load) and input (supply) cables as indicated by the terminal labels, ensuring a sound supply earth (ground) connection to the earth terminal.

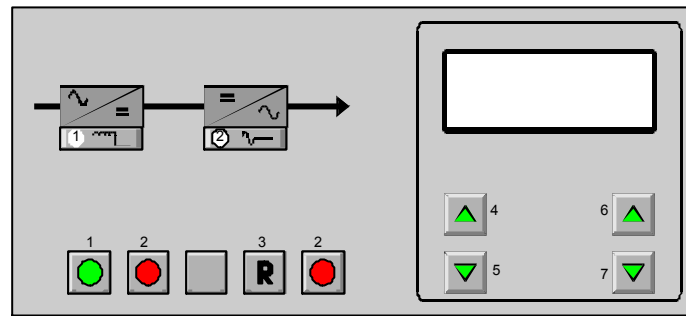
It is common practice for the neutral of any ac supply system to be grounded (earthed) at its source, and for the converter input this link is usually made by the supply authority at their substation. In accordance with this principle, the output neutral of the Converter is grounded internally. If you require floating output, or if your distribution system has an existing neutral earthing link, you will need to remove the internal link. Instructions for removal of the link will be provided on request.

When installation is complete, refit the terminal cover, to prevent casual access to the electrical connections.

## GENERAL ARRANGEMENT



## CONTROL PANEL



Indications are given by a mimic diagram, and a four-line alphanumeric display. The pushbuttons on the mimic diagram control the operation of the Converter, and the buttons below the display allow scrolling of its contents.

The first two lines of the display provide measurements of input and output values, and the third and fourth lines give status messages.

During normal operation of the Converter, the mimic diagram will show no indications, and the status display will read “Power System – OK” and “P.S. Use – nnn Days”.

### Pushbutton Controls

Start Output	(green)
Stop Output	(red, press both)
Reset Alarm Indication	(“R”)
Scroll Status Display	(up and down)
Scroll Meter Readings	(up and down)

### Mimic Diagram Indicators

Supply Voltage Low	(red, in left hand box on mimic diagram)
Output Off	(red, in right hand box on mimic diagram)

## **SWITCHGEAR COMPARTMENT**

Access to this area is via the narrow door at the rear of the Converter, to the right of the terminal cover. It contains the Auxiliary Power Supply Switch, the Input Circuit Breaker and the Output Isolator.

Setting either the Input Circuit Breaker or the Output Isolator to the Off position will prevent output, but various parts of the Converter will remain alive, including the input terminals. To ensure that all connections are dead, isolate the Converter elsewhere and wait at least two minutes to allow stored voltages to decay before touching any internal component.

### **Auxiliary Power Supply Switch**

The Converter includes a small rechargeable battery, which ensures a continued supply of power to the control electronics during supply transients, or extreme step changes of load. The Auxiliary Power Supply Switch controls the flow of power from the battery to the control electronics, and should be switched off during a planned disconnection of the Converter from the Supply of more than 1 hour, to avoid unnecessary discharge of the battery.

If the battery becomes discharged as a result of an unexpected break in the supply, such as a power cut outside working hours, it will be recharged automatically when the supply is restored.

If the Auxiliary Power Switch is left set to Off then the Converter will appear to operate normally, but it may shut down unnecessarily during supply transients or under extreme load conditions.



## **FIRST START UP**

Before starting the Converter for the first time after installation, set the Output Isolator to Off. Set the Auxiliary Power Switch to On, and check that the mimic diagram indicates Supply Voltage Low and Output Off. After connecting power with the Input Circuit Breaker On, check that the Supply Voltage Low indicator (red light in the left hand box on the Control Panel) goes off within 10 seconds. If this does not happen, set the Input Circuit Breaker to Off, and seek technical advice.

If the Control Panel illuminates as described, allow the starting sequence to complete to the Standby Condition as described in the following paragraph, and then continue through Starting Up and Shutting Down. The Output Isolator may now be closed, and the Converter may be used as described under Normal Operation.

## **NORMAL OPERATION**

### **Standby Condition**

On application of input power, either externally or by setting the Auxiliary Power Switch and the Input Circuit Breaker to On, the Converter will initialise. During this process, which may take up to 30 seconds to complete, there may be an indication of Supply Voltage Low before the display changes to Output Off.

This is the Standby condition, in which the Converter is ready to run but is not producing any output. The status message display will read “Inverter Off” and the audible alarm will sound. Press the Reset button to silence the alarm and to clear the status message.

### **Starting Up**

Press the green Start Output button to commence operation. The mimic diagram indication will change from Output Off to no indications, and if the Output Circuit Breaker is On, power will be supplied to the load.

The status messages will read “Power System - OK” and “P.S Use – nnn Days”.

### **Shutting Down**

Press both of the red Stop Output buttons. The Converter will revert to the Standby condition, and the mimic diagram indication will change from no indications to Output Off. The status message display will read “Inverter Off” and the audible alarm will sound. Press the Reset button to silence the alarm and clear the status message.

Disconnect the load (if required) by setting the Output Isolator to Off.

Remove Converter input power (if required) by setting the Input Circuit Breaker to Off, or by setting the Auxiliary Power supply switch to Off and isolating elsewhere.

### **Restarting after a Supply Interruption**

If a power cut occurs during normal operation, then when power is restored the Converter will initialise to the Standby condition. The status message display will read “Inverter Off” and the audible alarm will sound. Press the Reset button to silence the alarm and to clear the status message.

Press the green Start Output button to commence operation. The mimic diagram indication will change from Output Off to no indications and if the Output

Isolator is On, power will be supplied to the load.

The status messages will read “Power System - OK” and “P.S. use – nnn Days”.

## **ALARM CONDITIONS**

### **Overload**

The status messages will be “WARNING” and “Overload” and the audible alarm will sound. Press the Reset button to silence the alarm and to clear the status message.

If either the magnitude or the duration of the overload is beyond the capability of the Converter, it will shut down to the Standby condition. Extreme overload conditions may cause the Converter to shut down completely, in which case a Supply Voltage Low indication will also be given.

Investigate and if necessary remove the cause of the overload, observing any necessary safety precautions before making adjustments to wiring. Restart the Converter by pressing the green Start Output button on the mimic diagram.

### **Over Temperature**

The status messages will be “WARNING” and “Over Temperature” and the audible alarm will sound. The Converter will shut down to the Standby condition.

Press the Reset button to silence the alarm and to clear the status message, and check for any obstruction of the air inlets or outlets around the Converter. If no such cause can be found, it may be that a cooling fan has failed and will require replacement.

Restart the Converter by pressing the green Start Output button.

### **Short Circuit**

The status messages will be “WARNING” and “Short Circuit” and the audible alarm will sound. The Converter will shut down to the Standby condition.

Press the Reset button to silence the alarm and clear the status message. Remove the cause of the short circuit, taking any necessary safety precautions before making adjustments to wiring.

Restart the Converter by pressing the green Start Output button.

### **Inverter Fault**

The status messages will be “WARNING” and “Inverter Fault” and the audible alarm will sound. The Converter will shut down to the Standby condition.

Press the Reset button to silence the alarm and clear the status message, and restart the Converter by pressing the green Start Output button.

This error condition has a number of possible causes, and may be triggered by an internal fault. If the failure is repeated it is likely that the Converter will require repairs. Do not make further attempts to restart the Converter.

## **UNREPORTED PROBLEMS**

Some error conditions will cause the Converter to disconnect itself from the incoming supply, and the resulting absence of internal power will prevent the display of any message or indication. It will be impossible to start the Converter until the problem has been solved.

The most likely cause during commissioning or after any changes to the site electrical installation is a phase rotation fault, and other possibilities are significant undervoltage or overvoltage of the supply. Any of these causes will require remedial action either by an electrician or by the supply authority.

It is also possible that an internal fault will prevent starting, in which case a service visit by an experienced engineer will be required.

## **ELECTRICAL MEASUREMENTS**

The first two lines of the alphanumeric display can provide a number of indications, including running time since last started, input and output voltage, and output current as a percentage of the maximum allowed.

The scroll buttons allow these values to be displayed in sequence.

## **MAINTENANCE**

### **Preventive Maintenance**

The intake fans draw air in through vents at the front of the Converter. Exhaust fans discharge the air through vents at the rear of the unit.

At suitable intervals, check that any visible fans are operating normally, and that the air intakes are clear of any accumulation of fluff or dust.

### **Corrective Maintenance**

Spare parts are available from Magnus Power, and these can be fitted without the use of special tools. Provided the fault was correctly diagnosed, the Converter will return to normal operation after replacement of the defective part. In some cases, best results will be achieved by carrying out specialised adjustment procedures requiring the use of standard electronic test equipment.

For some failures, the defect and the effect may be in different places; for example a faulty output from a control printed circuit board may cause failure of one of the main power components. If only the power component is replaced, the failure will be repeated.

Because of the high MTBF of these Converters, it will be difficult for an on-site engineer responsible for only a small number of systems to become familiar with troubleshooting. The most cost-effective repair option will usually be to have the fault repaired by an experienced field service engineer. If immediate return to service after a breakdown is a priority, then a standby unit should be held on site.

### **Warranty Repair**

The standard Magnus Power warranty covers the cost of any repair that becomes necessary due to failure while in normal use during the specified warranty period, usually 12 months. It is unlikely that any unit will be out of order for more than 2 working days after having been reported as faulty.

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