



GEBRUIKERSHANDLEIDING/ USER'S MANUAL
BETRIEBSANLEITUNG / MODE D'EMPLOI

Mass SINE 12/1000 & 24/1000 - 117V / 60Hz

Mass SINE 12/1200 & 24/1500 - 230V / 50Hz

Mass SINE 12/2000, 24/2500 & 48/2500 - 230V / 50Hz

Mass SINE 12/2000 & 24/2500 - 117V / 60Hz



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1 GENERAL INFORMATION

1.1 USE OF THIS MANUAL

This manual serves as a guideline for safe and effective operation, maintenance and possible correction of minor malfunctions of the inverter. It is therefore obligatory that every person who works on or with the inverter must be completely familiar with the contents of this manual, and that he/she carefully follows the instruction contained herein.

Installation of, and work on the inverter, may be carried out only by qualified, authorized and trained personnel, familiar with the locally applicable standards and taking into consideration the safety guidelines and measures (chapter 2 of this manual).

1.2 GUARANTEE SPECIFICATIONS

Mastervolt guarantees that this unit has been built according to the legally applicable standards and specifications. Should work take place, which is not in accordance with the guidelines, instructions and specifications contained in this user's manual, then damage may occur and/or the unit may not fulfil its specifications. All of these matters may mean that the guarantee may become invalid.

1.3 QUALITY

During their production and prior to their delivery, all of our units are exhaustively tested and inspected.

The guarantee period is two years.

1.4 VALIDITY OF THIS MANUAL

All of the specifications, provisions and instructions contained in this manual apply solely to the Mastervolt-delivered standard versions of the MASS inverter.

1.5 LIABILITY

Mastervolt can accept no liability for:

- damage due to use of the inverter;
- possible errors in the manuals and the results thereof.



CAREFUL !

Never remove the type number plate.

Important technical information required for service, maintenance & secondary delivery of parts can be derived from the type number plate.

1.6 CHANGES TO THE INVERTER

Modifications to the inverter may be carried out only after the written permission of Mastervolt.

2 SAFETY GUIDELINES AND MEASURES

2.1 WARNINGS AND SYMBOLS

Safety instructions & warnings are marked in this manual by the following symbols:



CAREFUL !

special data, restrictions and rules with regard to preventing damage.



WARNING refers to possible injury to the user or significant material damage to the charger if the user does not (carefully) follow the procedures.

2.2 USE FOR INTENDED PURPOSE

- 1 The inverter is constructed as per the applicable safety-technical guidelines.
- 2 Use the inverter only:
 - in a technically correct condition;
 - in a closed, well-ventilated room, protected against rain, moisture, dust and non condensing circumstances;
 - observing the instructions in the user's manual.



Never use the inverter in situations where there is danger of gas or dust explosion!

- 3 Use other than as mentioned above is not considered to be consistent with the intended purpose. Mastervolt is not liable for any damage resulting from failure to comply with the above.

2.3 ORGANIZATIONAL MEASURES

The user must always:

- have access to the user's manual;
- be familiar with the contents of this manual. This applies in particular to chapter 2, Safety Guidelines and Measures.

2.4 MAINTENANCE & REPAIR

- 1 If the inverter is switched off during maintenance and/or repair activities, it should be secured against unexpected and unintentional switching on:
 - switch off the connection with the batteries or remove the **inverter fuse**;
 - be sure that third parties cannot reverse the measures taken.
- 2 If required, use only original spare parts. The inverter has no serviceable parts, except the fan and pcb.

2.5 WARNING FOR SPECIFIC DANGERS

- 1 Connect the earth of the inverter output to the central ground and use a RCCB switch in the inverter output.
- 2 Protect the DC wiring with a **fuse**, according to the guidelines in this users manual.
- 3 Check the wiring at least once a year. Defects such as loose connections, heat damaged cables etc. must be corrected immediately.

- 4 Do not work on the inverter or the system if it is still connected to a current source. Only allow changes in your electrical system to be carried out by qualified electricians.
- 5 Connection and protection must be done in accordance with local standards.
- 6 Before opening the cabinet of the inverter, switch off the mains and remove the inverter fuse.

Setting the switch on the front of the inverter to 'off' is not sufficient !

2.6 WARNING REGARDING LIFE SUPPORT APPLICATIONS

Mastervolt products are not sold for applications in any medical equipment intended for use as a component of any life support system unless a specific written agreement pertaining to such intended use is executed between the product manufacturer and Mastervolt. Such agreement will require the equipment manufacturer either to contract for additional reliability testing of the Mastervolt parts and/or to commit to undertake such testing as a part of the manufacturing process. In addition such manufacturer must agree to indemnify Mastervolt from any claims arising from the use of Mastervolt parts in the life support equipment.

3 INSTALLATION



During installation and commissioning of the MASS inverter, the Safety Guidelines and Measures are applicable at all times. See chapter 2 of this manual.



Never remove the type number plate!
Important technical data required for service, maintenance and later delivery of parts can be obtained from the type number plate (see fig. 1).

3.1 ENVIRONMENT

Install the MASS inverter in a dry, well ventilated, dust free situation. Locate the inverter as close as possible to the DC distribution in order to keep the battery cables short. Do not locate the inverter in the same compartment as the batteries. The heat of the inverter is discharged by a fan with a variable speed, from the top and side of the cabinet to the bottom of the cabinet.

When fitting the inverter be sure that:

- the air flow is not obstructed;
- the inverter is mounted vertically;
- no water and/or dust can enter the cabinet.



Never use the inverter in locations where there is gas or explosion danger!

3.2 WIRING

The routing of the wires has influence on the EMC behaviour of the system in which the inverter is a component. This is caused by the fact that wires are excellent receivers and transmitters of radio frequency electro magnetic interference. Most problems originate from mutual influencing between wires and cables.

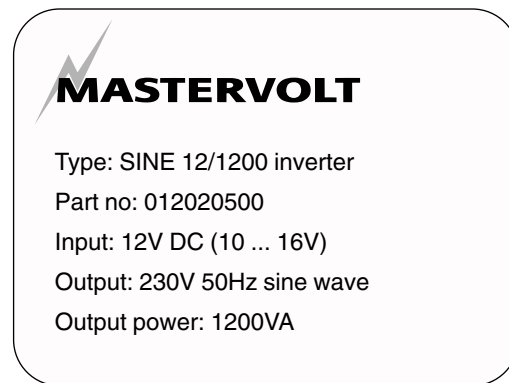


Fig. 1: Type number plate Mass Sine inverter.

3.3 MOUNTING OF THE CABINET

To mount the MASS inverter follow the described instructions:

- 1 Determine the mounting points (see fig. 2 and 3).
- 2 Drill mounting holes for the cabinet.
- 3 Mount the MASS inverter with four screws or bolts (M6) to the wall.
- 4 Fasten all screws or bolts securely.

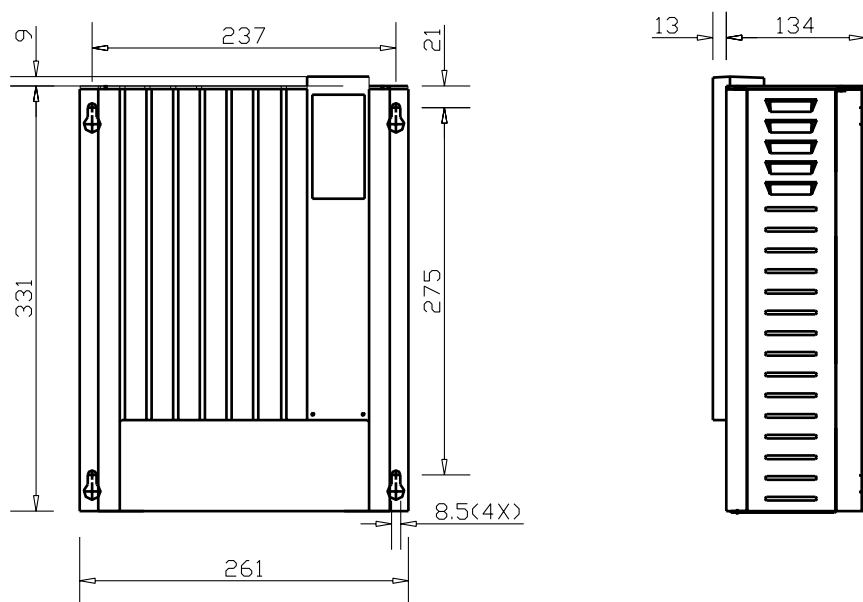


Fig. 2: Mounting points Mass Sine 12/1200, 24/1500 230V / 50Hz and Mass Sine 12/1000, 24/1000 117V / 60Hz.

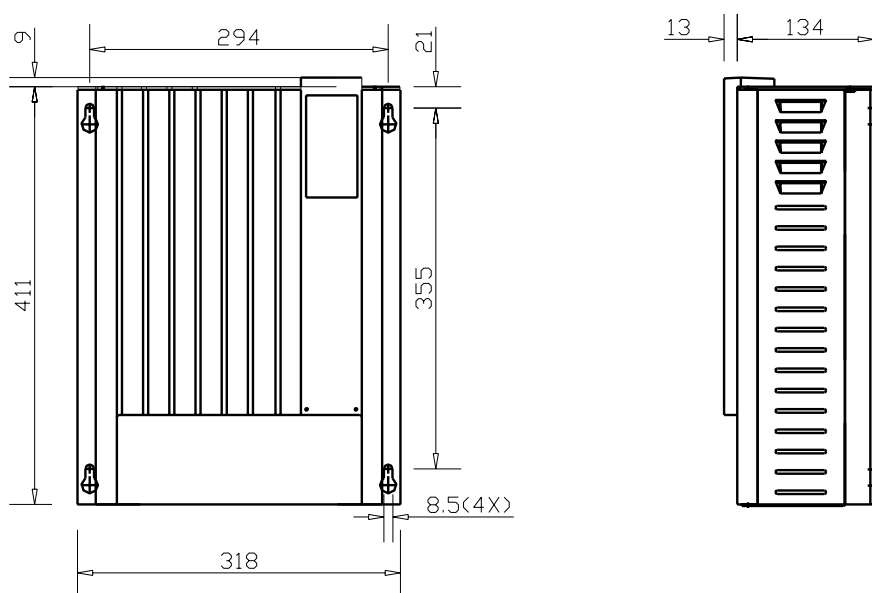


Fig. 3: Mounting points Mass Sine 12/2000, 24/2500, 48/2500 230V / 50Hz and Mass Sine 12/2000, 24/2500 117V / 60Hz.

3.4 CONNECTING

The Mastervolt Service Centers have all accessories available, e.g. battery terminals and supply cables in all sizes.



Before beginning to connect the wiring, make the AC and DC distribution voltage-free.

Opening the front panel

Remove the two Philips screws from the front panel of the cabinet. Pull the grey front panel away from the cabinet (downwards). The terminals and cable glands are now accessible (see fig. 4).

3.4.1 Connecting AC wiring & earth wiring

General:

The inverter is protected against overload and short circuit, so it is not necessary to install a fuse in the output of the inverter.



IMPORTANT!

For safe installation it is necessary to:

- connect the earth (PE) and neutral (N) of the inverter output to the central ground;
- insert a RCCB (earth leakage) switch of 30mA in the inverter output.



Check whether the voltage from the inverter is the same as the connected equipment.



The earth wire offers protection only if the inverter cabinet is connected to the earth. Connect the inverter's earth terminal (at the right hand side of the AC terminal block) to the hull or chassis.

To connect the MASS Sine inverters:

Switch the on/off/remote switch to 'OFF'. The L1, N and PE terminals are situated on the left hand side inside the cabinet.

Connect the AC on-board system brown phase 1.5-2.5 mm² wire to terminal L1, the blue 0-phase wire to terminal N and the green/yellow earth wire to terminal PE (see fig. 4).

3.4.2 DC wiring

Keep the cable length as short as possible, this will keep the system efficiency as high as possible. The recommended minimum size of the battery cables is:

	12/2000 & 24/2500	48/2500	12/1200 & 24/1500
cable thickness	50 mm ²	35 mm ²	35 mm ²

The recommended length is a maximum of 6 meters. When longer cables are required, use thicker cables. When possible, use coloured (red and black) battery cables. If this is not possible, mark the cables with red and black isolation tape or heat shrink sleeve.

Battery cable connections

Pull the battery cables through the glands at the bottom side of the inverter. Keep the cable connection between batteries and inverter as short as possible (maximum 6 meters). Connect the black negative battery cable to the negative connection bolt (right) and the red positive battery cable to the positive bolt (left) of the inverter. Cut the cables to the right length and fix, if necessary, connect cable clamps to both ends. Connect the negative cable to the negative battery pole and the positive cable via the inverter fuse to the positive red pole (see fig. 4).



Pull the battery cables through the glands before you install the cable clamps.

**CAREFUL !**

Reversing positive and negative will cause major damage to the inverter. This damage is not covered by the guarantee.

**CAREFUL !**

Too-thin cables and/or loose connections can cause dangerous overheating of the cables and/or terminals. Therefore tighten all connections well, in order to limit transition resistance as much as possible. Use DC cables of the correct size.

3.5 CONNECTING THE REMOTE CONTROL PANEL

The remote control panel C4-RI for the MASS inverter comprises an off/on switch and two LEDs. The LED 'inverter on' indicates proper functioning of the inverter and the availability of 230/117V AC output voltage. The LED 'failure' indicates overload, over-temperature or too low voltage. Connect the remote control panel by means of a telephone cable (not supplied with the panel), see fig. 5.

3.6 COMMISSIONING AFTER INSTALLATION

Carefully check the polarity of the connections.

**Careful !**

Only insert the inverter fuse if the polarity is correct. Switching on with incorrect polarity will damage the inverter irreparably. The inverter fuse cannot prevent this.

If the connections are correct:

- check whether the on/off switch is in the "OFF" position;
- when inserting the inverter fuse, a spark will occur, caused by the capacitor used in the inverter. This is normal.

The inverter is now ready for use.

3.7 AUTOMATIC SWITCHING BETWEEN MASS INVERTER, THE AC GENSET AND/OR SHORE POWER

Please contact your Mastervolt supplier if you intend to use the inverter with a genset or shore power connection. Handswitched or simple relay switching systems could damage your inverter, because of the lack off time delay. This kind of damage is not covered by the warranty.

Fig. 4: Connection of the Mass Sine.

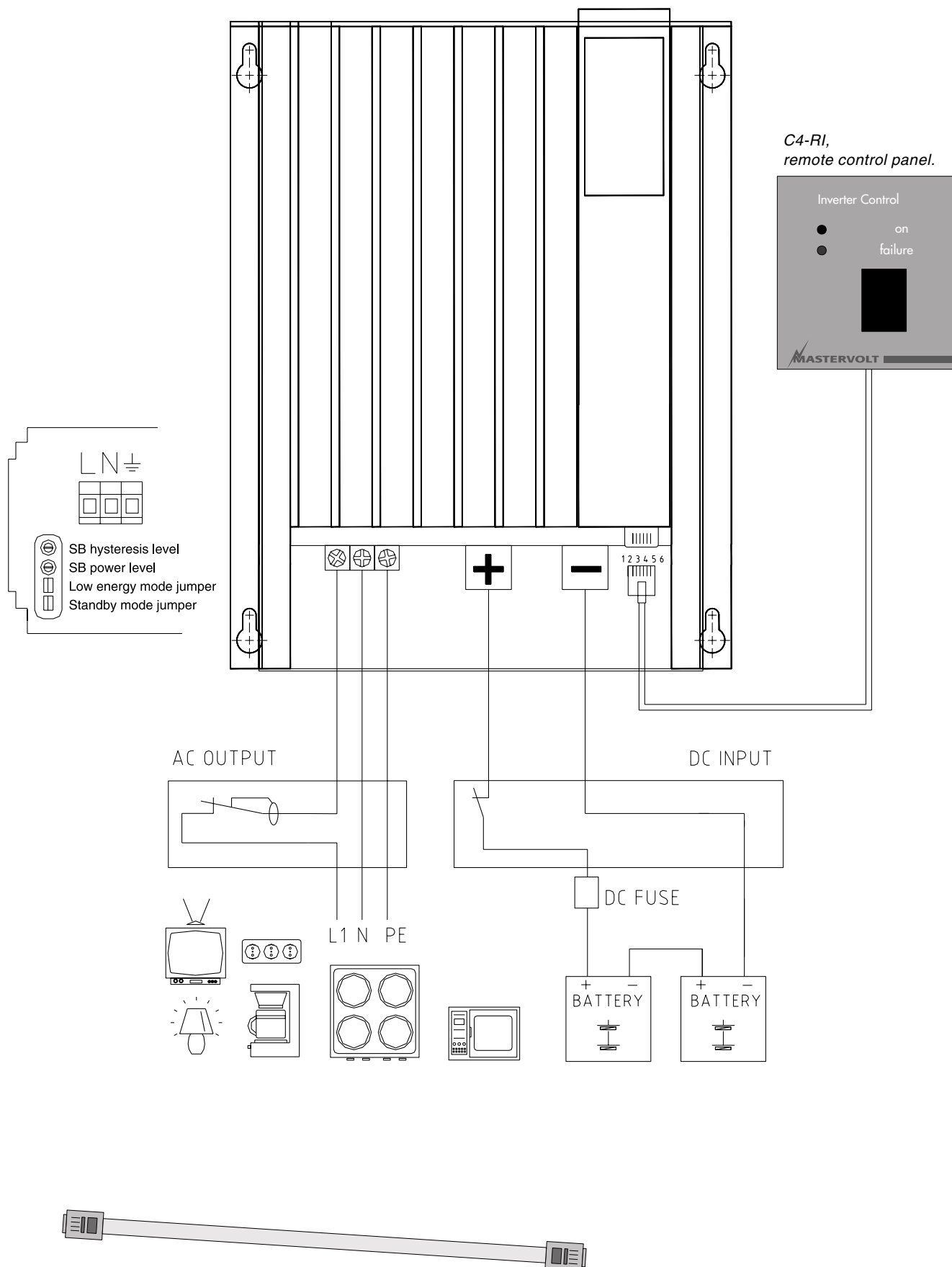


Fig. 5: Connection cable for panel C4-RI (not delivered as a standard).

4 OPERATION

4.1 INTRODUCTION

The MASS SINE inverter is a fully automatic high efficiency inverter, developed and produced by Mastervolt Amsterdam. The MASS SINE inverter is part of a series of advanced quality battery chargers and inverters supplied by Mastervolt all over the world. The MASS SINE inverter converts DC voltage to 230V AC, 50 Hz. The output voltage of 230V AC has a sinusoidal waveform for reliable and trouble free operation of connected equipment. The inverter is protected against overload, short circuit and over temperature. In case of overload, the inverter will reduce its output power. The MASS SINE inverter has a very high efficiency of 87%, due to the application of mosfets with high frequency switching technology.

4.2 SWITCHING ON AND OFF

Switching on:

Put the on/off/remote switch on the front of the inverter on "**on**". The green lamp "inverter on" lights up, and the inverter will start. If you use a remote control panel, put the on/off/remote switch to 'remote', and put the on/off switch on the remote control panel to 'on'.

Switching off:

Put the on/off/remote switch on the front of the inverter on "**off**". The inverter stops and all the lights that are on, go off.



Careful !

Switching off the inverter with the switch on the front does not break the connection to the mains. The inverter remains connected to the mains.

4.3 INDICATOR LIGHTS

The functions of the indicator lights on the front are:

inverter on:	inverter is switched on
overload:	inverter is overloaded
overload + on slow:	overload in 'wait' state
overload + on fast:	inverter is switched off
low battery:	battery voltage is too low
temperature:	inverter is overheated

Short description:

"inverter on"

The green light shows when the inverter is switched on.

"overload"

Glows if the inverter is overloaded. When the inverter is overloaded, the power limit reduces the output voltage. Depending on the load, the inverter will shut down after a short period.

"overload" + "on"

When the inverter is in a state of overload for a long period of time the inverter will switch off and the overload + on indicators will flash slowly. This takes approx. 20 seconds after which the inverter automatically will restart. This so called wait state gives the inverter time to recover from any heavy surge loads and the battery time to recover in case of an empty battery. When the inverter is switched of 10 times with intervals no more than 30 seconds apart the inverter will switch off permanently and the 'overload' and 'on' indicators will flash fast. To switch the inverter on again, you must manually switch the inverter off and on. When the output is short circuited, the inverter will go into overload. The 'overload' and 'on' indicators will flash slowly. The inverter will try to start up ten times. If the short circuit is not removed, the inverter will switch off permanently.

Remove the short circuit and reset the inverter by switching it off and on.

“low battery”

The inverter is switched off if the battery voltage is too low (see table below). If the voltage rises above the values given below, the inverter restarts automatically.

model	12V	24V	48V
switch off voltage	10V	19V	36V
switch on voltage	11V	22V	44V

“temperature”

The inverter switches off in high ambient temperatures and /or sustained overload. After cooling down, the inverter restarts automatically.

4.4 ON THE REMOTE CONTROL

If you use a remote control panel, put the on/off switch to ‘remote’, and put the on/off switch on the remote control panel to ‘on’.

The meaning of the illuminated LED’s is:

inverter on:	inverter is switched on
failure:	inverter is overloaded, overheated or battery voltage is too low

If the failure lamp is lit you can check the nature of the failure on the inverter front. See fig. 3 for a view of the panel.

5 MAINTENANCE

For a reliable and optimum function of the inverter, the following is required:

- Check at least once a year if all cable and wire connections are still firmly connected.
- Keep the inverter dry, clean and dust-free, in order to ensure good heat discharge.
- Check the fan operation (has a lifetime of at least 10 years in normal use).

6 TROUBLE SHOOTING

Malfunction	Possible cause	What to do
No output voltage and no indication lights (LED's off).	High output voltage.	Check battery voltage and switch charger off.
	DC fuse blown.	Replace the fuse.
	Switch set to remote, but no remote present.	Put switch at on.
No output voltage, LED low batt is lit.	Flat battery.	Charge the batteries, the inverter will switch on if the battery voltage is above 11/22/24V.
No output voltage and LED temp is lit.	The inverter has been overloaded.	Reduce the load and let the inverter cool down.
No output voltage and LED on is lit.	The inverter is in stand by mode.	Connect a load or change the jumper settings.
Low output voltage (208V).	Low power mode = jumper setting.	Connect a load > 30W or change jumper settings.
Inverter goes on and off, LED on and LED low bat are blinking in turn.	Flat battery.	Disconnect load and charge batteries.
	Cables too thin.	Replace with cables of correct diameter.
	Connections are corroded or bad.	Tighten the connections. If the cables are burned, replace them.
Inverter goes on and off, LED on and overload blink in turns one time per second, ventilator is running at full speed.	Inverter is overloaded.	Reduce the load on the inverter.
Inverter goes on and off, LED on and overload blink in turns five times per second, ventilator is running at full speed.	Inverter has been switched off ten times as a result of an overload situation or a short circuit.	Reduce the load or the short. circuit. Reset the inverter manually by means of the on/off switch.

If you cannot correct a problem with the aid of the malfunction table, contact your Mastervolt Service Center or Mastervolt Amsterdam for an extended service list, tel: INT+ 31-20-3422100.

7 TECHNICAL DATA 230V INVERTERS

GENERAL

Function apparatus	supplying of AC equipment
Models	Mass Sine 12/1200, 24/1500, 12/2000, 24/2500 and 48/2500
Manufacturer	Mastervolt, Amsterdam

INPUT 12/1200	12/1200	24/1500	12/2000	24/2500	48/2500
Battery voltage nominal	12 Volt	24 Volt	12 Volt	24 Volt	48 Volt
Switch off voltage low	10 Volt	19 Volt	10 Volt	19 Volt	36 Volt
Switch on voltage low	11 Volt	22 Volt	11 Volt	22 Volt	44 Volt
Switch off voltage high	16 Volt	32 Volt	16 Volt	32 Volt	62 Volt
Switch on voltage high	14 Volt	30 Volt	14 Volt	30 Volt	59 Volt
Maximal ripple	5% RMS				
Current (nominal load)	120A	80A	200A	120A	60A
No load (stand by)	50 mA/0.6W	25 mA/0.6W	50 mA/0.6W	25 mA/0.6W	13 mA/0.7W
No load power (low mode)	420mA/5W	210mA/5W	420mA/5W	225mA/5W	110mA/3W
No load (full power)	450mA/6W	225mA/6W	480mA/6W	250mA/6W	140mA/6W
Fuse	120A	80A	240A	160A	100A
DC cables	25 mm ²	25 mm ²	50 mm ²	50 mm ²	35 mm ²

OUTPUT

Output voltage	230 Volt, $\pm 5\%$				
Output waveform	true sine wave, $< 5\%$ thd				
Frequency	50 Hz, $\pm 0.1\%$				
Nominal power Tamb=40°C	1000 Watt	1200 Watt	1800 Watt	2000 Watt	2000 Watt
Half hour power Tamb=25°C	1200 Watt	1500 Watt	2000 Watt	2500 Watt	2500 Watt
Peak power	2400 Watt	2900 Watt	4000 Watt	5000 Watt	5000 Watt
Cos phi	all power factors allowed				
Efficiency nominal	89% / 92%				

CLIMATE

Nominal temperature	-20 till 40°C
Cooling	partial conventional / forced with temperature regulated fan
Humidity	$< 95\%$ relative humidity, non condensing

ENCLOSURE

Dimensions (h x w x d)	340 x 261 x 130 mm		420 x 318 x 136 mm		
Weight	8 kg	8 kg	14,6 kg	14,6 kg	14,6 kg
Protection degree	IP 23				

STANDARDS

Emmission	EN 50081-1:1992
Immunity	EN 50082-1:1997
Safety	IEC 950

7 TECHNICAL DATA 117V INVERTERS

GENERAL

Function apparatus	supplying of AC equipment
Models	Mass Sine 12/1000, 24/1000, 12/2000 and 24/2500
Manufacturer	Mastervolt, Amsterdam

INPUT 12/1000	12/1000	24/1000	12/2000	24/2500
Battery voltage nominal	12 Volt	24 Volt	12 Volt	24 Volt
Switch off voltage low	10 Volt	19 Volt	10 Volt	19 Volt
Switch on voltage low	11 Volt	22 Volt	11 Volt	22 Volt
Switch off voltage high	16 Volt	32 Volt	16 Volt	32 Volt
Switch on voltage high	14 Volt	30 Volt	14 Volt	30 Volt
Maximal ripple	5% RMS			
Current (nominal load)	120A	80A	200A	120A
No load (stand by)	50 mA / 0.6W	25 mA / 0.6W	50 mA / 0.6W	25 mA / 0.6W
No load power (low mode)	420mA/ 5W	225mA/ 5W	420mA/ 5W	225mA/ 5W
No load (full power)	450mA / 6W	225mA / 6W	480mA/6W	250mA/6W
Fuse	120A	80A	100A	63A
DC cables	25 mm ²	25 mm ²	50 mm ²	50 mm ²

OUTPUT

Output voltage	117 Volt, ± 5%			
Output waveform	true sine wave, < 5% thd			
Frequency	60 Hz, ± 0.1%			
Nomimal power Tamb=40°C	800 Watt	800 Watt	1800 Watt	2000 Watt
Half hour power Tamb=25°C	1000 Watt	1000 Watt	2000 Watt	2500 Watt
Peak power	2000 Watt	2000 Watt	4000 Watt	5000 Watt
Cos phi	all power factors allowed			
Efficiency nominal	88% / 91%			

CLIMATE

Nominal temperature	-20 till 40°C
Cooling	partial conventional / forced with temperature regulated fan
Humidity	< 95% relative humidity, non condensing

ENCLOSURE

Dimensions (hwxwd)	340 x 261 x 130 mm		420 x 318 x 136 mm	
Weight	8 kg	8 kg	14,6 kg	14,6 kg
Protection degree	IP 23			

STANDARDS

Emmission	EN 50081-1:1992
Immunity	EN 50082-1:1997
Safety	IEC 950

8 ENERGY SAVING MODES

8.1 LOW ENERGY MODE

For applications that require a very low energy mode, it is possible to set the inverter into “low energy mode”. The “low energy mode” can be selected by placing a jumper (black) on the two metal pins on the bottom left of the unit (see fig. 4).

When the jumper is in place, the unit will drop the output voltage from 230V to 208V at no load conditions. In case the inverter supplies 30W or more, the unit will supply 230V nominal output voltage.

8.2 STAND BY MODE

For applications that require an extremely low energy mode, it is possible to set the inverter to ‘stand by mode’. The stand by mode can be selected by placing a jumper (black) onto the metal pins on the bottom left hand side of the unit (see fig. 4). When the jumper is in place, the inverter will have no output voltage but will check the connected output load once every two seconds. The inverter will switch on when a load is detected. The stand by power and stand by hysteresis can be adjusted with the potentiometers on the bottom left of the unit (see fig. 4).

Stand by mode settings:

• energy mode	low /high energy mode
• stand by mode	on/off
• stand by power	0..40 Watt
• stand by hysteresis	0..100%

9 EC DECLARATION OF CONFORMITY



Manufacturer Mastervolt

Address: Snijdersbergweg 93
 1105 AN Amsterdam
 The Netherlands

Herewith declares that:

Product: MASS sine wave inverters

Models:	Mass Sine 12/1200-230V	Mass Sine 12/1000-117V
	Mass Sine 24/1500-230V	Mass Sine 24/1000-117V
	Mass Sine 12/2000-230V	Mass Sine 12/2000-117V
	Mass Sine 24/2500-230V	Mass Sine 24/2500-117V
	Mass Sine 48/2500-230V	

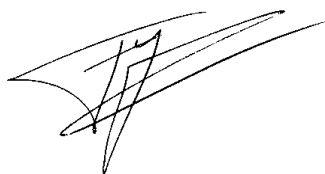
Conform with the provision of the EC:

EMC directive 89/336/EEC and amendments 92/31/EEC, 93/68/EEC.

The following harmonized standards have been applied:

Generic emission standard	EN 50081-1:1992
Generic immunity standard	EN 50082-1:1992
Safety according	73/23/EEG
Low voltage directive	EN60950/A4: 1996

Amsterdam,



Dr. F.J. ter Heide,
Managing director Mastervolt



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