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STROOM OP MAAT

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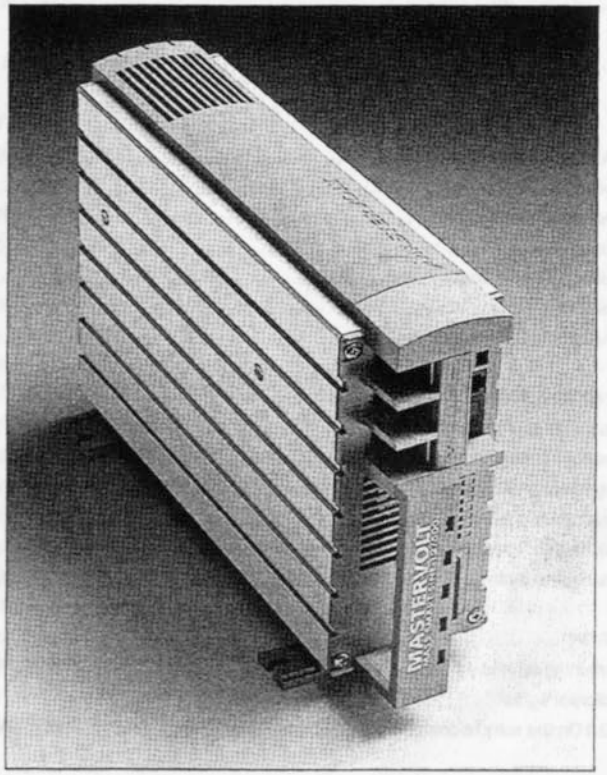
MASTERVOLT
TAILOR MADE ENERGY

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

MASS SINE 12/500

- 230V & 117V models SINE WAVE H.F.-



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CE

V1. March 2000

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 personel, familiar with the locally applicable standards and taking into consideration the safety guidelines and measures (chapter 2 of this manual).

This manual has 20 pages.

1.2 GARANTEE SPECIFICATIONS

Mastervolt quarantees 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 standard versions of the MASS inverter.

1.5 LIABLITY

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 QUIDELINES 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

a 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 technical correct condition;
- in a closed, wel-ventilated room, protected against rain, moisture, dust and non condensing circumstances;
- observing the instructions in the user's and installations 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 caried 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 0 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 OPERATION

3.1 SWITCHING ON AND OFF

Switching on: Put the on/off/remote switch on the front of the inverter on **"I on"**. The green lamp "inverter on" lights up, and the inverter will start. 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'.

Switching off: Put the on/off/remote switch on the front of the inverter on **"0 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 batteries. The inverter remains connected to the batteries.

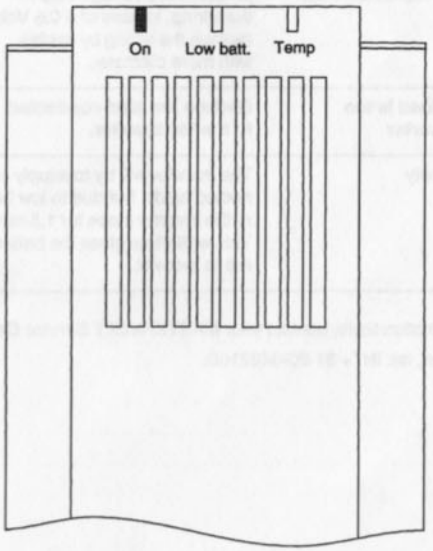


Fig. 1: Mass Sine 12/500 indicator lights.

3.2 INDICATOR LIGHTS

The functions of the indicator lights are (see fig. 1):

inverter on:	inverter is switched on
low battery:	battery voltage is too low
temperature:	inverter is overheated

Short description:

"inverter on"
The green led will be lit when the inverter is switched on. In case of an overload (and the inverter has been switched off) the green led will start to blink.

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

model	12V
switch off voltage	10V
switch on voltage	11V

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

3.2.1 On the remote control

In case of connecting a remote control panel, you can read the following after switching on the inverter:

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

4 TROUBLE SHOOTING

Malfunction	Possible cause	What to do
No output voltage	Battery voltage too low	Check battery voltage with a Voltmeter, disconnect the users or charge the batteries.
	Battery voltage too high	Check battery voltage, switch off the charger.
	Fuse in DC distribution failed	Replace failed fuse.
	Short circuit or overloaded	Disconnect load from the inverter.
	On/off switch on 'remote'	You can only use this switch if a remote control panel is connected. Switch the remote panel on/off switch to 'on'.
Inverter constantly switches on/off	Battery voltage too low	Check battery voltage, disconnect the users or charge the batteries.
	Loose connections in wiring	Check the wiring between inverter and battery for loose connections.
	Diameter battery cables too small	Measure the voltage drop in the wiring, in case of > 0.5 Volt replace the wiring by cables with more diameter.
LED "on" blinks and the inverter is switched off	**The connected load is too much for the inverter**	**Reduce the load connected to the the inverter.**
	The battery is empty	The inverter will try to supply connected loads, but due to low battery the inverter stops for 1,5 minute. This wait-state gives the battery time to recover.

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.

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 stil 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 TECHNICAL DATA 230V & 117V INVERTERS

GENERAL		
Function apparatus	supplying of AC equipment	
Models	MASS Sine 12/500	
Manufacturer	Mastervolt, Amsterdam	

INPUT	12/500 - 230V	12/500 - 117V
Battery voltage nominal	12 Volt	12 Volt
Switch off voltage low	10 Volt	10 Volt
Switch on voltage low	11 Volt	11 Volt
Switch off voltage high	16 Volt	16 Volt
Switch on voltage high	14 Volt	14 Volt
Maximal ripple	5% RMS	5% RMS
Current (nominal load)	50A	50A
No load (full output)	400 mA / 5W	400 mA / 5W
No load (low power)	375 mA / 4.5W	375 mA / 4.5W
No load (stand by)	40 mA / 0.5W	40 mA / 0.5W
Fuse	63A	63A
DC cables	25 mm²	25 mm²
OUTPUT		
Output voltage	230 Volt, ± 5%	117 Volt, ± 5%
Output waveform	true sine wave, < 5% thd	true sine wave, < 5% thd
Frequency	50 Hz, ± 0,1%	60 Hz, ± 0,1%
Nomimal power Tamb=40°C	450 Watt	450 Watt
Half hour power Tamb=25°C	500 Watt	500 Watt
Peak power	1000 Watt	1000 Watt
Cos phi	all power factors allowed	
Efficiency nominal	89% / 92%	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 (hxwxd)	310 x 190 x 100 mm (see fig. 3)
Weight	3 kg
Protection degree	IP 23

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

7 TECHNOLOGY

7.1 INTRODUCTION

The MASS SINE inverter is a fully automatic high efficiency inverter, developped and produced by Mastervolt Amsterdam. The MASS SINE inverter is part of a series 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 has a sinusoïdal 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, due to the application of mosfets with high frequency switching technology.

** or 117V / 60 Hz.*

8 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.

8.1 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 inver-ter is discharged by a fan with a variable speed, from the bottom of the cabinet to the side.

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!

8.2 WIRING

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

Starting points for wiring with good EMC properties: Lay the cables in metal cable trunking. The metal of the trunking offers a low resistance to interference currents, so that these currents run in the trunking. The DC cables are to be in contact with one another, as far as possible. The cables of different groups should not be twisted, but run in parallel. If trunking is not possible, lay the cables parallel to a metal bar. If this is not possible, make a cable bunch in which the cables run in parallel.

8.3 UNPACKING

In the box in which the inverter is delivered contains, in addition to the inverter:

- a guarantee card;
- this user's manual.

After unpacking, check the inverter for possible damage.

CAREFUL!
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. 2).

MASTERVOLT
Type: Mass Sine 12/500
Part no: 012020500
Input: 12V DC (10 ... 16V)
Output: 230V 50Hz sine wave
Output power: 500VA
CE

Fig. 2: Type number plate.

8.4 MOUNTING OF THE CABINET

For mounting the MASS inverter follow the described instructions:

1 Determine the mounting points (see fig. 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.

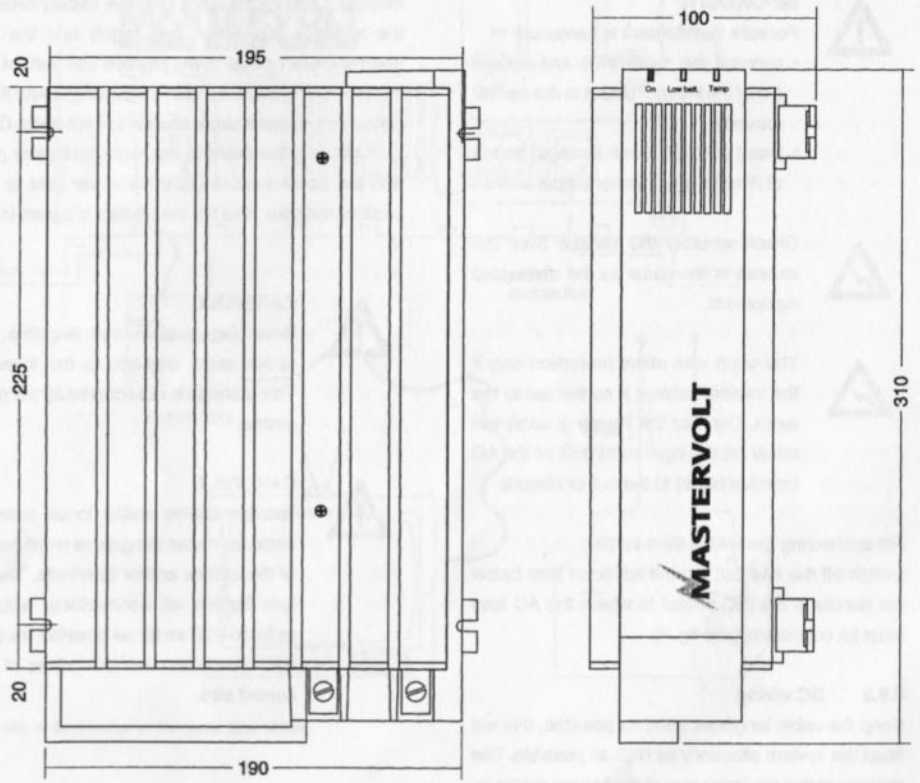


Fig. 3: Dimensions of the Mass Sine 12/500.

8.5 CONNECTING

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

8.5.1 Connecting the AC wiring and 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.

For connecting the MASS Sine 12/500:
Switch off the inverter. On the left hand side below the handle is the IEC socket to where the AC load must be connected (see fig. 4).

8.5.2 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:

	12V
cable thickness	25 mm²

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 sleve.

8.5.3 Battery cable connections

The Mastervolt Service Centers have all accessories available, like battery terminals and supply cables in all sizes. 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 the connection diagram in fig. 4.

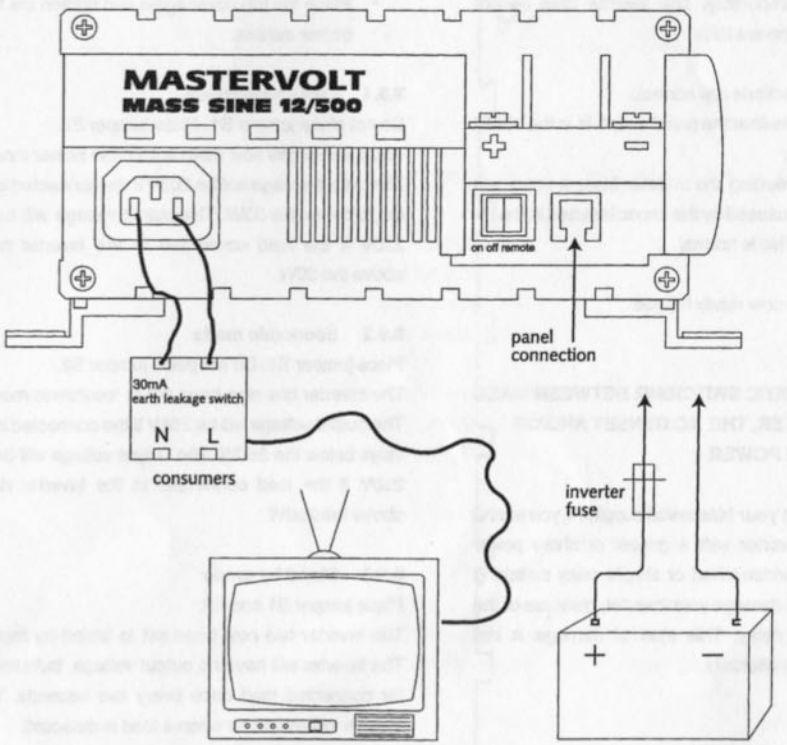
CAREFUL!
Reversing positive and negative will cause major damage to the inverter. This damage is not covered by the guarantee.

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 as far as possible transistion resistance. Use DC cables of the correct size.

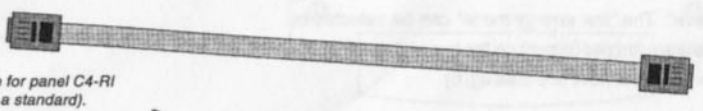
8.6 CONNECTING THE REMOTE CONTROL PANEL (see fig. 4)

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, overtemperature or too low voltage.

C4-RI, remote control panel.



Afb. 4: Connection of the Mass Sine 12/500.



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

8.7 COMMISSIONING AFTER INSTALLATION

Remove the inverter fuse, if placed already.

1 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 inreparably. The inverter fuse cannot prevent this.

2 If the connections are correct:
- check whether the on/off switch is in the "OFF" position;
- when inserting the inverter fuse, a spark will occure, caused by the capacitor used in the inverter. This is normal.

The inverter is now ready for use.

8.8 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.

8.9 LOW ENERGY MODE

For applications that request 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 (green) on the two metal pins on the corner of the front pcb (see fig. 6).

To change the jumper settings, act as follows:
- Pull the inverter away from the wall.
- Loosen the four corner screws from the top cover.
- Remove the top cover.
- The jumpers S1 and S2 are visible now.
- Set the jumpers to the desirable state (see table 1).
- Place the top cover again and tighten the four corner screws.

8.9.1 Low power mode

Do not place jumper S1. Place jumper S2.
The inverter has now been set to 'low power mode'. The output voltage will be 208V if the connected load stays below the 30W. The output voltage will be to 230V if the load connected to the inverter rises above the 30W.

8.9.2 Economic mode

Place jumper S1. Do not place jumper S2.
The inverter has now been set to 'economic mode'. The output voltage will be 208V if the connected load stays below the 250W. The output voltage will be to 230V if the load connected to the inverter rises above the 250W.

8.9.3 Stand by mode

Place jumper S1 and S2.
The inverter has now been set to 'stand by mode'. The inverter will have no output voltage, but checks for connected load once every two seconds. The inverter will switch on when a load is detected.

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Table 1,
jumper settings:

S1	S2	mode	output voltage
0	0	standard	230V
0	1	low power	208V < 30W
1	0	economic	208V < 250W
1	1	stand by	0V, switches on at load

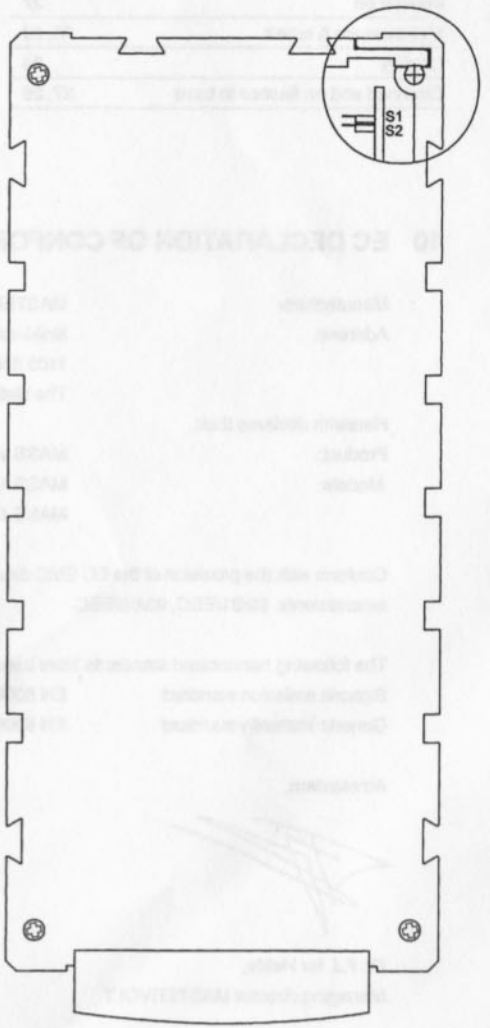

Fig. 6: Position of the jumpers at the MASS Sine 12/500.

9 LIST OF KEY WORDS

10 EC DECLARATION OF CONFORMITY

CE

Manufacturer	MASTERVOLT
Address:	Snijdersbergweg 93
	1105 AN Amsterdam
	The Netherlands

Herewith declares that:

Product:	MASS sine wave inverters
Models:	MASS 12-500-230V
	MASS 12/500-117V

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

Amsterdam,

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