MASTERVOLT
TAILOR MADE ENERGY

USERS- AND INSTALLATION MANUAL

Mass Sine 24/10000
Mass Sine 24/15000

Modular high power inverter system

MASTERVOLT
Snijdersbergweg 93, 1105 AN Amsterdam
The Netherlands
Tel.: +31-20-342 21 00
Fax.: +31-20-697 10 06
www.mastervolt.com

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1 GENERAL INFORMATION

1.1 Product description

The MASS SINE 24/10kVA inverter system consists of two DC/DC-converters and one DC/AC inverter. The MASS SINE 24/15kVA inverter system consists of three DC/DC-converters and one DC/AC inverter. The DC/DC-converters convert a low battery voltage into a high DC-voltage. The DC/AC inverter converts the high DC-voltage into a single phase sine wave AC voltage.

1.2 Use of this manual

This manual serves as a guideline for the safe and effective installation, operation, maintenance and possible correction of minor malfunctions of the MASS SINE inverter system.
It is therefore obligatory that every person who works on or with the MASS SINE inverter system must be completely familiar with the contents of this manual, and that he/she carefully follows the instructions contained herein. Installation of, and work on the MASS SINE inverter system may only be carried out 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).
This English manual has 24 pages.
Save this manual at a secure place!

1.3 Warranty Specifications

Mastervolt guarantees that this unit has been built according to the legally applicable standards and specifications. Mastervolt assures the product warranty of the MASS SINE inverter system during two years after purchase, on the condition that all instructions and warnings given in this manual are taken into account during installation and operation.
The warranty is limited to the costs of repair and/or replacement of the product by Mastervolt only. Costs for installation labour or shipping of the defective parts are not covered by this warranty.

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 SINE inverter system (Refer to chapter 7).

1.5 Liability

Mastervolt can accept no liability for consequential damage due to use of the MASS SINE inverter system, possible errors in the manual and the results thereof.

1.6 Identification labels

Important technical information required for service, maintenance & secondary delivery of parts can be derived from the identification labels. Therefore the identification labels may not be removed!

1.7 Changes to the MASS SINE inverter system

Modifications to the MASS SINE inverter system may only be carried out by Mastervolt.

2 SAFETY GUIDELINES AND WARNINGS

2.1 Warnings and symbols

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

CAREFUL!
Special data, restrictions and rules with regard to preventing damage.

WARNING!
A WARNING refers to possible injury to the user or significant material damage to the MASS SINE inverter system if the installer / user does not (carefully) follow the procedures.

2.2 Use for intended purpose

1. The MASS SINE inverter system is constructed as per the applicable safety-technical guidelines.

2. Use the MASS SINE inverter system only:
- in a technically correct condition;
- in a closed, well-ventilated area, protected against rain, moisture, dust and non condensing circumstances;
- observing the instructions in this manual.

WARNING!
Never use the MASS SINE inverter system 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 Organisational measures

The installer / user must always:
- have access to this manual;
- be familiar with the contents of this manual. This applies particularly to Chapter 2, Safety Guidelines & Warning.

2.4 Installation, maintenance and repair

If the MASS SINE inverter system 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 DC-fuses of all DC/DC-converters
- be sure that third parties cannot reverse the measures taken

2.5 Warning of special dangers

- Connect the Safety Ground (PE) of the DC/AC inverter output circuit to the central ground. For save installation it is necessary to connect the Neutral conductor (N) of the DC/AC inverter output circuit to the Safety Ground (PE) and to use a RCD switch in the inverter output circuit. Refer to local regulations on this issue.
- Protect both the DC battery wiring and the AC wiring with a fuse, according to the guidelines in this users manual. See specifications in chapter 7.1.
- Check the wiring at least once a year. Defects such as loose connections, heat damaged cables etc. must be corrected immediately.
- Do not work on the MASS SINE inverter system or the electrical installation if it is still connected to a power source. Only allow changes in your electrical system to be carried out by qualified electricians.
- Connection and protection must be done in accordance with local standards.
- Except the connection compartment, the cabinet of the DC/AC-inverter and/or DC/DC-converter may never be opened. There are no serviceable parts inside the cabinet. Only authorized qualified, authorized and trained electricity installers are authorized to open the connection compartment.
- Before opening the connection compartment of the DC/AC-inverter and/or DC/DC-converter, switch off the load and remove the DC-fuses of all DC/DC converters. Setting the switches on the front of the cabinets to ‘OFF’ is not sufficient!
- Not only the batteries, but the DC/DC-converters and the DC/AC-inverter are heavy as well! Ensure adequate mounting security and always use suitable handling equipment for transportation.

3 TECHNOLOGY

3.1 Introduction

This user's manual describes the installation and use of the Mastervolt MASS SINE 24/10kVA and 24/15kVA inverter systems. These inverter systems convert a low DC voltage to a high DC-voltage, which is subsequently converted to an AC voltage.

The Mastervolt MASS SINE inverter system consists of several modular components, as indicated in figure 1. Depending on the required power consumption, two or three DC/DC-converters transform the battery voltage of one or more battery sets to a high DC-voltage. The DC/AC-inverter converts this high DC-voltage into a single phase AC sine wave voltage.

3.2 The DC/DC-converter

The DC/DC-converter (Mass Power Module 5000) converts the battery voltage (24VDC) to a galvanic separated constant high DC-voltage (approximately 350VDC). The output current of this DC/DC-converter will increase when the required power consumption increases. One single DC/DC-converter can convert up to 5kW. By paralleling more DC/DC-converters larger powers can be converted: 10 kW if two DC/DC-converters are applied, 15kW if three DC/DC-converters are applied.
The DC/DC-converter has several protection devices that protect the converter and the batteries against too high or too low battery voltages, overload and over temperature.

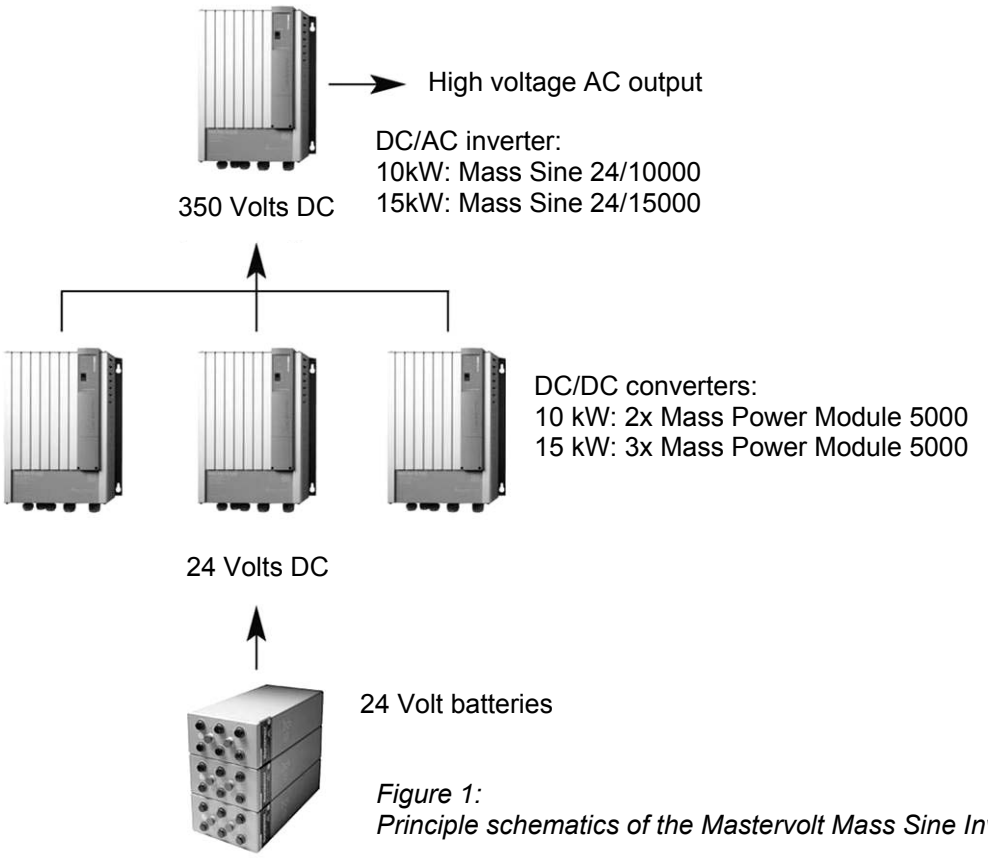


Figure 1:
Principle schematics of the Mastervolt Mass Sine Inverter System

3.3 The DC/AC-inverter

The DC/AC-inverter (Mass Sine 24/10000 or 24/15000) converts the high DC-voltage of the DC/DC-converters to a single phase AC voltage. This AC voltage has a sinusoidal waveform for reliable and trouble free operation of the connected equipment. Depending on the number of applied DC/DC-converters the DC/AC-inverter can convert a maximum nominal output power up to 15kW. The available output power can be doubled up to 10 seconds to meet high inrush currents of the connected load.
For protection reasons cut-out circuits against low input power, overload, over temperature and short circuit have been implemented.

3.4 Remote control panels

For remote controlled operation several Mastervolt control panels can be connected to the DC/AC-inverter. Refer to chapter 5.

3.5 Field of application

The MASS SINE inverter system is intended:

- as a DC to AC inverter;
- for use in recreational vehicles;
- for use in professional vehicles;
- for use in recreational and professional marine vessels;
- to be permanently installed, not portable;
- to be used with a DC fuse between the batteries and the DC-input of the DC/DC-converters (see chapter 5)

4 OPERATION

The MASS SINE inverter system is a fully automatic inverter system. Under normal circumstances there is no need for adjustment or operation. The MASS SINE inverter system is protected against overload, short circuit and over temperature. In case of overload or short circuit, the output power of the inverter system is limited.

WARNING!
Never disconnect any of the wiring during operation of the MASS SINE inverter system.

4.1 Switching On and Off

4.1.1 Switching On

1 Move the ON/OFF/REMOTE switches of the DC/DC-converters to the “REMOTE”-position. By moving this switch to the “REMOTE”-position, the operation of the DC/DC-converters is controlled by the ON/OFF/REMOTE switch of the DC/AC-inverter.
2 Move the ON/OFF/REMOTE switch of the DC/AC-inverter to the “ON”-position. If you use a remote control panel, put the ON/OFF/ REMOTE switch of the DC/AC-inverter to the “REMOTE”-position and put the on/off switch of the remote control panel to ‘ON’.

The green “inverter on" indicators illuminate and the inverter system will start. There will be a three seconds delay before the DC/AC-inverter will supply an output voltage.

4.1.2 Switching Off

Move the ON/OFF/REMOTE switch of the DC/AC-inverter to the “OFF”-position. If you use a remote control panel, put the on/off switch on the remote control panel to ‘OFF’.
Move the ON/OFF/REMOTE switches of the DC/DC-converters to the “OFF”-position.

The inverter system stops and all the indicators that are on, go off.

CAREFUL!
Switching off the DC/AC-inverter and/or the DC/DC-converter with the switch on front of the cabinets does not cut off the connection to the batteries or the high DC-voltage.

CAREFUL!
When the DC/DC-converters are switched to “ON” while the DC/AC-inverter is switched to “OFF”, the MASS SINE inverter system still consumes an idle power from the batteries.

4.2 Indicators

The operation of the DC/AC-inverter and the DC/DC-converters are controlled and checked by microprocessors. As long as none of the red indicators is illuminated, no failure is detected and the inverter system is operating normally. When one of the red indicators illuminates, a failure is detected. The cause of this failure is explained in the tables below.

Refer to chapter 6 (trouble shooting) if you cannot solve the problem by means of the tables below.

overload	low battery	high temperature	inverter on	Meaning
off	off	off	on	Normal operation. The DC/AC-inverter is switched on. Full AC power available on the output.
off	off	off	off	The DC/AC-inverter is switched off manually or no communication to the DC/DC-converters.
–	–	on	on	Internal temperature is too high. The DC/AC-inverter will switch off soon.
–	–	on	off	The DC/AC-inverter is switched off because of too high internal temperature.
–	on	–	on	High voltage DC-input power is too low. One or more DC/DC-converters are switched off.
–	on	–	off	High voltage DC-input power is too low. All DC/DC-converters are switched off. No AC- voltage on the output.
on	–	–	on	Too much load connected to the output. The DC/AC-inverter will switch off soon.
on	–	–	off	The DC/AC-inverter is switched off because of overload.

Table 1: Indicators of the DC/AC-inverter

overload	low battery	high temperature	inverter on	Meaning
off	off	off	on	Normal operation. The converter is switched on, Full DC power available on the output.
off	off	off	off	The DC/DC-converter is switched off manually or no DC-input voltage available.
–	–	on	on	Internal temperature is too high. The DC/DC-converter operates at half power.
–	–	on	off	The DC/DC-converter is switched off because of too high internal temperature.
–	on	–	on	DC-input voltage is too low. The DC/DC-converter operates at half power.
–	on	–	off	The DC/DC-converter is switched off because of too low DC-input voltage (see specifications).
on	–	–	on	No communication between the DC/DC-converter and the DC/AC-inverter.

Table 2: Indicators of the DC/DC-converter

4.3 Remote control panel (optional)

If a remote control panel is applied, you can switch on/off the inverter system by means of the panel's on/off switch.

The meaning of the remote panel's indicators is:

on: The inverter system is switched on
failure: An error is detected

If the failure indicator is lit you can check the cause of the failure on the front panel of the DC/AC-inverter or the DC/DC-converter. See tables 1 and 2.

4.4 Overload

If an overload situation lasts too long, the MASS SINE-inverter system will shutdown. After reducing the load, the DC/AC inverter will only restart if the unit is manually switched off and on again.

4.5 Maintenance

For reliable and optimum function examine your electrical installation on a regular base, at least once a year. Defects such as loose connections, burnt wiring etc. must be corrected immediately.
If necessary, use a soft clean cloth to clean the cabinets. Never use any liquids, acids and/or scourers

5 INSTALLATION AND COMMISSIONING

5.1 Before you start

During installation and commissioning of the MASS SINE-inverter system the Safety Guidelines and Measurements are applicable at all times. See chapter 2 of this manual.

Check from the Identification labels whether the battery voltage is the same as the input voltage of the DC/DC-converter (e.g. 24V battery set for a 24V input voltage). Also check whether the output voltage and output power of the DC/AC-inverter satisfy loading requirements.

5.2 Things you need

Make sure you have all the parts you need to install the MASS SINE inverter system:

MASS SINE 24/10kVA (27026000)	**MASS SINE 24/15kVA** (27027000)	Description
2	3	DC/DC-converters, part number 24093500 (included)
1	1	DC/AC-inverter; part number 24093100 (230V/50Hz) or 24093160 (208V/60Hz) (included)
4	6	DC-cables to connect the plus-inputs (+) of the DC/DC-converters to the plus poles of the DC-distribution; specifications: 50mm²/AWG 0; maximum length: 2m / 6ft; colour: red.
4	6	DC-cables to connect the minus-input (–) of the DC/DC-converters to the minus poles of the DC-distribution; specifications: 50mm²/AWG 0; maximum length: 2m / 6ft; colour: black.
4	6	DC-fuse holders with DC-fuses, to be integrated in the plus DC-cables. Specifications: 160A, according to VDE 0636 / IEC 269 / DIN43620
2	3	Double insulated wires (350VDC) to connect the positive output (+) of the DC/DC-converters to the positive inputs (+) of the DC/AC-inverter; specifications: 4mm²/AWG 11; maximum length: 50m / 160ft; colour: red
2	3	Double insulated wires (350VDC) to connect the negative outputs (–) of the DC/DC-converters to the negative inputs (–) of the DC/AC-inverter; specifications: 4mm²/AWG 11; maximum length: 50m / 160ft; colour: black
2	3	Modular 8-pole communication cables with 8 pole RJ45 connectors, cross wired. See figure 2.
12	16	Screws / bolts (Ø 6mm) (with plugs) to mount the cabinets to a wall
1	--	A double insulated cable 3x10mm²/AWG 7 to connect the AC output of the DC/AC-inverter to the AC-distribution; wire colours: brown – blue – green/yellow.
--	1	A double insulated cable 3x16mm²/AWG 5 to connect the AC output of the inverter to the AC-distribution; wire colours: brown – blue – green/yellow.
x	x	Batteries. Refer to chapter 7.1 for specifications
8	12	Cable lugs M8 to be fixed to the wire ends of the DC-cables 50mm²/AWG 0. First feed the cables through the cable glands of the cabinets before you fix the cable lugs to the wire ends!
3		Cable lugs M6 to be fixed to the wire ends of the AC-cables 3x10mm²/AWG 7. First feed the cables through the cable glands of the cabinets before you fix the cable lugs to the wire ends!
	3	Cable lugs M6 to be fixed to the wire ends of the AC-cables 3x16mm²/AWG 5. First feed the cables through the cable glands of the cabinets before you fix the cable lugs to the wire ends!
x	x	Appropriate cable terminals, battery terminals and cord end terminals. Use reliable terminals!

Table 3: Materials for installation of the Mass Sine inverter system

We recommend as a minimum tool kit:

- Socket wrench 13mm to fix the DC-input (battery) cables;
- Socket wrench 10mm to fix the AC-output cables;
- Flat blade screw driver 0,6 x 3,5 mm to fix the screw terminals of the double insulated wires;
- Tools to fix the screws / bolts (Ø6mm) (with plugs) to mount the cabinets to a wall;
- Philips screw driver to open the connection areas of the cabinets;

5.3 Environment

Obey the following stipulations during installation (also refer to the specifications, chapter 7.1)

- The DC/DC-converters and the DC/AC-inverter are designed for indoor use only.
- Mount the DC/DC-converters and the DC/AC-inverter vertically, on a solid wall, with the connecting cables downwards.
- Make sure that the hot air that is developed during operation can be discharged. The DC/DC-converters and the DC/AC-inverter must be mounted in such a way that obstruction of the airflow through the ventilation openings will be prevented.
- No objects must be located within a distance of 10 cm / 4 inch around the DC/DC-converters and the DC/AC-inverter.
- Locate the DC/DC-converters and the DC/AC-inverter as close as possible to each other in order to keep all cables short, but keep at least 10 cm / 4 inch in between the cabinets when installed next to each other.
- Do not locate the DC/DC-converters and the DC/AC-inverter in the same compartment as the batteries.
- A fuse must be integrated in all connections between the batteries and the DC/DC-converters. See specifications (chapter 7.1).
- The AC output of the MASS SINE inverter system must be connected to an AC-distribution consisting of groups that are each protected by an AC-fuse of 16 Amps maximum.

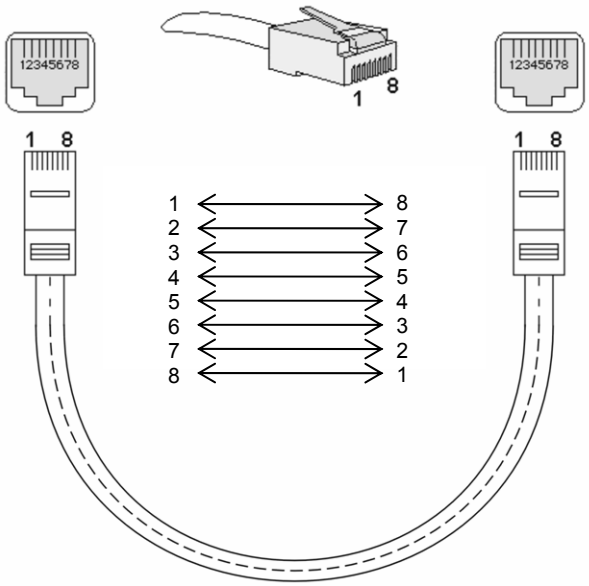


Figure 2: Modular 8-pole communication cables with 8 pole RJ45 connectors, cross wired

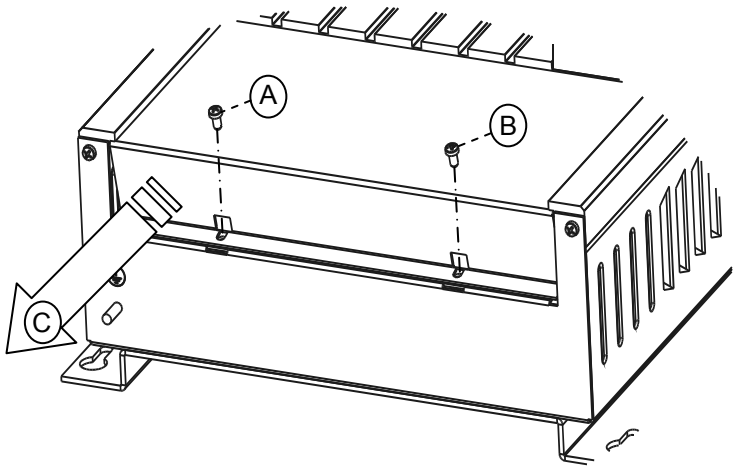
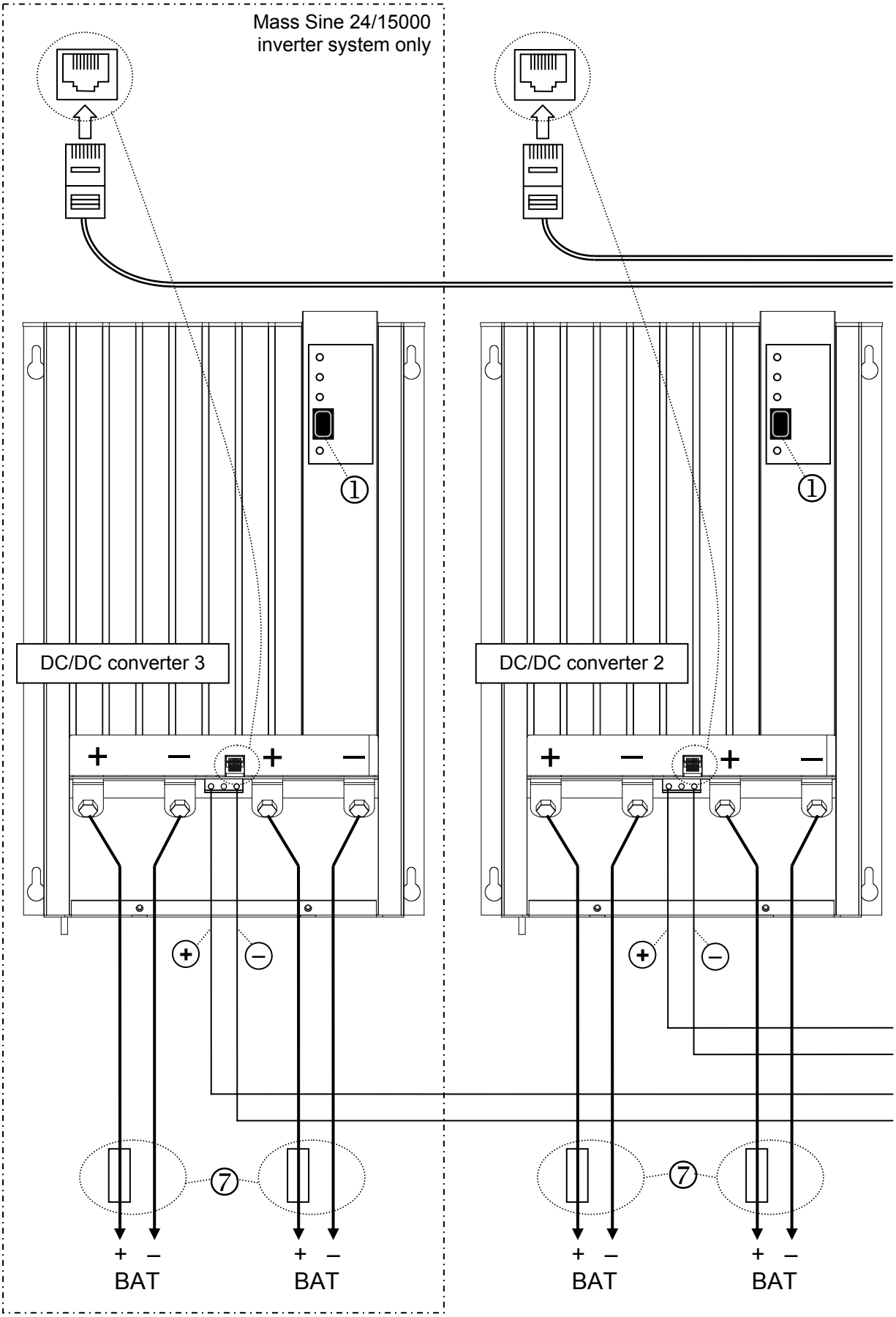


Figure 3: Opening the connection compartment


Mass Sine 24/15000
inverter system only
DC/DC converter 3
DC/DC converter 2
①
①
+ – + –
+ – + –
⑦
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+ – + –
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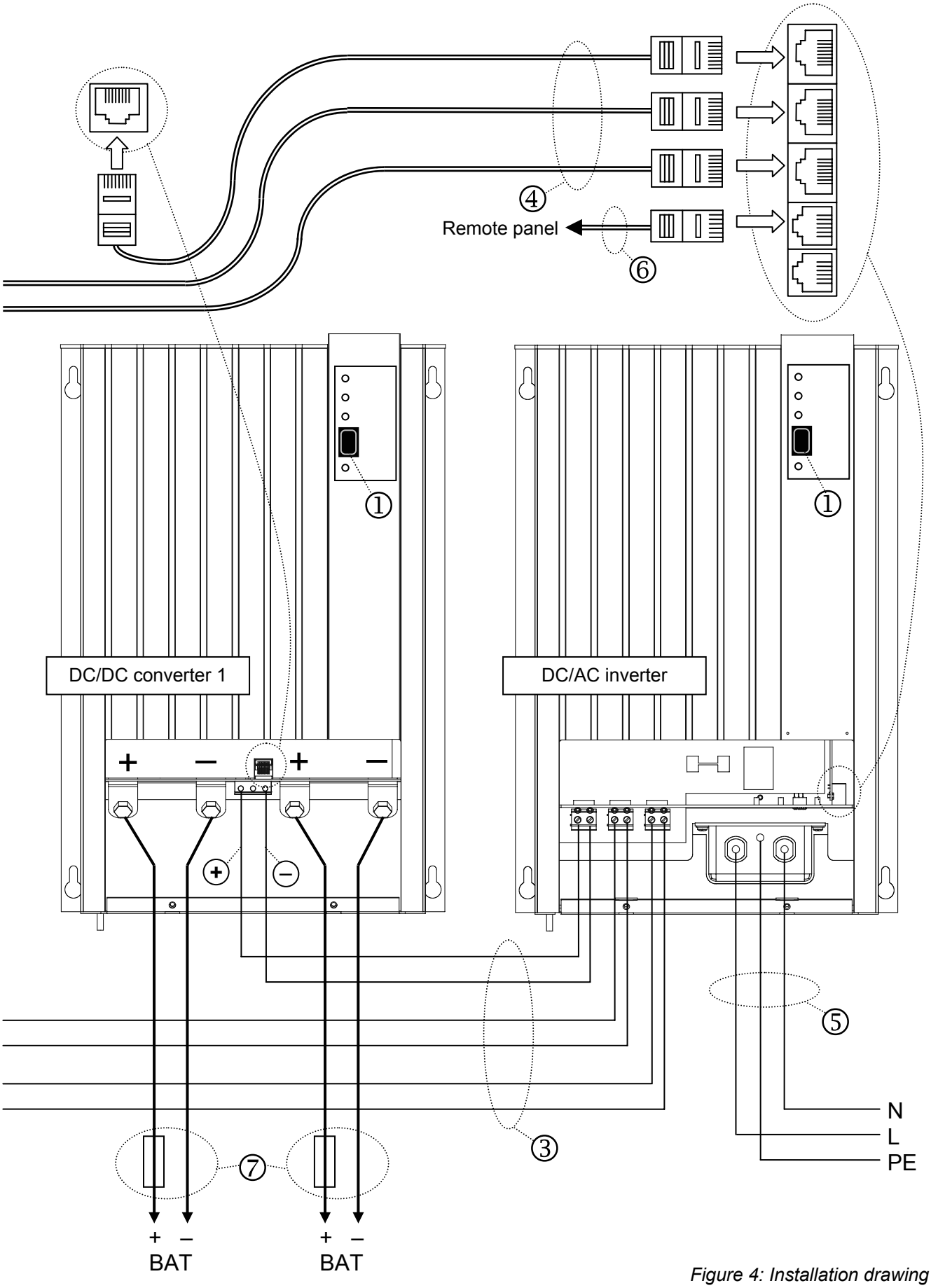


Figure 4: Installation drawing

5.4 Installation

5.4.1 Mounting of the cabinets

Take the following steps to mount the cabinets:

1 Determine for each cabinet the four mounting spots on the basis of the outline drawings (chapter 7.2 and 7.3).
2 Turn the screws / bolts (Ø 6mm) already into the wall but do not tighten them entirely.
3 Place the housing over the screws / bolts.
4 Fix the housing by fastening the screws securely.

5.4.2 Wiring

The wiring is connected inside the connection compartment, at the bottom side of the cabinets. If necessary, the cabling can be fed from the top to the bottom side of the cabinets along the backside of the cabinets. Feed all wires and cables through the cable glands provided.
The routing of the wires has influence on the EMC behaviour of the system in which the DC/DC-converters and the DC/AC-inverter are components. 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.

WARNING!
Short circuiting or reversing polarity may lead to serious damage to the batteries, the DC/DC-converters, the DC/AC-inverter, the cabling and/or the terminal connections. Fuses between the batteries and the DC/DC-converters can not prevent damage to the DC/DC-converters caused by reversed polarity. This damage is not covered by the warranty.

WARNING!
Be sure that all AC and DC systems are switched off or disconnected during installation. Remove the DC-fuses from the DC-distribution and/or disconnect the plus connections of the batteries prior to installation.

WARNING!
The ground wire offers protection only if all cabinets of the MASS SINE inverter system are connected to the system ground. Connect the inverter's earth terminal (PE) to the hull or the chassis.

WARNING!
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 far as possible. See chapter 7.1 for recommended torques.

Follow in detail all steps of the wiring instructions in order of succession as described below:

1 See figure 4, references ①. Move all ON/OFF/ REMOTE switches of the DC/DC-converters and the DC/AC-inverter to the “OFF”-position.
2 See figure 3. Open the connection compartments of the DC/DC-converters and the DC/AC-inverter by loosening the two Philips screws A and B that secure the front cover plate. Slide the front cover plate from the cabinet (C) (downwards).
3 Run the double insulated wires 4mm²/AWG 11 between DC-output(s) of the DC/DC-converters and the input(s) of the DC/AC-inverter. Strip the wire ends over 10 mm. Connect the cabling to the screw connectors according to figure 4, reference ③. The red cables on the plus (+) connections, the black cables on the minus (–) connections.
4 Run the modular 8-pole communication cables between the DC/DC-converters and the DC/AC-inverter. Connect these cables according to figure 4, reference ④.
5 See figure 4, reference ⑤. Run the AC wiring between the AC output of the DC/AC-inverter and the input of the AC-distribution. Feed the wiring through the cable glands of the cabinet, and then fix the cable lugs M6 to the wires ends. Connect the wiring according to figure 4. Fix the brown phase line wire to terminal L1, the blue neutral wire to terminal N and the green/yellow wire to terminal PE.
6 See figure 4, reference ⑥. If a remote panel is applied, run a communication cable between the DC/AC-inverter and the remote control panel (RI).
7 See figure 4, references ⑦. Run the DC-cables 50mm²/AWG 0 between the DC-distribution and the DC/DC-converters. Feed the cables through the cable glands of the cabinet, and then fix the cable lugs M8 to the wire ends. Integrate a fuse holder in each plus (red) cable. Do not install the DC-fuses in the fuse holders before the entire installation is completed (see chapter 5.5, “Commissioning after installation”). Connect the red cables to the plus-connections, the black cables to the minus connections.
8 Tighten all cable glands to ensure the pull relief
9 See figure 4. Check all wiring and connections.

Continue with chapter 5.5 for commissioning

5.5 Commissioning after installation

WARNING!
Make sure that the MASS SINE-inverter system has been installed according to the installation instructions in chapter 5.4. Check the polarity of all wiring prior to commissioning: plus connected to plus (red cables), minus connected to minus (black cables).
The DC-fuses may not have been placed in the fuse holders yet.
Make sure that no load is connected to the AC-output of the DC/AC-inverter during commissioning

Follow the steps described below to switch on the MASS SINE inverter system.

1 Disconnect the modular 8-pole communication cables from the modular sockets of all DC/DC-converters.
2 First the battery connections of all inverters are checked one by one. Keep the ON/OFF/ REMOTE switch of the DC/AC inverter in the “OFF”-position. Start with DC/DC converter 1 (see figure 4)
   a. Place the DC-fuses of this DC/DC-converter in the fuse holders to connect the batteries to the DC/DC-converter. When inserting the fuses a spark can occur, caused by the capacitors used in the DC/DC-converter; this is a normal situation.
   b. Move the ON/OFF/ REMOTE switch of this DC/DC-converter to the “ON”-position.
   c. After approximately 5 seconds the red “overload” indicator and the green “inverter on” indicator will illuminate. This indicates that the DC/DC-converter is working properly, although there is no communication with the DC/AC-inverter yet. Check chapter 4.2, table 2 if these indicators do not illuminate or if any of the other indicators are illuminated.
   d. Move the ON/OFF/ REMOTE switch of this DC/DC-converter to the “OFF”-position again. After a few seconds the indicators will go off again. Leave the DC-fuses of this DC/DC-converter installed.
3 Repeat steps 2a till 2d for DC/DC-converter 2 and DC/DC-converter 3 (Mass Sine 24/15000 only).

4 Now the installation of the modular communication cables is checked one by one. First move the ON/OFF/ REMOTE switch of the DC/AC-inverter to the “ON”-position. Keep the ON/OFF/ REMOTE switches of all DC/DC converters in the “OFF”-position. Commence with DC/DC converter 1 (see figure 4)
   a. Insert the modular 8-pole communication cable into the modular socket of this DC/DC-converter.
   b. After approximately 2 seconds the red “low battery” indicator of the DC/AC-inverter will illuminate. All other indicators are off. This indicates a good communication between this DC/DC converter and the DC/AC-inverter. If the red “low battery” indicator of the DC/AC-inverter does not illuminate, check the installation of the modular communication cable between this DC/DC converter and the DC/AC-inverter. See chapter 5.2 and figure 2 for specifications or see chapter 5.4.2, step 4 for correct installation
   c. Disconnect the modular 8-pole communication cable from the modular socket of this DC/DC-converter again.
5 Repeat steps 4a till 4c for DC/DC-converter 2 and DC/DC-converter 3 (Mass Sine 24/15000 only).
6 Next the operation of each DC/DC-converter in combination with the DC/AC-inverter is checked one by one. Make sure that all ON/OFF/ REMOTE switches of the DC/DC-converters are switched to the “OFF”-position.
7 Switch on and the DC/AC-inverter by moving the ON/OFF/ REMOTE switch of the DC/AC-inverter to the “ON”-position. Start with DC/DC converter 1.
   a. Move the ON/OFF/ REMOTE switch of this DC/DC-converter to the “REMOTE”-position.
   b. Now the green indicators “inverter on” on both this DC/DC-converter and the DC/AC-inverter will illuminate, indicating that AC-power is available on the output of the DC/AC-inverter. If this is not the case, refer to chapter 6 (trouble shooting)
   c. Move the ON/OFF/ REMOTE switch of this DC/DC-converter to the “OFF”-position again.
8 Repeat steps 7a till 7c for DC/DC-converter 2 and DC/DC-converter 3 (Mass Sine 24/15000 only).
9 Finally the MASS SINE-inverter system is put into operation. Close the front covers of the connection compartments of the DC/DC-converters and the DC/AC-inverter. Beware that the cabling does not obstruct the cooling fans.
10 Move the ON/OFF/ REMOTE switches of the DC/DC-converters to the “REMOTE”-position. When switched to “REMOTE”, the DC/DC-converters follow the operation of the DC/AC-inverter.
11 Move the ON/OFF/ REMOTE switch of the DC/AC-inverter to the “ON”-position (or to the “REMOTE” position if a remote control panel is applied).

After approximately five seconds the MASS SINE inverter system will switch on. Now the MASS SINE inverter system is in operation!

5.6 Decommissioning

If it is necessary to put the inverter system out of operation, follow the instructions in order of succession as described below:

1 See figure 4, references ①. Move the ON/OFF/ REMOTE switches of both the DC/DC-converters and the DC/AC-inverter to the “OFF”-position.
2 Remove the DC-fuses of the DC-distribution and/or disconnect connect the batteries.
3 See figure 3. Open the connection compartments of the DC/DC-converters and the DC/AC-inverter by loosening the two Philips screws A and B that secure the front cover plate. Slide the front cover plate from the cabinet (C) (downwards).
4 Check with a suitable voltage meter whether the inputs and the outputs of the DC/DC-converters and the DC/AC-inverter are voltage free.
5 Disconnect the AC-output of the DC/AC-inverter

Now the MASS SINE inverter system and its wiring can be removed in a safe way.

5.7 Storage and transportation

When not installed, store the DC/DC-converters and the DC/AC-inverter in the original packing, in a dry and dust free environment.

Always use the original packing for transportation. Contact your local Mastervolt Service Centre for further details if you want to return the apparatus for repair.

5.8 Re-installation

To reinstall the MASS SINE inverter system, follow the instructions as described in chapter 5.4.

6 TROUBLE SHOOTING

If you cannot solve a problem with the aid of the below table, contact your local Mastervolt Service Centre.

Malfunction	Possible cause	What to do?
No output voltage and no indicators are illuminated	The DC/AC-inverter is switched off manually.	Switch on the DC/AC-inverter by means of the ON/OFF/ REMOTE switch.
	ON/OFF/ REMOTE switch of the DC/AC-inverter is set to “REMOTE” while no remote control panel is applied.	Switch the ON/OFF/ REMOTE switch of the DC/AC-inverter to “ON”.
	Modular communication cables are disconnected or wrong communication cable(s).	See chapter 5.2 and figure 2 for specifications. See chapter 5.4.2, step 4 for correct installation.
	DC-fuse blown.	Investigate the cause of the fuse failure. Then replace the fuse.
	Battery voltage too high.	Check batteries and battery charger.
No output voltage and “overload” indicator of the DC/AC-inverter is illuminated	Inverter system is overloaded.	Reduce connected load. See also chapter 4.4.
No output voltage and “high temperature” indicator of the DC/AC-inverter is illuminated	DC/AC-inverter is switched off because of too much load.	Reduce the connected load and let the DC/AC-inverter cool down.
	DC/AC-inverter is switched off because of too high temperature.	Check whether the airflow of the DC/AC-inverter blocked. Check whether the ambient temperature is too high.
No output voltage and “low battery” indicator of the DC/AC-inverter is illuminated.	DC/DC-converters do not supply power.	See malfunctions beneath (illuminating indicators of the DC/DC-converters).
No output voltage. The “overload” indicator of the DC/DC-converter is illuminated.	No communication between DC/AC-inverter and DC/DC-converter.	Check the communication cabling between the DC/AC-inverter and the DC/DC converter. Did you apply the correct cable type? See figure 2.
	DC/AC-inverter is switched off.	Switch the ON/OFF/ REMOTE switch of the DC/AC-inverter to “ON”.
No output voltage and “low battery” indicator of the DC/DC-converter is illuminated	DC/DC converter is switched off because of a flat battery.	Charge the batteries. The DC/DC-converter will switch on again when the battery voltage is higher than 22.0V.
No output voltage and “high temperature” indicator of the DC/DC-converter is illuminated	DC/DC-converter is switched off because of too much load.	Reduce connected load and let the DC/DC-converter cool down.
	DC/DC-converter is switched off because of too high temperature.	Is the airflow of the DC/DC-converter blocked? Is the ambient temperature too high?

7 TECHNICAL DATA

7.1 Specifications

General

Inverter system:	MASS SINE 24/10kVA	MASS SINE 24/15kVA
Part number (230V/50Hz):	24026000	24027000
Configuration (230V/50Hz):	2x DC/DC-converter 24093500 1x DC/AC-inverter 24093100	3x DC/DC-converter 24093500 1x DC/AC-inverter 24093100
Part number (208V/60Hz):	24026060	24027060
Configuration (208V/60Hz):	2x DC/DC-converter 24093500 1x DC/AC-inverter 24093160	3x DC/DC-converter 24093500 1x DC/AC-inverter 24093160
Required battery capacity:	1000 Ah (minimum)	1500 Ah (minimum)
No load power consumption:	150W	180W
AC-output		
30 min power @25°C/ 77°F:	10 kVA @ cos phi 1	15 kVA @ cos phi 1
Nominal power @40°C/104°F:	8 kVA @ cos phi 1	12 kVA @ cos phi 1
Peak power:	20 kVA	30 kVA
Cos phi :	all power factors allowed	
connections:	Nuts M6	
Minimum wire size:	3x10mm²/AWG 7	3x16mm²/AWG 5
Efficiency:	85%	
Peak efficiency:	92%	
Remote indication:	on, and failure, LED which indicates overload alarm, low battery-shut down, temperature shut down	
Remote control:	yes, on/off RJ45 6p cross wired	
Control loop:	4-20 mA 8p RJ45 cross wired	

DC/DC-converter (specifications of one Mass Power Module 5000)

General:	Mass Power Module 5000
Function:	Conversion of a 24 VDC voltage to a 350V DC voltage
Manufacturer:	Mastervolt, Amsterdam, the Netherlands
Part number:	24093500
Weight:	11kg / 24 lbs
Operating temperature:	0°C to 40°C / 32°F to 104°F above 40°C/104°F: 5% derating per °C
Storage temperature:	-20°C to 70°C / -4°F to 158°F
Relative humidity:	max. 95% non condensing.
Protection degree:	IP23
Dimensions cabinet:	see outline drawings (chapter 7.2)

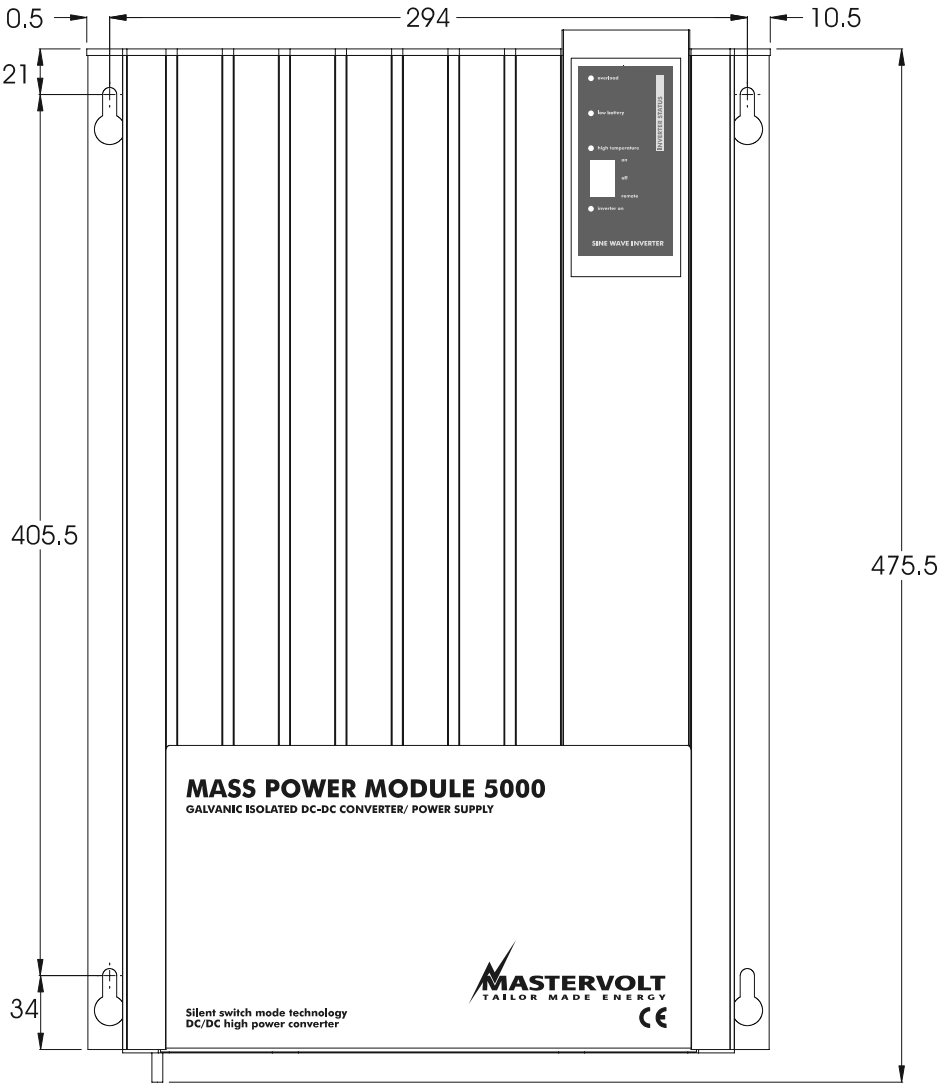
DC/DC-converter (continued)

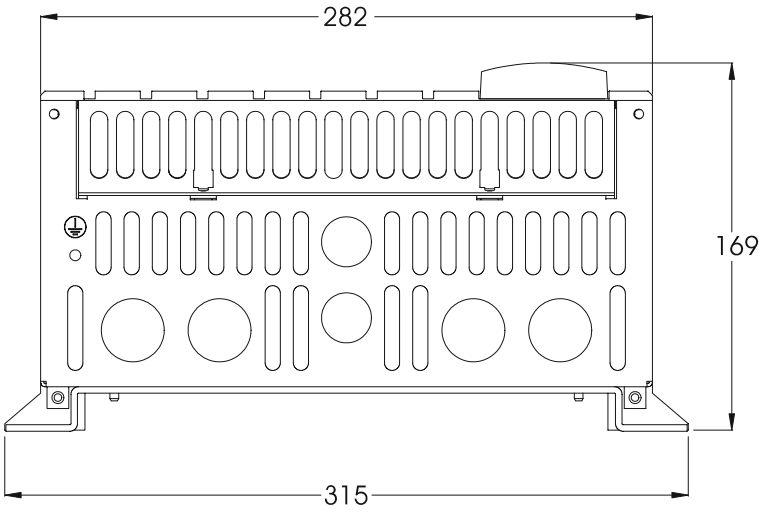
DC-input	
Nominal battery voltage:	24V
Low battery switch off:	19V
Low battery switch on:	22V
High battery switch off:	32V
High battery switch on:	30V
Maximum allowed ripple on DC:	5% RMS
Nominal current:	2 x 120A
No load power off:	0W
No load power on:	5W
DC fuses required:	2 x 160A (VDE 0636 / IEC 269 / DIN43620) (one fuse in each positive conductor)
DC cable size:	50 mm² / AWG 0
Maximum length DC cable:	2 meter / 6ft.
Connections:	M8 bolts
Torque:	15 – 20 Nm / 130 - 175 In-Lbs
DC-output	
Nominal output voltage:	350V DC
Connections:	Screw terminals
Minimum wire size:	4 mm² / AWG 9
Maximum wire size:	10 mm² / AWG 20-6
Torque:	1.2 – 1.5 Nm / 11 - 13 In-Lbs

DC/AC-inverter

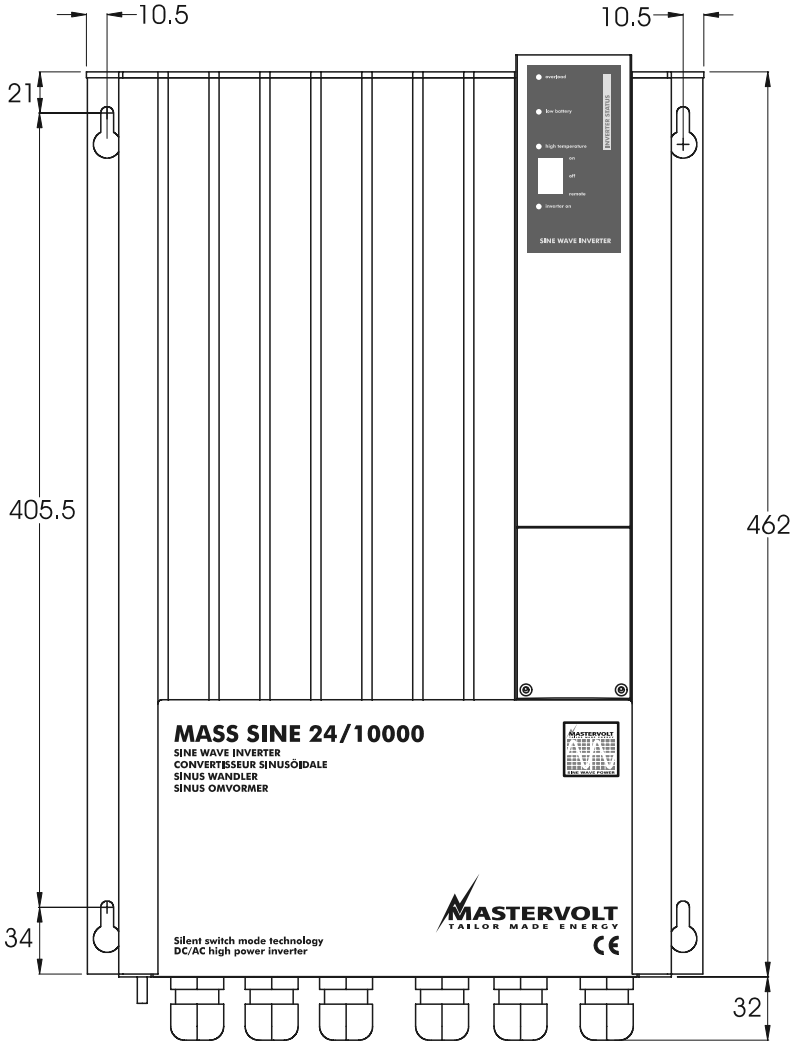
General:	Mass Sine 24/10000 or Mass Sine 24/15000
Function:	Conversion of a 350 VDC voltage to a high AC voltage
Manufacturer:	Mastervolt, Amsterdam, the Netherlands
Part number:	24093100 (230V AC) / 24093160 (208V AC)
Weight:	22kg / 51 lbs
Operating temperature:	0°C to 40°C / 32°F to 104°F above 40°C/104°F: 5% derating per °C
Storage temperature:	-20°C to 70°C / -4°F to 158°F
Relative humidity:	max. 95% non condensing.
Protection degree:	IP23
Dimensions cabinet:	see outline drawings (chapter 7.3)
DC-input:	
Nominal Input voltage:	350V DC.
Connections:	Screw terminals
Minimum wire size:	4 mm² / AWG 9
Maximum wire size:	10 mm² / AWG 20-6
Torque:	1.2 – 1.5 Nm / 11 - 13 In-Lbs
AC-output	
Voltage	part # 24093100: 230V ± 5%, part # 24093160: 208V ± 5%
Waveform	true sine
THD:	<5%, 2.5% typical
Frequency:	part # 24093100: 50Hz, ± 0.1% part # 24093160: 60Hz, ± 0.1%
Wire system:	1ph, 3 wire, 10 - 16mm² / AWG 7 - 5
Cos phi :	all power factors allowed
Connections:	Nuts M6
Torque:	3.2 – 3.8 Nm / 28 – 33 In-Lbs

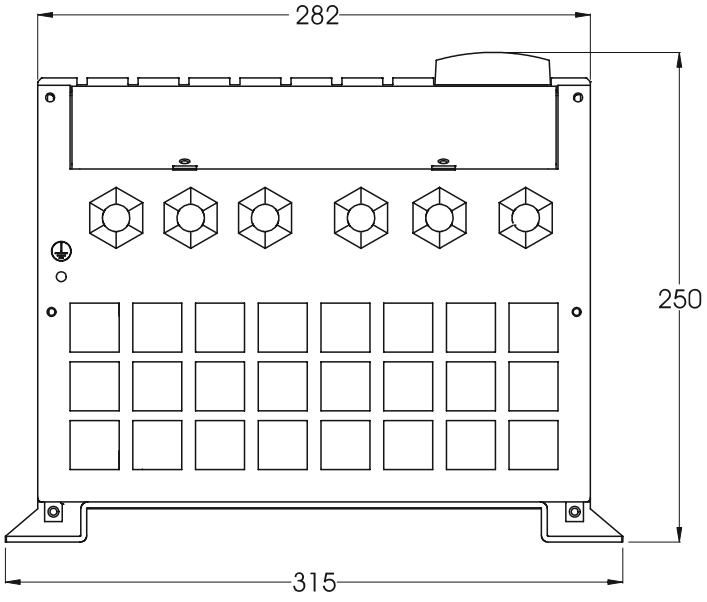
7.2 Outline drawings DC/DC-converter





7.3 Outline drawings DC/AC-inverter Mass Sine 24/10000 or 24/15000





8 CE DECLARATION OF CONFORMITY

Manufacturer: Mastervolt

Address: Snijdersbergweg 93
1105 AN Amsterdam
The Netherlands

Herewith declares that:

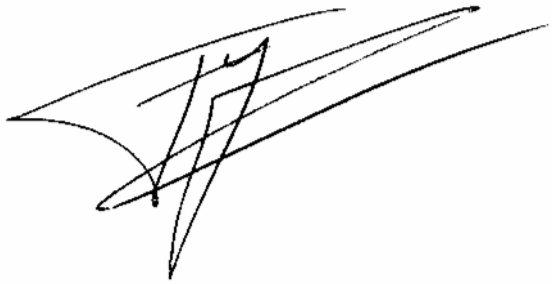
Product:
DC/DC-converter “Mass Power Module 5000”
DC/AC-inverter “Mass Sine 24/10000” and “Mass Sine 24/15000”

Is in conformity 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 50082-1:1997,

And the safety directive 73/23/EEC and amendment 93/68/EEC, with the following standard:
Low voltage standard EN 60950:2000,

Amsterdam,



Dr. F.J. ter Heide,
General Manager MASTERVOLT