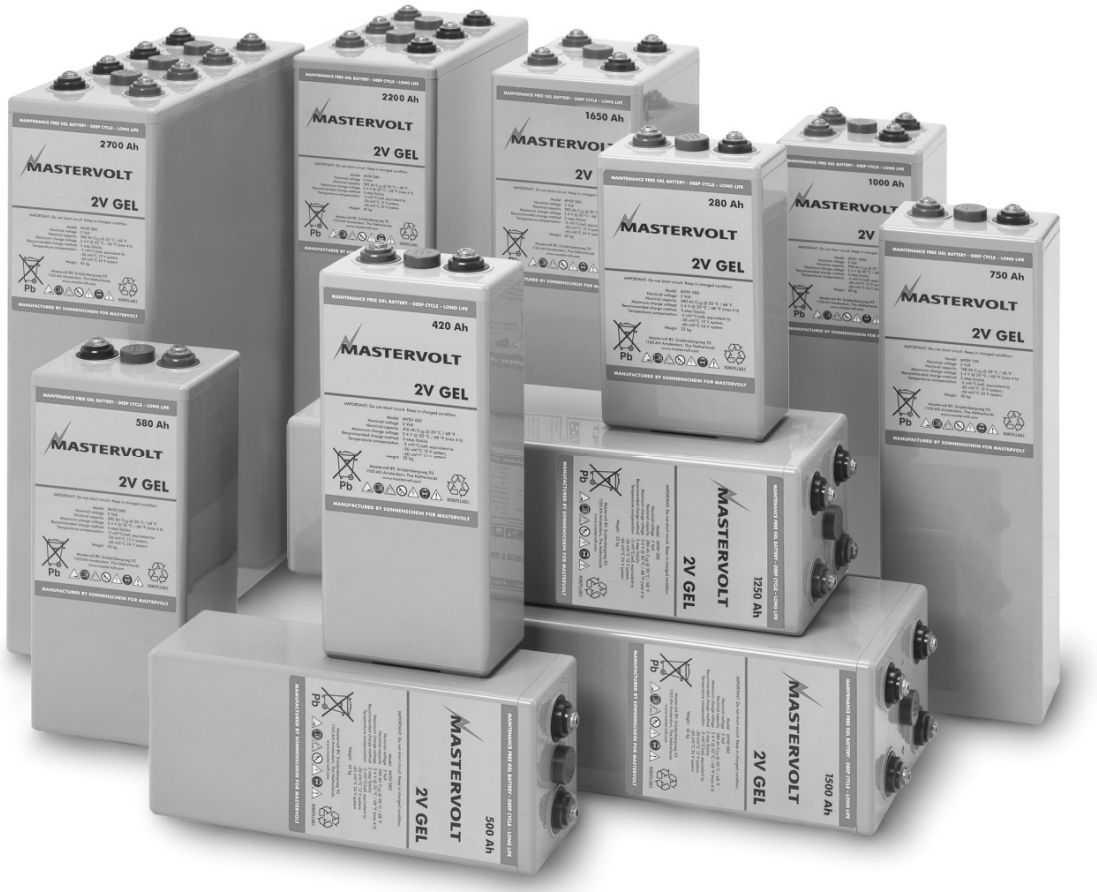
MASTERVOLT

USER'S MANUAL / GEBRUIKERSHANDLEIDING
BETRIEBSANLEITING / MANUEL D'UTILISATION

2 VOLT GEL CELLS

MVSV series



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1 SAFETY GUIDELINES AND MEASURES

Observe these instructions and keep them located near the battery for future reference. Work on the battery should be carried out by qualified personnel only.

Do not smoke!
Do not use any naked flame or other sources of ignition.
Risk of explosion and fire

While working on batteries wear protective eye-glasses and clothing.
Observe the accident prevention rules as well as EN 50 272-2, VDE 0105 Part 1.

Any acid splashes on the skin or in the eyes must be flushed with plenty of clean water immediately. Then seek medical assistance. Spillages on clothing should be rinsed out with water.

Explosion and fire hazard, Avoid short circuits, use insulated tools. Do not place tools or other items on the battery. Do not wear any metallic items such as watches, bracelets, et cetera

Electrolyte is very corrosive. In normal working conditions contact with the electrolyte is impossible. If the battery container is. damaged do not touch the exposed electrolyte because it is corrosive

Batteries are heavy. If involved in an accident they can become a projectile! Ensure adequate and secure mounting and always use suitable handling equipment for transportation. Handle with care because batteries are sensitive to mechanical shock.

Caution! Metal parts of the battery are always alive; therefore do not place items or tools on the battery

Keep children away from batteries

Non-compliance with operating instructions, repairs made with other than original parts, or repairs made without authorization (e. g. opening of valves) render the guarantee void.

	**Disposal of batteries.** Spent batteries are harmful to health and the environment. Therefore batteries may not be mixed with domestic or industrial waste but must be collected and recycled separately. Contact your supplier for recollection and recycling of batteries or contact an authorized waste management company.

2 GENERAL INFORMATION

2.1 USE OF THIS MANUAL

This manual serves as a guideline for the safe and effective installation, operation and maintenance of the Mastervolt MVSV gel batteries, further mentioned as “cell(s)” or “battery” / “batteries”

It is therefore obligatory that every person who works on or with the batteries 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 batteries, may be carried out only by qualified, authorised and trained personnel, consistent with the locally applicable standards and taking into consideration the safety guidelines and measures (chapter 1 of this manual).
Keep this manual at a secure place!
The English version has 8 pages.

2.2 VALIDITY OF THIS MANUAL

All of the specifications, provisions and instructions contained in this manual apply solely to standard versions of the Mastervolt MVSV gel batteries that were delivered by Mastervolt from 1 July 2006 on.

2.3 GUARANTEE SPECIFICATIONS

Mastervolt guarantees that the Mastervolt MVSV gel batteries have 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 users manual, then damage may occur and/or the batteries may not fulfil its specifications. All of these matters may mean that the guarantee becomes invalid.
The guarantee is limited to the costs of repair and/or replacement of the product. Costs for installation labor or shipping of the defective parts are not covered by this guarantee.
The period and conditions of this guarantee are laid down in the general conditions of delivery as registered with the Chamber of Commerce and Industries in Amsterdam number 33279951 and are available on request.

2.4 LIABILITY

Mastervolt can accept no liability for:

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

2.5 IMPORTANT TO KNOW

Stationary valve-regulated lead acid batteries do not require topping up water. Never open the battery. Do not add acid or distilled water. Pressure valves are used for sealing and cannot be opened without destruction.

For the installation and operation of stationary batteries EN 50 272-2 is mandatory.

3 INSTALLATION

3.1 BEFORE YOU START

- Installation, connection and protection must be executed in accordance with the locally applicable regulations.
- Check the contents of the delivery. See Specifications for an overview of components that are standard included with the delivery
- After unpacking, check each battery for mechanical damage. Do not use the product if it is damaged. If in doubt, contact your supplier.
- Check the batteries for correct polarity:

Terminal colour	Indication on battery	Meaning:
Red	+	Positive
Blue	–	Negative

- Check each cell separately by measuring the open circuit voltage. U ≥ 2.07V
- Control of insulation resistance: New batteries: > 1MΩ Used batteries: > 100 Ω/Volt

3.2 LOCATION TO INSTALL

3.2.1 General

Standards referring to installation, cabinets, equipment or battery rooms are: EN 50 091-I (/2/), IEC 896-2 (/3/) (draft IEC 60896-21 (/4/)) and EN 50272-2 (/1/)
Obey the following stipulations when choosing a location to install the batteries:

- Keep batteries away from heat sources. Allowed operating temperature: –20 to 45ºC / –4 to 113ºF; Nominal operating temperature: 10 to 30ºC / 50 to 86ºF. Recommended at 20ºC/ 68ºF. The battery life is halved for every 10ºC of rise in temperature. Lower temperatures will reduce the available capacity.
- Battery installation should be made such that temperature differences between individual units do not exceed 3ºC / 5ºF.
- Keep at least 1cm / 0.5 inch space between the batteries. Mastervolt can supply dedicated profiles for this purpose.
- All models of the MVSV range are suitable for both horizontal and vertical mounting. All cells should be mounted either vertically or horizontally.
- Please note that models MVSV 2000 (67162000) and MVSV 2500 (67202500) which were delivered before January 1st 2006 are only allowed to be installed in upright (vertical) position. See also chapter 2.2. If in doubt, contact your supplier.

3.2.2 Ventilation

Under overcharging conditions lead acid batteries can vent an explosive mixture of hydrogen gas. Therefore the batteries may not installed in airtight enclosures

The ventilation of battery rooms and cabinets, respectively, must be carried out acc. to EN 50272-2. Among others this means that under normal conditions the minimum air flow rate for ventilation of a battery location or compartment for Mastervolt MVSV gel batteries shall be calculated by the following formula (up to 40° C operating temperature)

$$Q = 0.05 \times n \times C_{nom} \times 10^{-3} \ [m^3/h]$$

With

n = number of cells
C_{nom} = Nominal capacity (see Specifications)

With natural ventilation (air convection) the minimum inlet and outlet area (A) is calculated as follows (Air convection speed = 0.1 m/s):

$$A = 28 \times Q \ [cm^2]$$

Example:
Given: 24V battery bank consisting of 12 pieces Mastervolt MVSV 800 gel batteries, C_{nom} = 998 Ah,
Calculation of fresh air necessary:

$$Q = 0.05 \times n \times C_{nom} \times 10^{-3} \text{ [m}^3\text{/h]}$$
$$= 0.05 \times 12 \times 998 \text{ Ah} \times 10^{-3} \text{ [m}^3\text{/h]}$$
$$= 0.5988 \text{ [m}^3\text{/h]}$$

$$A = 28 \times Q \text{ [cm²]}$$
$$= 28 \times 0.5988 \text{ [cm²]}$$
$$= \text{approx. } 16.8 \text{ [cm²]}$$

Potential sources of ignition must have a safety distance to the pressure valves of the batteries as specified in EN 50272-2

3.2.3 Use of battery racks

When batteries are installed horizontally, use of a battery rack is obligatory. Obey the following recommendations:

- Each cell should be supported separately by the rack over its full length. Never stack a battery on another.
- Check that the battery racks are stable and horizontal. For the shelf assemblies with 4 levels of 2 rows or 5 levels of 3 rows, the assembly should be anchored with on the floor
- Precautions must be taken if batteries are being installed in metallic cabinets or on racks. Keep an air safety distance of at least 10 mm / 0.5 inch between insulated cables and electrically conductive parts, or use additional insulation
- The use of metal clamps on the cells is not recommended. A system made of insulating material should be used
- Racks and cabinets shall have a distance of at least 100 mm to the wall for a better placement of connections and better access for cleaning

3.3 CONNECTION

- To avoid corrosion of the battery poles Mastervolt recommends to lubricate the inserts and connections moderately using a small quantity of silicone grease (Vaseline). The use of a petroleum-based lubricant is not recommended
- Use properly sized and reliable, cables, cable lugs and battery terminals. Tighten all connections firmly. The following torque values apply for screw connectors: M8 (20±1) Nm / 175±10 InLbs
- Rubber covers shall be fitted to both ends of the connector cables (pole covers) before installation.
- Batteries in series or parallel must be of the same brand, type, capacity and state of charge. Do not mix old and new batteries.

If a battery temperature sensor is used, it should be located on top or on one side of the cell which is located in the centre of the battery bank.

Connect the battery with the correct polarity to the charger (positive pole to positive terminal). Note that the position of the battery poles may differ from previous installed batteries! The charger may not be switched on during this process and the load must not be connected. Connect the minus cable last of all.

Check if all connections are firmly seated. Then switch on charger and start charging following chapter 4.2.

4 OPERATION

4.1 DISCHARGE

- Avoid deep discharges. Regular discharges beyond 60% of the nominal capacity are not recommended as they might shorten the lifetime of the battery.
- Recharge the battery immediately after a discharge.
- Never discharge below the final discharge voltage. The final discharge voltage is related to the discharge current. See paragraph “Final discharge voltage” of the Specifications.

4.2 CHARGING

Recommended charging method: three step battery charger with IUoUo characteristic. Voltage settings (@ 25ºC / 77ºF):

Nominal voltage	Float	Absorption*
2V (one cell)	2.30V	2.38V
12V (6 cells)	13.8V	14.25V
24V (12 cells)	27.6V	28.5V
48V (24 cells)	55.2V	57.0V

*max 5 hrs

The batteries must be charged to the full 100% regularly, at least every month

4.3 ALTERNATING CURRENTS

When using old-style charging equipment or battery chargers of inferior quality, alternating currents may flow through the battery superimposing onto the direct current during charge operation.
Alternating currents and the reaction from the loads may lead to an additional temperature increase of the battery, and strain the electrodes with possible damages, which can shorten the battery life. Such damages can be avoided by using Mastervolt battery chargers.

When recharging up to 2.38V/cell under normal operation the actual value of the alternating current is occasionally permitted to reach 10A (RMS) / 100Ah nominal capacity. In a fully charged state during float charge or standby parallel operation the actual value of the alternating current must not exceed 5A (RMS) / 100Ah nominal capacity.

4.4 CHARGING CURRENTS

The charging current should range between 10A to 50A / 100Ah nominal capacity (guide values). When selecting a battery charger keep in mind that the battery charger must be capable of supplying both the current of the connected load and the battery charging current.
Contact your Mastervolt representative for advice if the charger current exceeds 50A/100Ah nominal capacity.

4.5 TEMPERATURE

The recommended operation temperature range for Mastervolt MVSV batteries is 10°C to 30°C, best at 20°C (50°F to 86°F, best at 68°F). Higher temperatures will seriously reduce service life. Lower temperatures reduce the available capacity. The absolute maximum temperature is 55°C (131°F) and should not exceed 45°C (113°F) in service.

4.6 TEMPERATURE RELATED CHARGE VOLTAGE

Temperature compensated charging is recommended according to the table below:

Nominal voltage	Temperature compensation	
2V (one cell)	–5mV/ºC	–2.8mV/ºF
12V (6 cells)	–30mV/ºC	–17 mV/ºF
24V (12 cells)	–60mV/ºC	–33 mV/ºF
48V (24 cells)	–120mV/ºC	–67 mV/ºF

Mastervolt battery chargers are standard provided with a battery temperature sensor for automatic adjustment of the charge voltage.

4.7 ELECTROLYTE

The electrolyte is diluted sulphuric acid and fixed in a gel.

5 MAINTENANCE

5.1 BATTERY MAINTENANCE AND CONTROL

Keep the battery clean and dry to avoid leakage currents. Plastic parts of the battery, especially the containers, must be cleaned with pure water. Never use any additives, acids and/or scourers.

Check batteries and connections on a regular base. Defects such as loose or corroded connections must be corrected immediately.

At least every 6 month measure and record:
- Overall voltage the batteries
- Voltages of several cells
- Surface temperature of several cells
- Battery-room temperature

If the cell voltages differs from the average float charge voltage by more than +0.2V respectively -0.1V or if the surface temperature difference between cells exceeds 5ºC, a Mastervolt service representative should be contacted.

Check and record at least every year:
- Voltage of each cell
- Surface temperature of each cell
- Battery-room temperature
- Screw connections
- Screw connections without locking devices have to be checked for tightness
- Battery installation and arrangement
- Ventilation

5.2 TESTS

Tests have to be carried out according to IEC 60896-22, DIN 43539 part 1. Special instructions like DIN VDE 0107 and DIN VDE 0108 have to be observed.

5.3 FAULTS

Call a Mastervolt service representative immediately if faults in the battery or the battery charger are found. Recorded data as described in chapter 5.1. must be made available to the service representative. It is recommended that a service contract is taken out with your agent.

5.4 STORAGE AND TAKING OUT OF OPERATION

To store or decommission cells for a longer period of time they should be fully charged and stored in a dry and cold but frost-free room, away from direct sun light.

The rate of self discharge is approximately 2% per month @ 20ºC/68°F. Elevated environmental temperatures increase the self-discharge rate of the batteries. Therefore batteries need supplementary charge according to the table below to keep its capacity.

Storage temperature	Maximum charging interval
< 20ºC / < 68 ºF	Every 24 months
20 to 30 ºC / 68 to 86 ºF	Every 12 months
30 to 40 ºC / 86 to 104 ºF	Every 6 months
40 to 50 ºC / 104 to 122 ºF	Every 3 months

5.5 TRANSPORT

The batteries must be transported in an upright position. Never lift the batteries at the terminals. Use soft slings to avoid damage. Do no stand below the batteries. Batteries without any visible damage are not defined as dangerous goods under the regulations for transport of dangerous goods by road (ADR) or by railway (RID). They must be protected against short circuits, slipping, upsetting or damaging. Cells may be suitable stacked and secured on pallets (ADR and RID, special provision 598). It is prohibited to staple pallets.
No dangerous traces of acid shall be found on the exteriors of the packing unit. Cells whose containers leak or are damaged must be packed and transported as class 8 dangerous goods under UN no. 2794.