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OPzV
Valve Regulated Lead-Acid STANDBY POWER BATTERIES

OPERATING, INSTALLATION AND MAINTENANCE INSTRUCTIONS

OPzV

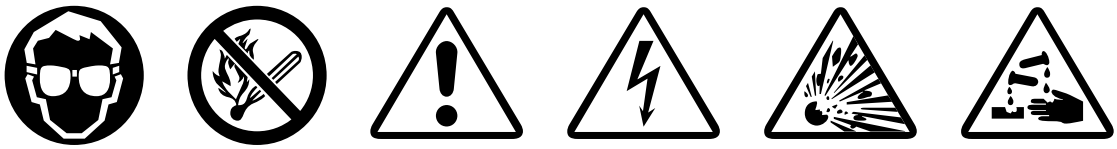
1. INTRODUCTION

Standby batteries are generally used as back-up power, to support all those users who need a reliable service continuity in case of black-out of the distribution network of electricity, hybrid and off-grid installations.
Lead-acid standby batteries are components of a system and they require the observance of suitable precautions and behavioral norms to guarantee safe working conditions and to ensure the best performance of the battery during its entire life. Scope of this document is to supply the necessary instructions for the correct cure, handling, installation, use and maintenance of MIDAC OPzV VRLA Standby Power batteries.

2. RECOMMENDATIONS

Carefully read this manual in all its parts upon receipt of MIDAC OPzV VRLA standby batteries.
The non-compliance with the instructions given herein may cause injury to people and damages to the equipment, as well as the bad operation of the battery.
Keep this manual in the battery room in a place easily accessible to the staff.

3. SAFETY RULES



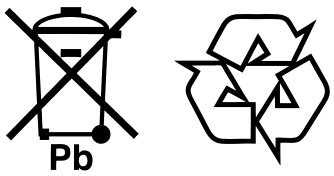
Observe the following precautions at all times.

Exposed metal parts of the battery always carry a voltage and are electrically live with the risk of short circuits.

Avoid any electrostatic charge; before starting your work on the battery, first discharge any possible electricity from yourself by touching an earth-connected part; repeat this action occasionally until the work is complete.

Always take the following precautions:
- Use protective equipment, such as protective clothing, rubber gloves and goggles.
- Use insulated tools.
- DO NOT place or drop metal objects on top of the battery.
- DO NOT wear rings or bracelets. Remove any articles of clothing with metal parts that might come in contact with the battery terminals.
- DO NOT smoke and DO NOT use open flames or create electric sparks.
- Take all precautions when using the main supply.
- Make sure that the first aid kits and fire extinguishers are easily accessible.

Used batteries contain recyclable materials. They must not be disposed with the house waste but as a special waste. Methods of return and recycling must conform to the regulations in operation at the site where battery is located.



4. DELIVERY AND STORAGE

Unpack the batteries as soon as they are delivered.
Verify that the equipment has been delivered in good condition. Any damage must be reported immediately to the carrier and the damaged items retained for inspection by the carrier's representative.

If the battery cannot be immediately installed, store it in a dry, cool and clean place.
Do not expose the battery to direct sunlight, to avoid any damage to containers and lids.

IMPORTANT NOTE! Storage time for charged cells is limited. The recommended storage time is as follows:

Ambient Temperature	Storage Time
20°C (68°F)	6 months
30°C (86°F)	3 months
40°C (104°F)	6 weeks

During the storage time, the open circuit voltage (OCV) must periodically be checked.
Cells with OCV below 2.10 Vpc must be recharged providing constant voltage of 2.35 Vpc with current limitation of 0.15 C10 (A), for 24 hours.

The OCV of a fully charged battery should result between 2.15-2.19 Vpc.

Failure to observe the above conditions may result in a greatly reduced capacity and service life or in permanent damage to the cells.

5. BATTERY ROOM (NORM REF. EN 50272-2)

The battery room must be dry, clean and not subject to vibrations.
It must be properly sized to enable installation, inspection and maintenance. Its temperature should be as moderate as climate allows, preferably between 10°C (50°F) and 30°C (86°F). The battery will give its best performance when working in a temperature of 20°C (68°F) - 25°C (77°F), but will be functioning even operating in temperatures between -10°C (14°F) and 60°C (140°F).
High temperatures increase the performance but reduce battery life, while low temperatures reduce the performance.
The entry doors of battery room must be provided with warning signs banning smoking, sparks and naked flames.
The batteries should be installed on suitable racks or shelves properly sized in loading capacity and dimensions. The layout must enable easy access to all cells.
Racks or shelves can be made of wood or metal with acid-proof coating. If metal racks are used, they must be equipped with rubber or plastic insulators to avoid any contact between the battery and the metal.
The rack location and ventilation system should be such that the maximum temperature differential between cells does not exceed 3°C (5°F).

PAY SPECIAL ATTENTION TO BATTERY ROOM STANDARDS, EFFECTIVE AT THE MOMENT OF THE INSTALLATION OF THE BATTERY.

6. INSTALLATION

Before installing the cells, clean all parts. Remove the protections from the terminal posts and clean them with a soft clean cloth.

Place the cells on the rack (or cabinet) and make sure that the spacing allows the accommodation of the supplied inter-cell connectors (around 10 mm). Most batteries have cells connected in a simple series arrangement, so the cells should be arranged to preserve the sequence: positive (+), negative (-), positive (+), negative (-) throughout the whole battery.

WARNING
NEVER LIFT CELLS BY THE TERMINAL POSTS. ALWAYS USE APPROPRIATED DEVICES (SUCH AS LIFTING STRAPS AND SUITABLE MECHANICAL LIFTING DEVICES) TO PREVENT INJURY TO PERSONNEL OR DAMAGE TO THE CELLS.

For batteries to be installed on multiple tiers, start by placing the cells on the lower tier on either side of the frame where the stand sections meet. Any unused stand space should be on the upper tier.

For batteries on stepped racks, leave any unused space on the back (top) step.

Where multiple racks are arranged end-to-end, adjust the position of the adjacent end cells to accommodate the flexible inter-rack connectors supplied.

Take particular care to preserve the positive to negative sequence when using flexible inter-tier, inter-step or inter-rack connectors between rows of cells. Leave the main positive and negative terminals of the battery free for connection to the charging source.
Check cell alignment.
Prepare the inter-cell connectors by deeply clean the contact surfaces with soft clean cloth.

Apply a light coating of no-oxide grease to the contact-making areas of each connector. This is best done by carefully melting the grease and dipping connector ends (it is unnecessary to coat the central part of the connector).

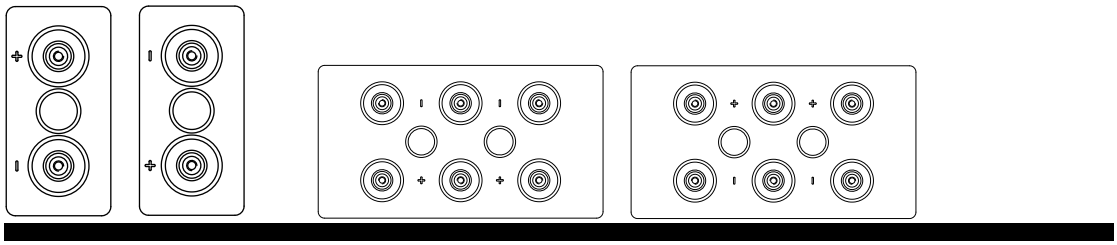
Fit the inter-cell and inter-tier connectors using the bolts, nuts and washers supplied. Before assembly, lightly smear no-oxide grease on the surfaces of all hardware.
Use the insulated wrenches to tighten the parts firmly together, with torque setting of 18-22 Nm (160-195 in lbs).
Pay special attention to avoid short-circuiting the cells with any of the battery hardware.

Check tightness and cleanliness.

Connect the positive terminal of the battery to the positive terminal of the charger and the battery negative to the charger negative.

Number the cells by using the set of numbering stickers supplied with the battery. It is common practice to number the cells beginning with #1 at the positive end of the battery and following the sequence of electrical connection of the cells, through to the negative end of the battery.

Horizontal Installation: ensure that the internal plates are vertical:



7. CHARGING

7.1 Temperature compensation

Temperature compensation must be as follows:
±3.5 mV each °C out of the range 20°C / 25°C

- from 20°C to 25°C: no need of temperature compensation
- below 20°C (68°F): voltage +0.0035 V/°C
- above 25°C (77°F): voltage -0.0035 V/°C

7.2 Commissioning

Batteries loses charge while in transit or during storage. For this reason, a freshening charge should be given before putting the battery into service.
Recommended charge settings - at the ambient temperature range of 20°C to 25°C - are as follows:

12 hours at constant voltage of 2.35 Vpc at 20°C (68°F)
(Current limitation 0.15 C10 Amps)

7.3 Charging in service

Once put into service, MIDAC OPzV VRLA Standby Power batteries should be charged as follows:

7.3.1 Float charge

To maintain the battery in fully charged condition during normal battery operation or, after a discharge, to recover 90% of nominal capacity within 20 hours, a recommended float charge has to be applied.
Recommended float voltage settings are as follows:

Constant voltage 2.23 ÷ 2.27 Vpc at 20°C (68°F)
(Current limitation 0.20 C10 Amps)

With the method described above, the effective charging current is limited to very low values; such current increases as a function of temperature and age of the battery.

7.3.2 Equalizing charge

Chargers have usually two adjustable charging voltages: one for the "floating" charge and one for the "equalizing" charge (also known as "boost", "high rate" or "recharge").
The equalizing charge is generally required:
- when the total voltage spread between the cells is greater than 0.04 V under float charging conditions;
- for fast recharging after a discharge;
- for float charge using voltages below 2.23 Vpc (see table below)

Float Vpc	Equalizing Required at these Intervals
2.23 - 2.27	Never
2.21	Every 6 Months
2.18	Every 3 Months
2.16	Every Months

Recommended equalize voltage settings are as follows:

Constant voltage 2.33 ÷ 2.37 Vpc at 20°C (68°F)
(Current limitation 0.15 C10 Amps)

The length of equalize charging required will depend on the depth of discharge, temperature and normal float voltage level. The best guideline is to provide equalizing charge at least for 12 hours.

7.3.3 IU charge

The IU charge is normally used for fast recharging or in cycling use.

IU charge consists of two phases:
- 1st phase: constant current – recommended rate: 0.20 C10 (A). The voltage increases up to the limited voltage of 2.35 Vpc;
- 2nd phase: constant voltage of 2.35 Vpc. The absorbed current decreases. Once the current has reached a low and constant value (approx. 0.005 A per Ah) the charge continues in floating.

8. BATTERY MAINTENANCE

MIDAC OPzV are sealed - maintenance free lead-acid batteries and need no water addition.

The containers and lids must be kept dry and free from dust.
Cleaning must be done only with a damp cotton.
Avoid static discharges generated during cleaning.

Every 6 months

- Check the evidence of damages on battery and equipment;
- Check and record the total battery floating voltage, the voltage on pilot cells and temperature.

Once a year

- Check and record individual cell voltages.
- Perform a discharge test according to IEC or IEEE Standards until the battery shows signs of degradation and every six months thereafter.

Keep a log book to record all maintenance and inspection operations, which will be helpful to monitor long-term changes of the battery condition.

Do not attempt to open the safety valve. Opening could cause damage to the battery.

Pilot Cell

For regular monitoring of the battery condition, select one cell near the middle of the battery string as a “pilot” cell (for batteries consisting of more than 60 cells, it is advisable to select one pilot cell out of 60).

9. ADDITIONAL INFORMATION

For any further information on MIDAC OPzV VRLA Standby Power batteries, please contact:

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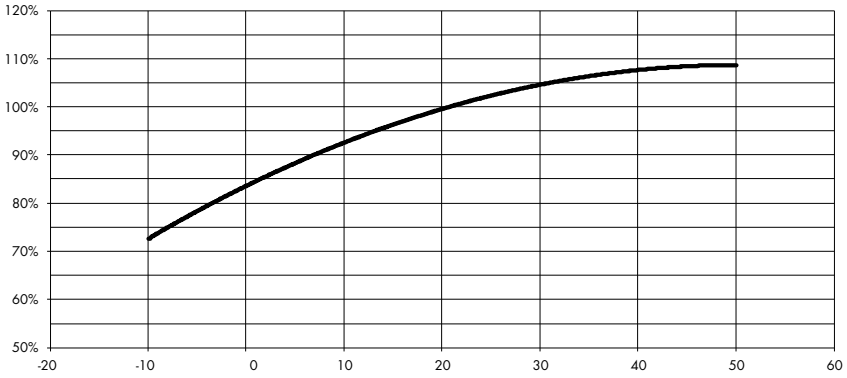
OPzV

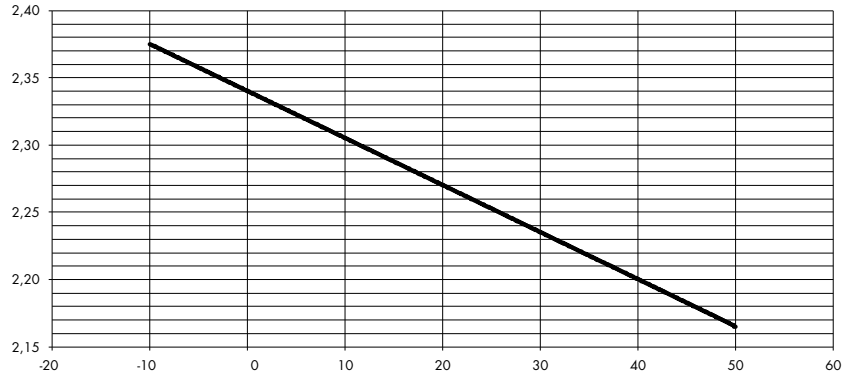
10. TECHNICAL DATA

Type	Nominal Voltage	Actual Capacity		Ri	Isc	Dimensions (mm)			Weight	No. of Terminals
	V	Ah/10Hrs	Ah/120Hrs	mOhm	kA	Length	Width	Overall Height	Kg	
OPzV 150	2	**150**	**197**	1,434	1,498	**103**	**206**	**385**	**15,0**	**2**
OPzV 200	2	**200**	**262**	1,076	1,997	**103**	**206**	**385**	**18,0**	**2**
OPzV 250	2	**250**	**328**	0,860	2,497	**124**	**206**	**385**	**22,0**	**2**
OPzV 300	2	**300**	**392**	0,717	2,996	**145**	**206**	**385**	**25,5**	**2**
OPzV 350	2	**350**	**458**	0,739	3,050	**124**	**206**	**504**	**28,0**	**2**
OPzV 420	2	**420**	**550**	0,616	3,659	**145**	**206**	**504**	**33,5**	**2**
OPzV 490	2	**490**	**641**	0,528	4,269	**166**	**206**	**504**	**37,5**	**2**
OPzV 600	2	**600**	**785**	0,463	4,604	**145**	**206**	**679**	**46,5**	**2**
OPzV 800	2	**800**	**1046**	0,348	6,139	**210**	**191**	**679**	**62,0**	**4**
OPzV 1000	2	**1000**	**1308**	0,278	7,674	**210**	**233**	**679**	**77,5**	**4**
OPzV 1200	2	**1200**	**1572**	0,232	9,209	**210**	**275**	**679**	**91,5**	**4**
OPzV 1500	2	**1500**	**1920**	0,185	11,511	**210**	**340**	**677**	**112,5**	**4**
OPzV 2000	2	**2000**	**2628**	0,167	12,657	**212**	**399**	**804**	**153,0**	**6**
OPzV 2500	2	**2500**	**3240**	0,134	15,821	**212**	**487**	**804**	**194,0**	**8**
OPzV 3000	2	**3000**	**3936**	0,111	18,986	**212**	**576**	**804**	**230,0**	**8**

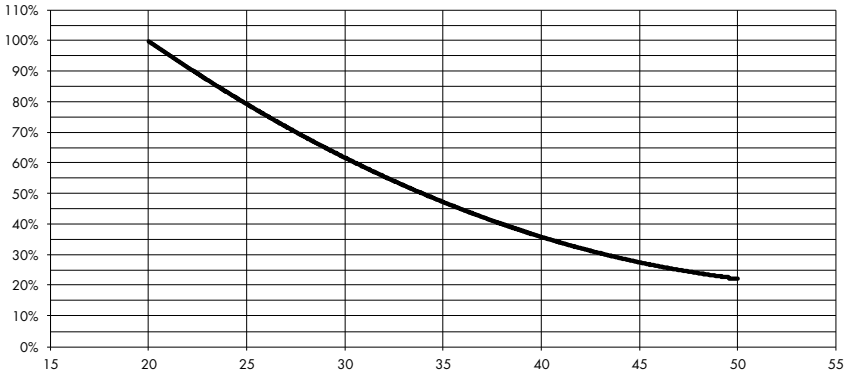
PERFORMANCE Capacity vs Temperature (°C)



TEMPERATURE COMPENSATION Float Voltage vs Temperature (°C)



THERMAL DEGRADATION Lifetime vs Temperature (°C)



LIFECYCLES No. of Cycles vs D.o.D. (% C10)