Installation, Operation and Maintenance Instruction
Stationary batteries, type VRLA - range MVR

Important: Please read this manual immediately on receipt of battery before unpacking and installing. Failure to comply with these instructions will render any warranties null and void.

	Observe the written Instructions.
	Do not smoke; avoid naked flames, sparks and other sources of ignition.
	Wear eyes protection.
	Electrical hazard.
	Danger. Cells and monoblocs are heavy. Always use suitable handling equipment for transportation.
	Re-cycle scrap batteries. Contains lead.

Handling
Valen MVR batteries are supplied in a charged state and must be unpacked carefully to avoid high currents at short-circuit between terminals of opposite polarity. Use lifting hooks compatible with the plastic handles on the cell/monobloc.

Keep flames away
In case of accidental overcharge a flammable gas can leak off the safety vent. Discharge any possible static electricity from clothes by touching an grounded conductive part.

Tools
Use tools with insulated handles.
Do not place or drop metal objects on the battery.
Remove rings, wristwatch and articles of clothing with metal parts that may come into contact with the battery terminals.

1. Transport
All Batteries to be transported in an upright position. To avoid short circuits, the terminals have to be fully insulated. Batteries without any visible damages are not defined as dangerous goods if they are protected against short circuit, slipping, upsetting or damaging and packed in upright, proper and secure condition onto pallets or in wooden boxes. In case of damaged battery containers, refer to national regulations (dangerous goods).

2. Unpacking and cleaning
It is advisable to unpack all the batteries and accessories before commencing to erect and not to unpack and erect cell by cell.
All cells/units should be handled carefully, as the plastic container can be damaged or broken if allowed to fall. Under no circumstances should they be lifted by their terminal pillars.
All items should be carefully checked against the accompanying advice notes to ascertain if any are missing and also inspected to see whether any are damaged or broken. Should this happen the Sales Department should be consulted.
If unit cleaning is needed, use water damp cloth or a clean cotton or soft-tissue cloth moistened in clean water only. Never use sprays, chemicals, solvents or feather dusters.

3. Storage
Store the batteries in a dry, clean and preferably cool location.
As the batteries are supplied charged, storage time is limited. In order to easily charge the batteries after prolonged storage, it is advised not to store batteries for more than:
- 6 months at 20°C
- 3 months at 30°C
- 1.5 month at 40°C

A refreshing charge shall be performed after this time at 2.27 to 2.29 Vpc as stated on the battery label, at 20°C for 48 to 96 hours. A current limit is not essential, but for optimum charge efficiency the current output of the charger can be limited to 0.2C10

The necessity of a refreshing charge can also be determined by measuring the open circuit voltage of a stored battery. Refreshing charge is advised if the voltage drops below 2.10Vpc. Failure to observe these conditions may result in greatly reduced capacity and service life.

4. Installation
Install batteries in a clean, dry and airy area. The MVR battery products release minimal amounts of gas during normal operation (gas recombination efficiency >98%). Batteries must be installed in accordance with standard EN 50272-2, and in accordance with this instruction.

- **Temperature**

Avoid placing the battery in a hot place or in front of a window. The battery will give the best performance and service life when working at a temperature between 20°C and 25°C. The maximum operating temperature range is between -10°C and +45°C.

- **Ventilation**

Under normal conditions gas release is very low and natural ventilation is sufficient. This enables safe use of MVR batteries in offices and with electronic equipment. However care must be taken to ensure adequate ventilation for cooling purposes. Batteries without degassing system, must not be placed in closed cabinets.

- **Mounting**

Valen approved battery racks or cabinets are recommended when installing the cells. Assemble the rack according to instructions. Place the battery blocks or cells on the rack and arrange the positive and the negative terminals for connection according to the wiring diagram. Adjust the positioning of the blocks to the air holes in the trays. Assure 10 mm air gap between units and between units and cabinet walls for proper airflow. The gap between the units is guaranteed by proper installation of the spacers and connectors provided by Valen Check that all contact surfaces are clean and apply the block or cell connectors and the terminal screws, only provided by Valen. Use the provided grease to protect the terminals. Finally connect the battery terminals and fix the connector covers.

Torque
Tighten the bolts to the recommended level of 7 Nm. A loose connector can cause problems in the rectifier adjustment, low battery performance, possible damage to the battery and/or personal injury. Overtighten bolts also can cause battery damage.

5. Connecting strings in parallel
For increasing battery capacity parallel strings connection is possible, if the strings consist blocks with the same type and capacity. Using constant voltage IU chargers and ensuring that the connections made between the charger and the batteries have the same electrical resistance, no special arrangements have to be made for batteries in parallel. Provide that each string is equipped with a circuit breaker or a fuse.

6. Applications

- **Operation at continuous float**

MVR batteries are designed for continuous float operation on constant voltage IU chargers in the operating conditions of reliable grid, stable ambient temperature, compensation to float voltage for any temperature fluctuation in the ambient temperature and no or very little cyclic use.

- **Operation in unstable grid (cycling application)**

MVR batteries could be used also in not sufficiently reliable grid and ambient temperature. In this case the number of cycles and depth of discharge shall be on mean level. Anyway at a partial state of charge operation the batteries should be carefully monitored.

7. Charging

• Commissioning charge

Before use, the batteries should be charged at a constant charging voltage (with a charging current limited to 0.1C10) with one of the following method :

• Charge during 96 hours with the floating voltage between 2.27 and 2.29 Vpc as stated on the battery label in ambient temperature range 20°C to 25°C.

• Boost charge with the 2.40Vpc at 20°C boost charge voltage during 24 hours to reduce the commissioning charging period (the battery will then be switched over to float charging, maintain the battery under floating voltage for 24 hours before any discharge test).

If the battery has to be subjected to a discharge test, in this case the test will be performed imperatively after that the commissioning charge has been carried out. Check that the battery is fully charged.

• Float voltage

The recommended float charge voltage is between 2.27 and 2.29 Vpc ± 0.5 % at 20°C. Usually after 6 months continuous charge at the recommended float voltage, individual cell voltages will stabilize within ± 5% of the mean applied voltage.

However, individual cell voltage values outside the above tolerance may be observed without negative effect.

When the average ambient temperature deviates more than ± 5ºC from the reference temperature (20°C), it is necessary to adjust the float voltage as follows:

Temperature, °C	Float voltage range, Vpc	Boost voltage range, Vpc
-10	2.36 - 2.38	2.500 – 2.575
0	2.33 - 2.35	2.475 – 2.500
10	2.30 - 2.32	2.450 – 2.475
20	2.27 - 2.29	2.400 – 2.425
25	2.25 - 2.27	2.375 – 2.400
30	2.24 - 2.26	2.350 – 2.375
35	2.22 - 2.24	2.325 – 2.350
≥ 40	2.21 - 2.23	2.300 – 2.325

Automatic temperature compensation of float voltage requires periodic inspection. For chargers with temperature sensor, temperature correction for float charge must be 3 mV/cell/°C, for boost charge 4 mV/cell/°C.

• Charging current

A discharged VRLA battery will accept a high recharge current, but for those seeking a more economical charging system a current limit of 0.1C10 is adequate. The MVR range batteries accept without damage large charging currents so that only under high battery temperature conditions (T>25°C) a current limitation to 0.25C10 is recommended.

• Fast recharge

Increasing the charge voltage to 2.40 Vpc at 20°C with a current limited to 0.1C10 can reduce recharge times. Fast charge should be stopped after approximately 12 hours. This charge regime, in order to achieve a normal service life, must not be used more than once per month.

• Float charge ripple

Excessive ripple on the DC supply across a battery has the effect of reducing life and making performance poorer.

The superimposed AC current left should not exceed a value of 5A AC (rms) per 100 Ah C10 cell capacity during float charge and 10A AC (rms) per 100 Ah C10 during boost charge.

• State of charge (SOC)

The battery state of charge can be determined approximately by measuring the open circuit voltage (OCV) after the battery has been at rest for a minimum of 24 hours at 20°C.

OCVpc	SOC
2.14	100 %
2.10	80 %
2.07	60 %
2.04	40 %
2.02	20 %

Open circuit voltage variation with temperature is 2.5 mVpc per 10°C.

8. Discharging

The VRLA cells and monoblocs must not be left in a discharged condition after supplying the load, but must immediately return to float recharge mode.

Failure to observe these conditions may result in greatly reduced service life.

• Accidental deep discharging

For optimum operation results the minimum discharge voltage should be related to the duty as follows:

Duration of discharge	Recommended end voltage, Vpc
5 min ≤ t ≤ 1h	1.65
1h ≤ t ≤ 5h	1.70
5h ≤ t ≤ 8h	1.75
8h ≤ t ≤ 12h	1.80
12h ≤ t ≤ 20h	1.85

In order to protect the battery it is advisable to have system monitoring and low voltage cut-out.

Deep discharge will produce a premature deterioration of the battery and a noticeable reduction in the life expectancy of the battery.

• The effect of temperature

- **on battery capacity**

Correction factors of the capacity, according to the temperature, are as follows:

Discharge time	-10°C	0°C	10°C	20°C	25°C	30°C	40°C	45°C
5 to 59 min	0.66	0.77	0.87	0.96	1	1.02	1.06	1.07
1h to 24h	0.75	0.83	0.91	0.97	1	1.02	1.04	1.05

- **on battery life**

Operation of valve regulated batteries at temperatures higher than 20°C will reduce their expected life. Life is reduced by 50% for every 10°C rise in temperature.

9. Monitoring and Maintenance

MVR batteries are maintenance free, sealed, lead acid batteries and need no water addition.

The containers and lids shall be kept dry and free from dust.

Cleaning must be done only with a damp cotton cloth without man-made fibers.

WARNING - Do NOT use any type of oil, solvent, detergent, petroleum-based solvent or ammonia solution to clean the battery containers or lids. These materials will cause permanent damage to the battery container and lid and will invalidate the warranty.

Check monthly that total voltage at battery terminals is (N x 2.27 to 2.29 Vpc) for a temperature at 20°C. (N being the number of cells in the battery). Make annual readings of the voltages of cells making up the battery.

Keep a logbook to record values, power outages, discharge tests, etc.

10. Technical data when charging with a constant voltage

If the charger does not permit an adjustment of the float voltage in relation with the temperature, it is possible to set a float voltage value and a recharging voltage value according to the temperature ranges as indicated in the table below:

Temperature	Float Voltage	Recharging Voltage
0°C to 10°C	2.33Vpc	2.45Vpc
10°C to 20°C	2.30Vpc	2.40Vpc
20°C to 30°C	2.27Vpc	2.35Vpc
30°C to 40°C	2.24Vpc	2.30Vpc