

12V/120AH@10h Rate  
GEL Deep Cycle Battery  
RECHARGEABLE BATTERY  
NONSPILLABLE



**GEL**  
**12-120**

• **Constant voltage charge**  
Standby use: 13.50–13.80V @ 25°C  
Cycle use: 14.10–14.40V @ 25°C  
Max. initial current: less than 30A

• **Caution:**  
Avoid short-circuiting battery terminals  
Avoid charging under airtight conditions  
Recharge after use

  
Sealed Lead Battery  
Must Be Recycled  
Or Disposed Of Properly

[www.victronenergy.com](http://www.victronenergy.com)

# Batteries

Energy Unlimited

# Batteries

## 1. VRLA technology

VRLA stands for Valve Regulated Lead Acid, which means the batteries are sealed. Gas will escape through the safety valves only in case of overcharging or cell failure.

VRLA batteries have exceptional leak resistance, and can be used in any position.

VRLA batteries are maintenance free for life.

## 2. Sealed (VRLA) AGM batteries

AGM stands for Absorbent Glass Mat. In these batteries the electrolyte is absorbed into a glass-fibre mat between the plates by capillary action. As explained in our book 'Energy Unlimited', AGM batteries are more suitable for short-time delivery of very high currents (engine starting) than gel batteries.

## 3. Sealed (VRLA) Gel batteries

Here the electrolyte is immobilized as gel. Gel batteries in general have a longer service life and better cycle capacity than AGM batteries.

## 4. Low Self-discharge

Because of the use of lead calcium grids and high purity materials, Victron VRLA batteries can be stored during long periods of time without recharge. The rate of self-discharge is less than 2% per month at 20°C. The self discharge doubles for every increase in temperature with 10°C.

Victron VRLA batteries can therefore be stored during up to a year without recharging, if kept under cool conditions.

## 5. Exceptional Deep Discharge Recovery

Victron VRLA batteries have exceptional discharge recovery, even after deep or prolonged discharge. It should however be stressed that repetitive deep discharge and prolonged discharge have a very negative influence on the service life of all lead acid batteries, Victron batteries are no exception.

## 6. Battery discharging characteristics

The rated capacity of Victron batteries refers to a 10 hour discharge, in other words: a discharge current of 0,1 C. The effective capacity decreases with increasing discharge current (see table 1). Please note that the capacity reduction will be even faster in case of a constant power load, such as an inverter.

Discharge time (constant current)	End voltage V	AGM Deep Cycle %	Gel Deep Cycle %	Gel Long Life %
20 hours	10,8	105	103	102
10 hours	10,8	100	100	100
5 hours	10,8	95	95	94
3 hours	10,8	82	81	79
1 hour	9,6	66	65	63
30 min	9,6	52	49	45
15 min	9,6	42	38	28
10 min	9,6	36	27	20
5 min	9,6	27	18	10
5 seconds		8 C	7 C	

**Table 1: Effective capacity as a function of discharge time.** (the lowest row gives the maximum allowable 5 seconds discharge current)

Our AGM deep cycle batteries have excellent high current performance and are therefore recommended for high current applications such as engine starting.

Due to their construction, Gel batteries have a lower effective capacity at high discharge currents. On the other hand, Gel batteries have a longer service life, both under float and cycling conditions.

## 7. Effect of temperature on service life

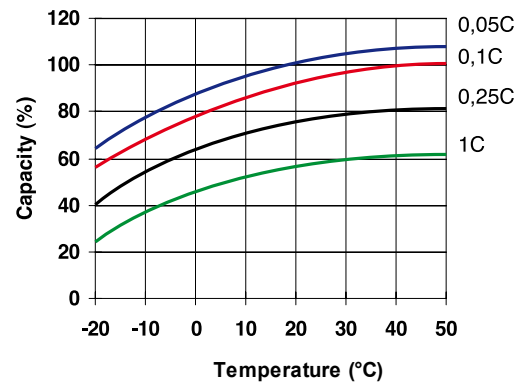
High temperature has a very negative effect on service life. The service life of Victron batteries as a function of temperature is shown in table 2.

Average operating temperature	AGM deep cycle years	Gel Deep Cycle years	Gel Long Life years
20°C / 68°F	7 - 10	12	20
30°C / 86°F	4	6	10
40°C / 104°F	2	3	5

**Table 2: Design service life of Victron batteries under float service**

## 8. Effect of temperature on capacity

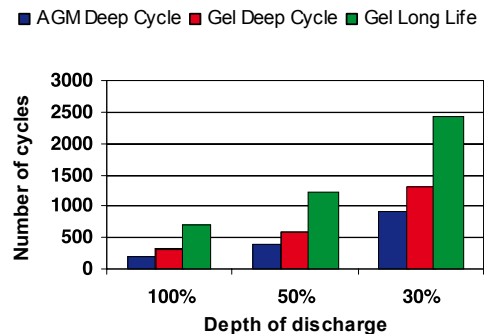
As is shown by the graph below, capacity reduces sharply at low temperatures.



**Fig 1: Effect of temperature on capacity**

## 9. Cycle life of Victron batteries

Batteries age due to discharging and recharging. The number of cycles depends on the depth of discharge, as is shown in figure 2.



**Fig 2: Cycle life**



# Deep Cycle AGM - Deep Cycle Gel - Long Life Gel

## 10. Battery charging in case of cycle use: the 3-step charge characteristic

The most common charge curve used to charge VRLA batteries in case of cyclic use is the 3-step charge characteristic, whereby a constant current phase (the bulk phase) is followed by two constant voltage phases (absorption and float), see fig. 3.

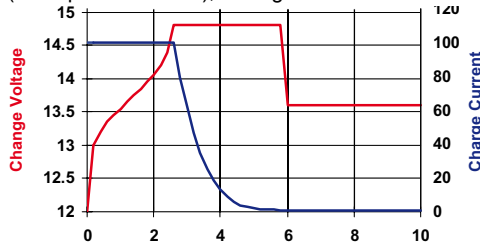


Fig 3: Three step charge curve

During the absorption phase the charge voltage is kept at a relatively high level in order to fully recharge the battery within reasonable time. The third and last phase is the float phase: the voltage is lowered to standby level, sufficient to compensate for self discharge.

### Disadvantages of the traditional 3-step charge characteristic:

- During the bulk phase the current is kept at a constant and often high level, even after the gassing voltage (14,34 V for a 12 V battery) has been exceeded. This can lead to excessive gas pressure in the battery. Some gas will escape through the safety valves, reducing service life.
- Thereafter the absorption voltage is applied during a fixed period of time, irrespective of how deep the battery has been discharged previously. A full absorption period after a shallow discharge will overcharge the battery, again reducing service life. (a. o. due to accelerated corrosion of the positive plates)
- Research has shown that battery life can be increased by decreasing the float voltage to an even lower level when the battery is not in use.

## 11. Battery charging: longer battery life with Victron 4-step adaptive charging

Victron developed the adaptive charge characteristic. The 4-step adaptive charge curve is the result of years of research and testing.

### The Victron adaptive charge curve solves the 3 main problems of the 3 step curve:

- **Battery Safe mode**  
In order to prevent excessive gassing, Victron has invented the 'Battery Safe Mode'. The battery Safe Mode will limit the rate of voltage increase once the gassing voltage has been reached. Research has shown that this will reduce internal gassing to a safe level.
- **Variable absorption time**  
Based on the duration of the bulk stage, the charger calculates how long it will keep the battery in absorption. If the bulk time is short, this means the battery was already charged and the resulting absorption time will be short. A longer bulk time will also result in a longer absorption time.
- **Storage mode**  
After completion of the absorption period the battery should be fully charged, and the voltage is lowered to the float or standby level. If no discharge occurs during the next 24 hours, the voltage is reduced even further and the battery goes into storage mode. The lower storage voltage reduces corrosion of the positive plates. Once every week the charge voltage is increased to the absorption level for a short period to compensate for self discharge (Battery Refresh mode).

## 12. Battery charging in case of standby use: constant voltage float charging

When a battery is not frequently deeply discharged, a 2-step charge curve can be used. During the first phase the battery is charged with a limited current (the bulk phase). Once a preset voltage has been reached the battery is kept at that voltage (the float phase). This charge method is used for starter batteries in vehicles, and in uninterruptible power supplies (UPS).

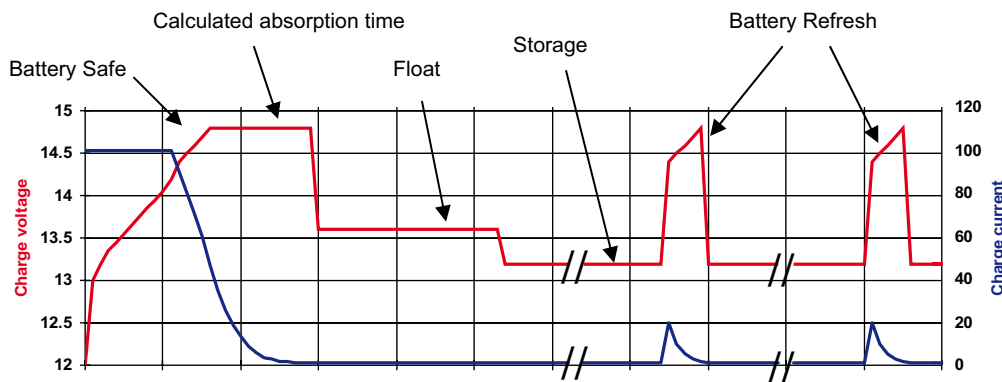


Fig 4: Four-step adaptive charge curve



