
# Lead Ultra Carbon Battery

## Years of Research for What?

Nordische has developed through years of research and development to manufacture high quality carbon based batteries which includes recent advances in the use of Nano Scale Carbon in the construction of Ultra carbon-lead acid batteries, which are reducing acid volume requirements and maintenance frequency, while extending cycle life.

## Why This Solution Is Critical?

Engineered Carbon nano-materials, perhaps the current leading materials advance for lead-acid batteries, yield substantial recharge performance gains. For example, Advanced Battery concepts can recharge twice as fast as standard lead storage batteries, provide higher power and offer an increased cycle life by about 100% compared to conventional lead storage batteries.

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PRODUCT SPECS AT A GLANCE

ADVANTAGES SUMMARY

**Compared to mainstream rechargeable industrial batteries like lead acid, lead gel and AGM batteries, Lead Carbon batteries perform as follows:**

- Lead Carbon batteries can be charged faster.
- Lead Carbon batteries can be discharged deeper (even to 100% DOD !)
- lead Carbon batteries can be charged below 7 degrees Celsius
- Lead Carbon batteries can be cycled more often (2400 @ 80% DOD)
- lead Carbon batteries have ultra low gassing (only if over-charged)
- Lead Carbon batteries can be used in a partial state of charge
- Lead Carbon batteries can be stored for 1.5 years without top-up charging
- Lead Carbon batteries require no special ventilation or cooling
- Lead Carbon batteries do NOT have risk of fire or explosion (unlike lithium batteries)
- Lead Carbon batteries do not release any harmful, dangerous or poisonous gasses during normal charging / discharging usage.
- Lead Carbon batteries will not leak any harmful or dangerous acid during normal charging / discharging usage.
- Lead Carbon batteries do not require an active BMS system to protect & balance them (unlike lithium batteries.
- Lead Carbon batteries do NOT suffer from Liquid / GEL drying out inside the battery like normal AGM.
- Lead Carbon batteries are one of the most ABUSE TOLERANT / RESISTANT batteries available today.
- Lead Carbon batteries can easily be retrofitted (retro-fitted) to 95% of applications that use existing lead acid.
- Lead Carbon batteries have an operating temperature from +2 to +40 degrees Celsius

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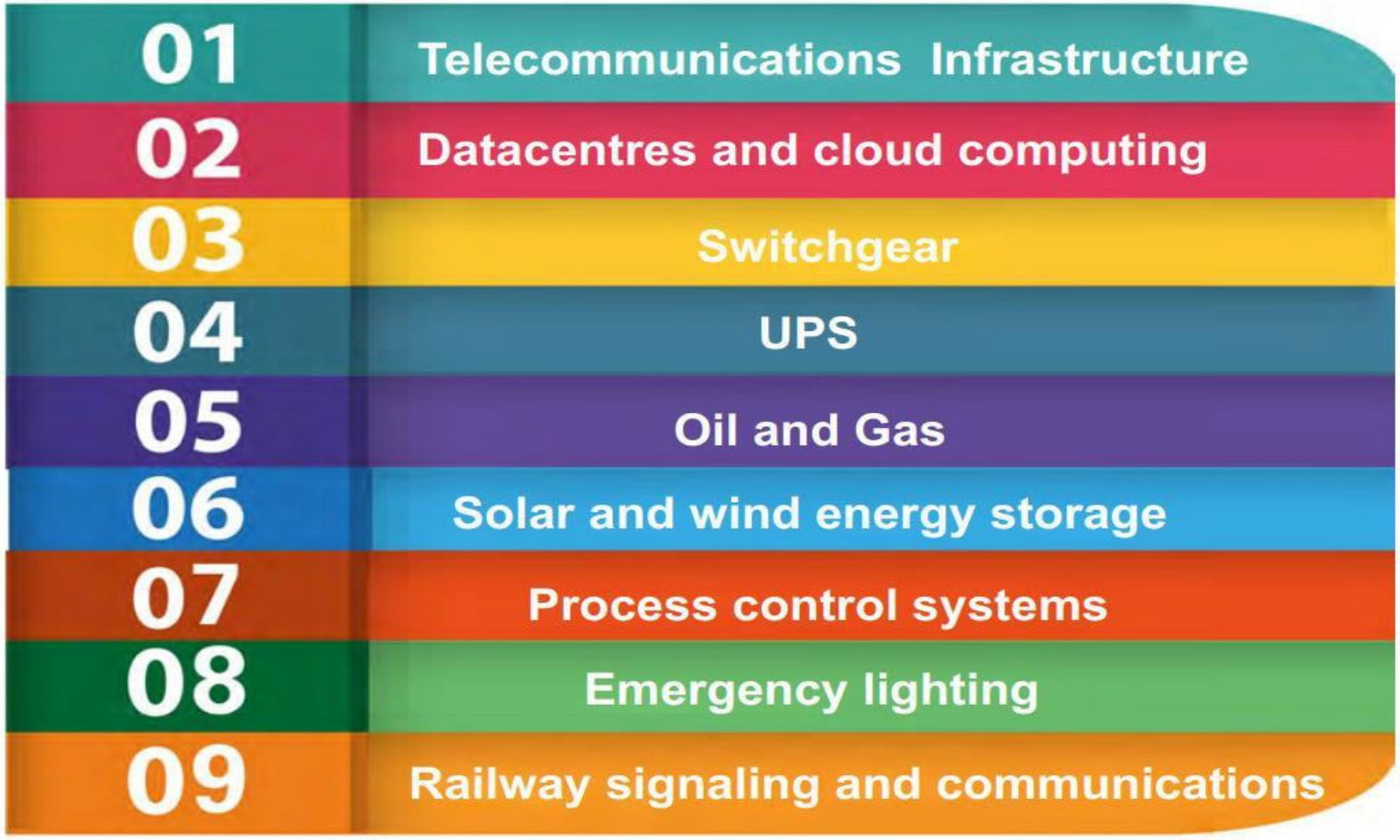
APPLICATION AREAS OF OUR BATTERIES

# Our batteries can be used in wide sectors!!



- **Lead carbon batteries have longer a longer cycle-life.** If you take the battery's 'end of life' to be the point at which it can only be charged/discharged to 80% of its original capacity, a lead carbon battery will last **for 7000 cycles at 30% DoD daily** – compared to 2000 – 5500 cycles at 30% DoD for VRLA-types and 800 cycles at 30% DoD for flooded batteries.
- The patented technology found in lead carbon batteries uses a **special advanced technology negative carbon plate formula**, developed to completely replace traditional regular sulphuric lead acid batteries. It effectively overcomes the disadvantages of **plate sulphation, active material loss and water loss rate**, has good low temperature product life.
- **Lead carbon batteries are better at sitting at partial states of charge (PSOC).**
- **Lead Carbon batteries use supercapacitor negative electrodes.** The supercapacitor negative electrode reduces corrosion on the positive electrode and also helps to inhibit sulphation for the negative electrode to last up to 20 years design life and 10yrs daily life.
- **Lead carbon batteries have faster charge/discharge rates.** Lead Carbon have a theoretical unlimited discharge rate and a fast charge rate also.
- **Ultra High Charge vs Discharge Efficiency Level.** Standard lead-type batteries usually have around a 50% charge vs discharge efficiency, so for every 1000w of solar / generator charge power you put into the battery (per hour) 50% of that is retained and 50% is wasted. This means for every 1000w of solar / generator charge power you put into the battery (per hour) then 90% of that is retained and only 10% is wasted.

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STRUCTURAL CHARACTERISTICS

| SL. No | Parameters | Details |
|---|---|---|
| 1 | **Special Electrolyte Composition** | A unique complex technology of Activated Carbon / Nano Carbon /Graphene is used to synergize a much longer life and higher efficiency internal Anode (negative) advanced plate technology, thereby optimizing the reaction between the electrolyte and the active electrode material, effectively preventing sulphation problems / issues |
| 2 | **Safety Valve** | A safety exhaust valve is used that has high sensitivity, and can open or close according to the internal pressure change of the battery. |
| 3 | **Sealing Performance** | Battery compartment and cover are seals made of rubber rings and terminals that are dual-sealed. A sealing material that has small shrinkage is used to ensure that the terminal seals well. |
| 4 | **Operating Temperature Range** | 2°C to +40°C |



# SOME FINER DETAILS

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BATTERY PERFORMANCE BFORE AND AFTER ADDITIVE

## *Performance of 12volts 100 ah & 12v150ah normal lead acid battery before Adding of Carbon as Special additive*

| Capacity | Type | Voltage | Cells | Terminal | Dimensions (MM) | | | | Application |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Length | Width | Height | Weight (Kg) | |
| 100Ah | Tubular | 12 | 6 | "L"/Stud - Type | 417 ± 2 | 191 ± 2 | 417± 2 | 30 | Solar |
| 150Ah | Tubular | 12 | 6 | "L"/Stud - Type | 417 ± 2 | 191 ± 2 | 417± 2 | 32 | Solar |

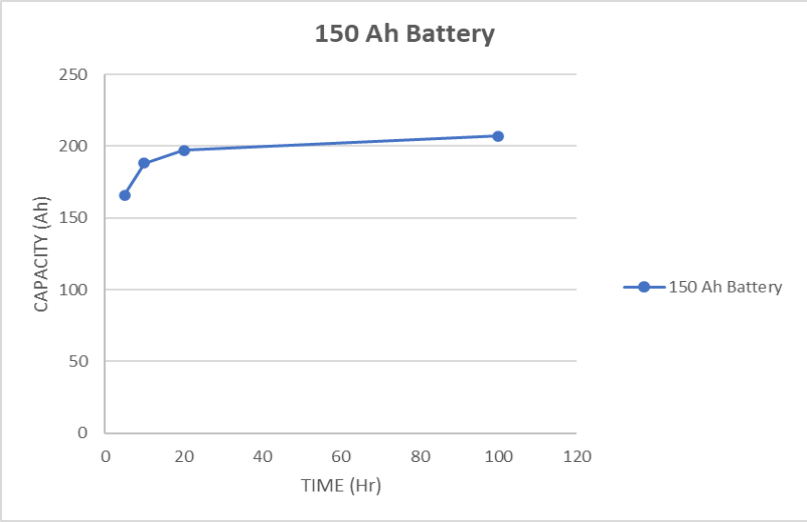
| Electrical Specifications: | | Capacity (Minutes) | | | Capacity Amp. Hrs | | | | ENERGY (kWh) |
|---|---|---|---|---|---|---|---|---|---|
| Capacity | Type | 25amps | 50amps | 75amps | 5-Hr | 10-Hr | 20-Hr | 100-Hr | 100-Hr |
| 100Ah | Tubular | 148 | 60 | 35 | 89 | 100 | 105 | 115 | 1.2 |
| 150Ah | Tubular | 250 | 101 | 60 | 133 | 150 | 157.6 | 165.75 | 1.5 |

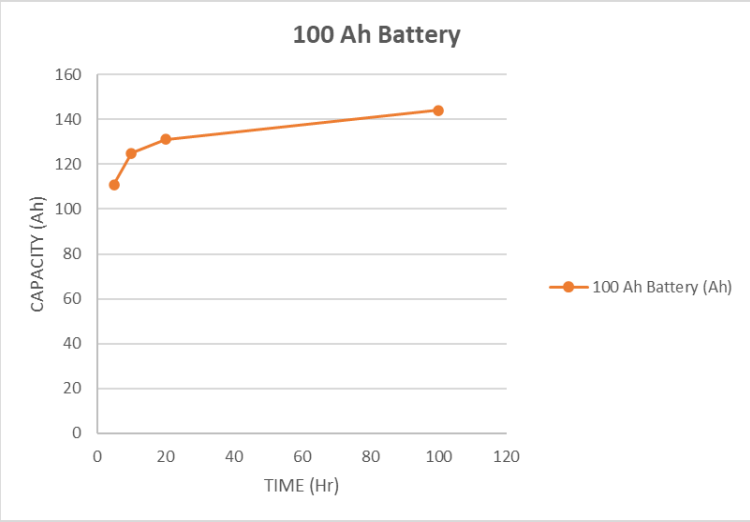
## *Performance of improved version of 12volts 100 ah & 12v 150ah after adding of Carbon as Special additive*

| Capacity | Type | Voltage | Cells | Terminal | Dimensions (MM) | | | | Application |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Length | Width | Height | Weight (Kg) | |
| 100Ah | Tubular | 12 | 6 | "L"/Stud - Type | 417 ± 2 | 191 ± 2 | 417± 2 | 30 | Solar |
| 150Ah | Tubular | 12 | 6 | "L"/Stud - Type | 417 ± 2 | 191 ± 2 | 417± 2 | 32 | Solar |

| Electrical Specifications: | | Capacity (Minutes) | | | Capacity Amp. Hrs | | | | ENERGY (kWh) |
|---|---|---|---|---|---|---|---|---|---|
| Capacity | Type | 25amps | 50amps | 75amps | 5-Hr | 10-Hr | 20-Hr | 100-Hr | 100-Hr |
| 100Ah | Tubular | 192 | 78 | 46 | 111 | 125 | 131 | 144 | 1.2 |
| 150Ah | Tubular | 325 | 131 | 78 | 166 | 188 | 197 | 207 | 1.5 |

## CHARGING CHARACTERISTICS

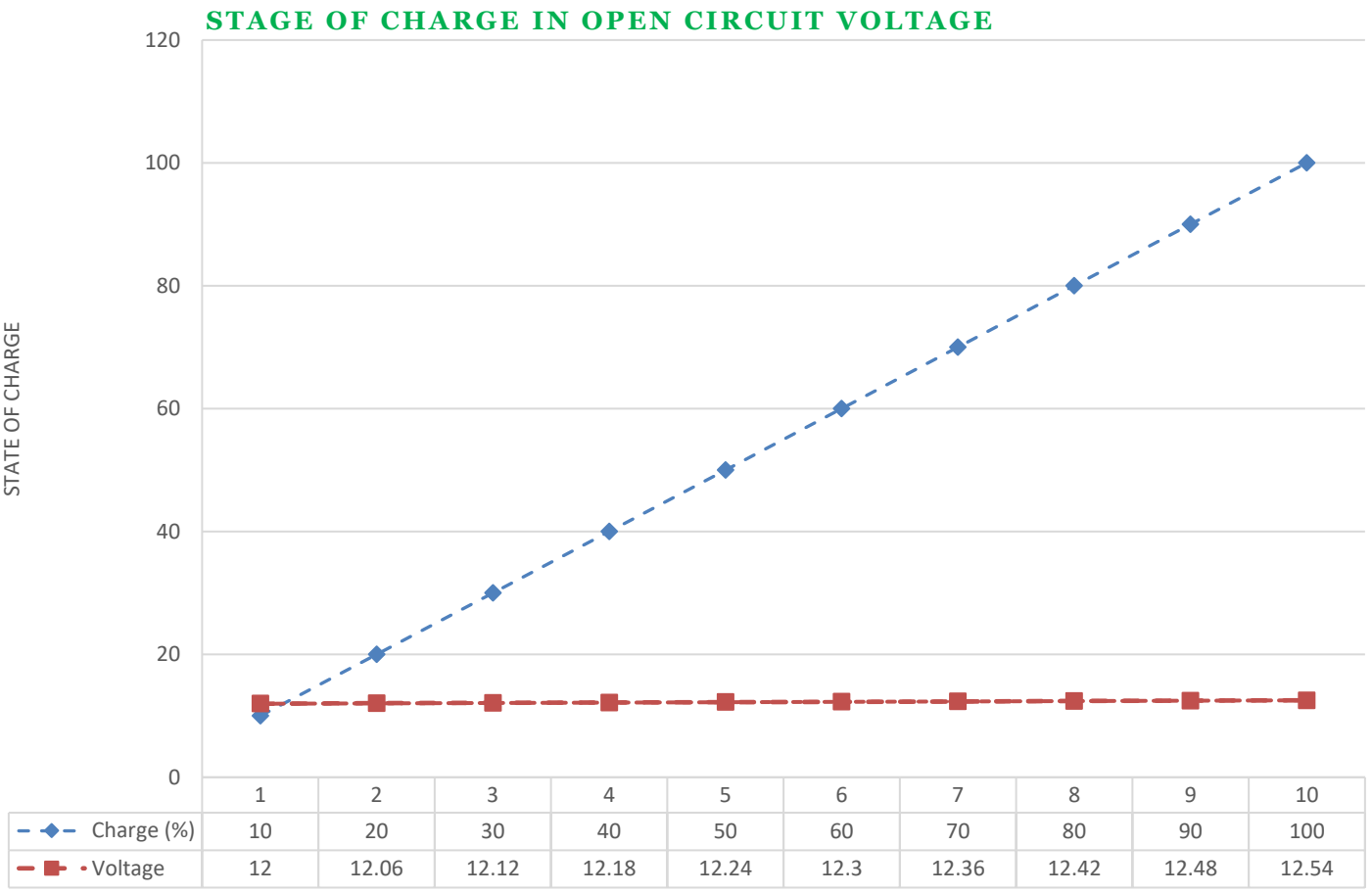



Lead Carbon Batteries are high-end products that work best with good quality battery chargers that have a compatible charge profile (or ability to adjust custom charge settings). Below settings for automated battery chargers are recommended to fully utilize the benefits of Lead Carbon Batteries.

- **Cyclic charging:** the battery is frequently charged and discharged like a daily routine. The battery is boosted to a higher voltage (absorb / equalization) phase then automatically followed by the float phase when and if the battery is (close to) full. You don't want to exceed 14.1v for the boost / absorb / equalize charging phase.
- **Standby charging:** the battery is only discharged once per week (or less).
- **Float charging:** the battery is in a constant charged state and rarely discharged. The Float Phase will also set in on standby charging when the battery is full (fully automated).

**STATE OF CHARGE** MEASURE OF OPEN-CIRCUIT VOLTAGE




| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Charge (%) | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| Voltage | 12 | 12.06 | 12.12 | 12.18 | 12.24 | 12.3 | 12.36 | 12.42 | 12.48 | 12.54 |

**Operating Temperature Self Discharge :** -4°F to 113°F (-20°C to +45°C). At temperatures below 32°F (0°C) maintain a state of charge greater than 60%.
***5-10%** per month depending on storage temperature conditions.

## DISCHARGING CHARACTERISTICS

Battery Capacity Batteries under certain discharge conditions will release a certain amount of current. This amount of current released is called the capacity. The symbol used to identify the capacity is "C". The commonly used unit of measure is Amp Hours (Ah).

- **Battery Discharge Rate:** The battery discharge rate uses rated hours to determine the discharge time. This time is influenced by the amount of current drawn from the battery. If the discharge current increases, the discharge time will decrease and also affect the rated capacity.
- **Influence of Temperature on Capacity:** The discharge characteristics and temperature of batteries are closely related. When the temperature is low, the discharge capacity of the battery will be reduced. For example, when the temperature is dropped from 25°C to 5°C, the capacity of the battery will drop to about 70% of its rated capacity.
- **Ambient Temperature:** As the ambient temperature rises, the battery capacity will increase within a certain range, for example, the battery capacity will rise to about 105% of the rated capacity when the temperature rises from 25°C to 40°C, however if the temperature continues to rise, the capacity increase will slow down, and ultimately not increase further.

| Details of values recorded on Discharge test conducted on 12volts 100 ah Flooded type - Version -1 | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Discharge Current - 10 Amps | Open Circuit values on Full Charge | Discharge Values on1st Hr. | Discharge Values on 2nd Hr. | Discharge Values on 3rd Hr. | Discharge Values on 4th Hr. | Discharge Values on 5th Hr. | Discharge Values on 6th Hr. | Discharge Values on 7th Hr. | Discharge Values on 8th Hr. | Discharge Values on 9th Hr. | Discharge Values on 10th Hr. |
| Bat. No's | Volt | Vol t | Volt | Volt | Volt | Volt | Volt | Volt | Volt | Volt | Volt |
| 1 | 13.05 | 12.38 | 12.29 | 12.07 | 11.95 | 11.83 | 11.72 | 11.57 | 11.41 | 11.22 | 10.52 |
| 2 | 13.01 | 12.23 | 12.10 | 11.92 | 11.93 | 11.82 | 11.71 | 11.56 | 11.40 | 11.20 | 10.51 |
| **Details of values recorded on Discharge test conducted on 12volts 100 ah Flooded type - Version -2** | | | | | | | | | | | |
| 1 | 13.05 | 12.31 | 12.20 | 12.03 | 11.91 | 11.82 | 11.70 | 11.53 | 11.39 | 11.17 | 10.50 |
| 2 | 13.05 | 12.30 | 12.18 | 12.01 | 11.90 | 11.83 | 11.71 | 11.55 | 11.40 | 11.19 | 10.52 |

## Particulars:

- Charge Method: Constant current constant voltage (CCCV) charge method. (Three Stage of Charging)
- Battery Taken up for discharge: Version 1
- Battery discharged at 10amps for 10hrs
- Battery Capacity - 12v 100ah
- Battery type: Flooded - Tubular
- Rest period allowed after full charge - 24hrs.
- OCV was observed to be 12.50 & 12.51 in $V_1$ & 12.52 & 12.54 after 24 hrs in idle conditions.
- Discharge started after freshening charge of 1hr.
- Capacity achieved corrected to 27$^0$C @ $C_{10}$ rate on completion of 10 hr. Discharge is 81%.
- Temperature while charging found to be nearer to ambient temperature throughout.

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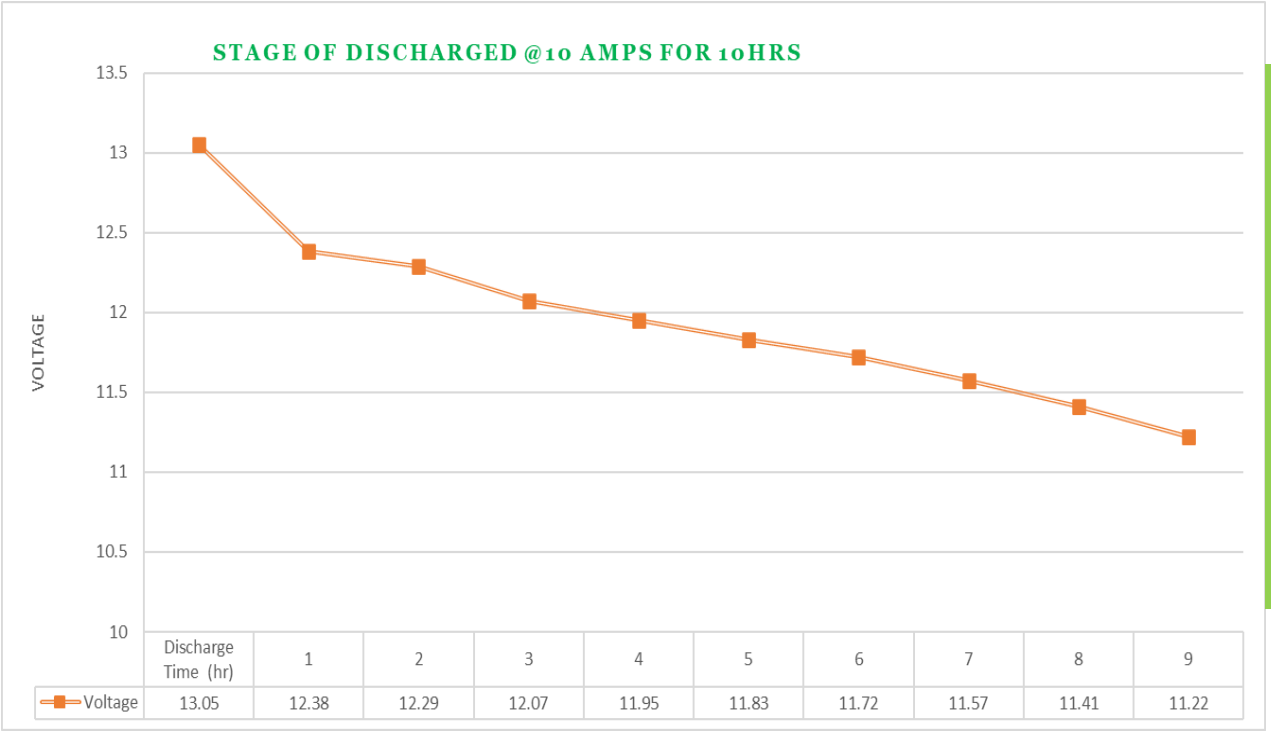
# DISCHARGING CHARACTERISTICS




| Discharge Time (hr) | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| Voltage 13.05 | 12.38 | 12.29 | 12.07 | 11.95 | 11.83 | 11.72 | 11.57 | 11.41 | 11.22 |

12V, 100Ah Battery

•**Discharge Voltage:** The termination voltage refers to the battery voltage dropping during discharge to the minimum working voltage required for operation. The termination voltage and the discharge current are closely related. Generally during high current discharge the termination voltage of the battery should be set low. Over discharging below the termination voltage should be avoided since the over discharging could only gain a small amount of additional capacity, but drastically reduce the battery's service life.

•**Self Discharge:** The self-discharge characteristics of a battery changes with environmental temperatures, the higher the temperature the higher the self-discharge, so the batteries should not be stored in an environment that is subjected to extremely high temperature conditions for long durations of time. Due to the use of our unique lead carbon plate technology, the self-discharge consumption of Lead Carbon Batteries is efficiently reduced. At a constant 25°C environmental temperature Lead Carbon Batteries can be kept on a shelf for up to 1.5 years without constant top up charging. The batteries will maintain over 60% of their rated capacity after 12 months.

- It offers a very long cycle life of 2500-3000 cycles on 100% depth- of-discharge .It reduces the rate of charge and discharge.
- High-rate charge acceptance up to 40% of Ah capacity(0.4C) with rapid recharge
- Our batteries are designed for increased overall usefulness in various applications.
- Requiring virtually no maintenance resulting in low operating costs and improved safety
- It is better self-balancing retaining charge.
- Reduced overall weight compared to normal lead acid battery
- Low Thermal Risk
- Fast rate of charge acceptance in minutes depending on the application and SOC.
- These batteries are fully recyclable at fraction of the cost.

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