Lfp nominal voltage

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For reference, we have taken the datasheet of80Ah LFP prismatic cell from Great Power. This 80Ah cell is regularly imported in India and popularly used in e-rickshaw applications. The terms on the datasheet are explained below.

It is the average voltage delivered by the cell during discharge. Lithium-ion cells don"t have a steady voltage profile. An LFP cell discharges from 3.60V - 3.65V (depends on the cell brand) to close to 3.2V and offers a flat voltage curve during discharge, and then goes all the way down to 2.5V. On the other hand, an NMC cell discharges from 4.20V - 4.25V (depends on the cell brand) and has a falling curve and goes all the way to 2.75V. The industry standard for nominal voltage of an LFP cell is 3.2V. For NMC cells, it is 3.60V or 3.70V, depending on the cell manufacturer.

A common reason for cells experiencing thermal runaway is BMS failure leading to overcharging (during charging), temperature sensors of the BMS failing to detect the rising temperature of the battery pack or due to internal short-circuit of the cell.

Also known as the lower cut-off voltage of a cell, it is the voltage level at which the cell needs to be stopped from further discharging. It is usually recommended by the cell manufacturer, but battery pack companies tend to set their lower cut-off voltage depending on the depth of discharge planned for their battery packs. Manufacturer recommended lower cut-off voltage for an LFP cell is 2.50V, and for an NMC cell is 2.75V.

Discharging the cells below this voltage can increase the irreversible capacity degradation and lead to lower cycle life and calendar life. It can also lead to swelling of pouch cells, bulging of prismatic cells and leakage at the positive terminals of the cylindrical cells.

It is the recommended charging method for a cell to achieve a maximum cycle life. It is mentioned either in C rating or Amperes. In this case, it’s 0.5C. It means the standard charging current for this cell is 40A (0.5x80A) in constant current mode until it reaches 3.65V, and after that, it should be charged in constant voltage mode. Charging the cell at a lower charging current than the standard charging current can lead to higher cycle life.

It is the recommended discharging method for a cell to achieve a maximum cycle life. In this case, it is mentioned as 0.5C, meaning the standard discharging current for the cell is 40A until the cell reaches its lower cut-off voltage. Discharging the cell at a lower current than standard discharging current can lead to higher cycle life.

Internal resistance refers to the resistance by the cells to the flow of current, which results in the generation of heat. It is measured in mO. The lower the internal resistance of a cell, the more continuous discharge current

the cell can provide and the faster the cell can charge.

A cell of particular chemistry and a particular capacity has an industry standard value for internal resistance. Any value below this standard value would mean the cells are EV grade and any value above this standard value would mean the cells are ESS/Solar grade.In this case, it is <=0.7mO. According to the industry standard, this 80Ah LFP cell with <=0.7mO is an EV grade cell.

The weight of a cell matters a lot, especially for an EV application, as it directly affects the gravimetric energy density (measured in Wh/Kg) of a battery pack. NMC cells have better gravimetric energy density as compared to LFP cells. The lower weight of the cells can reduce the overall weight of the battery pack and lead to a higher range for the EV using the same capacity and voltage of the battery pack (measured in Wh/Km).

Dimensions of a cell affect the volumetric energy density (measured in Wh/L) of a battery pack. It is the main criteria when a particular capacity and/or voltage of a battery needs to fit in given volume space. More capacity and/or voltage of a battery pack means higher range for an electric vehicle. It is the reason why NMC cells are preferred over LFP cells in electric 2 wheelers and electric cars. These applications have limited volume space to fit the battery, but end-users expect a high range.

Operating temperature of Lithium-ion cells affects the cycle life and calendar life of the battery pack. The standard operation temperature for a Lithium-ion cell is 25?C, and a rise in the operation temperature can reduce the battery pack’s cycle life and calendar life. Since Indian conditions can not offer 25?C temperature through the year, it becomes a challenge for EV battery packs to provide a good cycle life.