

Features of Lithium Ion Batteries from Clayton Power

System control

The lithium battery works as the main controller in a complete power system. The battery manages power distribution and the priority of operation of different power consumers.

Charger control

It is necessary to control the charging of lithium batteries in order to avoid un-controlled disconnects and to protect the lithium cells from unstable conditions. The charging can be controlled via the interface using communication or output pins.

G3 Inverter/Charger control

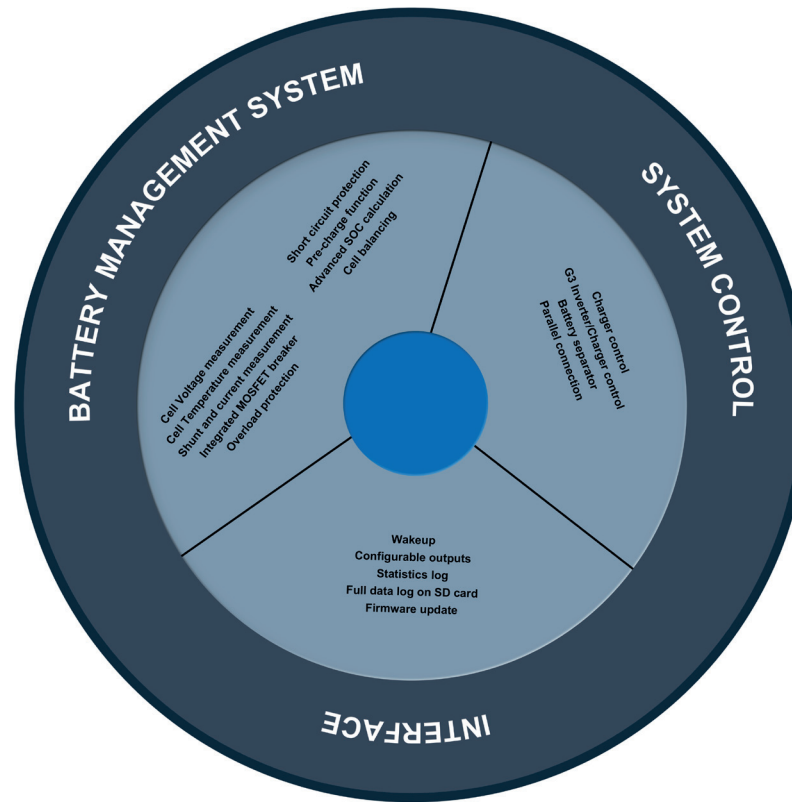
The lithium batteries can communicate with a CP G3 Inverter/Charger and control power distribution and charging.

Battery Separator

Clayton Power lithium batteries have a built-in battery separator to control the charge current coming directly from a starter battery. This reduces the need for external components and ensures safe charging using the excess current from the alternator.

Parallel connection

Several lithium batteries can be parallel connected in order to increase battery capacity and current capability. The interconnected batteries have separate MOSFET safety breakers ensuring parallel connection without any safety risk while maintaining full control over the batteries.



Battery Management System

Each lithium battery has a built-in Battery Management System ensuring full control and safety. The BMS monitors lithium cell activity and uses the information for safety, maintenance, SOC, and interface control.

Cell voltage measurement

The BMS measures cell voltage with high accuracy. The accuracy is necessary to calculate the SOC as a few mVolt make a big difference.

Cell temperature measurement

The BMS measures the temperature of all individual cells in a battery pack to ensure that none of the cells overheat or cause thermal runaway. The temperature information is also used for SOC calculations.

Shunt and current measurement

The current goes through the BMS and the internal shunt. The BMS measures the current and uses it for protection and SOC calculation.

Integrated MOSFET safety breaker

The most important part of the BMS circuit protection is the integrated MOSFET safety breaker. It allows the BMS to cut off all charge and discharge currents in hazardous situations.

Overload protection

The advantage of the internal MOSFET safety breaker is its capability to disconnect high currents without damaging the main switch. The BMS can use the MOSFET safety breaker for overload protection without damaging the cells.

Short-circuit protection

The MOSFET safety breaker in the BMS protects the battery against output short-circuits. The MOSFET has a very short reaction time and can disconnect the output in short-circuit situations without damaging any components.

Pre-charge function

The BMS has a pre-charge function build into the MOSFET breaker. The pre-charge function reduces inrush currents when high-capacity consumers are connected.

Advanced SOC calculation

The highly advanced algorithm for SOC calculation involves a combination of voltage, temperature and impedance mapped in tables combined with detection of actual data. The data tables include information about SOC vs. OCV, immediate cell impedance, time-effected cell impedance, and temperature vs. cell impedance.

Cell balancing

The advanced SOC calculation ensures that all cells are kept in a balanced condition at all times. The BMS has a high cell-balance current that reduces the need for active cell balancing and restores the cells to a balanced condition faster. The BMS is cell balancing of each single cell in charge, discharge and idle mode.

Interface

Each lithium battery has an extended interface that allows it to control power distribution for different consumers. The interface can control alternative chargers, solar panels, gen-sets, and other charging devices. The control of external devices is ensured via several communications, wake-ups, and input and output pins.

2* CAN Communication

1* CP Single Wire Communication

4* high/low inputs

4* open collection outputs

Wake-up

When the lithium battery is not in use enters the BMS a low power state. In this state the BMS keeps power consumption ultra-low to avoid further discharge of the lithium cells. The BMS can be re-activated through several wake-up high/low input pins and charge currents plugged into the battery.

Configurable outputs

The output pins can be configured via PC software to be triggered in occasion of different events caused by cell voltage, cell temperature, current and/or SOC levels.

Statistics log

The BMS statistics log is a diagnostics tool by which the BMS logs all events, ampere hours going in and out of the battery, and tracking failures. The information is stored in a non-volatile EEPROM.

Full data log on SD-Card

The BMS has an internal SD-Card which logs all activity. The data can be analysed for battery usage / performance and for diagnostics.

Firmware update via CAN

The firmware can be updated via a simple USB-connection to a CAN-adaptor to ensure the newest firmware and functions.