



**Smart Battery®**  
**3.2V 5Ah LiFePO4 Battery Cell**  
**Cell Safety Features**



**Safe - LiFePO4 chemistry**

**Built in safety fuse (CID)**

**Explosion proof stainless steel case**



**High pressure safety vent 1.5Mpa (CID)**

**Over temperature protection (CID)**

**Flame retardant additive in electrolyte**

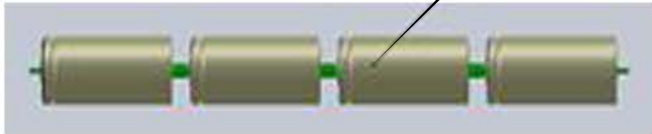
**Bolted Connection**

# Smart Battery® 12V Pack Assembly Structure and Design

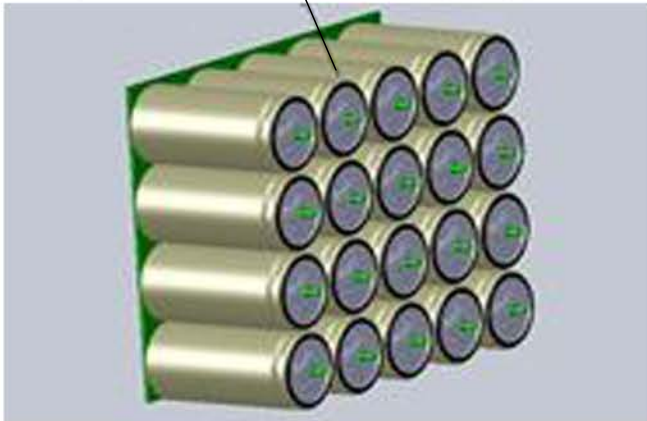


## ASSEMBLY INSTRUCTIONS

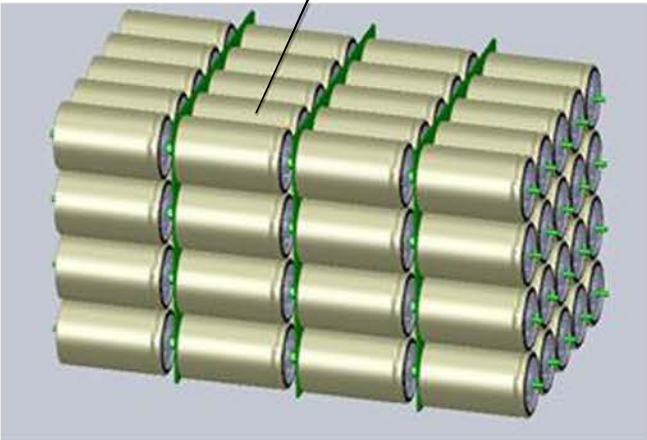
Series four 3.2V 5Ah cells to create 12.8v 5Ah nominal



Create parallel connection to build capacity (3.2v 100Ah)



Combine parallel bus into series creating 12V 100Ah



## FIRM

The cell's positive and negative are welded to the pillars, and connected tightly with nuts.



## PASSIVE CIRCUIT BOARD

The structure has a unique function of lengthways overcurrent and cross protection, which protects each cell.





# Smart Battery® 3.2V 5Ah LiFePO4 Battery Cell

## Cell Safety and Design



### Generation 2:

Smart Battery Model 32650 LiFePO4 Cell has reached a capacity of over 6Ah. 4000 cycles at 100% for each cell. The ratio of weight against energy is 130Wh/Kg. It has long cycle life for over 10 years. Cells are bolted together for strength and for strong electrical conduction. performance and design ranks the world level.

### Triple Protection Design:

1. The diaphragm shuts down the inner ion while the cell is at high temperature
2. If the cell casing is of high internal pressure, the positive and external (negative) current will cut off.
3. If the internal pressure is over the safe value of 1.5Mpa. the valve discharges.

### Cell Matching Process:

When assembling multiple cells together either in series or in parallel we match and group cells together based on 10 consistencies;

1. Consistency of self discharge
2. Consistency of voltage
3. Consistency of inner impedance
4. Consistency of capacity
5. Consistency of cycle life
6. Consistency of platform
7. Consistency of constant current rate
8. Consistency of cell power control
9. Consistency of parallel module control
10. Consistency of finished battery control



Cell Batching and Monitoring Stations

### Safety:

#### Built In Fuse:

In the event a vehicle were to catch fire for some reason (not related to batteries) and the battery is consumed, each 3.2V 5Ah cell has a built in fuse, in the event of temperatures in excess of 135°C the separator's passage for the ion would be closed, and then the ion can not flow any more, close circuit breaks.

The same situation for the external protection, when internal air pressure is over 1.5Mpa, the air vent is going to flip over, CID shall be detached, so the close circuit breaks, and no ion inside will flow any more.

### Electrolyte:

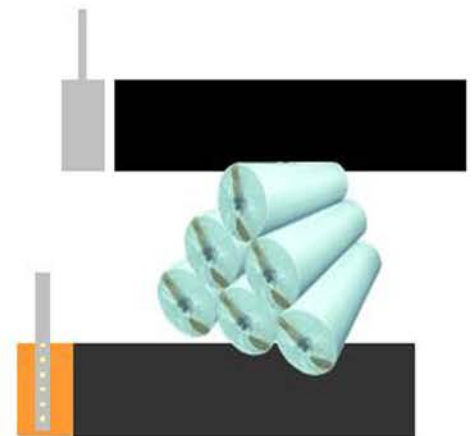
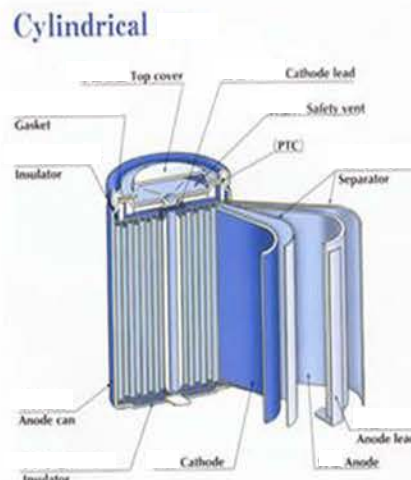
We add a fire retardant into the electrolyte

### High Pressure Relief Valve:

A high pressure relief valve is set 1.5Mpa

### Explosion Proof:

Stainless Steel Explosion Proof Design

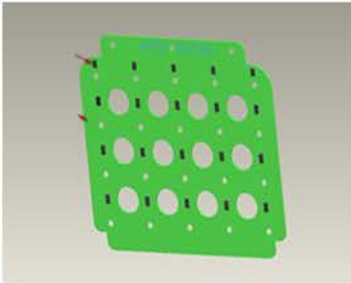




# Smart Battery® 12V Pack Assembly Lengthway Circuit Board



## Lengthway Circuit Board



### PACK TECH LENGTHWAYS

The Lengthway circuit boards have a unique function of overcurrent and cross protection, The cells are bolted through the lengthway Circuit boards providing balancing, even current flow and short circuit separation.

### CELL CIRCUIT PROTECTION

If the battery is penetrated by bullets or lodged metal from an accident the circuit board will separate the impacted cells from the rest of the cells allowing the battery to continue functioning with less capacity.

## BOLTED DESIGN PROVIDES

### STRENGTH

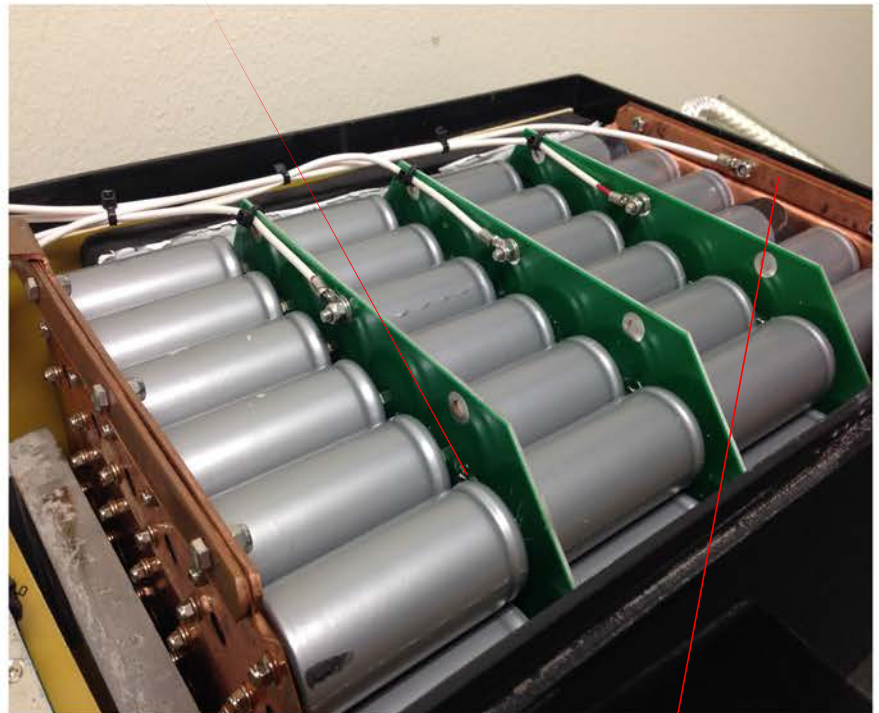
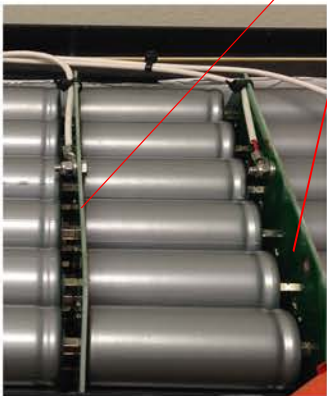
For demanding applications and environments The cell's positive and negative are welded to the pillars, and connected tightly with nuts.

### SHOCK RESISTANT

Highly reliable and durable After the Shock and Vibration test there is no mechanical damage and looseness of the battery pack according to the test GB/T 2423.10 Result: battery pack is in good condition.

### ELECTRICAL CONDUCTIVITY

Very low impedance with high current capability, cells are evenly divided with spacing for good heat dissipation.



### Copper Bus

Both ends of the module are built with the same design on the assembly structure so charge and discharge is in the same lengths.





## Smart Battery® 12V Pack Assembly Circuit Function and Balancing



### SMART BATTERY® INTERNAL PROTECTION SYSTEM

The PCB is designed with functions of cross balance, lengthway current, and multiple functions of cell protection. This design has been applied for international Patent of Invention.



LENGTHWAY BALANCING

CROSS BALANCE

CABLE HEAT SHIELD

COPPER BUS

BATTERY PROTECTION SYSTEM

### PCB BOARD FUNCTION

Balancing, Over Current, Short Circuit, Reverse Polarity Under / Over Voltage Protection

In the event any of the above conditions is applied the PCB board can disconnect power to the terminal post protecting the lithium ion cells from damage, After the fault condition is removed the PCB will automatically reconnect for normal operation. In the event of a low voltage shut off the PCB will reconnect with a charge current.

### BALANCING

During charging the PCB board will provide up to 2A current through the lengthway circuit board which is lower voltage than the other lengthway boards.

Tests show that the cells are so precisely matched, batched together with high conformity and passive assembly design that the balancing function will remain inactive for most of the battery life.