



## Safe, High Power Battery Solutions

Power. Safety. Life.™

Fast Charging LFP Nanophosphate® Battery Packs are ideal for

- Automated Guided Vehicles (AGV)
- Autonomous Mobile Robots (AMR)
- Fuel Cells for Material Handling Electric Vehicles (FCEV)

### Fast Charging Batteries



Up to **4C continuous high rate charge rate** and **8C peak pulse charging**, will maintain the highest SOC on the battery system, by using opportunity charging whenever the AGV is not picking products, to keep the AGV/Fuel Cell system running 24 hours a day. LFP batteries can be charged to 100% SOC, whereas LMC/NCA have to end charging below 90% SOC for safety.

### High Calendar & Cycle Life



Long running discharges & fast 4C charge will deliver a minimum of 4000 cycles to 100% DOD, 6000 cycles to 80% DOD, and 10,000 cycles to 50% DOD and will greatly extend battery cycle life, making your cost per cycle very low compared to other lithium ion chemistries or lead acid batteries.

### Extreme Safety



**An AGV or Fuel Cycle battery fire in the middle of warehouse shelves is not an option.** Using an inherently safe LFP Nanophosphate® cell technology (does not make oxygen even if forced into a thermal runaway or given an internal short), versus other lithium technologies like NMC or NCA which make oxygen (which will fuel a fire) if shorted or enters into a thermal runaway. NMC or NCA must add expensive flame retardant gels around each of the cells in a pack to try to mitigate a fire at a very high temperature, making it hard to put it out until it burns itself out. Lithium Werks safety is priceless.

### Low Capacity Fade Low Self-Discharge Rates



LFP Batteries have the ability to sit idle for a long time (if needed) with very little capacity fade, which is important. If an AGV, AMR, or FCEV sits over the weekend or is put in storage for some time, you do not want a high self-discharge rate battery (NMC/NCA) to cause you to have to boost charge before its next use.

### High Discharge Rates



Up to **20C continuous discharge rate**, and **48C peak pulse discharge** are key to FCEV's that need high discharge rates to handle the high peak capacity loads. AGV's and AMR's often have a higher surge rate when they start moving a heavy pallet or other payload forward. The high discharge rate cell will also allow the battery pack to run cooler than most other battery technologies without the need for extra forced cell cooling.

### Wider Temperature Range



Operation in a wider temperature range is possible with the LFP Nanophosphate® technology allows for more robust performance in extreme temperatures, delivering longer life, and greater safety.

### Lowest Total Cost of Ownership

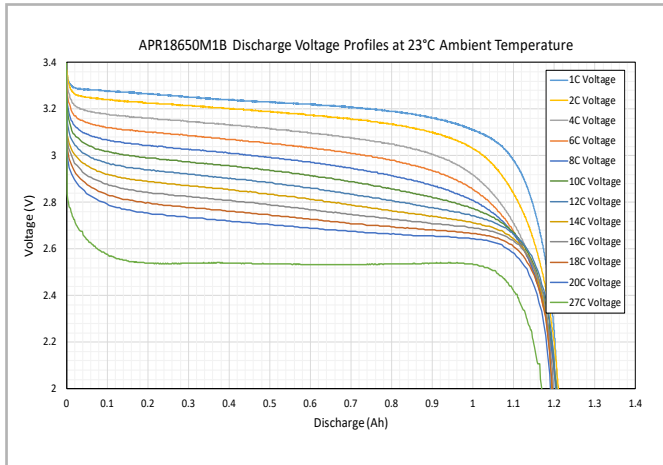


Total Cost of Ownership takes into consideration initial battery cost/charging speed/cycle and calendar life/any additional costs like extra forced cooling cost/flame retarding gel costs, or extra maintenance to handle capacity losses. **Lithium Werks cells are in a class by themselves.**

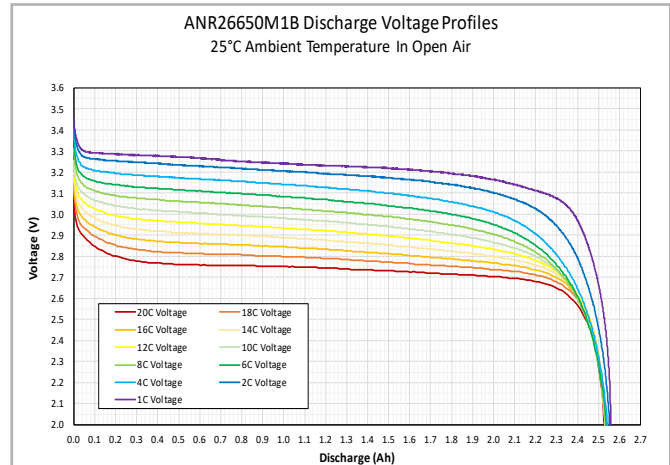
# Safe, High Power Battery Solutions

Power. Safety. Life.™

## 18650 Power Cell



## 18650 Power Cell



## Power Cell Specifications

Nominal Ratings	18650 Cells	26650 Cells
Voltage	3.3 V	3.3 V
Capacity @ 23 °C Typical (Min)	1.2 Ah (1.15 Ah)	2.6 Ah (2.5 Ah)
Energy @ 23 °C	3.96 Wh	8.58 Wh
Impedance (1kHz AC)	<16 mΩ	<10 mΩ
Cycle Life at 1C/1C, 100% DOD		> 4000 cycles
<b>Discharging</b>		
Max Continuous Discharge Current	30 A (25C rate)	52 A (20C rate)
Max Pulse Discharge Current (10s)	50 A (42C rate)	120 A (40C rate)
Minimum Voltage / HPPC Pulse		2 V / 1.6 V
Temperature		-30 °C to 60 °C
<b>Charging</b>		
Recommended Charge Current	1.5 A (1C rate)	3 A (1.2C rate)
Max Continuous Charge Current	4 A (3C rate)	10 A (4C rate)
Max Pulse Charge Current (10s)	10 A (8C rate)	26 A (8C rate)
Recommended Charge Voltage		3.6 V
Terminate Charge @ 3.6 V		< 50 mA
HPPC Pulse Voltage		3.8 V
Float Voltage		3.5 V
Temperature Range (Charging current at <40mA when under 0 °C for some applications)		0 °C to 60 °C
<b>Storage</b>		
Storage Temperature		-40 °C to 70 °C
<b>Mechanical</b>		
Diameter	Ø18.5 +/- 0.1 mm	Ø25.96 +/- 0.5 mm
Length	64.95 +/- 0.2 mm	65.15 +/- 0.5 mm
Mass	41.5 +/- 1.0 g	76 +/- 1.5 g