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Charge and discharge rates of a battery are governed by C-rates. The capacity of a battery is commonly rated at 1C, meaning that a fully charged battery rated at 1Ah should provide 1A for one hour. The same battery discharging at 0.5C should provide 500mA for two hours, and at 2C it delivers 2A for 30 minutes. Losses at fast discharges reduce the discharge time and these losses also affect charge times.

A C-rate of 1C is also known as a one-hour discharge; 0.5C or C/2 is a two-hour discharge and 0.2C or C/5 is a 5-hour discharge. Some high-performance batteries can be charged and discharged above 1C with moderate stress. Table 1 illustrates the typical times at various C-rates.

2. The discharge current value under 20C discharge condition is 4.8(A)*20(C)=96A This battery reveals the excellent performance even if the battery discharges 20C discharge condition. The following is the available time of the battery when the capacity of a battery shows 4.15Ah

The discharge rate provides you with the starting point for determining the capacity of a battery necessary to run various electrical devices. The product I x t is the charge Q, in coulombs, given off by the battery. Engineers typically prefer to use amp-hours to measure the discharge rate using time t in hours and current I in amps.

From this, you can understand battery capacity using values like watt-hours (Wh) which measure the battery’s capacity or discharge energy in terms of a watt, a unit of power. Engineers use the Ragone plot to evaluate the watt-hour capacity of batteries made of nickel and lithium. The Ragone plots show how to discharge power (in watts) falls off as discharge energy (Wh) increases. The plots show this inverse relationship between the two variables.

These plots let you use the battery chemistry to measure the power and discharge rate of different types of batteries including lithium-iron-phosphate (LFP), lithium-manganese oxide (LMO), and nickel manganese cobalt (NMC).

The battery discharge curve equation that underlies these plots lets you determine the runtime of a battery by finding the inverse slope of the line. This works because units of watt-hour divided by watt give you hours of the runtime. Putting these concepts in equation form, you can write E = C x Vavg for energy E in watt-hours, capacity in amp-hours C, and Vavg average voltage of the discharge.

Watt-hours provide a convenient way to convert from discharge energy to other forms of energy because multiplying the watt-hours by 3600 to get watt-seconds gives you the energy in units of joules. Joules are frequently used in other areas of physics and chemistry such as thermal energy and heat for thermodynamics or the energy of light in laser physics.

A few other miscellaneous measurements are helpful alongside discharge rate. Engineers also measure the power capability in units of C, which is the amp-hour capacity divided by precisely one hour. You can also convert directly from watts to amps knowing that P = I x V for power P in watts, current I in amps, and voltage V in volts for a battery.

For example, a 4 V battery with a 2 amp-hour rating has a watt-hour capacity of 2 Wh. This measurement means you can draw the current at 2 amps for one hour or you can draw a current at a single amp for two hours. The relationship between current and time both depend on one another, as given by the amp-hour rating.

If you need any help finding the right battery for your application please get in touch with one of the BSLBATT Lithium Battery application engineers. < >   Golf Cart Lithium Battery Upgrade Guide ...

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