What Size Battery Do I Need?

These Formulas Will Tell You!

for Lithium ION chemistry

If you are looking for a quick way to understand the size and weight of a battery solution given power, voltage and current requirements - the formulas below will make the job a bit easier for *Lithium ION* chemistry.

The following is a scenario using a current of 1 A, a run time of 2 hours and a voltage of 12 V.

If you know the given current, run time and voltage - multiply these three numbers together to determine the number of watt-hours (Wh) needed.

For example: a 12 V load that draws 1 A of current for 2 hours would be:

(12 V * 1 A * 2 h) = 24 Wh

Or, if you are given just power (12 W) - multiply by the run time to get the number of Wh:

(12 W * 2 h = 24 Wh)

Multiply the current and time duration together to get the capacity needed:

(1 A * 2 h) = 2 Ah.

Divide the current by the capacity to get the average power rate needed:

(1 A / 2 Ah) = 0.5 (this is represented as 0.5C)

At power rates at approximately 1.0C and less, Lithium ION batteries have, on average, an energy density of approximately 170 Wh / g and 330 Wh / l. These numbers will vary from manufacturer to manufacturer and do not include incremental design features such as the circuit board or plastics. The idea is to get a quick estimate. In this instance, we can find the estimated weight and volume as follows:

Estimated Weight: = **24 Wh * (1 kg / 170 Wh) = 0.14 kg**

Estimated Volume:

= **24 Wh * (1 liter / 330 Wh) * (10^{-3} m^3 / liter) * (1 mm^3 / 10^{-9} m^3) = 72700 mm^3**

Now you can evaluate average mechanical dimensions given constraints in the X, Y or Z dimension.

For additional assistance with power requirements and your application, complete our short Battery Application Form.