

Battery Pack

From Tesla Motors Wiki

The **Battery Pack** is the main fuel source in all Tesla Motors (/wiki/Tesla_Motors) cars. In Model S (/wiki/Model_S) it is mounted beneath the floor of the cabin and forms a structural member; in Roadster (/wiki/Roadster) it is mounted behind the seats and ahead of the rear axel.

Model S originally came in 3 battery pack variants: 40 (/wiki/40_kWh_battery) kWh (/wiki/KWh), 60 (/wiki/60_kWh_battery) kWh and 85 (/wiki/85_kWh_battery) kWh. Roadster was originally available with a 53 kWh battery, but in 2014 Roadster owners were contacted about plans to offer a 90 kWh battery as an upgrade.

The battery packs in both cars are comprised of thousands of rechargeable Lithium-ion cells officially named as 18650 or 168A and which resemble an AA battery in physical size.

Model S

TMC (/wiki/TMC) user WK057 purchased an 85 kWh pack from a salvaged Model S and shared all the details in this thread (<http://www.teslamotorsclub.com/showthread.php/34934-Pics-Info-Inside-the-battery-pack>). His teardown confirmed what was already suspected about the pack:

- It contains 7104 individual cells.
- It is believed the cells are Panasonic 3400 mAh at 3.6V. This would yield a pack capacity of $7104 * 3400 * 3.6 = 86.95$ kWh. It is possible that the cells are 3.7V, which would yield a capacity of 89.4 kWh. The difference between 85 kWh and these higher figures has been speculated to be capacity that is reserved by Tesla for battery protection.
- The cells are arranged in 96 groups of 74 cells each.
- The 74 cells in a group (also called a "brick" in the Roadster (/wiki/Roadster) are wired in parallel so that the batteries are balanced (/index.php?title=Battery_Balancing&action=edit&redlink=1) amongst themselves. Each group as one large approximately 4.1V cell with a current capacity of approximately 230 Ah.
- Each of these 96 groups are connected in series, rendering a pack output of 403v at 230Ah.
- Physically, six groups are connected in series to form a "sheet" or "module", delivering 25.2V at 230A each sheet (Tesla's parlance I believe), contains 6 of those groups, all connected in series, rendering a sheet output of ~25v@230Ah. Each of those 16 sheets is then connected in series for the final output.

There are Battery Management System (/index.php?title=Battery_Management_System&action=edit&redlink=1) (BMS) boards on each module that are wired to monitor each group (brick) as well as the module itself. There is a main BMS for the overall pack, mounted in the back of the pack near the contactors.

Approximately 25% (250lb) of the weight of the pack is in the frame/housing, with the remaining 75% being in the battery modules.

60 kWh Battery

Details for the 60kWh pack are not as certain. One view is that it is made of 60 cells per group instead of 74. As with the 85 kWh pack, 6 groups are arranged to form a module, and 14 (not 16) modules make up the pack, for a total of 5040 cells.

Another view is that there are 15 modules, not 14. A further view is that there are 14 modules, but three of them have fewer cells. Lastly it is possible that there are in fact 74 cells per module like the larger pack.

Whatever the configuration, it results in a pack with a lower maximum voltage. In turn this means the battery can deliver a lower maximum power (than the 85), which explains why the S60 (/wiki/S60) accelerates slower than the S85 (/wiki/S85) despite weighing less.

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