

Automotive Scene

Tesla electric sports car driven by Lithium ion batteries

By Bill Vance

Electric cars go back to the dawn of the automobile when they vied for supremacy with gasoline and steam as the power of choice. An electric was the first to exceed 96 km/h, and they held the land speed record from December 18, 1898 to August 5, 1902 before losing it to the gasoline engine.

But electrics didn't join the mainstream and eventually disappeared because of limited driving range and heavy batteries, conditions unchanged in 100 years.

General Motors made a serious attempt with its 1997-1999 EV1, available by lease only in limited areas of the U.S. southwest.

A leader in the electric car quest is Tesla Motors of San Carlos, CA, maker of the Tesla two seat roadster named after the Serbian electrical genius Nikola Tesla (1856-1943), inventor of alternating current among other things. Financial backers are chairman Elon Musk, founder of PayPal, and Sergey Brin and Larry Page founders of Google so there is no shortage of money (some \$60 million) or expertise behind it.

Since Tesla Motors is concentrating on the powertrain they used the Lotus Elise sports car from Lotus Cars in England as their base. This vehicle was already crash test compliant, and Tesla seeks no govern-

ment exemptions. It has a carbon fibre body and the bonded aluminum platform was strengthened and modified where necessary to accommodate the electrical components, particularly to protect the battery pack in the event of a crash. Curb weight is 1225 kg compared with the Elise's 875.

In the former engine bay behind the seats is a 317 kg pack of 6831 standard small # 18650 lithium ion cells of the type used to power cell phones and laptop computers. These are wired together in groups in parallel, with these groups then connected in series to power a proprietary 248 hp ac electric motor that

spins up to 13,000 rpm and weighs less than 52 kg. The battery pack is guaranteed for 160,000 km.

Since an electric motor develops very high torque at virtually zero rpm a transmission is normally not necessary. But Tesla's VP Martin Eberhard wanted to design in outstanding acceleration so they used an electrically shifted two-speed automatic transmission. High gear is adequate for most driving, and the motor can run backwards for reverse. The transmission and differential are located behind the batteries.

Because Li-ion cells can run hot (remember those lap top fires) the battery pack is cooled by pumping glycol coolant through tubes in the pack. Temperature is monitored carefully and if it rises above 122°F the pack

Standard cells
wired together
occupy engine bay



A proprietary 248 hp ac electric motor spins up to 13,000 rpm and weighs less than 52 kg. The battery pack is guaranteed for 160,000 km.

is cooled by the air conditioner.

Tesla claims a reasonable range of 250 to 350 km in typical driving. If, however, the Tesla's claimed performance of zero to 96 km/h in 4 s and top speed of 209 km/h were being explored this range would drop accordingly.

Recharging, in addition to some from regenerative braking and coasting, is accom-

plished in about 3.5 h by the 240 V household charger included with the car.

In spite of the US\$100,000 price the first run of 100 cars was sold out within a month of announcement. Planned annual production is about 1000 cars.

Bill Vance is an automotive journalist and author. His books are available at billvanceautohistory.ca.

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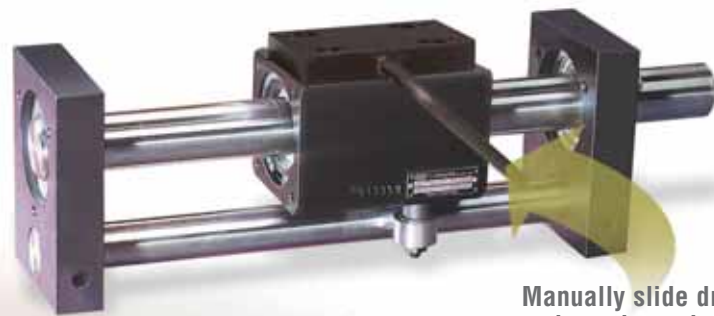
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