

How much range does comfortable indoor climate cost?

AVILOO study sheds light on the energy consumption of heating and air conditioning systems in electric vehicles

Wiener Neudorf 04. 04. 2024 - A new study by AVILOO has found that in extreme outdoor temperatures, heating and cooling the interior can have a significant impact on range and energy efficiency. Energy consumption can increase significantly depending on driving behavior and use of the air conditioning system. For average city trips, this can account for around 35% of total consumption after the first hour. This corresponds to a loss of **more than a third** of the total range.

To measure the heating and cooling energy in total consumption, 14 different electric vehicles were preconditioned and cooled to 0°C while stationary under the same environmental conditions. The interiors were then heated to the pre-set temperature of 22°C in the automatic mode and the heating was left on for 2 hours. All battery data was recorded and analyzed using AVILOO battery diagnostics tools. In particular, the energy consumed for heating was measured.

After the first hour of warming up the vehicles, the energy consumed was between 1.5 kWh and 2.5 kWh, with an average of 2.07 kWh. In another hour, it increased to between 2.7 kWh and 4.5 kWh. Depending on the driving style, this can have different effects on the range. Especially when driving in the city, heating energy accounts for an average of 35% of total consumption after 60 minutes. When driving on the highway, fuel consumption is generally higher and significantly greater distances are covered in 60 minutes. This means that the proportion of heating energy has a less drastic effect here and is around 10% (Fig. 1).

The vehicles were also cooled to 22°C with air conditioning on hot days (between 28°C - 35°C) in August-September 2023. Extrapolated to an average cooling of 10°C, a consumption of 1.6 kWh - 2.2 kWh was measured after 60 minutes. This means that similar considerations apply to cooling as to heating.

"We measured the extent, to which the proportion of energy consumed by heating and air conditioning depends on whether you are driving in the city or on the highway. In addition, the heating and cooling processes were closely scrutinized. Consumption is naturally much higher here than when maintaining a constant temperature, which leads to particularly large efficiency losses during short trips," says DI Nikolaus Mayerhofer, AVILOO CTO.

In fact, the non-linear progression of the output during the heating or cooling process is an important point. As long as the room air is significantly above or below the desired temperature, significantly more energy is consumed than for maintaining a constant room temperature. In Fig.2. an example vehicle was used to show that the energy consumption for heating in the first hour is approximately twice as high as in the second hour. It is at its highest in the first 15 minutes, so special care should be taken on short journeys.

AVILOO GmbH, a developer of battery diagnostics for electric and plug-in hybrid vehicles, is an Austrian-based company operating across the EU market and beyond. AVILOO's technology is independent and reliable, and its battery tests are simple and customized to meet the needs of each user. AVILOO collaborates with numerous prominent partners such as TÜV Süd, Arval and ADAC in Germany, AXA in Switzerland, Maverick in the UK, Viking and Norsk Elbilforeningen in Norway, Diagno in Finland, au2part and Applus in Denmark, VAA in Australia, ÖAMTC and ARBÖ in Austria, VAB in Belgium, Elgersma in Netherlands and many more.

Contact:

Radinka Danilov Sehovic, Senior
Communication Expert

AVILOO GmbH

radinka.sehovic@aviloo.com

Tel.: +43 676 88932 209