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The Reliability of Independent Battery Health Tests for Used Battery Electric Vehicles

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Executive Summary

The field study, commissioned by BOVAG (Dutch the sector organization for the motor trade) and VER (Dutch Association of Electric Vehicle Drivers), investigates the reliability and applicability of independent battery health tests for used Battery Electric Vehicles (BEVs) on the Dutch market. The need for an accessible, accurate, and brand-independent battery health test has grown significantly with the increase in the used EV market. Five test providers (Aviloo, Bosch, Hella-Gutmann, Mahle, and Moba) were evaluated both qualitatively and quantitatively. The results show that Aviloo and Moba offer the most reliable and user-friendly test solutions for market application.

Keywords: Batteries, Measuring Methods & Equipment, Electric Vehicles, Consumer demand, Battery Management System

1 Introduction

With the upcoming surge of second-hand electric vehicles from lease fleets, evaluating the State of Health (SoH) of high-voltage (HV) batteries becomes critical for consumer confidence and accurate market valuation. The State of Health provides a percentage value that reflects the current capacity of the battery compared to when it was new. This information is crucial for the used car market, affecting the pricing and resale value of BEVs.

Earlier research by TNO ((Netherlands Organization for Applied Scientific Research) and DNV (Det Norske Veritas, international accredited registrar and classification society) highlighted the absence of a uniform method to assess battery health reliably across different vehicle brands. Given new market developments and the emergence of several independent test providers, BOVAG and VER initiated a renewed field study to assess the current state of available solutions.

2 Methodology

2.1 Research Approach

A dual methodology was employed: a quantitative analysis compared SoH results from independent tests

with those obtained from OEM diagnostic tools, while a qualitative evaluation focused on usability, cost, and information clarity provided to consumers and automotive businesses.

2.2 Sample and Data Collection

Seventeen specialized workshops across the Netherlands participated, testing 24 distinct BEV models that together represent approximately 83% of the fleet in the 4 to 8-year age segment. A total of 185 tests were performed, with SoH values recorded and qualitative feedback collected from the workshops as well as information gathered from the websites of the test providers.

2.3 Test Providers and Methods

The study engaged five providers:
- Aviloo Flash: Static software-based battery diagnostic.
- Bosch KTS: OEM-derived data extraction with limited model coverage.
- Hella-Gutmann Mega Macs X: Diagnostic combined with AC charging session.
- Mahle: DC fast-charging based diagnostic system.
- Moba: App-driven BMS data extraction.

These tests employ varying techniques, including BMS data reading, active load cycling, and intelligent algorithmic evaluation.

3 Results

3.1 Quantitative Evaluation

Of the 185 executed tests, 161 (87%) were completed successfully. The reliability results show:
- Aviloo Flash: Mean deviation of -0.16% from OEM SoH.
- Moba: Mean deviation of -0.09%.
- Bosch KTS: Mean deviation of +0.14%, but with a higher incomplete test rate (30%).

Tests from Hella-Gutmann and Mahle could not yield statistically significant results due to infrastructural and procedural limitations.

3.2 Qualitative Evaluation

Moba and Aviloo both ranked highest for user experience, cost-effectiveness, and information transparency. Moba's app-guided interface particularly resonated with workshops and consumers, providing real-time feedback.

3.3 Test Characteristics

- Aviloo Flash: Static test via dongle; full results emailed.
- Moba: Mobile app-guided; instant results.
- Bosch KTS: Diagnostic tool-dependent; real-time printable report.
- Hella-Gutmann: Requires wallbox AC charger; longer test duration.
- Mahle: DC fast-charging required; hardware-intensive.

4 Discussion

The necessity for independent, reliable battery testing is evident as BEVs flood the second-hand market. The cost of battery replacement being a substantial portion of a BEV's value makes SoH a decisive factor.

Limitations such as infrastructure requirements (e.g., AC/DC chargers) hinder some test methods. The new European Commission's regulations (State of Certified Energy and Range) will aid standardization but cars according the standard within the 4-8 year age are still years from widely available.

A notable insight is the consumer demand for transparency: simple, clear reporting directly impacts purchase decisions. Of the 5 test providers Moba and Aviloo are best positioned to meet this need today.

5 Conclusion

Aviloo Flash and Moba provide the most reliable, scalable, and consumer-friendly solutions currently available. These solutions help close the gap between OEM testing and market needs. Until regulatory standards are enforced post-2027, their role will be critical in safeguarding consumer trust and enabling fair valuation.

For warranty disputes, OEM-level testing remains advisable.

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Presenter Biography

Robert van Gent, Charging Manager of the Dutch Electric Vehicle Drivers Association. The Dutch EV Drivers Association represents more than 18.000 Dutch electric vehicle drivers and aims to speed up the transition to Electric Vehicles. Robert's focus is on subjects such as Price Transparency, Smart Charging and Charging in Home Owners Associations.