# TÜV Rheinland: Advanced driver assistance systems not always reliable in long-term operation



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Study by TÜV Rheinland and TRL: advanced driver assistance systems important for improving road safety, but considering lifetime performance is crucial / Regular maintenance and inclusion in periodical technical inspection needed / Example of lane keeping assistant systems: Limited functionality due to wear and tear, improper repairs or damage

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Advanced driver assistance systems contribute significantly to improved road safety and are therefore becoming increasingly mandatory. However, they must be reliably maintained and checked throughout a vehicle's entire lifetime. Otherwise, they can become a "risk factor" themselves. According to projections by experts from TÜV Rheinland and the British Transport Research Laboratory (TRL), there could be an average of around 790,000 risk events per year on roads in the European Union (EU) in 2029 that are attributable solely to reduced performance of lane keeping assistant systems. This is the central finding of the study on the "Lifetime performance of advanced driver assistance systems". For the study, experts used lane keeping assistants (LKA) as an example to investigate the specific impact of age-related wear and tear, damage to the system, and accidents or a lack of calibration of cameras when replacing windscreens on the function of assistance systems. The study comprises two parts. First, the authors compiled current findings based on publications and exchanges with other experts and industry organizations. Second, the experts conducted driving tests on a test track to practically investigate various scenarios.

#### Assistance systems also wear out

"Advanced driver assistance systems protect lives. From our point of view, it makes sense and is absolutely appropriate that a number of assistance systems will be mandatory equipment for new vehicles in the EU from next year, including lane keeping assistants, emergency braking functions or reversing systems," says Dr. Matthias Schubert, Executive Vice President Mobility at TÜV Rheinland and responsible for the global mobility business. However, Schubert believes that too little is known about how accidents, improper repairs or wear and tear affect the functionality of assistance systems and thus road safety in the long term. "Assistance systems must function reliably for many years. With our study, we have gained initial insights into the circumstances under which lane-keeping systems might function to a limited extent only – and into the consequences this may have for road safety," says Schubert. He



therefore advocates conducting further studies on the long-term reliability of the assistance systems and their wear and tear.

Depending on the scenario, the current study by TÜV Rheinland and TRL showed that the estimated number of annual risk events due to malfunctions of the systems could even be as high as 2.3 million on average. So-called risk events are failures in the system that reduce performance.

# Modified test vehicle with different scenarios

As part of the study, TÜV Rheinland experts took a modified test vehicle equipped with a state-of-the-art lane keeping assistance system on the Zalazone test track in Hungary. For example, TÜV Rheinland experts simulated damages on the windscreen in the area of the LKA camera, incorrect calibration of the cameras after replacing the windscreen and interruptions in data communication in the vehicle while driving. Furthermore, components were artificially aged. In one scenario, they also made changes to the chassis.

During the test drives, the experts compared how the modified car behaved in specific road sections (curved and straight). The focus was on situations in which neither indicator lights nor other warning systems were activated. The experts observed, for example, that the function of the LKA deteriorated in simulated stone impacts in the windscreen and that in rare cases the LKA switched off without warning. The experts were also able to detect driving over the lane markings without warning or reaction from the system. When contacts in the car's data line were intentionally interrupted while driving, the system deactivated immediately; the subsequent abrupt return movement of the steering wheel toward the center position can take the driver by surprise.

"The increasing prevalence of advanced driver assistance systems means that we rely on them more and more. This happens unconsciously – even if the systems are actually only supposed to relieve us and the



responsibility always remains with us as the driver," explains Rico Barth, global head of the connected and automated driving competence area at TÜV Rheinland.

#### The routine effect: drivers are taken by surprise

In the study, failure mechanisms that lead to reduced LKA performance are defined as "risk events." A risk event can occur, for example, when an aged lane keeping assistance system switches off as intended because it can no longer "see" properly in certain situations due to damage to the windscreen. "The spontaneous deactivation of a system becomes problematic if the driver is not fully concentrated at that moment or does not have his or her hands firmly on the steering wheel at all because he or she has relied completely on the system," explains Rico Barth. "To put it differently, there are situations that drivers experience as a malfunction, even though the assistance system is working properly."

# Regular technical testing for lasting reliability

Technical development and changes in legal regulations will quickly lead to the widespread use of advanced driver assistance systems. For example, the study's authors estimate that some 9.7 million windscreens equipped with cameras are likely to be replaced in the EU as early as 2025, up from just two million in 2019. The quality of these millions of repairs also has a significant impact on the proper functioning of assistance systems, components of which are installed in the windscreen. "The increasing spread of assistance systems and their outstanding technical quality are enormously important for achieving even greater road safety," says Matthias Schubert. "In our view, our study has confirmed that only regular maintenance and technical inspections will demonstrate how well a technical system functions in the long term. Among other things, access to system data for independent third parties such as TÜV Rheinland as part of the periodical technical inspections is crucial to achieving this. The correct functioning of an assistance system when new can be seriously affected by even minor accidents or faulty repairs."



According to the German Federal Motor Transport Authority, the average age of registered passenger cars in Germany is currently 9.8 years and rising steadily. Schubert therefore believes that further findings should now urgently be obtained on how to ensure the reliable functioning of advanced driver assistance systems throughout their entire lifetime. For example, a further study could look at additional assistance systems such as predictive emergency braking systems or assistance systems from the small car segment.

# Future Mobility Solutions at TÜV Rheinland

The international "Future Mobility Solutions" competence team at TÜV Rheinland deals with key mobility issues of the future. It brings together experts worldwide to advance projects in areas such as e-mobility and alternative drive technologies, improved vehicle safety and assistance systems with "Vision Zero," automated and autonomous driving, and new mobility concepts. In the certification of innovative technologies – such as for autonomous driving or new driver assistance systems – TÜV Rheinland is involved as a partner in numerous projects. In addition, TÜV Rheinland has a global network of testing facilities and capacities on numerous test tracks in China, Hungary and Germany, among other places. The driving tests for the study on the performance of advanced driver assistance systems were conducted at the Hungarian "ZalaZONE Automotive Proving Ground".

Further information: <u>www.tuv.com/smartmobility</u> at TÜV Rheinland.



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