

Independent Inspection of Roadworthiness and Operational Safety of Modern Vehicles – For Their Entire Life Cycle

Modern vehicles are no longer just hardware, but rather components of a digitally interconnected and integrated mobility ecosystem. The path to highly automated and connected driving goes hand in hand with a significant increase in complex and interdependent systems both inside and outside the vehicle. In future, it will be possible to make remote changes to a vehicle's functionality from a cloud using radio technology. Current assistance systems, such as distance control, turning assistants for commercial vehicles or automated parking aids, have numerous control units using intelligent and complex sensors and actuators. The safety of vehicles and systems is increasingly defined by the most secure and up-to-date software for the respective vehicle components and the entire vehicle system. The further development and safeguarding of these systems by means of software updates provided by the manufacturers will become necessary with increasing frequency. Therefore, future testability in the context of periodic technical inspections (PTI) for the entire vehicle life cycle must already be implemented during the development and approval of these systems.

VdTÜV and its members have identified the following challenges in the periodic technical inspection of modern vehicles:

- As a general rule, testing specifications for the general inspection must be established in the vehicle type approval to ensure that safety and environment-related systems can be tested without barriers or discrimination. VdTÜV therefore urges that inspection organizations be granted access to vehicle electronics via the respective vehicle interfaces (OBD, OTA etc.) in order to fulfil their statutory inspection mandate.
- To ensure road safety, it must be possible to detect any damage to or manipulation of all safety-relevant systems over the entire vehicle life cycle during the periodic technical inspection. It is no longer sufficient to simply verify the system installation and analyse tell-tales or electronic status bits. Rather, the event memory and its testability and the function and effect of the systems and their components increasingly need to be included in the inspection.

VdTÜV therefore deems it necessary to standardise the communication requirements between the vehicle and the test equipment (ePTI) and to reference them in the respective international design regulations.

- Measuring equipment is already used by inspection organizations to assist with the assessment of environmentally or safety-relevant systems. For example, measurement at the exhaust tailpipe in combination with electronic testing has proven effective in emission inspection. In future, modern measuring equipment and ergonomic operating and display devices will further contribute to increasing the depth of testing for new safety-relevant systems. This is the only way to ensure that future Car2X systems, for example, continue to function properly.
- VdTÜV also maintains that the immediate implementation of existing EU Regulations (EC 715/2007) in national regulations and their further development for the provision of electronic data for the diagnosis, testing and inspection of engine management and exhaust gas purification systems and road safety-relevant systems is an absolute necessity. Due to the increasing complexity of vehicle systems, this data is needed to independently and competently inspect the road safety and environmental compatibility of these vehicles throughout their entire life cycle.
- Vehicle software must already be clearly identified during the type approval by a standardised and harmonised procedure in such a manner that changes to the vehicle software through legal updates or illegal manipulations in the vehicle life cycle can be clearly identified during the PTI. VdTÜV is committed to ensuring that future verification of software integrity during periodic technical inspections is implemented in the development and revision of international and European regulations for vehicle type approval.
- Credibility in ensuring the security of data and networked systems is an important aspect of the digital transformation in mobility. This includes identity management for modern, 'online-capable' vehicles, tested, certified and consistently secure encryption of data and communication and the ongoing provision of software updates by the manufacturers for the duration of the vehicle's registration.
- Highly automated and connected driving will result in periodic vehicle inspections having to extend not only to the vehicle but also to the connected traffic infrastructure. Data security and data protection of vehicles as well as the safety-relevant functionalities of the traffic infrastructure must be included in the test catalogue for independent third-party inspection.

Conclusion

The functional safety, security and integrity of the software of individual vehicle components must become integral to vehicle approval and testing and be monitored by independent inspection organizations throughout the entire life cycle. The testability of the electronic systems within the framework of the periodic technical inspection must already be established both constructively and through regulations during the vehicle type approval. This will serve to increase the independence of the PTI, its informative value with regard to electronic and digital systems and its consistency.

The stated goal is to keep pace with technological developments in legal and regulatory terms in order to make the best possible use of the security potential of digitisation, connectivity and the automation of transport in both the public and the economic interest. With the requisite framework in place, an independent technical inspection will continue to make a significant contribution to road safety and environmental protection in future while keeping pace with digitisation.