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Dr. Andreas Höfer, IPG Automotive GmbH

With the ISO 26262 certification of CarMaker, IPG Automotive has reached an important milestone in terms of functional safety. Henning Kemper spoke to Dr. Andreas Höfer, Senior Vice President of Development & CTO, about what makes this step so important for customers, and what requirements had to be met to achieve it. In the interview, he also explains how a certified tool can reduce development effort and why formal proof plays a crucial role in highly automated driving functions.

Could you briefly introduce yourself and your area of work?

Höfer: Gladly. I've been working at IPG Automotive since 2015. After holding various positions in product management and product development, I've now been CTO and Senior Vice President of Development since January 2024, overseeing all technical departments at IPG Automotive.

I particularly enjoy helping shape the company's technological strategy – always looking toward the future and, of course, at our customers' needs.

What led you to certify CarMaker in accordance with ISO 26262?

Höfer: In vehicle development, cycles are becoming noticeably shorter, while the number of driver assistance systems and automated driving functions is continuously growing. As a result, functional safety is playing an increasingly critical role – especially when it comes to electrical and electronic systems.

The ISO 26262 standard is the central reference framework for our customers because it defines the development, testing, and approval of safety-critical systems. As a solution provider for the automotive industry, our responsibility is to design the CarMaker simulation platform to optimally fulfill our customers' requirements. The ISO 26262 certification is an important step in that direction. Certified compliance helps us build trust and give our customers the assurance that CarMaker will seamlessly integrate into their existing processes – even when it comes to the systems with the most stringent safety requirements.

On the topic of compliance: What exactly did the certification process entail and which requirements did you focus on?

Höfer: First of all, it's important to note that certification is carried out by an independent testing institute – we chose TÜV Nord. We started off with an external auditor guiding us through a process audit. This involved the systematic analysis of our development processes and the assessment for ISO 26262 compliance. One key focus was on the tool's quality assurance – in other words, how potential defects in the development of CarMaker are prevented, detected, and dealt with.

Our test catalog, in particular, came under close scrutiny: We had to provide detailed documentation of our test methods, the scope of our test coverage and how each result can be fully traced without any gaps. This was combined with validation based on defined use cases: The tool's functionality was verified using practical, real-world application scenarios to ensure the reliability of the software within safety-critical toolchains. Finally, we also looked at documentation depth: All safety-relevant aspects had to be documented completely and comprehensively.

How did you find working with TÜV Nord, from your initial meeting to the final certificate being awarded?

Höfer: The collaboration started with a kick-off meeting to define our goals, the scope of application, and our expectations for the certification. Throughout the project duration, we held regular, constructive meetings where we discussed the development and extension of our test processes and test catalogs in accordance with ISO 26262, in particular.

Our test team recorded the specialized requirements, before implementing and integrating them into the existing quality assurance framework for our tools. To ensure a smooth process, technical proof and documentation were coordinated from the outset. After completing the technical validation and a formal audit, TÜV Nord finally awarded us the certification.

Were there technical challenges and did you have to make adjustments that were specifically required for the certification?

Höfer: Calling them "challenges" might be a bit of an overstatement, but we did have to make some minor adjustments. Our existing test catalogs provided an excellent starting point, but the certification required us to add some test cases to cover certain use cases. We also improved the documentation of our internal development processes. Overall, though, these were more selective optimizations as opposed to fundamental changes.

Dr. Andreas Höfer (right) in conversation with Henning Kemper

In the context of certification, we often hear the term Tool Confidence Level. Could you explain what this means exactly and why this aspect is so important?

Höfer: To answer that, I need to provide some background: The ISO 26262 standard classifies vehicle systems into four Automotive Safety Integrity Levels – abbreviated as ASIL – A through D. The classification depends on three factors: the potential consequences of a malfunction (severity), how often a relevant hazardous event may arise (exposure), and the likelihood of the driver being able to control or mitigate a malfunction (controllability).

ASIL A is the classification for systems with low risk, such as the control of a rear windscreen wiper. ASIL D is the highest level, reserved for safety-critical systems like brakes, where a malfunction could potentially have fatal consequences.

Now, to return to the original question: The Tool Confidence Level (TCL) describes the impact a malfunction within the development tool can have on the system under development (Tool Impact, TI), as well as the probability of this malfunction being detected or prevented (Tool Error Detection, TD).

The combination of ASIL and TCL determines which additional measures customers must implement to achieve ISO 26262 compliant tool usage, such as an in-depth evaluation of the tool's development process.

CarMaker's certification has the big advantage of making it suitable for the development of vehicle systems across all ASIL levels – from A to D. Depending on the application scenario, customers may then need to take additional validation measures.

What tangible benefits do users gain from working with a certified tool?

Höfer: In practice, CarMaker usually forms part of a complex toolchain rather than being used in isolation. For customers, this means that they must prove the ISO 26262 compliance of their entire toolchain. This often includes in-house developments, making the certification of such components rather cumbersome.

Using CarMaker, a certified platform, reduces these efforts considerably – in terms of proof, documentation, and additional testing procedures. As a result, the time required to approve the entire toolchain is significantly reduced. In addition to cost savings, this also strengthens confidence in our software, as it clearly demonstrates our commitment to preventing systematic defects in the software.

In your view, what role will certified simulation solutions play in the development of highly automated driving functions?

Höfer: I believe that the importance of certified simulation solutions will continue to grow. That's why we have committed not only to maintaining CarMaker's certification for future versions, but to extend it even further. Importantly, the certification is always tied to specific use cases, as the proof of faultlessness is demonstrated through test cases. A major focus therefore lies on consistency across MIL, SIL, and HIL.

This ensures that our customers can rely on a certified tool throughout the entire development and test process – regardless of the phase they are working in.

Thank you very much for taking the time for this interview.