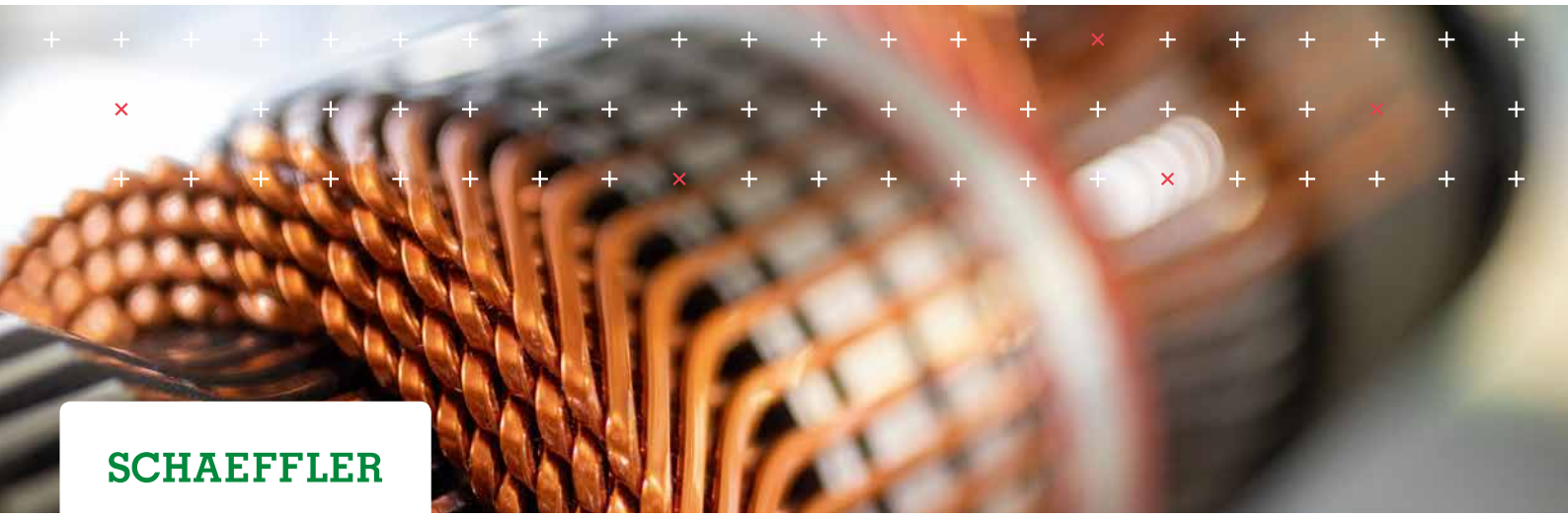
axivion
stopping software erosion



Architecture Verification of the Axivion Suite demonstrates **Freedom from Interference** in a Mixed ASIL Approach according to ISO 26262

Schaeffler is a leading global automotive and industrial supplier for the development of future mobility. At its Buehl location, the Automotive Technologies division carries out truly pioneering work in the field of electric drives and alternative mobility concepts, such as the development of hybrid gearboxes and electrical axle systems and components, including electric motors, inverters and the associated software. The level of complexity and the continuous extension of automotive embedded software presents the developers in the E-Mobility division with daily challenges, and the Axivion Suite plays a major role in their resolution.

THE CHALLENGE ++ Schaeffler offers its customers a complete range of products, from components and subsystems to highly integrated complete systems or from individual electric motors to complete 4in1 axle systems for hybrid or electric vehicles. The company has a high level of system know-how at the vehicle level, and places a high priority on quality, reliability and safety. This involves special challenges for the development of functions and software by the Schaeffler E-Mobility division in Buehl, which focuses on automotive embedded software development for e-mobility.
The development team pursues a mixed ASIL approach to ensure that safety-relevant applications and base software are specifically developed according to the stringent requirements of ISO 26262.

The team reduces the amount of development work for individual function groups by developing the groups according to their particular ASIL level. By means of suitable protective measures, the groups are separated both from each other and from unqualified functions, so that no interference occurs between the groups. This procedure creates a secure development basis for safety-relevant control devices. To meet the requirements of ISO 26262, the development team must provide evidence regarding freedom from interference for software components with different automotive safety integrity levels (ASIL). This requires a consistent software architecture. In the past the team sometimes needed to perform an enormous amount of manual work in order to review the architecture in relation

The complexity of automotive embedded software is further increased by software components with different ASIL requirements. With the ISO 26262 certified Axivion Suite, Schaeffler Automotive Buehl maintains the high quality of its mixed ASIL systems. Automated architecture verification reduces manual testing work and therefore creates free capacities for new developments in electromobility.

to the interfaces and undesirable dependencies between software with different automotive safety integrity levels.

THE SOLUTION ++ This is where the Axivion Suite came in. The Schaeffler Automotive division E-Mobility had already used this for many years for static code analysis, checking coding rules and MISRA. The Static Code Analysis (SCA) package of the Axivion tool suite is certified up to ASIL D for ISO 26262, SIL 4 for IEC 61508, Class C for IEC 62304 as well as SIL 4 for EN 50128 and EN 50657. Therefore the developers were familiar with the proven suitability of the Axivion Suite for developing safety-relevant automotive software, as well as the reliability of its checks and user-friendliness in daily use.
The architecture check by the Axivion Suite replaces manual checking with a tool-assisted automated analysis.
The Axivion Suite efficiently checks the safety architecture, i. e. the classification of software components according to their ASIL level or their categorisation as QM components. Violations of the explicitly defined safety architecture in the code are reliably detected and reported as forbidden dependencies by the automatic architecture check. The developers receive the messages directly in their development environment and can therefore perform further processing. Reports are also provided automatically.

THE SUCCESS ++ For the development team at Schaeffler Automotive Technologies, use of the Axivion Suite means a lightening of the workload on several levels. Automation of the architecture verification allows to avoid manual work. Based on the results of the architecture check, the developers can modify the code directly to remove forbidden dependencies. At the same time, immediate feedback enables team members to better understand the interrelationships of the safety architecture and how the various software components with their different ASIL requirements need to be handled. The proven suitability of the Axivion Suite for checking compliance with the relevant automotive safety standards, including for mixed ASIL systems, gives the developers the confidence which they need.
All in all, use of the Axivion Suite by Schaeffler reduces the effort for quality assurance of embedded software for electromobility. The stringent functional safety requirements can be checked at an early stage, continually checked during the development process, and demonstrated for safety certification.
This enables the company to provide new functions for the ever-growing market for electric vehicles much faster.

ABOUT SCHAEFFLER GROUP ++ As a leading global supplier to the automotive and industrial sectors, the Schaeffler Group has been driving forward groundbreaking inventions and developments in the fields of motion and mobility for over 75 years. With innovative technologies, products, and services for electric mobility, CO_2-efficient drives, Industry 4.0, digitalization, and renewable energies, the company is a reliable partner for making motion and mobility more efficient, intelligent, and sustainable. The technology company manufactures high-precision components and systems for powertrain and chassis applications as well as rolling and plain bearing solutions for a large number of industrial applications.
The Schaeffler Group generated sales of approximately EUR 13.9 billion in 2021. With around 83,000 employees, Schaeffler is one of the world's largest family companies. With more than 1,800 patent applications in 2021, Schaeffler is Germany's third most innovative company according to the DPMA (German Patent and Trademark Office).

ABOUT AXIVION ++ Axivion, based in Stuttgart, Germany, is a provider for innovative software solutions for static code analysis and for protection from software erosion. The core product of Axivion is the Axivion Suite, a tool suite for the improvement of software quality and maintainability of software systems implemented in the programming languages C, C++ and C#. In addition to static code analysis, the tool suite includes innovative software tools for architecture verification and clone management. Moreover, the tool suite detects software erosion factors such as cycles, dead code and violations of programming rules.
Axivion's MISRA checker covers 100 % of all automatically testable MISRA rules for the standards MISRA C:2004, MISRA C:2012, and MISRA C++:2008. Furthermore, the AUTOSAR C++14 styleguide as well as the CERT® programming rules for secure software development, rules for C Secure Coding (ISO/IEC TS 17961), and CWE (Common Weakness Enumeration) are supported.
The static code analysis package of Axivion Suite is certified for its suitability in safety systems according to ISO 26262 up to ASIL D, IEC 61508 up to SIL 4, IEC 62304 up to Class C, EN 50128 and EN 50657 up to SIL 4.
The Professional Services Team of Axivion supports customers with comprehensive service and advice on the configuration and integration of the tools.
Axivion's customers are companies that develop innovative technical software across different industries, e. g. industrial automation, automotive, railway, electronics, information and telecommunication, avionics, medical, mechanical engineering, as well as measurement, control and regulation technology.

More information is available at www.axivion.com

Axivion GmbH
Nobelstraße 15
70569 Stuttgart
Germany

Tel +49 711 620 43 78-24
Fax +49 711 620 43 78-99
info@axivion.com
www.axivion.com

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