#91

»INNO«

Innovative Technologies / New Applications

MOBILITY: INNOVATIONS DRIVING THE FUTURE

IVAM.

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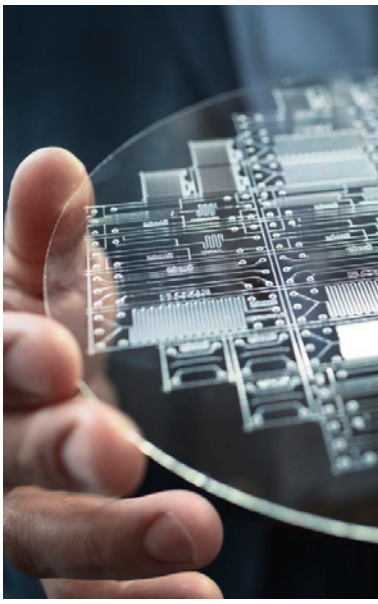

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“Mobility: Innovations Driving the Future”

Few everyday-technologies ignite debate like the car. For some, it is freedom; for others, a symbol of congestion and emissions. Whether electric or combustion, car or no car at all–the arguments often resemble a culture war.

Yet beyond ideology, cars have long been evolving into technological marvels: Autonomous driving pushes the limits of robotics and AI, while quantum computing promises breakthroughs in traffic optimization and machine learning. Additive manufacturing enables scalable die-casting of large aluminum parts, and new glass technologies redefine automotive lighting. Battery research, meanwhile, is extending lifespan and safety for electric vehicles.

The future of mobility is not about clinging to old certainties but embracing innovation. Whatever one’s stance on car ownership, the automobile remains a stage for human ingenuity–and its transformation is only accelerating.

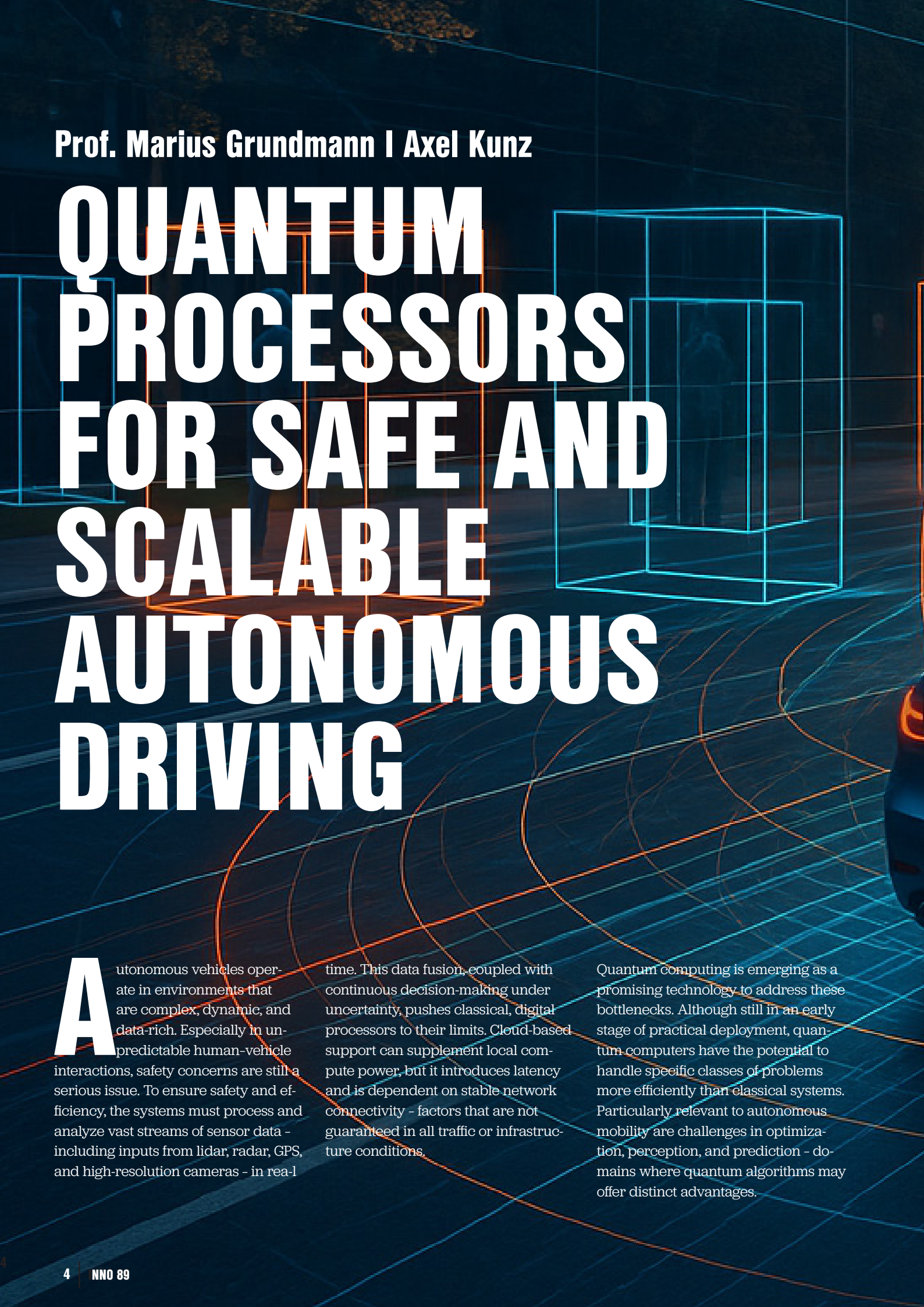
Join us in exploring the articles and perspectives in this issue, which highlight how innovation is redefining the automobile and shaping the future of mobility.

Warm regards,

Mona Okroy-Hellweg

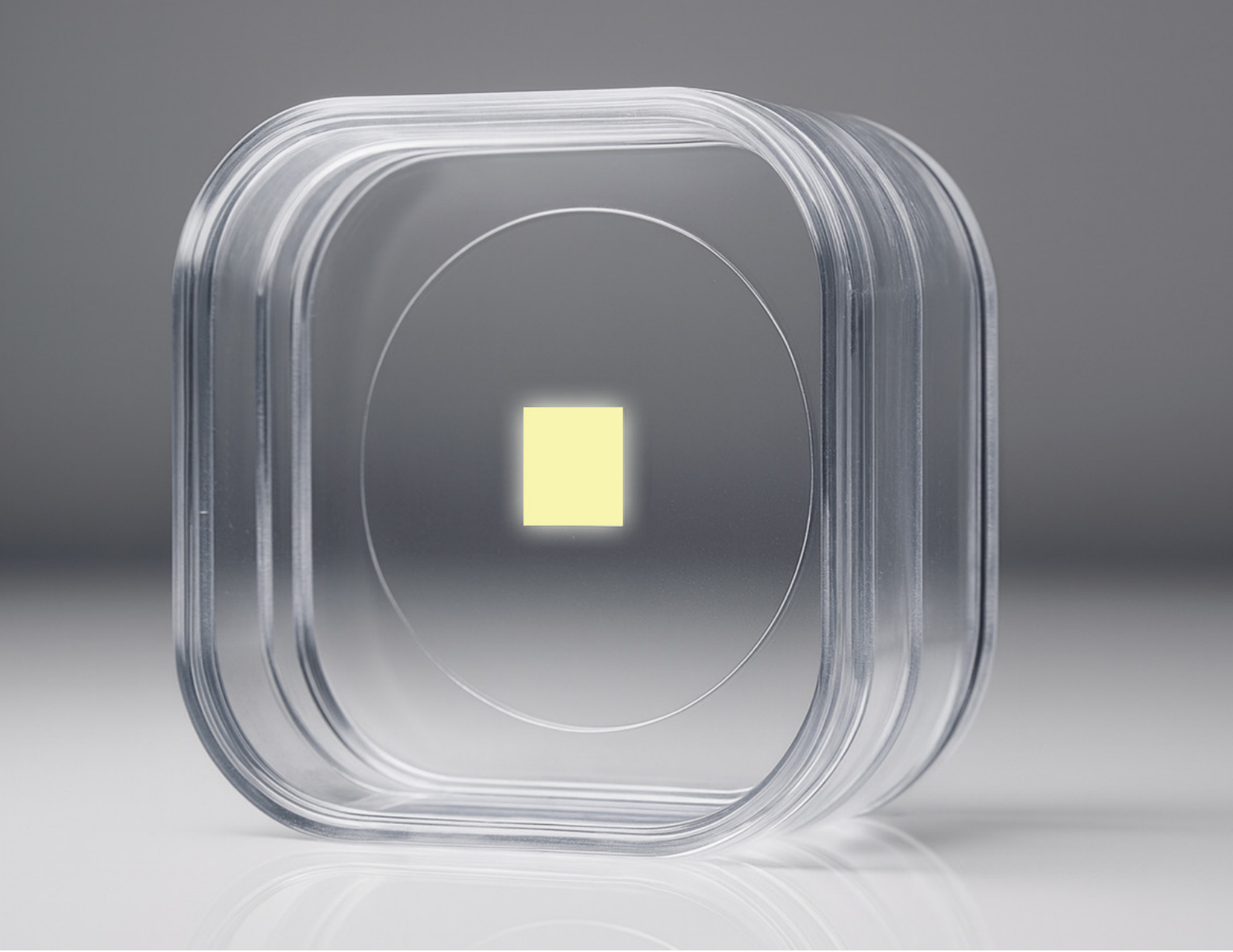
Prof. Marius Grundmann I Axel Kunz

QUANTUM PROCESSORS FOR SAFE AND SCALABLE AUTONOMOUS DRIVING



Autonomous vehicles operate in environments that are complex, dynamic, and data-rich. Especially in unpredictable human-vehicle interactions, safety concerns are still a serious issue. To ensure safety and efficiency, the systems must process and analyze vast streams of sensor data – including inputs from lidar, radar, GPS, and high-resolution cameras – in real-time. This data fusion, coupled with continuous decision-making under uncertainty, pushes classical, digital processors to their limits. Cloud-based support can supplement local compute power, but it introduces latency and is dependent on stable network connectivity – factors that are not guaranteed in all traffic or infrastructure conditions.

Quantum computing is emerging as a promising technology to address these bottlenecks. Although still in an early stage of practical deployment, quantum computers have the potential to handle specific classes of problems more efficiently than classical systems. Particularly relevant to autonomous mobility are challenges in optimization, perception, and prediction – domains where quantum algorithms may offer distinct advantages.



Diamond Quantum Chip with NV-technology by SaxonQ: All qubits on 2 Millimeters

“Especially in unpredictable human–vehicle interactions, safety concerns are still a serious issue.”

Efficient route planning

In the field of autonomous driving, route planning and trajectory optimization are key performance areas. These involve solving combinatorial problems with a vast number of possible outcomes and constraints. Classical approaches typically rely on heuristics or approximations, which may struggle with real-time demands or highly complex environments. Quantum algorithms, on the other hand, can explore large solution spaces in parallel and may converge faster, near-optimal outcomes.

Perception, reaction, and safety

Perception is another critical area, especially in the interaction between driverless vehicles and human traffic participants. The ability to reliably detect and classify objects in complex or adverse scenarios – such as low visibility or sensor occlusion – is essential for safety. Quantum machine learning techniques, particulary in hybrid configurations with classical systems, could contribute to improved performance in pattern recognition and data-driven decision-making. These approaches may also reduce the need for large datasets or extended training cycles, which are current limitations in conventional AI systems.

Mobile solutions

The potential integration of quantum processors directly into vehicles raises key questions about hardware readiness. Most quantum computers require cryogenic cooling and highly controlled electromagnetic and vibrational environments, making them unsuitable for mobile deployment. However, emerging platforms – such as those based on solid-state qubits with NV-technology – are being developed to operate at room temperature,

with greater vibration resistance. These properties make them candidates for embedded quantum computing systems that can be used in real-world mobility scenarios.

Such systems would not replace classical onboard computers, but augment them by offloading specific, computationally intensive tasks. This hybrid architecture allows quantum processors to be invoked during complex navigational decisions, adaptive sensor fusion, or high-stakes scenario analysis – without disrupting the overall control stack.

Quantum Computing on the Road to Real-World Applications

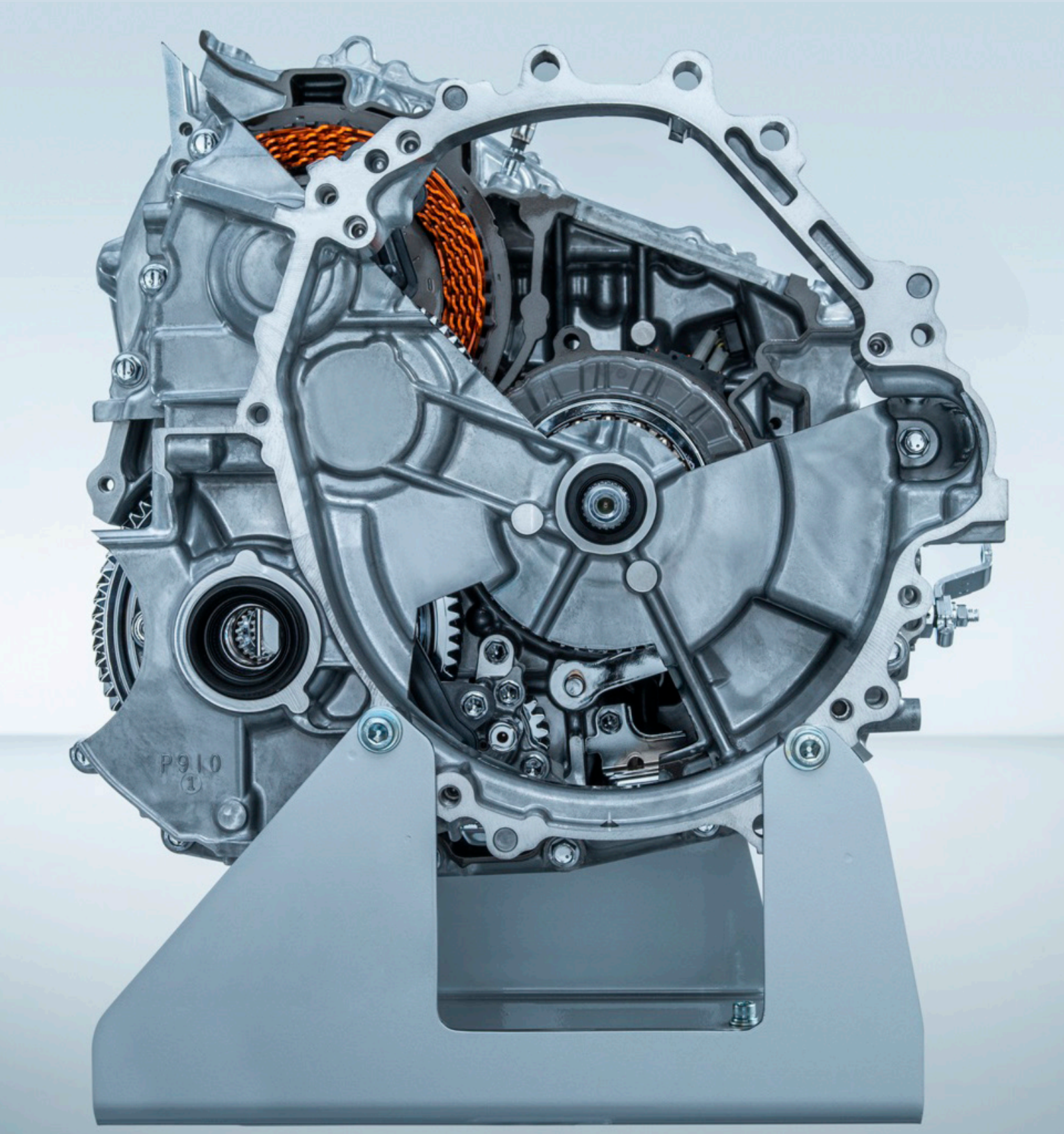
While fully scalable, fault-tolerant quantum processors are still years away, small-scale systems with a limited number of qubits are already being tested in real-world use cases. These include industrial simulations, logistics planning, and mobility research. Pilot projects across Europe are exploring how these early-stage systems can be integrated into existing infrastructures, particularly in sectors where safety, speed, and adaptability are critical.

Looking forward, quantum computing is likely to provide solutions to many challenges in autonomous driving, especially for specific tasks that require high-speed optimization, predictive modeling, or advanced perception. In the context of a broader computing ecosystem, they represent a powerful addition – one that could redefine the capabilities of autonomous systems as they move toward full-scale deployment.

SaxonQ GmbH, DE

https://www.saxonq.com

“Quantum computing will become a key enabler for autonomous driving, delivering the optimization, prediction, and perception capabilities needed for full-scale deployment.”



The additively manufactured aluminum die-cast tool is part of the tool for the transmission housing of the Toyota Yaris hybrid vehicle. It was chosen due to its size and the challenges of soldering and high maintenance time. Source: Toyota Europe.

ADDITIVE MANUFACTURING FOR COMPLEX DIE CASTING TOOLS: SCALABLE PROCESS FOR LARGE ALUMINUM COMPONENTS

The Fraunhofer ILT and MacLean-Fogg have jointly produced a complex die casting tool inlay using Laser Powder Bed Fusion (PBF-LB/M). The specially developed L-40 tool steel enables the additive manufacturing of heavily loaded, large-volume tools for the first time and thus the implementation of conformal cooling. Initial results from smaller tools, which Toyota is already using in series production, indicate a significantly longer service life for the additively manufactured tools. In the current project, a hybrid, large-volume tool was created for the transmission housing of the Toyota Yaris Hybrid. The combined process with conventional preforms plus additively manufactured structures shortens the production time, reduces costs and allows a high number of variants on a combined tool platform.

The automotive industry is in the midst of a profound upheaval. Cost pressure and the transition to electromobility are forcing many manufacturers to fundamentally rethink their vehicle architecture and production processes. Many manufacturers are currently reducing the number of individual pressed parts and striving for as few but highly complex structural components as possible. Particularly in the case of large aluminum components, such as frame or transmission components, this also increases the demands on the tools: they must be thermally highly resilient, allow variants and be able to be adapted to new geometries as quickly as possible.

New Challenges

This change brings new challenges: the required casting molds not only need to be larger than before, but also more resistant, with complex geometries and shorter development times. This is precisely where a project at the Fraunhofer Institute for Laser Technology ILT, together with the L-40 powder manufacturer MacLean-

> **“Cost pressure and the transition to electromobility are forcing many manufacturers to fundamentally rethink their vehicle architecture and production processes.”**

Successful joint project between Fraunhofer ILT, MacLean-Fogg and Toyota: A Laser Powder Bed Fusion manufactured tool inlay or the transmission housing of the Toyota Yaris Hybrid. Source: Toyota Europe.

Fogg and Toyota as the end user, comes in. By using a gantry-based PBF-LB/M machine developed at the Fraunhofer ILT with a scalable build volume and the tool steel developed by MacLean-Fogg for additive manufacturing, very large die casting molds with near-contour cooling could be additively manufactured for the first time - suitable for large-volume high-pressure die casting (HPDC) components.

Massive geometries previously led to residual stresses and critical defects in parts made with PBF-LB/M

As large casting processes are becoming increasingly established, the demands on the tools used in HPDC are growing. The molds must repeatedly maintain precise component quality at very high quantities and withstand extreme mechanical and thermal loads. To ensure a sufficient service life of the tool inlays, they need complex, internal cooling structures, which cannot be made with conventional manufacturing processes.

Two key problems have so far limited additive processes from manufacturing such large-format die casting molds: Firstly, the available construction volume of classic PBFLB/M machines is too small to produce die or mold inserts with dimensions of 600 x 600 mm² or more in one piece. Secondly, the tool steels used to date – in particular H11 (1.2343), H13 (1.2344) or M300 – cannot be processed reliably in this size range (>20,000 cm³). Even with optimum parameters, there is a risk of cracking, thermal distortion, and inadequate mechanical properties. This applies both during laser-based build-up and during downstream heat treatment. The greater the temperature gradients within the component during the manufacturing process, the greater the risk - an effect that is particularly pronounced with large-volume workpieces.
"To overcome these limitations, we need a new generation of machines and materials specifically tailored to the requirements of large-format HPDC tools," explains Niklas Prätzsch, Group Leader LPBF Process Technology at Fraunhofer ILT. "It was precisely this combination that was the subject of the latest changes we have implemented." The new material and machine technology make it possible for the first time to produce large-volume tools with a free-form cooling structure. This not only allows local temperature peaks in the casting process to be reduced in a targeted manner, it also increases the number of variants while simultaneously increasing service life. This means that different components can be manufactured on one tool platform without having to produce new tools each time.

Scalable LPBF production for crack-free large components

The gantry-based 5-laser PBF-LB/M machine developed at the Fraunhofer ILT, with a current build volume of 1,000 x 800 x 350 mm³ has been further developed for this purpose. In contrast to conventional systems, it has a movable processing head and local shielding gas guidance, so that the build volume can be scaled linearly along the machine axes with the same process boundary conditions (shielding gas flow speed, laser beam deflection angle, etc.). This

means that even larger tools can be additively manufactured in the future than the tool inlay considered in this project, with a volume of over 20,000 cm³ and a bounding box of 515 x 485 x 206 mm³.

A heatable substrate module was also developed in order to minimize the temperature gradients that are critical for large-volume tools. The build platform now reaches a temperature of 200 °C, which means that each new layer does not cool down to room temperature, but only to a predefined thermal plateau. This approach reduces thermally induced stresses and the risk of cracking during the construction process. A combination of large installation space, high process stability, and active preheating makes this system one of the first LPBF systems in the world that is suitable for the economical production of near-net-shape die casting molds, even for mega or giga casting.

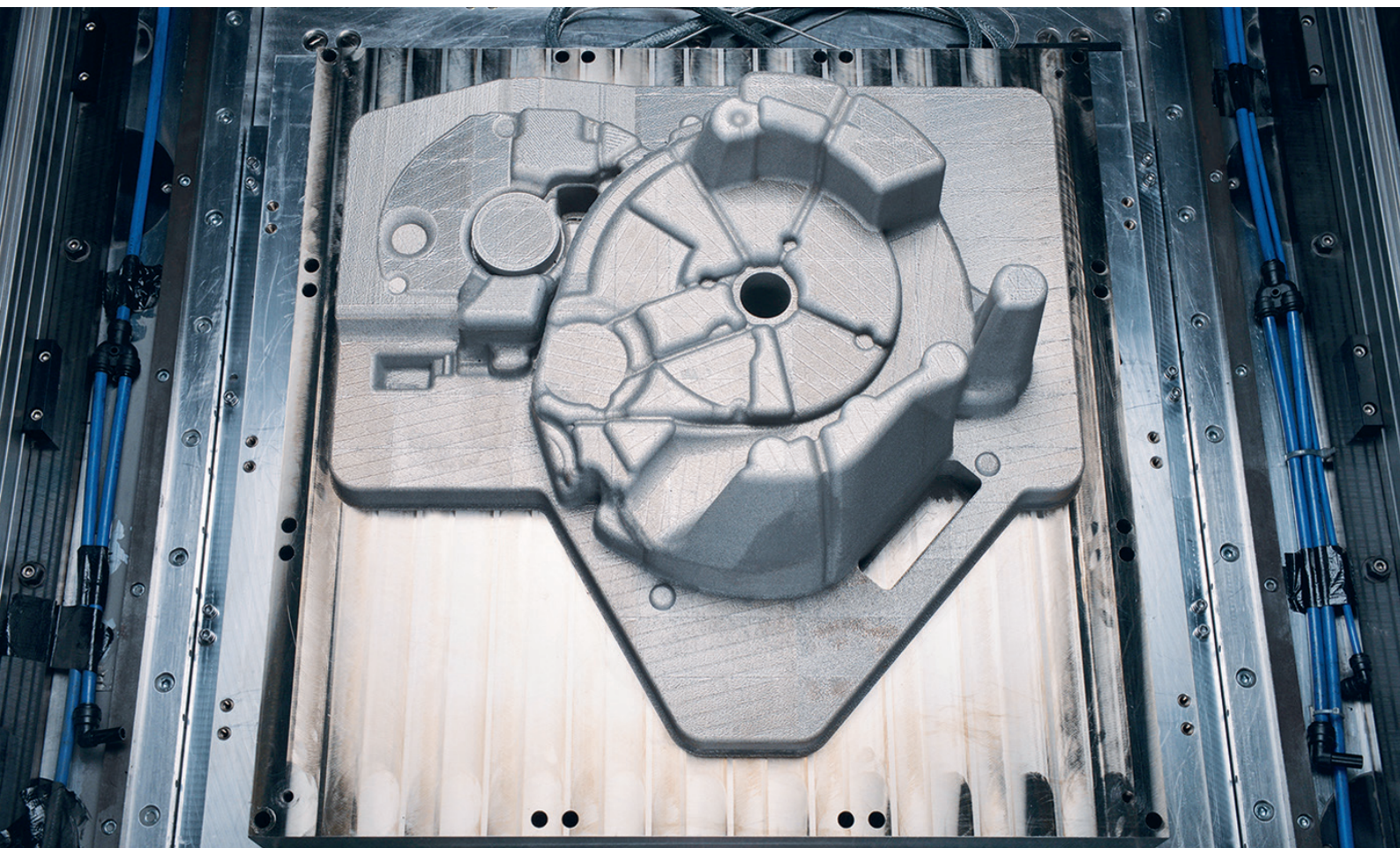
“The key to success lies in the L-40 material from MacLean-Fogg, which is tailored to the requirements of PBF-LB/M,” comments Prätzsch. This steel is characterized by a significantly reduced tendency to crack compared to conventional tool steels, both during production and during heat treatment. Even in the as-built condition, L-40 achieves high dimensional accuracy, outstanding properties in terms of hardness (48 HRC), tensile strength (1420 MPa), and notched impact strength (>60 J). Comprehensive tests have successfully validated both the parameter transfer to the new machine concept and the performance in complex geometries - for example, with round or overhanging cooling channels.

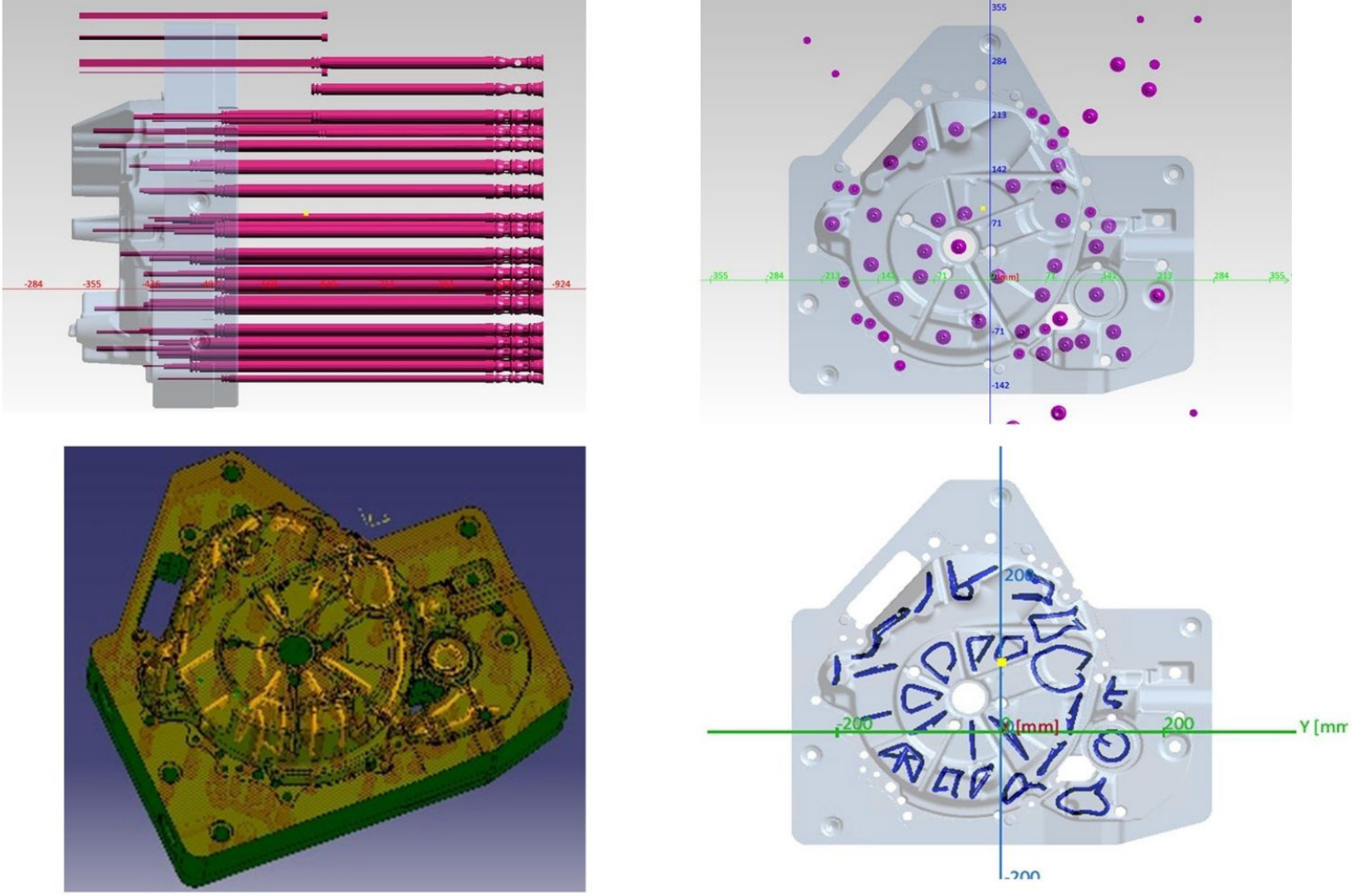
All in all, the combination of a scalable PBF-LB/M machine and a specially developed material enables the economical, reproducible production of large-format die casting molds with conformal cooling for the first time. Initial applications show that the service life of tools produced in this way can be significantly extended compared to conventional molds.

Hybrid production for series tool

As part of the project, the partners produced an additively manufactured tool insert for a gearbox housing that is already in use at Toyota. The die casting mold insert contains a complex network of near-contour cooling channels, which alone is a clear advantage of additive manufacturing that could not be achieved with conventional machining. For the additive tool design, the project team opted for a hybrid process on a specially manufactured preform that already had vertical cooling channels. The exact positioning and reliable connection of both components placed high demands on machine calibration, precision, and process control. Such hybrid structures have the potential to

Thanks to the gantry-based large-format system at Fraunhofer ILT, even complex, resistant tools with a volume of over 20,000 cm³ can be printed reproducibly – a milestone for industrial applications in aluminum die casting. Spurce: Fraunhofer ILT, Aachen, Germany.





Design of the cooling channels: Instead of conventional pin cooling (top), the new shape contains a complex network of conformal cooling channels (bottom). A geometry that cannot be produced by machining, precisely adapted to thermally highly stressed tool areas, reducing local temperature peaks, reducing wear and significantly extending tool life. Source: MacLean Additive.

further reduce construction time and costs, as the more cost-intensive PBF-LB/M process is only used in those component areas where conventional processes fail.

The researchers have designed the complex cooling structure in such a way that critical zones of the mold are effectively tempered during the die casting process. This reduces the thermal load, which significantly lengthens the service life of the mold. In previous projects, a comparable additive mold had already achieved a service life up to four times longer than a conventional H13 mold.

After the HPDC mold insert was built, it was stress relief annealed, and its functional surfaces were milled conventionally. The high-dimensional accuracy of the additive base body only required precise final finishing without additional material input.

Paving the way for efficient and durable casting molds in the automotive industry

The production of large-format casting molds using additive processes addresses several key challenges in today's automotive production, particularly in the context of the transformation towards electromobility. A decisive advantage lies in the conformal cooling, which can be freely designed for the first time using 3D printing. The cooling channels can be optimally adapted to the thermally highly stressed zones of the tool. This lowers local temperature peaks, reduces thermomechanical wear and significantly extends the service life of the mold.

At the same time, additive manufacturing can drastically shorten throughput times. Instead of time-consuming machining of several tool components and their assembly, a consolidated, end-to-

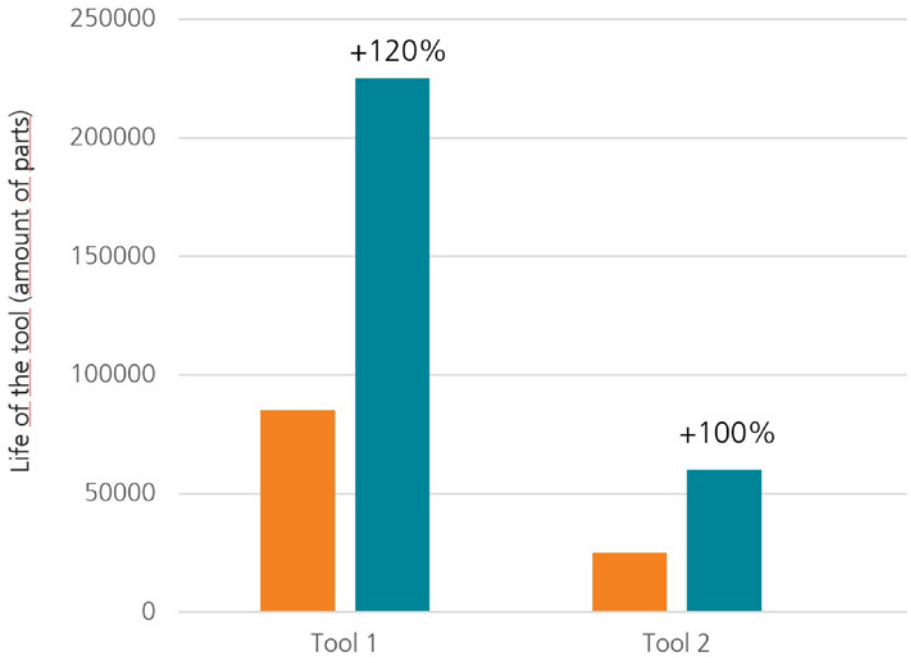
“The production of large-format casting molds using additive processes addresses several key challenges in today's automotive production, particularly in the context of the transformation towards electromobility.”

end additive structure can provide substantial lead time reductions. For OEMs, this means shorter development cycles and faster time-to-market for new vehicle platforms.

The ability to build large-volume tools using hybrid technology creates additional flexibility. Components with defined interfaces can be efficiently added and functionally optimized without having to manufacture the entire component from scratch. This reduces both material usage and costs per tool.

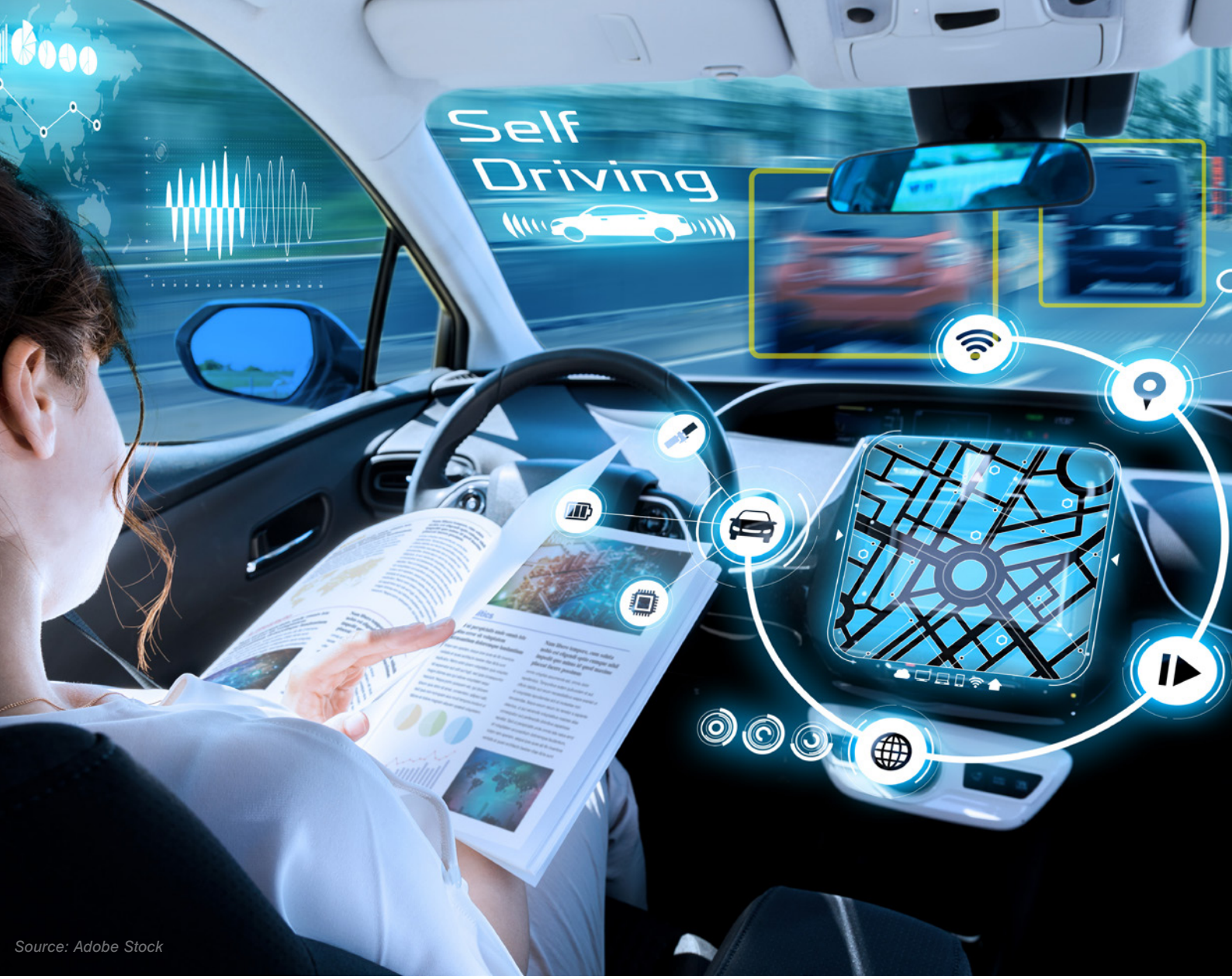
“With L-40, we set out to break the limits of additive manufacturing for hot and cold forming tools in general and die casting tools specifically. This project proves that it’s possible to produce large, complex, and highly durable inserts technically and gives clear milesstones for economic attractiveness. Additive manufacturing is ready to take on real industrial-scale challenges. For OEMs, this is a game changer: shorter lead times, longer tool life, and flexibility in tool design,” said Harald Lemke, Director of Product Management, MacLean-Fogg Component Solutions.

For vehicle manufacturers such as Toyota, who strive constantly for flexible manufacturing rely on fewer individual parts and more complex structures, these developments offer new possibilities in terms of tool strategy: less effort in tool production, longer running times and the possibility of realizing several variants with just one tool. The manufactured component impressively demonstrates that the developed process chain - consisting of a large-format LPBF system, innovative material and hybrid production - meets the requirements of real industrial applications, even in the field of giga casting. However, the potential extends far beyond the individual case: the developed process chain is not only suitable for large aluminum HPDC tool inserts, but also for applications in plastics processing or in the field of composite materials. Wherever heavily loaded tools with complex cooling and limited batch sizes are required, additive manufacturing can offer clear advantages.



Comparison of the service life of conventionally manufactured and additively manufactured tools made from L-40: The optimized near-contour cooling specifically tempers critical zones, reduces the thermal load and increases the service life. In earlier projects, the service life of the tools increased almost fourfold. Source: Fraunhofer ILT, Aachen.

Fraunhofer Institute for Laser Technology ILT
https://www.ilt.fraunhofer.de



Source: Adobe Stock

Sonja Buske

AUTONOMOUS DRIVING SYSTEMS ON THE RISE

The concept of autonomous driving systems will play a central role in the mobility of tomorrow. This opens up a wide range of opportunities and new markets for high-tech companies in the fields of microtechnology, sensor technology and intelligent systems.

Six levels of automation

The Society of Automotive Engineers (SAE) defines six levels of automation - from Level 0 (no automation) to Level 5 (full autonomy). Currently, many solutions are at level 2 or 3 where human monitoring is still required. The vision is for fully autonomous vehicles that are safe, efficient and environmentally friendly around the clock - without a steering wheel orpedals.

The technical complexity of autonomous systems is enormous. Vehicles must recognize and interpret their surroundings in real time and make decisions based on this data. To do this, sensor technologies such as lidar, radar, camera systems and ultrasonic sensors are used. The fusion of this data–known as sensor fusion– enables precise environment recognition.

> **“The concept of autonomous driving systems will play a central role in the mobility of tomorrow.”**

Microtechnology plays a key role

Microtechnologies play a key role in this: miniaturized, high-performance sensors and

actuators form the backbone of autonomous systems. This is complemented by powerful edge computing units that use artificial intelligence (AI) to make autonomous decisions - even with limited connectivity. Despite major advances, there are still numerous hurdles to overcome. Technically, driving systems must be able to cope with complex traffic situations, weather conditions and the unpredictable behavior of other road users. The transition between different levels of automation (e.g., from Level 3 to Level 2) is particularly challenging, as control must be transferred from the system to the driver at short notice. In addition, ethical, legal and safety issues pose new challenges for the industry. Who is responsible in the event of an accident? How can cybersecurity be guaranteed? And what does fair regulation look like that does not slow down innovation but at the same time offers protection?

While fully autonomous vehicles are still a long way off in Germany, a robot taxi service in the US is attracting attention: in cities such as Phoenix and San Francisco, modified cars without safety drivers (level 4) are driving fully autonomously in defined urban zones. Technologies such as lidar, radar, cameras, and proprietary AI software are used for this purpose. Market analyses predict a volume of over USD 1,300 billion for the global market for autonomous vehicles by 2030. The demand for high-precision sensor technology, secure communication, and smart control systems is increasing accordingly.

The future of mobility is interdisciplinary. Successful autonomous systems require the close integration of hardware, software, materials science and system integration. This is where great opportunities arise for specialized micro- and nanotechnology companies: whether in the form of innovative sensor platforms, miniaturized energy supply solutions, or secure communication interfaces. In addition, new areas of cooperation are opening up - for example, with OEMs, software companies, or operators of urban mobility services. The role of suppliers is changing: from component suppliers to solution providers with system responsibility.

IVAM will be exhibiting for the first time with a joint stand at XPONENTIAL Europe in Düsseldorf from March 24-26, 2026. The leading European trade fair for autonomous technologies and robotics will showcase high-tech products and components for the use of uncrewed systems solutions on roads, water, in the air, on rails, and in new space. New additions will include the topics of defense and critical infrastructure protection.

XPONENTIAL Europe 2026

https://www.xponential-europe.de

https://www.ivam.de/events/xponential-europe-2026

REAL-TIME MEASURING METHOD EXTENDS LIFESPAN AND ENHANCES SAFETY OF BATTERIES

An innovative measurement method enables optimized battery management in electric vehicles, helping to make them safer and extend their lifespans. Impedance spectroscopy from the Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM analyzes detailed measurement data on the battery's state in real time during operation. This means batteries can also be used for safety-critical applications.

Powerful, safe batteries are a key component in the success of electric mobility. This makes measuring a battery's capacity and state a crucial factor. The most informative method of doing this is impedance spectroscopy. Impedance itself cannot be measured directly; instead, it is calculated from the relationship between current and voltage. Impedance provides information on the battery's state of charge (SoC) and permits conclusions regarding its state of health (SoH, i.e., the condition inside the battery, where the cathode, anode and electrolyte are located) or its safety status.

Collecting all the necessary data requires time-consuming measurements and analytical methods. On top of that, measuring impedance has only been possible in a resting state so far. It can typically take as much as 20 minutes before the data needed to characterize the battery is ready and available.

Researchers from Fraunhofer IFAM further developed this method under the leadership of Fabio La Mantia. Now, for the first time, dynamic impedance spectroscopy makes it possible to calculate measurements regarding the battery's status during live operation and make them available in real time. The information obtained in this way encompasses much more than simple data about the charge capacity or remaining operating time. It provides a detailed, accurate and in-depth picture of what is going on inside the battery. This also makes it possible to predict the battery cell's potential lifespan individually.

While existing battery charge status displays – which are incorporated into the vehicle electronics in electric cars, for example – do also take measurements on an ongoing basis during use, they offer less information, are much slower to respond and are not as accurate. "First, dynamic impedance spectroscopy opens up new possibilities for optimizing battery management, thereby extending the batteries' lifespan. It also paves the way for these batteries to be used in safety-critical applications," explains Hermann Pleteit, who heads up the project.

High-resolution measurement method and direct analysis

In this innovative method, the discharging or charging current is overlaid by a multi-frequency test signal. The different frequencies make it possible to draw conclusions regarding the status of certain components or processes inside the battery. The response signal from the current and voltage is measured up to one million times a second. All of the data from the high-resolution measurement method flows into a data processing system that is running at the same time. A software program uses this information to calculate the evolution of the impedance values and then make inferences concerning the state of the relevant battery cell.

To obtain results in real time in spite of the vast volume of data generated by the high-resolution measurements, the Fraunhofer researchers devised

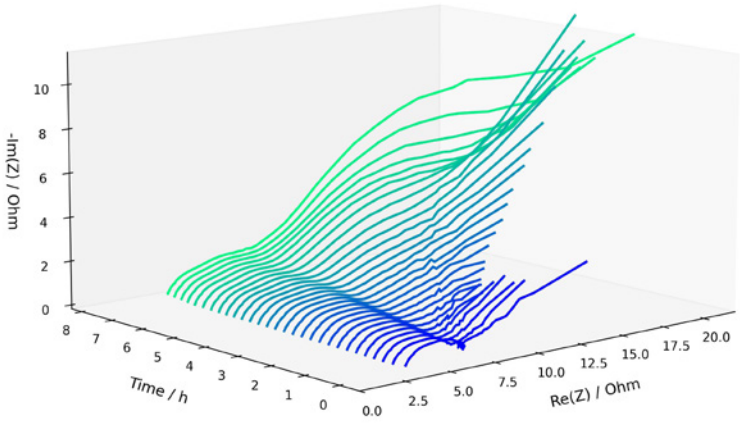
another clever trick. “We developed algorithms that significantly reduce the volume of data before the analysis without dropping relevant information,” Pleteit says. In line with these advances, real-time control of all aspects of the battery’s state through impedance spectroscopy offers significant advantages.

Quickly powering down overheated cells

The Battery management systems can use the impedance data to immediately register when a cell becomes locally overheated while driving, for example. Then they simply turn that cell off or reduce the power. This eliminates the need for conventional temperature sensors, which are placed on the outside of the battery cell , thus registering thermal issues with a delay. By that time, it is often too late to prevent the cell from being damaged.

There are also advantages to EV chargers. For example, this technology could be used to decide between extra-fast charging and charging that is slower but also reduces battery wear. During a brief pause at a rest stop, the battery management system charges the battery quickly while also ensuring that there are no dangerous temperature spikes and the internal components are not unduly stressed. If the vehicle is plugged into a charger for several hours, the management system charges the battery slowly to reduce wear and extend its lifespan.

The graph shows how the impedance curves change dynamically during a charging cycle. The curves provide information on the physical and chemical processes taking place inside the battery cell. Source: Fraunhofer IFAM



Application for renewable energy and aviation

Providers of renewable energies such as wind power or photovoltaics, who need to compensate for fluctuations in electricity production with energy storage, are provided with stable battery module systems that can be controlled at all times thanks to Fraunhofer technology.

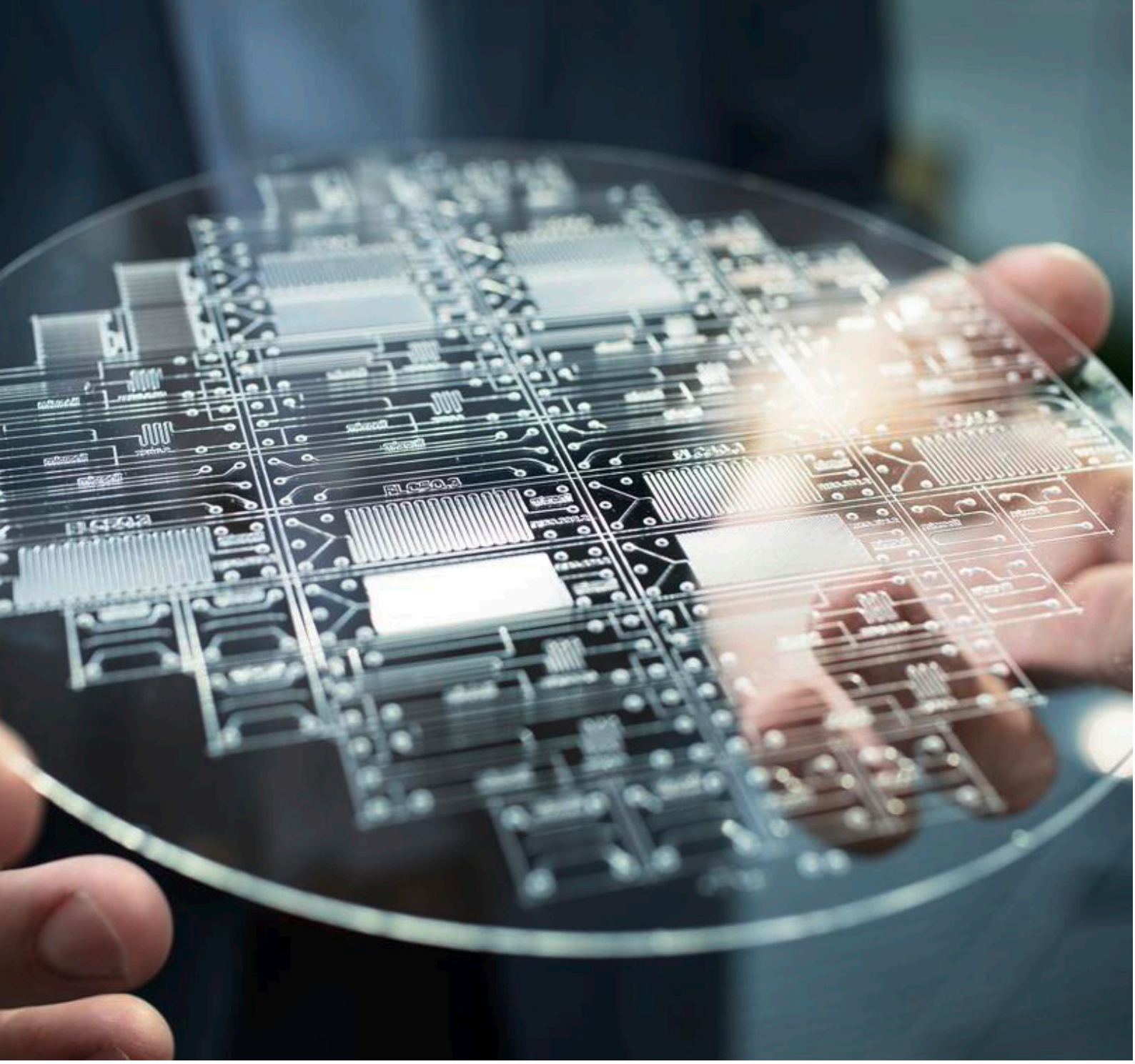
Real-time monitoring of the battery state will even unlock the possibility of use in safety-critical scenarios going forward. “These kinds of systems could be used in eco-friendly electric aircraft, for example. This market is in its infancy right now. And the shipping industry is also signaling interest in the technology,” Pleteit says. The Fraunhofer-Gesellschaft, headquartered in Germany, is one of the world’s leading organizations for applied research. It plays a major role in innovation by prioritizing research on cutting-edge technologies and the transfer of results to industry to strengthen Germany’s industrial base and for the benefit of society as a whole. Founded in 1949, the Fraunhofer-Gesellschaft currently operates 75 institutes and research units throughout Germany. Its nearly 32,000 employees, predominantly scientists and engineers, work with an annual business volume of 3.6 billion euros; 3.1 billion euros of this stems from contract research.

Impedance spectroscopy is not only suitable for the lithium-ion batteries that are commonly found today, either. This method can also be applied to solid-state, sodium-ion or lithium-sulfur batteries – or any other future technology.

Wireless sensor system for self-sufficient shock and vibration monitoring. Source: Fraunhofer ENAS

Lab setup for computer-assisted real-time measurement of impedance in a lithium-ion battery cell to analyze its state. Source: Fraunhofer IFAM

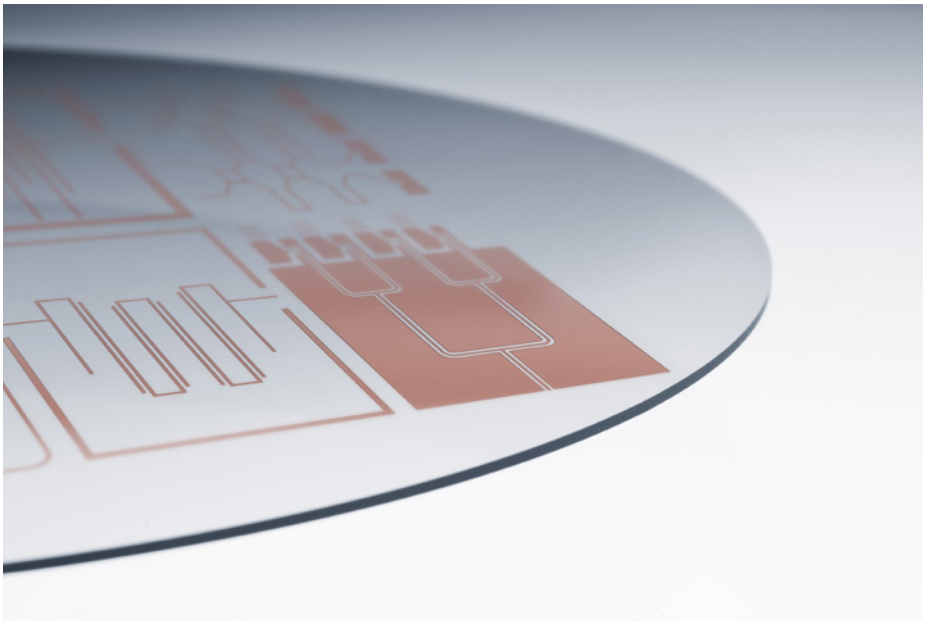
Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM
https://www.ifam.fraunhofer.de



Maximilian Glanzer

GLASS MEETS INNOVATION

BOROFLOAT 33 as a Key Material in Automotive Lighting



In the rapidly evolving world of automotive lighting, the demands placed on materials are becoming increasingly complex. Higher optical performance, thermal stability, mechanical robustness, and ongoing miniaturization are driving innovation across the industry. Amidst this transformation, one material has proven itself time and again: BOROFLOAT 33 - the world's first floated borosilicate glass.

Setting the Technological Benchmark in Glass

BOROFLOAT 33 is a borosilicate float glass with a unique combination of physical and chemical properties that set it apart from conventional soda-lime glass. Its low coefficient of thermal expansion (CTE of 3.25 ppm/K) resulting in outstanding resistance to thermal shock and thermal gradients. It has excellent chemical durability, and high optical clarity. These properties make it ideal for high-performance applications, especially in modern automotive lighting systems. With a remarkable thickness range of 0.4 to 25.4 mm and tight dimensional tolerances, BOROFLOAT 33 offers unmatched flexibility to product designers and engineers. Its high transmittance across UVA, VIS, and NIR spectra ranges enables precise light control, a critical factor for today's projection and headlight technologies.

Enabling Next-Generation Micro Lens Arrays

One of the most promising applications is in Micro Lens Arrays (MLAs) in precisely directing and shaping light, making them ideal for demanding optical applications especially when compact integration or space-saving design is essential. MLAs can be fabricated entirely from structured glass, offering high precision and excellent stability. An equally important technology is the fabrication of MLAs on specialty borosilicate glass substrate (as a substitution for fused silica substrates), which serves as a base for polymer-based microlenses. This hybrid solution combines the optical clarity and durability of glass with the flexibility and cost-effectiveness of polymer lens design.

Endurance Under Extreme Conditions

Durability is paramount, especially for exterior automotive components. BOROFLOAT 33 excels under extreme environmental conditions. Even after 100 hours in high heat and humidity (85 °C, 85% RH), the material shows no signs of degradation. It has an enhanced resistance to abrasion, sharp impacts and weathering. Additionally, it shows a low tendency toward autofluorescence and solarization. For these reasons, BOROFLOAT 33 is an excellent choice for exposed components such protective windows for camera and laser sensing systems.

From Lab to Road

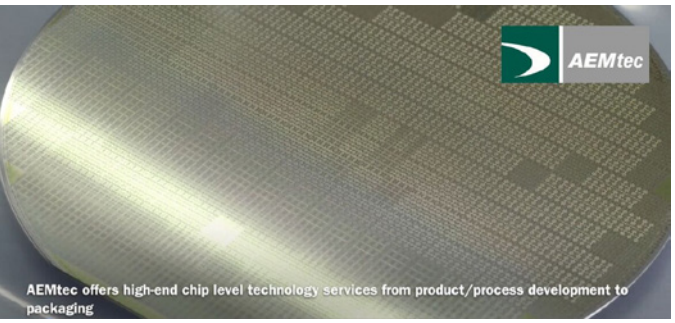
Automotive manufacturers are leveraging specialty glass material in optical systems in high-end lighting modules to combine optical precision with design flexibility. Applications range from adaptive matrix lighting to front projection systems, where light efficiency and thermal reliability are essential. The material's low dielectric constant and loss tangent also make it attractive for connected-car systems, including those operating in 5G and beyond. In some premium vehicles, the material is already serving as a key enabler of next-generation mobility technologies.

Conclusion: A Silent Champion of the Mobility Shift

BOROFLOAT 33 exemplifies the critical properties required for modern material solutions: multifunctionality, chemical and mechanical durability, and readiness for future technological demands. In the evolving landscape of automotive lighting, which calls for BOROFLOAT, efficient, and integrated systems, this borosilicate glass functions beyond a passive substrate. It provides optical precision, high thermal stability, and compatibility with advanced sensing and electronic integration. Its proven performance in demanding applications highlights its global relevance and reliability. As connected and autonomous vehicle technologies advance, glass-based components such as BOROFLOAT 33 will play a pivotal role in optical, sensing, and protective applications.

SCHOTT Technical Glass Solutions GmbH

https://www.schott.com/de-de/products/borofloat-p1000314



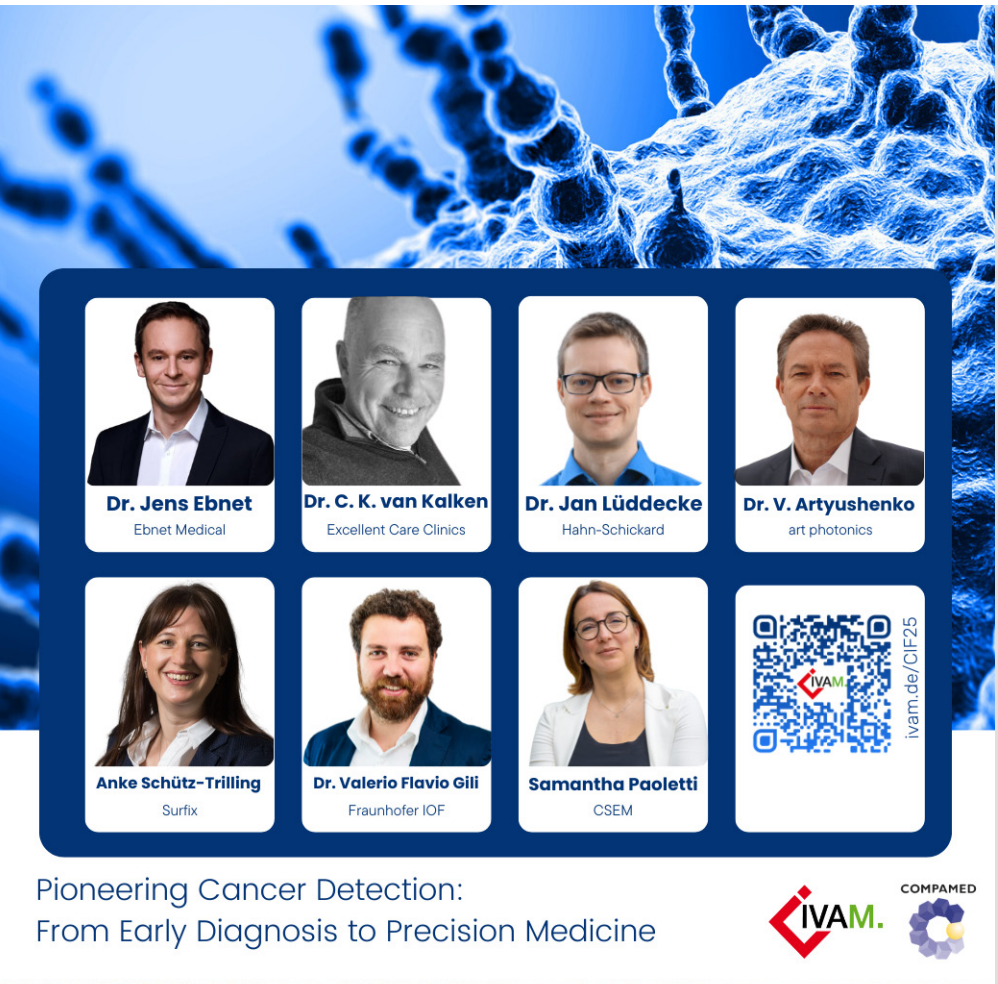
AEMTEC CELEBRATES 25 YEARS OF INNOVATION & NEW MANAGEMENT BOARD

AEMtec GmbH, a leading provider of advanced micro- and optoelectronic solutions, celebrates its 25th anniversary in 2025. Since its founding in 2000 as a spin-off from an international technology group, AEMtec has established itself as a reliable partner for global customers in the semiconductor, medical technology, biotechnology, data and telecommunications, industrial automation, aerospace, and defense industries.

"Our 25th anniversary is not only a time to reflect on our achievements, but also a powerful incentive to shape the future. Technological challenges are growing - and we are growing with them," emphasizes the management team.

Effective July 1, 2025, Robert Giertz joins AEMtec's management board. A long-standing member of the company, Giertz has served as Chief Technology Officer since 2018 and has been instrumental in shaping the company's technical development. With his deep expertise and forward-looking vision, he will now also support the strategic and international growth of the organization at the executive level. AEMtec stands for Advanced Electronic Microsystems, delivering customized, high-performance solutions in advanced packaging. From its headquarters in Berlin-Adlershof, the company offers a comprehensive technology portfolio, including wafer back-end services, chip-on-board, flip chip, 3D integration, and opto packaging. Known for its precision, reliability, and innovation, AEMtec supports the miniaturization of electronic systems in demanding high-tech environments.

https://www.aemtec.com



PRESENTATIONS NOW ON YOUTUBE

New technologies are fundamentally changing how we detect, understand and treat diseases. From early detection to personalized therapy - innovative approaches are opening up completely new perspectives for more precise, faster and patient-oriented care: Modern diagnostic procedures enable an individualized analysis of tumors. This not only improves the detection rate, but also the quality of treatment - with positive effects on patients' quality of life.

This year's COMPAMED Innovation Forum was dedicated to the latest trends and technologies in cancer diagnostics. The presentations from this year's webinar, held online on June 5, 2025, are now being released step by step on the IVAM Microtechnology Network YouTube playlist. Half of the expert talks are already available, with the remaining presentations to follow soon.

http://ivam.de/youTubeCif

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NEW DUAL LEADERSHIP AT BARTELS MIKROTECHNIK

As of August 1, 2025, Bartels Mikrotechnik proudly welcomes Florian Siemenroth as Co-Managing Director. Together with Monika Kremer, he will lead the company into its next phase of growth and innovation. Florian Siemenroth has been a valued member of the Bartels team for many years, bringing extensive expertise in Product Management, Business Development, and Marketing. His deep knowledge of microfluidics and customer experience will play a vital role in shaping the company's future. Monika Kremer will continue to focus on Finance, HR, and Quality Management, while Florian leads Business Development, Product, and Marketing. This complementary leadership ensures a strong foundation for the company's strategic growth.

https://bartels-mikrotechnik.de

VISIT THE IVAM JOINT BOOTH AT THE MICROSYSTEM-TECHNOLOGY CONGRESS 2025

The exhibition not only provides an overview of the current state of the art but also offers direct access to experts and decision-makers. It is the place where contacts, collaborations, and innovation dialogues are created that are crucial for the future of microsystems technology.

The MST Congress 2025 is the leading conference for microsystems technology and microelectronics. More than 1,000 participants from industry, science, and politics will come together in Duisburg in October to discuss current developments, research results, and market trends.

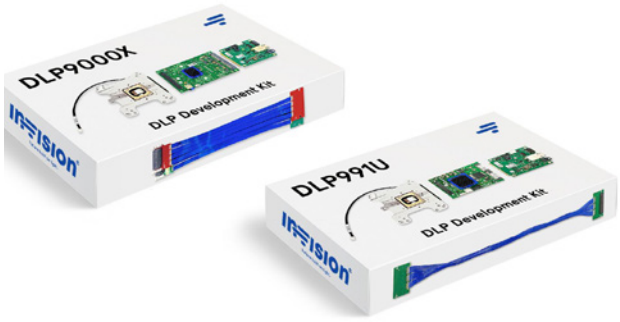
Visit the trade exhibition at the MST Congress 2025 and explore innovations, technologies, and trends in microsystems technology - gain compact insights, engage directly with leading companies, and build valuable connections for your projects.

Highlight: The Trade Exhibition
A central highlight is the accompanying trade exhibition. At the IVAM joint pavilion companies and institutions present their latest products, technologies, and services. Exhibiting Companies and Projects, among others

- IMT Masken und Teilungen AG
- SmarAct GmbH
- SmartMembranes GmbH
- VIA electronic GmbH
- Project MIND - Microtechnology, Interaction, New Perspectives on Diversity

Visitors have the opportunity to gain a compact overview of innovations along the entire value chain - from microsensors and packaging & interconnection technologies to quantum technologies and sustainable ICT.

https://www.ivam.de/events/MST%20Kongress%202025



IN-VISION LAUNCHES NEW ELECTRONIC SUBSYSTEMS FOR NATIVE 4K DLP CHIPSETS

IN-VISION Technologies AG, an Austrian optics company and official Texas Instruments Design House Partner, is expanding access to its advanced electronic subsystems for DLP technology. The company's open hardware platforms for high-performance DMD (Digital Micromirror Device) chipsets are now available to a broader range of users.

"With this step, we are pursuing our mission to provide open, high-performance platforms for all users who wish to work with advanced photonics and DLP technology," said Florian Zangerl, CEO of IN-VISION. The new subsystems offer direct access to cutting-edge DMD technology–without requiring users to develop their own electronics–whether for research, prototyping, or production applications in fields such as lithography, additive manufacturing, and biotechnology.

The product line includes driver electronics for Texas Instruments' native 4K DLP991U and 2K DLP9000X chipsets, both designed for high-speed dynamic light exposure applications. IN-VISION is currently the only manufacturer offering boards that combine ultra-fast optical interfaces, an open FPGA architecture, and flexible system integration.

https://in-vision.at

MANAGEMENT CHANGE AT HNP MIKROSYSTEME IN SCHWERIN

Dr. Matthias Jahncke is the new Managing Director of HNP Mikrosysteme GmbH. He takes over from Dr. Thomas Weisener, who is retiring after 27 years of leadership. Together with Dr. Gerald Vögele, Dr. Weisener developed the company from a Fraunhofer IPA start-up in Stuttgart into a globally recognized market leader for micro pumps. Today, HNPM offers a wide range of micro dosing products for applications in life sciences, chemistry, pharmaceuticals, and mechanical and plant engineering.

On August 1, 2025, Dr. Matthias Jahncke officially became the sole Managing Director of HNP Mikrosysteme. He had already joined the management team in November 2024. Dr. Jahncke brings many years of leadership experience in mechanical engineering and a deep understanding of technology-driven markets. Early in his career, he set up an innovation incubator in Leipzig - an experience that strengthened his passion for technical innovation. With the change in leadership, HNP Mikrosysteme is entering a new chapter. Dr. Jahncke is not only taking over management duties - he is also setting a clear course toward innovation and growth. “HNP Mikrosysteme is one of the most exciting companies in Mecklenburg-Vorpommern: a technology leader, internationally connected, and at the same time firmly rooted in the region,” he says.

https://www.hnp-mikrosysteme.de

PREMIERE FOR HIGH-TECH SUPPLIERS

For the first time, the IVAM Microtechnology Network will host its own joint booth at XPONENTIAL Europe 2026 in Düsseldorf. This offers companies from the high-tech supplier sector the opportunity to present themselves in the context of emerging future markets such as unmanned systems, robotics, sensor technology, communication technologies, and AI-based applications.

As the European edition of the leading U.S. trade show for autonomous systems, XPONENTIAL Europe addresses rapidly growing cross-sector markets that are highly relevant to key technology industries. The IVAM joint booth is designed to bring together suppliers of innovative components, materials, manufacturing processes, and system solutions.

Exhibitors benefit from a comprehensive full-service package: IVAM takes care of all trade show logistics and on-site support, provides a fully equipped booth space including setup and dismantling, and ensures maximum visibility through extensive marketing and PR activities. A pitch opportunity at the show’s Innovation Theater offers additional stage presence. In addition, participants gain access to networking events and receive complimentary trade visitor tickets for targeted outreach to potential customers and partners.

Technology companies looking to position themselves in these dynamic markets can now apply to join the IVAM joint booth.

https://www.ivam.de/events/xponential-europe-2026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MORE WOMEN AND DIVERSITY IN MICRO-TECHNOLOGY

The official kick-off of the nationwide project “MIND – Microtechnology, Interaction, New Perspectives on Diversity” marks a significant step toward promoting gender diversity in STEM, with a particular focus on the microtechnology sector. The initiative aims to actively support women and other underrepresented groups and increase their participation in this key area of innovation.

At the heart of the project is the development of a digital platform that offers information, learning, and exchange opportunities for companies, female and diverse professionals, and other marginalized groups. The platform will include tools and content for organizational and personal development, professional networking, and materials to support youth engagement and gender equality in STEM careers.

A particular emphasis is placed on raising awareness of diversity and inclusion in the workplace. The project addresses barriers such as unconscious bias, gender stereotypes, and challenges related to work-life balance. Running from July 2025 to June 2028, MIND is being implemented in close cooperation with companies and associations across German. The project is funded by the Federal Ministry of Labour and Social Affairs (BMAS) and the European Social Fund Plus (ESF Plus). Companies interested in contributing to and benefiting from the platform are warmly invited to join the project.

https://www.ivam.de/research/projects/ivam_projects/mind?

GET TO KNOW IVAM MICROTECHNOLOGY NETWORK - JOIN A Q&A SESSION

Have you ever thought about whether your company could benefit from a membership in a network? Perhaps an IVAM membership may be the right solution for current challenges in your microtech-, biotech- oder deeptech-company! We cordially invite you to get to know the network better. You are welcome to bring specific questions, which we will then answer personally. Additionally you have the possibility to arrange an individual appointment.

membership@ivam.de

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EVENTS

25 Sep 25

IVAM FOCUS GROUP PHOTONICS

Focus Group Session at W3+Fair in Jena, Germany on Photonics & Optics in Microtechnology on September 25, 2025 from 12:15 pm - 13:00 pm.

09 Oct 25

GET TO KNOW IVAM@

Information event about the network and the benefits of membership

10 Oct 25

IVAM MARKETING LUNCH TALK@

German Presentation on Corporate Influencing for SMEs at LinkedIn

15 Oct 25

MID WEEK COFFEE BREAK - FRAUNHOFER ENAS@

Virtual technology talk between IVAM Members

27-29 Oct 25

MICROSYSTEMTECHNOLOGY CONGRESS 2025

IVAM Joint Booth at the MicroSystemTechnology Congress 2025

5 Nov25

IVAM FOCUS GROUP MICROFLUIDIC@

Working Group Session

7 Nov25

SPOTLIGHTS HR@

German presentation on Companies caught between their core business and sustainability regulations

17-20 Nov 25

COMPAMED 2025

Product Market “High-tech for Medical Devices” and COMPAMED HIGH-TECH FORUM in Hall 8a in Düsseldirf, Germany

19 Nov25

EUROPE MEETS NORTH AMERICA AT COMPAMED

Connecting High-tech for Medical Devices in hall 8a, booth G40, Düsseldorf, Germany

26 Nov25

MID WEEK COFFEE BREAK - RECOM RECYCLING GMBH@

Virtual technology talk between IVAM Members

17 Dez 25

MID WEEK COFFEE BREAK - KUPTEC GMBH@

Virtual technology talk between IVAM Members

3-5 Feb 26

MD&M WEST 2026

Medical Design & Manufacturing - IVAM presents Micro Nanotech Area in Hall C Anaheim, CA, US

4-6 Feb 26

ASIA PHOTONICS EXPO 2026

Special exhibition area ”Photonics+ Europe powered by IVAM, EPIC and W3+, Singapore, SG

24-26 March 26

XPONENTIAL EUROPE 2026

New IVAM joint stand at theLeading European trade fair for autonomous technologies & robotics.

9-11 Sep 26

MEDICAL MANUFACTURING ASIA 2026

IVAM joint stand and IVAM Marketing Award Asia

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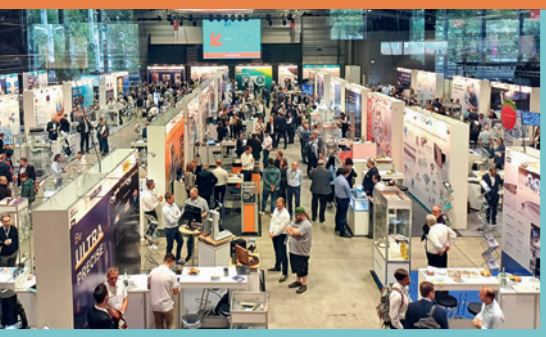
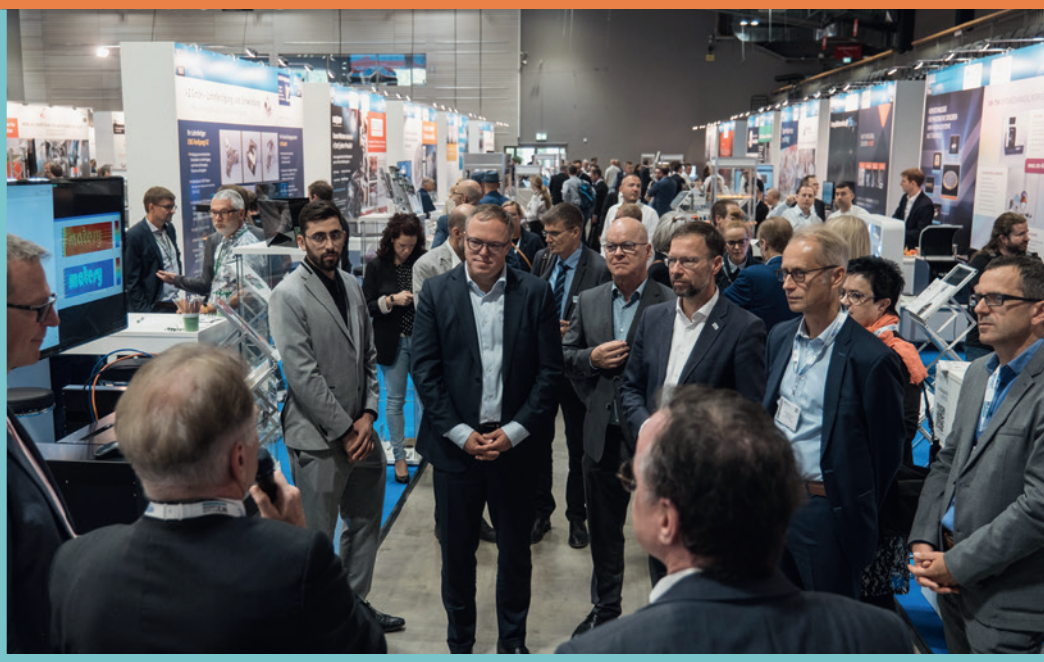
ENABLING TECHNOLOGIES

W3+ Fair Jena 2025

24. + 25. September 2025 | Jena, Thüringen





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