# 360°

## ELECTRIFIED

The move towards electrification in the field of mobility will continue to gain momentum. This presents a whole host of opportunities for HELLA. Energy management is already one of the fastest growing business fields. In order to actively shape the future of electromobility, HELLA is purposely investing in innovative product solutions for all development stages – and in doing so is making a significant contribution to clean mobility.

### Electrifying visions

Electrification is one of the major trends completely redefining the mobility of the future and is at the centre of the entire automotive industry's focus. What does the future hold for electromobility? And how can HELLA benefit from this trend? Find out more in an interview with HELLA electronics experts Björn Twiehaus and Frank Petznick.

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### Veritable powerhouses

Mild hybrids are seen as a quick and efficient entry point into the realm of electromobility. With the Dual Voltage Battery Management System and the PowerPack 48 Volt, HELLA is now one of the first companies to develop innovative battery module solutions for this fast-growing market.

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### A comprehensive network

For almost 20 years HELLA has been making driving more efficient. To further strengthen its position in the area of electromobility, HELLA is assembling a powerful network of experts across the globe. Five employees from the worldwide HELLA network tell us about the personal contribution they are making in this regard.

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# Electrifying visions

**ELECTRIFICATION** is one of the major trends redefining the mobility of the future and currently at the centre of the entire automotive industry's focus. What does the future hold for electromobility? And how can HELLA contribute to this development? Find out more in this interview with HELLA electronics experts Björn Twiehaus and Frank Petznick.

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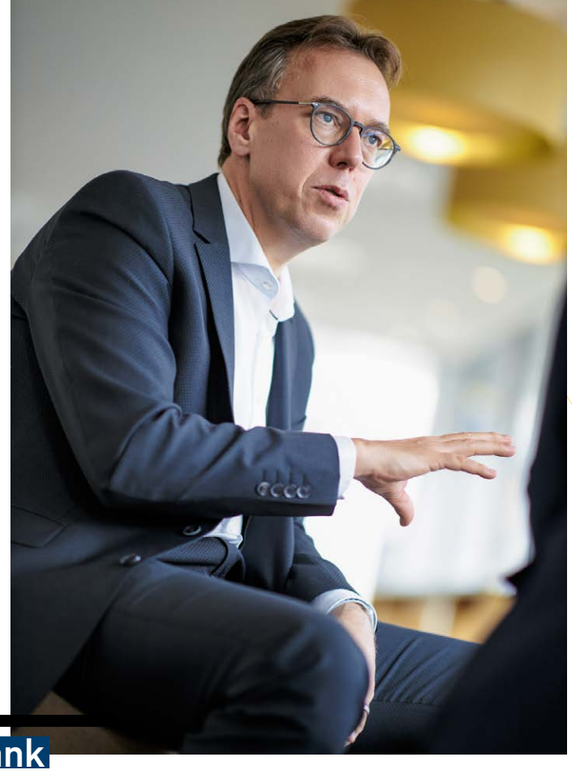
Meetings like this do not take place very often, for geographical reasons apart from anything else – Frank Petznick, responsible for the electronics business of HELLA in China and member of the Electronics Executive Board, is based in Shanghai. Visiting the HELLA headquarters in Lippstadt, Germany, he takes the time for a joint interview with another expert on electrification in the automotive industry: Björn Twiehaus, Head of the Product Center Energy Management and also a member of the Electronics Executive Board.

## 360° ELECTRIFIED

Electromobility continues to gain momentum. To take advantage of the opportunities that this presents, HELLA is developing **pioneering product solutions for all stages of electrification** – thus supporting its customers comprehensively on the road to electromobility.

**There's no question about it – electrification will continue to gain momentum. China has long since become a pioneer in this field and, in my opinion, is setting the pace.**

*Frank Petznick*



## Frank Petznick

**Frank Petznick moved** to Shanghai back in 2008, taking on the role of head of HELLA's local Technical Center. Today, as a member of the Executive Board Electronics, he is responsible for HELLA's electronics business in China. He has also been responsible for the company-wide Product Center Automated Driving since the end of 2018.

***Electromobility is on the rise. What is your personal experience of this development?***
Twiehaus: A few years ago, electromobility started to become a bigger part of my work, and it was clear that I had to experience it myself. That is why I drive a plug-in hybrid, and I'm very impressed by how quiet, smooth and powerful the car is. But that does not mean that I can't see the difficulties that are still associated with electromobility – especially in Europe.
Petznick: I have been living in Shanghai, a gigacity with some 25 million inhabitants, since 2008. Because of its size alone, emissions are a major problem and there is a real push to embrace electromobility. I can literally see the way things are changing as one neighbour after another switches to an electric vehicle, and the charging infrastructure is growing continuously. In China, people view electromobility as an enrichment and not as a restriction.

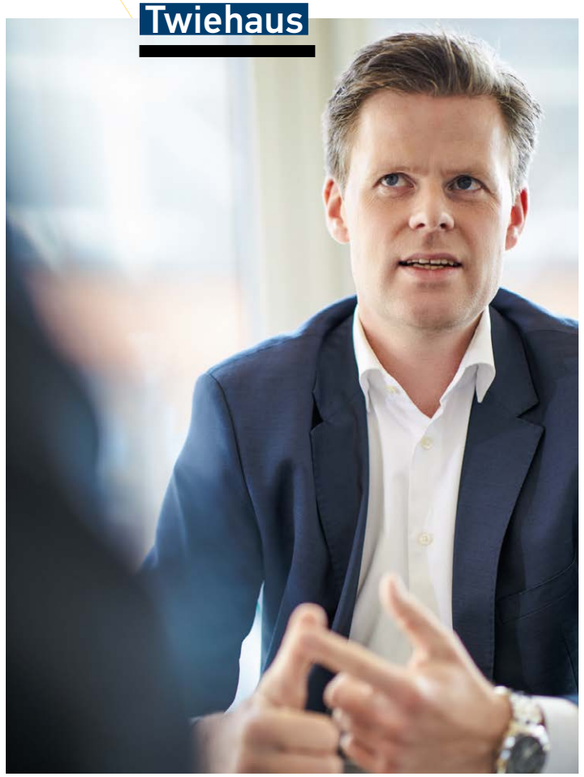
***How do you see the industry developing in the future?***
Petznick: There's no question about it – electrification will continue to gain momentum. China has long since become a pioneer in this field, with the highest number of new electric vehicle registrations. This is partly due to the extremely strict emissions targets and quota regulations for electric vehicles, but it is also down to the existence of various subsidies. China's strategic goal is to become a leader in electromobility and, in my opinion, it is setting the pace.
Twiehaus: But electromobility is also becoming increasingly attractive in Europe and other regions. On the one hand, because end-consumer acceptance is increasing, and on the other, because key technologies such as batteries and battery cells are becoming cheaper and more powerful at the same time. The infrastructures for hybrid and electric vehicles are also improving continuously. But it is also clear that the combustion engine will not just disappear overnight. Mild hybridisation on a 48 V basis will play a particularly important role as a kind of interim solution on the road to full electrification.

***To what extent can HELLA benefit from this development? After all, for many people, the company is still mainly associated with lighting.***
Petznick: Our lighting business has an excellent reputation, providing the HELLA brand with an enormous reach – and rightly so. But HELLA is more than just lighting. We are also a leading electronics supplier and our business has grown considerably over the past few decades. 50 years ago, a car's electronics consisted of only a few relay circuits and a maximum of one control unit. Today there are dozens – possibly up to 100 control units per vehicle – which are required for different functions. HELLA anticipated this increasing importance at an early stage and positioned itself accordingly.
Twiehaus: Looking at the major trend towards electromobility, our big advantage is that we don't need to reinvent our company. We positioned ourselves in the field of power and battery electronics at an early stage. We began producing intelligent battery sensors at the turn of the millennium and launched the world's first voltage converter in 2007. Today we are the global leader in both product groups and we have accumulated an enormous wealth of experience on which we can build. Energy management is already one of our fastest growing business fields and we aim to pursue this course for years to come.

***How is HELLA positioning itself when it comes to electromobility?***
Twiehaus: We want to fully support our customers on the road to electromobility – across all stages of electrification. This includes offering innovative products for electric vehicles as well as solutions for mild and full hybrids that make conventional internal combustion engines cleaner and more efficient. One of the key areas for us in terms of development is solutions for 48 V mild hybridisation, which offers considerable potential in terms of energy savings and is relatively easy to integrate into existing vehicle architectures. It helps manufacturers to meet increasingly stringent emissions targets quickly and efficiently. HELLA can make a significant contribution in this field.
Petznick: The same applies to our business in China. The Chinese market is no longer new territory as we have been active there since the early 1990s. At that time, we had only a few locations and a relatively small team that was primarily concerned with industrialising products developed in Germany for the Chinese market. Today paints quite a different picture – we have around 1300 developers in China in total, and many product innovations now originate from there. Our strategy is:

**Björn Twiehaus** has been responsible for the Energy Management division at HELLA since October 2017 and also serves as a member of the Executive Board Electronics as part of this role. He joined HELLA in 2002 as a production engineer at the electronics plant in Hamm, Germany.

## Björn Twiehaus

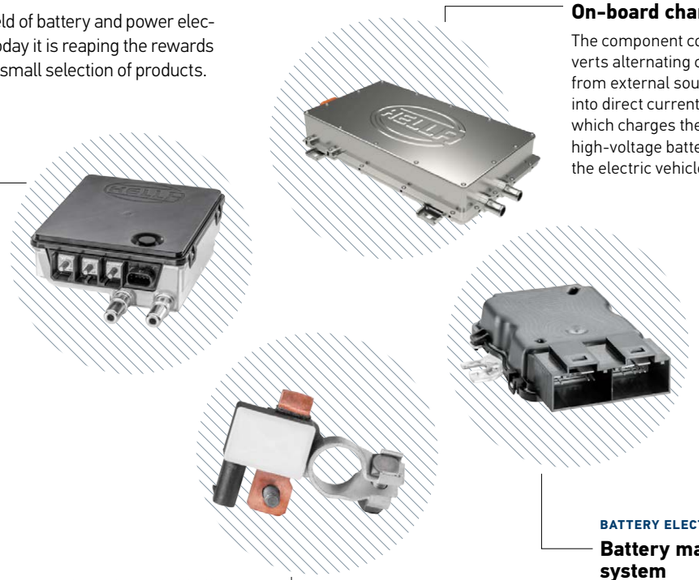


**We fully support our customers on the road to electromobility – across all stages of electrification.**

*Björn Twiehaus*

# More power

HELLA positioned itself in the field of battery and power electronics at an early stage – and today it is reaping the rewards of this pioneering role. Here is a small selection of products.



POWER ELECTRONICS

**On-board charger**

The component converts alternating current from external sources into direct current, which charges the high-voltage battery of the electric vehicle.

POWER ELECTRONICS

**DC-DC converter**

The power electronics supply the vehicle electrical system. In hybrid vehicles, they combine the different voltage classes with as little loss as possible.

BATTERY ELECTRONICS

**Battery management system**

The unit records all relevant data of the battery system in electric and hybrid vehicles and monitors the status.

BATTERY ELECTRONICS

**Intelligent battery sensor**

The key element of energy management: the intelligent battery sensor measures voltage, current and temperature.

## THE STAGES OF ELECTRIFICATION

**Vehicles with internal combustion engines**
Vehicles powered exclusively by internal combustion engines without any further assistance.

**Micro-hybrids**
Micro-hybrids are also powered by an internal combustion engine. However, electrical technology in the form of a 12 V battery enables additional energy-saving functions such as the start/stop automatic system, although it does not support the engine while driving.

**48 V mild hybrids**
Mild hybrids based on 48 V are regarded as a quick way into the world of electromobility, as they significantly improve energy efficiency and are comparatively easy to integrate into the vehicle architecture. They are equipped with an electric motor with limited power, which supports the internal combustion engine and uses the energy gained during rolling and braking. Due to their advantages, mild hybrids are expected to have have the highest growth rates.

**Full and plug-in hybrids**
Regarded as the big sisters of the mild hybrid, because they feature similar technology. However, the performance of the electric motor is usually much higher, making it possible to drive using electric power alone. If the battery used in a hybrid vehicle to drive the electric motor can also be charged via the power grid, the vehicle is referred to as a plug-in hybrid.

**Electric vehicles**
The highest stage of electrification: "pure" electric vehicles without internal combustion engines. They are emission-free, powered by a battery and charged via a charging station. The number of pure electric vehicle models is still relatively small, but the list is growing steadily.



in China, for China. For example, we have more than 85 developers working for over 20 customers at our main Chinese location for energy management – with the number still rising.

***In your opinion, what are the biggest challenges that HELLA will have to overcome on the road to electromobility?***
Petznick: It's all about finding the right balance between focus and flexibility. Electrification is taking place at various levels simultaneously, and the speed of development also differs considerably from region to region. Our key challenge is to remain as broadly positioned as possible in order to offer our customers suitable solutions but not to spread ourselves too thin.

***Both manufacturers and suppliers are constantly trying to overtake each other in terms of electrification with new solutions. How can HELLA assert itself successfully in this race?***
Twiehaus: There are two key factors. On the one hand, we want to continue to pursue our strategy of evolutionary development. In other words, the competencies that we have built up over many years in our components business with battery sensors and voltage converters will be further enhanced and applied to new fields. For example, we are producing battery management systems which we have developed specifically for full hybrid and electric vehicles, and we are working on smart charging solutions. On the other hand, we also intend to make revolutionary leaps by shifting from our role as a supplier of individual components to a supplier of subsystems.

> **Energy management is already one of our fastest growing business fields and we aim to pursue this course for years to come.**
>
> *Björn Twiehaus*

***What does that mean in concrete terms?***
Twiehaus: As technologies become more sophisticated, we can better serve our customers by eliminating some of the complexity and offering them a complete system in the future. In this context, core products include innovative system solutions for mild hybrids such as the PowerPack 48 Volt and the Dual Voltage Battery Management System.
Petznick: What's more, the focus is no longer just on the best technologies – speed is also becoming increasingly important. With this in mind, we need to work with partners. In China, for example, we are working with specific battery cell manufacturers, we have established a new electronics joint venture with our long-standing partner BHAP, and we are looking to intensify our collaboration with local partners in the field of battery management systems.

Twiehaus: Partnerships are very important to us in general. We have a strong, global development and production network in the field of energy management. However, we also need partners in the field of batteries and battery cells, for example. In the future, it will be more important than ever to be open to ideas developed in collaboration with our partners.

***In the race towards electromobility, new companies are entering the market, causing it to become more and more fragmented. Are we seeing a sea change in the automotive industry?***

Petznick: The market is indeed fragmented. When it comes to electromobility, the established automotive manufacturers have more or less all had to start from scratch. In the case of conventional internal combustion engines, Western manufacturers used to be one step ahead of Chinese manufacturers. This is no longer the case in the context of electromobility – although there may still be an advantage for now in terms of industrialisation expertise. Developing an electric car is one thing, establishing stable series production is another. However, it is likely that the current market fragmentation will revert to a consolidation phase.

> **What is particularly fascinating is that electrification will probably develop at different rates depending on the market. The state of affairs in 2030 will probably be completely different in Europe compared to China.**
>
> *Frank Petznick*

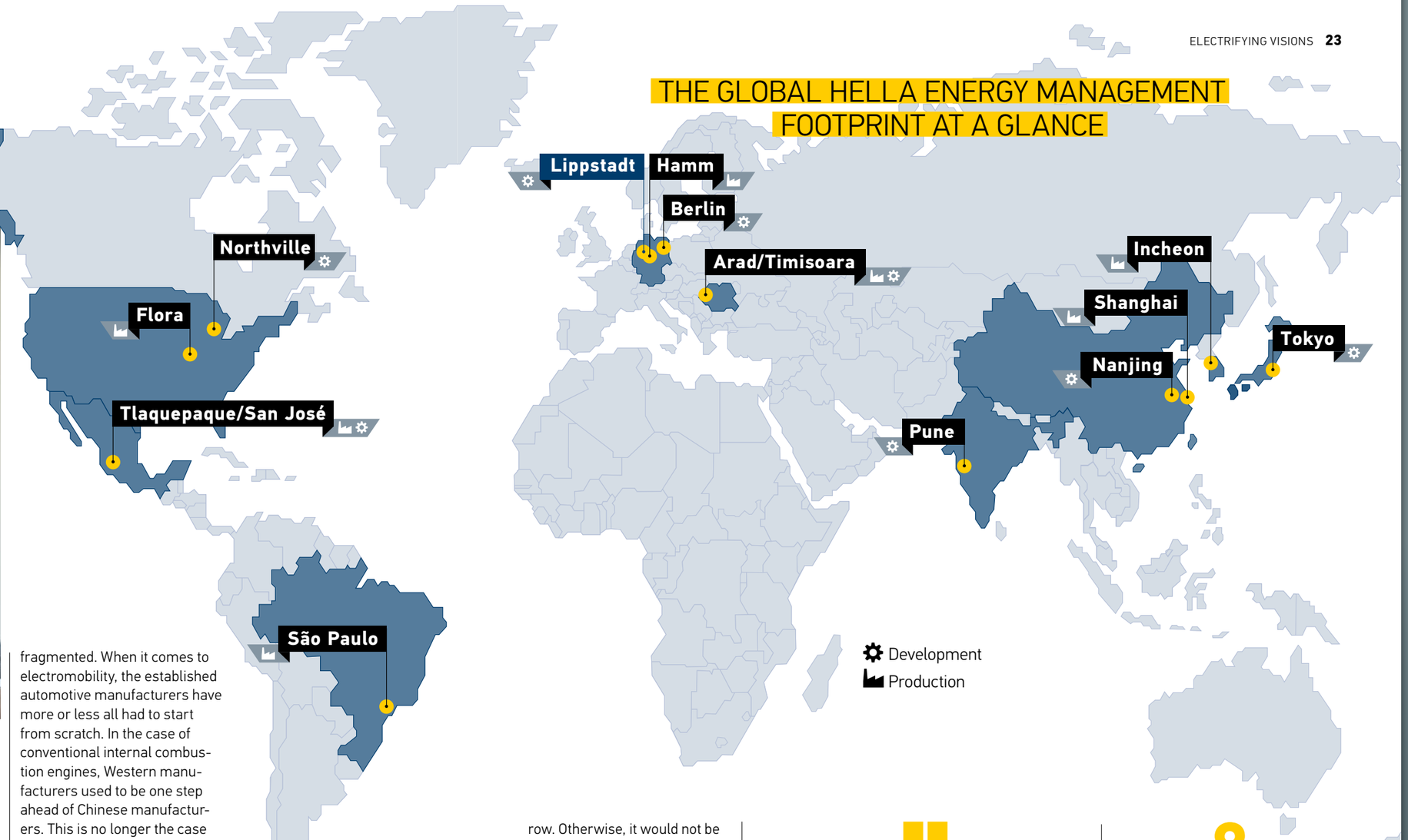
***When you get together to discuss scenarios for the mobility of the future, how far into the future do you look?***

Twiehaus: We always keep a close eye on the immediate future – in other words tomorrow. Otherwise, it would not be possible to successfully manage our business. In addition, however, we also consider what the world will look like in ten, 15 or 30 years in our day-to-day work.

Petznick: What is particularly fascinating is that these scenarios will probably develop at different rates depending on the market. The state of affairs in 2030 will probably be completely different in Europe compared to China. As a global company, we have to master the art of managing these different rates of development while ensuring scalability and synergies at the same time.

> **We want to further enhance the competencies that we have built up in our components business and apply them to new fields. At the same time, we are shifting from our role as a supplier of individual components to a supplier of subsystems.**
>
> *Björn Twiehaus*

## THE GLOBAL HELLA ENERGY MANAGEMENT FOOTPRINT AT A GLANCE




**8**
**development sites**

**8**
**plants**
has the global energy management footprint of HELLA

**560**
**employees**
worldwide work in research and development in the area of energy management

**360°**
ELECTRIFIED

Requiring few changes to be made to the vehicle architecture, yet offering improved energy efficiency, **48 V mild hybrids** are seen as a quick and efficient entry point into the realm of electromobility.


# Veritable powerhouses

**ON THE ROAD TO ELECTROMOBILITY**, HELLA is there to provide comprehensive support to its customers. With the Dual Voltage Battery Management System and the PowerPack 48 Volt, HELLA is now one of the first companies to develop innovative battery module solutions for the fast-growing mild hybrid market.

**Cars with at least a partially electric drive** are soon to become the norm – even beyond the countries that are currently setting the agenda when it comes to electromobility. A key stepping stone along the way is 48 V mild hybridisation.

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Global climate targets are becoming ever more stringent. In the European Union, for example, newly registered vehicles will not be allowed to emit more than 95 grams of $CO_2$ per kilometre on average from 2021, with emissions even being limited to a maximum of just 62 grams from 2030. Ambitious objectives have also been set in many other large economies such as the USA, China and Japan. Automobile manufacturers will have to electrify their vehicle fleets in order to meet these targets.

In the short term, however, it is not possible to move straight from the internal combustion engine to full electrification. There are many reasons for this: for example, an extensive charging infrastructure is not yet available and the price of purely electric vehicles is still comparatively high.

Intelligent solutions are therefore required which can be implemented relatively easily and which will help to reduce vehicle $CO_2$ emissions both quickly and to a significant extent. Partially electric vehicles in particular – known as mild hybrids – will therefore play a key role on the road to electromobility. It is estimated that global production of mild hybrids will rise from 6 million units in 2020 to 35 million in 2030.

FOCUSING DEVELOPMENT ON MILD HYBRIDS

Felix Schmauch (42) and Guido Schütte (43) are sitting in a modern conference room at the HELLA headquarters in Lippstadt. The international automotive supplier opened this new building a few short weeks ago, with the aim of creating additional space for its rapidly growing electronics business. A key driver of this growth is the field of energy management. Some 560 developers are employed worldwide in the Energy Management department alone and this figure is set to almost double within the next five years.

Schmauch and Schütte are two of the employees with responsibility in this area. Both have been working at HELLA

**We are anticipating that mild hybrids will become the largest growth driver for electrification in the coming years. They are a quick, efficient and relatively simple route into electromobility for our customers.**

*Guido Schütte*

for more than ten years and in their current leadership roles are responsible for advancing the development of pioneering product innovations in the field of energy management for HELLA: Schmauch works on the Dual Voltage Battery Management System, while Schütte focuses on the PowerPack 48 Volt.

Used in 48-volt mild hybridisation, both systems serve a drive type that will play a particularly important role as a transition technology between the internal combustion engine and electric drive. "HELLA has already established itself by offering product solutions for all stages of development on the road to electromobility – from the micro hybrid to high-voltage applications for fully electric vehicles," says Guido Schütte. "For us, however, product innovations for mild hybrids currently represent a key development focus. As they are a quick, efficient and relatively simple route into electromobility for our customers, mild hybrids will become the largest growth driver for electrification in the coming years."

In this stage of electrification, the conventional internal combustion engine – in addition to the standard 12 volt vehicle electrical system – is supplemented with a 48 volt system based on lithium ions. The second vehicle electrical system enables a range of additional functions to be incorporated which save fuel effectively. For example, it allows the vehicle to coast with the engine completely switched off, and when the vehicle starts, it supplies a boost which increases drive torque, improving driving dynamics. Above all, the 48 volt system can recover much more energy, for example through recuperation during braking, and can therefore charge itself. 48 volt hybridisation is a particularly promising development as it requires few changes to be made to the vehicle architecture, while offering efficient energy recovery methods and improved energy efficiency.

One interesting secondary aspect is the fact that energy-intensive units such as steering aids and other assistance systems can be powered electrically with a 48 volts vehicle electrical system. The 48 volt system is not only an entry point into fully fledged electromobility, it is also an essential requirement for autonomous driving.

## Guido Schütte

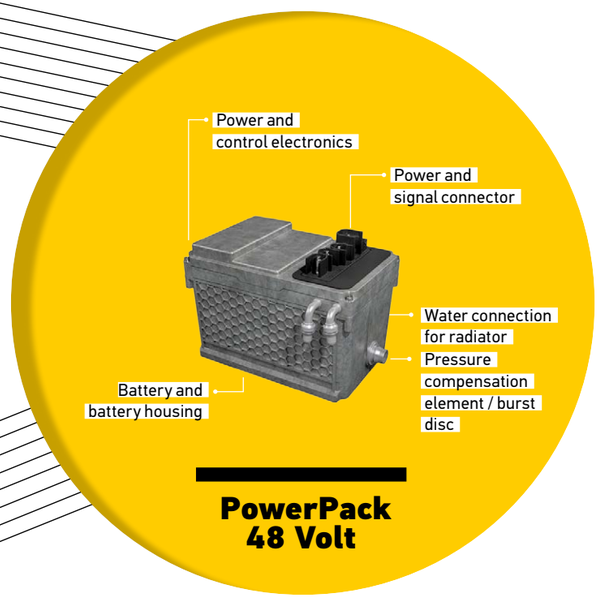
After completing his studies at Paderborn University, Germany, and Western Michigan University, USA, the graduate computer scientist started working in HELLA's Software Development department in 2001. In his role as Director Program Management Energy Management, he has been responsible for the power electronics used in hybrid and electric vehicles since 2014.

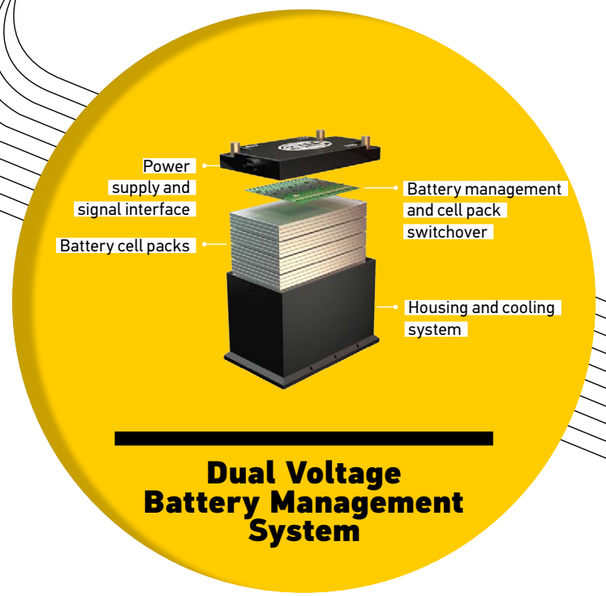
POWER AND BATTERY ELECTRONICS IN ONE PRODUCT

With both the Dual Voltage Battery Management System and the PowerPack 48 Volt system solutions, HELLA is now one of the first companies to offer innovative battery module solutions for mild hybrids, thereby further advancing the electrification of mobility. They might not look like much and are not much bigger than a conventional battery, yet they incorporate all of HELLA's expertise and experience in pow-

### PowerPack 48 Volt

**In addition to the 12 V lead-acid battery**, the PowerPack 48 Volt is used in larger vehicles in the mid-range and luxury classes to meet the power requirements of mild hybridisation. The combination of a 48 V lithium-ion battery and DC-DC converter in a subsystem brings together HELLA's electronics expertise in power electronics and battery management. Alongside functions such as boost, the module can recover significantly more energy and realise further comfort functions for the luxury class, such as ambient lighting, automatic climate control and active chassis control.




### Dual Voltage Battery Management System

**The system replaces the 12 V battery** as it combines cells in one pack which can be switched to different voltage classes based on requirements and the situation: 12 volts for high-performance operation of the vehicle electrical system and 48 volts for enhanced energy recovery. This compact component, which can be integrated into the vehicle architecture in the place of the conventional lead-acid battery, really sets itself apart thanks to its special power electronics which take care of the intelligent switching process and mean that an additional battery is no longer required.

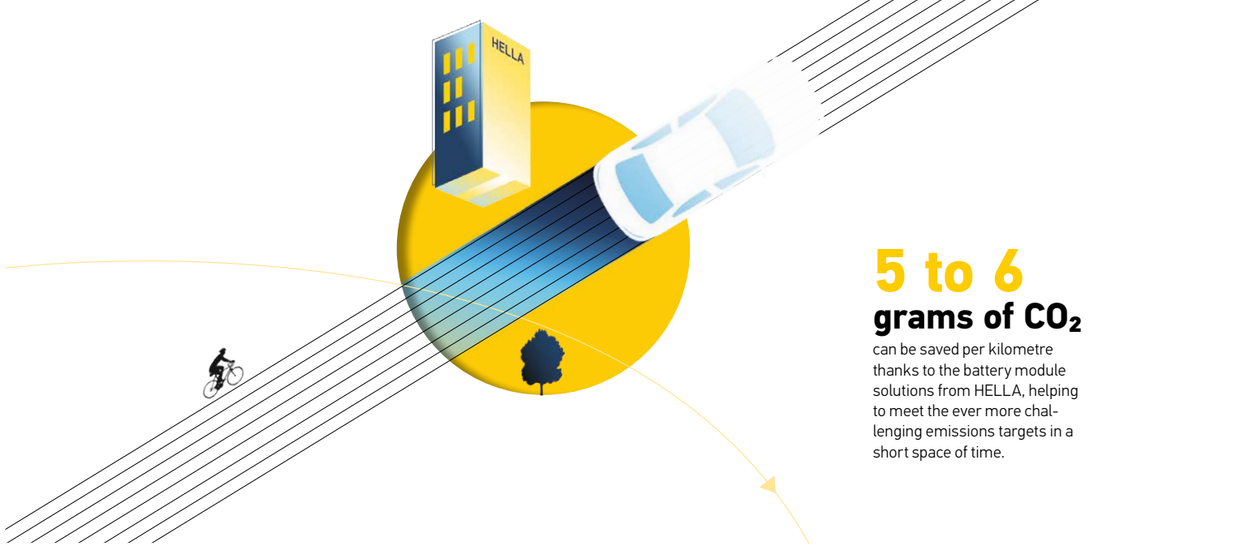
er electronics and battery management. The new solutions can achieve savings of 5 to 6 grams of $CO_2$ per kilometre, thereby helping to reach $CO_2$ targets in a short space of time.

Above all, the systems answer the question of how 12 volts and 48 volts systems can be integrated in the design of a mild hybrid. They have a major advantage in this regard: HELLA is able – in conjunction with various cooperation partners – to supply the solutions as complete subsystems from a single source. "Our customers can integrate our subsystems into their existing vehicle architecture with ease," emphasises Schütte. "Right from the start, we were guided by the principle of providing the best possible support to our customers by offering them an integrated system that brings together multiple high-performance individual components in a single product. And what's more, our efforts also focused on increasing cost efficiency and reliability."

## Award-winning innovation

**Thanks to the Dual Voltage Battery Management System**, HELLA received the AutomotiveINNOVATIONS Award 2019 in July 2019, recognising it as the most innovative automotive supplier in the Powertrain category. The award is conferred by the Center of Automotive Management together with auditing and consulting firm PricewaterhouseCoopers. The distinguished jury praised the fact that the system combines the standard elements of 48 V hybridisation within a single product and takes up the same amount of space as a conventional lead battery, meaning that it offers huge advantages in terms of cost, weight and efficiency. Over 330 innovations in total were submitted by suppliers and four awards were presented.

The first solution takes the form of the Dual Voltage Battery Management System for the compact and mid-range classes. The innovative dual-voltage battery comprises a battery pack of lithium-ion cells which can be switched to 12 or 48 volts as required. This is achieved thanks to innovative power electronics which also provide the functions of the DC-DC converter. When the vehicle brakes, as many cells as possible are switched to 48 volts to enable as much of the recovered energy as possible to be stored. During normal driving involving use of the radio, air-conditioning system and other comfort functions, the system switches more cells to 12 volts. The lead-acid battery is left out of the vehicle completely. As the new system only takes up the space of a conventional battery, it is easy to integrate into existing vehicle architectures. "12 and 48 volts can be supplied at the same time based on the situation," says Schmauch. "That means we only require one battery and don't need any additional components. This saves on space and weight and is a key advantage for the compact and mid-range classes."




**5 to 6**
**grams of $CO_2$**
can be saved per kilometre thanks to the battery module solutions from HELLA, helping to meet the ever more challenging emissions targets in a short space of time.

HELLA's second solution is the PowerPack 48 Volt, which has been designed for vehicles with higher power ratings. The system combines a 48 volt lithium-ion battery pack with intelligent battery management plus DC-DC converter. The PowerPack is integrated as an additional unit to the existing 12 volt battery, while the converter regulates the exchange of energy. Alongside functions such as recuperation and coasting, it enables further comfort functions to be realised for the luxury class, such as ambient lighting, automatic climate control and active chassis control. "These two product solutions are allowing us to address all relevant vehicle segments," emphasises Guido Schütte. "Here too, HELLA is making a significant contribution to clean mobility."



**Felix Schmauch**

The mechanical engineering graduate began his career at HELLA in 2004 as a quality engineer for lighting electronics. After holding a number of positions within the Company, he has been Program Management Director since 2018 and is responsible for the development of the new Dual Voltage Battery Management System in the field of energy management.

> **A major advantage here at HELLA is that we have been focusing on the areas of electrification and energy management for a long time, and can therefore call on many years of experience.**
>
> *Felix Schmauch*

PIONEERING ROLE THANKS TO EARLY INVOLVEMENT IN THE MARKET

"A major advantage here at HELLA is that we have been focusing on the areas of electrification and energy management for a long time," says Schmauch. "We have been actively involved in these areas from the start of the 2000s and are way ahead of many competitors in terms of the experience we have acquired."

An important impulse back then came from a major customer. The manufacturer was looking for a technology that would enable the condition and availability of the standard 12 volt battery to be checked in real time. HELLA developed a component which could measure temperature, charge state and other parameters and then convert the values into a continuous condition description. In 2003, the world's first intelligent battery sensor was ready for series production, followed four years later by the first voltage transformer. Its purpose was to stabilise the vehicle electrical system when using the start/stop function. The fact that the engine turned on and off electronically when the vehicle was stationary, for example at traffic lights, occasionally impaired the rest of the vehicle electrical system. Thanks to the stabiliser from HELLA, this no longer happened. Today, HELLA is the market leader in both product groups.

"Over the years, we have established a unique position for ourselves in the field of energy management," says Guido Schütte. This experience in battery and power electronics can now also be incorporated into the two new power solutions. Series production of the Dual Voltage Battery Management System and the PowerPack 48 Volt is expected to commence in 2023.

# A comprehensive network

**TO SHAPE THE ELECTROMOBILITY** of tomorrow you need a strong team. That is why HELLA recruits the best brains from across the world. Five employees from the global HELLA network tell us about the personal contribution that they are making.

## The man looking into the future of battery management: **Daniel Brieske**

PhD student Daniel Brieske, who is based at HELLA's electronic laboratory, has already started researching the battery management systems of the future.

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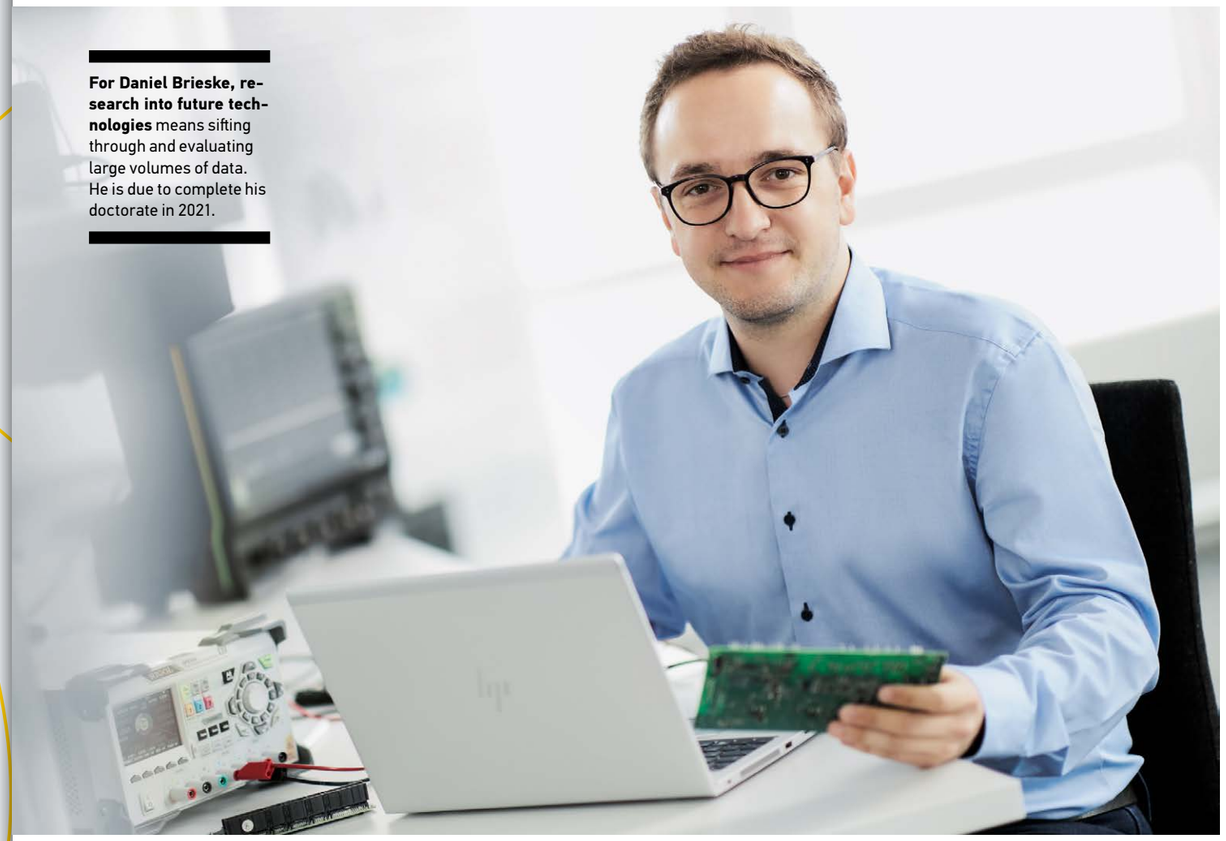
**Over the next few years, which battery technologies** will be replacing the lead-acid and lithium ion technologies that are currently still being used in vehicles today? And how will we need to adapt and develop our battery management systems to meet the demands of these new technologies? These are the sorts of questions that have been occupying me since I started working on my doctoral thesis back in July 2018

**360°**
ELECTRIFICATION

For almost 20 years HELLA has been making driving more efficient with its innovative solutions. To further strengthen its position in the **area of e-mobility**, HELLA is assembling a powerful network of experts across the globe.

**At the electronic laboratory in Lippstadt,** one of the topics being researched by Daniel Brieske is new battery technologies. A new battery test centre is currently being established.



**For Daniel Brieske, research into future technologies** means sifting through and evaluating large volumes of data. He is due to complete his doctorate in 2021.

at the E-LAB – a research facility for vehicle electronics that HELLA runs at its headquarters in Lippstadt in conjunction with various universities based in the region. The scientific partner for my research is RWTH Aachen University.

Among other things, I am carrying out research into lithium-sulphur cells. Potentially, these offer advantages over conventional battery technologies with regard to cost and weight. However, batteries based on lithium-sulphur technology are still so new that there are barely any prototypes around to be able to research their battery management requirements. What's more, the few examples that do exist bear very little similarity to the battery systems that the automotive sector might ultimately end up using.

> **Many vital research projects in the automotive industry are carried out by suppliers.**
>
> *Daniel Brieske*

## ADVANTAGE IN TIME AND KNOWLEDGE

Currently, my primary focus is on studying and assessing current scientific publications that – like my own research – deal with new battery technologies. On the basis of these, I will then devise some initial simulations for evaluating the behaviour of lithium-sulphur batteries. Essentially, it is a question of getting a knowledge head start now and making sure that we are one step ahead once batteries based on lithium-sulphur technology hit the market on a large scale. We are currently in the process of setting up a new battery test centre. As soon as this is ready, I will analyse some specific prototypes and use this as a basis for validating my inferences.

Even while still at school, I was passionate about the technological problems we had to solve during physics lessons. As soon as I got my first car, I knew that I wanted to end up doing something involving energy, engineering and vehicles at some point. That is why I studied Electrical Engineering and Information Technology at TU Dortmund University. As part of my bachelor's thesis, for instance, I developed a stand-alone emergency power supply for the SkyTrain system at Düsseldorf Airport. During my master's degree I specialised in Electrical Power Engineering. I knew that I definitely wanted to undertake my doctorate in conjunction with an industrial partner. Initially, I was thinking of one of the major car manufacturers. But, at the end of the day, many important research projects are carried out by automotive suppliers as well. It was then that I saw a post advertised by HELLA that was exactly what I had in mind.

While working on my doctorate at the E-LAB, I also get the chance to oversee student employees and other people's theses, and to swap ideas with other PhD students. Even though we are all tackling completely different topics, surprising points of intersection often emerge that are of benefit to all of us. Thanks to the flexibility I enjoy at HELLA, I am also able to interact with academics and other PhD students based at RWTH Aachen University whenever I want.

I am due to complete my doctorate in 2021. Lithium-sulphur batteries are unlikely to have arrived by then. However, we will certainly have discovered what the requirements will be for their battery management systems.

# The woman shaping electromobility in China: **Dr. May Deng**

China is currently strongly advancing the electrification of mobility. At the development centre in Nanjing, Dr. May Deng sees to it that HELLA offers solutions that are precisely developed for the requirements of the Chinese market.

**2**

**I have been working at HELLA since August 2017**, and head up the Energy Management Department at our Nanjing site. This is home to around 400 employees and HELLA's largest technology centre in China. Here, more than 85 of my colleagues are dedicated purely to the energy management business. Together, we work on a variety of areas, including high voltage battery management systems, 48V DC-DC converters, Dual Voltage Battery Management System and PowerPack 48 Volt as well as other key components for e-mobility, which enhance the driving experience and contribute to energy savings and emission reduction. The main focus is on the product solutions that we develop specifically for the Chinese market, with German quality and Chinese speed. In total, we are working on more than 35 projects for at least 20 customers.

Before joining HELLA, I worked as an R&D leader in the area of industrial automation control. As time went on, I became more and more fascinated by the automotive sector. One of the things that impressed me the most was the rapid growth experienced by the Chinese automotive industry over the past few years. Although this has seen a slowdown recently, China is increasingly becoming a technological pioneer. Many product innovations now originate from here. Another peculiarity of the Chinese market is that the quantities involved and the model diversity are higher than in other markets. Even the demand for fully electric vehicles is significantly greater here than in many other countries.

> **Watching the rapid growth of the Chinese market was truly impressive.**
>
> *Dr. May Deng*

I regard that, first and foremost, as a challenge. And that's why the first thing I did on joining HELLA was to visit all our customers and co-operation partners so that I could get a better handle on the specific requirements and the competitive situation. By remaining in close contact with our customers all the time, we are able to channel our development activities in the right direction more quickly and in a more focused way. For a market that is growing and changing as rapidly as China, that is a crucial factor for success.

## The man developing complex components: **Scott Bauer**

The hardware developer, who is based at the Northville site, is getting the new generation of charging converters ready for series production.

**3**

**The product that is keeping me busy is the On-Board Charger (OBC).** It serves as the interface between the AC power grid and the traction battery of the vehicle. My team is developing the OBC using new wide bandgap semiconductor devices. They provide performance far beyond that of previous silicon switches. An OBC with these new semiconductor materials can be smaller and lighter, while simultaneously providing higher output power as well as reduced charging times with increased power conversion efficiency. This way the On-Board Charger can be integrated into vehicles with less package space without compromising on performance. This is particularly relevant when it comes to compact electric vehicles.

A major challenge for us is: Every customer has different requirements, for example due to different vehicle architectures. Therefore, we need to adapt the design of our on-board chargers quickly and be flexible to meet the needs of our customers. The OBC is compatible with a wide range of vehicle battery voltages and AC power configurations.

Although the charging process of a battery may not appear to be too difficult at the first sight, the inner workings of the OBC are very complex. The OBC incorporates many custom-designed electrical components, very complex software control algorithms, and even includes issues of cybersecurity. After all, electrical safety is our major concern.

From an overall technological perspective, the On-Board Charger is the most complex project that I have ever been involved with during my nine years at HELLA. The On-Board Charger should be ready for series production around 2024. We cannot afford to waste any time because vehicle electrification is noticeably picking up pace and creating lots of new competitors. Those who stand still will not stand a chance.

> **The On-Board Chargers that we are working on are the most complex components that I have ever been involved with during my nine years at HELLA.**
>
> *Scott Bauer*

## The woman ensuring that the highest standards are upheld: **Alina Popovici**

The products that are manufactured in Ghiroda include components for vehicle energy management. Alina Popovici is responsible for quality at the plant.

**4**

**The products we manufacture in the Romanian town of Ghiroda include components for vehicle energy management**, such as various types of voltage converters. These ensure that the numerous electronic components inside a vehicle always receive the appropriate supply voltage. I joined HELLA straight after university in 2006. At that time, the plant in Ghiroda was only a year old, but it has grown continuously ever since. Today, there are around 1400 employees based here.

Given the continuous increase in demand for energy management solutions that is expected to intensify even more, we have established a dedicated department for this product area at the plant. This meant coming up with brand-new processes and quality controls so that we were in a position to produce larger quantities. Within this context, we are now reaping the benefits of the energy management expertise that we have built up via the HELLA global network over a long period of time. Another very important point is that we are always able to respond to customer queries in the most flexible way possible. This also includes the responsibility to always deliver the best quality even under increasing pressure.

> **To meet increasing demand, we had to create brand-new processes and quality controls so that we were well positioned to produce larger quantities.**
>
> *Alina Popovici*

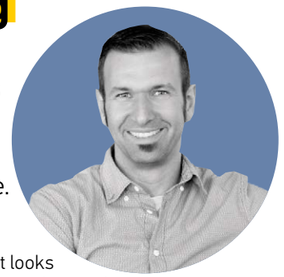
But that's why my job is so fantastic and yet so challenging at the same time: the fact that every working day is different. As the person in charge of quality at our electronics plant in Ghiroda, I have to keep certain routine appointments. That goes without saying. But if we suddenly receive an enquiry from a customer who needs our support or if a particular problem arises, we often have to respond and take action right away. Therefore, we are always prepared to implement the quality standards that our customers have come to expect from us in the shortest time possible.

Originally, I studied Electrical Engineering and Telecommunications. When I started out at HELLA, I was initially responsible for automatic optical testing. In 2009, I transferred across to Quality Management. This resulted in lots of direct contact with customers – which was a welcome and interesting addition to what I had been doing before. Since 2015, I have been in charge of quality throughout the entire plant, from products and processes right through to services.



## The man whose team is driving software development forwards: **Christian Jung**

Battery management systems demand appropriate software. Christian Jung and his team at HELLA Aglaia are making sure that digital control of battery management systems is as innovative and efficient as possible.



**5**

**It was the allure of helping to create something really big** that led me to HELLA Aglaia in Berlin in 2013. This location is the hotbed of the company's software development activities. Numerous components with a major role in electromobility are developed here alongside software for visual sensor systems. Just like everywhere else, virtually nothing here works without the appropriate software. For example, we develop complex algorithms that are necessary for monitoring the cells and controlling the high-voltage contactors, taking into account process and safety-relevant aspects.

To do this, we need strong teams and talented people. As a team leader for software development in the area of battery management systems at HELLA Aglaia, I have been at practically every job interview to ensure we are recruiting the right people for our organisation. It looks like we are succeeding: with our solid team spirit and talented workers, we have managed to impress our first customers – by supplying them with tailored software solutions in record time and getting these customers fit and ready for series production. We can now cater for every stage of electrification, from micro and mild hybrid technology right through to high-voltage applications.

My personal background is that I studied Electrical Engineering, then I worked as a software developer for a long time. Now I bring in my experience in the electromobility industry with a lot of pleasure in organizing and planning as a group leader. The greatest challenge for us is the speed at which the entire sector is currently changing. We are not only actively shaping this transformation, but also always want to be one step ahead of it. That makes it all the more important to develop innovative ideas and to find ideal solutions for our customers. That is what spurs us on day after day.

> **We are not only shaping the transformation of the automotive industry, we intend to remain one step ahead of it at all times.**
>
> *Christian Jung*